Workload Scheduler
Version 8.6

Administration Guide

IBM

SC23-9113-03

Workload Scheduler
Version 8.6

Administration Guide

SC23-9113-03

Note

Before using this information and the product it supports, read the information in Notices.

This edition applies to version 8, release 6 of IBM Tivoli Workload Scheduler (program number 5698-WSH) and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces SC23-9113-02

Contents

List of figures vii

List of tables ix

About this publication xi

What is new in this release xi
What is new in this publication xi
Who should read this publication xi
Publications xii
Accessibility xii
Tivoli technical training xii
Support information xii

Chapter 1. Getting started with administration 1

Where products and components are installed . . . 1
  Tivoli Workload Automation 1
  Tivoli Workload Automation instance 1
  Installation paths 2
  Finding out what has been installed in which Tivoli Workload Automation instances 4

Chapter 2. Customizing and configuring Tivoli Workload Scheduler 7

Setting global options 7
  optman 7
  Global options - summary 9
  Global options - detailed description 13
Setting local options 23
  Localopts summary. 24
  Localopts details. 26
  Local options file example 38
Setting user options 41
  Sample useropts file 42
  Multiple product instances 42
Configuring the Tivoli Workload Scheduler agent. . 43
  Configuring log message properties [JobManager.Logging.cclog] 43
  Configuring trace properties [JobManager.Logging.cclog] 44
  Configuring common launchers properties [Launchers] 45
  Configuring properties of the native job launcher [NativeJobLauncher] 46
  Configuring properties of the Java job launcher [JavaJobLauncher] 47
  Configuring properties of the Resource advisor agent [ResourceAdvisorAgent] 47
  Configuring properties of the System scanner [SystemScanner] 49
Configuring the dynamic workload broker server on the master domain manager and dynamic domain manager 49
| Maintaining the dynamic workload broker server on the master domain manager and dynamic domain manager 50
| Enabling unsecure communication with the dynamic workload broker server 51
  ResourceAdvisorConfig.properties file 52
  JobDispatcherConfig.properties file 54
| BrokerWorkstation.properties file 56
  Archiving job data 57
  Configuring to schedule J2EE jobs 59
| Configuring to schedule job types with advanced options 66
  Configuring security roles for users and groups 67
Configuring command-line client access authentication 70
  Connection parameters 71
  Entering passwords. 73
Tivoli Workload Scheduler console messages and prompts 73
  Setting sysloglocal on UNIX 74
  console command 74
Enabling the time zone feature 75
Configuring to use the report commands 75
Modifying jobmon service rights for Windows. . . 75

Chapter 3. Configuring the Dynamic Workload Console 77

Launching in context with the Dynamic Workload Console. 77
  Scenarios 77
  Advanced optional parameters 79
| Configuring access to the Dynamic Workload Console. 83
| Configuring a user registry 83
| Configuring the Dynamic Workload Console to use the local OS authentication method 83
| Configuring roles to access the Dynamic Workload Console 84
Configuring Dynamic Workload Console to use Single Sign-On 87
  LTPA token-keys. 88
Configuring the use of Lightweight Third-Party Authentication 88
  Configuring to use the same LTPA token_keys. . 89
  Disabling the automatic generation of LTPA token_keys 91
Configuring Dynamic Workload Console to use SSL 92
| Customizing Dynamic Workload Console (Advanced configuration). 92
| Customizing your global settings 92
| Managing Dynamic Workload Console settings repository 97
Configuring Dynamic Workload Console to view reports 97
  Configuring for a DB2 database 97

Configuring for an Oracle database 98
Preventing a connection to specific Tivoli Workload Scheduler Version 8.3 engines 99

Chapter 4. Configuring user authorization (Security file) 101

Security management overview 101
Getting started 102
Updating the security file 102
dumpsec 103
makesec 104
Centralized security management 105
Centralized security usage notes 106
Configuring the security file 106
Security file syntax 107
Specifying user attributes 108
Specifying object types 113
Specifying object attributes 114
Specifying access 119
The *TWS_user* - special security file considerations 133
Sample security file 133
TWS_users and root users logged in on the master domain manager 133
TWS_users and root users logged in on any domain manager (other than the master) . . . 134
TWS_users and root users logged in on any workstation other than any domain manager . . 134
Users logged into the *sys* group on the master domain manager 135
Users logged into the *sys* group on any workstation other than the master domain manager 136
Users logged into the *mis* group on any workstation 136
| Users logged in to multiple groups [continue
| keyword]. 137
All other users logged in on any workstation 138

Chapter 5. Configuring authentication 139

Where to configure authentication 139
Available configurations. 140
How to configure authentication 140
A typical configuration scenario 141
Rules for using a Federated User Registry with Tivoli Workload Scheduler 141
Configuring authentication using the Integrated Solutions Console 142
Configuring authentication using the WebSphere Application Server tools 143
Security properties: reference 144
ChangeSecurityProperties - output 153
Completing the configuration 154
1. Create users and groups 154
2. Update the Tivoli Workload Scheduler security file 154
3. Update associated WebSphere Application Server properties 154
4. Propagate the changes 155
Example configurations of LDAP servers 155
Using the Pluggable Authentication Module . . . 157

Chapter 6. Network administration 159

Network overview 159
Network definitions 160
Network communications 160
Network links 161
Network operation 162
Network processes 163
Optimizing the network 166
Data volumes 167
Connectivity. 167
Planning space for queues 168
Tuning mailman servers. 174
Netman configuration file 175
Determining internal Symphony table size. . . . 176
Extended agents 176
UNIX extended agents 177
IP address validation 179
Support for Internet Protocol version 6 179
Operating system configuration (UNIX only) 180
IP address validation messages 180
Impact of network changes 181

Chapter 7. Setting connection security 183

Connection security overview 183
Using SSL for netman and conman 183
Setting up private keys and certificates 184
Creating Your Own Certification Authority . . 185
Creating private keys and certificates 186
Configuring SSL attributes 187
Configuring the SSL connection protocol for the network 188
Configuring full SSL security 189
Interface communication 192
Overview. 192
Customizing the connector configuration files 194
Changing a server key 195
Customizing the SSL connection for the Dynamic Workload Console 196
| Customizing the SSL connection to the master
| domain manager and dynamic domain manager 197
Customizing the SSL connection for a command-line client 199
Working across firewalls. 200
| Configuring Tivoli Workload Scheduler to use
| LDAP 201
FIPS compliance 201
FIPS overview 202
Using FIPS certificates 202
Configuring SSL to be FIPS-compliant 206
Configuring DB2 for FIPS 209
Using Dynamic Workload Console and FIPS . . 214
Configuring dynamic workload broker for FIPS 215
Configuring batch reports for FIPS 215
Configuring LDAP for FIPS 216
Finding the GSKit version on agents running on UNIX and Linux operating systems 216

Chapter 8. Data maintenance. 217

Maintaining the database 217
Backing up and restoring 217
Reorganizing the database 219
Maintaining the file system. 220
Avoiding full file systems 220
Log files and archived files 223
Temporary files. 225
Managing event message queue file sizes . . . 225
Administrative tasks - DB2 225
Changing DB2 passwords 225
Locating the DB2 tools 225
User permissions for running the DB2 tools . . 226
Administering the DB2 maintenance feature . . 226
Reorganizing the DB2 database 228
Monitoring the lock list memory 229
Administrative tasks - Oracle 231
Changing the Oracle access password 232
Locating the Oracle tools 232
Maintaining the Oracle database 232
Obtaining information about the Tivoli Workload Scheduler databases installed on an Oracle instance 232
User permissions for running the Oracle tools 233
Migrating data from DB2 to Oracle and *vice versa* 233
Parallel data migration from DB2 to Oracle . . 234
Parallel data migration from Oracle to DB2 . . 235
Reconfiguration from DB2 to Oracle. 237
Reconfiguration from Oracle to DB2. 242
Upgrading your database 247
| Auditing facilities 248
| Database and plan audit. 248
| Dynamic workload scheduling audit 254
| Keeping track of database changes using audit reports 263

Chapter 9. Administrative tasks . . . 267
| Changing a domain manager or dynamic domain manager 269
| Choosing a backup domain manager or backup dynamic domain manager 269
| Setting up a backup domain manager 269
| Network security 269
| Switching a domain manager 270
| Switching a dynamic domain manager 270
Changing a master domain manager 270
Choosing a workstation for backup master domain manager 270
Setting up a backup master domain manager 271
Copying files to use on the backup master domain manager 271
Switching a master domain manager 272
Extended loss or permanent change of master domain manager 272
| Switching a master domain manager or dynamic domain manager 273
Changing key Tivoli Workload Scheduler passwords 274
Determining the role of the user whose password has changed 276
Determining the actions to take 277
Action 1 - change the WebSphere Application Server user ID password 278
Action 2 - change password used by command-line clients to access the master domain manager 279
Action 3 - change password used by fault-tolerant agent systems to access the master domain manager (for conman) 279
Action 4 - update the engine connection parameters in the GUIs 280
Action 5 - change the j2c user ID password . . 280
Action 6 - update SOAP properties 281
Action 7 - Windows - update Windows services 281
Action 8 - change the Tivoli Workload Scheduler Windows user definition 281
Using the changePassword script. 282
Unlinking and stopping Tivoli Workload Scheduler 283
Changing the database host name, port, or database name 285
Change the DB2 host name, port, or database name 285
Changing the Oracle host name, port, or database name 291
| Changing the workstation host name or IP address 291
| Reporting the changes in the WebSphere Application Server configuration file 292
| Reporting the changed host name or IP address of the workstation where you installed the RDBMS 293
| Reporting the changed host name or IP address in the workstation definition 294
| Reporting the changed host name or IP address of the dynamic workload broker server. . . . 295
| Reporting the changed host name or IP address of the dynamic agent. 296
Changing the security settings. 296
Managing the event processor 297
Starting, stopping, and displaying dynamic workload broker status 298
| Automatically initializing Tivoli Workload Scheduler instances 299
Application server tasks 300
Application server - starting and stopping. . . 300
Application server - automatic restart after failure 301
Application server - encrypting the profile properties files 305
Application server - updating the Windows services after modifications 305
Application server - updating the SOAP properties after changing the WebSphere Application Server user or its password . . . 306
Application server - configuration files backup and restore 307
Application server - changing the host name or TCP/IP ports 308
Application server - changing the trace properties 311
WebSphere Application Server tools - reference 312

Chapter 10. Performance 317

Network traffic 317
Tracing 317
Logging 318
Maintaining the database 318
Symphony file sizing 318
Tuning a UNIX domain manager to handle large numbers of fault-tolerant agents 318
Tuning job processing on a workstation 318
Tuning the database 319
Tuning the embedded WebSphere Application Server 319
  Inadequate Java heap size 320
Too many manual job submissions 320
Too many file dependency checks 320
Workload spreading 320
Improving job-processing performance 320
Mailbox caching - advantages and disadvantages 321
Setting the synch level parameter. 322
The fault-tolerant switch manager - impact on performance. 322
  Network Traffic 323
  Disk Space 323
Scalability 323
  Impact on `JnextPlan` 323
  Impact on reporting 324
  Impact on event rule deployment 324
  Increasing application server heap size 324
  Increasing maximum DB2 log capacity 325
Multiple Dynamic Workload Console production plan reports 328
Dynamic Workload Console - adjusting session timeout settings 329

Chapter 11. Availability 331
Resolving Windows user ID account 331
Using a temporary directory on UNIX 331

Notices 333
Trademarks 334

Index 337

List of figures

1. List of tasks 82
2. Tivoli Workload Scheduler network domain structure 159
3. Symphony file synchronization 163
4. Process creation on domain manager and fault-tolerant agent. 164
5. Typical Tivoli Workload Scheduler network flows. 168
6. SSL server and client keys 193

List of tables

1. Workload service assurance feature 9
2. Event-driven workload automation feature - general 10
3. Event-driven workload automation feature - event mailing 10
4. SSL 10
5. Job management 11
6. Job stream management 11
7. Stageman 11
8. Planman 11
9. Logging and auditing 12
| 10. Cross dependencies 12
11. General 12
12. Valid encryption cipher classes 29
13. JOA_JOB_ARCHIVES database table 58
14. JRA_JOB_RESOURCE_ARCHIVES database table 58
15. MEA_METRIC_ARCHIVES database table 59
16. Job statuses in the historical tables 59
17. J2EEJobExecutorConfig.properties file keywords 60
| 18. Configuration files for job types with advanced options 66
19. Default port numbers 78
20. Product versions and default server names 90
| 21. Syntax for special characters 95
| 22. Variables used in the URL definition 95
23. Object attribute types for each object type 115
24. Access keywords for composer actions 121
25. Actions - access keywords 122
26. Calendar - additional access keywords 123
27. Cpus - additional access keywords 124
28. Events - access keywords 125
29. Files - access keywords 125
30. Jobs - additional access keywords 126
31. Parameters - additional access keywords 129
32. Prompts - additional access keywords 129
33. Files- access keywords 130
34. Resources - additional access keywords 130
35. Job streams - additional access keywords 131
36. Users - additional access keywords 131
37. Variable tables - access keywords 132
38. Critical flow errors. 169
39. Queue sizing conditions. 170
40. Example for the ge operator 171
41. Example for the le operator 172
42. Calculation of internal Symphony table 176
43. Files for Local Options 187
44. Type of communication depending on the securitylevel value 188
45. Changes allowed in Tivoli Workload Scheduler key and trust stores 194
46. Algorithm for calculating the approximate size of the plan data in the Symphony file . . 220
47. Algorithm for calculating the approximate size of the database data in the Symphony file 221
48. Example for the ge operator 222
49. Example for the le operator 222
50. Log and trace file maintenance. 223
| 51. Auditable event properties 256
| 52. Elements in Action type 257
| 53. Elements in ObjectInfoList type 257
| 54. Elements in ObjectInfo type. 257
| 55. Elements in Outcome type 258
| 56. Elements in UserInfoList type 259
| 57. Elements in UserInfo type 259
58. If and where password changes are required 275
59. Values of `activeUserRegistry` to check 276
60. Password change actions. 277
61. Options for tuning job processing on a workstation 319

About this publication

IBM® Tivoli® Workload Scheduler: Administration provides information about the administration of the main components of IBM Tivoli Workload Scheduler (often called the *engine*).

What is new in this release

For information about the new or changed functions in this release, see *Tivoli Workload Automation: Overview*.

For information about the APARs that this release addresses, see the Tivoli Workload Scheduler Download Document at http://www.ibm.com/support/docview.wss?rs=672&uid=swg24027501, and Dynamic Workload Console Download Document at http://www.ibm.com/support/docview.wss?rs=672&uid=swg24029125.

What is new in this publication

The following sections have been added or modified since version 8.5.1:
- “Rules for using a Federated User Registry with Tivoli Workload Scheduler” on page 141
- “Configuring the dynamic workload broker server on the master domain manager and dynamic domain manager” on page 49
- “Configuring to schedule job types with advanced options” on page 66
- “Configuring access to the Dynamic Workload Console” on page 83
- “Auditing facilities” on page 248
- “Changing a domain manager or dynamic domain manager” on page 269.
- “Changing the workstation host name or IP address” on page 291

For more information about the new or changed functions in this release, see *Tivoli Workload Automation: Overview*.

Changed or added text with respect to the previous version is marked by a vertical bar in the left margin.

Who should read this publication

This publication provides information about the day-to-day administration of the product, and is aimed at the IT administrator or Tivoli Workload Scheduler IT administrator whose job it is to ensure that the product runs smoothly and correctly. This person will find information about making routine changes to the configuration, for example to add a user, and information about periodic procedures that ensure the integrity of the product, such as backups.

The reader of this book should be an expert systems programmer, who has a reasonable understanding of the Tivoli Workload Scheduler infrastructure and its inter-component interactions.

Publications

Full details of Tivoli Workload Automation publications can be found in *Tivoli Workload Automation: Publications*. This document also contains information about the conventions used in the publications.

A glossary of terms used in the product can be found in *Tivoli Workload Automation: Glossary*.

Both of these are in the Information Center as separate publications.

Accessibility

Accessibility features help users with a physical disability, such as restricted mobility or limited vision, to use software products successfully. With this product, you can use assistive technologies to hear and navigate the interface. You can also use the keyboard instead of the mouse to operate all features of the graphical user interface.

For full information with respect to the Dynamic Workload Console, see the Accessibility Appendix in the *Tivoli Workload Scheduler: User's Guide and Reference, SC32-1274*.

Tivoli technical training

For Tivoli technical training information, refer to the following IBM Tivoli Education website:

http://www.ibm.com/software/tivoli/education

Support information

If you have a problem with your IBM software, you want to resolve it quickly. IBM provides the following ways for you to obtain the support you need:

Online
: Go to the IBM Software Support site at http://www.ibm.com/software/support/probsub.html and follow the instructions.

IBM Support Assistant
: The IBM Support Assistant (ISA) is a free local software serviceability workbench that helps you resolve questions and problems with IBM software products. The ISA provides quick access to support-related information and serviceability tools for problem determination. To install the ISA software, go to http://www.ibm.com/software/support/isa.

Troubleshooting Guide
: For more information about resolving problems, see the problem determination information for this product.

For more information about these three ways of resolving problems, see the appendix on support information in *Tivoli Workload Scheduler: Troubleshooting Guide, SC32-1275*.

Chapter 1. Getting started with administration

This publication describes how to perform administrative tasks on Tivoli Workload Scheduler and Dynamic Workload Console. Many of the procedures described in it require you to identify a file in the installation path of the product and its components. However, these files might be in different installation paths for different components or on different systems, as described in “Where products and components are installed.”

Where products and components are installed

This section commences by briefly introducing Tivoli Workload Automation and explaining how this concept impacts the installed structure of Tivoli Workload Scheduler.

Tivoli Workload Automation

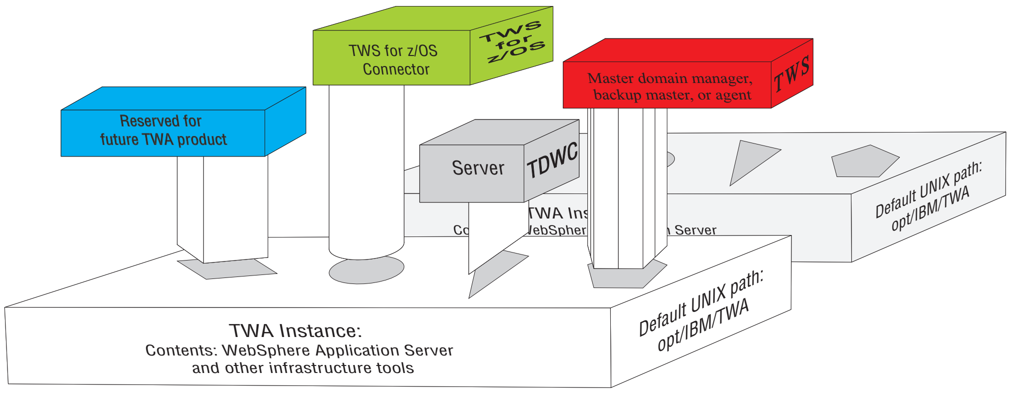
Tivoli Workload Automation is the name of a family of products and components, which includes the following:

- Tivoli Workload Scheduler
- Tivoli Workload Scheduler for z/OS®
- Tivoli Workload Scheduler for Applications
- Dynamic Workload Console
- Tivoli Workload Scheduler for Virtualized Data Centres
- Tivoli Workload Scheduler LoadLeveler®

Many Tivoli Workload Scheduler components are installed in what is called a *Tivoli Workload Automation instance*.

Tivoli Workload Automation instance

What is a Tivoli Workload Automation instance? You need to know the answer to this question to understand how multiple products and components are installed on the same system. The Tivoli Workload Automation products and components use the embedded WebSphere® Application Server as the communication infrastructure. To make the most efficient use of the WebSphere Application Server, several products and components can be installed together, using one instance of WebSphere Application Server, in a "Tivoli Workload Automation instance".


TWS for z/OS Connector
TWS for z/OS
Master domain manager, backup master, or agent
TWS
Reserved for future TWA product
Server
TDWC
Default UNIX path: opt/IBM/TWA
TWA Instance:
Contents: WebSphere Application Server and other infrastructure tools
Default UNIX path: opt/IBM/TWA

This image shows two instances of Tivoli Workload Automation. A component of Tivoli Workload Scheduler, the Tivoli Workload Scheduler for z/OS Connector, and the Dynamic Workload Console are shown ready to be plugged in to the Tivoli Workload Automation instance. Each "Tivoli Workload Automation instance" contains an instance of the embedded WebSphere Application Server.

One instance of the following can be plugged in (installed into) a Tivoli Workload Automation instance:

- Any one of the following components of Tivoli Workload Scheduler: master domain manager, backup master domain manager, or agent
- Dynamic Workload Console
- Tivoli Workload Scheduler for z/OS connector

You can have any number of Tivoli Workload Automation instances on the same system, to contain the products and components you want to install on it. Any other components of Tivoli Workload Scheduler, such as the command line client, are installed outside the Tivoli Workload Automation instance because they do not currently use the embedded WebSphere Application Server.

Installation paths

This section describes the installation paths of the Tivoli Workload Scheduler components:

TWA_home installation path

As described above, many of the components are installed in a Tivoli Workload Automation instance. Although this is a notional structure it is represented on the computer where you install Tivoli Workload Automation components by a common directory referred to in the documentation as *TWA_home*. The path of this directory is determined when you install a Tivoli Workload Scheduler component for the first time on a computer. You have the opportunity to choose the path when you make that first-time installation, but if you accept the default path, it is as follows:

Linux `/opt/IBM/TWA<n>`

UNIX `/opt/ibm/TWA<n>`

Windows
`C:\Program Files\IBM\TWA<n>`

where <n> is an integer value ranging from <null> for the first instance installed, 1 for the second, and so on.

This path is called, in the publications, *TWA_home*

Tivoli Workload Scheduler installation path

You can install more than one Tivoli Workload Scheduler component (master domain manager, backup master domain manager, domain manager, or backup domain manager) on a system, but each is installed in a separate instance of .Tivoli Workload Automation, as described above.

The installation path of Tivoli Workload Scheduler is:

TWA_home`/TWS`

Tivoli Workload Scheduler agent installation path

The agent also uses the same default path structure, but has its own separate installation directory:

TWA_home/TWS/ITA/cpa

Note: The agent also installs some files outside this path. If you have to share, map, or copy the agent files (for example when configuring support for clustering) share, map, or copy these files, as well:

UNIX and Linux operating systems

```
/etc/teb/teb_tws_cpa_agent_<TWS_user>.ini
/opt/IBM/CAP/EMICPA_default.xml
/etc/init.d/tebctl-tws_cpa_agent_<TWS_user>
   (on Linux and Solaris)
/etc/rc.d/init.d/tebctl-tws_cpa_agent_<TWS_user>
   (on AIX)
/sbin/init.d/tebctl-tws_cpa_agent_<TWS_user>
   (on HP-UX)
```

Windows operating systems

```
%windir%\teb\teb_tws_cpa_agent_&lt;tws_user>.ini
%ALLUSERSPROFILE%\Application Data\ibm\CAP\EMICPA_default.xml
```

The agent uses two configuration files which you might need to modify:

JobManager.ini
This file contains the parameters that tell the agent how to run jobs. You should only change the parameters if advised to do so in the Tivoli Workload Scheduler documentation or requested to do so by IBM Software Support. Its path is:

TWA_home/TWS/ITA/cpa/config/JobManager.ini

ita.ini This file contains parameters which determine how the agent behaves. Changing these parameters may compromise the agent functionality and require it to be reinstalled. You should only change the parameters if advised to do so in the Tivoli Workload Scheduler documentation or requested to do so by IBM Software Support. Its path is:

TWA_home/TWS/ITA/cpa/ita/ita.ini

Installation path for files giving the dynamic scheduling capability
The files that give the dynamic scheduling capability are installed in the following path:

TWA_home/TDWB

Dynamic Workload Console installation path
The Dynamic Workload Console can be installed in more than one path:

- It can be installed alongside Tivoli Workload Scheduler or alone in a *Tivoli Workload Automation instance* using the embedded version of WebSphere Application Server. In this case its path is:

  TWA_home/TDWC
- It can be installed on your own external instance of WebSphere Application Server. In this case its path depends on where your instance of WebSphere Application Server is installed (except for the uninstaller, which is installed in a path of your choice). The administrative procedures in this publication do not address problems that occur with the external version of WebSphere Application Server.

  If you are using the Dynamic Workload Console on an external version of WebSphere Application Server, and an administrative procedure refers to the path *TWA_home*/TDWC, substitute it with the installation path of the Dynamic Workload Console on your external version of WebSphere Application Server

The embedded WebSphere Application Server installation path
The embedded WebSphere Application Server is automatically installed when you create a new *Tivoli Workload Automation instance*. Its installation path is:

TWA_home/eWAS

The command line client installation path
The command line client is installed outside all *Tivoli Workload Automation instances*. Its default path is:

UNIX /opt/ibm/TWS/CLI

Windows
C:\Program Files\IBM\TWS\CLI

The application server tools installation path
Because the embedded WebSphere Application Server is not supplied with an administration GUI, many of its administration tasks are performed by running tools supplied with Tivoli Workload Scheduler, that perform the required configuration changes. These tools are known as the *wastools*, and are installed in:

TWA_home/wastools

However, the information above supplies only the *default* paths. To determine the actual paths of products and components installed in Tivoli Workload Automation instances, see "Finding out what has been installed in which Tivoli Workload Automation instances"

Finding out what has been installed in which Tivoli Workload Automation instances

If you are not the installer of Tivoli Workload Scheduler and its components, you might not know what components have been installed, and in which instances of Tivoli Workload Automation. Follow this procedure to find out:

1. Access the following directory:

   UNIX and Linux operating systems
   /etc/TWA

   Windows operating systems
   %windir%\TWA
2. List the contents of the directory. Each Tivoli Workload Automation instance is represented by a file called: twainstance<*instance_number*>.TWA.properties. These files are deleted when all the products or components in an instance are uninstalled, so the number of files present indicates the number of valid instances currently in use.
3. Open a file in a text viewer.

   Attention: Do not edit the contents of this file, unless directed to do so by IBM Software Support. Doing so might invalidate your Tivoli Workload Scheduler environment.

   The contents are similar to this:

```
#TWAInstance registry
#Mon Nov 24 15:35:02 CET 2008
TWS_version=8.5.0.00
EWas_basePath=C\:/Program Files/IBM/TWA/eWAS
TWS_counter=1
EWas_counter=2
```

```
TWA_path=C\:/Program Files/IBM/TWA
TWS_server_name=twaserver
TDWC_version=8.6.0.0
TWS_instance_type=MDM
EWas_profile_path=C\:/Program Files/IBM/TWA/eWAS/profiles/TIPProfile
EWas_node_name=DefaultNode
TWS_basePath=C\:\\Program Files\\IBM\\TWA\\TWS
EWas_user=twsuser86
EWas_cell_name=DefaultNode
TDWC_EXTERNAL_WAS_KEY=false
EWas_version=7.0.0.15
TDWC_counter=1
EWas_server_name=twaserver
EWas_update_installer_dir=C\:/Program Files/IBM/WebSphere/UpdateInstaller
TDWC_basePath=C\:/Program Files/IBM/TWA/TDWC
TWS_user_name=twsuser86
TWS_FIX_LIST_KEY=
TDWC_FIX_LIST_KEY=
TWA_componentList=TWS,EWas,TDWC
EWas_isc_version_key=7.1.0.06
EWas_profile_name=TIPProfile
EWas_service_name=twsuser85
```

The important keys to interpret in this file are:

TWA_path
This is the base path, to which the installation added one or more of the following directories, depending on what was installed:

TWS Where the Tivoli Workload Scheduler component is installed

TDWC Where the Dynamic Workload Console is installed

eWAS Where the embedded WebSphere Application Server is installed

wastools
Where the tools that you use to configure the embedded WebSphere Application Server are installed

ssm Where the Netcool® SSM monitoring agent is installed (used in event management)

TWA_componentList
Lists the components installed in the instance of Tivoli Workload Automation

TWS_counter
Indicates if a Tivoli Workload Scheduler component is installed in this instance of Tivoli Workload Automation (when the value=1)

TWS_instance_type
Indicates which component of Tivoli Workload Scheduler is installed in this instance:

MDM Master domain manager

BKM Backup master domain manager

DDM dynamic domain manager

BDDM
Backup dynamic domain manager

FTA Fault-tolerant agent or domain manager

TDWC_counter
Indicates if an instance of Dynamic Workload Console is installed in this instance of Tivoli Workload Automation (when the value=1)

EWas_counter
: Indicates how many applications are installed in this instance of Tivoli Workload Automation that access the embedded WebSphere Application Server

TWS_user_name
: The ID of the <*TWS_user*> of the Tivoli Workload Scheduler component.

EWas_user
: The ID of the administration user of the embedded WebSphere Application Server. For a default installation, this is the same as the <*TWS_user*>.

The only component of Tivoli Workload Scheduler which is installed in a Tivoli Workload Automation instance, but which is not explicitly indicated here, is the Connector. To determine if it has been installed, look at the following combinations of keys:

Agent installed with no Connector

```
TWS_counter=1
EWas_counter=
TWS_instance_type=FTA
TDWC_counter=
TWA_componentList=TWS
```

Agent installed with Connector

```
TWS_counter=1
EWas_counter=1
TWS_instance_type=FTA
TDWC_counter=
TWA_componentList=TWS,EWas
```

Agent installed with no Connector and Dynamic Workload Console

```
TWS_counter=1
EWas_counter=1
TWS_instance_type=FTA
TDWC_counter=1
TWA_componentList=TWS,EWas,TDWC
```

Agent installed with Connector and Dynamic Workload Console

```
TWS_counter=1
EWas_counter=2
TWS_instance_type=FTA
TDWC_counter=1
TWA_componentList=TWS,EWas,TDWC
```

Note: The only difference between these last two is that the `EWas_counter` is 2 instead of 1.

Chapter 2. Customizing and configuring Tivoli Workload Scheduler

After installing the product you can customize it to fit your operational requirements. You can also change the customized values at any time. This chapter describes the optional customization steps for Tivoli Workload Scheduler. It is divided into the following sections:

- "Setting global options"
- "Setting local options" on page 23
- "Setting user options" on page 41
- "Configuring the dynamic workload broker server on the master domain manager and dynamic domain manager" on page 49
- "Configuring the Tivoli Workload Scheduler agent" on page 43
- "Configuring command-line client access authentication" on page 70
- "Tivoli Workload Scheduler console messages and prompts" on page 73
- "Enabling the time zone feature" on page 75
- "Configuring to use the report commands" on page 75

Note: For information about automating the production cycle and managing the production environment, see the *User's Guide and Reference*.

Setting global options

Set global options using the **optman** command.

optman

Manages the Tivoli Workload Scheduler global options. You can list, show and change them.

Authorization

You must have the following security permissions for the global options file in the Tivoli Workload Scheduler security file to work with this command:

- For `optman ls` or `optman show`:
  ```
  FILE NAME=GLOBALOPTS ACCESS=DISPLAY
  ```
- For `optman chg`:
  ```
  FILE NAME=GLOBALOPTS ACCESS=MODIFY
  ```

See Chapter 4, "Configuring user authorization (Security file)," on page 101 for more information on the security file.

Syntax

optman [-u | -v]
optman [<*connectionParams*>] chg {<*option*> | <*shortName*>} = <*value*>
optman [<*connectionParams*>] ls
optman [<*connectionParams*>] show {<*option*> | <*shortName*>}

Arguments

<connectionParams>

If you are using **optman** from the master domain manager, the connection parameters were configured at installation and do not need to be supplied, unless you do not want to use the default values.

If you are using **optman** from the command line client on another workstation, the connection parameters might be supplied by one or more of these methods:

- Stored in the `localopts` file
- Stored in the `useropts` file
- Supplied to the command in a parameter file
- Supplied to the command as part of the command string

For full details of the connection parameters see "Configuring command-line client access authentication" on page 70.

chg {*<option>* | *<shortName>*} = *<value>*

Change the value of an option to the new value supplied. The option can either be identified by its full or its short name. See "Global options - summary" on page 9 for a table showing all of the options with their full and short names, value ranges and default values. See "Global options - detailed description" on page 13 for a full description of each option.

ls Lists the current values of all global options.

show {*<option>* | *<shortName>*}

Displays the current value of the indicated option. The option can either be identified by its full or its short name. See "Global options - summary" on page 9 for a table showing all of the options with their full and short names, value ranges and default values. See "Global options - detailed description" on page 13 for a full description of each option.

Comments

Some of the changes are effective immediately, but others require a specific action, such as running **`JnextPlan`**, restarting the WebSphere Application Server. These actions are indicated in the option descriptions. See *Tivoli Workload Scheduler: User's Guide and Reference* for more information on the **`JnextPlan`** command.

Examples

Example 1: list the global options

To list all of the global options, when your connection parameters are supplied via the `localopts` and `useropts` files, give the following command:

```
optman ls
```

Example 2: show the value of a global option

To show the current value of the `enCarryForward` global option, identifying it by its short name, give the following command:

```
optman show cf
```

Example 3: change the value of a global option

To change the current value of the `enCarryForward` global option, identifying it by its full name, give the following command:

```
optman chg enCarryForward no
```

Global options - summary

This section summarizes the global options that are managed by **`optman`**. The columns in the tables have the following meanings:

Description
The brief description of the option

Name The **`option`** as used in the **`optman`** commands.

Short name
The **`shortName`** as used in the **`optman`** commands.

Default
The default value that is applied to the option at installation (if present).

Range The range or choice of values you can supply (where appropriate).

Units The units that apply to the default and range.

Effect How to make any changes effective. The following codes have been used:

E If you are enabling the option, start the Event Processor. If you are disabling the option, stop the Event Processor.

Imm The change is effective immediately

Imm (DB)
The change is effective immediately in the database only.

J Run **`JnextPlan`**.

J (Plan)
Run **`JnextPlan`** - it makes the change effective in the plan only.

NSM The change is effective on the next send mail action.

W Restart the WebSphere Application Server

Global options grouped by feature or function

The following tables summarize the options for managing the features and functions of Tivoli Workload Scheduler:

Table 1. Workload service assurance feature

Description	Name	Short name	Default	Range	Units	Effect
Enable workload service assurance	enWorkloadServiceAssurance	wa	yes	yes, no	boolean	J
Approaching late offset	approachingLateOffset	al	120	>=0	seconds	J or W
Deadline offset	deadlineOffset	do	2	>=0	minutes	J or W
Promotion offset	promotionOffset	po	120	>=0	seconds	J
Enable forecast start time calculation	enForecastStartTime	st	no	yes, no	boolean	imm

Table 2. Event-driven workload automation feature - general

Description	Name	Short name	Default	Range	Units	Effect
Enable event driven workload automation	enEventDrivenWorkloadAutomation	ed	yes	yes, no	boolean	J or E
Rules deployment frequency	deploymentFrequency	df	5	0-60	minutes	Imm
Enable event processor HTTPS protocol	enEventProcessorHttpsProtocol	eh	yes	yes, no	boolean	J
Tivoli event integration facility port	eventProcessorEIFPort	ee	31131	0 - 65535	port number	W and J
Tivoli Enterprise Console® server name	TECServerName	th	localhost		name	J
Tivoli Enterprise Console server port	TECServerPort	tp	5529	0 – 65535	port number	J

Table 3. Event-driven workload automation feature - event mailing

Description	Name	Short name	Default	Range	Units	Effect
Mail sender name	mailSenderName	ms	TWS		name	NSM
SMTP server name	smtpServerName	sn	localhost		name	Imm
SMTP Server port	smtpServerPort	sp	25	0 – 65535	port number	NSM
Mail plug-in uses SMTP authentication	smtpUseAuthentication	ua	no	yes, no	boolean	Imm
SMTP user name	smtpUserName	un	TWS_user		name	Imm
SMTP user password	smtpUserPassword	up				Imm
Mail plug-in uses SSL	smtpUseSSL	us	no	yes, no	boolean	Imm
Mail plug-in uses TLS protocol	smtpUseTLS	tl	no	yes, no	boolean	Imm

Table 4. SSL

Description	Name	Short name	Default	Range	Units	Effect
Enable the SSL full connection	enSSLFullConnection	sf	no	yes, no	boolean	J
Enable strong password encryption	enStrEncrypt	se	no	yes, no	boolean	J

Table 5. Job management

Description	Name	Short name	Default	Range	Units	Effect
Maximum prompts after abend	baseRecPrompt	bp	1000	0 – 65535	prompts	J
Additional prompts after abend	extRecPrompt	xp	1000	0 – 65535	prompts	J
Concurrent access to resources	enExpandedResources	er	no	yes, no	boolean	J
Automatically grant logon as batch	enLogonBatch	lb	no	yes, no	boolean	J
Long duration job threshold	longDurationThreshold	ld	150	100 - 1000	seconds	J or W
User for binding to remote jobs from shadow job	bindUser	bu	TWS_user			Imm

Table 6. Job stream management

Description	Name	Short name	Default	Range	Units	Effect
Job streams without jobs policy	enEmptySchedsAreSucc	es	no	yes, no	boolean	J
Prevent job stream without "at" dependency from starting	enPreventStart	ps	yes	yes, no	boolean	J

Table 7. Stageman

Description	Name	Short name	Default	Range	Units	Effect
Carry job states	carryStates	cs	null		list of states	J
Enable carry forward	enCarryForward	cf	all	all, no	boolean	J
Enable carry forward for internetwork dependencies	enCFinterNetworkDeps	ci	yes	yes, no	boolean	J
Enable carry forward resource quantity	enCFResourceQuantity	rq	yes	yes, no	boolean	J
Retain rerun job name	enRetainNameOnRerunFrom	rr	no	yes, no	boolean	J

Table 8. Planman

Description	Name	Short name	Default	Range	Units	Effect
Maximum preproduction plan length	maxLen	xl	8	8 - 365	days	J
Minimum preproduction plan length	minLen	ml	8	7 - 365	days	J

Table 9. Logging and auditing

Description	Name	Short name	Default	Range	Units	Effect
Log cleanup frequency	logCleanupFrequency	lc	5	0 - 60	minutes	J
Log history period	logHistory	lh	10	>=0	days	J
Logman minimum and maximum run times policy	logmanMinMaxPolicy	lm	both		literal	J
Logman normal run time calculation policy	logmanSmoothPolicy	lt	-1	0 - 100	factor	J
Enable database auditing	enDbAudit	da	0	0, 1	boolean	Imm
Type of store to be used to log database audit records	auditStore	as	file	db, file, both		Imm
Audit history period	auditHistory	ah	180	>=1	days	Imm

Table 10. Cross dependencies

Description	Name	Short name	Default	Range	Units	Effect
Number of days for retrying to send notifications about job status changes to the remote engine if the notification fails	notificationTimeout	nt	5	1-90	Number	Imm

Table 11. General

Description	Name	Short name	Default	Range	Units	Effect
Company name	companyName	cn			name	J
Enable centralized security	enCentSec	ts	no	yes, no	boolean	J
Enable previous job stream ID	enLegacyId	li	no	yes, no	boolean	J
Evaluate start-of-day	enLegacyStartOfDayEvaluation	le	no	yes, no	boolean	J
Enable list security check	enListSecChk	sc	no	yes, no	boolean	J (Plan) Imm (DB)
Enable plan auditing	enPlanAudit	pa	0	0, 1	boolean	J
Enable the fault-tolerant switch manager	enSwfaultTol	sw	no	yes, no	boolean	J
Enable time zones	enTimeZone	tz	yes	yes, no	boolean	J (Plan) Imm (DB)
Ignore calendars	ignoreCals	ic	no	yes, no	boolean	J
Start time of processing day	startOfDay	sd	0600	0000 –2359	hhmm	J

Table 11. General (continued)

Description	Name	Short name	Default	Range	Units	Effect
Job statistics history period	statsHistory	sh	10	>=0	days	J (Plan) Imm (DB)

Global options - detailed description

This section gives full descriptions of the global options managed by **`optman`**:

approachingLateOffset | al

Approaching late offset. Used in workload service assurance. The critical start time of a job in the critical network is the latest time that the job can start without causing the critical job to finish after the deadline. In most cases, a job will start well before the critical start time so that if the job runs longer than its estimated duration, the situation does not immediately become critical. Therefore, if a job has not started and the critical start time is only a few minutes away, the timely completion of the critical job is considered to be potentially at risk.

The *approachingLateOffset* option allows you to determine the length of time before the critical start time of a job in the critical network at which you are to alerted to this potential risk. If a job has still not started the specified number of seconds before the critical start time, the job is added to a hot list that can be viewed on the Dynamic Workload Console.

Note: To qualify for addition to the hot list, all time and follow dependencies must have been resolved.

This option is only active if *enWorkloadServiceAssurance* is set to *yes*.

The default is *120* seconds.

Note: Whatever value you set for this option, if Tivoli Workload Scheduler loses the connection with its database, the default value is applied to critical job processing, and the warning message AWSJCO135W is issued to tell you what has happened.

Run **`JnextPlan`** or restart the WebSphere Application Server (**`stopappserver`** and **`startappserver`**) to make this change effective.

auditHistory | ah

Audit history period. Used in audit management. Enter the number of days for which you want to save audit record data. Audit records are discarded on a FIFO (first-in first-out) basis.

The default value is *180* days. This option takes effect immediately.

auditStore | as

Type of store to be used to log database audit records. Enter one of the following:

file To specify that a flat file in the `TWA_home/TWS/audit/database` directory is used to store the audit records (the default value).

db To specify that the Tivoli Workload Scheduler database itself is used to store the audit records.

both To have audit records logged in both the file and the database.

Any change of this value is effective immediately.

baseRecPrompt | bp
Maximum prompts after abend. Specify the maximum number of prompts that can be displayed to the operator after a job abends.

The default value is *1000*. Run **JnextPlan** to make this change effective.

bindUser | bu
User for binding to remote jobs from shadow job. Specify the user ID that is used to bind a shadow job to a remote job during the security check for "cross dependencies". This user must be given at least the following authorizations in the security file:

- *Display* access to the *job* and *schedule* objects that need to be bound
- *List* access to *job* objects that need to be bound

However, the ID does not need to be in the user registry of the engine, nor have a password, as it is only required for authorization purposes.

The default value is the TWS_user. Any change of this value is effective immediately.

carryStates | cs
Carry job states. A preproduction option that affects the operation of the *stageman* command. Specify the jobs, by state, to be included in job streams that are carried forward. Enclose the job states in parentheses, double quotation marks, or single quotation marks. Commas can be replaced by spaces. The valid internal job states are as follows:

|
abend	*abenp*	*add*	*bound*	*done*	*error*	*exec*
fail	*hold*	*intro*	*pend*	*ready*	*rjob*	*sched*
skel	*succ*	*succp*	*susp*	*wait*	*waitd*	

Some examples of the option are as follows:

```
carryStates="abend,exec,hold,intro"
carryStates='abend,exec,hold,intro'
carryStates="abend, exec, hold, intro"
carryStates='abend, exec, hold, intro'
```

An empty list is entered as follows:

```
carryStates=null
```

The default value is *null*, which corresponds to selecting all states. Run **JnextPlan** to make this change effective.

companyName | cn
Company name. Specify the name of your company. The maximum length is 40 bytes. If the name contains spaces, enclose the name in quotation marks ("). If you use the Japanese-Katakana language set, enclose the name within single or double quotation marks.

Run **JnextPlan** to make this change effective.

deadlineOffset | do
Deadline offset. Used in workload service assurance. Used to calculate the critical start of a critical job in the case where a deadline has not been specified neither for the job nor its job stream. In this case the deadline is defaulted to the plan end date and time, plus this offset, expressed in minutes.

This option is only active if *enWorkloadServiceAssurance* is set to *yes*.

The default is *2* minutes.

Note:

1. **Important**: When the plan is extended, the start time of critical jobs with a deadline calculated with this mechanism is automatically changed as a consequence of the fact that it must now match the new plan finishing time.
2. Whatever value you set for this option, if Tivoli Workload Scheduler loses the connection with its database, the default value is applied to critical job processing, and the warning message AWSJCO135W is issued to tell you what has happened.

Run **`JnextPlan`** or restart the WebSphere Application Server (**`stopappserver`** and **`startappserver`**) to make this change effective.

deploymentFrequency | df

Rules deployment frequency. Used in event rule management. Specify the frequency, in minutes, with which rules are to be checked to detect if there are changes to deploy. All active rules (active rules have the `isDraft` property set to `no` in their definition) that have been changed or added since the last deployment are deployed.

Valid values are in the *0-60* minutes range. If you specify *0*, the changes are not deployed automatically and you must use the **`planman deploy`** command.

The default value is *5* minutes. The change is effective immediately.

enCarryForward | cf

Enable carry forward. A preproduction option that affects the operation of the *stageman* command. Specify if job streams that did not complete are carried forward from the old to the new production plan (Symphony). Enter `yes` to have incompleted job streams carried forward only if the *Carry Forward* option is enabled in the job stream definition. Enter `all` to have all incompleted job streams carried forward, regardless of the *Carry Forward* option. Enter `no` to completely disable the *Carry Forward* function. If you run the `JnextPlan -for 0000` command and the *Carry Forward* option is set to either `yes` or `no`, a message is displayed informing you that incompleted job streams might not be carried forward. When the **`stageman -carryforward`** command is used, it overrides *enCarryForward*. See *Tivoli Workload Scheduler: User's Guide and Reference* for more information. If this option is set to no, running jobs are moved to the USERJOBS job stream.

The default value is *all*. Run **`JnextPlan`** to make this change effective.

enCentSec | ts

Enable centralized security. Determine how the security file is used within the network. Centralized security is not relevant to an end-to-end scheduling environment.

If set to *yes*, the security files of all the workstations of the network can be created and modified only on the master domain manager. In this case, the Tivoli Workload Scheduler administrator is responsible for their production, maintenance, and distribution.

If set to *no*, the security file of each workstation can be managed by the root user or administrator of the system. The local user can run the *makesec* command to create or update the file.

See *Tivoli Workload Scheduler: User's Guide and Reference* for more information about centralized security.

The default value is *no*. Run **`JnextPlan`** to make this change effective.

enCFinterNetworkDeps | ci

Enable carry forward for internetwork dependencies. A preproduction option that affects the way **`stageman`** handles internetwork dependencies. It specifies if external job streams are carried forward from the old to the new production plan (Symphony file). Enter *yes* to have all external job streams carried forward. Enter *no* to have no external job streams carried forward.

The default value is *yes*. Run **`JnextPlan`** to make this change effective.

enCFResourceQuantity | rq

Enable carry forward resource quantity. A preproduction option that affects the way **`stageman`** handles resources. Enter *yes* to carry forward the resource quantity from the old production file to the new. Enter *no* to not carry forward the resource quantity. **`Stageman`** carries forward resource quantities only if the resource is needed by a job or job stream that is also being carried forward. Otherwise the resource quantities are set to the original value. See *Tivoli Workload Scheduler: User's Guide and Reference* for details on using this feature.

The default value is *yes*. Run **`JnextPlan`** to make this change effective.

| **enDbAudit | da**

| **Enable database auditing.** Enable or disable database auditing. To disable
| database auditing, specify *0*. To activate database auditing, specify *1*.
| Auditing information is logged to a flat file in the `*TWA_home*/TWS/audit/`
| `database` directory, to the Tivoli Workload Scheduler database itself, or to
| both. To choose which, set the **`optman`** property *auditStore*. Each Tivoli
| Workload Scheduler workstation maintains its own log. Only actions are
| logged, not the success or failure of the action. Installation of dynamic
| domain managers and dynamic agents is not recorded in audit logs.

| For more information about using this feature, see the section about
| auditing facilities in the *Troubleshooting Guide*.

| The default value is *0*. Changes to this parameter are effective immediately.

enEmptySchedsAreSucc | es

Job streams without jobs policy. Specify the behavior of job streams without any jobs. If set to *yes*, the job streams that contain no jobs are set to SUCC after their dependencies are resolved. If set to *no*, the job streams are left in READY status.

The default value is *no*. Run **`JnextPlan`** to make this change effective.

enEventDrivenWorkloadAutomation | ed

Enable event driven workload automation. Enable or disable the event-driven workload automation feature. To enable, specify *yes*. To disable, specify *no*.

The default value is *yes*.

After disabling, you must run **`JnextPlan`** and stop the event processing server (with the **`conman stopevtp`** command).

After enabling, you must run **`JnextPlan`** and start the event processing server (with the **`conman startevtp`** command).

enEventProcessorHttpsProtocol | eh

Enable event processor HTTPS protocol. Used in event rule management. Enables or disables the use of the HTTPS protocol to connect to the event processor server. To enable, enter *yes*. To disable, enter *no*.

The default value is *yes*. Run `JnextPlan` to make this change effective.

enExpandedResources

enExpandedResources Enables up to 60 concurrent holders for a Tivoli Workload Scheduler resource. Enter *yes* to enable up to 60 concurrent holders for a resource. Enter *no* to disable the feature and use only 32 holders for a resource.

The default value is *no*. Run JnextPlan to make this change effective.

enForecastStartTime | st

Enable forecast start time. Only applicable when workload service assurance is enabled (see *enWorkloadServiceAssurance*). Enter *yes* to enable the calculation of the predicted start time of each job when running a forecast plan. Enabling this feature could negatively impact the time taken to generate the forecast plan. Enter *no* to disable the calculation of the predicted start time of each job when running a forecast plan.

The default value is *no*. Any change of this value is effective immediately.

When this option is set to *yes*, the **enPreventStart** global option is ignored during the creation of forecast plans.

enLegacyId | li

Enable previous job stream ID. Determine how job streams are to be named when operating in mixed environments with versions of Tivoli Workload Scheduler older than version 8.3, managed by a version 8.5 master domain manager. Use this option to keep consistency in identifying the job streams in the plan. The value assigned to this option is read either when the production plan is created or extended, or when submitting job streams in production using conman.

When the plan is created or extended, if this option is set to *no*, the job stream instance is assigned a new ID following the normal mechanism of Tivoli Workload Scheduler. In the Symphony file, the job stream name is equal to this ID. If the option is set to *yes*, the job stream instance is assigned an ID (symphony ID) equal to the job stream name. In the Symphony file the job stream name is equal to the real job stream name. If more instances of the same job stream are present, an ID is generated for every instance, with an alias that starts with the job stream name.

The default value is *no*. Run `JnextPlan` to make this change effective.

enLegacyStartOfDayEvaluation | le

Evaluate start-of-day. Specify how the *startOfDay* option is to be managed across the Tivoli Workload Scheduler network. If you set this option to *yes*, the *startOfDay* value on the master domain manager is converted to the local time zone set on each workstation across the network. If you set this option to *no*, the *startOfDay* value on the master domain manager is applied as is on each workstation across the network. This option requires that the *enTimeZone* option is set to *yes* to become operational.

The default value is *no*. Run `JnextPlan` to make this change effective.

enListSecChk | sc

Enable list security check. Control the objects in the plan that a user is permitted to list when running a query on the Dynamic Workload Console or a **`conman show <object>`** command. If set to *yes*, objects in the plan returned from a query or show command are shown to the user only if the user has been granted the list permission in the security file. If set to *no*, all objects are shown, regardless of the settings in the security file.

Note: Setting this option to *yes* affects how the graphical user interfaces function for the users defined in the security file.

The default value is *no*. Run **`JnextPlan`** to make this change effective for the plan. For the database, this option takes immediate effect.

enLogonBatch | lb

Automatically grant logon as batch. This is for Windows jobs only. If set to *yes*, the logon users for Windows jobs are automatically granted the right to *Logon as batch job*. If set to *no*, or omitted, the right must be granted manually to each user or group. The right cannot be granted automatically for users running jobs on a Backup Domain Controller, so you must grant those rights manually.

The default value is *no*. Run **`JnextPlan`** to make this change effective.

enPlanAudit | pa

Enable plan auditing. Enable or disable plan auditing. To enable plan auditing, specify *1*. To disable plan auditing, specify *0*. Auditing information is logged to a flat file in the `*TWA_home*/TWS/audit/plan` directory. Each Tivoli Workload Scheduler workstation maintains its own log. For the plan, only actions are logged in the auditing file, not the success or failure of any action. See *Tivoli Workload Scheduler: User's Guide and Reference* for more information on this feature.

The default value is *0*. Run **`JnextPlan`** to make this change effective.

enPreventStart | ps

Prevent job stream without "at" dependency from starting. Specify if job streams without an *at* dependency are to be prevented from starting immediately, without waiting for the run cycle specified in the job stream. Valid values are *yes* and *no*.

The default value is *yes*. Run **`JnextPlan`** to make this change effective.

When the **enForecastStartTime** option is set to *yes*, this option is ignored during the creation of forecast plans.

enRetainNameOnRerunFrom | rr

Retain rerun job name. A production option that affects the operation of **`Batchman`**, the production control process of Tivoli Workload Scheduler. Its setting determines if jobs that are rerun with the **`Conman`** *rerun* command retain their original job names. To have rerun jobs retain their original job names, enter *yes*. Enter *no* to assign the *rerun from* name to rerun jobs.

The default values is *no*. Run **`JnextPlan`** to make this change effective.

enSSLFullConnection | sf

Enable the SSL full connection. Specify that Tivoli Workload Scheduler uses a higher level of SSL connection than the standard level. For full details see “Configuring full SSL security” on page 189. Valid values are *yes* to enable the SSL full connection or *no* to disable the SSL full connection.

The default value is *no*. Run **`JnextPlan`** to make this change effective.

enStrEncrypt | se

Enable strong password encryption. Enable or disable strong encryption. Enable strong encryption by setting this option to *yes*. See "Configuring the SSL connection protocol for the network" on page 188.

The default value is *no*. Run **JnextPlan** to make this change effective.

enSwfaultTol | sw

Enable the fault-tolerant switch manager. Enable or disable the fault-tolerant switch manager feature. Valid values are *yes* to enable the fault tolerant switch manager, and *no* to disable it. See the *Tivoli Workload Scheduler: User's Guide and Reference* for more details.

The default value is *no*. Run **JnextPlan** to make this change effective.

enTimeZone | tz

Enable time zones. Enables or disables the time zone option. To activate time zones in your network, specify *yes*. To disable time zones in the network, specify *no*. See "Enabling the time zone feature" on page 75.

The default value is *yes*. Run **JnextPlan** to make this change effective in the plan. For the database, this option takes effect immediately.

enWorkloadServiceAssurance | wa

Enable workload service assurance. Enables or disables workload service assurance, which is the feature that manages the privileged processing of mission critical jobs and their predecessors. Specify *yes* to enable or *no* to disable.

Note: Before starting to use workload service assurance you must set up the *TWS_user* in the security file to have the appropriate access to the objects that this feature will modify - see "The *TWS_user* - special security file considerations" on page 133

The default value is *yes*. Run **JnextPlan** to make this change effective.

eventProcessorEIFPort | ee

Tivoli event integration facility port. Used in event rule management. Specify the port number where the event processor server receives events from the Tivoli Event Integration Facility (EIF). Valid values are in the *0-65535* range.

The default value is *31131*. If you change the value, restart the WebSphere Application Server (**stopappserver** and **startappserver**) and run **JnextPlan** to make this change effective.

If you use a security firewall, make sure this port is open for incoming and outgoing connections.

extRecPrompt | xp

Additional prompts after abend. Specify an additional number of prompts for the value defined in *baseRecPropmt*. This applies when a job is rerun after abending and the limit specified in *baseRecPropmt* has been reached.

The default value is *1000*. Run **JnextPlan** to make this change effective.

ignoreCals | ic

Ignore calendars. A preproduction option that affects the operation of the **planman** command. Its setting determines if user calendars are copied into the new production plan (Symphony) file. To prevent user calendars from being copied into the new production plan, enter *yes*.

The default value is *no*. See *Tivoli Workload Scheduler: User's Guide and Reference*. Run **`JnextPlan`** to make this change effective.

logCleanupFrequency | lc
: **Log cleanup frequency.** Used in event rule and audit management . Specify how often the automatic cleanup of log instances is run. Valid values are in the *0-60* minutes range. If you specify *0*, the automatic cleanup feature is disabled.

  The default value is *5* minutes. This option takes effect immediately.

logHistory | lh
: **Log history period.** Used in event rule management. Enter the number of days for which you want to save rule instance, action run, and message log data. Log instances are discarded on a FIFO (first-in first-out) basis.

  The default value is *10* days. This option takes effect immediately.

logmanMinMaxPolicy | lm
: **Logman minimum and maximum run times policy.** Specify how the minimum and maximum job run times are logged and reported by **`logman`**. Possible values are:

  elapsedtime
  : The minimum and maximum elapsed runtimes are logged and reported.

  cputime
  : The minimum and maximum CPU runtimes are logged and reported.

  both
  : Both the minimum and maximum job runtimes are logged and reported.

  See *Tivoli Workload Scheduler: User's Guide and Reference* for details on using this feature.

  The default value is *both*. Run **`JnextPlan`** to make this change effective.

logmanSmoothPolicy | lt
: **Logman normal run time calculation policy.** Set the weighting factor that favors the most recent job run when calculating the normal (average) run time for a job. This is expressed as a percentage. For example, specify *40* to apply a weighting factor of 40% to the most recent job run, and 60% to the existing average. See *Tivoli Workload Scheduler: User's Guide and Reference* for more information about how to use this option.

  The default value is *-1*. Run **`JnextPlan`** to make this change effective.

longDurationThreshold | ld
: **Long duration job threshold.** Specify, when comparing the actual duration of a job to the estimated duration, the threshold over which the job is considered to be of "long duration." The threshold value is expressed as a percentage with respect to the estimated duration. For example, if the threshold is set to *150*, and the actual duration is more than 150% of the estimated duration (it is 50% greater), the job is considered to be a "long duration" job.

  If you have the workload service assurance feature enabled, the effect of a "critical" job satisfying the long duration criteria is that the job is inserted automatically into the hot list.

Valid values are between:

100 The minimum value. All jobs that exceed the estimated duration are considered long duration jobs

1000 The maximum value. Only those jobs that last ten times as long as their estimated duration are considered as long duration jobs

The default is *150* seconds.

Note: Whatever value you set for this option, if you have the workload service assurance feature enabled, and Tivoli Workload Scheduler loses the connection with its database, the default value is applied to critical job processing, and the warning message AWSJCO135W is issued to tell you what has happened.

Run **`JnextPlan`** or restart the WebSphere Application Server (**`stopappserver`** and **`startappserver`**) to make this change effective.

mailSenderName | ms

Mail sender name. Used in event rule management. If you deploy rules implementing an action that sends emails via an SMTP server, specify a string to be used as the sender of the emails.

The default value is *TWS*. Changes to this parameter are effective for the next mail send action performed.

maxLen | xl

Maximum preproduction plan length. Specify the maximum length of the preproduction plan in days after it is automatically extended or created. The value for *maxLen* must be greater than or equal to the value for *minLen* and must be in the range of *8* to *365*.

The default is *8* days. Run **`JnextPlan`** to make this change effective.

minLen | ml

Minimum preproduction plan length. Specify the minimum length in days of the preproduction plan that can pass after the production plan is created or extended, without extending the preproduction plan. If the days left in the preproduction plan after a **`JnextPlan`** are less than the value of this option, the preproduction plan is automatically extended. The value for *minLen* must be less than or equal to the value for *maxLen* and must be in the range of *7* to *365*.

The default is *8* days. Run **`JnextPlan`** to make this change effective.

| **notificationTimeout | nt**

| **Notification timeout.** Used in cross dependencies. Specify how many days Tivoli Workload Scheduler must retry sending notifications about job status changes to the remote engine if the notification fails. When this timeout expires, the job request subscription and the status notifications associated to this job are discarded.

| Valid values are in the range of *1* to *90*. The default is *5* days. Changes are effective immediately.

promotionOffset | po

Promotion offset. Used in workload service assurance. Specify when a job become eligible for promotion in terms of the number of seconds before its critical start time is reached. Applies only to jobs that are flagged as critical in a job stream definition and to their predecessor jobs. A critical job and its predecessors make up a critical network.

When a predecessor jeopardizes the timely completion of the critical job, it is *promoted*; that is, it is assigned additional resources and its submission is prioritized with respect to other jobs that are out of the critical network. Also critical jobs might be promoted.

The scheduler calculates the critical start time of a critical job by subtracting its estimated duration from its deadline. It calculates the critical start time of a critical predecessor by subtracting its estimated duration from the critical start time of its next successor. Within a critical network the scheduler calculates the critical start time of the critical job first and then works backwards along the chain of predecessors. These calculations are reiterated as many times as necessary until the critical job has run.

This option is only active if *enWorkloadServiceAssurance* is set to *yes*.

The default is *120* seconds.

Run **`JnextPlan`** to make this change effective.

smtpServerName | sn
SMTP server name. Used in event rule management. If you deploy rules implementing an action that sends emails via an SMTP server, specify the name of the SMTP server to be used by the mail plug-in.

The default value is *localhost*. Changes to this parameter are effective immediately.

smtpServerPort | sp
SMTP Server port. Used in event rule management. If you deploy rules implementing an action that sends emails via an SMTP server, specify the port number used to connect to the SMTP server by the mail plug-in. Valid values are in the range *0–65535*.

The default value is *25*. Changes to this parameter are effective for the next mail send action performed.

smtpUseAuthentication | ua
Mail plug-in uses SMTP authentication. Used in event rule management. If you deploy rules implementing an action that sends emails via an SMTP server, specify if the SMTP connection needs to be authenticated. Values are *yes* or *no*.

The default is *no*. Changes to this parameter are effective immediately.

smtpUserName | un
SMTP server user name. Used in event rule management. If you deploy rules implementing an action that sends emails via an SMTP server, specify the SMTP server user name.

The default value is the name of the Tivoli Workload Scheduler user (the TWS_user) on the master domain manager. Changes to this parameter are effective immediately.

smtpUserPassword | up
SMTP server user password. Used in event rule management. If you deploy rules implementing an action that sends emails via an SMTP server, specify the SMTP server user password. The password is stored in an encrypted form.

Changes to this parameter are effective immediately.

smtpUseSSL | us
Mail plug-in uses SSL. Used in event rule management. If you deploy

rules implementing an action that sends emails via an SMTP server, specify if the SMTP connection is to be authenticated via SSL. Values are *yes* or *no*.

The default is *no*. Changes to this parameter are effective immediately.

smtpUseTLS | tl
: **Mail plug-in uses TLS protocol.** Used in event rule management. If you deploy rules implementing an action that sends emails via an SMTP server, specify if the SMTP connection is to be authenticated via the Transport Layer Security (TLS) protocol. Values are *yes* or *no*.

  The default is *no*. Changes to this parameter are effective immediately.

startOfDay | sd
: **Start time of processing day.** Specify the start time of the Tivoli Workload Scheduler processing day in 24-hour format: *hhmm* (*0000-2359*).

  The default value is *0600* (6:00 a.m.). If you change this option, you must also change the launch time of the *final* job stream, which is usually set to one minute before the start time: *0559* (5:59 a.m.). Run **`JnextPlan`** to make the change of *startOfDay* effective.

statsHistory | sh
: **Job statistics history period.** Specify the number of days for which you want to maintain job statistics. Statistics are discarded on a FIFO (first-in first-out) basis. For example, if you leave the default value of *10*, statistics are maintained for the last 10 days. This has no effect on job standard list files, which must be removed with the *rmstdlist* command. See the *Tivoli Workload Scheduler: User's Guide and Reference* for information about the *rmstdlist* command.

  The default value is *10*. Run **`JnextPlan`** to make this change effective in the plan. For the database, this option takes effect immediately.

TECServerName | th
: **Tivoli Enterprise Console server name.** Used in event rule management. If you use rules implementing an action that forwards events to a Tivoli Enterprise Console server (or any other application that can process events in Tivoli Enterprise Console format), specify the Tivoli Enterprise Console server name. You can change this value when you define the action if you want to use a different Tivoli Enterprise Console server.

  The default is *localhost*. Run **`JnextPlan`** to make this change effective.

TECServerPort | tp
: **Tivoli Enterprise Console server port.** Used in event rule management. If you use rules implementing an action that forwards events to a Tivoli Enterprise Console (TEC) server (or any other application that can process events in TEC format), specify the port number of the TEC server. You can change this value when you define the action if you want to use a different TEC server.

  The default port number is *5529*. Run **`JnextPlan`** to make this change effective.

Setting local options

Set local options in the `localopts` file. Changes do not take effect until **`netman`** is stopped (**conman shut;wait**) and restarted (**StartUp**).

A template file containing default settings is located in `TWA_home/TWS/config/localopts`.

Note: All of the SSL settings in the localopts file relate to the network communications and do not relate to the Dynamic Workload Console.

During the installation process, a working copy of the local options file is installed as `TWA_home/TWS/localopts`.

The options in the `localopts` file are described in the following sections:
- "Localopts summary"
- "Localopts details" on page 26
- "Local options file example" on page 38

Localopts summary

General attributes of the workstation:

thiscpu = *workstation*
merge stdlists = *yes|no*
stdlist width = *columns*
syslog local = *facility*
restricted stdlists = *yes|no*

The attributes of the workstation for the batchman process:

bm check file = *seconds*
bm check status = *seconds*
bm look = *seconds*
bm read = *seconds*
bm stats = *on|off*
bm verbose = *on|off*
bm check until = *seconds*
bm check deadline = *seconds*
bm late every = *minutes*

The attributes of the workstation for the jobman process:

jm job table size = *entries*
jm look = *seconds*
jm nice = *value*
jm promoted nice = *UNIX and Linux critical job priority*
jm promoted priority = *Windows critical job priority*
jm no root = *yes|no*
jm read = *seconds*

| **The attributes of the workstation for the mailman process:**

| **mm response** = *seconds*
| **mm retrylink** = *seconds*
| **mm sound off** = *yes|no*
| **mm unlink** = *seconds*
| **mm cache mailbox** = *yes|no*
| **mm cache size** = *bytes*
| **mm resolve master** = *yes|no*
| **autostart monman** = *yes|no*
| **mm read** = *minutes*

| **The attributes of the workstation for the netman process:**

nm mortal = *yes|no*
nm port = *port number*
nm read = *seconds*
nm retry = *seconds*

The attributes of the workstation for the writer process:

wr read = *seconds*
wr unlink = *seconds*
wr enable compression = *yes|no*

Optional attributes of the workstation for remote database files

mozart directory = *mozart_share*
parameters directory = *parms_share*
unison network directory = *unison_share*

The attributes of the workstation for the custom formats

date format = *integer*
composer prompt = *key*
conman prompt = *key*
switch sym prompt = *key*

The attributes of the workstation for the customization of I/O on mailbox files

sync level = *low|medium|high*

The attributes of the workstation for networking

tcp timeout = *seconds*
tcp connection timeout = *seconds*

The attributes of the workstation for SSL - General

ssl auth mode = *caonly|string|cpu*
ssl auth string = *string*
ssl fips enabled = *yes/no*
nm ssl full port = *value*
nm ssl port = *value*

OpenSSL attributes of the workstation - only used if *ssl fips enabled = "no"*

ssl key = **.pem*
ssl certificate = **.pem*
ssl key pwd = **.sth*
ssl ca certificate = **.crt*
ssl random seed = **.rnd*
ssl encryption cipher = *cipher*
cli ssl server auth = *yes|no*
cli ssl cipher = *string*
cli ssl server certificate = *file_name*
cli ssl trusted dir = *directory_name*

GSKit attributes of the workstation - only used if *ssl fips enabled = "yes"*

ssl keystore file = **.kdb*
ssl certificate keystore label = *name*

ssl keystore pwd = **.sth*
cli ssl keystore file = **.kdb*
cli ssl certificate keystore label = *name*
cli ssl keystore pwd = **.sth*

The attributes of the workstation for the embedded WebSphere Application Server

local was = *yes|no*

Application server check attributes on the workstation

appserver check interval = *minutes*
appserver auto restart = *on|off*
appserver min restart time = *minutes*
appserver max restarts = *number*
appserver count reset interval = *hours*
appserver service name = *name*

The Tivoli Workload Scheduler instance is a command line client

is remote cli = *yes|no*

Attributes for command line client connection (conman)

host = *host_name*
protocol = *protocol*
port = *port number*
proxy = *proxy server*
proxy port = *proxy server port number*
time out = *seconds*
default ws = *master_workstation*
useropts = *useropts_file*

Note: The SSL attributes for the command line client connection will depend on which SSL method is in use. They are included in the relevant section and all commence with "cli".

Event Management parameters

can be event processor = *yes|no*

Note: The `localopts` file syntax is not case-sensitive, and the spaces between words in the option names are ignored. For example, you can validly write **is remote cli** as:
- is remote cli
- Is Remote CLI
- isremotecli
- ISREMOTECLI
- isRemoteCLI
- ...

Localopts details

# comment
Treats everything from the indicated sign (#) to the end of the line as a comment.

appserver auto restart = yes|no
Requests the `appservman` process to automatically start WebSphere Application Server if it is found down. The default is `Yes`.

appserver check interval = *minutes*
Specifies the frequency in minutes that the `appservman` process is to check that WebSphere Application Server is still running. The default is 5 minutes.

appserver count reset interval = *hours*
Specifies the time interval in hours after which the restart count is reset from the last WebSphere Application Server start. The default is 24 hours.

appserver max restarts = *number*
Specifies the maximum number of restarting attempts the `appservman` process can make before giving up and exiting without restarting WebSphere Application Server. The counter is reset if WebSphere Application Server runs for longer than the `appserver count reset interval` value. The default is 5.

appserver min restart time = *minutes*
Specifies in minutes the minimum elapsed time the `appservman` process must wait between each attempt to restart the WebSphere Application Server if it is down. If this value is less than the `appserver check interval`, the WebSphere Application Server is restarted as soon as it is found down. If it is found down before this time interval (min restart time) has elapsed, `appservman` exits without restarting it. The default is 10 minutes.

appserver service name = *name*
Only in Windows environments. Specifies the name of the WebSphere Application Server windows service if different from the standard name. This field is generally not used.

autostart monman = yes|no
Used in event rule management. Restarts the monitoring engine automatically when the next production plan is activated (on Windows also when Tivoli Workload Scheduler is restarted). The default is `Yes`.

bm check deadline = *seconds*
Specify the minimum number of seconds Batchman waits before checking if a job has missed its deadline. The check is performed on all jobs and job streams included in the Symphony file, regardless of the workstation where the jobs and job streams are defined. Jobs and job streams with expired deadlines are marked as late in the local Symphony file. To obtain up-to-date information about the whole environment, define this option on the master domain manager. Deadlines for critical jobs are evaluated automatically, independently of the **bm check deadline** option. To disable the option and not check deadlines, enter a value of zero, the default value.

bm check file = *seconds*
Specify the minimum number of seconds Batchman waits before checking for the existence of a file that is used as a dependency. The default is 120 seconds.

bm check status = *seconds*
Specify the number of seconds Batchman waits between checking the status of an internetwork dependency. The default is 300 seconds.

bm check until = *seconds*
: Specify the maximum number of seconds Batchman waits before reporting the expiration of an Until time for job or job stream. Specifying a value below the default setting (300) might overload the system. If it is set below the value of Local Option **bm read**, the value of **bm read** is used in its place. The default is 300 seconds.

bm look = *seconds*
: Specify the minimum number of seconds Batchman waits before scanning and updating its production control file. The default is 15 seconds.

bm read = *seconds*
: Specify the maximum number of seconds Batchman waits for a message in the `intercom.msg` message file. If no messages are in queue, Batchman waits until the timeout expires or until a message is written to the file. The default is 10 seconds.

bm stats = on|off
: To have Batchman send its startup and shutdown statistics to its standard list file, specify **on**. To prevent Batchman statistics from being sent to its standard list file, specify **off**. The default is **off**.

bm verbose = on|off
: To have Batchman send all job status messages to its standard list file, specify **on**. To prevent the extended set of job status messages from being sent to the standard list file, specify **off**. The default is **off**.

| **bm late every = minutes**
| When an **every** job does not start at its expected start time, **bm late every**
| specifies the maximum number of minutes that elapse before Tivoli
| Workload Scheduler skips the job. This option applies only to jobs defined
| with **every** option together with the **at** time dependency, it has no impact
| on jobs that have only the **every** option.

can be event processor = yes|no
: Specify if this workstation can act as event processing server or not. It is set by default to **yes** for master domain managers and backup masters, otherwise it is set to **no**.

cli ssl certificate keystore label = *string*
: Only used if SSL is defined using GSKit (`ssl fips enabled="yes"`) Supply the label which identifies the certificate in the keystore when the command-line client is using SSL authentication to communicate with the master domain manager. The default is `IBM TWS 8.6 workstation`, which is the value of the certificate distributed with the product to all customers. This certificate is thus not secure and should be replaced with your own secure certificate. See "Configuring the SSL connection protocol for the network" on page 188.

cli ssl keystore file = *file_name*
: Only used if SSL is defined using GSKit (`ssl fips enabled="yes"`). Specify the name of the keystore file used for SSL authentication when the command-line client is using SSL authentication to communicate with the master domain manager. The default is `*TWA_home*/TWS/ssl/TWSPublicKeyFile.pem`. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See "Configuring the SSL connection protocol for the network" on page 188.

cli ssl keystore pwd = *file_name*

Only used if SSL is defined using GSKit (`ssl fips enabled="yes"`). Specify the password file of the keystore used for SSL authentication when the command-line client is using SSL authentication to communicate with the master domain manager. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See "Configuring the SSL connection protocol for the network" on page 188.

cli ssl cipher = *cipher_class*

Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) Specify the cipher class to be used when the command-line client and the server are using SSL authentication. Use one of the common cipher classes listed in Table 12. The default is MD5.

If you want to use an OpenSSL cipher class not listed in the table, use the following command to determine if your required class is supported:

```
openssl ciphers <class_name>
```

where *class_name* is the name of the class you want to use. If the command returns a cipher string, the class can be used.

Table 12. Valid encryption cipher classes

Encryption cipher class	Description
SSLv3	SSL version 3.0
TLSv1	TLS version 1.0
EXP	Export
EXPORT40	40-bit export
MD5	Ciphers using the MD5 digest, digital signature, one-way encryption, hash or checksum algorithm.
LOW	Low strength (no export, single DES)
MEDIUM	Ciphers with 128 bit encryption
HIGH	Ciphers using Triple-DES
NULL	Ciphers using no encryption

cli ssl server auth = yes|no

Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) Specify **yes** if server authentication is to be used in SSL communications with the command line client. The default is **no**.

cli ssl server certificate = *file_name*

Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) Specify the file that contains the SSL certificate when the command-line client and the server use SSL authentication in their communication. There is no default. See "Configuring the SSL connection protocol for the network" on page 188.

cli ssl trusted dir = *directory_name*

Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) Specify the directory that contains an SSL trusted certificate contained in files with hash naming (#) when the command-line client and the server are using SSL authentication in their communication. When the directory path contains blanks, enclose it in double quotation marks ("). There is no default.

composer prompt = *prompt*
: Specify the prompt for the composer command line. The prompt can be of up to 10 characters in length. The default is dash (-).

conman prompt = *prompt*
: Specify the prompt for the conman command line. The prompt can be of up to 8 characters in length. The default is percent (%).

date format = 0|1|2|3
: Specify the value that corresponds to the date format you desire. The values can be:

- 0 corresponds to *yy/mm/dd*
- 1 corresponds to *mm/dd/yy*
- 2 corresponds to *dd/mm/yy*
- 3 indicates usage of Native Language Support variables

The default is **1**.

default ws = *manager_workstation*
: The default workstation when you are accessing using a command line client. Specify the domain manager workstation.

host = *hostname_or_IP_address*
: The name or IP address of the host when accessing using a command line client.

is remote cli = yes|no
: Specify if this instance of Tivoli Workload Scheduler is installed as a command line client (yes).

jm job table size = *entries*
: Specify the size, in number of entries, of the job table used by Jobman. The default is 1024 entries.

jm look = *seconds*
: Specify the minimum number of seconds Jobman waits before looking for completed jobs and performing general job management tasks. The default is 300 seconds.

jm nice = *nice_value*
: For UNIX and Linux operating systems only, specify the **nice** value to be applied to jobs launched by Jobman to change their priority in the kernel's scheduler. The default is zero.

The **nice** boundary values vary depending upon each specific platform, but generally lower values correspond to higher priority levels and vice versa. The default depends upon the operating system.

Applies to jobs scheduled by the root user only. Jobs submitted by any other user inherit the same **nice** value of the Jobman process.

See also jm promoted nice.

jm no root = yes|no
: For UNIX and Linux operating systems only, specify **yes** to prevent Jobman from launching **root** jobs. Specify **no** to allow Jobman to launch **root** jobs. The default is **no**.

jm promoted nice = *nice_value*
: Used in workload service assurance. For UNIX and Linux operating systems only, assigns the priority value to a critical job that needs to be

promoted so that the operating system processes it before others. Applies to critical jobs or predecessors that need to be promoted so that they can start at their critical start time.

Boundary values vary depending upon each specific platform, but generally lower values correspond to higher priority levels and vice versa. The default is -1.

Be aware that:

- The promotion process is effective with negative values only. If you set a positive value, the system runs it with the -1 default value and logs a warning message every time Jobman starts.
- An out of range value (for example -200), prompts the operating system to automatically promote the jobs with the lowest allowed **nice** value. Note that in this case no warning is logged.
- Overusing the promotion mechanism (that is, defining an exceedingly high number of jobs as mission critical and setting the highest priority value here) might overload the operating system, negatively impacting the overall performance of the workstation.

You can use this and the jm nice options together. If you do, remember that, while **jm nice** applies only to jobs submitted by the root user, **jm promoted nice** applies only to jobs that have a critical start time. When a job matches both conditions, the values set for the two options add up. For example, if on a particular agent the local options file has:

```
jm nice= -2
jm promoted nice= -4
```

when a critical job submitted by the root user needs to be promoted, it is assigned a cumulative priority value of -6.

jm promoted priority = *value*
Used in workload service assurance. For Windows operating systems only, sets to this value the priority by which the operating system processes a critical job when it is promoted.

Applies to critical jobs or predecessors that need to be promoted so that they can start at their critical start time.

The possible values are:

- `High`
- `AboveNormal` (the default)
- `Normal`
- `BelowNormal`
- `Low` or `Idle`

Note that if you a set a lower priority value than the one non-critical jobs might be assigned, no warning is given and no mechanism like the one available for **jm promoted nice** sets it back to the default.

jm read = *seconds*
Specify the maximum number of seconds Jobman waits for a message in the `courier.msg` message file. The default is 10 seconds.

local was = yes|no
For master domain managers and backup masters connected to the Tivoli Workload Scheduler database. If set to **yes**, it improves the performance of job stream and job submission from the database The default is **no**.

merge stdlists = yes|no
: Specify **yes** to have all of the Tivoli Workload Scheduler control processes, except Netman, send their console messages to a single standard list file. The file is given the name **TWSmerge**. Specify **no** to have the processes send messages to separate standard list files. The default is **yes**.

mm cache mailbox = yes|no
: Use this option to enable Mailman to use a reading cache for incoming messages. In this case, only messages considered essential for network consistency are cached. The default is **yes**.

mm cache size = *messages*
: Specify this option if you also use **mm cache mailbox**. The maximum value (default) is **512**.

mm read = *seconds*
: Specify the maximum number of seconds Mailman waits for a connection with a remote workstation. The default is 15 seconds.

mm resolve master = yes|no
: When set to **yes** the $MASTER variable is resolved at the beginning of the production day. The host of any extended agent is switched after the next **`JnextPlan`** (long term switch). When it is set to **no**, the $MASTER variable is not resolved at **`JnextPlan`** and the host of any extended agent can be switched after a conman **switchmgr** command (short- and long-term switch). The default is **yes**. When you switch a master domain manager and the original has **`mm resolve master`** set to no and the backup has **`mm resolve master`** set to yes, after the switch any extended agent that is hosted by $MASTER switches to the backup domain manager. When the backup domain manager restarts, the keyword $MASTER is locally expanded by Mailman. You should keep the **`mm resolve master`** value the same for master domain managers and backup domain managers.

mm response = *seconds*
: Specify the maximum number of seconds Mailman waits for a response before reporting that a workstation is not responding. The minimum wait time for a response is **90** seconds. The default is 600 seconds.

mm retrylink = *seconds*
: Specify the maximum number of seconds Mailman waits after unlinking from a non-responding workstation before it attempts to link to the workstation again. The default is 600 seconds. The **tomserver** optional mailman servers do not unlink non-responding agents. The link is repetitively checked every 60 seconds, which is the default **retrylink** for these servers.

mm sound off = yes|no
: Specify how Mailman responds to a conman **tellop ?** command. Specify **yes** to have Mailman display information about every task it is performing. Specify **no** to have Mailman send only its own status. The default is **no**.

| **mm symphony download timeout =** *seconds*
| : Specify the maximum number of minutes Mailman waits after attempting
| to initialize a workstation on a slow network. If the timeout expires
| without the workstation being initialized successfully, Mailman initializes
| the next workstation in the sequence. The default is no timeout (0).

mm unlink = *seconds*
: Specify the maximum number of seconds Mailman waits before unlinking

from a workstation that is not responding. The wait time should not be less than the response time specified for the Local Option **nm response**. The default is 960 seconds.

mozart directory = *directory_name*
This parameter applies only to versions of Tivoli Workload Scheduler prior to version 8.3. Defines the name of the master domain managers shared mozart directory. The default is *TWA_home*/mozart.

nm mortal = **yes|no**
Specify **yes** to have Netman quit when all of its child processes have stopped. Specify **no** to have Netman keep running even after its child processes have stopped. The default is **no**.

nm port = *port*
Specify the TCP port number that Netman responds to on the local computer. This must match the TCP/IP port in the computers workstation definition. It must be an unsigned 16-bit value in the range 1- 65535 (values between 0 and 1023 are reserved for services such as, FTP, TELNET, HTTP, and so on). The default is the value supplied during the product installation.

If you run event-driven workload automation and you have a security firewall, make sure this port is open for incoming and outgoing connections.

nm read = *seconds*
Specify the maximum number of seconds Netman waits for a connection request before checking its message queue for **stop** and **start** commands. The default is 10 seconds.

nm retry = *seconds*
Specify the maximum number of seconds Netman waits before retrying a connection that failed. The default is 800 seconds.

nm ssl full port = *port*
The port used to listen for incoming SSL connections when full SSL is configured by setting global option `enSSLFullConnection` to `yes` (see "Configuring full SSL security" on page 189 for more details). This value must match the one defined in the **secureaddr** attribute in the workstation definition in the database. It must be different from the **nm port** local option that defines the port used for normal communication.

Note:
1. If you install multiple instances of Tivoli Workload Scheduler on the same computer, set all SSL ports to different values.
2. If you plan not to use SSL, set the value to 0.

There is no default.

nm ssl port = *port*
The port used to listen for incoming SSL connections, when full SSL is not configured (see "Configuring full SSL security" on page 189 for more details). This value must match the one defined in the **secureaddr** attribute in the workstation definition in the database. It must be different from the **nm port** local option that defines the port used for normal communication.

Note:
1. If you install multiple instances of Tivoli Workload Scheduler on the same computer, set all SSL ports to different values.

2. If you plan not to use SSL, set the value to 0.

There is no default.

parameters directory = *directory_name*
: This parameter applies only to versions of Tivoli Workload Scheduler prior to version 8.3. Defines the name of the master domain managers shared *TWA_home* directory. The default is none.

port = *port*
: The TCP/IP port number of the protocol used when accessing using a command line client. The default is 31115.

protocol = http|https
: The protocol used to connect to the host when accessing using a command line client.

proxy = *proxy_server_hostname_or_IP_address*
: The name of the proxy server used when accessing using a command line client.

proxy port = *proxy_server_port*
: The TCP/IP port number of the proxy server used when accessing using a command line client.

restricted stdlists = yes|no
: Use this option to set a higher degree of security to the `stdlist` directory (and to its subdirectories) allowing only selected users to create, modify, or read files.

This option is available for UNIX workstations only. After you define it, make sure you erase your current `stdlist` directory (and subdirectories) and that you restart Tivoli Workload Scheduler. The default is `no`.

If the option is not present or if it is set to `no`, the newly created `stdlist` directory and its subdirectories are unaffected and their rights are as follows:

```
drwxrwxr-x  22 twsmdm staff          4096 Nov 09 12:12
drwxrwxr-x   2 twsmdm staff           256 Nov 09 11:40 2009.11.09
drwxrwxr-x   2 twsmdm staff          4096 Nov 09 11:40 logs
drwxr-xr-x   2 twsmdm staff          4096 Nov 09 11:40 traces
```

If the option is set to `yes`, these directories have the following rights:

```
drwxr-x--x  5 twsmdm staff             256 Nov 13 18:15
rwxr-x--x   2 twsmdm staff             256 Nov 13 18:15 2009.11.13
rwxr-x--x   2 twsmdm staff             256 Nov 13 18:15 logs
rwxr-x--x   2 twsmdm staff             256 Nov 13 18:15 traces
```

Do the following to define and activate this option:

1. Change the line `restricted stdlists = no` to `restricted stdlists = yes` in your local options file.
2. Stop Tivoli Workload Scheduler.
3. Stop WebSphere Application Server if present.
4. Remove the `stdlist` directory (or at least its files and subdirectories).
5. Start Tivoli Workload Scheduler.
6. Start WebSphere Application Server if present.

ssl auth mode = caonly|string|cpu
: The behavior of Tivoli Workload Scheduler during an SSL handshake is based on the value of the SSL authentication mode option as follows:

caonly Tivoli Workload Scheduler checks the validity of the certificate and verifies that the peer certificate has been issued by a recognized CA. Information contained in the certificate is not examined. The default value.

string Tivoli Workload Scheduler checks the validity of the certificate and verifies that the peer certificate has been issued by a recognized CA. It also verifies that the Common Name (CN) of the Certificate Subject matches the string specified into the SSL auth string option. See 35.

cpu Tivoli Workload Scheduler checks the validity of the certificate and verifies that the peer certificate has been issued by a recognized CA. It also verifies that the Common Name (CN) of the Certificate Subject matches the name of the workstation that requested the service.

ssl auth string = *string*
Used in conjunction with the **SSL auth mode** option when the "string" value is specified. The **SSL auth string** (ranges from 1 — 64 characters) is used to verify the certificate validity. The default string is "tws".

ssl ca certificate = *file_name*
Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) Specify the name of the file containing the trusted certification authority (CA) certificates required for SSL authentication. The CAs in this file are also used to build the list of acceptable client CAs passed to the client when the server side of the connection requests a client certificate. This file is the concatenation, in order of preference, of the various PEM-encoded CA certificate files.

The default is *`TWA_home`*`/TWS/ssl/TWSTrustedCA.crt`. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See “Configuring the SSL connection protocol for the network” on page 188.

ssl certificate = *file_name*
Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) Specify the name of the local certificate file used in SSL communication.

The default is *`TWA_home`*`/TWS/ssl/TWSPublicKeyFile.pem`. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See “Configuring the SSL connection protocol for the network” on page 188.

ssl certificate keystore label = *string*
Only used if SSL is defined using GSKit (`ssl fips enabled="yes"`) Supply the label which identifies the certificate in the keystore when using SSL authentication.

The default is `IBM TWS 8.6 workstation`, which is the value of the certificate distributed with the product to all customers. This certificate is thus not secure and should be replaced with your own secure certificate. See “Configuring the SSL connection protocol for the network” on page 188.

ssl encryption cipher = *cipher_class*
Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) Define the ciphers that the workstation supports during an SSL connection.

Use one of the common cipher classes listed in Table 12 on page 29. The default is **SSLv3**. If you want to use an OpenSSL cipher class not listed in the table, use the following command to determine if your required class is supported:

```
openssl ciphers <class_name>
```

where *class_name* is the name of the class you want to use. If the command returns a cipher string, the class can be used.

ssl fips enabled = yes|no
Determines whether your entire Tivoli Workload Scheduler network is enabled for FIPS (Federal Information Processing Standards) compliance. FIPS compliance requires the use of GSKit instead of the default OpenSSL for secure communications. If you enable FIPS (*ssl fips enabled="yes"*) you must set values for all the SSL attributes that apply to GSKit. If you do not enable FIPS (*ssl fips enabled="no"*), set the values for OpenSSL. The default is **no**. See "FIPS compliance" on page 201 for more details.

ssl key = *file_name*
Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) The name of the private key file.

The default is `TWA_home/TWS/ssl/TWSPrivateKeyFile.pem`. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See "Configuring the SSL connection protocol for the network" on page 188.

ssl key pwd = *file_name*
Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`) The name of the file containing the password for the stashed key.

The default is `TWA_home/TWS/ssl/TWSPrivateKeyFile.sth`. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See "Configuring the SSL connection protocol for the network" on page 188.

ssl keystore file = *file_name*
Only used if SSL is defined using GSKit (`ssl fips enabled="yes"`). Specify the name of the keystore file used for SSL authentication.

The default is `TWA_home/TWS/ssl/TWSKeyRing.kdb`. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See "Configuring the SSL connection protocol for the network" on page 188.

ssl keystore pwd = *file_name*
Only used if SSL is defined using GSKit (`ssl fips enabled="yes"`). Specify the name of the keystore password file used for SSL authentication.

The default is `TWA_home/TWS/ssl/TWSKeyRing.sth`. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See "Configuring the SSL connection protocol for the network" on page 188.

ssl random seed = *file_name*
Only used if SSL is defined using OpenSSL (`ssl fips enabled="no"`)

Specify the pseudo random number file used by OpenSSL on some operating systems. Without this file, SSL authentication might not work correctly.

The default is *TWA_home*/TWS/ssl/TWS.rnd. This file is part of the SSL configuration distributed with the product to all customers. It is thus not secure and should be replaced with your own secure SSL configuration. See "Configuring the SSL connection protocol for the network" on page 188.

stdlist width = *columns*
Specify the maximum width of the Tivoli Workload Scheduler console messages. You can specify a column number in the range **1** to **255**. Lines are wrapped at or before the specified column, depending on the presence of imbedded carriage control characters. Specify a negative number or zero to ignore line width. On UNIX and Linux operating systems, you should ignore line width if you enable system logging with the **syslog local** option. The default is 0 columns.

switch sym prompt = *prompt*
Specify a prompt for the conman command line after you have selected a different Symphony file with the **setsym** command. The maximum length is 8 characters. The default is **n%**.

sync level = low|medium|high
Specify the rate at which Tivoli Workload Scheduler synchronizes information written to disk. This option affects all mailbox agents and is applicable to UNIX and Linux operating systems only. Values can be:

low Allows the operating system to handle it.

medium
Flushes the updates to disk after a transaction has completed.

high Flushes the updates to disk every time data is entered.

The default is **low**.

syslog local = *value*
Enables or disables Tivoli Workload Scheduler system logging for UNIX and Linux operating systems only. Specify **-1** to turn off system logging for Tivoli Workload Scheduler. Specify a number from **0** to **7** to turn on system logging and have Tivoli Workload Scheduler use the corresponding local facility (LOCAL0 through LOCAL7) for its messages. Specify any other number to turn on system logging and have Tivoli Workload Scheduler use the USER facility for its messages. The default is -1. See "Tivoli Workload Scheduler console messages and prompts" on page 73.

tcp connect timeout = *seconds*
Specify the maximum number of seconds that can be waited to establish a connection through non-blocking socket. The default is 15 seconds.

tcp timeout = *seconds*
Specify the maximum number of seconds that can be waited for the completion of a request on a connected workstation that is not responding. The default is 300 seconds.

this cpu = *workstation_name*
Specify the Tivoli Workload Scheduler name of this workstation. When a switch is made between the master domain manager and a backup domain

manager, using the **switchmgr** command, the Symphony header value for **this cpu** is overwritten by the **this cpu** value in the `localopts` file. The default is **$(this_cpu)**.

timeout = *seconds*
: The timeout in seconds when accessing using a command line client. The default is 3600 seconds.

unison network directory = *directory_name*
: This parameter applies only to versions of Tivoli Workload Scheduler prior to version 8.3. Defines the name of the Unison network directory. The default is `<TWA_home>/../unison/network`.

useropts = *file_name*
: If you have multiple instances of Tivoli Workload Scheduler on a system, use this to identify the *useropts* file that is to be used to store the connection parameters for the instance in which this *localops* file is found. See "Multiple product instances" on page 42 for more details.

wr enable compression = yes|no
: Use this option on fault-tolerant agents. Specify if the fault-tolerant agent can receive the Symphony file in compressed form from the master domain manager. The default is **no**.

wr read = *seconds*
: Specify the number of seconds the Writer process waits for an incoming message before checking for a termination request from Netman. The default is 600 seconds.

wr unlink = *seconds*
: Specify the number of seconds the Writer process waits before exiting if no incoming messages are received. The minimum is 120 seconds. The default is 180 seconds.

Local options file example

The following is an example of a default localopts file:

Note: Some parameters might not be present depending upon your version and configuration.

```
############################################################################
# Licensed Materials - Property of IBM(R)
# 5698-WSH
# (C) Copyright IBM Corp. 1991, 2011.   All Rights Reserved
# US Government Users Restricted Rights - Use, duplication, or disclosure
# restricted by GSA ADP Schedule Contract with IBM Corp.
# IBM is a registered trademark of International Business Machines Corporation
# in the United States, other countries, or both.
############################################################################
#
# The Tivoli Workload Scheduler localopts file defines the attributes of this
# workstation, for various processes.
#
#---------------------------------------------------------------------------
# General attributes of this workstation:
#
thiscpu             =$(this_cpu)
merge stdlists      =yes
stdlist width       =0
syslog local        =-1
restricted stdlists  =no
#
```

```
#----------------------------------------------------------------------------
# The attributes of this workstation for the batchman process:
#
bm check file        =120
bm check status      =300
bm look              =15
bm read              =10
bm stats             =off
bm verbose           =off
bm check until       =300
bm check deadline    =0
#
#----------------------------------------------------------------------------
# The attributes of this workstation for the jobman process:
#
jm job table size    =1024
jm look              =300
jm nice              =0
jm promoted nice     =-1    #UNIX
jm promoted priority =AboveNormal #WINDOWS
jm no root           =no
jm read              =10
#
#----------------------------------------------------------------------------
# The attributes of this workstation for the TWS mailman process:
#
mm response          =600
mm retrylink         =600
mm sound off         =no
mm unlink            =960
mm cache mailbox     =yes
mm cache size        =512
mm resolve master    =yes
autostart monman     =yes
mm read              =15
#
#----------------------------------------------------------------------------
# The attributes of this workstation for the netman process:
#
nm mortal            =no
nm port              =$(tcp_port)
nm read              =10
nm retry             =800
#
#----------------------------------------------------------------------------
# The attributes of this workstation for the writer process:
#
wr read                =600
wr unlink              =180
wr enable compression  =no
#
#----------------------------------------------------------------------------
# Optional attributes of this Workstation for remote database files
#
# mozart directory =         $(install_dir)/mozart
# parameters directory =     $(install_dir)
# unison network directory = $(install_dir)/../unison/network
#
#----------------------------------------------------------------------------
# The attributes of this workstation for custom formats
#
date format             =1   # The possible values are 0-yyyy/mm/dd,
                             # 1-mm/dd/yyyy, 2-dd/mm/yyyy, 3-NLS.
composer prompt         =-
conman prompt           =%
switch sym prompt       =<n>%
#
```

```
#----------------------------------------------------------------------------
# The attributes of this workstation for the customization of I/O on
# mailbox files
#
sync level              =low
#
#----------------------------------------------------------------------------
# The attributes of this workstation for networking
#
tcp timeout             =300
tcp connection timeout  =15
#
#----------------------------------------------------------------------------
# General Secure options
#
SSL auth mode          =caonly
#
# Use "SSL auth string" only if "SSL auth mode" is set to "string"
#
SSL auth string   =tws
#
# Supply "yes" for "SSL Fips enabled" to force TWS to use GSKIT,
# otherwise it uses OpenSSL
# This flag set to "yes" enables the FIPS 140-2 policies.
# The default value is "no".
#
SSL Fips enabled       = no
#
# Netman full SSL port, use "nm SSL full port" if "enSSLFullConnection"
# (Global Option) is set to "yes". The value "0" means the port is closed.
#
nm SSL full port       =0
#
# Netman SSL port
# the value "0" means port close
#
nm SSL port            =0
#
# End General Secure options
#----------------------------------------------------------------------------

#----------------------------------------------------------------------------
# OpenSSL options, TWS uses them if "SSL Fips enabled" is "no" ( the default )
#
SSL key                 ="$(install_dir)/ssl/TWSPrivateKeyFile.pem"
SSL certificate         ="$(install_dir)/ssl/TWSPublicKeyFile.pem"
SSL key pwd             ="$(install_dir)/ssl/TWSPrivateKeyFile.sth"
SSL CA certificate      ="$(install_dir)/ssl/TWSTrustedCA.crt"
SSL random seed         ="$(install_dir)/ssl/TWS.rnd"
SSL Encryption Cipher   =SSLv3
#
#CLI SSL server auth =
#CLI SSL cipher     = MD5
#CLI SSL server certificate =
#CLI SSL trusted dir =
# End OpenSSL options
#----------------------------------------------------------------------------

#----------------------------------------------------------------------------
# GSKIT options, TWS uses them if "SSL Fips enabled" is "yes"
##
SSL keystore file                    = "$(install_dir)/ssl/TWSKeyRing.kdb"
SSL certificate keystore label       = "IBM TWS 8.6 workstation"
SSL keystore pwd                     = "$(install_dir)/ssl/TWSKeyRing.sth"
#
#
CLI SSL keystore file                    = "$(install_dir)/ssl/TWSKeyRing.kdb"
CLI SSL certificate keystore label       = "IBM TWS 8.6 workstation"
CLI SSL keystore pwd                     = "$(install_dir)/ssl/TWSKeyRing.sth"
#----------------------- End GSKit options ----------------------------------


#---------------------------------------------------------------------------
# The attributes of this workstation for the embedded version of the
# IBM WebSphere Application Server
#
LOCAL WAS              =no
#
#---------------------------------------------------------------------------
# Application server check attributes

Appserver check interval        = 5     #minutes
Appserver auto restart          = yes    #yes/no
Appserver min restart time      = 10    #minutes
Appserver max restarts          =  5    #restarts number
Appserver count reset interval  = 24   #hours
#Appserver service name         = "IBMWAS70Service - tws860xx"
#---------------------------------------------------------------------------
# The TWS instance has been installed as REMOTE CLI
IS REMOTE CLI = no  # yes for a REMOTE CLI installation, no otherwise

#---------------------------------------------------------------------------
# Attributes for command-line client connections
#
host        =         # Master hostname used when attempting a connection.
protocol    = https   # Protocol used to establish a connection with the Master.
#protocol    = http    # Protocol used to establish a connection with the Master.
port        =         # Protocol port
proxy       =         # Hostname of proxy server
proxy port  =         # Port of proxy server
timeout     = 3600    # Timeout in seconds to wait for a server response
default ws  =
useropts    =
#
# The SSL connection options are listed above under the relevant section for
# the type of SSL you have implemented. They all have the prefix "cli" and
# must also be provided.
#
#---------------------------------------------------------------------------
```

Note: The "REMOTE CLI" refers to the command line client.

Setting user options

Set the user options you require for each user on a workstation who needs them in the `useropts` file. Changes do not take effect until Tivoli Workload Scheduler is stopped and restarted.

The concept of the `useropts` file is to contain values for `localopts` parameters that must be personalized for an individual user. The files must be located in the *`user_home`*`/.TWS` directory of the user. When Tivoli Workload Scheduler needs to access data from the `localopts` file, it looks first to see if the property it requires is stored only or also in the `useropts` file for the user, always preferring the `useropts` file version of the value of the key. If a property is not specified when invoking the command that requires it, or inside the `useropts` and `localopts` files, an error is displayed.

The main use of the `useropts` file is to store the user-specific connection parameters used to access the command line client (see "Configuring command-line client access authentication" on page 70). These are the following keys, which are not stored in the `localopts` file:

username
User name used to access the master domain manager. The user must be defined in the security file on the master domain manager (see Chapter 4, "Configuring user authorization (Security file)," on page 101)

password
Password used to access the master domain manager. The presence of the `ENCRYPT` label in the password field indicates that the specified setting has been encrypted; if this label is not present, you must exit and access the interface program again to allow the encryption of that field.

A `useropts` file is created for the <*TWS_user*> during the installation, but you must create a separate file for each user that needs to use user-specific parameters on a workstation.

Sample useropts file

This is the sample content of a `useropts` file:

```
#
# Tivoli Workload Scheduler useropts file defines attributes of this Workstation.
#
#----------------------------------------------------------------------------
# Attributes for CLI connections
USERNAME    = MDMDBE4    # Username used in the connection
PASSWORD    = "ENCRYPT:YEE7cEZs+HE+mEHCsdNOfg==" # Password used in the connection
#HOST       =            # Master hostname used when attempting a connection.
PROTOCOL    = https      # Protocol used to establish a connection with the Master.
#PROTOCOL   = http       # Protocol used to establish a connection with the Master.
PORT        = 3111       # Protocol port
#PROXY      =
#PROXYPORT  =
TIMEOUT     = 120        # Timeout in seconds to wait a server response
#DEFAULTWS  =

CLI SSL keystore file                   = "$(install_dir)/ssl/MyTWSKeyRing.kdb"
CLI SSL certificate keystore label      = "client"
CLI SSL keystore pwd                    = "$(install_dir)/ssl/MyTWSKeyRing.sth"
```

The SSL configuration options for the command line client depend on the type of SSL implemented - here GSKit is assumed.

Note: The # symbol is used to comment a line.

Multiple product instances

Because Tivoli Workload Scheduler supports multiple product instances installed on the same computer, there can be more than one instance of the `useropts` file per user. This is achieved by giving the `useropts` files for a user different names for each instance.

In the `localopts` file of each instance the option named ***useropts*** identifies the file name of the `useropts` file that has to be accessed in the `*user_home*/.TWS` directory to connect to that installation instance.

This means that, for example, if two Tivoli Workload Scheduler instances are installed on a computer and the user `operator` is a user of both instances, you could define the `useropts` credentials as follows:

- In the `localopts` file of the *first* instance the local option ***useropts*** = `useropts1` identifies the *operator_home*/`.TWS/useropts1` file containing the connection parameters settings that user `operator` needs to use to connect to the *first* Tivoli Workload Scheduler instance.
- In the `localopts` file of the *second* Tivoli Workload Scheduler instance the local option ***useropts*** = `useropts2` identifies the *operator_home*/`.TWS/useropts2` file containing the connection parameters settings that user `operator` needs to use to connect to the *second* Tivoli Workload Scheduler instance.

Configuring the Tivoli Workload Scheduler agent

The configuration settings of the Tivoli Workload Scheduler agent are contained in the `JobManager.ini` file (for the path of this file, see."Where products and components are installed" on page 1). The file is made up of many different sections. Each section name is enclosed between square brackets and each section includes a sequence of `variable = value` statements.

You can customize properties for the following:
- Log properties
- Trace properties
- Native job executor
- Java job executor
- Resource advisor agent
- System scanner

Not all the properties in the `JobManager.ini` file can be customized. For a list of the configurable properties, see the following sections.

Configuring log message properties [JobManager.Logging.cclog]

To configure the logs, edit the [JobManager.Logging.cclog] section in the `JobManager.ini` file. This procedure requires that you stop and restart the Tivoli Workload Scheduler agent

The section containing the log properties is named:

```
[JobManager.Logging.cclog]
```

You can change the following properties:

JobManager.loggerhd.fileName
The name of the file where messages are to be logged.

JobManager.loggerhd.maxFileBytes
The maximum size that the log file can reach. The default is 1024000 bytes.

JobManager.loggerhd.maxFiles
The maximum number of log files that can be stored. The default is 3.

| **JobManager.loggerhd.fileEncoding**
| By default, log files for the dynamic agent are coded in UTF-8 format. If
| you want to produce the log in a different format, add this property and
| specify the required codepage.

JobManager.loggerfl.level
: The amount of information to be provided in the logs. The value ranges from 4000 to 7000. Smaller numbers correspond to more detailed logs. The default is 3000.

Configuring trace properties [JobManager.Logging.cclog]

You have the following options when configuring traces:

- Edit the [JobManager.Logging] section in the `JobManager.ini` file. This procedure requires that you stop and restart the Tivoli Workload Scheduler agent.
- Use one or more of the following command line commands, without stopping and restarting the Tivoli Workload Scheduler agent:
  - enableTrace
  - disableTrace
  - showTrace
  - changeTrace

  For more information, see "Configuring traces immediately" on page 45.

The section containing the trace properties is named:

```
[JobManager.Logging.cclog]
```

You can change the following properties:

JobManager.trhd.fileName
: The name of the trace file.

JobManager.trhd.maxFileBytes
: The maximum size that the trace file can reach. The default is 1024000 bytes.

JobManager.trhd.maxFiles
: The maximum number of trace files that can be stored. The default is 3.

JobManager.trfl.level
: Determines the type of trace messages that are logged. Change this value to trace more or fewer events, as appropriate, or on request from IBM Software Support. Valid values are:

  DEBUG_MAX
  : Maximum tracing. Every trace message in the code is written to the trace logs.

  INFO
  : All *informational*, *warning*, *error* and *critical* trace messages are written to the trace. The default value.

  WARNING
  : All *warning*, *error* and *critical* trace messages are written to the trace.

  ERROR
  : All *error* and *critical* trace messages are written to the trace.

  CRITICAL
  : Only messages which cause the agent to stop are written to the trace.

The output trace (JobManager_trace.log) is provided in XML format.

Configuring traces immediately

Trace files are enabled by default for the Tivoli Workload Scheduler agent. You can use the following commands to configure traces without stopping and restarting the agent:

enableTrace
: Sets the trace to the maximum level, producing a verbose result.

disableTrace
: Sets the traces to the lowest level.

showTrace [>*trace_file_name***.xml]**
: Displays the current trace settings defined in the [JobManager.Logging] section of the `JobManager.ini` file. You can also redirect the [JobManager.Logging] section to a file to modify it. Save the modified file and use the **changeTrace** command to make the changes effective immediately.

changeTrace [*trace_file_name***.xml]**
: Reads the file containing the modified trace settings and implements the changes immediately and permanently, without stopping and restarting the Tivoli Workload Scheduler agent.

The following is an example of the file created by the **showTrace** command:

```
<?xml version="1.0" encoding="UTF-8"?><jmgr:updateConfigurationResponse
                  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
               xmlns:jmgr="http://www.ibm.com/xmlns/prod/scheduling/1.0/JobManager">
        <jmgr:Section name="JobManager.Logging.cclog">
                   <jmgr:Property>
                                   <jmgr:Name>JobManager.trfl.level</jmgr:Name>
                                <jmgr:Value>1011</jmgr:Value>
                        </jmgr:Property>
                        <jmgr:Property>
                                <jmgr:Name>JobManager.trhd.maxFileBytes</jmgr:Name>
                                <jmgr:Value>1024000</jmgr:Value>
                        </jmgr:Property>
                        <jmgr:Property>
                                <jmgr:Name>JobManager.trhd.maxFiles</jmgr:Name>
                                <jmgr:Value>4</jmgr:Value>
                     </jmgr:Property>
        </jmgr:updateConfigurationResponse>
```

where the JobManager properties indicated are as described in "Configuring trace properties [JobManager.Logging.cclog]" on page 44.

Configuring common launchers properties [Launchers]

In the `JobManager.ini` file, the section containing the properties common to the different launchers (or executors) is named:

```
[Launchers]
```

You can change the following properties:

BaseDir
: The installation path of the Tivoli Workload Scheduler agent.

SpoolDir
: The path to the folder containing the jobstore and outputs. The default is:

  `value of BaseDir``/stdlidst/JM`

MaxAge
: The number of days that job logs are kept (in path *TWA_home*/TWS/stdlidst/JM) before being deleted. The default is 2. Possible values range from a minimum of 1 day.

CommandHandlerMinThreads
: The default is 20.

CommandHandlerMaxThreads
: The default is 100.

ExecutorsMinThreads
: The default is 38.

ExecutorsMaxThreads
: The default is 400.

NotifierMinThreads
: The default is 3.

NotifierMaxThreads
: The default is 5.

DirectoryPermissions
: The access rights assigned to the Tivoli Workload Scheduler for z/OS agents for creating directories when running jobs. The default is 0755. Supported values are UNIX-format entries in hexadecimal notation.

FilePermissions
: The access rights assigned to the Tivoli Workload Scheduler for z/OS agents for creating files when running jobs. The default is 0755. Supported values are UNIX-format entries in hexadecimal notation.

Configuring properties of the native job launcher [NativeJobLauncher]

In the `JobManager.ini` file, the section containing the properties of the native job launcher is named:

```
[NativeJobLauncher]
```

You can change the following properties:

AllowRoot
: Applies to UNIX systems only. Specifies if the root user can run jobs on the agent. It can be `true` or `false`. The default is `true`.

CheckExec
: If `true`, before launching the job, the agent checks both the availability and the execution rights of the binary file. The default is `true`.

LoadProfile
: Specifies if the user profile is to be loaded. It can be `true` or `false`. The default is `true`.

PortMax
: The maximum range of the port numbers used by the task launcher to communicate with the Job Manager. The default is 0, meaning that the operating system assigns the port automatically.

PortMin
: The minimum range of the port numbers used by the task launcher to

communicate with the Job Manager. The default is 0, meaning that the operating system assigns the port automatically.

RequireUserName

When `true`, requires that you add the user name in the JSDL job definition.

When `false`, runs with the user name used by job manager, that is:
- *TWS_user* on UNIX and Linux systems
- The local system account on Windows systems

The default is `false`.

ScriptSuffix
The suffix to be used when creating the script files. It is:

`.cmd`	For Windows
`.sh`	For UNIX

VerboseTracing
Enables verbose tracing. It is set to `true` by default.

Configuring properties of the Java job launcher [JavaJobLauncher]

In the `JobManager.ini` file, the section containing the properties of the Java job launcher is named:

```
[JavaJobLauncher]
```

You can change the following properties:

JVMDir
The path to the virtual machine used to start job types with advanced options. You can change the path to another compatible Java virtual machine.

JVMOptions
The options to provide to the Java Virtual Machine used to start job types with advanced options. Supported keywords for establishing a secure connection are:
- htttps.proxyHost
- https.proxyPort

Supported keywords for establishing a non-secure connection are:
- Dhttp.proxyHost
- Dhttp.proxyPort

For example, to set job types with advanced options, based on the default JVM http protocol handler, to the unauthenticated proxy server called with name myproxyserver.mycompany.com, define the following option:

```
JVMOptions = -Dhttp.proxyHost=myproxyserver.mycompany.com
 -Dhttp.proxyPort=80
```

Configuring properties of the Resource advisor agent [ResourceAdvisorAgent]

In the `JobManager.ini` file, the section containing the properties of the Resource advisor agent is named:

```
[ResourceAdvisorAgent]
```

You can change the following properties:

CPUScannerPeriodSeconds
: The time interval that the Resource advisor agent collects resource information about the local CPU. The default value is every 10 seconds.

FullyQualifiedHostname
: The fully qualified host name of the Tivoli Workload Scheduler agent. It is configured automatically at installation time and is used to connect with the Tivoli Workload Scheduler master or dynamic domain manager. Edit only if the host name is changed after installation.

NotifyToResourceAdvisorPeriodSeconds
: The time interval that the Resource advisor agent forwards the collected resource information to the Resource advisor. The default (and maximum value) is every 180 seconds.

ResourceAdvisorUrl
: The URL of the Tivoli Workload Scheduler master or dynamic domain manager that is hosting the dynamic agent. This URL is used until the server replies with the list of its URLs. The value is `https://$(`*`tdwb_server`*`):$(`*`tdwb_port`*`)/JobManagerRESTWeb/JobScheduler/resource`, where:

  $(*tdwb_server***)**
  : is the fully qualified host name of the Tivoli Workload Scheduler master or dynamic domain manager.

  $(*tdwb_port***)**
  : is the port number of the Tivoli Workload Scheduler master or dynamic domain manager.

  It is configured automatically at installation time. Edit only if the host name or the port number are changed after installation, or if you do not use secure connection (set to `http`). If you set the port number to zero, the resource advisor agent does not start. The port is set to zero if at installation time you specify that you will not be using the Tivoli Workload Scheduler master or dynamic domain manager.

BackupResourceAdvisorUrls
: The list of URLs returned by the Tivoli Workload Scheduler master or dynamic domain manager. The agent uses this list to connect to the Tivoli Workload Scheduler master or dynamic domain manager.

ScannerPeriodSeconds
: The time interval that the Resource advisor agent collects information about all the resources in the local system other than CPU resources. The default value is every 120 seconds.

The resource advisor agent, intermittently scans the resources of the machine (computer system, operating system, file systems and networks) and periodically sends an update of their status to the Tivoli Workload Scheduler master or dynamic domain manager.

The CPU is scanned every `CPUScannerPeriodSeconds` seconds, while all the other resources are scanned every `ScannerPeriodSeconds` seconds. As soon as one of the scans shows a significant change in the status of a resource, the resources are synchronized with the Tivoli Workload Scheduler master or dynamic domain manager. The following is the policy followed by the agent to tell if a resource attribute has significantly changed:

- A resource is added or deleted
- A string attribute changes its value
- A CPU value changes by more than `DeltaForCPU`
- A file system value changes by more than `DeltaForDiskMB` megabytes
- A Memory value changes by more than `DeltaForMemoryMB` megabytes

If there are no significant changes, the resources are synchronized with the Tivoli Workload Scheduler master or dynamic domain manager every `NotifyToResourceAdvisorPeriodSeconds` seconds.

Configuring properties of the System scanner [SystemScanner]

In the `JobManager.ini` file, the section containing the properties of the System scanner is named:

```
[SystemScanner]
```

You can change the following properties:

CPUSamples
: The number of samples used to calculate the average CPU usage. The default value is 3.

DeltaForCPU
: The change in CPU usage considered to be significant when it becomes higher than this percentage (for example, DeltaForCPU is 20 if the CPU usage changes from 10 percent to 30 percent). The default value is 20 percent.

DeltaForDiskMB
: The change in use of all file system resources that is considered significant when it becomes higher than this value. The default value is 100 MB.

DeltaForMemoryMB
: The change in use of all system memory that is considered significant when it becomes higher than this value. The default value is 100 MB.

Configuring the dynamic workload broker server on the master domain manager and dynamic domain manager

You can perform these configuration tasks after completing the installation of your master domain manager, dynamic domain manager, and dynamic agents, and any time that you want to change or tune specific parameters in your environment.

The configuration parameters for the dynamic workload broker server are defined by default at installation time. You modify a subset of these parameters using the files that are created when you install dynamic workload broker. The following files are created in the path:

```
TWA_home/TDWB/config
```

ResourceAdvisorConfig.properties
: Contains configuration information about the **Resource Advisor**. For more information, see “ResourceAdvisorConfig.properties file” on page 52.

JobDispatcherConfig.properties
: Contains configuration information about the **Job Dispatcher**. For more information, see “JobDispatcherConfig.properties file” on page 54.

BrokerWorkstation.properties
: Contains configuration information about the broker server. “BrokerWorkstation.properties file” on page 56

CLIConfig.properties
: Contains configuration information for the dynamic workload broker command line. This file is described in *Tivoli Workload Scheduler: Scheduling Workload Dynamically*.

audit.properties
: Contains options for configuring the auditing of events. This file is documented in the *IBM Tivoli Workload Scheduler: Troubleshooting Guide*.

You can modify a subset of the parameters in these files to change the following settings:
- Heartbeat signal from the dynamic agents.
- Time interval for job allocation to resources
- Time interval for notifications on resources
- Polling time when checking the status of remote engine workstations
- Maximum number of results when allocating jobs to global resources
- Encryption of any passwords sent in the JSDL definitions
- Time interval for retrying the operation after a **Job Dispatcher** failure
- Time interval for retrying the operation after a client notification failure
- Archive settings for job data
- Job history settings
- Command line properties (see *IBM Tivoli Workload Scheduler: Scheduling Workload Dynamically*)

The editable parameters are listed in the following sections. If you edit any parameters that are not listed, the product might not work. After modifying the files, you must stop and restart the IBM WebSphere server.

Maintaining the dynamic workload broker server on the master domain manager and dynamic domain manager

Because one dynamic workload broker server is installed with your master domain manager and dynamic domain manager, and one server with every backup manager, you have at least two servers present in your Tivoli Workload Scheduler network. The server running with the master domain manager is the only one active at any time. The servers installed in the backup managers are idle until you switch managers, and the server in the new manager becomes the active server (see “Starting, stopping, and displaying dynamic workload broker status” on page 298 for important information about this scenario). To have a smooth transition from one server to another, when you switch managers, it is important that you keep the same configuration settings in the `ResourceAdvisorConfig.properties` and `JobDispatcherConfig.properties` files in all your servers. When you make a change in any of these files of your running dynamic workload broker server, remember to apply the same change also in the dynamic workload broker server idling on your backup manager.

Some of the settings for the dynamic workload broker server are stored in the local **BrokerWorkstation.properties** file and also in the Tivoli Workload Scheduler database. When you switch to the backup master domain manager or dynamic domain manager, the dynamic workload broker server settings are automatically updated on the backup workstation. For more information about the **BrokerWorkstation.properties** file, see “BrokerWorkstation.properties file” on page 56.

Note: The database is automatically populated with the information from the active workstation, regardless of whether it is the manager or the backup workstation. For example, if you modify the dynamic workload broker server settings on the backup master domain manager or dynamic domain manager, this change is recorded in the database. When you switch back to the manager workstation, the change is applied to the master domain manager or dynamic domain manager and the related local settings are overwritten.

It is important that you also keep the data pertinent to every dynamic workload broker server up-to-date. If you change the host name or port number of any of your dynamic workload broker servers, use the `exportserverdata` and `importserverdata` commands from the dynamic workload broker command line to record these changes in the Tivoli Workload Scheduler database. For information about these commands, see *Scheduling Workload Dynamically*.

The database records for your workload broker workstations all have LOCALHOST as the host name of the workstation. Leave the record as-is. Do not replace LOCALHOST with the actual host name or IP address of the workstation. LOCALHOST is used intentionally to ensure that the jobs submitted from Tivoli Workload Scheduler are successfully sent to the new local dynamic workload broker when you switch the master domain manager or dynamic domain manager.

Enabling unsecure communication with the dynamic workload broker server

By default, the dynamic workload broker server uses secure communication. You might need to enable unsecure communication, even though this type of communication is not recommended.

To enable unsecure communication with the dynamic workload broker server, perform the following steps on the master domain manager:

1. Run the exportserverdata command located in *installation_directory*/TDWB/bin:
   ```
   exportserverdata -dbUsr db_instance_admin -dbPwd db_instance_admin_pwd
   ```
2. Open the resulting server.properties file in a flat-text editor.
3. Copy the following line:
   ```
   https://hostname:port/JobManagerRESTWeb/JobScheduler
   ```
4. Change the copied line by replacing **https** with **http**:
   ```
   http://hostname:port/JobManagerRESTWeb/JobScheduler
   ```

   The file now contains two lines specifying the connection mode, one line specifying the https mode and one line specifying the http mode.

5. Save the file.
6. Import the new data with the importserverdata command located in *installation_directory*/TDWB/bin:

   ```
   importserverdata -dbUsr db_instance_admin -dbPwd db_instance_admin_pwd
   ```

For more information about the exportserverdata and importserverdata commands, see *Tivoli Workload Scheduler: Scheduling Workload Dynamically*.

ResourceAdvisorConfig.properties file

The parameters in this file affect the following dynamic workload broker server settings:

- Heartbeat signal from the dynamic agents
- Time interval for job allocation to resources
- Time interval for notifications on resources
- Polling time when checking the status of remote engine workstations
- Maximum number of results when allocating jobs to global resources

You can modify the following parameters in the `ResourceAdvisorConfig.properties` file:

DatabaseCheckInterval
Specifies the time interval within which the dynamic workload broker server checks the availability of the database. The default value is **180** seconds.

ResourceAdvisorURL
Specifies the URL of the **Resource Advisor**.

RaaHeartBeatInterval
Specifies the time interval within which the **Resource Advisor** expects a heartbeat signal from the dynamic agent. The default value is **200** seconds. After the maximum number of retries (specified in the **MissedHeartBeatCount** parameter) is exceeded, the **Resource Advisor** reports the related computer as unavailable. In a slow network, you might want to set this parameter to a higher value. However, defining a higher value might delay the updates on the availability status of computer systems. If, instead, you decrease this value together with the value defined for the **NotifyToResourceAdvisorPeriodSeconds** parameter, this might generate network traffic and increase CPU usage when updating cached data. The value defined in this parameter must be consistent with the **NotifyToResourceAdvisorPeriodSeconds** parameter defined in the `JobManager.ini` file, which defines the time interval for each dynamic agent to send the heartbeat signal to the **Resource Advisor**.

MissedHeartBeatCount
Specifies the number of missed heartbeat signals after which the computer is listed as not available. The default value is 2. In a slow network, you might want to set this parameter to a higher value.

MaxWaitingTime
Specifies the maximum time interval that a job must wait for a resource to become available. If the interval expires before a resource becomes available, the job status changes to Resource Allocation Failure. The default value is 600 seconds. You can override this value for each specific job by using the **Maximum Resource Waiting Time** parameter defined in the Job Brokering Definition Console. For more information about the **Maximum Resource Waiting Time** parameter, see the Job Brokering Definition

Console online help. If you set this parameter to -1, no waiting interval is applied for the jobs. If you set this parameter to 0, the **Resource Advisor** tries once to find the matching resources and, if it does not find any resource, the job changes to the ALLOCATION FAILED status. If you increase this value, all submitted jobs remain in WAITING status for a longer time and the **Resource Advisor** tries to find matching resources according to the value defined for the **CheckInterval** parameter.

CheckInterval
Specifies how long the **Resource Advisor** waits before retrying to find matching resources for a job that did not find any resource in the previous time slot. The default value is 60 seconds.

TimeSlotLength
Specifies the time slot interval during which the **Resource Advisor** allocates resources to each job. Jobs submitted after this interval has expired are considered in a new time slot. The default value is 15 seconds. The default value is adequate for most environments and should not be modified. Setting this parameter to a higher value, causes the **Resource Advisor** to assign resources to higher priority jobs rather than to lower priority jobs when all jobs are trying to obtain the same resource. It might also, however, cause the job resource matching processing to take longer and the resource state updates from agents to be slowed down. Setting this parameter to a lower value, causes the **Resource Advisor** to process the resource matching faster and, if you have a high number of agents with frequent updates, to update the resource repository immediately. If job requirements match many resources, lower values ensure a better load balancing. If most jobs use resource allocation, do not lower this value because the allocation evaluation requires many processing resources.

NotifyTimeInterval
Specifies the interval within which the **Resource Advisor** retries to send notifications on the job status to the **Job Dispatcher** after a notification failed. The default value is 15 seconds. The default value is adequate for most environments and should not be modified.

MaxNotificationCount
Specifies the maximum number of attempts for the **Resource Advisor** to send notifications to the **Job Dispatcher**. The default value is 100. The default value is adequate for most environments and should not be modified.

ServersCacheRefreshInterval

Specifies with what frequency (in seconds) the Resource Advisor checks the list of active and backup workload broker servers for updates. This list is initially created when the master domain manager is installed, and after that it is updated every time a new backup master is installed and connected to the master domain manager database (the master domain manager and every backup master include also a workload broker server). When the Resource Advisor agents send their data about the resources discovered in each computer, they are able to automatically switch between the servers of this list, so that the workload broker server that is currently active can store this data in its Resource Repository. For this reason, the Resource Advisor agents must know at all times the list of all workload broker servers. The possible values range between 300 (5 minutes) and 43200 (12 hours). The default value is 3600 seconds.

StatusCheckInterval
Specifies the time interval in seconds the Resource Advisor waits before polling for the status of a resource. For example this timeout applies when checking the status of a remote engine. The default value is 120 seconds.

After modifying the file, you must stop and restart the WebSphere Application Server.

JobDispatcherConfig.properties file

The parameters in this file affect the following dynamic workload broker server settings:

- Encryption of any passwords sent in the JSDL definitions
- Time interval for retrying the operation after a **Job Dispatcher** failure
- Time interval for retrying the operation after a client notification failure
- Archive settings for job data
- Job history settings

In the `JobDispatcherConfig.properties` file, the following parameters are available:

DatabaseCheckInterval
Specifies the time interval within which the dynamic workload broker server checks the availability of the database. The default value is **180** seconds.

EnablePasswordEncryption
Specifies that any user passwords contained in the JSDL definitions are to be encrypted when the definitions are sent to the dynamic agents. The default is `true`. Setting this property to `false` forces the workload broker server to send the passwords in plain text. This applies to any password field.

RAEndpointAddress
Specifies the URL of the **Resource Advisor**.

JDURL
Specifies the URL of the **Job Dispatcher**.

FailQInterval
Specifies the numbers of seconds for retrying the operation after the following failures:

- Client notification.
- Allocation, Reallocate, Cancel Allocation requests to **Resource Advisor**.
- Any database operation failed for connectivity reasons.

The default value is 30 seconds. Increasing this value improves recovery speed after a failure but can use many system resources if the recovery operation is complex. For example, if the workload broker workstation is processing a new Symphony file, this operation might require some time, so you should set this parameter to a high value. If you are not using workload broker workstation, this parameter can be set to a lower value.

MaxCancelJobAttemptsCount
The maximum number of times the Job Dispatcher attempts to cancel a shadow job or a job running on a dynamic agent when a request to kill the job is made and the kill request cannot be immediately processed. The

default is 1440 attempts. The Job Dispatcher attempts to cancel the job every 30 seconds for a maximum number of times specified by this parameter.

MaxNotificationCount
Specifies the maximum number of retries after a client notification failure. The default value is 1440. For example, if the workload broker workstation is processing a new Symphony file, this operation might require some time, so you should set this parameter to a high value. If you are not using the workload broker workstation, this parameter can be set to a lower value.

MoveHistoryDataFrequencyInMins
Specifies how often job data must be moved to the archive tables in the **Job Repository** database and the tables in the archive database must be dropped. The unit of measurement is minutes. The default value is 60 minutes. Increasing this value causes the **Job Dispatcher** to check less frequently for jobs to be moved. Therefore, the volume of jobs in the **Job Repository** might increase and all queries might take longer to complete. Dynamic workload broker servers with high job throughput might require lower values, while low job throughputs might require higher values.

SuccessfulJobsMaxAge
Specifies how long successfully completed or canceled jobs must be kept in the **Job Repository** database before being archived. The unit of measurement is hours. The default value is 240 hours, that is ten days.

UnsuccessfulJobsMaxAge
Specifies how long unsuccessfully completed jobs or jobs in unknown status must be kept in the **Job Repository** database before being archived. The unit of measurement is hours. The default value is 720 hours, that is 30 days.

ArchivedJobsMaxAge
Specifies how long jobs must be kept in the archive database before being deleted. The unit of measurement is hours. The default value is 720 hours, that is 30 days.

AgentConnectTimeout
Specifies the number of minutes that the workload broker server waits for a scheduling agent response after it first attempts to establish a connection with that agent. If the agent does not reply within this time, the server does not open the connection. Values range from 0 to 60 (use 0 to wait indefinitely). The default is 3.

AgentReadTimeout
Specifies the number of minutes that the workload broker server waits to receive data from established connections with a scheduling agent. If no data arrives within the specified time, the server closes the connection with the agent. Values range from 0 to 60 (use 0 to wait indefinitely). The default is 3.

You can use this file to configure the product behavior when archiving job data. For more information about archive tables, see "Historical database tables created during installation" on page 57.

If an unexpected job workload peak occurs and a cleanup of the database is required earlier than the value you specified in the

`MoveHistoryDataFrequencyInMins` parameter, you can use the **`movehistorydata`** command to perform a cleanup before the scheduled cleanup is performed.

After modifying the file, you must stop and restart the IBM WebSphere server.

BrokerWorkstation.properties file

If you need to make configuration changes to the broker server after the installation has completed, you can edit the `BrokerWorkstation.properties` file. The `BrokerWorkstation.properties` file contains the following configuration properties:

DomainManager.Workstation.Name
The name of the domain manager workstation.

DomainManager.Workstation.Port
The port of the domain manager workstation.

MasterDomainManager.Name
The name of the master domain manager workstation.

Broker.Workstation.Name
The name of the broker server in the Tivoli Workload Scheduler production plan. This name is first assigned at installation time.

MasterDomainManager.HostName
The host name of the master domain manager workstation.

MasterDomainManager.HttpsPort
The HTTPS port of the master domain manager workstation.

Broker.Workstation.Port
The port used by the broker server to listen to the incoming traffic (equivalent to the Netman port). It is first assigned at installation time. This port number must always be the same for all the broker servers that you define in your Tivoli Workload Scheduler network (one with the master domain manager and one with every backup master you install) to ensure consistency when you switch masters.

DomainManager.Workstation.Domain
The name of the domain where the broker server is registered.

Broker.AuthorizedCNs
The list of prefixes of common names authorized to communicate with the broker server. For more information about authorizing the connection to the dynamic domain manager, see "Customizing the SSL connection to the master domain manager and dynamic domain manager" on page 197.

Broker.Workstation.Enable
A switch that enables or disables the broker server. The value can be `true` or `false`. The default value is `true`.

Set this value to `false` if you decide not to use a broker server. Not using the broker server means that you can submit jobs dynamically on the workload broker directly (using either the Dynamic Workload Console or the workload broker command line) without using the scheduling facilities of Tivoli Workload Scheduler.

Broker.Workstation.CpuType
The workstation type assigned to the broker server. Supported values are:

- master domain manager (master)
- backup master domain manager (fta)

- dynamic domain manager (fta, broker, agent)
- backup dynamic domain manager (fta, broker, agent)

Broker.Workstation.RetryLink
The number of seconds between consecutive attempts to link to the broker server. The default is 600.

Note that no SSL security is available for the connection between the master domain manager and the broker server. All the data between the two workstations is sent unencrypted. If this might cause a security risk in your environment, you can choose not to use the broker server functions, by setting `Broker.Workstation.Enable` to `false`.

Archiving job data

Job definitions created using the Job Brokering Definition Console or the Dynamic Workload Console are stored in the **Job Repository** database. The **Job Repository** database stores also the jobs created when the job definitions are submitted to the dynamic workload broker.

Job information is archived on a regular basis. By default, successful jobs are archived every 24 hours. Jobs in failed or unknown status are archived by default every 72 hours. Archived jobs are moved to historical tables in the **Job Repository**.

You can configure the time interval after which job data is archived using the following parameters:

- **MoveHistoryDataFrequencyInMins**
- **SuccessfulJobsMaxAge**
- **UnsuccessfulJobsMaxAge**
- **ArchivedJobsMaxAge**

These parameters are available in the JobDispatcherConfig.properties file, as described in "JobDispatcherConfig.properties file" on page 54. You can also use the **`movehistorydata`** command to perform a cleanup before the scheduled cleanup is performed.

Historical database tables created during installation

Database creation differs depending on the database vendor you are using. If you are using DB2®, two databases are created by default when the dynamic workload broker server is installed. If you are using Oracle, two schemas are created in the same database. The names for both the databases and the schemas are as follows:

IBMCDB (DB2)/ CDB (Oracle)
Contains Agent manager data. The name is fixed and cannot be changed.

TDWB
Contains dynamic workload broker data. You can change the name.

The following three historical tables are created during the installation process in the **TDWB** database. These tables are used to contain historical data about job instances.

JOA_JOB_ARCHIVES
Contains archived job instances. See Table 13 on page 58.

JRA_JOB_RESOURCE_ARCHIVES
Contains resource information related to a job. See Table 14 on page 58.

MEA_METRIC_ARCHIVES
Contains metrics collected for a job. See Table 15 on page 59.

To improve RDBMS performance, you can move data from the standard tables to historical tables on a regular basis. You can configure RDBMS maintenance using the JobDispatcherConfig.properties file. For more information, see "JobDispatcherConfig.properties file" on page 54. You can also use the **movehistorydata** command to move data to the historical tables and delete archived data.

Table 13. JOA_JOB_ARCHIVES database table

Column Name	DB2 Data Type	Oracle Data Type	Length	Nullable	Description
JOA_ID	CHAR () FOR BIT DATA	RAW	16	No	Contains the unique identifier of the job
JOA_START_TIME	TIMESTAMP	TIMESTAMP	26	Yes	The start time of the job, if started
JOA_END_TIME	TIMESTAMP	TIMESTAMP	26	Yes	The end time of the job, if ended
JOA_JSDL_INSTANCE	CLOB	CLOB		No	The JSDL (job definition), stored in binary format
JOA_SUBMIT_USERNAME	VARCHAR	VARCHAR2	120	No	The submitter
JOA_TIMEZONE	VARCHAR	VARCHAR2	40	Yes	Not used in this release
JOA_STATE	DECIMAL	NUMBER	2	No	The job state code
JOA_RETURN_CODE	DECIMAL	NUMBER	10	No	The job return code
JOA_SUBMIT_TIME	TIMESTAMP	TIMESTAMP	26	No	The submit time
JOA_NAME	VARCHAR	VARCHAR2	250	No	The job definition name
JOA_NAMESPACE	VARCHAR	VARCHAR2	250	Yes	The job definition namespace
JOA_ALIAS_NAME	VARCHAR	VARCHAR2	250	Yes	The job definition alias
JOA_SUBMITTER_TYPE	VARCHAR	VARCHAR2	80	Yes	The submitter type (for example, TDWB CLI, TDWB UI)
JOA_UPDATE_TIME	TIMESTAMP	TIMESTAMP	26	No	The last update timestamp of actual row

Table 14. JRA_JOB_RESOURCE_ARCHIVES database table

Column Name	DB2 Data Type	Oracle Data type	Length	Nullable	Description
JOA_ID	CHAR () FOR BIT DATA	RAW	16	No	Contains the unique identifier of the job
JRA_RESOURCE_NAME	VARCHAR	VARCHAR2	250	No	The resource internal name
JRA_RESOURCE_TYPE	VARCHAR	VARCHAR2	30	No	The resource type (for example, ComputerSystem, FileSystem, ...)
JRA_RESOURCE_GROUP	DECIMAL	NUMBER	5	No	The group code (grouping an allocation for actual job)
JRA_DISPLAY_NAME	VARCHAR	VARCHAR2	250	Yes	The displayed name
JRA_IS_TARGET	DECIMAL	NUMBER	1	No	A flag indicating the root resource (typically the ComputerSystem)

Table 15. MEA_METRIC_ARCHIVES database table

Column Name	DB2 Data Type	Oracle Data Type	Length	Nullable	Description
JOA_ID	CHAR () FOR BIT DATA	RAW	16	No	Contains the unique identifier of the job
MEA_NAME	VARCHAR	VARCHAR2	80	No	The metric name (for example, JOB_MEMORY_USAGE, JOB_CPU_USAGE, ...)
MEA_TYPE	CHAR	CHARACTER	10	No	The metric datatype (for example, DECIMAL, ...)
MEA_VALUE	VARCHAR	VARCHAR2	250	No	The metric value

Table 16 lists the status of jobs as stored in the historical tables in association with the job status available in the Tivoli Dynamic Workload Console and in the command line, mapping them with the related options in the **movehistorydata** command.

Table 16. Job statuses in the historical tables

movehistorydata option	Job status in tables	Tivoli Dynamic Workload Console status	Command line status
SuccessfulJobsMaxAge	43	Completed successfully	SUCCEEDED_EXECUTION
	44	Canceled	CANCELED
UnsuccessfulJobMaxAge	41	Resource allocation failed	RESOURCE_ ALLOCATION_FAILED
	42	Run failed	FAILED_EXECUTION
	45	Unknown	UNKNOWN
	46	Unable to start	NOT_EXECUTED

Configuring to schedule J2EE jobs

Using the dynamic workload broker component you can schedule J2EE jobs. To do this you must complete the following configuration tasks:

- Configure the J2EE executor on every agent on which you submit J2EE jobs.
- Configure the J2EE Job Executor Agent on an external WebSphere Application Server

Configuring the J2EE executor

To dynamically schedule J2EE jobs, you must configure the following property files on every agent on which you submit J2EE jobs:

- J2EEJobExecutorConfig.properties
- logging.properties
- soap.client.props

These files are configured with default values at installation time. The values that you can customize are indicated within the description of each file.

J2EEJobExecutorConfig.properties file: The path to this file is `TWA_home/TWS/JavaExt/cfg/J2EEJobExecutorConfig.properties` (`TWA_home\TWS\JavaExt\cfg\J2EEJobExecutorConfig.properties`) on the agent.

The keywords of this file are described in the following table:

Table 17. J2EEJobExecutorConfig.properties file keywords

Keyword	Specifies...	Default value	Must be customized
wasjaas.default	The path to the IBM WebSphere configuration file (`wsjaas_client.conf`) used to authenticate on the external WebSphere Application Server using JAAS security.	*TWA_home*/TWS/JavaExt/cfg/ wsjaas_client.conf or *TWA_home*\TWS\JavaExt\cfg\ wsjaas_client.conf	Optionally yes, if you move the file to the path you specify.
credentials.mycred	The credentials (ID and password) used to establish the SOAP connection to the external WebSphere Application Serverwhen using indirect scheduling (the password must be {xor} encrypted)	wasadmin,{xor}KD4sPjsyNjE\= (ID=wasadmin and password=wasadmin in {xor} encrypted format)	Yes, see "Running {xor} encryption on your password" on page 61 to learn how to encrypt your password.
connector.indirect	The name of the communication channel with WebSphere Application Server. Selecting an indirect invoker means that dynamic workload broker uses an existing WebSphere Application Server scheduling infrastructure that is already configured on a target external WebSphere Application Server. When creating the job definition, you can specify if you want to use a direct or indirect connector in the **J2EE Application** pane in the **Application** page in the Job Brokering Definition Console, or in the **invoker** element in the JSDL file. For more information about the Job Brokering Definition Console, see the online help.	A single line with the following values separated by commas: • `indirect` keyword • Name of the scheduler: `sch/MyScheduler` • `soap` keyword • Host name of the external WebSphere Application Server instance: `washost.mydomain.com` • SOAP port of the WebSphere Application Server instance: `8880` • Path to the `soap.client.props` file: `*TWA_home*/TWS/JavaExt/cfg/soap.client.props` • Credentials keyword: `mycred`	You must customize the following: • The scheduler name. Replace the `sch/MyScheduler` string with the JNDI name of the IBM WebSphere scheduler that you plan to use. • The host name of the external WebSphere Application Server instance. • The SOAP port of the external WebSphere Application Server instance.

Table 17. J2EEJobExecutorConfig.properties file keywords (continued)

Keyword	Specifies...	Default value	Must be customized
connector.direct	The name of the direct communication channel without using the WebSphere Application Server scheduler. Select a direct invoker to have dynamic workload brokerimmediately forward the job to the external WebSphere Application Server instance components (EJB or JMS). When creating the job definition, you can specify if you want to use a direct or indirect connector in the **J2EE Application** pane in the **Application** page in the Job Brokering Definition Console, or in the **invoker** element in the JSDL file. For more information about the Job Brokering Definition Console, see the online help.	A single line with the following values separated by commas: • `direct` keyword • The following string: `com.ibm.websphere.naming.` `WsnInitialContextFactory` • The following string: `corbaloc:iiop:` `washost.mydomain.com:2809`	You must customize the following: • The host name of the external WebSphere Application Server instance: `washost.mydomain.com` • The RMI port of the external WebSphere Application Server instance: `2809`
trustStore.path	The path to the WebSphere Application Server trustStore file (this file must be copied to this local path from the WebSphere Application Server instance).	*TWA_home*/TWS/JavaExt/cfg/ DummyClientTrustFile.jks	You can change the path (*TWA_home*/TWS/ JavaExt/cfg), if you copy the trustStore path from the external WebSphere Application Server to this path.
trustStore.password	The password for the WebSphere Application Server trustStore file.	WebAs	Yes

Running {xor} encryption on your password:

To {xor} encrypt your password, use the `PropFilePasswordEncoder` command located in the *WAS_home*/bin directory of the external WebSphere Application Server.

Follow these steps:

1. Open a new text file and write the following line:
   ```
   string=your_password_in_plain_text
   ```
2. Save the file with a *file_name* of your choice.
3. Run `PropFilePasswordEncoder` as follows:
   ```
   PropFilePasswordEncoder file_name string
   ```
   where:

   file_name
   : Is the name of the file with your password.

string Is the *string* you used in the text file. This can be any word that you choose, for example, `password`, `mypwd`, `joe`, and so on.

4. When the command completes, open the text file again. The content has changed to:

   string={xor}*your_encrypted_password*
5. Copy your encrypted password, inclusive of the {xor} characters, and paste it where required into your property files.

For example, if you want to encrypt your password `catamaran`. Proceed as follows:

1. Open a text file and write the following:
   ```
   mypasswd=catamaran
   ```
2. Save the file with name `encrfile.txt`.
3. Run:
   ```
   PropFilePasswordEncoder encrfile.txt mypasswd
   ```
4. Open `encrfile.txt`. You find:
   ```
   mypasswd={xor}PD4rPjI+LT4x
   ```
5. Copy `{xor}PD4rPjI+LT4x` and paste it where you need to.

The logging.properties file:

The path to this file is *TWA_home*/TWS/JavaExt/cfg/logging.properties (*TWA_home*\TWS\JavaExt\cfg\logging.properties) on the agent.

After installation, this file is as follows:

```
# Specify the handlers to create in the root logger
 # (all loggers are children of the root logger)
 # The following creates two handlers
 handlers = java.util.logging.ConsoleHandler, java.util.logging.FileHandler

 # Set the default logging level for the root logger
 .level = INFO

 # Set the default logging level for new ConsoleHandler instances
 java.util.logging.ConsoleHandler.level = INFO

 # Set the default logging level for new FileHandler instances
 java.util.logging.FileHandler.level = ALL
 java.util.logging.FileHandler.pattern =
  C:\TWA_home\TWS\JavaExt\logs\javaExecutor%g.log
 java.util.logging.FileHandler.limit = 1000000
 java.util.logging.FileHandler.count = 10

 # Set the default formatter for new ConsoleHandler instances
 java.util.logging.ConsoleHandler.formatter = java.util.logging.SimpleFormatter
 java.util.logging.FileHandler.formatter = java.util.logging.SimpleFormatter

 # Set the default logging level for the logger named com.mycompany
 com.ibm.scheduling = INFO
```

You can customize:

| • The logging level (from INFO to WARNING, ERROR, or ALL) in the following
| keywords:

| **.level** Defines the logging level for the internal logger.

| **com.ibm.scheduling**
| Defines the logging level for the job types with advanced options. To log
| information about job types with advanced options, set this keyword to
| ALL.

- The path where the logs are written, specified by the following keyword:
  `java.util.logging.FileHandler.pattern`

The soap.client.props file:

The path to this file is *TWA_home*/TWS/JavaExt/cfg/soap.client.props (*TWA_home*\TWS\JavaExt\cfg\soap.client.props) on the agent.

After installation, this file is as follows:

```
#------------------------------------------------------------------------------
 # SOAP Client Security Enablement
 #
 # - security enabled status  ( false[default], true  )
 #------------------------------------------------------------------------------
 com.ibm.SOAP.securityEnabled=false

 com.ibm.SOAP.loginUserid=wasadmin
 com.ibm.SOAP.loginPassword={xor}KD4sPjsyNjE\=

 #------------------------------------------------------------------------------
 # SOAP Login Prompt
 #
 # The auto prompting will happen only if all of the following are met:
 #
 # - Running from a SOAP client
 # - Server is reachable and server security is enabled
 # - Username and password are not provided either on command line or in this
 #   file
 # - com.ibm.SOAP.loginSource below is set to either "stdin" or "prompt"
 #
 #   stdin: prompt in command window
 #   prompt: GUI dialog box; falls back to stdin if GUI not allowed
 #
 #   (So to disable auto prompting, set loginSource to nothing)
 #------------------------------------------------------------------------------
 com.ibm.SOAP.loginSource=prompt

 #------------------------------------------------------------------------------
 # SOAP Request Timeout
 #
 # - timeout (specified in seconds [default 180], 0 implies no timeout)
 #
 #------------------------------------------------------------------------------
 com.ibm.SOAP.requestTimeout=180

 #------------------------------------------------------------------------------
 # SSL configuration alias referenced in ssl.client.props
 #------------------------------------------------------------------------------
 com.ibm.ssl.alias=DefaultSSLSettings
```

If you want to enable SOAP client security, you must:

1. Change `com.ibm.SOAP.securityEnabled` to `true`
2. Customize:
   - `com.ibm.SOAP.loginUserid` with the true WebSphere Application Server administrator user ID.

- `com.ibm.SOAP.loginPassword` with the true WebSphere Application Server administrator password in {xor} encrypted format. See "Running {xor} encryption on your password" on page 61.

Configuring the J2EE Job Executor Agent

To set up the environment on the external WebSphere Application Server, Version 7.0 for the J2EE Job Executor Agent, do the following:

Create a Service Integration Bus

1. Open the WebSphere Administrative Console (for example, `http://localhost:9060/admin`, depending on the admin port you configured).
2. Expand **Service Integration** and select **Buses**. The Buses window is displayed.
3. Click **New** to display the Buses configuration window.
4. Type a name for the new bus, for example **MyBus** and click **Next** and then **Finish** to confirm.
5. Click the MyBus name and the MyBus properties are displayed.
6. Under Topology, click **Bus Members**. The Buses→MyBus→Bus members window is displayed.
7. Click **Add**, select the **Server** radio button, choose **<your_application_server_name>**, click **Next**, and then click **Finish**.
8. When the `Confirm the addition of a new bus member` panel is displayed, click **Finish**.
9. Select **Service Integration → Buses → MyBus → Destinations → New**.
10. Select **Queue** as the type and click **Next**
11. Type **BusQueue** as the identifier and assign the queue to a bus member. Click **Next**. In the confirmation panel click **Finish**.

Configure the Default Messaging Service

1. From the left panel of the WebSphere Administrative Console, expand **Resources→ JMS→ JMS Providers**, then click **Default messaging** at the server level as scope.
2. In the **Connection Factories** section, click **New**.
3. On the New JMS connection factory window, fill in the following fields:

   Name MyCF

   JNDI name
   jms/MyCF

   Bus name
   MyBus

   Provider endpoints
   <hostname>:<Basic SIB port number>:BootstrapBasicMessaging;<hostname>:<Secure SIB port number>:BootstrapSecureMessaging,

   where, <Basic SIB port number> and <Secure SIB port number> can be found by expanding **Servers**, selecting **<your_application_server_name>**, and then selecting **Messaging engine inbound transports** under **Server Messaging**.
4. Select again **Resources -→ JMS-→ JMS Providers → Default Messaging** at the server level as scope, locate the section **Destinations**, and click **Queues**. Click **New** and fill in the following fields as shown:

Name=MyQueue
JNDI name=jms/MyQueue
Bus name=MyBus
Queue name=BusQueue

Click **Ok**.

5. Select again **Resources → JMS → JMS Providers → Default Messaging** at the server level as scope, and locate the section **Activation Specifications**.
6. Click **JMS activation specification**. Click **New** and fill in the following fields as shown:
   Name=MyActSpec
   JNDI name=eis/MyActSpec
   Bus name=MyBus
   Destination type=Queue
   Destination JNDI name=jms/MyQueue

   Click **Ok**.

Configure the Java security

1. Select **Security → Secure Administration, applications and infrastructure**.
2. Locate the **Authentication** section, expand the **Java Authentication and Authorization Service**, and click **J2C authentication data**.
3. Click **New** and fill in the following fields as shown:
   Alias=*usr*
   User ID=*usr*
   Password=*pwd*

   where *usr* is the user ID authenticated when using connector security and *pwd* is the related password.
4. Click **Ok**.

Create an XA DataSource

1. In the left pane, go to **Resources → JDBC..→ JDBCProviders**. In the resulting right pane, check that the scope is pointing to **<your_application_server_name>**.
2. Locate the **DERBY JDBC Provider (XA)** entry and click it.
3. Locate the **Additional Properties** section and click **Data Sources**.
4. Click **New** and fill in the following fields as shown:
   Name = MyScheduler XA DataSource
   JNDI name = jdbc/SchedulerXADS
   Database name = ${USER_INSTALL_ROOT}/databases/Schedulers/ ${SERVER}/SchedulerDB;create=true
5. At the top of the page, click **Test connection button**.
6. Even if you get a negative result, modify the **Database name** field, deleting the part `;create=true`. Click **Ok**.

Create a WorkManager

1. In the left pane, go to **Resources → Asynchronous beans → Work managers** and click **New**.
2. Fill in the following fields as shown:
   Name=SchedulerWM
   JNDI name=wm/SchedulerWM
3. Click **Ok**.

Create and configure a scheduler

1. In the left pane, go to **Resources → Schedulers** and click **New**.
2. Fill in the following fields as shown:
   Name=MyScheduler
   JNDI name=sch/MyScheduler
   Data source JNDI name=jdbc/SchedulerXADS
   Table prefix=MYSCHED
   Work managers JNDI name=wm/SchedulerWM
3. Click **Ok**.
4. Select **MyScheduler** and click **Create tables**.
5. Deploy the test application.

Security order of precedence used for running J2EE tasks

There are three ways of verifying that a task runs with the correct user credentials. Tasks run with specified security credentials using the following methods:

1. Java Authentication and Authorization Service (JAAS) security context on the thread when the task was created.
2. `setAuthenticationAlias` method on the `TaskInfo` object.
3. A specified security identity on a `BeanTaskInfo` task `TaskHandler` EJB method.

The authentication methods are performed in the order listed above, so that if an authentication method succeeds, the following checks are ignored. This means that the *usr* and *pwd* credentials defined in **Configure the Java security** take precedence over any credentials specified in the tasks themselves.

Configuring to schedule job types with advanced options

In addition to defining job types with advanced options using the Dynamic Workload Console or the **composer** command, you can use the related configuration files. The options you define in the configuration files apply to all job types with advanced options of the same type. You can override these options when defining the job using the Dynamic Workload Console or the **composer** command.

Configuration files are available on each dynamic agent in *TWA_home*/TWS/JavaExt/cfg for the following job types with advanced options:

Table 18. Configuration files for job types with advanced options

Job type	**File name**	**Keyword**
• Database job type • MSSQL Job	DatabaseJobExecutor.properties	Use the `jdbcDriversPath` keyword to specify the path to the JDBC drivers. Define the keyword so that it points to the JDBC jar files directory, for example: `jdbcDriversPath=c:\\mydir\\jars\\jdbc` The JDBC jar files must be located in the specified directory or its subdirectories. Ensure you have list permissions on the directory and its sub subdirectories. **Note:** For the MSSQL database, use version 4 of the JDBC drivers.

Table 18. Configuration files for job types with advanced options (continued)

Job type	File name	Keyword
Java job type	JavaJobExecutor.properties	Use the `jarPath` keyword to specify the path to the directory where the jar files are stored. This includes all jar files stored in the specified directory and all sub directories.
J2EE job type	J2EEJobExecutorConfig.properties	For more information about the J2EE job type, see "Configuring to schedule J2EE jobs" on page 59.

Configuring security roles for users and groups

At Dynamic Workload Console installation time, new predefined roles and groups are created in Tivoli Integrated Portal. These roles determine which Dynamic Workload Console windows are available to a user, and therefore which activities the user is authorized to perform from the Dynamic Workload Console. If you do not assign a role to a Tivoli Integrated Portal user, that user does not see any entry for workload broker in the navigation tree. Access to the entries in the navigation tree does not mean that the user can access product functions. There is a second level of authorization, which is determined by a set of security roles created at master domain manager installation time in WebSphere Application Server. These roles define the levels of authorization needed to perform product functions regardless of the interface used.

You must therefore map the users and roles in WebSphere Application Server to match the users and roles defined in the Tivoli Integrated Portal so that communication between the Dynamic Workload Console and the workload broker instance is ensured. This procedure is described in "Mapping security roles to users and groups in WebSphere Application Server"

Mapping security roles to users and groups in WebSphere Application Server

When the workload broker instance is installed on your master domain manager, corresponding roles are set up in WebSphere Application Server. By default, these roles are not used. However, if you enable global security in your environment, the authorization required to perform any tasks is always validated by WebSphere Application Server. Users are required to provide credentials for accessing dynamic scheduling tasks. These credentials correspond to existing users defined in the domain user registry or the LDAP server.

To allow users and groups to access the workload broker functions when global security is enabled, they must be mapped to the security roles in WebSphere Application Server. This mapping allows those users and groups to access applications defined by the role. At installation time, the following actor roles are created in the WebSphere Application Server:

Operator
Monitors and controls the jobs submitted.

Administrator
Manages the scheduling infrastructure.

Developer
Defines the jobs to be run specifying the job parameters, resource requirements, and so on.

Submitter
: Manages the submission of their own jobs and monitors and controls the job lifecycle. This is the typical role for a Tivoli Workload Scheduler user.

  Tivoli Workload Scheduler acts as submitter of jobs to the Tivoli Workload Scheduler dynamic agent.

Configurator
: Is the entity responsible for running the jobs on a local environment.

To map security roles to users and groups on the WebSphere Application Server you must modify the **`BrokerSecurityProps.properties`** file using the **`changeBrokerSecurityProperties`** script.

To avoid the risk of changing a configuration value inadvertently or of overwriting the latest changes, you should always first create a file containing the current properties, edit it to the values you require, and apply the changes. Proceed as follows:

1. Log on to the computer where Tivoli Workload Scheduler is installed as the following user:

   UNIX root

   Windows
   Any user in the *Administrators* group.
2. Access the directory: `<TWA_home>/wastools`
3. Stop the WebSphere Application Server using the **`conman stopappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
4. From that same directory run the following script to create a file containing the current broker security properties:

   UNIX **`showBrokerSecurityProperties.sh > my_file_name`**

   Windows
   `showBrokerSecurityProperties.bat > my_file_name`
5. Edit `my_file_name` with a text editor.
6. Edit the properties as you require. For each of the roles in the file, you can set the following properties:

   Everyone?
   Possible values:
   - **Yes**: Every user is authorized to perform tasks for the role. No check is performed on the WebSphere Application Server user registry.
   - **No** : Access is denied to users not defined in the WebSphere Application Server user registry.

   All authenticated?
   Possible values:
   - **Yes**: All users belonging to the current WebSphere Application Server user registry who have been authenticated can access resources and tasks for the role. This is the default value.
   - **No** : Access is granted only to those users and groups defined in the WebSphere Application Server user registry and listed in the mapped user and mapped group properties.

Mapped users
: If specified, one or more users separated by the vertical bar symbol (|). This field can be left blank.

Mapped groups
: If specified, one or more groups separated by the vertical bar symbol (|). This field can be left blank.

7. Save the file *my_file_name*.
8. Run the script:

   Windows
   : **`changeBrokerSecurityProperties.bat my_file_name`**

   UNIX
   : **`changeBrokerSecurityProperties.sh my_file_name`**

   where *my_file_name* is the *fully qualified path* of the file containing the new parameters.

   The properties are updated, according to the rules given in the descriptions of each property type.
9. Start the WebSphere Application Server using the **`conman startappserver`** command (see “Starting and stopping the application server and **appservman**” on page 303)
10. Check that the change has been implemented.

Note:

1. If the mapped user or group names contain blanks, the entire user or group list must be specified between double quotes ("). For example, if you want to add the users John Smith, MaryWhite and DavidC to the developer role, you specify them as follows:

   ```
   Role: Developer
   Everyone?: No
   All authenticated?: No
   Mapped users:"John Smith|MaryWhite|DavidC"
   Mapped groups:
   ```
2. In the file there is an additional default role named **WSClient** which you must leave as is.

Examples: To assign the Operator role to users Susanna and Ann belonging to the current WebSphere Application Server user registry:

```
Role: Operator
Everyone?: No
All authenticated?: No
Mapped users:Susanna|Ann
Mapped groups:
```

To assign the Administrator role to user Tom and the Developer role to the user group MyGroup defined in the current WebSphere Application Server user registry:

```
Role: Administrator
Everyone?: No
All authenticated?: No
Mapped users:Tom
Mapped groups:

Role: Developer
```

```
Everyone?: No
All authenticated?: No
Mapped users:
Mapped groups:MyGroup
```

BrokerSecurityProps.properties file

```
################################################################
# Broker Security Properties
################################################################


Role: WSClient
Everyone?: No
All authenticated?: Yes
Mapped users:
Mapped groups:

Role: Administrator
Everyone?: No
All authenticated?: Yes
Mapped users:
Mapped groups:

Role: Operator
Everyone?: No
All authenticated?: Yes
Mapped users:
Mapped groups:

Role: Submitter
Everyone?: No
All authenticated?: Yes
Mapped users:
Mapped groups:

Role: Configurator
Everyone?: No
All authenticated?: Yes
Mapped users:
Mapped groups:

Role: Developer
Everyone?: No
All authenticated?: Yes
Mapped users:
Mapped groups:
```

Configuring command-line client access authentication

This section describes how to reconfigure the connection used by the command line client.

The command line client is installed automatically on the master domain manager and can be installed optionally on any other workstation. On the master domain manager you use it to run all of the commands and utilities.

On any other workstation you use it to run one of the following commands:
- **evtdef**
- **composer**
- **conman** (selected subcommands)
- **optman**
- **planman**

- **sendevent**
- Selected reports

It is configured automatically by the installation wizard, but if you need to change the credentials that give access to the server on the master domain manager, or you want to use it to access a different master domain manager, modify the ***connection parameters*** as described here.

Note:

1. The ***connection parameters*** are not required to use the local **conman** program on a fault-tolerant agent.
2. The command-line client on the master domain manager uses exactly the same mechanism to communicate with the server as it does when it is installed remotely.

Connection parameters

The connection parameters can be provided in one of three ways:

Define them in localopts

All fields except *username* and *password*, can be defined by editing the *TWA_home*/TWS/**localopts** properties file on the computer from which the access is required. See "Setting local options" on page 23 for a full description of the file and the properties.

In **localopts** there is a section for the general connection properties, which contains the following:

```
host = host_name
protocol = protocol
port = port number
proxy = proxy server
proxyport = proxy server port number
timeout = seconds
defaultws = master_workstation
useropts = useropts_file
```

In addition, there are separate groups of SSL parameters which differ depending on whether your network is FIPS-compliant, and thus uses GSKit for SSL, or is not, and uses OpenSSL (see "FIPS compliance" on page 201 for more details):

FIPS-compliant (GSKit)

```
CLI SSL keystore file = keystore_file_name
CLI SSL certificate keystore label = label
CLI SSL keystore pwd = password_file_name
```

Not FIPS-compliant (OpenSSL)

```
CLI SSL server auth = yes|no
CLI SSL cipher = cipher_class
CLI SSL server certificate =certificate_file_name
CLI SSL trusted dir =trusted_directory
```

Store some or all of them in useropts

As a minimum, the **username** and **password** parameters can be defined in the *user_home*/.TWS/**useropts** file for the user who needs to make the connection. Also, if you need to personalize for a user any of the properties normally found in the `localopts` file, add the properties to the `useropts` file. The values in the `useropts` file always take precedence over those in the `localopts` file. See "Setting user options" on page 41 for a full description of the file and the properties.

The minimum set of properties you would find in **useropts** is as follows:

```
username=user_ID
password=password
```

Supply them when you use the command

When you use any of the commands you can add one or more of the connection parameters to the command string. These parameters take precedence over the parameters in **localopts** and **useropts**. This allows you, for example, to keep the parameters in the **localopts** file and just get users to supply the **username** and **password** parameters when they use one of the commands, avoiding the necessity to store this data in the **useropts** file for each user..

The parameters can either be supplied fully or partially in a file, to which you refer in the command string, or typed directly as part of the command string. The full syntax is as follows:

```
[-file <parameter_file>
|
 [-host <host_name>]
 [-password <user_password>]
 [-port <port_number>]
 [-protocol {http|https}]
 [-proxy <proxy_name>]
 [-proxyport <proxy_port_number>]
 [-timeout <timeout>]
 [-username <username>]
```

-file <*parameter_file*>
: A file containing one or more of the connection parameters. Parameters in the file are superseded if the corresponding parameter is explicitly typed in the command.

-host <*host_name*>
: The host name or IP address of the master domain manager to which you want to connect.

-password <*user_password*>
: The password of the user supplied in the `-username` parameter.

-port <*port_number*>
: The listening port of the master domain manager to which you want to connect.

-protocol {http|https}
: Enter either http or https, depending on whether you want to make a secure connection.

-proxy <*proxy_name*>
: The host name or IP address of the proxy server involved in the connection (if any).

-proxyport <*proxy_port_number*>
: The listening port of the proxy server involved in the connection (if any).

-timeout <*timeout*>
: The number of seconds the command line client is to wait to make the connection before giving a timeout error.

-username *<username>*
The user ID of the user making the connection.

Note: From the command line, neither the default workstation, nor the command line client SSL parameters can be supplied. These must always be supplied in either the `localopts` (see "Setting local options" on page 23) or the `useropts` file for the user (see "Setting user options" on page 41).

The command line client needs to assemble a full set of parameters, and it does so as follows:

1. First it looks for values supplied as parameters to the command
2. Then, for any parameters it still requires, it looks for parameters supplied in the file identified by the `-file` parameter
3. Then, for any parameters it still requires, it looks in the `useropts` file for the user
4. Finally, for any parameters it still requires, it looks in the `localopts` file

If a setting for a parameter is not specified in any of these places an error is displayed.

Entering passwords

Password security is handled as follows:

Password entered in `useropts` file
You type the connection password into the `useropts` file in unencrypted form. When you access the interface for the first time it is encrypted. This is the preferred method.

Password entered in the parameter file used by the command
You type the connection password into the parameter file in unencrypted form. It is not encrypted by using the command. Delete the file after use to ensure password security.

Password entered using the `-password` parameter in the command
You type the password in the command string in unencrypted form. It remains visible in the command window until you clear the command window contents.

Note: On Windows workstations, when you specify a password that contains double quotation marks (") or other special characters, make sure that the character is escaped. For example, if your password is `tws11"tws`, write it as `"tws11\"tws"` in **`useropts`**.

Tivoli Workload Scheduler console messages and prompts

The Tivoli Workload Scheduler control processes (Netman, Mailman, Batchman, Jobman, and Writer) write their status messages (referred to as console messages) to standard list files. These messages include the prompts used as job and job stream dependencies. On UNIX and Linux operating systems, the messages can also be directed to the **syslog** daemon (**syslogd**) and to a terminal running the Tivoli Workload Scheduler console manager. These features are described in the following sections.

Setting sysloglocal on UNIX

If you set **sysloglocal** in the local options file to a positive number, Tivoli Workload Scheduler's control processes send their console and prompt messages to the **syslog** daemon. Setting it to **-1** turns this feature off. If you set it to a positive number to enable system logging, you must also set the local option **stdlistwidth** to **0**, or a negative number.

Tivoli Workload Scheduler's console messages correspond to the following **syslog** levels:

LOG_ERR
Error messages such as control process abends and file system errors.

LOG_WARNING
Warning messages such as link errors and stuck job streams.

LOG_NOTICE
Special messages such as prompts and tellops.

LOG_INFO
Informative messages such as job launches and job and job stream state changes.

Setting **sysloglocal** to a positive number defines the syslog facility used by Tivoli Workload Scheduler. For example, specifying **4** tells Tivoli Workload Schedulerto use the local facility LOCAL4. After doing this, you must make the appropriate entries in the **/etc/syslog.conf** file, and reconfigure the syslog daemon. To use LOCAL4 and have the Tivoli Workload Scheduler messages sent to the system console, enter the following line in **/etc/syslog.conf**:

```
local4    /dev/console
```

To have the Tivoli Workload Scheduler error messages sent to the **maestro** and **root** users, enter the following command:

```
local4.err    maestro,root
```

The selector and action fields must be separated by at least one tab. After modifying **/etc/syslog.conf**, you can configure the **syslog** daemon by entering the following command:

```
kill -HUP `cat /etc/syslog.pid`
```

console command

You can use the conman **console** command to set the Tivoli Workload Scheduler message level and to direct the messages to your terminal. The message level setting affects only Batchman and Mailman messages, which are the most numerous. It also sets the level of messages written to the standard list file or files and the **syslog** daemon. The following command, for example, sets the level of Batchman and Mailman messages to **2** and sends the messages to your computer:

```
console sess;level=2
```

Messages are sent to your computer until you either run another **console** command, or exit conman. To stop sending messages to your terminal, enter the following conman command:

```
console sys
```

Enabling the time zone feature

Time zones are enabled by default on installation of the product.

When you upgrade, the time zone feature inherits the setting of the previous installation. You can enable the time zone using the **enTimeZone** option of the **optman** command, as follows:

```
optman chg enTimeZone = yes
```

The following steps outline the method of implementing the time zone feature:

1. Load Tivoli Workload Scheduler.

   The database allows time zones to be specified for workstations, but not on *start* and *deadline* times within job streams in the database. The plan creation (JnextPlan) ignores any time zones that are present in the database. You will not be able to specify time zones anywhere in the plan.
2. Define workstation time zones.

   Set the time zone of the master domain manager workstation, of the backup master domain manager, and of any agents that are in a different time zone than the master domain manager. No time zones are allowed in the database for **Start**, **Latest Start Time**, and **Termination Deadline** times. No time zones are allowed anywhere in the plan at this point, because **enTimeZone** is set to **no**.
3. When workstation time zones have been set correctly, enable the time zone feature.

   All users are able to use time zones anywhere in the database, although they should wait for the next run of JnextPlan to use them on **Start**, **Latest Start Time**, and **Termination Deadline** times. The next time JnextPlan runs, time zones are carried over to the plan and the Dynamic Workload Console, and the back end allows specification of time zones anywhere in the plan.
4. Start using time zones on *start* and *until* times where needed.

   You can now use all time zone references in the database and in the plan with the Dynamic Workload Console and the command-line interface.

Configuring to use the report commands

You use the Tivoli Workload Scheduler report commands to obtain summary or detailed information about your workload scheduling. Before using these commands, however, they must be configured for your environment. This process is described in the chapter on getting reports and statistics in the *Tivoli Workload Scheduler: User's Guide and Reference*.

Modifying jobmon service rights for Windows

On Windows systems, the Tivoli Workload Scheduler jobmon service runs in the SYSTEM account with the right **Allow Service to Interact with Desktop** granted to it. You can remove this right for security reasons. However, if you do so, it prevents the service from launching interactive jobs that run in a window on the user's desktop. These jobs will be run, but are not accessible from the desktop or from Tivoli Workload Scheduler and do not have access to desktop resources. As a result, they may run forever or abend due to lack of resources.

Chapter 3. Configuring the Dynamic Workload Console

This chapter describes how to configure Dynamic Workload Console. It is divided into the following sections:

- "Launching in context with the Dynamic Workload Console"
- "Configuring roles to access the Dynamic Workload Console" on page 84
- "Configuring Dynamic Workload Console to use Single Sign-On" on page 87
- "Configuring the use of Lightweight Third-Party Authentication" on page 88
- "Configuring Dynamic Workload Console to use SSL" on page 92
- "Customizing Dynamic Workload Console (Advanced configuration)" on page 92
- "Configuring Dynamic Workload Console to view reports" on page 97
- "Preventing a connection to specific Tivoli Workload Scheduler Version 8.3 engines" on page 99

Launching in context with the Dynamic Workload Console

This chapter describes how to create a URL to launch the Dynamic Workload Console and have it directly open the results of a particular query.

You can then include this URL in an external application, for example, to monitor jobs and job streams that are critical to your business, and to quickly and easily manage them. You can access specific job or job stream details without having to create customized queries and monitor the state and health of the workstations that are critical in your environment so that, when unavailability or malfunctioning impacts job scheduling, you are alerted.

Scenarios

The following main scenarios can be identified:

- Obtain the result of a Monitor task on:
  - Jobs
  - Critical jobs
  - Job streams
- Obtain the result of a Monitor task on workstations
- Obtain the result of a saved task.

For all the scenarios, you must create a basic URL as described in "Creating a basic URL."

Creating a basic URL

To create a basic URL, perform the following steps:

1. Define the URL to access the Dynamic Workload Console:

   ```
   https://{WebUIHostname:adminSecurePort}
   /ibm/console/xLaunch.do?pageID=com.ibm.tws.
   WebUI.External.navigation&showNavArea=false
   ```

   where:

WebUIHostname
: It is the fully qualified hostname or the IP address of the computer where the Tivoli Dynamic Workload Console is installed.

adminSecurePort
: It is the number of the port on which the Tivoli Dynamic Workload Console is listening.

Example

```
https://mypc:29443/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false
```

2. Specify the action that you want to run, by specifying the corresponding parameter:

   &action
   It indicates the action that you want to perform and can have one of the following values:
   - BrowseJobs
   - ZBrowseJobs
   - BrowseJobStreams
   - BrowseCriticalJobs
   - BrowseWorkstation
   - InternalTask

3. Specify the engine on which you want to run the query, by entering its parameters:

   &hostname
   For distributed environments, it is the host name or TCP/IP address of the computer on which the Tivoli Workload Scheduler engine is installed. For z/OS environments, it is the host name or TCP/IP address of the computer on which the z/OS connector is installed.

   &port The port number that is used to connect to the computer on which the Tivoli Workload Scheduler engine or the z/OS connector is installed. Typically, the default port numbers are:

Table 19. Default port numbers

Port number	Engine
31117	Tivoli Workload Scheduler distributed engine
31127	Tivoli Workload Scheduler for z/OS engine with z/OS connector V.8.3
31217	Tivoli Workload Scheduler for z/OS engine with z/OS connector V.8.5 or higher

   &server
   It applies to z/OS systems only and is mandatory. It is the name of the remote server of the engine as it was specified in the z/OS connector.

   Example

```
&hostname = webuidev&port = 31217&server = C851
```

Example of a complete URL:

```
https://mypc:29443/ibm/console/xLaunch.do?pageID=
com.ibm.tws.WebUI.External.navigation&showNavArea=false
&action=BrowseJobs&hostname=webuidev&port=31117
```

Advanced optional parameters

Depending on the query whose results you want to view, you can complete your URL with the following parameters.

Monitor Jobs on distributed systems

Create a URL by specifying the **BrowseJobs** action, as described in "Creating a basic URL" on page 77.

You can also specify any of the following filters:

&workstation
Filter by the workstation on which the jobs runs.

&jobstream
Filter by the job stream that contains the jobs.

&job Filter by the job name.

&schedtime
Filter by the job scheduled time.

&status
Filter by the job status. You can filter by one or more statuses. Possible values are:

W	Waiting
O	Successful
H	Held
R	Ready
E	Error
U	Undecided
S	Running
C	Canceled
B	Blocked

&columns
Specify the number of columns that you want to display in your result table. If not specified, the default number of columns for this query is shown. Supported values are:

Min	Display a minimum set of columns
All	Display all columns

Example:

```
https://mypc:29043/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false&action=BrowseJobs
&hostname=webuidev&port=31117
&workstation=my_ws&jobstream=my_js_name&job=my_job_name&status=ESB&columns=ALL
```

Monitor Jobs on z/OS systems

Create a URL by specifying the **ZBrowseJobs** action, as described in "Creating a basic URL" on page 77.

You can also specify any of the following filters:

&workstation
Filter by the workstation on which the job runs.

&jobstream
Filter by the job stream that contains the jobs.

&job Filter by the job name.

&schedtime
Filter by the job scheduled time.

&columns
Specify the number of columns that you want to display in your result table. If not specified, the default number of columns for this query is shown. Supported values are:

Min display a minimum set of columns

All display all columns

Example:

```
https://mypc:29043/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false&action=ZBrowseJobs
&hostname=webuidev&port=31117
&server=C851&workstation=my_ws&jobstream=my_js_name
&job=my_job_name&schedtime=200812081100
```

Monitor Critical Jobs

Create a URL by specifying the **BrowseCriticalJobs** action, as described in "Creating a basic URL" on page 77.

You can also specify any of the following filters:

&workstation
Filter by the workstation on which the job runs.

&jobstream
Filter by the job stream that contains the jobs.

&job Filter by the job name.

&schedtime
Filter by the job scheduled time.

&columns
Specify the number of columns that you want to display in your result table. If not specified, the default number of columns for this query is shown. Supported values are:

Min Display a minimum set of columns

All Display all columns

Example:

```
https://mypc:29043/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false&action=BrowseCriticalJobs
&hostname=webuidev&port=31117
&workstation=my_ws&jobstream=my_js_name
&job=my_job_name&server=C851&columns=Min
```

where **&server** is a parameter used for z/OS only.

Monitor Job Streams

Create a URL by specifying the **BrowseJobStreams** action, as described in "Creating a basic URL" on page 77.

You can also specify any of the following filters:

&workstation
Filter by the workstation on which the job stream runs.

&jobstream
Filter by the job stream name.

&columns

Specify the number of columns that you want to display in your result table. If not specified, the default number of columns for this query is shown. Supported values are:

Min Display a minimum set of columns

All Display all columns

Example:

```
https://mypc:29043/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false&action=BrowseJobStreams
&hostname=webuidev&port=31117
&workstation=my_ws&jobstream=my_js_name
```

Monitor Workstations

Create a URL specifying the **BrowseWorkstation** action, as described in "Creating a basic URL" on page 77.

You can also specify any of the following filters:

&workstation

Filter by the workstation on which the job stream runs.

&columns

Specify the number of columns that you want to display in your result table. If not specified, the default number of columns for this query is shown. Supported values are:

Min Display a minimum set of columns

All Display all columns

Example:

```
https://mypc:29043/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false&action=BrowseJobStreams
&hostname=webuidev&port=31117
&workstation=my_ws&jobstream=my_js_name
&server=C851&columns=ALL
```

where **&server** is a parameter used for z/OS only.

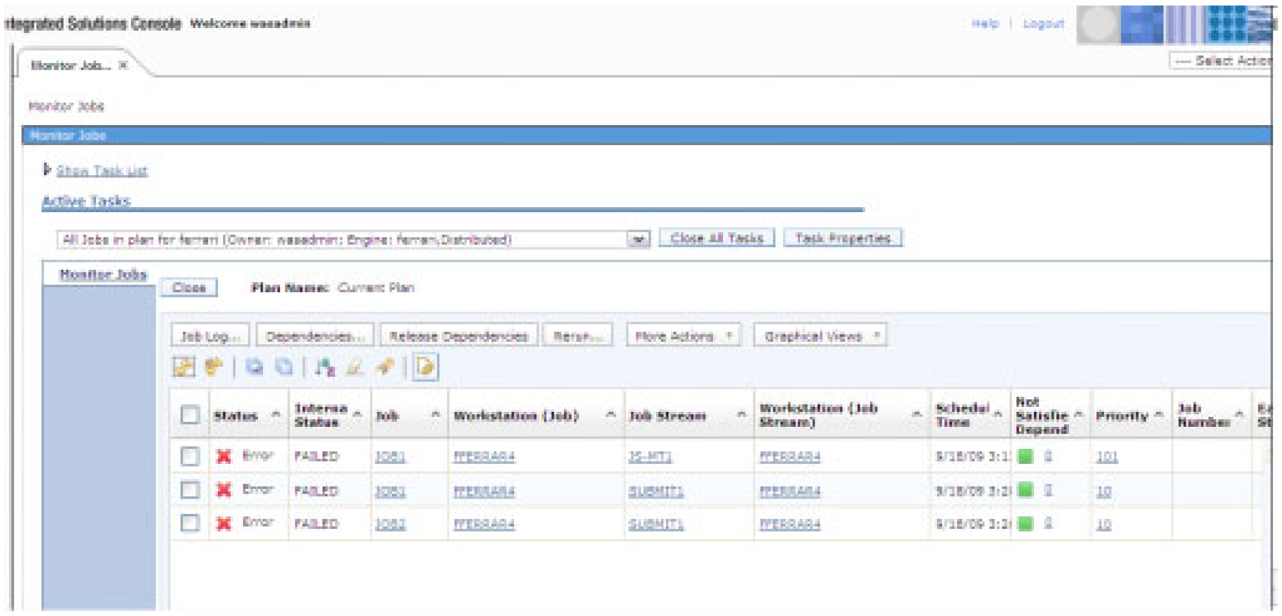
Existing task

Create a URL by specifying the **InternalTask** action, as described in "Creating a basic URL" on page 77.

You can save this URL can be saved as a bookmark in your browser, so that, by clicking the bookmark, you can directly open the results of a previously created task.

To save a task URL, perform the following steps:

1. Create a task with the Tivoli Dynamic Workload Console:



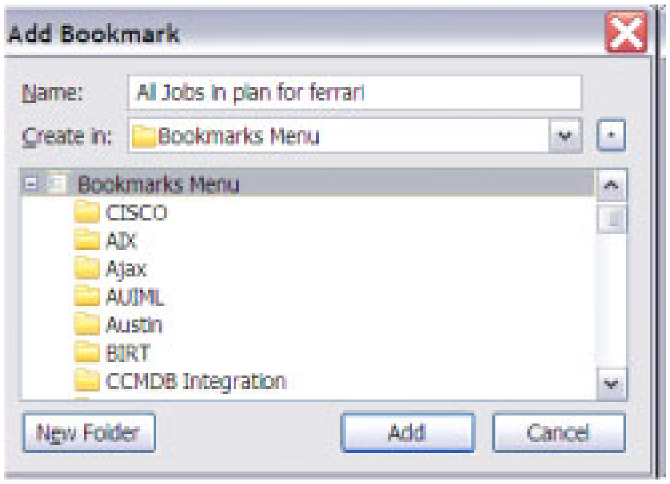
Plan Name: Current Plan

	Status	Internal Status	Job	Workstation (Job)	Job Stream	Workstation (Job Stream)	Schedul Time	Not Satisfie Depend	Priority	Job Number
☐	✗ Error	FAILED	JOB1	FFERRAR4	JS-MT1	FFERRAR4	9/18/09 3:1	🟩 0	101	
☐	✗ Error	FAILED	JOB1	FFERRAR4	SUBMIT1	FFERRAR4	9/18/09 3:2	🟩 0	10	
☐	✗ Error	FAILED	JOB2	FFERRAR4	SUBMIT1	FFERRAR4	9/18/09 3:2	🟩 0	10	

Figure 1. List of tasks

2. From the displayed panel, click the **Add bookmark icon**

   to save this link in your bookmarks.
3. Specify a name for the new bookmark. By default the task name is used. Organize your bookmarks for your convenience, for example, you might organize your saved tasks in a different folder for each engine.



Name: All Jobs in plan for ferrari

Create in: Bookmarks Menu

Example of a saved bookmark:

```
https://cairapc:29043/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false
&action=InternalTask&hostname=fferrar4&port=31117
&taskname=All%20Jobs%20in%20plan%20for%20ferrari
```

Starting from this bookmark you can manually create a URL as follows:

```
https://mypc:29043/ibm/console/xLaunch.do?pageID=com.ibm.tws.WebUI.
External.navigation&showNavArea=false&action= InternalTask
&hostname=webuidev&port=31117
&server=C851 &taskname=myTask
```

where **&server** parameter is used for z/OS engines only.

Configuring access to the Dynamic Workload Console

As soon as you finish installing the Dynamic Workload Console, you can launch it by using the link provided in the final installation panel.

However, after the installation, the administrator is the only user who can log into the console, using the credentials specified during the installation.

This is the user defined in the Local OS user registry (for Windows) or in the custom user registry (for UNIX).

There are two important steps an administrator must perform before other users can log into and use the Dynamic Workload Console
- “Configuring a user registry”
- “Configuring roles to access the Dynamic Workload Console” on page 84

If WebSphere Application Server is configured to use the local operating system user registry (the default value), users and groups must be created in the local operating system. However, you can replace the local operating system user registry with LDAP or a file registry, or configure the use of more than one of these.

Users defined in the user registry can log in to the Dynamic Workload Console; then they need to be associated to a role to be able access the Dynamic Workload Console features (see ““Configuring roles to access the Dynamic Workload Console” on page 84.)

By default, the Dynamic Workload Console on UNIX operating systems uses PAM (Pluggable Authentication Module) for authentication purposes. If you want to switch to local OS authentication, perform the steps defined in “Configuring the Dynamic Workload Console to use the local OS authentication method.”

Configuring a user registry

If WebSphere Application Server is configured to use LDAP user registry, users and groups must be created by the system administrator in the chosen LDAP server database.

Configuring user registries for the Dynamic Workload Console and all other Tivoli Workload Scheduler components is described in Chapter 5, “Configuring authentication,” on page 139.

Configuring the Dynamic Workload Console to use the local OS authentication method

To modify the authentication method from PAM to local OS, perform the following steps:
1. Login to the Dynamic Workload Console with WebSphere Application Server administration credentials.
2. Create a new user on the file registry clicking **Manage users** in the Dynamic Workload Console portfolio (do not create it on the operative system).

3. Backup the WebSphere Application Server configuration using the **backupConfig** command .
4. Dump your current security properties to a text file using the following command:
   ```
   showSecurityProperties.sh > text_file
   ```
5. Customize the security properties by editing the file as follows:
   ```
   ################################################################
   Global Security Panel
   ################################################################
   enabled=true
   enforceJava2Security=false
   useDomainQualifiedUserNames=false
   cacheTimeout=600
   ltpaTimeOut=720
   issuePermissionWarning=false
   activeProtocol=CSI
   useFIPS=false
   activeAuthMechanism=LTPA
   activeUserRegistry=LocalOS

   ################################################################
   Federated Repository Panel
   ################################################################
   PrimaryAdminId=new_user
   UseRegistryServerId=true
   ServerID=new_user
   ServerPassword=new_pwd
   VMMRealm=TWSREALM
   VMMRealmDelimiter=@
   VMMIgnoreCase=true
   ```
6. Stop the server using the **stopWas.sh** wastool. To stop the server, use the WebSphere Application Server administration credentials.
7. Load the new properties using the following command:
   ```
   changeSecurityProperties.sh text_file
   ```
8. Restart the server using the **startWas.sh** wastool.

Configuring roles to access the Dynamic Workload Console

During the Dynamic Workload Console installation, new predefined roles are created in the Tivoli Integrated Portal. They determine which console panels are available to a user, and therefore which activities that user can perform from Dynamic Workload Console.

If you do not assign any of the predefined roles to a Tivoli Integrated Portal user, that user, after having logged in, will not see any entry for Tivoli Workload Scheduler, and dynamic workload broker in the navigation tree.

Depending on the security repository you use, the following points apply:

LocalOS
Create the user in the operating system and assign the roles to that user using the TIP console.

WIM Create the user using the TIP console. The user is a WAS user.

To create and assign roles, you must log into Tivoli Integrated Portal, expand **Users and Groups** entry in Tivoli Integrated Portal navigation tree and click the entries displayed below. For more information about creating and assigning roles, see the Tivoli Integrated Portal online help by clicking the "**?**" (question mark) on top-right corner of the panels.

Tip It is not necessary to assign a role to every single user. If the user registry already contains groups of users that are properly defined for using the console, it is possible to assign roles to groups too. If groups are not available in the user registry, then the special role **all authenticated portal users** can be used to assign roles to *all* the users at once.

Within Tivoli Integrated Portal, you can create your own custom views to enable users to see all or a subset of Tivoli Workload Scheduler pages. To do it, you must have the **iscadmins** role and perform the following steps:

1. Create a new Tivoli Integrated Portal View with the pages you want to be available:
   a. In the Tivoli Integrated Portal portfolio, click **Settings** > **Views**.
   b. In the Views panel, click **New** and specify a name for the new view.
   c. Expand **Pages in This View** and click **Add** to add pages to the new view.
   d. Select the pages you want to be available to this view and click **Add**
2. Add the created view to the **all authenticated portal users** role:
   a. In the Tivoli Integrated Portal portfolio, click **User and Groups** > **Roles**.
   b. Click **all authenticated portal users** role.
   c. Expand **Access to Views** section, click the **Add** (plus sign) icon, select the newly created view that you want to add to this role and click **Add**.
   d. Expand **Access to Views** and select the pages to which the users of this role must have access.

The following lists the predefined roles created in the Tivoli Integrated Portal for accessing the Tivoli Workload Scheduler environments using Dynamic Workload Console, and the panels they can access:

TWSWEBUIAdministrator

Users in this group can use all features of the Dynamic Workload Console. They can see:All panels

TWSWEBUIOperator

Users in this group usually monitor and manage workload in the plan. They can see:
- All Configured Tasks
- Dashboard
- Workload
  - Forecast
    Generate Trial Plan
    Generate Forecast Plan
    List Available Plans
  - Submit
    Submit Predefined Job Streams
    Submit Predefined Jobs
    Submit Ad Hoc Jobs
  - Monitor
    - Monitor Jobs
    - Monitor Critical Jobs
    - Monitor Job Streams
    - Show Plan View
    - Workload Dependencies
      Monitor Files
      Monitor Resources

- Monitor Prompts
  - Workload Events
    - Monitor Event Rules
    - Monitor Operator Messages
    - Monitor Triggered Actions
- Scheduling Environment
  - Monitor
    - Monitor Workstations
    - Monitor Domains
- Settings
  - Manage User Preferences

TWSWEBUIDeveloper

Users in this group can create, list, and edit workload definitions, workstations, and event rule definitions in the Tivoli Workload Scheduler database. They can see:

- Workload
  - Design
    - Create Workload Definitions
    - Create Event Rules
    - List Workload Definitions
    - List Event Rules
    - List Jobs on SAP
- Settings
  - Manage User Preferences

TWSWEBUIAnalyst

Users in this group can manage Dynamic Workload Console reports and user preferences. They can see:

- All Configured Reports
- Reporting
  - Generate Historical reports
  - Generate Plan Reports
  - Generate Custom SQL Reports
- Settings
  - Manage User Preferences

TWSWEBUIConfigurator

Users in this group can manage engine connections, user preferences, and scheduling environment design. They can see:

- Scheduling Environment
  - Design
    - Create Workstations
    - List Workstations
- Settings
  - Manage Engines
  - Manage User Preferences

Assigning a predefined role to an Tivoli Integrated Portal user allows that user to access the Dynamic Workload Console panels. The Tivoli Workload Scheduler user specified in the engine connection, instead, determines which operations can be run locally on the connected Tivoli Workload Scheduler engine. For example, if the user specified in a Tivoli Workload Scheduler engine connection is not authorized to run reporting in the Tivoli Workload Scheduler *Security file*, then, even though the Tivoli Integrated Portal user logged in to Dynamic Workload Console can access the reporting panels, he or she cannot perform reporting operations on that specific Tivoli Workload Scheduler engine. For more information about how to configure the security file, see “Configuring the security file” on page 106

The following lists the predefined roles created in the Tivoli Integrated Portal for accessing the dynamic workload broker environments using Dynamic Workload Console, and the panels they can access:

TDWBAdministrator
All panels

TDWBOperator
Scheduling Environment
Configuration
Definitions, except Define a New Job
Tracking
Preferences

TDWBDeveloper
Configuration
Definitions
Preferences

TDWBConfigurator
Scheduling Environment
Configuration
Tracking, except Job Instances
Preferences

Configuring Dynamic Workload Console to use Single Sign-On

Single Sign-On (SSO) is a method of access control that allows a user to authenticate once and gain access the resources of multiple applications sharing the same user registry.

This means that using SSO you can run queries on the plan or manage object definitions on the database accessing the engine without authenticating, automatically using the same credentials you used to login to the Dynamic Workload Console.

After the installation completes you can configure Dynamic Workload Console and the Tivoli Workload Scheduler engine to use SSO. To do this they must share the same LDAP user registry.

The Lightweight Directory Access Protocol (LDAP) is an application protocol for querying and modifying directory services running over TCP/IP - see Chapter 5, “Configuring authentication,” on page 139 for more details.

If you configured Dynamic Workload Console to use Single Sign-On with an engine, then, the following behavior is applied:

If engine connection has the user credentials specified in its definitions
These credentials are used. This behavior regards also engine connections that are shared along with their user credentials.

If the user credentials are not specified in the engine connection
The credentials you specified when logging in to Dynamic Workload Console are used. This behavior regards also shared engine connections having unshared user credentials.

LTPA token-keys

In addition to sharing the same LDAP user registry, the instance of WebSphere Application Server that supports the Dynamic Workload Console and also the instance which supports the engine where the Single Sign-On is required, must both be configured to use the same Lightweight Third-Party Authentication token-keys. See "Configuring the use of Lightweight Third-Party Authentication"

Configuring the use of Lightweight Third-Party Authentication

The WebSphere Application Server uses the Lightweight Third-Party Authentication (LTPA) mechanism to propagate user credentials.

Depending on your circumstances, you might need to configure the use of the same LTPA token_keys between Dynamic Workload Console and the engine, or disable the automatic generation of the LTPA token_keys, or both:

Configuring for Single Sign-On

If you are configuring for Single Sign-On, between any version of Dynamic Workload Console and any engine, whether or not they are installed on the same system, you must configure both instances of WebSphere Application Server involved to use the same LTPA token_keys, and disable their automatic regeneration on expiry, following the procedures described in:

- "Configuring to use the same LTPA token_keys" on page 89
- "Disabling the automatic generation of LTPA token_keys" on page 91

More than one instance of WebSphere Application Server on one system

In this case you *must* use the same LTPA token_keys on all the applications on the system that use a version of WebSphere Application Server (for example, the Dynamic Workload Console and the Tivoli Workload Scheduler engine, regardless of their versions), even if you are not implementing Single Sign-On. You must also disable their automatic regeneration on expiry. Whether you need to take any action depends on which multiple instances of WebSphere Application Server are involved:

Multiple instances of the embedded WebSphere Application Server freshly installed in multiple Tivoli Workload Automation instances

In any system, if you have installed more than one instance of the embedded WebSphere Application Server (for example, Dynamic Workload Console and Tivoli Workload Scheduler in different instances of Tivoli Workload Automation) they will by default use the same keys, so you only need to take an action to use the same keys if you need to change them for any reason. However, you must disable the automatic regeneration on expiry, following the procedure described in:

- "Disabling the automatic generation of LTPA token_keys" on page 91

Other multiple instances of the WebSphere Application Server

In any other circumstances where two instances of WebSphere Application Server are installed on the same system (for example, you have installed Dynamic Workload Console on an external WebSphere Application Server and a Tivoli Workload Scheduler component in a Tivoli Workload Automation instance on the same system, or you have installed a new instance of Dynamic Workload Console to work with a previous version of Tivoli Workload

Scheduler, or vice versa), you must yourself ensure that all instances use the same keys, and disable their automatic regeneration on expiry, following the procedures described in:

- "Configuring to use the same LTPA token_keys"
- "Disabling the automatic generation of LTPA token_keys" on page 91

No Single Sign-On, and only one instance of WebSphere Application Server on a system
No action need to be taken.

Configuring to use the same LTPA token_keys

To use the same LTPA token_keys between WebSphere Application Servers, you must run this procedure between Dynamic Workload Console and each engine you want to connect to.

The LTPA token_keys can be either exported from Dynamic Workload Console and imported into the engine, or exported from the engine and imported into Dynamic Workload Console.

1. Use the following script to export the LTPA token_keys from the WebSphere Application Server where the Dynamic Workload Console is installed, and to import them into the other instance of WebSphere Application Server:

   Tivoli Workload Scheduler and Tivoli Dynamic Workload Console, Version 8.5, 8.5.1, and 8.6
   `<TWA_home>/wastools/manage_ltpa.sh` or `...\manage_ltpa.bat`

   Tivoli Workload Scheduler, Version 8.4
   `<TWA_home>/wastools/manage_ltpa.sh` or `...\manage_ltpa.bat`

   Tivoli Dynamic Workload Console, Version 8.4
   `tdwc_install_dir\_tdwcutils\scripts\manage_ltpa.sh` or `...\manage_ltpa.cmd`

   Tivoli Workload Scheduler and Tivoli Dynamic Workload Console, Version 8.3
   For information relating to these releases see the relevant product documentation.

   There is also a copy of `manage_ltpa.sh` and `manage_ltpa.bat` on each installation image.

   Make sure that the user who runs this script is allowed to access the WebSphere Application Server profile that hosts the Dynamic Workload Console or the engine.

   The syntax used to run the script is the following:

   ```
   manage_ltpa -operation import|export -profilepath profile_path
               -ltpafile LTPA_file_path -ltpapassword LTPA_file_password
               -user username -password password
               -port SOAP_port -server server_name
   ```

   where:

   –operation
   Select *export* to read the LTPA token_keys from the profile and save it to a file. Select *import* to update the profile with the LTPA token_keys stored in a file.

–profilepath
Specify the path to the profile on top of which the application, either Dynamic Workload Console or Tivoli Workload Scheduler is installed.

–ltpafile
Specify the fully qualified path name of the file that contains, if you import, or where to encrypt, if you export, the LTPA token_keys.

–ltpapassword
Specify a password of your choice to encrypt the file that contains the LTPA keys when exporting them, or, when importing them, the password that was used to encrypt them when they were exported. This password is used only when importing and exporting that LTPA token_keys. It does not need to match the administrator password.

–user The administrator of the server hosting the Dynamic Workload Console or the engine. In the case of Tivoli Workload Scheduler, the administrator is, by default, the owner of the instance (*TWS_user*).

–password
The password of the administrator of the server defined in the selected profile.

–port Specify the SOAP port used by the profile. By default the SOAP port is 28880 for Dynamic Workload Console installed on the embedded WebSphere Application Server, and 31118 for Tivoli Workload Scheduler installed on the embedded WebSphere Application Server.

–server
Specify the name of the server of the profile on which to import or export the LTPA tokens. The default server name varies, depending on how it was installed. See Table 20.

Note:

a. The server and path might have been modified from the default value after installation.
b. This keyword is mandatory if the Tivoli Workload Scheduler server name is different from the Dynamic Workload Console server name.

Table 20. Product versions and default server names

Product version	WebSphere Application Server version	Default server name
Tivoli Workload Scheduler, V8.5 and 8.5.1:	The embedded WebSphere Application Server installed in an instance of Tivoli Workload Automation (on which any Tivoli Workload Scheduler component, including the Dynamic Workload Console is installed).	`twaserver<n>`, found in the following path: `<TWA_home>/eWAS/profiles/TIPProfile/config/cells/DefaultNode/nodes/DefaultNode/servers`
	Your external version of the WebSphere Application Server, on which the Dynamic Workload Console is installed.	`server1`, found in the appropriate path of your external version of WebSphere Application Server

Table 20. Product versions and default server names (continued)

Product version	WebSphere Application Server version	Default server name
Tivoli Workload Scheduler, V8.4 and before:	The embedded WebSphere Application Server on which Tivoli Workload Scheduler is installed.	`server1`, found in the following path: `<TWS_home>/appserver/profiles/twsprofile/config/cells/DefaultNode/nodes/DefaultNode/servers`
	The embedded WebSphere Application Server on which the Dynamic Workload Console is installed.	`tdwcserver`, found in the following path: `<tdwc_install_dir>/AppServer/profiles/tdwcprofile/servers`
	Your external version of the WebSphere Application Server, on which the Dynamic Workload Console is installed.	`server1`, found in the appropriate path of your external version of WebSphere Application Server

2. Stop and start each server involved in this activity to enable it.
3. If you are configuring Single Sign-On, test that the configuration is correctly set between and the engine by performing the following steps:
   a. Log in to Dynamic Workload Console.
   b. Create an engine connection without specifying User ID and password.
   c. Perform a test connection.

The next step is to disable the automatic generation of the LTPA token_keys, for which see: "Disabling the automatic generation of LTPA token_keys"

Disabling the automatic generation of LTPA token_keys

Disable the automatic generation of LTPA token_keys, in either of the following circumstances:
- You are enabling Single Sign-On
- You have more than one instance of WebSphere Application Server on the same system

You must disable the generation of the keys at both ends of the communication, in other words, at the Dynamic Workload Console, and at the engine of Tivoli Workload Scheduler or dynamic workload broker, as appropriate:

At the Dynamic Workload Console

1. Log in to Dynamic Workload Console.
2. Click **Settings > WebSphere Administrative Console > Launch WebSphere > Administrative Console**.
3. On WebSphere Administrative Console, click **SSL certificate and key management**.
4. Click the **Key set groups** link.
5. Click on the name of the key set group displayed in the list.
6. Clear the **Automatically generate keys** check box.
7. Click **OK**.
8. Check in the list that the field **Automatically generate keys** beside the available key set group is set to *false*.

At Tivoli Workload Scheduler

The implementation of the embedded WebSphere Application Server on the Tivoli Workload Scheduler engine includes a limited functionality version of the Tivoli Integrated Portal. Use this portal to disable the automatic generation of LTPA token_keys, as follows:

1. Connect to the Tivoli Integrated Portal from an Internet browser, using the following URL:

   ```
   http://TWS_server_hostname:WAS_admin_host_(secure_)port/ibm/console
   ```

   Use the **showHostProperties** tool to identify the *WAS_admin_host_port* (default 31123) or *WAS_admin_host_secure_port* (default 31124), as appropriate. For more information about this tool, refer to “Application server - using the utilities that change the properties” on page 312.
2. Perform the procedure you used above to disable the token-keys generation for the Dynamic Workload Console, starting from step 2 on page 91.

Configuring Dynamic Workload Console to use SSL

The Secure Sockets Layer (SSL) protocol provides secure communications between remote server processes or applications. SSL security can be used to establish communications inbound to, and outbound from, an application. To establish secure communications, a certificate, and an SSL configuration must be specified for the application.

Full details are supplied in Chapter 7, “Setting connection security,” on page 183

Customizing Dynamic Workload Console (Advanced configuration)

Optionally, you can configure some advanced settings of Dynamic Workload Console to customize its behavior. To do it, you must specify your settings in a customizable file named `TdwcGlobalSettings.xml`, which you must then copy it in the Dynamic Workload Console installation structure.

When you modify this file, stop and restart the Dynamic Workload Console to make the changes effective in your environment.

Customizing your global settings

Users with Administrator privileges can use a configuration file, named `TdwcGlobalSettings.xml`, to add and modify some customizable information.

A template of this file is located on the installation DVD under `WEBUI/platform_name/utils`. You can modify it, replacing default values with customized ones and enabling commented sections. After customizing, you must copy it under the following path: *Installation_dir*`/TWA/eWAS/profiles/TIPProfile/registry` directory.

This file is accessed at each login, and all configurations specified in the file are immediately applied, except for **precannedTaskCreation** property. This property is read only when a user logs in for the first time and then is used whenever this user logs in again.

You can use any text or XML editor to edit this file, but ensure that you save it is as a valid XML file.

The file is organized into several sections that group similar properties.

Sections can also be repeated multiple times in the same file and applied differently to different user roles; however, for each role, you cannot have more than **one** section associated. To apply a section only to the users belonging to a specific role, the section must be included within the following setting:

settings role
: The user for which the following configuration must be applied. Default value: all users, unless otherwise specified.

Only one **settings** section can be specified for each role. If a user has more than one role, the settings associated to the higher role are taken into consideration.

Example:

```
<settings>
 <graphViews>
  <property name="planViewNewWindow" value="true"/>
 </graphViews>
</settings>

<settings  role="TWSWEBUIOperator">
 <graphViews>
  <property name="planViewNewWindow" value="false"/>
 </graphViews>
</settings>
```

graphViews

The graphViews section contains the configuration parameters that apply to the graphical views in the plan, such as the maximum number of objects shown in each view.

planViewMaxJobstreams
: The maximum number of job streams displayed in the Plan View. Default value is **1000**.

jobstreamViewLimit
: The maximum number of objects displayed in the Job Stream View. Default value is **1000**.

impactViewLimit
: The maximum number of job streams displayed in the Impact View. Default value is **2000**.

planViewNewWindow
: Set it to **TRUE** if you want the plan view to be displayed in a new window each time it is launched. Default value is **FALSE**.

NewsFeed

The NewsFeed section contains the configuration details to be constantly up-to-date with product information.

FeedURL
: Contains the URL from which you receive news and updates. Default value is the product's Information Center at: http://publib.boulder.ibm.com/infocenter/tivihelp/v47r1/index.jsp?topic=/com.ibm.tivoli.itws.doc_8.6/welcome_TWA.html

PollInterval
: The interval in seconds between two checks for updates. Default value is **3600**.

FeedType
A string that identifies the type of update. Default value is **JSONP**.

application

The application section defines the environment for which predefined tasks are created

precannedTaskCreation
Some predefined tasks are created by default and are available when you log in to the console. There is a predefined Monitor task for every object, for both z/OS and distributed engines. Default value is **all**. To change this setting, use one of the following values:

- all
- distributed
- zos
- none

help

The help section indicates the address of the current version of the Information Center.

infocenterURL
The URL of the Information Center. Default value is: http://publib.boulder.ibm.com/infocenter/tivihelp/v47r1/index.jsp?topic=/com.ibm.tivoli.itws.doc_6/welcome.html/welcome_TWA.html.

security

Use this section to configure some properties related to the User Registry in use.

groupIdMap
The property is related to the groups of User Registry, and can be modified to map and display the specified value of each group. The default is the common name of the group.

Examples:

```
<settings>
  <security>
     <property name="groupIdMap" value="cn"></property>
  </security>
</settings>
```

Therefore, if you need to change the default value "cn" to "racfid", you can define this property as follows:

```
<property name="groupIdMap" value="racfid"></property>
```

twsObjectDoc

The twsObjectDoc section contains URLs where you can store customized documentation about your jobs or job streams. By default this setting is not specified. If you want to associate customized documentation to a job or job stream, use this setting to specify the external address where this information is located. When you specify this setting, an action to access the relevant documentation becomes available from **More Actions** menus in Monitor Jobs and Monitor Job Streams tasks as well as in the graphical views in the plan (in the object's tooltips, context menus and properties) making it possible to open the documentation while monitoring your job or job stream in the plan.

To change this setting, use one of the following values:

customActionLabel
The name of the action displayed in menus, object properties, and tooltips to access customized documentation about your jobs or job streams.

jobUrlTemplate
The address of your job documentation. No default value available.

jobstreamUrlTemplate
The address of your job stream documentation. No default value available.

These properties must be valid URLs, containing one or more of the variables listed in the table below, as shown in the example:

```
<settings>
  <twsObjectDoc>
     <property
          name="jobstreamUrlTemplate"
          value="http://www.yourhost.com/tws/docs/jobstream/${js_name_w}" />
     <property
          name="jobUrlTemplate"
          value="http://www.yourhost.com/docs/jobs/${job_name_w}" />
  </twsObjectDoc>
</settings>
```

If you use any of the following special characters in the URL, you must write them as follows:

Table 21. Syntax for special characters

Special characters	Write them as...
quote (")	\\"
apostrophe (')	&apos;
ampersand (&)	&amp;
less than (<)	&lt
greater than (>)	&gt
backslash (\\)	\\\\

Multiple variables can be included in a URL and must be specified using the following syntax: `${variable}`:

Table 22. Variables used in the URL definition

Name	Object	Description
job_number_w	Job z/OS	The number of the job
job_wkst_w	Job	The name of the workstation on which the job runs
job_jsname_w	Job	The name of the job stream that contains the job
job_jswkst_w	Job	The name of the workstation on which the job stream runs

Table 22. Variables used in the URL definition (continued)

Name	Object	Description
job_actualarrival_w	Job z/OS	The actual start time of the job (date format: YYYY-MM-DDThh:mm:ss)
job_actualend_w	Job z/OS	When the job actually completed (date format: YYYY-MM-DDThh:mm:ss)
job_starttime_w	Job	The start time of the job (date format: YYYY-MM-DDThh:mm:ss)
job_id_w	Job	The ID of the job
job_returncode_w	Job	The return code of the job
js_name_w	Job stream	The name of the job stream that contains the job
js_wkst_w	Job stream	The name of the workstation on which the job stream runs
js_id_w	Job stream	The job stream ID
js_latest_start_w	Job stream	The latest time at which a job stream can start (date format: YYYY-MM-DDThh:mm:ss)
engine_name_w	Engine	The name of the engine connection
engine_host_w	Engine	The hostname of the engine connection
engine_port_w	Engine	The port number of the engine connection
engine_plan_w	Engine	The ID of selected plan
engine_serv_w	Engine	The remote server name of the engine connection

TdwcGlobalSettings.xml sample

The following is a sample of the file:

```
<settings role="TWSWEBUIOperator">
 <graphViews>
  <property name="planViewMaxJobstreams" value="1000"></property>
  <property name="jobstreamViewLimit" value="1000"></property>
  <property name="impactViewLimit" value="1000"></property>
 </graphViews>
</settings>

<settings role="TWSWEBUIAdministrator">
 <application>
  <property name="precannedTaskCreation" value="all" />

 </application>
</settings>

<settings>
 <twsObjectDoc>
    <property
    name="jobstreamUrlTemplate"
    value="http://www.yourhost.com/tws/docs/jobstream/${js_name_w}" />
  <property
    name="jobUrlTemplate"
    value="http://www.yourhost.com/docs/jobs/${job_name_w}" />
  </twsObjectDoc>
</settings>
```

Managing Dynamic Workload Console settings repository

User settings like user preferences, saved tasks and engine connections are stored in the settings repository, which by default is a local file. However, you can change this setting and use the database settings repository for all Dynamic Workload Console operations that involve user settings. This can be useful, for example, for scalability purposes or to have multiple Dynamic Workload Console instances sharing the same user settings.

To use a database as your settings repository, you must configure the database settings, as described in the sections about changing and sharing settings repository, in the *Tivoli Workload Scheduler: Dynamic Workload Console User's Guide*, available at the product's Information Center: http://publib.boulder.ibm.com/infocenter/tivihelp/v47r1/index.jsp?topic=/com.ibm.tivoli.itws.doc_6/welcome.html/welcome_TWA.html.

Configuring Dynamic Workload Console to view reports

This topic describes the configuration steps that you perform to be able to see the reports from the Dynamic Workload Console.

To access the databases where reports are stored, you must have the following prerequisites:
- A user ID and password to access the database
- A working connection between the Dynamic Workload Console and the database

Perform the following steps on the system where the Tivoli Workload Scheduler engine is running:
- “Configuring for a DB2 database”
- “Configuring for an Oracle database” on page 98

Configuring for a DB2 database

For DB2, the IT administrator, or the Tivoli Workload Scheduler IT administrator, or both working together, do the following:
1. Create an operating system user and specify a password.
2. Launch the following script:

   ```
   <TWA_home>/TWS/dbtools/DB2/scripts/dbgrant.bat/.sh
     <ID_of_user_to_be_granted>
     <database_name>
     [<database_admin_user> <password>]
   ```

   where the variables are as follows:

   <TWA_home>
   : The Tivoli Workload Automation instance directory

<ID_of_user_to_be_granted>
: The ID of the user created in step 1 on page 97, who is going to be granted the access to the reports

<database_name>
: The name of the database, as created when the master domain manager was installed

[*<database_admin_user> <password>***]**
: The user ID and password of the database administration user. If you are running this command as the database administration user, you can omit these parameters.

3. Log on to the Dynamic Workload Console.
4. In the Portfolio, select **Manage Engines**. The Manage Engines panels is displayed.
5. Select the engine you defined or create another engine. The Engine Connection properties panel is displayed.
6. In Database Configuration for Reporting, do the following:
   a. Check **Enable Reporting** to enable the engine connection you selected to run reports.
   b. In **Database User ID and Password**, specify the database user and password that you authorized to access reports.

Configuring for an Oracle database

For Oracle, the IT administrator, or the Tivoli Workload Scheduler IT administrator, or both working together, do the following:

1. Create a database user authorized to access the database and specify a password.
2. Launch the following script:
   ```
   <TWA_home>/TWS/dbtools/Oracle/scripts/dbgrant.bat/.sh
     <ID_of_user_to_be_granted>
     <database_name>
     <database_admin_user> <password>
   ```
   where the variables are as follows:

   <TWA_home>
   : The Tivoli Workload Automation instance directory

   <ID_of_user_to_be_granted>
   : The ID of the user created in step 1, who is going to be granted the access to the reports

   <database_name>
   : The name of the database, as created when the master domain manager was installed

   <database_schema_owner> <password>
   : The user ID and password of the database schema owner.
3. Define a valid connection string to the database:
   a. Ensure that the following property is set in the `<TWA_home>/eWAS/profiles/TIPProfile/properties/TWSConfig.properties` file to point to the Oracle JDBC URL:
   ```
   com.ibm.tws.webui.oracleJdbcURL
   ```

For example:

```
com.ibm.tws.webui.oracleJdbcURL=
                    jdbc:oracle:thin:@//9.132.235.7:1521/orcl
```

   b. Restart the embedded WebSphere Application Server.
4. Log on to the Dynamic Workload Console.
5. In the Portfolio, select **Manage Engines**. The Manage Engines panels is displayed.
6. Select the engine you defined or create another engine. The Engine Connection properties panel is displayed.
7. In Database Configuration for Reporting, do the following:
   a. Check **Enable Reporting** to enable the engine connection you selected to run reports.
   b. In **Database User ID and Password**, specify the database user and password that you authorized to access reports.

Preventing a connection to specific Tivoli Workload Scheduler Version 8.3 engines

Run the following script on Tivoli Workload Scheduler side if you want to disable the ability to establish engine connections from Dynamic Workload Console to a Tivoli Workload Scheduler Version 8.3 engine

On Windows:

```
webui -operation disable
```

Run the script as Tivoli Workload Scheduler administrator, from the directory *TWS_home*\wastools:

On UNIX

```
./webui.sh -operation disable
```

Run the script as root, from the directory *TWS_home*/wastools:

Restart the WebSphere Application Server on the Tivoli Workload Scheduler engine where you run the script.

Chapter 4. Configuring user authorization (Security file)

This chapter describes how to manage the authorizations to access scheduling objects assigned to Tivoli Workload Scheduler users.

The chapter is divided into the following sections:
- "Security management overview"
- "Getting started" on page 102
- "Updating the security file" on page 102
- "Centralized security management" on page 105
- "Configuring the security file" on page 106
- "Sample security file" on page 133

Security management overview

The way Tivoli Workload Scheduler manages security is controlled by a configuration file named ***security file***. This file controls activities such as:
- Linking workstations.
- Accessing command-line interface programs and the Tivoli Dynamic Workload Console.
- Performing operations on scheduling objects in the database or in the plan.

In the file you specify for each user what scheduling objects the user is allowed to access, and what actions the user is allowed to perform on those objects. You can determine access by object type (for example, workstations or resources) and, within an object type, by selected attributes, such as the object's name or the workstation in the object's definition. You can use wildcards to select related sets of objects. Access rights can be granted on an "included" or an "excluded" basis, or a combination of both.

Whenever you need to change access permissions you modify the configuration file and convert it into an encrypted format (for performance and security), replacing the previous file. The system uses this encrypted *security file* from that point onwards.

Each time a user runs Tivoli Workload Scheduler programs, commands, and user interfaces, the product compares the name of the user with the user definitions in the *security file* to determine if the user has permission to perform those activities on the specified scheduling objects.

By default, the security on scheduling objects is managed locally on each workstation. This means that the system administrator or the *TWS_user* who installed the product on that system can decide which Tivoli Workload Scheduler users defined on that system can access which scheduling resources in the Tivoli Workload Scheduler network and what actions they can perform.

Alternatively, you can centralize control of how objects are managed on each workstation. This can be configured by setting a global option. In this scenario, you configure all user permissions in the *security file* on the master domain manager. The encrypted version of the file is distributed automatically every time you run **JnextPlan**, so that all workstations have the file locally to determine the permissions of the users on that workstation.

Getting started

This section describes how to get started with defining authorizations after installation.

A template file named `*TWA_home*/TWS/config/Security.conf` is provided with the product. During installation, a copy of the template file is installed as *TWA_home*/`TWS/Security.conf`, and a compiled, operational copy is installed as *TWA_home*/`TWS/Security`.

This version of the file contains a full access definition for the user who installed the product, *TWS_user*, and the system administrator (root on UNIX or Administrator on Windows), who are the only users defined and allowed to connect to the user interfaces and to perform all operations on all scheduling resources.

Within the Tivoli Workload Scheduler network, using the security file you can make a distinction between local **root** users and the **root** user on the master domain manager by allowing local **root** users to perform operations affecting only their login workstations and providing the master domain manager **root** user the authorizations to perform operations affecting any workstation across the network.

As you continue to work with the product you might want to add more users with different roles and authorization to perform specific operations on a defined set of objects.

Do not edit the original *TWA_home*/`TWS/config/Security.conf` template, but follow the steps described in "Updating the security file" to make your modifications on the operational copy of the file.

Updating the security file

By default, every workstation in a Tivoli Workload Scheduler network (domain managers, fault-tolerant agents, and standard agents) has its own security file. You can maintain that file on each workstation, or, if you enable centralized security management you can create a security file on the master domain manager and copy it to each domain manager and agent, ensuring that all Tivoli Workload Scheduler users are assigned the required authorization in the file (see "Centralized security management" on page 105). Whether working on an agent workstation for an individual security file, or on the master domain manager to modify a centralized file, the steps are just the same; all that changes are the number of users you are defining - just those on the local system or all in the Tivoli Workload Scheduler network.

Neither the Tivoli Workload Scheduler processes nor the WebSphere Application Server infrastructure needs to be stopped or restarted to update the security file. You just need to close any open **`conman`** user interfaces before running **`makesec`**.

To modify the security file, perform the following steps:

1. Navigate to the *TWA_home*/`TWS` directory from where the **`dumpsec`** and **`makesec`** commands *must* be run.

2. Run the **dumpsec** command to decrypt the current security file into an editable configuration file. See "dumpsec."
3. Modify the contents of the editable security configuration file using the syntax described in "Configuring the security file" on page 106.
4. Close any open **conman** user interfaces using the **exit** command.
5. Stop any connectors on systems running Windows operating systems.
6. Run the **makesec** command to encrypt the security file and apply the modifications. See "makesec" on page 104.
7. If you are using local security, the file will be immediately available on the workstation where it has been updated.

   If you are using centralized security (see "Centralized security management" on page 105) you must now do the following:

   a. If you are using a backup master domain manager, copy the file to it
   b. Distribute the centralized file manually to all fault-tolerant agents in the network (not standard, extended, or broker agents), and store it in the *TWA_home*/TWS directory
   c. Run **JnextPlan** to distribute the Symphony file that corresponds to the new Security file

   See the next pages for a full description of **dumpsec** and **makesec**.

dumpsec

Writes in an editable format the information contained in the compiled and encrypted security file. The output file can be edited and then used as input for the **makesec** command which compiles and activates the modified security settings.

Authorization

You must have ***display*** access to the security file and write permission in the *TWA_home*/TWS directory from where the command *must* be run.

Syntax

dumpsec –v | –u

dumpsec *security_file* [> *output_file*]

Comments

If no arguments are specified, the operational security file is sent to stdout. To create an editable copy of the security file, redirect the output of the command to an output file, using the redirect symbol.

Arguments

–v Displays command version information only.

–u Displays command usage information only.

security_file
Specifies the name of the security file to dump.

[> *output_file***]**
: Specifies the name of the output file, If omitted, the security file is output to the stdout.

Examples

The following command dumps the operational security file (`TWA_home/TWS/Security`) to a file named **mysec**:

```
dumpsec > mysec
```

The following command dumps a security file named **sectemp** to **stdout**:

```
dumpsec sectemp
```

makesec

Compiles security definitions and installs the security file. Changes to the security file are recognized as soon as **`makesec`** has completed, or, in the case of centralized security, after **JnextPlan** has distributed it.

Note: Before running the **makesec** command, stop **`conman`**, and, on systems running Windows operating systems, any connectors.

Authorization

You must have ***modify*** access to the security file and read permission in the `TWA_home/TWS` directory from where the command *must* be run.

Syntax

makesec –v | –u

makesec [**–verify**] *in_file*

Comments

The **makesec** command compiles the specified file and installs it as the operational security file (`../TWA_home/TWS/Security`). If the **–verify** argument is specified, the file is checked for correct syntax, but it is not compiled and installed.

Arguments

–v Displays command version information only.

–u Displays command usage information only.

–verify
: Checks the syntax of the user definitions in *in_file*. The file is not compiled and installed as the security file.

in_file Specifies the name of a file or set of files containing user definitions. Syntax checking is performed automatically when the security file is installed.

Examples

Example 1: Modifying the security file definitions - full scenario

The following example shows how to modify the security file definitions:

1. An editable copy of the operational security file is created in a file named `tempsec` with the **`dumpsec`** command:
   ```
   dumpsec > tempsec
   ```
2. The user definitions are modified with a text editor:
   ```
   edit tempsec
   ```
3. The file is then compiled and installed with the **makesec** command:
   ```
   makesec tempsec
   ```

Example 2: Compiling user definitions from multiple files

The following command compiles user definitions from the fileset `userdef*` and replaces the operational security file:

```
makesec userdef*
```

Centralized security management

A Tivoli Workload Scheduler environment where centralized security management is enabled is an environment where all workstations share the same security file information contained in the security file stored on the master domain manager and the Tivoli Workload Scheduler administrator on the master domain manager is the only one who can add, modify, and delete entries in the security file valid for the entire Tivoli Workload Scheduler environment.

This is configured with the ***enCentSec*** global option. By default the value assigned to the ***enCentSec*** option is **no**.

To set central security management, the Tivoli Workload Scheduler administrator must run the following steps on the master domain manager:

1. Use the **optman** command line program, to set the value assigned to the *enCentSec* global property to **yes**. For information on how to manage the global properties using **`optman`**, see “Setting global options” on page 7.
2. Save the information in the security file into an editable configuration file using the **dumpsec** command.
3. Set the required authorizations for all Tivoli Workload Scheduler users, as described in “Configuring the security file” on page 106
4. Close any open **`conman`** user interfaces using the **exit** command.
5. Stop any connectors on systems running Windows operating systems.
6. Compile the security file using the **makesec** command.
7. If you are using a backup master domain manager, copy the compiled security file to it as soon as possible.
8. Distribute the compiled security file to all the workstations in the environment and store it in their `*TWA_home*/TWS` directories.
9. Run **JnextPlan** to update the security information distributed with the `Symphony` file.

   The value of the checksum of the newly compiled security file is encrypted and loaded into the `Symphony` file and distributed to all the workstations in the Tivoli Workload Scheduler network.

On each workstation, when a link is established or when a user connects to a user interface or attempts to issue commands on the plan, either with **conman** or the Dynamic Workload Console, Tivoli Workload Scheduler compares the value of the checksum in the security file delivered with the `Symphony` file with the value of the checksum of the security file stored on the workstation. If the values are equal, the operation is allowed. If the values are different, the operation fails and a security violation message is issued.

Centralized security usage notes

In a network with centralized security management, two workstations are unable to establish a connection if one of them has ***enCentSec*** turned off in its `Symphony` file or if their security file information does not match.

The only exception to the security file matching criteria introduced by the centralized security management mechanism is that a workstation must always accept incoming connections from its domain manager, regardless of the result of the security file matching process.

Centralized security does not apply to Tivoli Workload Scheduler operations for which the `Symphony` file is not required. Commands that do not require the `Symphony` file to run use the local security file. For example, the **`parms`** command, used to modify or display the local parameters database, continues to work according to the local security file, even if centralized security is active and the local security file differs from the centralized security rules.

If a workstation's security file is deleted and recreated, the checksum of the new security file will not match the value in the `Symphony` file. In addition, a run-number mechanism associated with the creation process of the `Symphony` file ensures prevention from tampering with the file.

Configuring the security file

In the security file you can specify which scheduling objects a user can manage and how. You define these settings by writing user definitions. A user definition is an association between a name and a set of users, the objects they can access, and the actions they can perform on the specified objects.

When defining user authorization consider that:

- When commands are issued from the **composer** command line program, the user authorizations are checked in the security file of the master domain manager since the methods used to manage the entries in the database are invoked on the master domain manager. Therefore the user must be defined:
  - As system user on the system where the master domain manager is installed.
  - In the security file on the master domain manager with the authorizations needed to run the allowed commands on the specific objects.
- When commands are issued from the **conman** command line program, the user must be authorized to run the specific commands in the security file both on the connecting workstation and on the master domain manager where the command actually runs.

The configuration is described in these sections:

- “Security file syntax” on page 107
- “Specifying user attributes” on page 108
- “Specifying object types” on page 113

- "Specifying object attributes" on page 114
- "Specifying access" on page 119
- "The *TWS_user* - special security file considerations" on page 133

Security file syntax

The syntax of the security file is as follows:

Security file

Syntax

[**#** *comment*]

user *definition_name user_attributes*

begin [* *comment*]

object_type [*object_attributes*]. **access**[=*keyword*[,*keyword*]...]

[*object_type* [*object_attributes*]. **access**[=*keyword*[,*keyword*]...]]...

end | **continue**

Arguments

[# | *] *comment*
: All text following a pound sign or an asterisk and at least one space is treated as a comment. Comments are not copied into the operational security file installed by the **makesec** command.

user *definition_name*
: Specifies the name of the user definition. The name can contain up to 36 alphanumeric characters and must start with an alphabetic character.

user_attributes
: Contains one or more attributes that identify the user or users to whom the definition applies. For details of how to define user attributes, see "Specifying user attributes" on page 108.

begin Begins the part containing object statements and accesses within the user definition.

object_type
: Identifies the type of object (for example: workstation, resource, or prompt) to which access is to be given for the specified user or users. All object types that the specified user or users needs to access must be explicitly defined. If they are not, no access will be given. For details of how to define object types, see "Specifying object types" on page 113.

object_attributes
: Contains one or more attributes that identify the specific objects of the defined object type to which the same access is to be given. If no object attributes are defined, access is given to all objects of the defined object type. For details of how to define object attributes, see "Specifying object attributes" on page 114.

access[=*keyword***[,***keyword***]...]**
: Describes the access to the specified objects given to the selected users. If none is specified (by specifying just the keyword "access") no access is

given to the associated objects. If **access=@** then all access rights are assigned to the specified users. For details of how to define access, see "Specifying access" on page 119.

continue
: Terminates the user definition. A user gets all the accesses defined for each group that they belong to, until a user definition with an `end` statement is reached. For an example of the use of the `continue` keyword, see "Users logged in to multiple groups [continue keyword]" on page 137

end
: Terminates the user definition. The users defined in the user definition that terminates with an `end` statement do not match any subsequent user definition.

Wildcards

The following wildcard characters are permitted in user definition syntax:

? Replaces one alphanumeric character.

@ Replaces zero or more alphanumeric characters.

For information about variables supplied with the product that can be used in object attributes, refer to "Using variables in object attribute definitions" on page 118. Refer to "Sample security file" on page 133 for an example on how to use variables.

Specifying user attributes

The user attributes define *who* has the access that is going to be subsequently defined. They can identify one user, a selection of users, a group of users, a selection of groups of users, or all users. You can also exclude one or more specific users or groups from a selection. As well as being identified by logon ID and group name, users can also be described by the workstation from which they log on. And finally, you can mix selection criteria, for example selecting all users in a named group that can access from a set of workstations identified by a wildcard, but excluding a specific set of users identified by their logon IDs.

The general syntax

You make this selection by specifying one or more user attributes. Each user attribute is specified as follows:

user_attribute_type=*value*

user_attribute_type
: Can be *cpu* (workstation), *group*, or *logon*

value Identifies an individual *cpu* (workstation), *group*, or *logon*, or, by using wildcards, can identify a set of any of these.

Including or excluding

Each attribute can be *included* or *excluded* from the selection.

Thus, for each *attribute type*, your options are one of the following:

Include all
: This is the default. Thus, for example, if you want to include all *groups*, you need add no user attribute with respect to any group.

Include a selection
: This can be defined in one of these ways:

- By specifically including users you want to select (individuals or one or more sets)
- By specifically excluding (from the *include all* default) all users you do *not* want to select
- By specifically including a set of users and then excluding some of those contained in the set

Which of these options you choose is determined by which is easier to specify.

Using the include or exclude symbols:

Include
: Precede the user attribute expression by a plus (+) sign. All users identified by the expression will be selected, unless they are also selected by an *exclude* expression. If the first attribute in your definition is an *include*, it does not need to have a (+) sign defined, because the sign is implicit.

  The default (if you specify no user attributes) is to include all users, on all workstations, in all groups, so if you want to define, for example, all users except one named user, you would just supply the *exclude* definition for the one user.

Exclude
: Precede the user attribute expression by a tilde (~) sign. All users identified by the expression will *never* be selected, regardless of if they are identified by any *include* expressions.

Selection expressions

The following are the different types of selection expression you can use:

Basis selection expressions

Include only one attribute

user_attribute_type=*value*

For example, to include one named user logon ID, and exclude all other users:

```
logon=jsmith1
```

Exclude one attribute

~*user_attribute_type*=*value*

For example, to exclude one set of logon IDs identified by a wildcard (those that start with the letter "j"), but include all others:

```
~logon=j@
```

Include only several attributes of the same type

user_attribute_type=*value*[,*value*]...

For example, to include three specific users and exclude all others:

```
logon=jsmith1,jbrown1,jjones1
```

Exclude several attributes of the same type

~*user_attribute_type*=*value*[,*value*]...

For example, to exclude three specific users and include all others:

```
~logon=jsmith1,jbrown1,jjones1
```

Complex selection expressions

Include users identified by different selection expressions

basic_selection_expression[+*basic_selection_expression*]...

The selection expressions can be of the same or a different attribute type:

Same attribute type

An example of the same attribute type is the following, which selects all the groups beginning with the letter "j", as well as those with the letter "z":

```
group=j@+group=z@
```

If the first selection identifies 200 users, and the second 300, the total users selected is 500.

Different attribute type

An example of selection expressions of a different attribute type is the following, which selects all the groups beginning with the letter "j", as well as all users with IDs beginning with a "6":

```
group=j@+logon=6@
```

If the first selection identifies 200 users, and the second 20, of whom 5 are also in the first group, the total users selected is 5.

Exclude users identified in one selection expressions from those identified in another

basic_selection_expression[~*basic_selection_expression*]...

Same attribute type

The selection expressions can be of the same attribute type, provided that the second is a subset of the first. An example of the same attribute type is the following, which selects all the workstations beginning with the letter "j", but excludes those with a "z" as a second letter:

```
group=j@~group=jz@
```

If the first selection identifies 200 users, and the second 20, the total users selected is 180. Note that if the second expression had not been a subset of the first, the second expression would have been ignored.

Different attribute type

Selection expressions of a different attribute type do not have to have a subset relationship, an example being the following, which selects the group "mygroup", but excludes from the selection all users in the group with IDs beginning with a "6":

```
group=mygroup~logon=6@
```

If the first selection identifies 200 users, and the second 20, of whom 5 are also in the first group, the total users selected is 195.

Multiple includes and excludes

You can link together as many include and exclude expressions as you need to identify the precise subset of users who require the same access. The overall syntax is thus:

[~]*user_attribute_type*=*value*[,*value*]...
[{+|~}*user_attribute_type*=*value*[,*value*]...

Note: Making your *first* user attribute an *exclude* means that *all* user attributes of that type are selected *except* the indicated *value*. Thus, ~*user_attribute_type=value* equates to the following:

user_attribute_type=@~*same_user_attribute_type=value*

However, if you use this syntax, you cannot, and do not need to, specifically add "+*user_attribute_type*=@", after the negated item, so you do not define:

~*user_attribute_type=value*+*same_user_attribute_type=@*

Order of user definition

You must order user definitions from most specific to least specific. Tivoli Workload Scheduler scans the security file from top-down, with each user ID being tested against each definition in turn. If the user ID is satisfied by the definition, it is selected, and the matching stops.

For example:

Incorrect:

```
#First User Definition in the Security File
USER TwsUser
CPU=@+LOGON=TWS_user
Begin
job name=@ access=modify
End

#Second User Definition in the Security File
USER Twsdomain:TwsUser
CPU=@+LOGON=TWSDomain\\TWS_user
Begin
job name=@ access=display
End
```

Note: The domain name is actually "TWSDomain\TWS_user", but it has been "escaped", as described in “Escaping special characters in user attribute values” on page 113.

The definitions are intended to determine the following:

1. Users on all workstations with a logon of "TWS_user" will be given "modify" access to all jobs
2. Users on all workstations with a logon of "TWSDomain\TWS_user" will be given "display" access to all jobs

However, all users with a logon of "TWS_user" will satisfy the first rule, regardless of their domain, and will be given "modify" access to all jobs. This is because defining a user without its domain is a shorthand way of defining that user ID in *any* domain; it is the equivalent of "@\TWSUser". So the second rule will never be satisfied, for any user, because the matching for the "TWS_user" stops after a successful match is made.

Correct

```
#First User Definition in the Security File
USER Twsdomain:TwsUser
CPU=@+LOGON="TWSDomain\\TWS_user"
Begin
job name=@ access=display
End
```

```
#Second User Definition in the Security File
USER TwsUser
CPU=@+LOGON=TWS_user
Begin
job name=@ access=modify
End
```

By putting the more specific definition first, both object access definitions are applied correctly.

See “Sample security file” on page 133 for a practical example.

User attribute types - detailed description

The *user_attribute_types* and their associated *values* can be any of the following:

cpu={*workstation*|**@**}
: where:

  workstation
  : Specifies the workstation on which the user is logged in. Wildcard characters are permitted. The following Tivoli Workload Scheduler variables can be used:

    $master
    : Means that the user is logged in on the Tivoli Workload Scheduler master domain manager.

    $manager
    : Means that the user is logged in on the Tivoli Workload Scheduler domain manager.

    $remotes
    : Means that the user is logged in on any Tivoli Workload Scheduler standard agent.

    $slaves
    : Means that the user is logged in on any Tivoli Workload Scheduler fault-tolerant agent.

    $thiscpu
    : Means that the user is logged in on the Tivoli Workload Scheduler workstation on which the security check is running.

    @ Specifies that the user is accessing Tivoli Workload Scheduler with the Tivoli Dynamic Workload Console, or is logged in on any Tivoli Workload Scheduler workstation.

group=*groupname*
: Specifies the name of the group of which the user is a member. Available for both UNIX and Windows users. Wildcard characters are permitted.

logon={*username*|**@**}
: where:

  username
  : Specifies the user ID with which the user is logged in on a Tivoli Workload Scheduler workstation. Wildcard characters are permitted. The **cpu=** attribute must be set to a specific workstation name (no wildcards) or @.

    Note:

1. If the WebSphere Application Server security configuration option **useDomainQualifiedUserNames** is set to *true*, each user ID defined in the security file must have the format `domain/username` to use the product from one of the following:
   - **composer**
   - Tivoli Dynamic Workload Console
   - **logman**
   - **optman**
   - **planman**

   For more information on WebSphere Application Server security configuration, see "Changing the security settings" on page 296.
2. If the user is defined on a Windows 2000 Service Pack 4 (SP4), or Windows XP Service Pack 2 (SP2), or Windows 2003 system, or when upgrading the Windows operating system from an older version to one of those mentioned above, make sure you add the **Impersonate a client after authentication** right to the user settings.

@ Specifies any user logged in with any name or being a member of any Tivoli administrators group.

Escaping special characters in user attribute values

If you need to use a special character in the value field of a user attribute , you must enclose the value in double quotes and escape the special character with a back slash. These are the special characters supported in this way:

```
'
"
\
space
```

This, if you want to include a group called `wingrp\sales`, you should enter:

```
+group="wingrp\\sales"
```

Similarly, `Wingroup Sales` would be:

```
+group="Wingroup\ Sales"
```

Specifying object types

Specify one or more object types that the user or users in the associated user definition is authorized to access. If you specify the object type but no attributes, the authorized actions defined for the user with the **access** keyword apply to all the objects of that type defined in the Tivoli Workload Scheduler domain. If an object type from the following list is omitted for a user or users, no objects of that type can be accessed.

The object types are the following:

action Actions defined in scheduling event rules

calendars
User calendars

cpu Workstations, domains and workstation classes

event Event conditions in scheduling event rules

eventrule
Scheduling event rule definitions

file Tivoli Workload Scheduler database file

job Scheduled jobs and job definitions

parameter
Local parameters. See note below.

prompt
Global prompts

report The reports on the Dynamic Workload Console that have the following *names*:

RUNHIST
Job Run History

RUNSTATS
Job Run Statistics

WWS Workstation Workload Summary

WWR Workstation Workload Runtimes

SQL Custom SQL

ACTPROD
Actual production details (for current and archived plans)

PLAPROD
Planned production details (for trial and forecast plans)

Permission to use these reports is granted by default to the *TWS_user* on fresh installations.

resource
Scheduling resources

schedule
Job streams

userobj
User objects

vartable
Variable tables. This includes authorization to the variable definitions in the tables. See the note below.

Note: Starting from version 8.5, the **parameter** object type is reserved for parameters created and managed in a local parameter database with the `parms` utility command, while authorization to act on global variables is managed using the **vartable** object type. For this reason, when the security file is migrated from previous versions to 8.5, a `vartable` security definition for the default variable table is added to match each `parameter` definition found, as part of the upgrade process documented in the *Tivoli Workload Scheduler: Planning and Installation Guide*.

Specifying object attributes

Specify one or more attributes that identify a set of objects that the user of the user definition is authorized to access. If you specify the object type but no object sets, the authorized actions defined for the user with the **access** keyword apply to all the objects of that type defined in the Tivoli Workload Scheduler domain.

The general syntax

Each object attribute is specified as follows:

object_attribute=*value*

object_attribute
: Object attributes differ according to the object. All objects can be selected by *name*, but some, *jobs*, for example, can be selected by the *workstation* on which they run. See "Object attribute" for full details of which attributes are available for each object type.

value
: Identifies an individual object, or, by using wildcards, a set of objects. See "Specifying object attributes" on page 114 for full details of which attributes are available for each object type.

Object attribute

"Specifying object attributes" on page 114 lists object attributes that are used to identify a specific set of object within all objects of the same type. For example, access can be restricted to a set of resource objects having the same name or being defined on the same workstation, or both.

Table 23. Object attribute types for each object type

Attribute										
Object	**name**	**cpu**	**custom**	**jcl**	**jcltype**	**logon**	**provider**	**type**	**host**	**port**
action							✓	✓	✓	✓
calendar	✓									
cpu (workstation)		✓						✓		
event			✓				✓	✓		
eventrule	✓									
file	✓									
job	✓	✓		✓	✓	✓				
parameter	✓	✓								
prompt	✓									
report	✓									
resource	✓	✓								
schedule (job stream)	✓	✓								
userobj		✓				✓				
vartable	✓									

Including or excluding

Each attribute can be *included* or *excluded* from the selection using the plus (+) and tilde (~) symbols, in the same way as for the user attributes.

Selection expressions

The detailed syntax and use of the selection expressions for objects is the same as that used to select users:

[~]*object_attribute*=*value*[,*value*]...[{+|~}*object_attribute*=*value*[,*value*]...

Order of object definition

You must order object definitions from most specific to least specific, in the same way as for user attributes. For example,

Incorrect

```
job name=@ access=display
job name=ar@ access=@
```

In this case, a job with the name beginning with "ar" would satisfy the first definition, and so would be given the display access, not all access.

Correct

```
job name=ar@ access=@
job name=@ access=display
```

| Ensure that you order object definitions from most specific to least specific also
| when you use the `Continue` keyword. With this keyword, you match more user
| definitions to a single user, so the user receives accesses from more user definition
| statements. These accesses are then processed in the order they are written in the
| security file. For an example of a security file with the `Continue` keyword, see
| "Users logged in to multiple groups [continue keyword]" on page 137

Specifying object attribute values

The following describes the values allowed for each object attribute type:

name=*name*[**,***name*]**...**

Specifies one or more names for the object type. Wildcard characters are permitted. Multiple names must be separated by commas.

- The following values apply to the **`file`** object type:

  globalopts

  Allows the user to set global options with the `optman` command. Gives the following access types:
  - Display access for `optman ls` and `optman show`
  - Modify access for `optman chg`

  prodsked

  Allows the user to create, extend, or reset the production plan.

  security

  Allows the user to manage the security file.

  Symphony

  Allows the user to run **stageman** and **JnextPlan**.

  trialsked

  Allows the user to create trial and forecast plans or to extend trial plans.

  Note: Users who have restricted access to files should be given at least the following privilege to be able to display other objects (ie. calendars and cpus):

  ```
  file  name=globalopts  access=display
  ```

- For the **`event`** object type use one or more of the event type names listed in the *`TWSObjectsMonitor` events* table or the *`FileMonitor` events* table in the *Tivoli Workload Scheduler: User's Guide and Reference*.
- For the **`action`** object type use one or more of the action type names listed in the table *Action types by action provider* in the *Tivoli Workload Scheduler: User's Guide and Reference*.

- For the **vartable** object type, you can use the $DEFAULT value for the **name** attribute to indicate the default variable table. This selects the table defined with the `isdefault` attribute.

cpu=*workstation***[,***workstation***]...**
: Specifies one or more workstation, domain, or workstation class names. Wildcard characters are permitted. Multiple names must be separated by commas. If this attribute is not specified, all defined workstations and domains can be accessed. Workstation variables can be used - see "Using variables in object attribute definitions" on page 118.

custom=value[,*value***]...**

Use this attribute to assign access rights to events defined in event plug-ins. The precise syntax of the value will depend on the plug-in. For example:

- Specify different rights for different users based on SAP R/3 event names when defining event rules for SAP R/3 events.
- Define your own security attribute for your custom-made event providers.
- Specify the type of event that is to be monitored. Every event can be referred to an event provider.

jcl="*path***" | "***command***"**
: Specifies the command or the path name of a job object's executable file. The command or path must be enclosed in double quotes ("). Wildcard characters are permitted. If omitted, all defined job files and commands qualify.

jcltype=[scriptname | docommand]
: Specifies that the user is allowed to act on the definitions of jobs that run only scripts (if set to **`scriptname`**) or commands (if set to **`docommand`**). Use this optional attribute to restrict user authorization to actions on the definitions of jobs of one type or the other only. Actions are granted for both scripts and commands when **`jcltype`** is missing.

A user who is not granted authorization to work on job definitions that run either a command or a script is returned a security error message when attempting to run an action on them.

logon=*username***[,...]**
: Specifies the user IDs. Wildcard characters are permitted. Multiple names must be separated by commas. If omitted, all user IDs qualify. For the **`job`** type object, the following variables are permitted: **$jclowner**, **$owner**, and **$user** (see "Using variables in object attribute definitions" on page 118).

provider=*provider_name***[,...]**

For **action** object types, specifies the name of the action provider.

For **event** object types, specifies the name of the event provider.

Wildcard characters are permitted. Multiple names must be separated by commas. If `provider` is not specified, no defined objects can be accessed.

type=*type***[,...]**

For **action** object types, is the `actionType`.

For **event** object types, is the `eventType`.

For **cpu** object types, the permitted values are those used in **`composer`** or the Dynamic Workload Console when defining workstations, such as `manager`, `broker`, `fta`, `agent`, `s-agent`, `x-agent`, `rem-eng`, `pool`, and `d-pool`.

Note: The value `master`, used in **`conman`** is mapped against the `manager` security attributes.

Wildcard characters are permitted. Multiple names must be separated by commas. If **type** is not specified, all defined objects are accessed for the specified providers (this is always the case after installation or upgrade, as the type attribute is not supplied by default).

host=*host_name*
For **action** object types, specifies the TEC or SNMP host name (used for some types of actions, such as sending TEC events, or sending SNMP). If it does not apply, this field must be empty.

port=*port_number*
For **action** object types, specifies the TEC or SNMP port number (used for some types of actions, such as sending TEC events, or sending SNMP). If it does not apply, this field must be empty.

Using variables in object attribute definitions

The following variables supplied with the product can be used in object attributes:

User identifiers

$jclgroup
The group name of a job's executable file.

$jclowner
The owner of a job's executable file.

$owner
The creator of a job stream and its jobs.

$user The user running the Tivoli Workload Scheduler command or program.

Note: The variables **$jclgroup** and **$jclowner** can only be verified if the user is running a Tivoli Workload Scheduler program on the workstation where the job's executable file is present. If the program is being run on a different workstation, the user is denied access.

Workstation identifiers

$master
The Tivoli Workload Scheduler master domain manager.

$manager
The Tivoli Workload Scheduler domain manager.

$remotes
All standard agent workstations.

$slaves
All fault-tolerant agent workstations.

$thiscpu
The workstation on which the user is running the Tivoli Workload Scheduler command or program.

Variable table identifiers

$default
The name of the current default variable table.

Specifying access

Specify the type of access the selected users are allowed to have to the specified objects as follows:

access[=*keyword*[,*keyword*]...]

- To specify that no actions are permitted, use **access=**
- To specify that all actions are permitted, use **access=@**
- To specify any other access, consult the access tables, by object type, below.

How the access tables are organized

The access tables for object types are as follows:

"Object types - calendar, cpu, eventrule, job, prompt, resource, schedule, userobj - using in composer" on page 120
Most of the **composer** and GUI database maintenance actions are common to most objects, so they are listed in a table of common object access keywords.

"Object type - action" on page 122
This gives the access rights for action objects, which are not included in the common table.

"Object type - calendar" on page 123
This gives the access rights for calendars, which are different or additional to those in the common table.

"Object type - cpu" on page 123
This gives the access rights for workstations (cpus), which are different or additional to those in the common table.

"Object type - event" on page 125
This gives the access rights for events, which are different or additional to those in the common table.

"Object type - file" on page 125
This gives the access rights for files, which are different or additional to those in the common table.

"Object type - job" on page 125
This gives the access rights for jobs, which are different or additional to those in the common table.

"Object type - parameter" on page 128
This gives the access rights for local parameters, which are not included in the common table.

"Object type - prompt" on page 129
This gives the access rights for prompts, which are different or additional to those in the common table.

"Object type - report" on page 130
This gives the access rights for reports, which are different or additional to those in the common table.

"Object type - resource" on page 130
: This gives the access rights for resources, which are different or additional to those in the common table.

"Object type - schedule" on page 130
: This gives the access rights for job streams (schedules), which are different or additional to those in the common table.

"Object type - userobj" on page 131
: This gives the access rights for userobj, which are different or additional to those in the common table.

"Object type - vartable" on page 132
: This gives the access rights for variable tables, which are not included in the common table.

Object types - calendar, cpu, eventrule, job, prompt, resource, schedule, userobj - using in composer

The following table gives the access keywords required to use composer to work with objects of the following types:

- calendar
- cpu
- eventrule
- job
- prompt
- resource
- schedule
- userobj

Note: Starting from version 8.5, the `parameter` keyword is reserved for parameters created and managed in a local parameter database with the `parms` utility command. For more information about `parms`, see *User's Guide and Reference*.

Table 24. Access keywords for composer actions

Activity			Access keywords required
Composer	add	Add new object definitions in the database from a file of object definitions. Unlock access is needed to use the `;unlock` attribute.	add, modify, unlock
	create	Create a text file of object definitions in the database. Modify access is need to use the `;lock` attribute.	display, modify
	delete	Delete object definitions from the database.	delete
	display	Display object definitions in the database.	display
	extract	Extract a text file of object definitions from the database.	display
	list	List object definitions in the database.	display
	lock	Lock object definitions in the database.	modify
	modify	Modify object definitions in the database. Definitions are extracted into a file. After you have edited the file the definitions are used to replace the existing ones.	add, modify
	new	Create object definitions in the database from a template.	add, modify
	print	Print object definitions in the database.	display
	rename	Rename object definitions in the database. You need add access to the new object and delete and display access to the old object.	add, delete, display
	replace	Replace object definitions in the database. Unlock access is needed to use the `;unlock` attribute.	add, modify, unlock
	unlock	Unlock object definitions in the database.	unlock

Table 24. Access keywords for composer actions (continued)

Activity			Access keywords required
Tivoli Dynamic Workload Console	Create object in database	Add new object definitions in the database.	add
	Delete object in database	Delete object definitions from the database. Unlock access is needed to use the `;unlock` option.	delete
	Display object in database	Display object definitions in the database.	display
	List object in database	List object definitions in the database.	display
	Modify object in database	Modify object definitions in the database. Unlock access is needed to use the `;unlock` option.	modify
	Unlock object in database	Unlock object definitions in the database locked by another user.	unlock
	Perform operations for job types with advanced options, both those supplied with the product and the additional types implemented through the custom plug-ins. You can define and perform operations on job types with advanced options with the Workload Designer.	Perform operations for job types with advanced options in the database.	run
Using the workload service assurance feature	All activities	For any user to perform any workload service assurance activities, the *TWS_user* must have the following access keywords for all *cpu*, *job*, and *schedule* objects:	display, modify, list

Example: To allow a user to use the composer list, display, and modify actions on event rules, specify:

```
eventrule         access=add,display,modify
```

Object type - action

The following table gives the access keywords required for actions:

Table 25. Actions - access keywords

Activity		Access keywords required
Tivoli Dynamic Workload Console	Display action instances	display
	List action instances.	list

Table 25. Actions - access keywords (continued)

Activity		Access keywords required
Tivoli Dynamic Workload Console **conman**	Use these specific action types in event rule definitions. • For actions with provider `TWSAction` and types `sbj`, `sbd`, or `sbs`, you must set this keyword in combination with the `submit` access keyword for the specific jobs and job streams specified in the action. • For actions with provider `TWSAction` and type `reply`, you must set this keyword in combination with the `reply` access keyword set for the specific prompts specified in the action. The *TWS_user* of the workstation running the event processing server must have these `submit` and `reply` authorizations, otherwise the event processing server will not be able to run this type of actions.	use

Example: To allow a user to use the Tivoli Dynamic Workload Console to list action instances, specify:

```
action         access=list
```

Object type - calendar

The following table gives the additional access keywords required to work with calendars, other than those described in Table 24 on page 121:

Table 26. Calendar - additional access keywords

Activity		Access keywords required
Composer Tivoli Dynamic Workload Console	Use calendars in job streams	use

Example 1: To allow a user to only use calendars when working with job streams in any of the interfaces, specify:

```
calendar         access=use
```

Example 2: To allow a user to display, list, and print calendars, and use them when working with job streams in any of the interfaces, specify:

```
calendar         access=display,use
```

Object type - cpu

The following table gives the additional access keywords required to work with cpus (includes workstations, domains, and workstation classes), other than those described in Table 24 on page 121:

Table 27. Cpus - additional access keywords

Activity			Access keywords required
Conman Tivoli Dynamic Workload Console	console	View and send messages to the Tivoli Workload Scheduler **conman** console.	console
	deployconf	Force update the monitoring configuration file for the event monitoring engine.	start
	fence	Alter workstation job fences in the production plan.	fence
	limit cpu	Alter workstation job limits in the production plan.	limit
	link	Open workstation links.	link
	resetfta	Generates an updated Sinfonia file and sends it to a fault-tolerant agent on which the Symphony file has corrupted.	resetfta
	showcpus	Display workstations, domains and links in the plan.	list
	shutdown	Shut down Tivoli Workload Scheduler processing.	shutdown
	start	Start Tivoli Workload Scheduler processing.	start
	startappserver	Start the application server.	start
	starteventprocessor	Start the event processor server.	start
	startmon	Start the event monitoring engine.	start
	stop	Stop Tivoli Workload Scheduler processing.	stop
	stop;progressive	Stop Tivoli Workload Scheduler processing progressively.	stop
	stopappserver	Stop the application server.	stop
	stopeventprocessor	Stop the event processor server.	stop
	stopmon	Stop the event monitoring engine.	stop
	switcheventprocessor	Switch the event processor server from the master domain manager to the backup master domain manager or vice versa.	start, stop
	switchmgr	Switch the domain manager functionality to a workstation.	start, stop
	unlink	Close workstation links.	unlink
Startup	Start Tivoli Workload Scheduler processing.		start
Using the workload service assurance feature	All activities	For any user to perform any workload service assurance activities, the *TWS_user* must have the following access keywords:	display, modify, list

Example: To allow a user to display, list, and print workstation, workstation class, and domain definitions, and link and unlink workstations, specify:

```
cpu         access=display,link,unlink
```

Object type - event

The following table gives the access keywords required to work with events:

Table 28. Events - access keywords

Activity		Access keywords required
Composer Tivoli Dynamic Workload Console	Use an event in an event rule definition.	use

Example: To allow a user to use an event in an event rule definition, specify:

```
event        access=use
```

Object type - file

The following table gives the access keywords required to work with files (valid only for the command line.

You must specify the file names to which the type of access applies.

Table 29. Files - access keywords

Activity			Access keywords required
Delete objects from the database.			delete
dumpsec	Create a text file of the settings contained in the compiled security file.		display
JnextPlan	Generate the production plan.		build
makesec	Compile the security file from a text file of the settings.		modify
optman	ls	List all global options.	display
	show	Show the details of a global option.	display
	change	Change the details of a global option.	modify
planman	deploy	Manually deploy event rules.	build
prodsked	Work with the production plan.		build
stageman	Carry forward incompleted job streams, archive the old production plan, and install the new production plan.		build

Example 1: To allow a user to manage the Security file, specify:

```
file         access=display,modify
```

Example 2: To allow a user to run **JnextPlan**, specify:

```
file         access=build
```

Note: The user will also be able to run **planman deploy**, **prodsked**, and **stageman**.

Object type - job

The following table gives the additional access keywords required to work with jobs, other than those described in Table 24 on page 121:

Table 30. Jobs - additional access keywords

Activity			**Access keywords required**
Composer Tivoli Dynamic Workload Console	Use jobs in job streams. Also, if a job is used as a recovery job in a job definition, the user must have "use" access to the definition of the job identified as the recovery job.		use
Conman Tivoli Dynamic Workload Console	adddep	Add dependencies to jobs in the production plan. Not valid for workstations in end-to-end environment.	adddep
	altpri	Alter the priority of jobs in the production plan. Not valid for workstations in end-to-end environment.	altpri
	cancel job	Cancel jobs in the production plan. Not valid for workstations in end-to-end environment.	cancel
	confirm	Confirm completion of jobs in the production plan. Not valid for workstations in end-to-end environment.	confirm
	deldep job	Delete dependencies from jobs in the production plan. Not valid for workstations in end-to-end environment.	deldep
	display	Display jobs in the plan.	display
	kill	Kill running jobs.	kill
	release job	Release jobs from dependencies in the production plan. Not valid for workstations in end-to-end environment.	release
	reply	Reply to job prompts in the production plan.	reply
	rerun	Rerun jobs in the production plan. Not valid for workstations in end-to-end environment.	rerun
	showjobs	Display information about jobs in the production plan.	list

Table 30. Jobs - additional access keywords (continued)

Activity			**Access keywords required**
Conman Tivoli Dynamic Workload Console	submit docommand	Submit commands as jobs or recovery jobs into the production plan. If the **submit** also identifies a second job with the "ALIAS" or "RECOVERYJOB" arguments, the user must have "submit" access to that other job, as well Not valid for workstations in end-to-end environment.	submit
	submit file	Submit files as jobs or recovery jobs into the production plan. If the **submit** also identifies a second job with the "ALIAS" or "RECOVERYJOB" arguments, the user must have "submit" access to that other job, as well Not valid for workstations in end-to-end environment.	submit
	submit job	Submit jobs or recovery jobs into the production plan. If the **submit** also identifies a second job with the "ALIAS" or "RECOVERYJOB" arguments, the user must have "submit" access to that other job, as well Not valid for workstations in end-to-end environment.	submit
		Restricts the submission action to jobs defined in the database. With this authorization level a user cannot submit ad hoc jobs. Use this keyword to allow a user to submit only jobs defined in the database. Use the **submit** keyword to allow a user to submit both defined and ad hoc jobs. Users granted only **submitdb** rights: • Cannot run **submit docommand** and **submit file** successfully • Are displayed tasks related to ad hoc job submission on the graphical user interfaces, but if they run them, are returned error messages for lacking the **submit** access right.	submitdb
	submit sched	Submit job streams into the production plan. Not valid for workstations in end-to-end environment.	submit
Tivoli Dynamic Workload Console	For critical jobs on which you run any of the following actions: • Display hot list • Display critical path • Display incompleted predecessors • Display completed predecessors	The predecessors are listed regardless of the fact that this authorization might not be extended to them. However, if you want to run any further action on any of the listed predecessors, this will require that you have the proper authorization.	list
Using the workload service assurance feature	All activities	For any user to perform any workload service assurance activities, the *TWS_user* must have the following access keywords:	display, modify, list

Example 1: To allow a user to manage only job dependencies, specify:

```
job          access=adddep,deldep
```

Example 2: To allow a user to only manage critical jobs, specify:

```
job          access=list,altpri
```

Example 3: User `administrator` is granted **`add`** and **`modify`** rights for all job definitions, and is therefore permitted to create and modify job definitions that run scripts or commands as needed, with no restriction:

```
USER TWSADMIN
CPU=@+LOGON=administrator
BEGIN
JOB CPU=@ ACCESS=ADD,MODIFY,DISPLAY,...
[...]
END
```

User `sconnor` is granted the same rights for jobs that match the condition **`jcltype=scriptname`**, which means that he can create or modify only job definitions that run scripts and cannot change any of them into a job that runs a command:

```
USER RESTRICTED
CPU=@+LOGON=sconnor
BEGIN
JOB CPU=@+JCLTYPE=SCRIPTNAME ACCESS=ADD,MODIFY,DISPLAY,...
[...]
END
```

Example 4: User `administrator` is granted **`submit`** permission for all jobs, and is therefore permitted to submit jobs defined in the database and ad hoc, with no restriction:

```
USER TWSADMIN
CPU=@+LOGON=administrator
BEGIN
JOB CPU=@ ACCESS=ADD,ADDDEP,...,RERUN,SUBMIT,USE,LIST,UNLOCK
[...]
END
```

User `jsmith` is granted **`submitdb`** permission for all jobs, allowing her to submit all jobs defined in the database, but she is not permitted to run ad hoc job submissions:

```
USER RESTRICTED
CPU=@+LOGON=jsmith
BEGIN
JOB CPU=@ ACCESS=ADD,ADDDEP,...,RERUN,SUBMITDB,USE,LIST,UNLOCK
[...]
END
```

Object type - parameter

The following table gives the access keywords required to work with parameters:

Note: Starting from version 8.5, the `parameter` keyword is reserved for parameters created and managed in a local parameter database with the `parms` utility command. See the *Tivoli Workload Scheduler: User's Guide and Reference* for details on `parms`.

Table 31. Parameters - additional access keywords

Activity		Access keywords required
parms	Manage local parameter definitions.	display

Example: To allow a user to perform all activities on parameters, specify:

```
parameter         access=@
```

Object type - prompt

The following table gives the additional access keywords required to work with prompts, other than those described in Table 24 on page 121:

Table 32. Prompts - additional access keywords

Activity			Access keywords required
Composer Tivoli Dynamic Workload Console	Use prompts when defining or submitting jobs and job streams		use
Conman Tivoli Dynamic Workload Console	adddep	Use prompts when adding dependencies to jobs in the production plan. Not valid for workstations in end-to-end environment.	use
	recall	Display prompts waiting for a response.	display
	reply	Reply to a job or job stream prompt.	reply
	showprompts	Display information about prompts.	list
	submit docommand	Use prompts when submitting commands as jobs into the production plan. Not valid for workstations in end-to-end environment.	use
	submit file	Use prompts when submitting files as jobs into the production plan. Not valid for workstations in end-to-end environment.	use
	submit job	Use prompts when submitting jobs into the production plan. Not valid for workstations in end-to-end environment.	use
	submit sched	Use prompts when submitting job streams into the production plan. Not valid for workstations in end-to-end environment.	use

Example: To allow a user to perform all activities on prompts except reply to them, specify:

```
prompt         access=use,display,list
```

Object type - report

The following table gives the access keywords required to work with reports.

Table 33. Files- access keywords

Activity		**Access keywords required**
Tivoli Dynamic Workload Console	Display reports on Tivoli Dynamic Workload Console.	display

Example: To allow a user to display reports on the Tivoli Dynamic Workload Console, specify:

```
report          access=display
```

Object type - resource

The following table gives the additional access keywords required to work with resources, other than those described in Table 24 on page 121:

Table 34. Resources - additional access keywords

Activity			**Access keywords required**
Composer Tivoli Dynamic Workload Console	Use resources when defining or submitting jobs and job streams		use
Conman Tivoli Dynamic Workload Console	adddep	Use resources when adding dependencies to jobs in the production plan. Not valid for workstations in end-to-end environment.	use
	resource	Change the number of units of a resource on a workstation.	resource
	showresources	Display information about resources.	list
	submit docommand	Use resources when submitting commands as jobs into the production plan. Not valid for workstations in end-to-end environment.	use
	submit file	Use resources when submitting files as jobs into the production plan. Not valid for workstations in end-to-end environment.	use
	submit job	Use resources when submitting jobs into the production plan. Not valid for workstations in end-to-end environment.	use
	submit sched	Use resources when submitting job streams into the production plan. Not valid for workstations in end-to-end environment.	use

Example: To allow a user to display information about resources and change the units of a resource on a workstation, but not to use them in any other scheduling objects or actions, specify:

```
resource          access=list,resource
```

Object type - schedule

The following table gives the additional access keywords required to work with job streams, other than those described in Table 24 on page 121:

Table 35. Job streams - additional access keywords

Activity			Access keywords required
Conman Tivoli Dynamic Workload Console	adddep	Add dependencies to job streams in the production plan. Not valid for workstations in end-to-end environment.	adddep
	altpri	Alter the priority of job streams in the production plan. Not valid for workstations in end-to-end environment.	altpri
	cancel sched	Cancel job streams in the production plan. Not valid for workstations in end-to-end environment.	cancel
	deldep sched	Delete dependencies from job streams in the production plan. Not valid for workstations in end-to-end environment.	deldep
	display	Display job streams in the plan. .	display
	limit sched	Modify the limit for jobs concurrently running within a job stream.	limit
	release sched	Release job streams from dependencies in the production plan. Not valid for workstations in end-to-end environment.	release
	reply	Reply to job stream prompts in the production plan.	reply
	showschedules	Display information about job streams in the production plan.	list
	submit sched	Submit job streams into the production plan. If the **`submit`** also identifies a second job stream with the "ALIAS" argument, the user must have "submit" access to that other job stream, as well Not valid for workstations in end-to-end environment.	submit
Using the workload service assurance feature	All activities	For any user to perform any workload service assurance activities, the *TWS_user* must have the following access keywords:	display, modify, list

Example: To allow a user to perform all actions on a job stream except submit it and release it, specify:

```
schedule         access=adddep,altpri,cancel,deldep,display,limit,reply,list
```

Object type - userobj

The following table gives the additional access keywords required to work with users, other than those described in Table 24 on page 121:

Table 36. Users - additional access keywords

Activity			Access keywords required
Conman Tivoli Dynamic Workload Console	altpass	Alter user passwords in the plan.	altpass

Example: To allow a user to list and modify user information, including passwords in the database, specify:

```
userobj         access=display,modify,altpass
```

Object type - vartable

The following table gives the access keywords for using variable tables and the variables they contain (this includes the global variables)

Table 37. Variable tables - access keywords

Activity			Access keywords required
Composer Tivoli Dynamic Workload Console	add	Add new variable table (vartable) definitions in the database from a file of object definitions. Unlock access is needed to use the `;unlock` attribute. To *add* individual variable entries within a table, the table must have *modify* access.	add, modify, unlock
	create	Create a text file of variable table (vartable) definitions in the database. Modify access is need to use the `;lock` attribute. Create individual variable entries within the table.	display, modify
	delete	Delete variable table (vartable) definitions from the database. To *delete* individual variable entries within a table, the table must have *modify* access.	delete
	display	Display variable table (vartable) definitions in the database. Display individual variable entries within the table.	display
	extract	Extract a text file of variable table (vartable) definitions from the database. Extract individual variable entries within the table.	display
	list	List variable table (vartable) definitions in the database. List individual variable entries within the table.	display
	lock	Lock variable table (vartable) definitions in the database.	modify
	modify	Modify variable table (vartable) definitions in the database. Definitions are extracted into a file. After you have edited the file the definitions are used to replace the existing ones. To *modify* individual variable entries within a table, the table must have *modify* access.	add, modify
	new	Create variable table (vartable) definitions in the database from a template.	add, modify
	print	Print variable table (vartable) definitions in the database. Print individual variable entries within the table.	display
	rename	Rename variable table (vartable) definitions in the database. The user needs add access to the new object and delete and display access to the old object.	add, delete, display
	replace	Replace variable table (vartable) definitions in the database. Unlock access is needed to use the `;unlock` attribute.	add, modify, unlock
	unlock	Unlock variable table (vartable) definitions in the database. Unlocking a table unlocks all the variables contained therein. Unlocking a variable unlocks the entire table where it is defined.	unlock
	Use variable tables in run cycles, job streams, and workstations		use

Example: To allow a user only to use variable tables when defining other scheduling objects, specify:

```
vartable         access=use
```

The *TWS_user* - special security file considerations

The TWS_user is a special user, and requires special consideration for the security file.

Required access for the *TWS_user* for workload service assurance
For any user to perform Workload service Assurance activities, the *TWS_user* must have *display*, *modify* and *list* access keywords assigned for all *job*, *schedule* and *cpu* objects.

New *TWS_user* in migrated Security file
If you change the *TWS_user* of your environment, for example, as you might do when performing a parallel upgrade, and then you migrate the Security file (to preserve your settings) you must set up the new *TWS_user* in the Security file in advance, with all its required access rights, before attempting to start Tivoli Workload Scheduler.

Sample security file

This section contains a sample security file divided into sections for each different class of user.

Note that the order of definitions is from most to least-specific. Because of the order, *TWS_users* and **root** users are matched first, followed by users in the **sys** group, and then users in the **mis** group. All other users are matched with the last definition, which is the least specific.

TWS_users and root users logged in on the master domain manager

user mastersm cpu=$master + logon=*TWS_user*,root

```
###########################################################
#     Sample Security File
###########################################################
# APPLIES TO TWS_users AND ROOT USERS LOGGED IN ON THE
# MASTER DOMAIN MANAGER.
user mastersm  cpu=$master + logon=TWS_user,root
begin
#  OBJECT     ATTRIBUTES        ACCESS CAPABILITIES
# ----------  ------------      ----------------------
job                             access=@
schedule                        access=@
resource                        access=@
prompt                          access=@
file                            access=@
calendar                        access=@
cpu                             access=@
parameter     name=@ ~ name=r@  access=@
userobj       cpu=@ + logon=@   access=@
eventrule     name=@            access=add,delete,display,modify,list,unlock
action        provider=@        access=display,submit,use,list
event         provider=@        access=use
report        name=@            access=display
vartable      name=a@,$default  access=add,delete,display,modify,use,list,unlock
end
```

This user definition applies to GUI and CLI access for *TWS_users* and **root** users logged into a master domain manager. They are given unrestricted access to all objects, except parameters that have names beginning with **r**. Access to the **r** parameters is given only to users in the **mis** group. They are the only ones who can generate all kinds of plans and who can create, update, and delete event rule definitions.

All users have access to all variable tables beginning with "a" and to the default table, irrespective of the default variable table name.

TWS_users and root users logged in on any domain manager (other than the master)

user testerlondon cpu=$manager + logon=*TWS_user*,root

```
#########################################################
#     Sample Security File
#########################################################
# APPLIES TO TWS_users AND ROOT USERS LOGGED IN ON ANY
# DOMAIN MANAGER.
user testerlondon  cpu=$manager + logon=TWS_user,root
begin
#  OBJECT     ATTRIBUTES      ACCESS CAPABILITIES
# ----------  ------------    ----------------------
job                           access=add,delete,display
schedule                      access=add,delete,display
resource                      access=@
prompt                        access=@
file          name=prodsked   access=build, display
file          name=trialsked  access=build, display
calendar                      access=@
cpu                           access=@
parameter  name=@ ~ name=v@   access=@
userobj    cpu=@ + logon=@    access=@
eventrule       name=@        access=add,delete,display,modify,list,unlock
action     provider=@         access=display,submit,use,list
event      provider=@         access=use
report     name=@             access=display
vartable   name=a@,$default   access=add,delete,display,modify,use,list,unlock
end
```

This user definition applies to GUI and CLI access for *TWS_users* and **root** users logged into any domain manager other than the master. They are given unrestricted access to all objects, except parameters that have names beginning with **v**, and jobs and jobs streams to which they have limited access. They can generate all types of plans and can create, update, and delete event rule definitions.

All users have access to all variable tables beginning with "a" and to the default table, irrespective of the default variable table name.

TWS_users and root users logged in on any workstation other than any domain manager

user sm logon=*TWS_user*,root

```
#########################################################
# APPLIES TO TWS_users AND ROOT USERS LOGGED IN ON ANY
# WORKSTATION OTHER THAN THE MASTER DOMAIN MANAGER.
user sm  logon=TWS_user,root
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
job           cpu=$thiscpu     access=@
schedule      cpu=$thiscpu     access=@
resource      cpu=$thiscpu     access=@
prompt                         access=@
```

```
calendar                       access=@
cpu           cpu=$thiscpu     access=@
parameter     cpu=$thiscpu
              ~ name=r@        access=@
action        provider=@       access=display,submit,use,list
event         provider=@       access=use
report        name=RUNHIST,RUNSTATS  access=display
file          name=globalopts  access=display
end
```

This user definition applies to *TWS_users* and **root** users to whom definition (1) does not apply, which are those who are logged in on any workstation other than the master domain manager or any other domain manager. They are given unrestricted access to all objects on their login workstation. Note that prompts, files, and calendars are global in nature and are not associated with a workstation.

They can use event rules, but are not allowed to create, update, or delete event rule definitions.

Users logged into the *sys* group on the master domain manager

user masterop cpu=$master + group=sys

```
############################################################
# APPLIES TO USERS LOGGED INTO THE SYS GROUP ON THE
# MASTER DOMAIN MANAGER.
user masterop  cpu=$master + group=sys
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
job           cpu=@
              + logon="TWS_domain\\TWS_user" access=@
job           cpu=@
              + logon=root     access=adddep,altpri,cancel,
                                      confirm,deldep,release,
                                      reply,rerun,submit,use
job           cpu=@
              + logon=$user,$jclowner
              ~ logon=root     access=add,adddep,altpri,
                                      cancel,confirm,
                                      deldep,release,reply,
                                      rerun,submit,use
schedule      cpu=$thiscpu     access=@
schedule      cpu=@            access=adddep,altpri,cancel,
                                      deldep,limit,release,
                                      submit
resource                       access=add,display,
                                      resource,use
file          name=globalopts  access=display
file          name=prodsked    access=display
file          name=symphony    access=display
file          name=trialsked   access=build, display
calendar                       access=display,use
cpu                            access=@
parameter     name=@ ~ name=r@ access=@
report        name=RUNHIST,RUNSTATS  access=display
end
```

This user definition applies to users logged into the **sys** group on the master domain manager. They are given a unique set of access capabilities. Multiple object statements are used to give these users specific types of access to different sets of objects. For example, there are three job statements:

- The first job statement permits unrestricted access to jobs that run on any workstation (@) under the user's name (**$user**).
- The second job statement permits specific types of access to jobs that run on any workstation and that run as **root**.
- The third job statement permits specific types of access to jobs that run on any workstation. The jobs must run under the user's name (**$user**) or under the name of the owner of the job file (**$jclowner**). Jobs that run as root are excluded.

They are the only users defined on the master domain manager, different from maestro or root, who can generate trial and forecast plans.

Users logged into the *sys* group on any workstation other than the master domain manager

user op group=sys

```
############################################################
# APPLIES TO USERS LOGGED INTO THE SYS GROUP ON ANY
# WORKSTATION OTHER THAN THE MASTER DOMAIN MANAGER
user op  group=sys
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
job           cpu=$thiscpu
              + logon=$user    access=@
job           cpu=$thiscpu
              + logon=root     access=adddep,altpri,cancel,
                                      confirm,deldep,release,
                                      reply,rerun,submit,use
job           cpu=$thiscpu
              ~ logon=root     access=adddep,altpri,cancel,
                                      confirm,deldep,release,
                                      reply,rerun,submit,use
schedule      cpu=$thiscpu     access=@
resource                       access=add,display,resource,use
prompt                         access=add,display,reply,use
calendar                       access=use
cpu           cpu=$thiscpu     access=console,fence,limit,
                                      link,start,stop,unlink
parameter     name=@ ~ name=r@ access=@
end

############################################################
```

This user definition applies to **sys** group users to whom definition (3) does not apply, which are those who are logged in on any workstation other than the master domain manager. They are given a set of access capabilities similar to those in definition (3). The exception is that access is restricted to objects on the user's login workstation (**$thiscpu**).

Users logged into the *mis* group on any workstation

user misusers group=mis

```
############################################################
# APPLIES TO USERS LOGGED INTO THE MIS GROUP ON
# ANY WORKSTATION.
user misusers  group=mis
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
job           cpu=$thiscpu
              + logon=$user    access=@
job           cpu=$thiscpu
```

```
              + logon=$jclowner
              ~ logon=root     access=submit,use
schedule      cpu=$thiscpu     access=add,submit,
                                      modify,display
cpu           type=agent,s-agent,fta
                               access=console,fence,limit,
                                      link,start,stop,unlink
parameter     name=r@          access=@
parameter     name=@           access=display
end
###########################################################
```

This user definition applies to users logged into the **mis** group on any workstation. They are given a limited set of access capabilities to fault-tolerant, standard, and dynamic agents. Resources, prompts, files, calendars, and workstations are omitted, which prevents access to these objects. These users are given unrestricted access to parameters with names that begin with **r**, but can only display other parameters.

Users logged in to multiple groups [continue keyword]

This is an example of a security file where the `continue` keyword is used. With this kind of security file, users get all accesses defined for each group that they belong to. As a result, a user can get authorizations from multiple user definitions.

```
###########################################################
# User misusers USER DEFINITION APPLIES TO USERS LOGGED IN TO
# THE MIS GROUP ON ANY WORKSTATION.
#
# User dbusers USER DEFINITION APPLIES TO USERS LOGGED IN TO
# THE DB GROUP ON ANY WORKSTATION.
#
# User default USER DEFINITION APPLIES TO ALL USERS.
#

user misusers  group=mis
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
job           name=mis@        access=@
schedule      name=mis@        access=@
parameter     name=mis@        access=@
continue

user dbusers  group=db
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
job           name=db_@        access=@
schedule      name=db_@        access=@
parameter     name=db_@        access=@
continue

user default logon=@
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
parameter     name=@           access=display
end


###########################################################
```

Users that belong only to the *mis* group get access to all objects that have a name starting with the *mis* prefix, as specified in the `user misusers` user definition. In addition, the `user default` user definition gives them display access to all parameters.

Users that belong only to the *db* group get access to all objects that have a name starting with the *db_* prefix, as specified in the `user dbusers` user definition. In addition, the `user default` user definition gives them display access to all parameters.

Users that belong to both the *mis* and the *db* groups get access to the objects that have a name starting with the *mis* prefix and to the objects that have a name starting with the *db_* prefix, as specified in the `user misusers` and in the `user dbusers` user definitions. In addition, the `user default` user definition gives them display access to all parameters.

You must order definitions from most specific to least specific. The `user default` user definition gives generic accesses, and must be therefore specified at the end of the file.

All other users logged in on any workstation

user default logon=@

```
###########################################################
# APPLIES TO ALL OTHER USERS LOGGED IN ON ANY
# WORKSTATION.
user default  logon=@
begin
#  OBJECT     ATTRIBUTES       ACCESS CAPABILITIES
# ----------  ------------     ----------------------
job           cpu=$thiscpu
              + logon=$user    access=@
job           cpu=$thiscpu
              + logon=$jclowner
              ~ logon=root     access=submit,use
schedule      cpu=$thiscpu     access=add,submit,
                                      modify,display
cpu           cpu=$thiscpu     access=console,fence,limit,
                                      link,start,stop,unlink
parameter     name=u@          access=@
parameter     name=@ ~ name=r@ access=display
end
###########################################################
```

This user definition gives a set of default capabilities to users other than those covered by the preceding definitions (1 to 5). These users are given unrestricted access to parameters with names that begin with **u**, but can only display other parameters. No access is permitted to parameters with names that begin with **r**.

Chapter 5. Configuring authentication

This section describes how to configure authentication using, amongst other methods, the popular LDAP (Lightweight Directory Access Protocol). It is divided into these main topics:

- "Where to configure authentication"
- "Available configurations" on page 140
- "How to configure authentication" on page 140
- "Rules for using a Federated User Registry with Tivoli Workload Scheduler" on page 141
- "Configuring authentication using the Integrated Solutions Console" on page 142
- "Configuring authentication using the WebSphere Application Server tools" on page 143
- "Completing the configuration" on page 154
- "Example configurations of LDAP servers" on page 155
- "Using the Pluggable Authentication Module" on page 157

Where to configure authentication

Authentication must be configured on each instance of the embedded WebSphere Application Server that you are installing, following these rules:

To authenticate command-line users
For users of the command-line, the command-line client, the command-line as clients connected to the master domain manager using HTTP or HTTPS, or of agents where the connector has been installed, the same authentication method must be configured for the following components:

- Master domain manager
- Backup master domain manager
- Agents that have a connector installed

To authenticate Dynamic Workload Console
If the Dynamic Workload Console is *not* installed on the same instance of Tivoli Workload Automation as the master domain manager, authentication for this instance must be separately configured. The authentication configuration for one instance can be different from the other, unless you plan to use single sign-on, in which case it must be identical. If the Dynamic Workload Console is installed in the same instance as the master domain manager, you do not need to separately configure authentication for it.

To authenticate z/OS connector users
If the z/OS connector is *not* installed on the same instance of Dynamic Workload Console, authentication for this instance must be separately configured. The authentication configuration for one instance can be different from the other, unless you plan to use single sign-on, in which case it must be identical. If the z/OS connector is installed in the same instance as the Dynamic Workload Console, you do not need to separately configure authentication for it.

To authenticate dynamic domain manager users
The same authentication method must be configured for each dynamic

domain manager and its corresponding backup dynamic domain manager. This authentication method does not need to be the same as that used for the master domain manager.

Available configurations

On installation, all Tivoli Workload Scheduler components that use the embedded WebSphere Application Server are configured for authentication in VMM (Virtual Member Manager) mode. This creates a *Federated User Registry*, using which you can choose to use one or more of the following authentication systems:

- Local operating system - the default authentication system at installation on Windows operating systems
- Custom (through PAM - Pluggable Authentication Module) - the default authentication system at installation on UNIX and Linux operating systems
- LDAP
- File Registry

If you want to use local OS as the authentication method for the Dynamic Workload Console on UNIX operating systems, perform the steps in "Configuring the Dynamic Workload Console to use the local OS authentication method" on page 83.

If you choose to enable LDAP, you can use one of the following servers, for which sample configuration templates are supplied in this documentation:

- IBM Tivoli Directory Server
- Sun Java Director Server
- Microsoft Windows Active Directory
- z/OS Integrated Security Services LDAP Server

How to configure authentication

LDAP can be configured in either of these ways:

Using the Integrated Solutions Console

On each instance of the embedded WebSphere Application Server where you want to modify the default authentication configuration you open the Integrated Solutions Console and select to configure Global Security. You choose and configure the authentication mechanism or mechanisms you use in your environment.

See "Configuring authentication using the Integrated Solutions Console" on page 142 for a full description.

Manually, using the WebSphere Application Server tools supplied with the product

On each instance of the embedded WebSphere Application Server where you want to modify the default authentication configuration you run a script called `showSecurityProperties` to create a template containing the current security configuration. You modify this template by adding and amending the properties that define the authentication mechanism or mechanisms you use in your environment. Finally, you run a script called `changeSecurityProperties` to update the WebSphere Application Server security configuration.

See "Configuring authentication using the WebSphere Application Server tools" on page 143 for a full description.

A typical configuration scenario

In a complex environment, you might want to use the following scenario to configure your chosen authentication mechanism across your workload scheduling environment:

1. Use the `changeSecurityProperties` script to configure the mechanism on one instance of WebSphere Application Server, for example that installed with the master domain manager.
2. Test that you can log in using the configured authentication with several user IDs.
3. On that instance run the `showSecurityProperties` script and save the output to create a text template file containing the configuration. `showSecurityProperties` extracts *only* those configurations that have been created by using the `changeSecurityProperties`.
4. On each of these systems where you want to configure authentication
   - Copy the text template file created in the previous step.
   - Run `showSecurityProperties` and save the output file.
   - Merge this output file with the configuration template file.
   - Run `changeSecurityProperties` to update the WebSphere Application Server configuration.
   - Test that you can log in using the configured authentication with several user IDs.

Rules for using a Federated User Registry with Tivoli Workload Scheduler

This section describes the simple rules you must follow when configuring Tivoli Workload Scheduler to use a Federated User Registry:

No duplicate User IDs
You can define any number of user registries in a Federated User Registry. However, no user ID must be present in more than one registry (this prohibits using both Local OS and PAM as a joint authentication mechanism). Thus, if you configure multiple user registries it is because you have users in different non-inclusive groups that use different user registries and which need to access Tivoli Workload Scheduler.

Reserved registry IDs
The WebSphere Application Server tools use some specific IDs to recognize the registries and these are thus reserved keywords that you cannot use to create your own registries, whichever method you use to configure them:

twaLocalOS
Identifies the custom user registry bridge adapter configured for local operating system users

twaPAM
Identifies the custom user registry bridge adapter configured to use the Pluggable Authentication Module (PAM) with Tivoli Workload Scheduler – it is not available on Windows operating systems

twaLDAP
: Identifies the user registry bridge configured for LDAP users

defaultWIMFileBasedRealm
: Identifies the default embedded WebSphere Application Server File Registry

Compatibility
: To ensure compatibility with nodes in your Tivoli Workload Scheduler network that are at a previous version, only Tivoli Workload Scheduler components and Dynamic Workload Console at version 8.4 and higher can be configured with an LDAP login.

Configuring authentication using the Integrated Solutions Console

The Integrated Solutions Console is installed automatically with every instance of the embedded WebSphere Application Server. Use it to configure authentication as follows:

1. **Login to the Dynamic Workload Console**

   Login to the Dynamic Workload Console with the current WebSphere Application Server administration credentials.
2. **Backup the configuration**

   Backup the WebSphere Application Server configuration using the command **`backupConfig`**.
3. **Access the Integrated Solutions Console**

   To access the Integrated Solutions Console, use one of the following URLs:

   ```
   https://<Hostname>:<adminSecurePort>/ibm/console/

   http://<Hostname>:<adminPort>/ibm/console/
   ```

   where:

   Hostname
   : The fully qualified hostname or the IP address of the computer.

   adminSecurePort
   : If you connect with HTTPS, supply the WebSphere Application Server Administration secure port, the default value of which is `31124`.

   adminPort
   : If you connect with HTTP, supply the WebSphere Application Server Administration port, the default value of which is `31123`.

   Example

   ```
   https://mypc:31124/ibm/console/
   ```
4. **Login to the console**

   Log into the console using the WebSphere Administration Server credentials. You supplied these when you installed the component on this system (they might have been modified since then).
5. **Navigate to the security section**

   Select **Security** ▸ **Global security**
6. **Configure your required authentication mechanism or mechanisms.**

   In the User account repository section you will see the default **Federated repositories** option selected. Click the adjacent **Configure** button. Use the Integrated Solutions Console to configure your authentication mechanism or mechanisms. When you modify the rows in the **Repositories in the realm** table, the value **InternalFileRepository** corresponding to the Repository Identifier column must not be deleted.

For example, click **Add Base entry to Realm ...** to add a new repository, such as LDAP.

Use the built-in context-sensitive help to understand what information to supply in each field.

In addition, all the key/value pairs output by the **`showSecurityProperties`** tool are documented in "Security properties: reference" on page 144. Each key/value pair corresponds to a field or concept expressed in the GUI of the Integrated Solutions Console; the keys are mnemonic, to help you make the correspondence.

7. **Save the modified configuration**

   Click **Save** to save the new configuration.

8. **Restart the server**

   Stop the application server using the command **`stopappserver`**, as described in the *Tivoli Workload Scheduler: User's Guide and Reference*. To stop the server, use the original WebSphere administrator credentials.

   Restart the server using the command **`startappserver`**, as described in the *Tivoli Workload Scheduler: User's Guide and Reference*.

Configuring authentication using the WebSphere Application Server tools

When you install a Tivoli Workload Scheduler component that uses the embedded WebSphere Application Server, you also install a set of WebSphere Application Server tools (sometimes called "wastools"). You use two of these tools to configure the authentication for . For more general information about the tools, see "Application server utilities" on page 313.

You can use the application server tools to configure only the following LDAP servers:
- Microsoft Active Directory
- Oracle Java System Directory Server
- IBM Tivoli Directory Server

For the other LDAP servers use the procedure described in "Configuring authentication using the Integrated Solutions Console" on page 142.

To configure authentication, perform the following steps:
1. Login to the Dynamic Workload Console with the current WebSphere Application Server administration credentials.
2. Backup the WebSphere Application Server configuration using the command **`backupConfig`**.
3. Dump your current security properties to a text file using the command **`showSecurityProperties > <text_file>`**.
4. Customize the security properties by editing <*text_file*>. See "Security properties: reference" on page 144.
5. Stop the server using the commands **`stopappserver`**, as described in the *Tivoli Workload Scheduler: User's Guide and Reference*. To stop the server, use the original WebSphere administrator credentials.

6. Load the new properties using the command **changeSecurityProperties <text_file>**.
7. Restart the server using the commands **startappserver**, as described in the *Tivoli Workload Scheduler: User's Guide and Reference*.

Security properties: reference

This section describes the important security properties in the file generated by the showSecurityProperties script. It is divided into *panels*:

Global Security Panel

Required panel.

```
################################################################
Global Security Panel
################################################################
enabled=true
enforceJava2Security=false
useDomainQualifiedUserNames=false
cacheTimeout=600
ltpaTimeOut=720
issuePermissionWarning=true
activeProtocol=CSI
useFIPS=false
activeAuthMechanism=SWAM
activeUserRegistry=LDAP LocalOS WIM Custom <repository_id>:<repository_base_name>
#activeUserRegistry=Custom <is not available on Windows platforms>
```

Note to users of previous versions of Tivoli Workload Scheduler: Nearly all of the properties are unchanged with respect to previous Tivoli Workload Scheduler releases.

The following property is new:

enabled=true|false
Specifies if application security is enabled (true) or not (false). The default is "true".

enforceJava2Security=false
Specify if Java 2 security is enabled (true). Tivoli Workload Scheduler does not support Java 2 security so this must be set to false (the default).

useDomainQualifiedUserNames=true|false
Specify if domain-qualified (realm-qualified) user names are to be used (true). If this is set to true, all user names in the Security file must be qualified with their domains. The default is false. Changing this value while using Tivoli Workload Scheduler could endanger your access to the product; if you need to do so discuss the best method with IBM Software Support.

cacheTimeout=*<seconds>*
Specifies the timeout value in seconds for the security cache. The security cache timeout can influence performance. The timeout setting specifies how often to refresh the security-related caches. Security information pertaining to beans, permissions, and credentials is cached. When the cache timeout expires, all cached information becomes invalid. Subsequent requests for the information result in a database lookup. Sometimes, acquiring the information requires invoking a Lightweight Directory Access Protocol (LDAP)-bind or native authentication. Both invocations are relatively costly operations for performance. Determine the best trade off for the application, by looking at usage patterns and security needs for the

site. The default security cache timeout value is 600 seconds. If you have a small number of users, it should be set higher than that, or if a large number of users, it should be set lower.

ltpaTimeout=<*seconds*>
Specifies the cache timeout for the LTPA data. The LTPA timeout value should not be set lower than the security cache timeout. The default is 720 seconds.

issuePermissionWarning=true
Specifies that during application deployment and application start, the security runtime issues a warning if applications are granted any custom permissions (true). Custom permissions are permissions that are defined by the user applications, not Java API permissions. Java API permissions are permissions in the java.* and javax.* packages. For Tivoli Workload Scheduler leave the setting as "true".

activeProtocol=CSI
Specifies the active authentication protocol for Remote Method Invocation over the Internet Inter-ORB Protocol (RMI IIOP) requests, when security is enabled. For Tivoli Workload Scheduler leave the setting as "CSI".

useFIPS=true|false
Specify if the Tivoli Workload Scheduler network is FIPS compliant (true) and thus uses GSKit, for SSL or is not FIPS compliant (false), and uses OpenSSL. The default is false. See "FIPS compliance" on page 201 for more details.

activeAuthMechanism=SWAM
Specifies the active authentication mechanism. For Tivoli Workload Scheduler leave the setting as "SWAM".

activeUserRegistry=<*space_separated_list*>
Specifies a list of space-separated entries that identify the registries to enable. All the entries listed here will be enabled together in the VMM Federated User Registry. Allowed values are:

- LocalOS
- Custom (not available for Windows operating systems)
- LDAP
- WIM
- <REPOSITORY_ID>:<REPOSITORY_REALM_BASENAME>

  Use this if you have configured another repository using Integrated Solutions Console or any other mechanism other than the Tivoli Workload Scheduler WebSphere Application Server tools, and you want to enable such a repository either on its own or together with the default registries indicated above.

  For example, if you have created a repository with id "BluePages" and with a realm base name of "ibm.com®", you must specify:

  ```
  activeUserRegistry=BluePages:o=ibm.com <other_repository_ids>
  ```

Federated repository panel

Required panel.

```
################################################################
Federated Repository Panel
################################################################
PrimaryAdminId=
UseRegistryServerId=
ServerID=
```

```
ServerPassword=
VMMRealm=TWSREALM
VMMRealmDelimiter=@
VMMIgnoreCase=true
```

Note to users of previous versions of Tivoli Workload Scheduler: This is a new panel.

PrimaryAdminId=<*name*>
: Specifies the name of the user with administrative privileges which is defined in the repository, for example, `adminUser`. The user name is used to log on to the administrative console when administrative security is enabled. WebSphere Application Server requires an administrative user which is distinct from the server user identity so that administrative actions can be audited.

UseRegistryServerId=true|false
: Specifies whether the server identity is to be generated automatically or supplied manually.
- If true, enables the application server to generate the server identity, which is recommended for environments that contain only WebSphere Application Server 6.1 or later nodes. Automatically generated server identities are not stored in a user repository.
- If false, requires that a user is specified as ServerID for internal process communication.

ServerID=<*name*>
: Specifies a user identity in the repository that is used for internal process communication. Configurations that also contain WebSphere Application Server V6.0.x require a server user identity which is defined in the active user repository.

ServerPassword=<*password*>
: Specifies the password that corresponds to the ServerID.

VMMRealm=<*name*>
: Specifies the name of the realm. The default for this value is TWSREALM. Ensure this property is configured correctly for your environment, in order to allow communication between different servers and to improve speed.

VMMRealmDelimiter=<*value*>
: Specifies the delimiter used to distinguish between user and realm when federating multiple repositories with different realms. The default value is "@".

VMMIgnoreCase=true|false
: Specifies whether a case-insensitive authorization check is performed.
- If true, specifies that case sensitivity is not a consideration for authorization. Must be set to true when enabling LDAP repository with IBM Tivoli Directory Server
- If false, the case of the user ID being authenticated will be used to match against the user IDs in the registry.

LDAP Panel

Complete this panel if configuring for an LDAP user registry.

```
##############################################################
LDAP Panel
##############################################################
LDAPServerType=IDS
LDAPHostName=
LDAPPort=389
LDAPBaseDN=
LDAPBindDN=
LDAPBindPassword=
LDAPloginProperties=
LDAPsearchTimeout=120
LDAPsslEnabled=false
LDAPsslConfig=
LDAPCertificateFilter=
LDAPCertificateMapMode=EXACT_DN
```

Note to users of previous versions of Tivoli Workload Scheduler: This is not a new panel, but is significantly different from previous versions.

LDAPServerType=<*name*>
: Specifies the type of LDAP server to which you connect. If you use the IBM Tivoli Directory Server for z/OS, you must specify **IDS** . Allowed values are:

IDS IBM Tivoli Directory Server (the default LDAP value)

AD Microsoft Windows Active Directory

LDAPHostName=<*IP_address_or_hostname*>
: Specifies the host name of the primary LDAP server. This host name is either an IP address or a domain name service (DNS) name.

LDAPPort=<*number*>
: Specifies the LDAP server port. The default value is 389, which is not a Secure Sockets Layer (SSL) connection. Use port 636 for an SSL connection. For some LDAP servers, you can specify a different port for a non-SSL or SSL connection.

LDAPBaseDN=<*distinguished_name_list*>
: Specifies the LDAP distinguished name (DN) of the base entry within the repository, which indicates the starting point for LDAP searches of the directory service. The entry and its descendants are mapped to the subtree that is identified by the "twaLDAP" base entry. If this field is left blank, then the subtree defaults to the root of the LDAP repository.

For example, for a user with a DN of `cn=John Doe , ou=Rochester, o=IBM, c=US`, specify that the `LDAPBaseDN` has any of the following options:

- `ou=Rochester, o=IBM, c=US`
- `o=IBM c=US`
- `c=US`

For authorization purposes, this field is case sensitive. This specification implies that if a token is received, for example, from another cell or Lotus® Domino®, the base DN in the server must match the base DN from the other cell or Lotus Domino server exactly. If case sensitivity is not a consideration for authorization, enable the Ignore case for authorization option.

LDAPBindDN=<*name*>
: Specifies the distinguished name (DN) for the application server to use when binding to the LDAP repository. If no name is specified, the application server binds anonymously. In most cases, `LDAPBindDN` and `LDAPBindPassword` are needed. However, when anonymous bind can satisfy all of the required functions, `LDAPBindDN` and `LDAPBindPassword` are not needed.

LDAPBindPassword=<*password*>
: Specifies the password for the application server to use when binding to the LDAP repository.

LDAPloginProperties=<*login_token_list*>
: Specifies the login tokens to use to log into the application server. This field takes multiple login tokens, delimited by a semicolon (;). For example, `uid;mail`. All login properties are searched during login. If multiple entries or no entries are found, an error is given. For example, if you specify the login properties as `uid;mail` and the login ID as Bob, the search filter searches for `uid=Bob` or `mail=Bob`. When the search returns a single entry, then authentication can proceed. Otherwise, an error is given.

  If you supply more than one login token, the order you give to the login tokens is very important, because regardless of the token by which the user is authenticated, VMM sets the first property as the principal name. This principal name is then passed to Tivoli Workload Scheduler. For example, if you set the login properties to `cn;mail`, even if the user logs in with "mail", the principal name returned will be "cn"and the Tivoli Workload Scheduler security checks (in the security file, for example) are performed using the "cn" value for that user.

LDAPsearchTimeout=<*value*>
: Specifies the timeout value in milliseconds for an LDAP server to respond before the request is aborted. A value of 0 specifies that no search time limit exists.

LDAPsslEnabled=true|false
: Specifies whether secure socket communication is enabled to the LDAP server.
  - If true, SSL is enabled, and the Secure Sockets Layer (SSL) settings for LDAP are used, if specified.
  - If false, SSL is not enabled.

LDAPsslConfig=<*alias*>
: Specifies the SSL configuration alias to use for LDAP outbound SSL communications. This option overrides the centrally managed configuration for the JNDI platform. The default value is "`DefaultNode/DefaultSSLSettings`".

LDAPCertificateFilter=<*filter_specification*>
: Specifies the filter certificate mapping property for the LDAP filter. The filter is used to map attributes in the client certificate to entries in the LDAP repository. If more than one LDAP entry matches the filter specification at run time, authentication fails because the result is an ambiguous match. The syntax or structure of this filter is:

  <LDAP_attribute>=${<Client_certificate_attribute>}

  For example, `uid=${SubjectCN}`.

  The left side of the filter specification is an LDAP attribute that depends on the schema that your LDAP server is configured to use. The right side of the filter specification is one of the public attributes in your client certificate. The right side must begin with a dollar sign ($) and open bracket ({) and end with a close bracket (}). You can use any of the following certificate attribute values on the right side of the filter specification (the case of the strings is important):
  - ${UniqueKey}

- ${PublicKey}
- ${PublicKey}
- ${Issuer}
- ${NotAfter}
- ${NotBefore}
- ${SerialNumber}
- ${SigAlgName}
- ${SigAlgOID}
- ${SigAlgParams}
- ${SubjectCN}
- ${Version}

LDAPCertificateMapMode=<*value*>
: Specifies whether to map X.509 certificates into an LDAP directory by `EXACT_DN` or `CERTIFICATE_FILTER`.

Advanced LDAP Panel

Complete this panel if configuring for an LDAP user registry.

```
################################################################
Advanced LDAP Panel
################################################################
LDAPUserEntityType=PersonAccount
LDAPUserObjectClasses=
LDAPUserSearchBases=
LDAPUserSearchFilter=
LDAPUserRDNAttributes=
LDAPGroupEntityType=Group
LDAPGroupObjectClasses=
LDAPGroupSearchBases=
LDAPGroupSearchFilter=
LDAPGroupSearchFilter=
LDAPGroupRDNAttributes=
LDAPOrgContainerEntityType=OrgContainer
LLDAPOrgContainerObjectClasses=
LDAPOrgContainerSearchBases=
LDAPOrgContainerSearchFilter=
LDAPOrgContainerRDNAttributes=
LDAPGroupConfigName=ibm-allGroups
LDAPGroupConfigScope=all
LDAPGroupConfigMemberNames=member;uniqueMember
LDAPGroupConfigMemberClasses=groupOfNames;groupOfUniqueNames
LDAPGroupConfigMemberScopes=direct;direct
LDAPGroupConfigMemberDummies=uid=dummy;
```

Note to users of previous versions of Tivoli Workload Scheduler: It is not a new panel, but is different from previous versions.

LDAPUserEntityType=<*value*>
: Specifies the `PersonAccount` entity type name that is supported by the member repositories. By default, this value is "`PersonAccount`"

LDAPUserObjectClasses=<*entity_type_list*>
: Specifies the object classes that are mapped to the `PersonAccount` entity type. You can specify multiple values delimited by a semicolon (;) LDAP entries that contain one or more of the object classes belong to this entity type. You cannot map multiple entity types to the same LDAP object class.

LDAPUserSearchBases=<*search_base_list*>
: Specifies the search bases that are used to search the `PersonAccount` entity type. The search bases specified must be subtrees of the base entry in the repository.

For example, you can specify the following search bases, where `o=ibm,c=us` is the base entry in the repository:

- `o=ibm,c=us`
- `cn=users,o=ibm,c=us`
- `ou=austin,o=ibm,c=us`

In the preceding example, you cannot specify search bases `c=us` or `o=ibm,c=uk`.

Delimit multiple search bases with a semicolon (;). For example: `ou=austin,o=ibm,c=us;ou=raleigh,o=ibm,c=us`

LDAPUserSearchFilter=<*name***>**
Specifies the LDAP search filter that is used to search the `PersonAccount` entity type. If a search filter is not specified, the object classes and the relative distinguished name (RDN®) properties are used to generate the search filter.

LDAPUserRDNAttributes=<*rdn_attributes_list***>**
Specifies the relative distinguished name (RDN) properties that are used to generate the search filter for the `PersonAccount` entity type. You can specify multiple values delimited by a semicolon (;). Specify this value in the form <*rdn_attribute_name*>:<*object_class*>. *object_class* is optional; if you specify it, this value is used by the **PersonAccount** entity type to map the corresponding *rdn_attribute_name*.

LDAPGroupEntityType=<*name***>**
Specifies the Group entity type name that is supported by the member repositories. By default, this value is **Group**.

LDAPGroupObjectClasses=<*object_classes_list***>**
Specifies the object classes that are mapped to the Group entity type. You can specify multiple values delimited by a semicolon (;) LDAP entries that contain one or more of the object classes belong to this entity type. You cannot map multiple entity types to the same LDAP object class.

LDAPGroupSearchBases=<*search_base_list***>**
Specifies the search bases that are used to search the Group entity type. The search bases specified must be subtrees of the base entry in the repository. See "`LDAPUserSearchBases`" for more information.

LDAPGroupSearchFilter=<*name***>**
Specifies the LDAP search filter that is used to search the Group entity type. If a search filter is not specified, the object classes and the relative distinguished name (RDN) properties are used to generate the search filter.

LDAPGroupRDNAttributes=<*rdn_attributes_list***>**
Specifies the relative distinguished name (RDN) properties that are used to generate the search filter for the **Group** entity type. You can specify multiple values delimited by a semicolon (;). Specify this value in the form <*rdn_attribute_name*>:<*object_class*>. *object_class* is optional; if you specify it, this value is used by the **Group** entity type to map the corresponding *rdn_attribute_name*.

LDAPOrgContainerEntityType=<*name***>**
Specifies the `OrgContainer` entity type name that is supported by the member repositories. By default, this value is "`OrgContainer`".

LDAPOrgContainerObjectClasses=<*object_classes_list***>**
Specifies the object classes that are mapped to the `OrgContainer` entity type. You can specify multiple values delimited by a semicolon (;) LDAP

entries that contain one or more of the object classes belong to this entity type. You cannot map multiple entity types to the same LDAP object class.

LDAPOrgContainerSearchBases=<*search_base_list***>**
Specifies the search bases that are used to search the `OrgContainer` entity type. The search bases specified must be subtrees of the base entry in the repository. See "`LDAPUserSearchBases`" for more information.

LDAPOrgContainerSearchFilter=<*name***>**
Specifies the LDAP search filter that is used to search the `OrgContainer` entity type. If a search filter is not specified, the object classes and the relative distinguished name (RDN) properties are used to generate the search filter.

LDAPOrgContainerRDNAttributes=<*rdn_attributes_list***>**
Specifies the relative distinguished name (RDN) properties that are used to generate the search filter for the `OrgContainer` entity type. You can specify multiple values delimited by a semicolon (;). Specify this value in the form *rdn_attribute_name*>:<*object_class*>. *object_class* is optional; if you specify it, this value is used by the **OrgContainer** entity type to map the corresponding *rdn_attribute_name*.

LDAPGroupConfigName=<*value***>**
Specifies the name of the group membership attribute. Only one membership attribute can be defined for each LDAP repository. Every LDAP entry must have this attribute to indicate the groups to which this entry belongs.

For example, `memberOf` is the name of the membership attribute that is used in Active Directory. `Ibm-allGroups` is the name of the membership attribute that is used in IBM Tivoli Directory Server. The group membership attribute contains values that reference groups to which this entry belongs. If `User` belongs to `Group`, then the value of the `memberOf` attribute of `User` must contain the distinguished name of `Group`. If your LDAP server does not support the group membership attribute, then do not specify this attribute. The LDAP repository can look up groups by searching the group member attributes, though the performance might be slower.

LDAPGroupConfigScope=<*value***>**
Specifies the scope of the group membership attribute. The default value is direct. For IBM Tivoli Directory Server the value to specify is "`all`". For Active Directory the value to specify is "`direct`" Allowed values:

direct The membership attribute contains direct groups only. Direct groups are the groups that contain the member.

For example, if `Group1` contains `Group2` and `Group2` contains `User1`, then `Group2` is a direct group of `User1`, but `Group1` is not a direct group of `User1`.

nested The membership attribute contains both direct groups and nested groups.

all The membership attribute contains direct groups, nested groups, and dynamic members.

LDAPGroupConfigMemberNames=<*names_list***>**
Specifies the names of the "member attributes" in LDAP. You can specify more "member attributes" separating them with ";".

For example, member and uniqueMember are two commonly used names of member attributes. The member attribute is used to store the values that reference members that the group contains. For example, a group type with an object class groupOfNames has a member attribute named member; group type with object class groupOfUniqueNames has a member attribute named uniqueMember.

An LDAP repository supports multiple group types if multiple member attributes and their associated group object classes are specified.

LDAPGroupConfigMemberClasses=groupOfNames;groupOfUniqueNames
Specifies the object class of the group that uses these member attributes. If this field is not defined, this member attribute applies to all group object classes. You can specify more "member classes" separating them with ";".

If you specify more than one value in "LDAPGroupConfigMemberNames", then you can specify the class related to the specific member name defining the right value in the right position.

Example:

```
LDAPGroupConfigMemberNames=member;uniqueMember
LDAPGroupConfigMemberClasses=groupOfNames;groupOfUniqueNames
```

LDAPGroupConfigMemberScopes
Specifies the scope of the members attribute. You can specify more "member scopes" separating them with ";". The default value is direct. If you specify more than one value in "LDAPGroupConfigMemberNames", then you can specify the scope related to the specific member name defining the right value in the right position. Allowed values:

direct The member attribute contains direct members only. Direct members are members that are directly contained by the group. For example, if Group1 contains Group2 and Group2 contains User1, then User1 is a direct member of Group2, but User1 is not a direct member of Group1.

nested The member attribute contains both direct members and nested members.

all The member attribute contains direct members, nested members, and dynamic members.

Example:

```
LDAPGroupConfigMemberNames=member;uniqueMember
LDAPGroupConfigMemberScopes=direct;all
```

LDAPGroupConfigMemberDummies=uid=dummy;
Indicates that if you create a group without specifying a member a dummy member is filled in to avoid creating an exception about missing a mandatory attribute. Allowed value is "uid=dummy" If you specify more than one value in "LDAPGroupConfigMemberNames", then you can specify the dummy member related to the specific member name defining the right value in the right position.

Example:

```
LDAPGroupConfigMemberNames=member;uniqueMember
LDAPGroupConfigMemberDummies=uid=dummy;
```

It means that only "member" have a "dummy member", while "uniqueMember" do not have a "dummy member" enabled.

SSL Panel

This panel is used to configure SSL and is not relevant to user authentication. All properties are unchanged with respect to the previous version.

J2C Authentication Data Panel

This panel is used to configure J2C Authentication and is not relevant to user authentication. All properties are unchanged with respect to the previous version.

ChangeSecurityProperties - output

The output of the `ChangeSecurityProperties` script contains messages that help you to understand if the configuration changes you have made have been accepted. These messages include those that are generated when upgrading a Tivoli Workload Scheduler component or the Dynamic Workload Console from a version prior to V8.6.

The sample output of the script is as follows:

```
--------------------------------------------------------------------------------
I: Using Property File: C:/TWS/wastools/FRESHI~1.TXT

I: Configuring Global Security ...
I: The LTPA LTPA has been found.
I: The LTPA timeout has been set to 720 minutes
I: Setting the authentication mechanism to (cells/DefaultNode|security.xml#LTPA_1)
I: Configuring SSL ...
I: Configuring LocalOS registry ...
I: twaLocalOS user registry bridge already exists
I: Configuring Advanced J2C Auth
I: twaLDAP LDAP user registry already exists
I: Configuring LDAP ...
I: Configuring Advanced LDAP ...
I: Enabling "LocalOS" user registry bridge
I: Enabling "LDAP" user registry bridge
I: The Active Authentication Mechanism is (cells/DefaultNode|security.xml#LTPA_1)
I: The Active User Registry is (cells/DefaultNode|security.xml#WIMUserRegistry_1)
   with base entries:
   o=twaLocalOS
   o=twaLDAP
I: The VMM useRegistryServerId property is "true"
I: The VMM ignoreCase property is "true"
I: The VMM realm is "TWSREALM"
I: Current LDAPServerType for user registry with id "twaLDAP" is "IDS"
I: The activeAuthmechanism is LTPA

I: Validation success. Configuration saved
--------------------------------------------------------------------------------
```

Each message begins with a letter indicating whether it is Informational (I), a Warning (W), or an Error (E).

Note:

1. In the event that an error occurs, the configuration is not changed.
2. If a property is not supplied in the input file, the corresponding field in the embedded WebSphere Application Server is not updated.
3. If a password field is blank or "*****", the corresponding password in the embedded WebSphere Application Server is not updated.

Completing the configuration

After you have configured the WebSphere Application Server to use a new authentication configuration, whichever configuration method you used, you must also perform the following steps:

1. Create users and groups

Follow these steps to create users and groups after you have configured the new user registry (the example uses the Dynamic Workload Console but you can achieve the same result using **composer**..

1. Login to the WebSphere Application Server using the newly changed WebSphere Application Server administrative user and password.
2. Assign the `TWSWEBUIAdministrator` role to the new administrative user.
3. Create new users and groups and assign roles to them, as explained in "Configuring roles to access the Dynamic Workload Console" on page 84.

2. Update the Tivoli Workload Scheduler security file

The Tivoli Workload Scheduler security file needs to be updated to allow users to access Tivoli Workload Scheduler objects (see "Updating the security file" on page 102 for full details). The following is a brief example of an updated security file, where the user `TEST_LDAP` has been added to the `USER MAESTRO` section:

```
USER MAESTRO
 CPU=@+LOGON=tws83,Administrator,administrator,TEST_LDAP
BEGIN
 USEROBJ CPU=@  ACCESS=ADD,DELETE,DISPLAY,MODIFY,ALTPASS,UNLOCK
 JOB  CPU=@  ACCESS=ADD,ADDDEP,ALTPRI,CANCEL,CONFIRM,DELDEP,DELETE,DISPLAY,KILL,
                  MODIFY,RELEASE,REPLY,RERUN,SUBMIT,USE,LIST,UNLOCK
 SCHEDULE CPU=@ ACCESS=ADD,ADDDEP,ALTPRI,CANCEL,DELDEP,DELETE,
        DISPLAY,LIMIT,MODIFY,RELEASE,REPLY,SUBMIT,LIST,UNLOCK
 RESOURCE CPU=@ ACCESS=ADD,DELETE,DISPLAY,MODIFY,RESOURCE,USE,LIST,UNLOCK
 PROMPT    ACCESS=ADD,DELETE,DISPLAY,MODIFY,REPLY,USE,LIST,UNLOCK
 FILE  NAME=@ ACCESS=CLEAN,DELETE,DISPLAY,MODIFY,UNLOCK
 CPU  CPU=@  ACCESS=ADD,CONSOLE,DELETE,DISPLAY,FENCE,LIMIT,LINK,MODIFY,
        SHUTDOWN,START,STOP,UNLINK,LIST,UNLOCK
 PARAMETER CPU=@ ACCESS=ADD,DELETE,DISPLAY,MODIFY,UNLOCK
 CALENDAR    ACCESS=ADD,DELETE,DISPLAY,MODIFY,USE,UNLOCK
END
```

In the example, note that the **`useDomainQualifiedUserNames`** security property is set to **`false`**, so the user name has been specified without its domain.

3. Update associated WebSphere Application Server properties

On both Windows and UNIX after the WebSphere Application Server has been modified to use LDAP, it is important to change the SOAP client properties and revalidate the user credentials of the Windows services:

Update SOAP client properties

Use the **`updateWAS.sh/.bat`** script to update the SOAP client properties. (see "Application server - updating the SOAP properties after changing the WebSphere Application Server user or its password" on page 306 for full details). For example:

```
updateWas.sh -user john.smith@domain.com -password zzzz
```

where the**user** and **password** options are the new logical user that is authorized to stop the WebSphere Application Server. The user must be defined in the user registry

Update Windows services

On Windows, after WebSphere Application Server has been modified to use LDAP, it is important to update or revalidate the credentials of the Windows services using the **updateWasService.bat** script (see "Application server - updating the Windows services after modifications" on page 305 for full details). For example:

```
updateWasService -userid tws83 -password zzzz
—wasuser TEST_LDAP —waspassword xxxxxx
```

where the **—userid** and **—password** options are the operating system user ID and password of the user that is running the WebSphere Application Server process, and **—wasuser** and **—waspassword** are the new logical user that is authorized to stop the WebSphere Application Server. The **—wasuser** must be defined in the user registry

4. Propagate the changes

Propagate the changes you have made, as follows:

1. Update the USERNAME and PASSWORD fields in the `useropts` file on every command-line client that points to your workstation
2. Update the USERNAME and PASSWORD fields in the `useropts` file on every fault-tolerant agent in your environment that has an HTTP/HTTPS connection defined in localopts that points to your workstation. The HTTP/HTTPS connection is used to submit a predefined job or jobstream.
3. Update the USERNAME and PASSWORD fields in the engine connection parameters on every connected Dynamic Workload Console.

Note: To change the useropts file, change the USERNAME and type the new PASSWORD in plain text between quotes. The password will be encrypted the first time you log in.

Example configurations of LDAP servers

Refer to this template also if you are using an IBM Tivoli Directory Server (ITDS) for z/OS LDAP server to access to information stored in RACF. Note that on the Tivoli Integrated Portal, LDAP users are queried only by the userid attribute. Check that an auxiliary class of **eperson** type and an uid attribute is added to the LDAP user ID.

Active Directory

```
################################################################
Global Security Panel
################################################################
enabled=true
enforceJava2Security=false
useDomainQualifiedUserNames=false
cacheTimeout=600
ltpaTimeOut=720
issuePermissionWarning=true
activeProtocol=CSI
useFIPS=false
activeAuthMechanism=LTPA
activeUserRegistry=WIM LocalOS LDAP
```

```
################################################################
Federated Repository Panel
################################################################
PrimaryAdminId=tws_admin
UseRegistryServerId=false
ServerID=
ServerPassword=
VMMRealm=myrealm
VMMRealmDelimiter=@
VMMIgnoreCase=true

################################################################
LDAP Panel
################################################################
LDAPServerType=AD
LDAPHostName=myhostname
LDAPPort=389
LDAPBaseDN=dc=test,dc=it
LDAPBindDN=CN=ldap bind,DC=test,DC=it
LDAPBindPassword=*****
LDAPloginProperties=uid
LDAPsearchTimeout=120000
LDAPsslEnabled=false
LDAPsslConfig=
LDAPCertificateFilter=
LDAPCertificateMapMode=

################################################################
Advanced LDAP Panel
################################################################
LDAPUserEntityType=PersonAccount
LDAPUserObjectClasses=user
LDAPUserSearchBases=
LDAPUserSearchFilter=(objectCategory=user)
LDAPUserRDNAttributes=sAMAccountName:user
LDAPGroupEntityType=Group
LDAPGroupObjectClasses=group
LDAPGroupSearchBases=
LDAPGroupSearchFilter=(objectCategory=group)
LDAPGroupRDNAttributes=cn:group
LDAPOrgContainerEntityType=OrgContainer
LDAPOrgContainerObjectClasses=organization;organizationalUnit
;domain;container
LDAPOrgContainerSearchBases=
LDAPOrgContainerSearchFilter=
LDAPOrgContainerRDNAttributes=ou:organizationalUnit;cn:container;
dc:domain;o:organization

LDAPGroupConfigName=memberOf
LDAPGroupConfigScope=direct
LDAPGroupConfigMemberNames=member
LDAPGroupConfigMemberClasses=groupOfNames
LDAPGroupConfigMemberScopes=direct
LDAPGroupConfigMemberDummies=
```

IBM Tivoli Directory Server

```
################################################################
Global Security Panel
################################################################
enabled=true
enforceJava2Security=false
useDomainQualifiedUserNames=false
cacheTimeout=600
ltpaTimeOut=720
issuePermissionWarning=true
activeProtocol=CSI
useFIPS=false
```

```
activeAuthMechanism=LTPA
activeUserRegistry= WIM LocalOS LDAP

################################################################
Federated Repository Panel
################################################################
PrimaryAdminId=tws_admin
UseRegistryServerId=false
ServerID=
ServerPassword=
VMMRealm=myrealm
VMMRealmDelimiter=@
VMMIgnoreCase=true
################################################################
LDAP Panel
################################################################
LDAPServerType=IDS
LDAPHostName=myhostname
LDAPPort=389
LDAPBaseDN=o=ibm.com
LDAPBindDN=
LDAPBindPassword=
LDAPloginProperties=mail;cn
LDAPsearchTimeout=120000
LDAPsslEnabled=false
LDAPsslConfig=
LDAPCertificateFilter=
LDAPCertificateMapMode=
################################################################
Advanced LDAP Panel
################################################################
LDAPUserEntityType=PersonAccount
LDAPUserObjectClasses=user;ePerson
LDAPUserSearchBases=
LDAPUserSearchFilter=(objectclass=ePerson)
LDAPUserRDNAttributes=mail:ePerson;cn:ePerson
LDAPGroupEntityType=Group
LDAPGroupObjectClasses=group;groupOfUniqueNames
LDAPGroupSearchBases=
LDAPGroupSearchFilter=(&(ou=memberlist)(ou=ibmgroups)
(o=ibm.com)(objectclass=groupOfUniqueNames))
LDAPGroupRDNAttributes=cn:groupOfUniqueNames
LDAPOrgContainerEntityType=OrgContainer
LDAPOrgContainerObjectClasses=organization;
organizationalUnit;domain;container
LDAPOrgContainerSearchBases=
LDAPOrgContainerSearchFilter=
LDAPOrgContainerRDNAttributes=ou:organizationalUnit;
cn:container;dc:domain;o:organization
LDAPGroupConfigName=ibm-allGroups
LDAPGroupConfigScope=all
LDAPGroupConfigMemberNames=uniqueMember
LDAPGroupConfigMemberClasses=groupOfUniqueNames
LDAPGroupConfigMemberScopes=direct
LDAPGroupConfigMemberDummies=
```

Using the Pluggable Authentication Module

Tivoli Workload Scheduler enhances the embedded WebSphere Application Server by supporting a user authentication mechanism based on the Pluggable Authentication Module.

This enhancement provides a single authentication mechanism that is capable of authenticating users no matter what their user registry implementations are based on, local OS or LDAP.

Tivoli Workload Scheduler automatically installs the plug-in that enables WebSphere Application Server to use Pluggable Authentication Module-enabled authentication. The plug-in uses the service with name `other`. Ordinarily, you need do nothing to configure the Pluggable Authentication Module. However, if the level of your authorizations inhibits you from using `other`, you should add the service with name `checkpassword` in the `/etc/pam.conf` file.

The use of the Pluggable Authentication Module also extends the WebSphere Application Server's capabilities to include support for authentication in HP Trusted Mode environments.

Tivoli Workload Scheduler is set by default to use a Pluggable Authentication Module user registry called "custom". If the Pluggable Authentication Module is not configured with this registry, WebSphere Application Server looks in the local user registry on the master domain manager.

Chapter 6. Network administration

This chapter describes how to administer the Tivoli Workload Scheduler network. It has the following topics:

- "Network overview"
- "Network definitions" on page 160
- "Network communications" on page 160
- "Network operation" on page 162
- "Support for Internet Protocol version 6" on page 179
- "Optimizing the network" on page 166
- "Netman configuration file" on page 175
- "Extended agents" on page 176
- "IP address validation" on page 179
- "Impact of network changes" on page 181

Network overview

A Tivoli Workload Scheduler network consists of one or more domains arranged hierarchically. A Tivoli Workload Scheduler domain is a logical grouping of workstations, consisting of a domain manager and a number of agents.

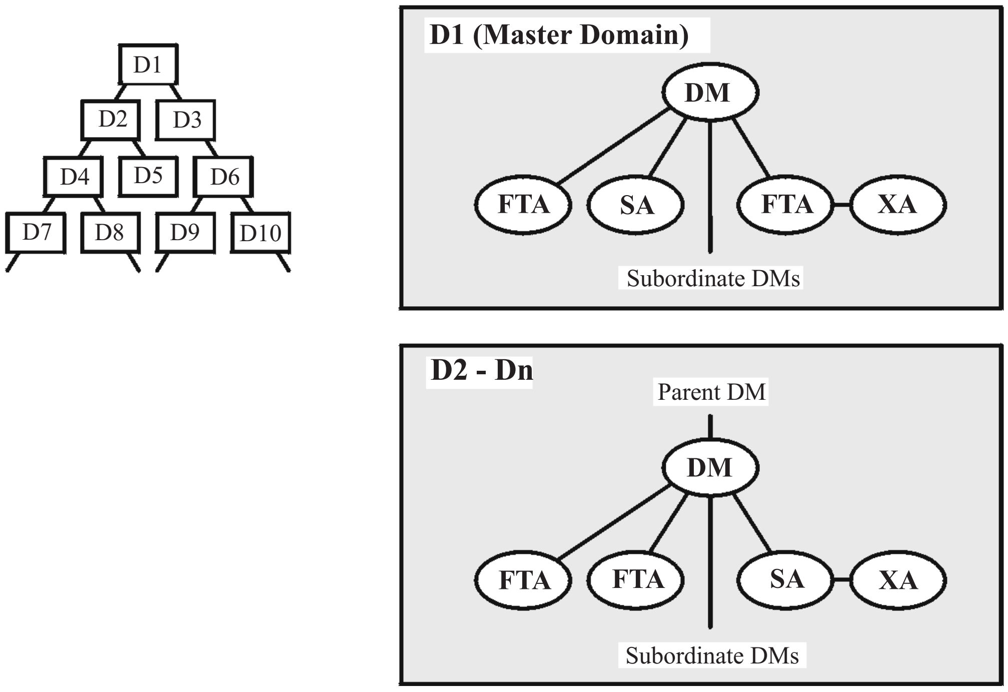


Figure 2. Tivoli Workload Scheduler network domain structure

Network definitions

Domain
A named group of Tivoli Workload Scheduler workstations consisting of one or more agents and a domain manager. All domains have a parent, except the master domain.

Master domain
The topmost domain in an Tivoli Workload Scheduler network.

Master domain manager
The domain manager in the topmost domain of an Tivoli Workload Scheduler network. It contains the centralized master files used to document scheduling objects. It creates the Production Control file (Symphony) at the start of each production period and performs all logging and reporting for the network. See also Domain Manager.

Backup master domain manager
A fault-tolerant agent capable of assuming the responsibilities of the master domain manager.

Parent domain
The domain directly above the current domain. All domains, except the master domain, have a parent domain. All communications to/from a domain is rooted through the parent domain manager.

Domain Manager
The management hub in a domain. All communications in and from the agents in a domain is routed through the domain manager. See also Master Domain Manager.

Backup domain manager
A fault-tolerant agent capable of assuming the responsibilities of its domain manager.

Fault-tolerant agent
An agent workstation capable of resolving local dependencies and launching its jobs in the absence of a domain manager.

Standard agent
An agent workstation that launches jobs only under the direction of its domain manager.

Extended agent
An agent workstation that launches jobs only under the direction of its host. Extended agents can be used to interface Tivoli Workload Scheduler with non-Tivoli Workload Scheduler systems and applications

Host
The scheduling function required by extended agents. It can be performed by any Tivoli Workload Scheduler workstation, except another extended agent.

Network communications

In a Tivoli Workload Scheduler network, agents communicate with their domain managers, and domain managers communicate with their parent domain managers. There are basically two types of communications that take place:

- Start-of-production period initialization (distribution of new Symphony file)
- Scheduling events in the form of change-of-state messages during the production period

Before the start of each new production period, the master domain manager creates a production control file called Symphony. Then, Tivoli Workload Scheduler is restarted in the network, and the master domain manager sends a copy of the new `Symphony` file to each of its automatically-linked agents and subordinate domain managers. The domain managers, in turn, send copies to their automatically-linked agents and subordinate domain managers. Agents and domain managers that are not set up to link automatically are initialized with a copy of `Symphony` as soon as a link operation is run in Tivoli Workload Scheduler.

Once the network is started, scheduling messages, like job starts and completions, are passed from the agents to their domain managers, through parent domain managers to the master domain manager. The master domain manager then broadcasts the messages throughout the hierarchical tree to update the `Symphony` files of all domain managers and the domain managers forward the messages to all fault-tolerant agents in their domain running in *FullStatus* mode.

Network links

Links provide communications between Tivoli Workload Scheduler workstations in a network. Links are controlled by the AUTO Link flag, and the Console Manager **link** and **unlink** commands. When a link is open, messages are passed between two workstations. When a link is closed, the sending workstation stores messages in a local `pobox` file and sends them to the destination workstation when the link is reopened.

This means that when links are closed, the message queues fill up with messages for the inaccessible workstations. To maximize the performance of Tivoli Workload Scheduler, monitor workstations for closed links and attempt to reopen them as soon as possible.

Note: Extended agents do not have links. They communicate with their domain managers through their hosts.

To have a workstation link opened automatically, turn on the AUTO Link flag in the workstation's definition. The link is first opened when Tivoli Workload Scheduler is started on the Master Domain workstation. If the subdomain manager and workstations are not initialized and their AUTO Link flag is on, the master domain manager attempts to link to its subordinates and begin the initialization processes. If the AUTO Link flag is turned off, the workstation is only initialized by running a **link** command from the master domain manager. After the workstation is initialized, it automatically starts and issues a link back to its domain manager.

If you stop a workstation, the links from it to other workstations are closed. However, the links from the other workstations to it remain open until either one of the following situations occurs:

- The stopped workstation is restarted and a **link** command is issued
- The other workstations' **mailman** processes time out, and perform an **unlink** for the workstation

When the **link** command is issued and the connection has been established, if the domain manager does not receive any reply within the timeout period, the `chkhltst` service is automatically invoked by **mailman**.

This service verifies that the workstation mailbox can be successfully read, and checks if there are errors in the mailbox header. Resulting information is logged in the `TWSMERGE.log` file of the domain manager as follows:

- If a file system error occurs while opening the mailbox, the following message is reported: `AWSBDY126E An error occurred opening the Mailbox.msg file in` *`CPU_NAME`*`.`
- If an error occurs while opening the mailbox because **mailman** is reading the mailbox, the following message is reported: `AWSBDY123I The Mailbox.msg file in` *`CPU_NAME`* `is correctly read by Mailman.`
- If the mailbox is correctly opened, but an error occurs while reading the header, the following message is reported: `AWSBDY125E An error occurred reading the header of the Mailbox.msg file in` *`CPU_NAME`*`.`
- If the mailbox is correctly opened and no error occurs while reading the header, the following message is reported: `AWSBDY124W The Mailbox.msg file in` *`CPU_NAME`* `is not read by Mailman.`

This service can also be launched manually by using the **conman** command. See the *IBM Tivoli Workload Scheduler User's Guide and Reference* for more details.

To be certain that inter-workstation communication is correctly restored, you can issue a **link** command after restarting a workstation.

Network operation

The batchman process on each domain manager and fault-tolerant agent workstation operates autonomously, scanning its `Symphony` file to resolve dependencies and launch jobs. Batchman launches jobs via the jobman process. On a standard agent, the jobman process responds to launch requests from the domain manager's batchman.

The master domain manager is continuously informed of job launches and completions and is responsible for broadcasting the information to domain managers and fault-tolerant agents so they can resolve any inter-workstation dependencies.

The degree of synchronization among the `Symphony` files depends on the setting of the *FullStatus* mode in a workstation's definition. Assuming that these modes are turned on, a fault-tolerant agent's Symphony file contains the same information as the master domain manager's (see the section that explains how to manage workstations in the database in the *Tivoli Workload Scheduler: User's Guide and Reference*).

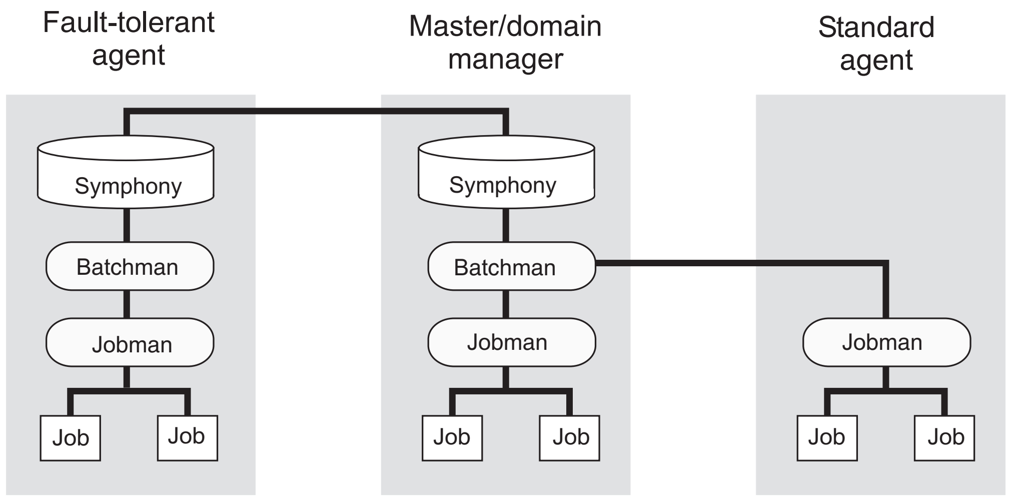


Figure 3. Symphony file synchronization

Network processes

Netman is started by the **`StartUp`** script (command). The order of process creation is netman, mailman, batchman, and jobman. On standard agent workstations, batchman does not run. All processes, except jobman, run as the **TWS** user. Jobman runs as **root**.

When network activity begins, netman receives requests from remote mailman processes. Upon receiving a request, netman spawns a writer process and passes the connection off to it. Writer receives the message and passes it to the local mailman. The writer processes (there might be more than one on a domain manager) are started by link requests and are stopped by unlink requests (or when the communicating mailman terminates).

Domain managers, including the master domain manager, can communicate with a large number of agents and subordinate domain managers. For improved efficiency, you can define mailman servers on a domain manager to distribute the communications load (see the section that explains how to manage workstations in the database in the *Tivoli Workload Scheduler: User's Guide and Reference*).

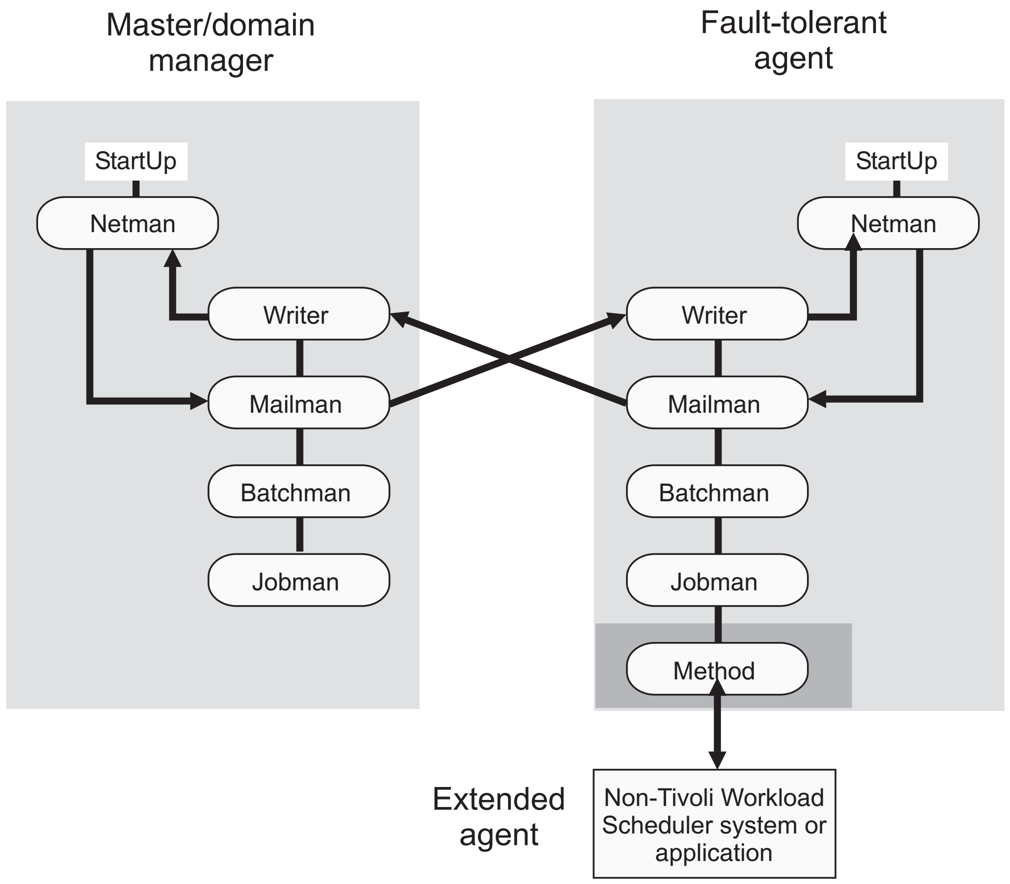


Figure 4. Process creation on domain manager and fault-tolerant agent

The **StartUp** command is normally run automatically, but can also be run manually, as follows:

StartUp

Starts **netman**, the Tivoli Workload Scheduler network management process.

In Windows, the **netman** service is started automatically when a computer is restarted. **StartUp** can be used to restart the service if it is stopped for any reason.

In UNIX, the **StartUp** command can be run automatically by invoking it from the `/etc/inittab` file, so that WebSphere Application Server infrastructure and **netman** is started each time a computer is rebooted. **StartUp** can be used to restart **netman** if it is stopped for any reason.

The remainder of the process tree can be restarted with the

```
conman start
conman startmon
```

commands. See the documentation about **conman** in the *Tivoli Workload Scheduler: User's Guide and Reference* for more information.

Note: If you start the StartUp command using a remote shell, the netman process maintains the shell open without returning the prompt. To avoid this problem, modify the StartUp command so that the netman process is called in the background, as follows:

```
# Start netman
/usr/local/TWS851/mae851/TWS/bin/netman&
```

Authorization

You must have ***start*** access to the workstation.

Syntax

StartUp [**–v** | **–u**]

Arguments

–v	Displays the command version and exits.
–u	Displays command usage information and exits.

Examples

To display the command name and version, run the following command:

```
StartUp -v
```

To start the **netman** process, run the following command:

```
StartUp
```

Monitoring the Tivoli Workload Scheduler processes

You can use event-driven workload automation (EDWA) to monitor the status of network processes and to start a predefined set of actions when one or more specific events take place. For more information about event-driven workload automation, refer to *Tivoli Workload Scheduler: User's Guide and Reference*.

You can monitor the following processes:
- agent
- appservman
- batchman
- jobman
- mailman
- monman
- netman

The .XML file contains the definition of a sample event rule to monitor the status of the specified processes on the specified workstation. This event rule calls the MessageLogger action provider to write a message in a log file in an internal auditing database. If the condition described in the rule is already existing when you deploy the rule, the related event is not generated. For more information about the MessageLogger action provider, refer to *Tivoli Workload Scheduler: User's Guide and Reference*:

```
<eventRule name="PROCESSES" ruleType="filter" isDraft="no">
 <eventCondition name="twsProcMonEvt1" eventProvider="TWSApplicationMonitor"
 eventType="TWSProcessMonitor">
   <scope>
    AGENT, BATCHMAN DOWN
   </scope>
   <filteringPredicate>
    <attributeFilter name="ProcessName" operator="eq">
     <value>process_name1</value>
    </attributeFilter>
    <attributeFilter name="TWSPath" operator="eq">
     <value>TWS_path</value>
    </attributeFilter>
    <attributeFilter name="Workstation" operator="eq">
     <value>workstation_name</value>
    </attributeFilter>
    <attributeFilter name="SampleInterval" operator="eq">
     <value>sample_interval</value>
    </attributeFilter>

   </filteringPredicate>
  </eventCondition>
  <action actionProvider="MessageLogger" actionType="MSGLOG" responseType="onDetection">
   <scope>
    OBJECT=AAAAAAA MESSAGE=TWS PROCESS DOWN: %{TWSPROCMONEVT1.PROCESSNAME}
ON %{TWSPROCMONEVT1.TWSPATH}
   </scope>
   <parameter name="ObjectKey">
    <value>object_key</value>
   </parameter>
   <parameter name="Severity">
    <value>message_severity</value>
   </parameter>
   <parameter name="Message">
    <value>log_message</value>
   </parameter>
  </action>
 </eventRule>
</eventRuleSet>
```

where:

process_name
: Is the name of the process to be monitored. You can insert more that one process name, as follows:

```
<attributeFilter name="ProcessName" operator="eq">
     <value>agent</value>
     <value>batchman</value>
    </attributeFilter>
```

TWS_path
: Is the directory containing the Symphony file and the `bin` directory.

workstation_name
: Is the workstation on which the event is generated.

sample_interval
: Is the interval, expressed in seconds, for monitoring the process status.

object_key
: Is a key identifying the object to which the message pertains.

message_severity
: Is the severity of the message.

log_message
: Is the message to be logged.

Optimizing the network

The structure of a Tivoli Workload Scheduler network goes hand in hand with the structure of your enterprise's network. The structure of the domains must reflect the topology of the network in order to best use the available communication channels.

But when planning the Tivoli Workload Scheduler network, the following must be taken into consideration:
- Data volumes
- Connectivity

Data volumes

Network capacity must be planned to adapt to the amount of data that is circulating. Particularly high transmission volumes might be caused by the following:
- Transfer of large Symphony files.
- Message traffic between the master domain manager and a *FullStatus* agent.
- Message traffic from a domain manager when the domain has many agents.
- Heavy use of internetwork dependencies, which extends traffic to the entire network.

Connectivity

For the more critical agents in your network, you need to consider their position in the network. The reliability of workload execution on a particular agent depends on its capacity to receive a fresh Symphony file at the start of the production period. If the workload contains many dependencies, a reliable connection to the rest of the network is also required. These factors suggest that the best place for critical agents is in the master domain, or to be set up as domain managers immediately under the master domain manager, possibly receiving their Symphony files through a set of dedicated mailman servers. Further, it is important for critical agents that any domain manager above them in the tree structure must be hosted on powerful systems and must have an adequate backup system to ensure continuity of operation in the event of problems.

Tivoli Workload Scheduler provides two mechanisms to accommodate a particular network situation: the domain structure and mailman servers. Whereas domain structure establishes a hierarchy among Tivoli Workload Scheduler agents, mailman servers are used to tune the resources dedicated to the connection between two agents.

Domain

Use the Tivoli Workload Scheduler domain structure mechanism to create a tree-shaped structure for the network, where all communications between two points use the unique path defined by the tree (climb to the common ancestor and go down to the target, as opposed to direct TCP communication). As a consequence, the domain structure separates the network into more-manageable pieces. This is for easier filtering, overview, action, and monitoring. However, it does also introduce some delay in the workload processing. For instance when distributing the Symphony file, a fault-tolerant agent inside a domain needs to wait for two steps of Symphony distribution to be completed (from master domain manager to domain manager and from domain manager to fault-tolerant agent). The same is valid for every other type of communication that comes from the master domain manager.

This has the following implications:
- Critical business activities must be as close as possible to the master domain manager
- The domain manager must be installed on as powerful a workstation as possible

- A similarly powerful backup domain manager must be included in the network
- The network link between the domain manager and its backup must be as fast as possible to pass all the updates received from the subtree
- If intervention is needed directly on the domain, either give shell access to the operators to use the Tivoli Workload Scheduler command line, or install a connector so that the Dynamic Workload Console can be used.

Mailman servers

Mailman servers allocate separate processes dedicated to the communication with other workstations. The main mailman is dedicated to the transfer and network hub activities. The use of mailman servers on the domain manager must be carefully planned. The main parameter is the number of downstream connections at each level of the tree. This number describes the number of mailman servers that a main mailman is connected to, or the number of agents a mailman server is connected to. The maximum number of downstream connections is about 20 for Solaris, 50 for Windows and about 100 for other UNIX workstations, depending on their power. Typical downstream connections is about 10 for Solaris, about 15 for Windows and about 20 for other UNIX workstations. However, you must also take into consideration the link speed and the queue sizes, discussed below.

Planning space for queues

In order to plan space for event queues, and possible alert levels and reactions, it is necessary to model the flows passing through the agents, and the domain managers in particular.

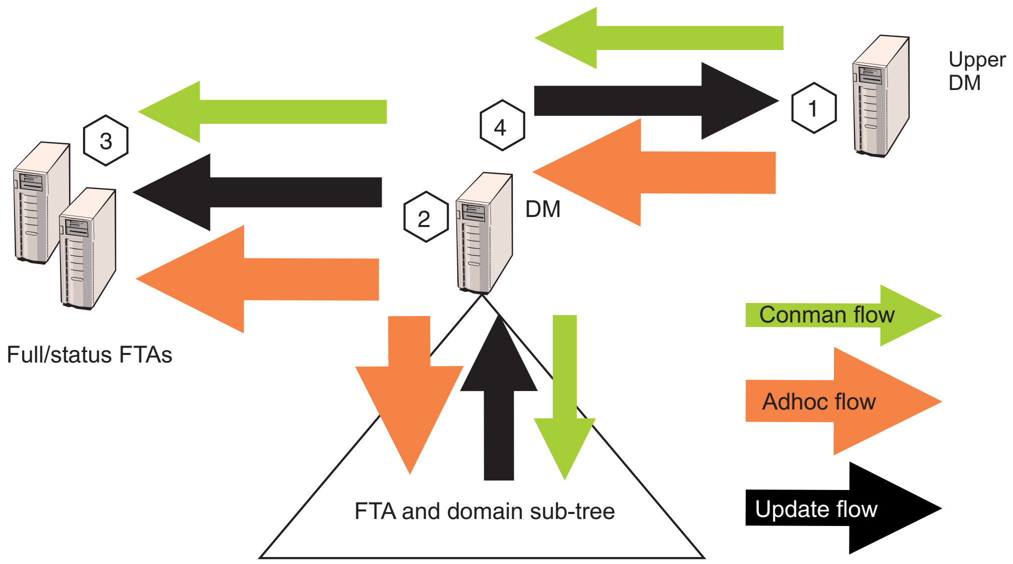


Figure 5. Typical Tivoli Workload Scheduler network flows.

For a typical domain manager, the main flow comes from update activity reported by the sub tree, and from ad hoc submissions arriving from the master domain manager and propagating to the entire network. Under these conditions, the most critical errors are listed by order of importance in Table 38 on page 169:

Table 38. Critical flow errors.

Flow no.	Location	Queue	Risk	Impact
1	Upper domain manager	dm.msg	The queue fills up because of too many unlinked workstations in the domain or a downstream domain manager has failed.	The upper domain manager fails and propagates the error.
2	Domain manager	*FullStatus* fta.msg	The queue fills because of too many unlinked workstations in the domain or because the *FullStatus* fault-tolerant agent is not coping with the flow.	The domain manager fails and favors the occurrence of #1.
3	Domain manager and *FullStatus* fault-tolerant agent	Mailbox.msg or Intercom.msg	The queue fills because the *FullStatus* fault-tolerant agent cannot cope with flow.	The *FullStatus* fault-tolerant agent fails and favors the occurrence of #2.
4	Domain manager	tomaster.msg	The queue fills because of too many unlinked workstations in the domain.	The domain manager starts to unlink the subtree and accumulates messages in the structure.
5	Fault-tolerant agents - only when `enSwfaultTol` global option is set to *yes*	deadletter.msg	The queue fills because of too many unlinked workstations in the domain.	The agent stops.
6	Fault-tolerant agents - only when `enSwfaultTol` global option is set to *yes*	ftbox.msg	This queue is circular. The rate of messages entering the queue exceeds the rate of messages being processed, because of too many unlinked workstations in the domain.	Events are lost.

Note:

1. Flows are greater at the master domain manager and at any *FullStatus* fault-tolerant agents in the master domain than at subordinate domain managers or *FullStatus* fault-tolerant agents.
2. Use **`evtsize -show`** to monitor queue sizes.
3. The amount of update flow is related to the amount of workload running in a particular subtree and is unavoidable.
4. The amount of ad hoc flow is related to the amount of additional workload on any point of the network. It can be reduced by planning more workload even if it is inactive. Note that simple reruns (not `rerun from`) do not create an ad hoc flow.

The planning, alert and recovery strategy must take into account the following points:

- Queue files are created with a fixed size and messages are added and removed in a cyclical fashion. A queue reaches capacity when the flow of incoming messages exceeds the outgoing flow for a sufficient length of time to use up the available space. For example, if messages are being added to a queue at a rate of 1MB per time unit and are being processed and removed at a rate of 0.5 MB per time unit, a queue sized at 10 MB (the default) is at capacity after 20 time units. But if the inward flow rate descends to be the same as the outward flow rate after 19 time units, the queue does not reach capacity.

- The risk of the domain manager failing can be mitigated by switching to the backup domain manager. In this case, the contents of the queues on the domain manager are unavailable until the domain manager backup is started. In all cases, the size of the queue on the upper domain manager towards any other domain manager must respect condition A of Table 39.
- The risk that fault-switching fault-tolerant agents might not be able to cope with the flow must be planned beforehand. The specifications for fault-switching fault-tolerant agents must be similar to those of the domain manager, to avoid that an agent receives a load that is not appropriate to its capacity. Check if a queue is forming at the *FullStatus* fault-tolerant agents, both in ordinary and peak operation situations.
- Once risk #2 has been dealt with, the possibility of a network link failure can be mitigated by sizing the queue from a domain manager to the *FullStatus* fault-tolerant agents appropriately as a function of the average network outage duration, and by increasing the size of the mailbox in case of unexpected long outage (see condition B of Table 39).
- The same condition applies for avoiding an overflow of the domain manager's tomaster.msg queue with respect to network outages (see condition C) of Table 39.

Table 39. Queue sizing conditions.

A	MaxAlertTime <= size(UpperDM#queueToDM) / averageAdhocFlow
B	MaxNetOutage <= size(DM#queueToFSFTA) / (averageAdhocFlow + averageUpdateFlow)
C	MaxNetOutage <= size(DM#queueToUpperDM) / (averageUpdateFlow)

Monitoring the Tivoli Workload Scheduler message queues

You can use event-driven workload automation (EDWA) to monitor the size of message queues and to start a predefined set of actions when one or more specific events take place. For more information about event-driven workload automation, refer to *Tivoli Workload Scheduler: User's Guide and Reference*.

You can monitor the following message queues:
- appserverbox
- mailbox
- clbox
- intercom
- courier
- monbox
- moncmd
- server
- tomaster
- pobox
- planbox

The following .XML file contains the definition of a sample event rule to monitor the mailbox queue on the specified workstation and send an email when the filling percentage is greater than the specified value. If the condition described in the rule is already existing when you deploy the rule, the related event is not generated. This event rule calls the MailSender action provider to send an email to the receivers you specify. For more information about the MailSender action provider, refer to *Tivoli Workload Scheduler: User's Guide and Reference*:

```
<?xml version="1.0"?>
<eventRuleSet  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="http://www.ibm.com/xmlns/prod/tws/1.0/event-management/rules"
  xsi:schemaLocation="http://www.ibm.com/xmlns/prod/tws/1.0/event-management/rules
   http://www.ibm.com/xmlns/prod/tws/1.0/event-management/rules/EventRules.xsd">
 <eventRule name="MONITORQUEUE" ruleType="filter" isDraft="no">
  <eventCondition name="twsMesQueEvt1" eventProvider="TWSApplicationMonitor" eventType="TWSMessageQueues">
   <scope>
    MAILBOX FILLED UP 80% ON FTA
   </scope>
   <filteringPredicate>
    <attributeFilter name="MailboxName" operator="eq">
     <value>mailbox_name</value>
    </attributeFilter>
    <attributeFilter name="FillingPercentage" operator="ge">
     <value>filling_percentage</value>
    </attributeFilter>
    <attributeFilter name="Workstation" operator="eq">
     <value>workstation_name</value>
    </attributeFilter>
    <attributeFilter name="SampleInterval" operator="eq">
     <value>sample_interval</value>
    </attributeFilter>
   </filteringPredicate>
  </eventCondition>
  <action actionProvider="MailSender" actionType="SendMail" responseType="onDetection">
   <scope>
    TWSUSER@TWS : THE MAILBOX ON workstation_name...
   </scope>
   <parameter name="To">
    <value>main_receiver_list</value>
   </parameter>
   <parameter name="Subject">
    <value>mail_subject</value>
   </parameter>
  </action>
 </eventRule>
</eventRuleSet>
```

where:

mailbox_name
: Is the name of the mailbox to monitor.

filling_percentage
: Is the filling percentage. Supported operators are as follows:

  ge causes the event generation when the mailbox filling percentage increases over the threshold value. The event is generated only the first time the specified mailbox filling percentage is reached. If you restart the SSM agent and the filling percentage is higher than the threshold value, the event is generated again. Table 40 provides an example in which the **ge** operator is set to 70%.

Table 40. Example for the ge operator

Mailbox name	Filling percentage	Action
Sample (0)	>= 70%	event not generated
Sample (0)	< 70%	event not generated
Sample (n-1)	< 70%	event not generated
Sample (n)	>= 70%	event generated

Table 40. Example for the ge operator (continued)

Mailbox name	Filling percentage	Action
Sample (n+1)	>= 70%	event not generated

le causes the event generation when the mailbox filling percentage decreases under the threshold value. The event is generated only the first time the specified mailbox filling percentage is reached. If you restart the SSM agent and the filling percentage is lower than the threshold value, the event is not generated until the filling percentage increases over the threshold value and then decreases under it again. Table 41 provides an example in which the **le** operator is set to 50%:

Table 41. Example for the le operator

Mailbox name	Filling percentage	Action
Sample (0)	<= 50%	event not generated
Sample (0)	> 50%	event not generated
Sample (n-1)	> 50%	event not generated
Sample (n)	<= 50%	event generated
Sample (n+1)	<= 50%	event not generated

workstation_name
Is the workstation on which the event is generated.

sample_interval
Is the interval, expressed in seconds, for monitoring the mailbox filling percentage.

main_receiver_list
Is the main receiver list.

mail_subject
Is the subject of the mail.

Changing a queue size

Use the **evtsize** command to resize a queue.

When you have used **evtsize** to resize a queue, the queue remain at that size until the next time you use **evtsize**. It only reverts to the default size of 10MB if you delete it, at which point Tivoli Workload Scheduler recreates it with the default size.

evtsize:

Defines the size of the Tivoli Workload Scheduler message files. This command is used by the Tivoli Workload Scheduler administrator either to increase the size of a message file after receiving the message, “End of file on events file.”, or to monitor the size of the queue of messages contained in the message file.

Authorization

You must be **maestro** or **root** in UNIX, or **Administrator** in Windows to run **evtsize**. Stop the IBM Tivoli Workload Scheduler engine before running this command.

Syntax

evtsize -V | -U

evtsize *file_name size*

evtsize -compact *file_name* [*size*]

evtsize -show *file_name*

Arguments

-V Displays the command version and exits.

-U Displays command usage information and exits.

-compact *file_name* **[***size***]**
Reduces the size of the specified message file to the size occupied by the messages present at the time you run the command. You can optionally use this keyword to also specify a new file size.

-show *file_name*
Displays the size of the queue of messages contained in the message file

file_name
The name of the event file. Specify one of the following:

```
|    Courier.msg
|    Intercom.msg
|    Mailbox.msg
|    PlanBox.msg
|    Server.msg
|    pobox/workstation.msg
```

size The maximum size of the event file in bytes. When first built by Tivoli Workload Scheduler, the maximum size is set to 10 MB.

Note: The size of the message file is equal to or bigger than the real size of the queue of messages it contains and it progressively increases until the queue of messages becomes empty; as this occurs the message file is emptied.

Examples

To set the maximum size of the `Intercom.msg` file to 20 MB, run the following command:

```
evtsize Intercom.msg 20000000
```

To set the maximum size of the `pobox` file for workstation `chicago` to 15 MB, run the following command:

```
evtsize pobox\chicago.msg 15000000
```

The following command:

```
evtsize -show Intercom.msg
```

returns the following output:

```
Tivoli Workload Scheduler (UNIX)/EVTSIZE 8.3 (1.2.2.4) Licensed Materials -
Property of IBM(R)
5698-WSH
```

```
(C) Copyright IBM Corp 1998, 2006 All rights reserved.
US Government User Restricted Rights
Use, duplication or disclosure restricted by
GSA ADP Schedule Contract with IBM Corp.
IBM is a registered trademark of International Business Machines
Corporation in the United States, other countries, or both.
AWSDEK703I Queue size current 240, maximum 10000000 bytes (read 48, write 288)
```

where:

880 Is the size of the current queue of the `Intercom.msg` file

10000000
Is the maximum size of the `Intercom.msg` file

read 48
Is the pointer position to read records

write 928
Is the pointer position to write records

Tuning mailman servers

Once the distribution of agents to mailman servers has been established, all the groups of agents attached to the same server must respect the link condition.

The link condition relates the number of agents connected to a mailman process and the tuning parameters for unlink on the mailman and writer side.

No_agents(i)
The number of agents connected to a given mailman server *i*

Mm_unlink
A parameter set in the localopts of both domain manager and agent. Specifies the maximum number of seconds mailman waits before unlinking from a workstation that is not responding.

Wr_unlink
A parameter set in the localopts of both domain manager and agent. Specifies the number of seconds the writer process waits before exiting if no incoming messages are received.

Max_down_agents
The maximum probable number of agents that are unavailable without having the `ignore` flag set in the database and having the `autolink` flag on.

Avg_connect_timeout
The system timeout (not set by Tivoli Workload Scheduler) for a TCP connection. This can be computed by the command, which times out because no process is listening on that port.

```
telnet agent inactive port
```

The condition is:

```
Wr_unlink = Mm_unlink > 1.2 * Max_down_agents * Avg_connect_timeout
```

This condition expresses that if the time before unlink is smaller than the probable time of idle waiting of the mailman process (waiting connect timeout for each agent that is currently down) in its loop to reactivate the connections, the agents unlink constantly when some agents are down.

Netman configuration file

The netman configuration file exists on all Tivoli Workload Scheduler workstations to define the services provided by netman. It is called `<TWA_home>/TWS/network/Netconf`. The `NetConf` file includes comments describing each service. The services are:

2001 Start a writer process to handle incoming messages from a remote mailman.

2002 Start the mailman process. Mailman, in turn, starts the rest of the process tree (batchman, jobman).

2003 Stop the Tivoli Workload Scheduler process to handle incoming messages from a remote mailman.

2004 Find and return a stdlist file to the requesting Conman process.

2005 Switch the domain manager in a domain.

2006 Locally download scripts scheduled by an Tivoli Workload Scheduler for z/OS master domain manager.

2007 Required to bypass a firewall.

2008 Stop Tivoli Workload Scheduler workstations in a hierarchical fashion

2009 Runs the switchmgr script to stop and restart a manager in such a way that it does not open any links to other workstations until it receives the *switchmgr* event. Can only be used when the `enSwfaultTol` global option is set to *yes*.

2010 Starts mailman with the parameter *demgr*. It is used by the service *2009*. Can only be used when the `enSwfaultTol` global option is set to *yes*.

2011 Runs **`monman`** as a child process (`son bin/monman.exe`)

2012 Runs **`conman`** to stop the event monitoring engine (`command bin/conman.exe stopmon`).

2013 Runs **`conman`** to switch event processors (`command bin/conman.exe switchevtproc -this`)

2014 Runs **`conman`** to start event processing (`command bin/conman.exe startevtproc -this`)

2015 Runs **`conman`** to stop event processing (`command bin/conman.exe stopevtproc -this`)

2016 Runs **`conman`** to force the update of the monitoring configuration file for the event monitoring engine (`command bin/conman.exe deployconf`)

2017 Runs **`conman`** to stop event processing on a client (`client bin/conman.exe synchronizedcmd -stopevtproc`)

2018 Runs **`conman`** to check event processing on a client (`client bin/conman.exe synchronizedcmd -checkevtproc`)

2021 Runs **`conman`** to start appservman

2022 Runs **`conman`** to run the subcommand **`stopappserver`** that stops the application server

2023 Runs **`conman`** to run the subcommand **`startappserver`** that starts the application server

2501 Check the status of a remote job.

2502 Start the Console Manager – a service requested by the client side of the Remote Console. See the *IBM Tivoli Remote Control: User's Guide* for more information.

2503 Used by the connector to interact with r3batch extended agent.

Determining internal Symphony table size

The mailman service (2002) can optionally take a parameter that determines the initial size of the internal Symphony table. If you do not supply this parameter, mailman calculates the initial table size based on the number of records in the file.

Note: Mailman expands the table if it needs to, even if this parameter is not supplied.

In normal circumstances, leave mailman to take the default value in the `NetConf` file as supplied (32000). However, if you are experiencing problems with memory, you can allocate a table that is initially smaller. To do this you change the parameter to the service *2002* in the `NetConf` file. The syntax for the entry is:

```
2002     son     bin/mailman [ -parm <number> ]
```

where, <*number*> is used to calculate the initial Symphony table size based on the number of records in the Symphony file.

If *r* is the number of records in the Symphony file when batchman starts, Table 42 shows how the size of the internal Symphony table is calculated, depending on the value of <*number*>:

Table 42. Calculation of internal Symphony table

Value of <*number*>	Table size
0	(4/3r) + 512

n	if n > r, n
	if n <= r, (4/3r) + 512

-1	65535

-n	if +n => r, n
	if +n < r, r + 512

If during the production period you add more jobs, the maximum internal Symphony table size is increased dynamically, up to the maximum number of records allowed in the Symphony file, which is 2,000,000,000.

Extended agents

An extended agent is a logical workstation related to an access method hosted by a physical Tivoli Workload Scheduler workstation (not another extended agent). More than one extended agent workstation can be hosted by the same Tivoli Workload Scheduler workstation and use the same access method. The extended agent is defined using a standard Tivoli Workload Scheduler workstation definition, which gives the extended agent a name and identifies the access method. The access method is a program that is run by the hosting workstation whenever Tivoli Workload Scheduler submits a job to an external system.

Jobs are defined for an extended agent in the same manner as for other Tivoli Workload Scheduler workstations, except that job attributes are dictated by the external system or application.

Extended agent software is available for several systems and applications. The UNIX extended agents, included with Tivoli Workload Scheduler, are described in the following section. Please contact your sales representative for information about other extended agents. For information on defining Tivoli Workload Scheduler workstations, see the section that explains how to manage workstations in the database in the *Tivoli Workload Scheduler: User's Guide and Reference*. For information on writing access methods, also see the *Tivoli Workload Scheduler: User's Guide and Reference*.

UNIX extended agents

Tivoli Workload Scheduler includes access methods for two types of UNIX extended agents. Use the Local UNIX method to enable a single UNIX workstation to operate as two Tivoli Workload Scheduler workstations, both of which can run Tivoli Workload Scheduler scheduled jobs. Use the Remote UNIX access method to designate a remote UNIX workstation to run Tivoli Workload Scheduler scheduled jobs without having Tivoli Workload Scheduler installed on it.

Information about a job's execution is sent to Tivoli Workload Scheduler from an extended agent using the job's `stdlist` file. A method options file can specify alternate logins to launch jobs and check *opens* file dependencies. For more information, see the *Tivoli Workload Scheduler: User's Guide and Reference*.

Local UNIX access method

The Local UNIX method can be used to define multiple Tivoli Workload Scheduler workstations on one workstation: the host workstation and one or more extended agents. When Tivoli Workload Scheduler sends a job to a local UNIX extended agent, the access method, **unixlocl**, is invoked by the host to run the job. The method starts by running the standard configuration script on the host workstation (`<TWA_home>/TWS/jobmanrc`). If the job's logon user is permitted to use a local configuration script and the script exists as `$HOME/TWS/.jobmanrc`, the local configuration script is also run. The job itself is then run either by the standard or the local configuration script. If neither configuration script exists, the method starts the job.

The launching of the configuration scripts, `jobmanrc` and `.jobmanrc` is configurable in the method script. The method runs the configuration scripts by default, if they exist. To disable this feature, you must comment out a set of lines in the method script. For more information, examine the script file `<TWA_home>/TWS/methods/unixlocl` on the extended agent's host.

Remote UNIX access method

The Remote UNIX access method can be used to designate a non-Tivoli Workload Scheduler workstation to run jobs scheduled by Tivoli Workload Scheduler. You can use `unixrsh` or `unixssh`:

The `unixrsh` method

When Tivoli Workload Scheduler sends a job to a remote UNIX extended agent, the access method, `unixrsh`, creates a `/tmp/maestro` directory on the non-Tivoli Workload Scheduler workstation. It then transfers a wrapper script to the directory and runs it. The wrapper then runs the scheduled job. The wrapper is created only once, unless it is deleted, moved, or is outdated.

To run jobs using the extended agent, the job logon users must be given appropriate access on the non-Tivoli Workload Scheduler UNIX workstation. To do this, a `.rhost`, `/etc/host.equiv`, or equivalent file must be set up on the workstation. If *opens* file dependencies are to be checked, *root* access must also be permitted. Contact your system administrator for help. For more information about the access method, examine the script file `<TWA_home>/TWS/methods/unixrsh` on an extended agent's host.

The `unixssh` method

The `unixssh` method works like `unixrsh` but uses a secure remote shell to connect to the remote host. The files used by this method are:

```
methods/unixssh
methods/unixssh.wrp
```

The `unixssh` method uses the *ssh* keyword. You can generate this keyword with any tools that are compatible with the secure remote shell.

Note: The passphrase must be blank.
The following scenario gives an example of how to set up the method:

You have installed a Tivoli Workload Scheduler, version 8.4 fault-tolerant agent with the <*TWS_user*>: `tws830`. You want to run a remote shell in the remote host "REMOTE_HOST" with the user "guest". The procedure is as follows:

1. Create the public and private key for the user tws830, The following is an example using rsa:
   a. Log on as `tws830`
   b. Run
      ```
      ssh-keygen -t rsa
      ```
   c. When the tool asks for the passphrase, press Enter (leaving the passphrase blank.) The keys are saved as follows:

Key	Location	Comment
Public	`<TWA_home>/TWS/.ssh/id_rsa.pub`	
Private	`<TWA_home>/TWS/.ssh/id_rsa`	Do not send this file!

   Note: Different tools store the key in different places.
2. At the remote host, do the following:
   a. Telnet to the remote host.
   b. Log on as "guest".
   c. Change to the `.ssh` directory in the user's home directory, or create it if it does not exist (the directory permissions must be adequate: for example, 600 for the directory and 700 for its contents.).
   d. Append the *public* key you created in step 1. to the `authorized_keys` file (create the file if it does not exist), using the command:
      ```
      cat id_rsa.pub >> authorized_keys
      ```
3. At the fault-tolerant agent, make the remote host "known" before attempting to let Tivoli Workload Scheduler processes use the connection. This can be achieved in one of two ways:
   - Log on as `tws830` and connect to the host using the command:
     ```
     ssh -l guest <remote_host_name> ls
     ```

A prompt will be displayed saying that the host is not known, and asking permission to access it. Give permission, and the host will be added to the list of known hosts.

- Alternatively, use the ssh documentation to add the remote host to the file of known hosts.

Managing production for extended agents

In general, jobs that run on extended agents behave like other Tivoli Workload Scheduler jobs. Tivoli Workload Scheduler tracks a job's status and records output in the job's `stdlist` files. These files are stored on the extended agent's *host* workstation. For more information on managing jobs, see the section that describes Tivoli Workload Scheduler plan tasks in the *Tivoli Workload Scheduler: User's Guide and Reference*.

Failure launching jobs on an extended agent

If the access method is not located in the proper directory on the extended agent's host, or the method cannot be accessed by Tivoli Workload Scheduler, jobs fail to launch or a file dependency is not checked. For a job, the Tivoli Workload Scheduler job's logon or the logon specified in the method options file must have read and execute permissions for the access method. When checking a file to satisfy an *opens* dependency, root is used as the login unless another login is specified in the method options file. For more information on method options, see the *Tivoli Workload Scheduler: User's Guide and Reference*.

IP address validation

When a TCP/IP connection is established, netman reads the requester's node name and IP address from the socket. The IP address and node name are used to search the `Symphony` file for a known Tivoli Workload Scheduler workstation with one of the following possible results:

- If an IP address match is found the validation is considered successful.
- If a node name match is found, the validation is considered successful.
- If no match is found in the `Symphony` file or the IP address returned does not match the one read from the socket, the validation is considered unsuccessful.

The local option, `nm ipvalidate`, determines the action to be taken if IP validation is unsuccessful. If the option is set to `full`, unsuccessful validation causes Tivoli Workload Scheduler to close the connection and generate an error message. If the option is set to `none` (default), Tivoli Workload Scheduler permits all connections, but generates a warning message for unsuccessful validation checks.

Support for Internet Protocol version 6

Tivoli Workload Scheduler supports Internet Protocol version 6 (IPv6) in addition to the legacy IPv4. To assist customers in staging the transition from an IPv4 environment to a complete IPv6 environment, Tivoli Workload Scheduler provides IP dual-stack support. In other terms, the product is designed to communicate using both IPv4 and IPv6 protocols simultaneously with other applications using IPv4 or IPv6.

To this end, the IPv4-specific `gethostbyname` and `gethostbyaddr` functions have been replaced by the new `getaddrinfo` API that makes the client-server mechanism entirely protocol independent.

The `getaddrinfo` function handles both name-to-address and service-to-port translation, and returns `sockaddr` structures instead of a list of addresses These `sockaddr` structures can then be used by the socket functions directly. In this way, `getaddrinfo` hides all the protocol dependencies in the library function, which is where they belong. The application deals only with the socket address structures that are filled in by `getaddrinfo`.

Operating system configuration (UNIX only)

IP validation depends on the system call `getaddrinfo()` to look up all the valid addresses for a host. The behavior of this routine varies, depending on the system configuration. When `getaddrinfo()` uses the file `/etc/hosts`, it returns the first matching entry. If the connection is initiated on an address which appears after the first matching entry, IP validation fails. To resolve the problem, place the entry used to initiate the connection before any other matching entries in the `/etc/hosts` file. If `getaddrinfo()` uses the "named" name server or the Network Information Service server and `getaddrinfo()` fails, contact your system administrator for assistance.

IP address validation messages

Following is a list of the messages for IP validation. If the Local Option `nm ipvalidate` is set to `none` (default), the errors appear as warnings.

See the end of the list of conditions for the key to the variables:

- Tivoli Workload Scheduler workstation name is not found in the Symphony file

```
Ip address validation failed for request:
Service <num> for <program> on <workstation>(<operating_system_type>).
Connection received from IP address:
<c_ipaddr>. MAESTRO CPU <workstation> not found in
Symphony file.
```

- Call to `getaddrinfo()` fails:

```
IP address validation failed for request:
Service num for <program> on cpu(<operating_system_type>).
Connection received from IP address:
<c_ipaddr>. getaddrinfo() failed, unable to
retrieve IP address of connecting node: <node>.
```

- IP Addresses returned by `getaddrinfo()` do not match the IP address of connection workstation:

```
IP address validation failed for request:
Service <num> for <program> on <workstation>(<operating_system_type>).
Connection received from IP address:
<c_ipaddr>. System known IP addresses for node
name node: <k_ipaddr>.
```

- The IP address specified in the workstation definition for the Tivoli Workload Scheduler workstation indicated in the service request packet does not match the IP address of connecting workstation:

```
IP address validation failed for request:
Service <num> for <program> on <workstation>(<operating_system_type>).
Connection received from IP address:
<c_ipaddr>. TWS known IP addresses for cpu
<k_ipaddr>.
```

- Regardless of the state of nm ipvalidate, the following information message is displayed when IP validation cannot be performed because the Symphony file does not exist or an error occurs when reading it:

```
IP address validation not performed for
request: Service <num> for <program> on
<workstation>(<operating_system_type>). Connection received from IP
address: <c_ipaddr>. Cannot open or read
Symphony file. Service request accepted.
```

  Where:

  <num>
  : Service number (2001-**writer**, 2002-**mailman**...)

  <program>
  : Program requesting service

  <workstation>
  : Tivoli Workload Scheduler workstation name of connecting workstation

  <operating_system_type>
  : Operating system of connecting workstation

  <node>
  : Node name or IP address of connecting workstation

  <c_ipaddr>
  : IP address of connecting workstation

  <k_ipaddr>
  : Known IP address for connecting workstation

IP validation is always successful in the absence of a Symphony file. In communications from a domain manager to an agent it is normally successful because a Symphony file does not yet exist. However, if the agent has a Symphony file from a previous run, the initial link request might fail if the Symphony file does not include the name of the domain manager.

Impact of network changes

Any changes that you make to your network might have an impact on Tivoli Workload Scheduler. Workstations can be identified within Tivoli Workload Scheduler by host name or IP address. Any changes to host names or IP addresses of specific workstations must obviously be also implemented in the Tivoli Workload Scheduler database. However, remember that if those workstations are involved in jobs that are currently scheduled in the Symphony file, those jobs are looking for the old workstation identity.

Changes to host names or IP addresses of specific workstations can be activated immediately by running **JnextPlan -for 0000**. A new production plan is created (containing the updated IP addresses and host names), but the plan time span is not extended.

Thus, plan any network changes with the job schedules in mind, and for major changes you are advised to suspend Tivoli Workload Scheduler activities until the changes have been completed in the network and also implemented in the Tivoli Workload Scheduler database.

Network changes also have a specific impact on the connection parameters used by the application server and the command line client:

Application server
If you change the network you will need to change the communication parameters specified in the application server's configuration files. How to do this is described in the appendix on the utilities supplied with the embedded WebSphere Application Server in the *Tivoli Workload Scheduler: Planning and Installation Guide*.

Command line client
When you connect from the command line client you supply a set of connection parameters. This is done in one of these ways:

From the localopts file
The default method is that the connection parameters in the `localopts` file are customized when the command line client is installed.

From the useropts file
A `useropts` file might have been created for the user in question, containing a version of the connection parameters personalized for the user.

In the command line, individually
When you invoke one of the command line programs, you can optionally include the parameters as arguments to the command. These override the values in the `localopts` or `useropts` files.

In the command line, in a file
When you invoke one of the command line programs, you can optionally include the parameters in a file, the name of which is identified as the **`-file`** argument to the command. These override the values in the `localopts` or `useropts` files.

Modify whichever method you are using to incorporate the new network connection details.

Chapter 7. Setting connection security

This chapter describes connection security. It is divided into the following sections:

- "Connection security overview"
- "Using SSL for netman and conman"
- "Interface communication" on page 192
- "Working across firewalls" on page 200
- "FIPS compliance" on page 201

Connection security overview

Tivoli Workload Scheduler uses the following protocols:

- SSL for communication across the network by **`netman`** and **`conman`**
- HTTP/HTTPS over SSL for the command-line client
- RMI/IIOP over SSL for the Dynamic Workload Console

The Tivoli Workload Scheduler password encryption algorithm uses 3DES, which is also known as Triple-DES, or DES-FDE3. The algorithm is run in Cipher Block Chaining Mode, which uses padding according to the PKCS#5 standard.

The product is installed with default settings that you customize according to your security requirements.

Before you perform any customization of the SSL connections, stop the WebSphere Application server. Depending on the security settings you implement in your network, you will need to reconfigure the security settings of the WebSphere Application Server. This is described generically in "Changing the security settings" on page 296, and the detail of the procedure described therein is not repeated in this chapter.

Using SSL for netman and conman

Tivoli Workload Scheduler provides a secure, authenticated, and encrypted connection mechanism for communication across the network topology. This mechanism is based on the Secure Sockets Layer (SSL) protocol and uses the OpenSSL Toolkit, which is automatically installed with Tivoli Workload Scheduler.

The SSL protocol is based on a private and public key methodology. SSL provides the following authentication methods:

CA trusting only
: Two workstations trust each other if each receives from the other a certificate that is signed or is trusted. That is, if the CA certificate is in the list of trusted CAs on each workstation. With this authentication level, a workstation does not perform any additional checks on certificate content, such as the distinguished name. Any signed or trusted certificate can be used to establish an SSL session. See "Setting local options" on page 23 for a definition of the **`caonly`** option.

Check if the distinguished name matches a defined string
: Two workstations trust each other if, after receiving a trusted or signed certificate, each performs a further check by extracting the distinguished

name from the certificate and comparing it with a string that was defined in its local options file. See "Setting local options" on page 23 for a definition of the **`string`** option.

Check if the distinguished name matches the workstation name
Two workstations trust each other if, after receiving a signed or trusted certificate, each performs a further check by extracting the distinguished name from the certificate and comparing it with the name of the workstation that sent the certificate. See "Setting local options" on page 23 for a definition of the **`cpu`** option.

To provide SSL security for a domain manager attached to z/OS in an end-to-end connection, configure the OS/390® Cryptographic Services System SSL in the Tivoli Workload Scheduler code that runs in the OS/390 USS UNIX shell in the IBM Tivoli Workload Scheduler for z/OS server address space. See the Tivoli Workload Scheduler z/OS documentation.

When configuring SSL you can:

Use the same certificate for the entire network
If the workstations are configured with CA trusting only, they accept connections with any other workstation that sends a signed or trusted certificate. To enforce the authentication you define a name or a list of names that must match the contents of the certificate distinguished name (DN) field in the `localopts` file of each workstation.

Use a certificate for each domain
Install private keys and signed certificates for each domain in the network. Then, configure each workstation to accept a connection only with partners that have a particular string of the certificate DN field in the `localopts` file of each workstation.

Use a certificate for each workstation
Install a different key and a signed certificate on each workstation and add a Trusted CA list containing the CA that signed the certificate. Then, configure each workstation to accept a connection only with partners that have their workstation name specified in the `Symphony` file recorded in the DN field of the certificate.

Setting up private keys and certificates

To use SSL authentication on a workstation, you need to create and install the following:

- The private key and the corresponding certificate that identify the workstation in an SSL session.
- The list of certificate authorities that can be trusted by the workstation.

Use the **openssl** command line utility to:

- Create a file containing pseudo random generated bytes (TWS.rnd). This file is needed on some operating systems for SSL to function correctly.
- Create a private key.
- Save the password you used to create the key into a file.
- Create a Certificate Signing Request.
- Send this Certificate Signing Request (CSR) to a Certifying Authority (CA) for signing, or:
  - Create your own Certificate Authority (CA)

  – Create a self-signed CA Certificate (X.509 structure) with the RSA key of your own CA
  – Use your own Certificate Authority (CA) to sign and create real certificates

These actions will produce the following files that you will install on the workstation(s):

- A private key file (for example, TWS.key). This file should be protected, so that it is not stolen to use the workstation's identity. You should save it in a directory that allows read access to the TWS user of the workstation, such as *TWA_home*/TWS/ssl/TWS.key.
- The corresponding certificate file (for example, TWS.crt). You should save it in a directory that allows read access to the TWS user of the workstation, such as *TWA_home*/TWS/ssl/TWS.crt.
- A file containing a pseudo-random generated sequence of bytes. You can save it in any directory that allows read access to the TWS user of the workstation, such as *TWA_home*/TWS/ssl/TWS.rnd.

In addition, you should create the following:

- A file containing the password used to encrypt the private key. You should save it in a directory that allows read access to the TWS user of the workstation, such as *TWA_home*/TWS/ssl/TWS.sth.
- The certificate chain file. It contains the concatenation of the PEM-encoded certificates of certification authorities which form the certificate chain of the workstation's certificate. This starts with the issuing CA certificate of the workstation's certificate and can range up to the root CA certificate. Such a file is simply the concatenation of the various PEM-encoded CA certificate files, usually in certificate chain order.
- The trusted CAs file. It contains the trusted CA certificates to use during authentication. The CAs in this file are also used to build the list of acceptable client CAs passed to the client when the server side of the connection requests a client certificate. This file is simply the concatenation of the various PEM-encoded CA certificate files, in order of preference.

Creating Your Own Certification Authority

If you are going to use SSL authentication within your company's boundaries and not for outside internet commerce, you might find it simpler to create your own certification authority (CA) to trust all your IBM Tivoli Workload Scheduler installations. To do so, follow the steps listed below.

Note: In the following steps, the names of the files created during the process TWS and TWSca are sample names. You can use your own names, but keep the same file extensions.

1. Choose a workstation as your CA root installation.
2. Type the following command from the SSL directory to initialize the pseudo random number generator, otherwise subsequent commands might not work.
   - On UNIX:
     ```
     $ openssl rand -out TWS.rnd -rand ./openssl 8192
     ```
   - On Windows:
     ```
     $ openssl rand -out TWS.rnd -rand ./openssl.exe 8192
     ```
3. Type the following command to create the CA private key:
   ```
   $ openssl genrsa -out TWSca.key 1024
   ```

4. Type the following command to create a self-signed CA Certificate (X.509 structure):

   ```
   $ openssl req -new -x509 -days 365 -key TWSca.key -out TWSca.crt -config ./
     openssl.cnf
   ```

Now you have a certification authority that you can use to trust all of your installations. If you wish, you can create more than one CA.

Creating private keys and certificates

The following steps explain how to create one key and one certificate. You can decide to use one key and certificate pair for the entire network, one for each domain, or one for each workstation. The steps below assume that you will be creating a key and certificate pair for each workstation and thus the name of the output files created during the process has been generalized to *workstationname*.

On each workstation, perform the following steps to create a private key and a certificate:

1. Enter the following command from the SSL directory to initialize the pseudo random number generator, otherwise subsequent commands might not work.
   - On Windows operating systems:

     ```
     $ openssl rand -out workstationname.rnd -rand ./openssl.exe 8192
     ```
   - On UNIX and Linux operating systems :

     ```
     $ openssl rand -out workstationname.rnd -rand ./openssl 8192
     ```
2. Enter the following command to create the private key (this example shows triple-DES encryption):

   ```
   $ openssl genrsa -des3 -out workstationname.key 1024
   ```

   Then, save the password that was requested to encrypt the key in a file named *workstationname*.pwd.

   Note: Verify that file *workstationname*.pwd contains just the characters in the password. For instance, if you specified the word *maestro* as the password, your *workstationname*.pwd file should not contain any CR or LF characters at the end (it should be 7 bytes long).
3. Enter the following command to save your password, encoding it in base64 into the appropriate stash file:

   ```
   $ openssl base64 -in workstationname.pwd -out workstationname.sth
   ```

   You can then delete file *workstationname*.pwd.
4. Enter the following command to create a certificate signing request (CSR):

   ```
   $ openssl req -new -key workstationname.key -out workstationname.csr
      -config ./openssl.cnf
   ```

   Some values-such as company name, personal name, and more- will be requested at screen. For future compatibility, you might specify the workstation name as the distinguished name.
5. Send the *workstationname*.csr file to your CA in order to get the matching certificate for this private key.

   Using its private key (TWSca.key) and certificate (TWSca.crt), the CA will sign the CSR (*workstationname*.csr) and create a signed certificate (*workstationname*.crt) with the following command:

   ```
   $ openssl x509 -req -CA TWSca.crt -CAkey TWSca.key -days 365
      -in workstationname.csr   -out workstationname.crt -CAcreateserial
   ```

6. Distribute to the workstation the new certificate *workstationname*.crt and the public CA certificate TWSca.crt.

The table below summarizes which of the files created during the process have to be set as values for the workstation's local options.

Table 43. Files for Local Options

Local option	File
SSL key	*workstationname*.key
SSL certificate	*workstationname*.crt
SSL key pwd	*workstationname*.sth
SSL ca certificate	TWSca.crt
SSL random seed	*workstationname*.rnd

Configuring SSL attributes

Use the **`composer`** command line or the Dynamic Workload Console to update the workstation definition in the database. See the *Tivoli Workload Scheduler: User's Guide and Reference* for further information.

Configure the following attributes:

secureaddr
: Defines the port used to listen for incoming SSL connections. This value must match the one defined in the **nm SSL port** local option of the workstation. It must be different from the **nm port** local option that defines the port used for normal communications. If **securitylevel** is specified but this attribute is missing, 31113 is used as the default value.

securitylevel
: Specifies the type of SSL authentication for the workstation. It must have one of the following values:

  enabled
  : The workstation uses SSL authentication only if its domain manager workstation or another fault-tolerant agent below it in the domain hierarchy requires it.

  on
  : The workstation uses SSL authentication when it connects with its domain manager. The domain manager uses SSL authentication when it connects to its parent domain manager. The fault-tolerant agent refuses any incoming connection from its domain manager if it is not an SSL connection.

  force
  : The workstation uses SSL authentication for all of its connections and accepts connections from both parent and subordinate domain managers. It will refuse any incoming connection if it is not an SSL connection.

  If this attribute is omitted, the workstation is not configured for SSL connections. In this case, any value for **secureaddr** will be ignored. You should also set the **nm ssl port** local option to 0 to be sure that this port is not opened by netman. The following table describes the type of communication used for each type of **securitylevel** setting.

Table 44. Type of communication depending on the securitylevel value

Fault-tolerant agent (domain manager)	Domain manager (parent domain manager)	Connection type
-	-	TCP/IP
Enabled	-	TCP/IP
On	-	No connection
Force	-	No connection
-	On	TCP/IP
Enabled	On	TCP/IP
On	On	SSL
Force	On	SSL
-	Enabled	TCP/IP
Enabled	Enabled	TCP/IP
On	Enabled	SSL
Force	Enabled	SSL
-	Force	No connection
Enabled	Force	SSL
On	Force	SSL
Force	Force	SSL

The following example shows a workstation definition that includes the security attributes:

```
cpuname MYWIN
os WNT
node apollo
tcpaddr 30112
secureaddr 32222
for maestro
autolink off
fullstatus on
securitylevel on
end
```

Configuring the SSL connection protocol for the network

To configure SSL for your network, perform the following steps:

1. Create an SSL directory under the *TWA_home*/TWS directory. By default, the path *TWA_home*/TWS/ssl is registered in the `localopts` file. If you create a directory with a name different from ssl in the *TWA_home*/TWS directory, then update the `localopts` file accordingly.
2. Copy openssl.cnf and openssl.exe to the SSL directory
3. Create as many private keys, certificates, and Trusted CA lists as you plan to use in your network.
4. For each workstation that will use SSL authentication:
   - Update its definition in the Tivoli Workload Scheduler database with the SSL attributes.
   - Add the SSL local options in the `localopts` file.

Although you are not required to follow a particular sequence, these tasks must all be completed to activate SSL support.

In Tivoli Workload Scheduler, SSL support is available for the fault-tolerant agents only (including the master domain manager and the domain managers), but not for the extended agents. If you want to use SSL authentication for a workstation that runs an extended agent, you must specify this parameter in the definition of the host workstation of the extended agent.

Configuring full SSL security

This section describes how to implement full SSL security when using an SSL connection for communication across the network by **`netman`** and **`conman`**. It contains the following topics:

- "Overview"
- "Setting up full SSL security"
- "Migrating a network to full SSL connection security" on page 190
- "Configuring full SSL support for internetwork dependencies" on page 191

Overview

This feature provides the option to set a higher degree of SSL-based connection security on Tivoli Workload Scheduler networks in addition to the already available level of SSL security.

If you require a more complete degree of SSL protection, this enhancement supplies new configuration options to setup advanced connection security.

If you do not require more SSL security than Tivoli Workload Scheduler has provided prior to the release of this feature, you can use the standard settings documented above in this chapter.

The Full SSL security enhancements: Full SSL security support provides the following enhancements:

- TCP ports that can become security breaches are no longer left open.
- Traveling data, including communication headers and trailers, is now *totally* encrypted.

Compatibility between SSL support levels: The non-full and the full SSL support levels are mutually exclusive. That is, they cannot be configured simultaneously and cannot be enabled at the same time. If you enable full SSL support for a Tivoli Workload Scheduler network, any connection attempts by agents that are not configured for full SSL will be rejected by agents with full SSL support enabled. Vice versa, agents configured for full SSL support cannot communicate with the rest of a network set up for non-full SSL support.

Setting up full SSL security

To set full SSL connection security for your network, you must, *in addition to all the steps described above in Chapter 7, "Setting connection security," on page 183)* configure the following options:

enSSLFullConnection (or `sf`)
: Use `optman` on the master domain manager to set this global option to `Yes` to enable full SSL support for the network.

nm SSL full port

Edit the `localopts` file on every agent of the network (including the master domain manager) to set this local option to the port number used to listen for incoming SSL connections. Take note of the following:

- This port number is to be defined also for the `SECUREADDR` parameter in the workstation definition of the agent.
- In a full SSL security setup, the `nm SSL port` local option is to be set to zero.
- You must stop **`netman`** (**conman shut;wait**) and restart it (**StartUp**) after making the changes in `localopts`.
- Check that the `securitylevel` parameter in the workstation definition of each workstation using SSL is set at least to *enabled*.

Other than the changed value for `secureaddr`, no other changes are required in the workstation definitions to set up this feature.

Migrating a network to full SSL connection security

Run the following steps to migrate your Tivoli Workload Scheduler version 8.3 production environment to full SSL connection security support. The scenario assumes that the network already runs on non-full SSL; that is, that the master and all the agents have:

- The `securitylevel` attribute set to `enabled`, `on`, or `force` in their workstation definition. On the master it is set to `enabled`.
- Either the `nm port` or the `nm SSL port` local option configured and the port number set as the value of the `secureaddr` attribute in their workstation definition.
- Group or individual private keys and certificates.

Proceed as follows:

1. Upgrade all the agents. The objective is to upgrade locally every agent in the network (including the master domain manager). You can perform this step over several days. On the master and on every agent:
   a. Install the fix containing the full SSL support feature.
   b. Add the `nm SSL full port` local option and set it to a port number.

   At this stage, the network is still operating on non-full SSL connection security.
2. Enable full SSL support in the network. Perform this step in one single time slot. To do this:
   a. Check that no firewall blocks the connection between the agents and their domain manager (and, optionally, the master domain manager).
   b. In the workstation definition of the master and of every agent set the value of the `secureaddr` attribute to the port number you configured for the `nm SSL full port` local option.
   c. Use Optman to set the `enSSLFullConnection` global option to `yes` in the database.
   d. Run `JnextPlan -for 0000` to make these settings operational.

   At this stage, the network is operating on full SSL connection security. Any agents left on SSL security can no longer communicate with the rest of the full SSL security network.

   The upgraded workstations still have the old SSL and TCP ports open in listening mode. The aim of the final step is to close them down.

3. Disable the old SSL and TCP ports on the master and on every agent. You can perform this step over several days. To do this, edit the local options file of every workstation as follows:
   - On the workstations that have the `securitylevel` attribute set to `enabled` or `on`, set the `nm SSL port` local option to 0.
   - On the workstations that have the `securitylevel` attribute set to `force`, set both `nm port` and `nm SSL port` local options to 0.

   At this stage, all the agents operate with the new SSL connections and all agents set on `securitylevel=force` listen only on the new SSL full port. From now on:
   - No bytes are sent in clear.
   - No active services are left in clear.
   - No TCP ports are left in listening mode on agents with `securitylevel=force`.

Configuring full SSL support for internetwork dependencies

The network agent that resolves internetwork dependencies requires a particular setup for full SSL support.

To enable a network agent for full SSL support:
1. Configure both the hosting and the remote fault-tolerant agents for full SSL support.
2. On the hosting fault-tolerant agent copy or move the `netmth.opts` file from the *`TWA_home`*`/TWS/config` to the *`TWA_home`*`/TWS/methods` directories and add (and configure) the following options:

   SSL remote CPU
      The workstation name of the remote master or fault-tolerant agent.

   SSL remote full port
      The port number defined for full SSL support on the remote master or fault-tolerant agent.

   The local options that specify the private key and certificate on the hosting fault-tolerant agent
      These are documented in the "Setting local options" on page 23).

   Note that if the hosting fault-tolerant agent hosts more than one network agent, the *`TWA_home`*`/TWS/methods` directory contains one `netmth.opts` file for every defined network agent. In this case the complete name of each `netmth.opts` file must become:

   `network-agent-name``_netmth.opts`

   If the *`TWA_home`*`/TWS/methods` directory contains both *`network-agent-name`*`_netmth.opts` and `netmth.opts` files, only *`network-agent-name`*`_netmth.opts` is used. If multiple agents are defined and the directory contains only `netmth.opts`, this file is used for all the network agents.

The following example adds full SSL support to the example described in *A sample network agent definition* in the *Tivoli Workload Scheduler: User's Guide and Reference*:
- This is the workstation definition for the `NETAGT` network agent:

```
CPUNAME NETAGT
 DESCRIPTION "NETWORK AGENT"
 OS OTHER
 NODE MASTERA.ROME.TIVOLI.COM
 TCPADDR 31117
 FOR maestro
  HOST MASTERB
  ACCESS NETMTH
END
```

- These are the full SSL security options in the `netmeth.opts` file of `NETAGT`:

```
#######################################################
# Remote cpu parameters
#######################################################

SSL remote full port = 31119
SSL remote CPU = MASTERA

#######################################################
# Configuration Certificate
#######################################################

SSL key                ="C:\TWS\installations\SSL\XA.key"
SSL certificate        ="C:\TWS\installations\SSL\XA.crt"
SSL CA certificate     ="C:\TWS\installations\SSL\VeriSte.crt"
SSL key pwd            ="C:\TWS\installations\SSL\XA.sth"
SSL certificate chain  ="C:\TWS\installations\SSL\TWSCertificateChain.crt"
SSL random seed        ="C:\TWS\installations\SSL\random_file.rnd"
SSL auth mode          =cpu
SSL auth string       =tws
```

Note: The SSL configuration certificate options must refer to the private key and certificate defined on the hosting fault-tolerant agent.

- This is the workstation definition for `MASTERA` (the remote workstation):

```
CPUNAME MASTERA
  OS WNT
  NODE 9.168.68.55 TCPADDR 31117
  SECUREADDR 31119
  DOMAIN NTWKA
  FOR MAESTRO
    TYPE MANAGER
    AUTOLINK ON
    BEHINDFIREWALL OFF
    SECURITYLEVEL enabled
    FULLSTATUS ON
    SERVER H
END
```

Interface communication

This section describes how to configure SSL communication for the Tivoli Workload Scheduler interfaces. It has the following topics:

- "Overview"
- "Customizing the connector configuration files" on page 194
- "Changing a server key" on page 195
- "Customizing the SSL connection for the Dynamic Workload Console" on page 196
- "Customizing the SSL connection to the master domain manager and dynamic domain manager" on page 197
- "Customizing the SSL connection for a command-line client" on page 199

Overview

The following interfaces use SSL encryption and server authentication to communicate:

Dynamic Workload Console and SOAP internal communication on master domain manager

The Dynamic Workload Console and the SOAP internal communication on the master domain manager use RMI/IIOP over SSL. They use both the server and client security features of WebSphere Application Server to implement it.

The command-line client

The command-line client communicates using HTTP/HTTPS over SSL, and does not use WebSphere Application Server

The command line

The command-line on the master domain manager communicates using HTTP/HTTPS over SSL, and does not use WebSphere Application Server

The Tivoli Workload Scheduler interfaces, with the exception of the command-line interface, use default certificates that are installed into default keystores. To set SSL, you customize the defaults to the required security level. The default certificates are not used for the Dynamic Workload Console client authentication, which is obtained using a user ID and password. The default password associated with each of the default keystores is **default**.

The SSL security paradigm implemented in the WebSphere Application Server requires two stores to be present on the clients and the server: a keystore containing the private key and a trust store containing the certificates of the trusted counterparts.

Figure 6 shows the server and client keys, and to where they must be exported for the Dynamic Workload Console:

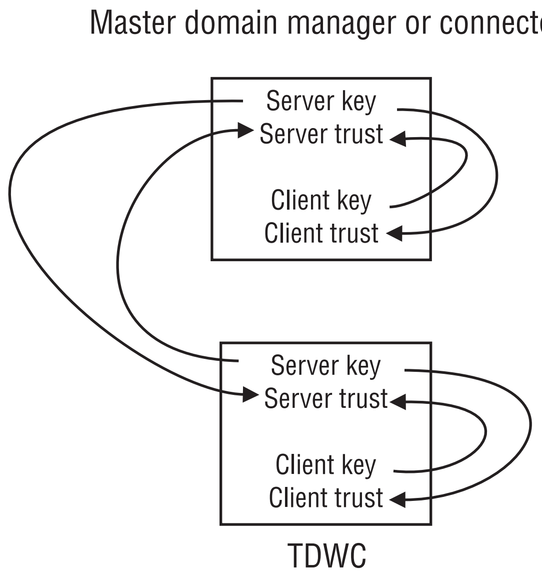


Figure 6. SSL server and client keys

The diagram shows the keys that must be extracted and distributed to enable SSL between the master domain manager and the Dynamic Workload Console, and within the components for the internal SOAP connection. Each arrow in the diagram includes the following activities performed using an appropriate key management tool on each keystore:

1. Create a self-signed certificate or import a third party certificate

2. Extract a new key
3. Open the appropriate trust store
4. Use the new key to add a signed certificate to the trust store

In addition to creating a new key, for some of these key and trust stores you can also customize the name, location, and password of the store. Table 45 details the possibilities:

Table 45. Changes allowed in Tivoli Workload Scheduler key and trust stores

File	Name	Path	Password	New key
TWS server key store	✓	✓	✓	✓
TWS server trust store	✓	✓	✓	✓
TWS client key store				✓
TWS client trust store				✓
TDWC client key store				✓
TDWC client trust store				✓

The following sections tell you how to customize the configuration files for the key and trust stores (where you need to make changes), and how to create a new key.

Customizing the connector configuration files

To make any changes to the name, location, password of the Tivoli Workload Scheduler server key or trust stores, you must modify the configuration files which describe them. The configuration files are as follows:

Configuration files for server key files

The name and location of the server key and trust stores are contained in the `security.xml` file located in the *TWA_home*/`eWAS/profiles/TIPProfile/config/cells/DefaultNode/` directory. Alternatively, use the **`showSecurityProperties`** tool.

The default names and locations are: **TWSServerKeyFile.jks** and **TWSServerTrustFile.jks**, located in *TWA_home*/`eWAS/profiles/TIPProfile/etc`

The following is an example of the `security.xml` that contains those settings:

```
<repertoire xmi:id="SSLConfig_1" alias="DefaultNode/DefaultSSLSettings">
  <setting xmi:id="SecureSocketLayer_1"
         keyFileName="/opt/ibm/TWA0/eWAS/profiles/TIPProfile/etc/
                                           TWSServerKeyFile.jks"
         keyFilePassword="{xor}Ozo5PiozKw==" keyFileFormat="JKS"
         trustFileName="/opt/ibm/TWA0/eWAS/profiles/TIPProfile/etc/
                                           TWSServerTrustFile.jks"
         trustFilePassword="{xor}Ozo5PiozKw==" trustFileFormat="JKS"
         clientAuthentication="false" securityLevel="HIGH"
         enableCryptoHardwareSupport="false">
<cryptoHardware xmi:id="CryptoHardwareToken_1"
tokenType="" libraryFile="" password="{xor}"/>
<properties xmi:id="Property_6" name="com.ibm.ssl.protocol" value="SSL"/>
<properties xmi:id="Property_7" name="com.ibm.ssl.contextProvider"
  value="IBMJSSE2"/>
</setting>
</repertoire>
```

Client key files for all components

The client key files are described in the file:*TWA_home*/eWAS/profiles/TIPProfile/properties/ssl.client.props

The information in this file must not be modified. An example of it is as follows:

```
# KeyStore information
com.ibm.ssl.keyStoreName=ClientDefaultKeyStore
com.ibm.ssl.keyStore=/opt/ibm/TWA0/eWAS/profiles/TIPProfile/etc/
                                             TWSClientKeyFile.jks
com.ibm.ssl.keyStorePassword={xor}Ozo5PiozKw\=\=
com.ibm.ssl.keyStoreType=JKS
com.ibm.ssl.keyStoreProvider=IBMJCE
com.ibm.ssl.keyStoreFileBased=true

# TrustStore information
com.ibm.ssl.trustStoreName=ClientDefaultTrustStore
com.ibm.ssl.trustStore=/opt/ibm/TWA0/eWAS/profiles/TIPProfile/etc/
                                             TWSClientTrustFile.jks
com.ibm.ssl.trustStorePassword={xor}Ozo5PiozKw\=\=
com.ibm.ssl.trustStoreType=JKS
com.ibm.ssl.trustStoreProvider=IBMJCE
com.ibm.ssl.trustStoreFileBased=true
```

To modify the server key file names, paths, or passwords, modify the configuration files using the script **changeSecurityProperties** located in the *TWA_home*/TWS/wastool directory. For instructions on how to do this see "Changing the security settings" on page 296. The following is a sample of the input:

```
################################################################
SSL Panel
################################################################
alias=DefaultSSLSettings
keyFileName=${USER_INSTALL_ROOT}/etc/TWSServerKeyFile.jks
keyFilePassword=*****
keyFileFormat=JKS
trustFileName=${USER_INSTALL_ROOT}/etc/TWSServerTrustFile.jks
trustFilePassword=*****
trustFileFormat=JKS
clientAuthentication=false
securityLevel=HIGH
enableCryptoHardwareSupport=false
```

Changing a server key

You change a server key when you want the console or command-line client to safely authenticate with their server. Changing a connector private key means that the trusted server certificates for the consoles and command-line client must also be updated.

This section describes how to apply changes to the connector side.

"Customizing the SSL connection for a command-line client" on page 199 describes the configuration for the command-line client.

"Customizing the SSL connection for the Dynamic Workload Console" on page 196 describes the configuration for the Dynamic Workload Console.

You can customize certificates and update server keystores using **ikeyman** that is provided with the embedded WebSphere Application Server, or using the **keytool** utility provided with the Java runtime environment. There are also other tools distributed with other products or available in the Internet. For the connector **ikeyman** is located in the directory `*TWA_home*/eWAS/bin`. The **keytool** utility is located in `*TWA_home*/eWAS/java/jre/bin`.

You can change the server key with a new self signed certificate that you generate directly, or with a certificate signed by a Certificate Authority.

If you use a self signed certificate for the server, replace the server private key in the server Key keystore and the server public key in the Trust keystores for all the consoles and command-line clients that connect to it.

If you use a certificate signed by a Certificate Authority, replace the server private key in the server Key keystore and make sure you have the certificate of the Certificate Authority in the Trust keystores for all the consoles and command-line clients that connect to it.

The following procedure is an example of how to create a new server key pair using the **keytool** utility:

1. Generate an RSA key pair for the connector in the keystore:
```
keytool -genkey
        -alias tws
        -dname "CN=TWS, OU=Test, O=IBM, C=US"
        -keystore TWSServerKeyFile.jks
        -storepass default
        -keypass default
        -validity 3000
        -keyalg RSA
```
2. Export the certificate to PEM format and import it into the keystore:
```
keytool -export
        -alias tws
        -rfc
        -file server.crt
        -keystore TWSServerKeyFile.jks
        -storepass default
```

When creating self signed certificates, do not use the DSA algorithm as the Tivoli Workload Scheduler command-line utilities cannot use it to establish SSL connection to the server. Make sure that the keys have the same password as the keystore where they are contained. Make sure you update the Trust keystores for the consoles and command-line client.

Customizing the SSL connection for the Dynamic Workload Console

When you change the connector private key you need to update the Trust keystore of the Dynamic Workload Console with the public key pair when you use self signed certificates, or make sure that it contains the certificate of the Certificate Authority.

When you configure the Dynamic Workload Console to connect to different connectors it must have a certificate in its Trust keystore that enables trust for each connector.

You can customize certificates and update the Dynamic Workload Console Trust keystore using **ikeyman** that is provided with the embedded WebSphere Application Server, or using the **keytool** utility provided with the Java runtime environment.

For the Dynamic Workload Console **ikeyman** and the **keytool** utility are located in the directory `TWA_home/eWAS/profiles/TIPProfile/etc`.

The following is an example of how to import the connector certificate in PEM format:

```
keytool -import
        -alias tws
        -file server.crt
        -trustcacerts
        -noprompt
        -keystore TDWCClientTrustFile.jks
        -storepass default
```

When you are customizing the Dynamic Workload Console settings, make sure the keys have the same password as the keystore where they are contained. The keystore password must correspond between the connector server and the Dynamic Workload Console client. The keys in the Dynamic Workload Console Trust and Key keystores must be paired with the keys in the connector Key and Trust keystores respectively.

Encrypt the password using the **`encryptProfileProperties`** utility. See "Application server - encrypting the profile properties files" on page 305 for details on how to encrypt profile properties.

Customizing the SSL connection to the master domain manager and dynamic domain manager

The connection to the broker server installed with the dynamic domain manager requires the use of certificates from a certificate authority to provide authentication. In addition, the master domain managers, backup master domain managers, and z/OS controllers that communicate with the dynamic domain manager must be defined on the related broker server to ensure role-based authorization.

The examples in this section refer to a dynamic domain manager, but the same configuration applies to all the following components:

- Master domain manager
- Backup master domain manager (if any)
- z/OS controller (if any)

When you install Tivoli Workload Scheduler, the default certificates provided ensure correct authentication and role-based authorization between the master domain manager and the dynamic domain manager. The certificates installed with the dynamic agents also ensure that they can connect to the dynamic domain manager they are registered to and can perform operations that belong specifically to the dynamic agents (role-based authorization). The default value for the certificate is `Server` on the master domain manager and `Client` on the dynamic agents.

To ensure that the master domain manager can communicate with the dynamic domain manager, the prefix of the common name of the master domain manager must be defined in the **BrokerWorkstation.properties** file located in the*TWA_home*/`TDWB/config` directory on the dynamic domain manager. This ensures that the dynamic domain manager recognizes the master domain manager as such and allows it to perform operations that belong specifically to a master domain manager (role-based authorization).

If you plan to use your own certificates rather than the default ones, ensure that the prefix of the common names present in the certificates on the master domain manager is listed in the `Broker.AuthorizedCNs` option in the **BrokerWorkstation.properties** file on the dynamic domain manager.

If you modify the certificate on the master domain manager, add the prefix for the common name defined in the updated certificate also in the `Broker.AuthorizedCNs` option in the **BrokerWorkstation.properties** file on the dynamic domain manager.

To modify the security settings, perform the following steps:

1. Modify the certificate on the master domain manager. For example, define the `mdm1` common name in the certificate.
2. Deploy the certificate to the master domain manager, as described in Chapter 7, "Setting connection security," on page 183.
3. Modify the list of common names on the dynamic domain manager, as follows:
   a. Browse to *TWA_home*/TDWB/config.
   b. Open file BrokerWorkstation.properties.
   c. In the option `Broker.AuthorizedCNs`, define one or more prefixes of common names for the authorized master domain manager. Separate each value with a semicolon. For example, you can define the following list:
      ```
      Broker.AuthorizedCNs=mdm;mdm1;mdm2
      ```
      This ensures that all master domain managers, if any, with a common name equal to or starting with `mdm` can connect to the dynamic domain manager.
4. Stop and start the dynamic domain manager to make the change effective, as follows:
   a. Use wastool **`stopBrokerApplication.sh`** on UNIX and Linux or **`stopBrokerApplication.bat`** on Windows:
      ```
      stopBrokerApplication -user username -password password [-port portnumber]
      ```
      where *username* and *password* are the credentials used at installation. The parameter *portnumber* is optional. If it is not specified, the default is used.
   b. Use wastool **`startBrokerApplication.sh`** on UNIX and Linux or **`startBrokerApplication.bat`** on Windows:
      ```
      startBrokerApplication -user username -password password [-port portnumber]
      ```
      where *username* and *password* are the credentials used at installation. The parameter *portnumber* is optional. If it is not specified, the default is used.

For more information, see "BrokerWorkstation.properties file" on page 56 and "Starting, stopping, and displaying dynamic workload broker status" on page 298.

Customizing the SSL connection for a command-line client

Tivoli Workload Scheduler command-line clients connect to the connector through HTTP or HTTPS. The default connection type is HTTPS. If the command-line connects through a proxy, use the HTTP connection protocol as HTTPS is not supported for this type of configuration.

You configure the connection protocol as described in "Configuring command-line client access authentication" on page 70. If you have previously not been using SSL for the command line client access, you will need to change at least the following parameters:

proxy Specify the IP address or the server name for the proxy server.

proxy port
Specify the listening port of the proxy server.

protocol
Specify the protocol type as HTTP or HTTPS.

port Specify the port required by the protocol you set in the **`protocol`** option. The default is 31115 for HTTP and 31116 for HTTPS.

The HTTPS connection protocol offers the following additional security features:
- Data encryption between the command-line utility and the connector
- Optional server authentication by validating the server certificates

You can activate optional server authentication in one of the following ways:
- "Configuring SSL using the predefined certificate"
- "Configuring multiple SSL communication instances"
- "Using a customized certificate" on page 200

Configuring SSL using the predefined certificate

To customize the SSL connection for the command-line client using the predefined certificate, perform the following steps:
1. Stop the embedded WebSphere Application Server using the **conman stopappserver** command.
2. Extract the certificate from the `TWSServerKeyFile.jks` keystore:
```
keytool -export
        -alias tws
        -rfc
        -file server.crt
        -keystore TWSServerKeyFile.jks
        -storepass default
```
3. Copy the .crt certificate to each workstation that has a command-line client installed.
4. Set the **`cli ssl server auth`** and **`cli ssl server certificate`** command-line client options in the `localopts` file. See "Setting local options" on page 23.
5. Start the embedded WebSphere Application Server using the **conman startappserver** command.

Configuring multiple SSL communication instances

To customize the SSL connection for the command-line client for multiple connections to WebSphere Application Server, perform the following steps:

1. Stop WebSphere Application Server using the **conman stopappserver** command.
2. Extract a certificate from `TWSServerKeyFile.jks` keystore for each instance.
```
keytool -export
        -alias tws
        -rfc
        -file server.crt
        -keystore ServerKeyFile.jks
        -storepass default
```
   .
3. Extract the hash number for each exported certificate:
```
openssl x509
        -hash
        -noout
        -in keyname
```
4. Rename each certificate file with the exported key.
5. Copy the renamed certificates to each workstation that has a command-line client installed.
6. Set the **`cli ssl server auth`** and **`cli ssl trusted dir`** command-line client options in the `localopts` file. See "Setting local options" on page 23.
7. Start the WebSphere Application Server using the **conman startappserver** command.

Using a customized certificate

To customize the SSL certificate and keystore, perform the following steps:
1. Create a new RSA and extract the key for the server keystore TWSServerKeyFile.jks.
2. Follow the steps in "Customizing the SSL connection for the Dynamic Workload Console" on page 196.
3. Follow the steps in "Configuring SSL using the predefined certificate" on page 199.

Note: When you want to customize certificates for multiple instances, perform these steps for each instance.

Working across firewalls

In the design phase of a Tivoli Workload Scheduler network, the administrator must know where the firewalls are positioned in the network, which fault-tolerant agents and which domain managers belong to a particular firewall, and which are the entry points into the firewalls. When this has been clearly understood, the administrator should define the **behindfirewall** attribute for some of the workstation definitions in the Tivoli Workload Scheduler database. In particular, if a workstation definition is set with the **behindfirewall** attribute to ON, this means that there is a firewall between that workstation and the Tivoli Workload Scheduler master domain manager. In this case, the workstation-domain manager link is the only link allowed between the workstation and its domain manager.

All Tivoli Workload Scheduler workstations should be defined with the **behindfirewall** attribute if the link with the corresponding domain manager, or with any domain manager in the Tivoli Workload Scheduler hierarchy right up to the master domain manager, is across a firewall.

When mapping an IBM Tivoli Workload Scheduler network over an existing firewall structure, it does not matter which fault-tolerant agents and which domain managers are on the secure side of the firewall and which ones are on the non secure side. Firewall boundaries should be the only concern. For example, if the master domain manager is in a non secure zone and some of the domain managers are in secured zones, or vice versa, does not make any difference. The firewall structure must always be considered starting from the master domain manager and following the Tivoli Workload Scheduler hierarchy, marking all the workstations that have a firewall between them and their corresponding domain manager.

For all workstations with **behindfirewall** set to ON, the conman **start** and **stop** commands on the workstation, and the **showjobs** commands are sent following the domain hierarchy, instead of making the master domain manager or the domain manager open a direct connection to the workstation. This makes a significant improvement in security.

This attribute works for multiple nested firewalls as well. For extended agents, you can specify that an extended agent workstation is behind a firewall by setting the **behindfirewall** attribute to ON, on the host workstation. The attribute is read-only in the plan; to change it in the plan, the administrator must update it in the database and then recreate the plan.

See the *Tivoli Workload Scheduler: User's Guide and Reference* for details on how to set this attribute.

Configuring Tivoli Workload Scheduler to use LDAP

To use LDAP configured in SSL with Tivoli Workload Scheduler, perform the following steps:

1. Import the LDAP public key in the truststore of the Tivoli Workload Scheduler server, by storing it in the `TWSServerTrustFile.jks` file located in `TWA_home/eWAS/profiles/TIPProfile/etc`.
2. Import the LDAP public key in the truststore of the Tivoli Workload Scheduler client, by storing it in the `TWSClientTrustFile.jks` file located in `TWA_home/eWAS/profiles/TIPProfile/etc`.

FIPS compliance

This section describes Federal Information Processing Standards (FIPS) compliance. It is divided into the following topics:

- "FIPS overview" on page 202
- "Using FIPS certificates" on page 202
- "Configuring SSL to be FIPS-compliant" on page 206
- "Configuring DB2 for FIPS" on page 209
- "Using Dynamic Workload Console and FIPS" on page 214
- "Configuring dynamic workload broker for FIPS" on page 215
- "Configuring LDAP for FIPS" on page 216
- "Finding the GSKit version on agents running on UNIX and Linux operating systems" on page 216

FIPS overview

Federal Information Processing Standards (FIPS) are standards and guidelines issued by the National Institute of Standards and Technology (NIST) for federal government computer systems. FIPS are developed when there are compelling federal government requirements for standards, such as for security and interoperability, but acceptable industry standards or solutions do not exist. Government agencies and financial institutions use these standards to ensure that the products conform to specified security requirements.

Tivoli Workload Automation uses cryptographic modules that are compliant with the Federal Information Processing Standard FIPS-140-2. Certificates used internally are encrypted using FIPS-approved cryptography algorithms. FIPS-approved modules can optionally be used for the transmission of data.

To satisfy the FIPS 140-2 requirement, you must use IBM Global Security Kit (GSKit) version 7d runtime dynamic libraries instead of OpenSSL. GSKit uses IBM Crypto for C version 1.4.5 which is FIPS 140-2 level 1 certified by the certificate number 755. See http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/1401val2007.htm. IBM Java JSSE FIPS 140-2 Cryptographic is another module used by Tivoli Workload Automation. It has the certificate number 409.

If you are currently using SSL for secure connections across the network, to ensure FIPS compliance, you must use GSKit for secure connections instead of OpenSSL Toolkit. GSKit is automatically installed with Tivoli Workload Scheduler. It is based on dynamic libraries and offers several utilities for certificate management.

To comply with FIPS, all components of Tivoli Workload Automation must be FIPS-compliant. You must use Dynamic Workload Console or the Tivoli Workload Scheduler command-line as the interface to Tivoli Workload Scheduler. Additionally, you must use DB2 as your Tivoli Workload Scheduler database.

If FIPS compliance is not of concern to your organization, you can continue to use SSL for secure connections across your network.

To set FIPS compliance for your network, perform the procedures described in the following sections:
- To create FIPS certificates, see "Using FIPS certificates."
- To configure SSL for FIPS-compliance, see "Configuring SSL to be FIPS-compliant" on page 206.
- To configure your DB2 database for FIPS-compliance, see "Configuring DB2 for FIPS" on page 209.

Using FIPS certificates

To ensure your network is FIPS-compliant, create FIPS certificates as follows:
- If you do not already have SSL certificates, see "Using fresh FIPS certificates" on page 203.
- If you already have SSL certificates but are switching to GSKit, see "Switching from OpenSSL to GSKit" on page 204.

If you are using FIPS certificates, you must use SSL parameters for communication over the network. During the installation or upgrade to Tivoli Workload Scheduler version 8.5.1, note that default SSL certificates are located in the following directories:

```
TWS_InstallDir\TWS\ssl\GSKit
TWS_InstallDir\TWS\ssl\OpenSSL
```

Using fresh FIPS certificates

Create FIPS certificates for communication between workstations by using the –fips option in the GSKit command line utility. You can create FIPS certificates in the following ways:

- Use the default FIPS certificates existing on each Tivoli Workload Scheduler agent in the network. Note that the default FIPS certificates are not secure.
- Create your own secure FIPS certificates. See "Creating your own FIPS certificates."

Creating your own FIPS certificates: Use the **`gsk7capicmd`** command line utility to:

- Create your own Certificate Authority (CA).
- Create a self-signed CA certificate (x.509 structure) for your CA.
- Export the CA certificate in PEM format.

Creating your own Certificate Authority: Create the CA on any workstation in your network. Run the following steps only once to create a CA that will be used each time a new certificate needs to be created and signed.

1. Enter the following command to create the CMS key database "ca.kdb" with password "password00" that expires after 1000 days.
   ```
   gsk7capicmd -keydb -create -db ca.kdb -pw password00 -stash -expire 1000 -fips
   ```
2. Enter the following command to create the self-signed certificate with label "CA certificate" using the distinguish name "CN=CA certificate,O=IBM,OU=TWS,C=IT". The certificate expires after 1000 days.
   ```
   gsk7capicmd -cert -create  -db ca.kdb -pw password00 -label "CA certificate"
        -size 1024 -expire 1000 -dn "CN=CA certificate,O=IBM,OU=TWS,C=IT"
   ```
3. Enter the following command to extract the CA certificate into external file "ca.crt". The certificate is addressed by the corresponding label.
   ```
   gsk7capicmd -cert -extract -db ca.kdb -pw password00 -label "CA certificate"
         -target CA.crt
   ```

This file will contain the public certificate of the certificate authority.

Creating a certificate for the Tivoli Workload Scheduler agent: Perform the following steps to create certificates that are signed by a local common trusted CA on every Tivoli Workload Scheduler agent in your network.

1. Enter the following command to create a default CMS key database client.kdb" with password "password02" that expires after 1000 days. The password is also stored in stash file "client.sth".
   ```
   gsk7capicmd -keydb -create -db client.kdb -pw password02
       -stash -expire 1000 -fips
   ```
2. Enter the following command to add the CA certificate as trusted in the CMS key database. The label "CA certificate client" is used to address that certificate.
   ```
   gsk7capicmd -cert -add -db client.kdb -pw password02
       -label "CA certificate client" -trust enable -file CA.crt
       -format ascii -fips
   ```
3. Enter the following command to create the client certificate request based on 1024 bits key, with label **`"Client TWS85 Certificate"`** and distinguish name **`"CN=Client TWS85,O=IBM,OU=TWS,C=IT"`**. The certificate request "client.csr" is generated and the private key is created in the key database client.kdb.

```
gsk7capicmd -certreq -create -db client.kdb -pw password02
    -label "Client TWS85 Certificate" -size 1024 -file client.csr
    –dn "CN=Client  TWS85,O=IBM,OU=TWS,C=IT" -fips
```

4. Enter the following command so that the CA signs the client's certificate request and generates a new signed in file “client.crt”.

   ```
   gsk7capicmd -cert -sign -db ca.kdb -pw password00 -label "CA certificate"
        -target client.crt -expire 365 -file client.csr -fips
   ```

5. Enter the following command to import the signed certificate “client.crt” in the CMS key database “client.kdb”.

   ```
   gsk7capicmd -cert -receive -db client.kdb -pw password02 -file client.crt -fips
   ```

You can repeat these steps above for all agents or you can use the same certificate for all agents, depending on your security policies and Tivoli Workload Automation localopts configurations.

Switching from OpenSSL to GSKit

This section describes how to migrate your OpenSSL certificates to GSKit certificates.

The following is a list of certificate formats that can be migrated to the GSKit format, **KDB**:
- **PEM**: Used by OpenSSL
- **JKS**: Used by Java and WebSphere Application Server
- **PKCS12**: Used by Microsoft applications and Internet Explorer

To migrate certificates, you may use one or more of the following tools:
- **gsk7cmd**: Java command line provided by GSKit
- **gsk7capicmd**: Native command line provided by GSKit
- **openssl**: Native command line provided by OpenSSL
- **ikeyman**: Optional graphical interface provided by GSKit
- **keytool**: Optional graphical interface provided by Java Virtual Machine (JVM)

Note: Be sure to backup your original certificates before migrating them to GSKit format.

To migrate your certificates, perform the following steps:
1. “Configuring the tool environment”
2. “Migrating the certificates” on page 205

Configuring the tool environment: This section describes the commands you must run to configure gsk7cmd, gsk7capicmd, and openssl.

Configuring gsk7cmd:

UNIX

```
export JAVA_HOME=/opt/IBM/TWA/eWAS/java/jre

export CLASSPATH= /opt/IBM/TWA/eWAS/java/bin:

/opt/IBM/TWA/eWAS/java/lib
```

Windows

```
set JAVA_HOME=C:\Program Files\IBM\TWA\eWAS\java\jre
```

```
set CLASSPATH= C:\Program Files\IBM\TWA \eWAS\java\bin; C:\Program
Files\IBM\TWA \eWAS\java\lib
```

Configuring gsk7capicmd: `set PATH=C:\Program Files\IBM\TWA\TWS\GSkit\7d\lib; C:\Program Files\IBM\TWA\TWS\GSkit\7d\bin;%PATH%`

Configuring openssl:

UNIX `tws_env.sh`

Windows
`tws_env.cmd`

Migrating the certificates: This section describes the commands you must run to migrate certificates to the FIPS-compliant format, KDB.

Note that PEM format cannot be directly converted to KDB format; you must first convert PEM to PKCS12 and then to KDB.

The following list describes the command you must run to convert from one format to another:

JKS format to KDB format

gsk7cmd -keydb -convert -db TWSClientKeyFile.jks -pw default -old_format jks -new_format cms

gsk7cmd -keydb -convert -db TWSClientTrustFile.kdb -pw default -old_format cms -new_format jks

PKCS12 format to KDB format
gsk7capicmd -cert -export -target TWSClientKeyFile_new.kdb -db TWSClientKeyFileP12.P12 -fips -target_type cms -type pkcs12

PKCS12 format to PEM format
openssl pkcs12 -in TWSClientKeyFileP12.P12 -out TWSClientKeyFile.pem

PEM format to PKCS12 format
openssl pkcs12 -export -in TWSClientKeyFile.pem -out cred.p12

KDB format to PKCS12 format
gsk7capicmd -cert -export -db TWSClientKeyFile.kdb -target TWSClientKeyFileP12.P12 -fips -target_type pkcs12 -type cms

Converting PEM certificates to CMS certificates: This section describes the procedure to convert PEM (OpenSSL) certificates to CMS (GSKit) certificates. The examples in this section use the following input and output files.

Input files

Personal certificate file: *CPU1.crt*
Personal key of certificate file: *CPU1.key*
Certificate of CA file: *TWSca.crt*
Stash file: *CPU1.sth*

Output files

Keystore database file: *TWS.kdb*
Stash file: *TWS.sth*
Label of your certificate: *CPU1*

To migrate OpenSSL certificates to GSKit certificates, perform the following procedure:

1. Merge the public and private keys in a new temporary file called **all.pem** by running the following commands:

   UNIX cat CPU2.crt CPU2.key > all.pem

   Windows
   type CPU1.crt CPU1.key > all.pem
2. If you do not already know the password, extract it from the stash file by running `openssl base64 -d -in CPU1.sth`.
3. Choose a password for the new keystore database. You can reuse the old password.
4. Choose a label for your personal certificate and personal key (in this example, CPU1) and create the PKCS12 database that contains the labels. You use the name, CPU1, as the label of the new keystore database. To create the PKCS12 database, run the following:
   ```
    openssl pkcs12 -export -in all.pem -out TWS.p12 -name CPU1  -passin pass:
            password1 -passout pass:password2
   ```
   where *password1* is the password extracted from the stash file and *password2* is is the new password to manage the new keystore database.
5. Convert the PKCS12 database from TWS.p12 to the CMS database, TWS.kdb by running the following:
   ```
   gsk7capicmd -cert -import -target TWS.kdb -db TWS.p12 -target_type cms
             -type pkcs12 -label CPU1 -target_pw "password2" -pw "password3"
   ```
   where *password2* is the old password that you extracted from the stash file, CPU1.sth and *password3* is the new password.
6. Choose a label for your Certification Authority contained in TWSca.crt. For this example, it is *TWSca*.
7. Add the certificate of the Certification Authority into your TWS.kdb file by running:
   ```
   gsk7capicmd -cert -add -db TWS.kdb -label TWSca -trust -file TWSca.crt
           -format ascii -pw "password"
   ```
8. Delete all .pem files.

Configuring SSL to be FIPS-compliant

To configure SSL to be FIPS-compliant, perform the following procedures:

- Set localopts parameters. See "Setting localopts parameters for FIPS" on page 207.
- Configure embedded WebSphere Application Server. See "Configuring embedded WebSphere Application Server for FIPS" on page 207.
- Configure the Tivoli event integration facility port. See "Configuring the Tivoli event integration facility port" on page 209.

Note:

If you are using dynamic workload broker for dynamic scheduling in your network, note that the workstation of type `BROKER` does not support SSL. All Tivoli Workload Scheduler workstations must communicate with the workstation of type `BROKER` using TCP/IP protocol.

Setting localopts parameters for FIPS

To set your environment for FIPS, set the following local option on every Tivoli Workload Scheduler agent in the network.

SSL Fips enabled = *yes*

The following example applies to a Windows agent. Set the following local options for the engine:

SSL keystore file = *"<TWA_home>\TWS\ssl\GSKit\TWSClientKeyStore.kdb"*
SSL certificate keystore label = *"client"*
SSL keystore pwd = *"<TWA_home>\TWS\ssl\GSKit\TWSClientKeyStore.sth"*

where <*TWA_home*> is the installation directory of the instance of Tivoli Workload Automation where the agent is installed.

Set the following local options for the CLI:

CLI SSL keystore file =
"<TWA_home>\TWS\ssl\GSKit\TWSClientKeyStore.kdb"
CLI SSL certificate keystore label = *"client"*
CLI SSL keystore pwd =
"<TWA_home>\TWS\ssl\GSKit\TWSClientKeyStore.sth"

where <*TWA_home*> is the installation directory of the instance of Tivoli Workload Automation where the agent is installed.

Note: On Windows workstations, the user, **SYSTEM**, must have read-permissions to read the GSKit FIPS certificates.

Configuring embedded WebSphere Application Server for FIPS

To be FIPS-compliant, you must configure embedded WebSphere Application Server for Tivoli Workload Scheduler.

The section describes how to:
- Configure embedded WebSphere Application Server for Tivoli Workload Scheduler. See "Configuring embedded WebSphere Application Server for Tivoli Workload Scheduler."
- Configure the Tivoli event integration facility port. See "Configuring the Tivoli event integration facility port" on page 209.

Configuring embedded WebSphere Application Server for Tivoli Workload Scheduler: To configure embedded WebSphere Application Server for FIPS compliance, perform the following steps:
1. In the WebSphere Application Server administration interface, click **Security > SSL certificate and key management**. Select **Use the United States Federal Information Processing Standard (FIPS) algorithms** and click **Apply**. Alternatively, you can use wastools, running **changeSecurityProperties** to change the following parameter:
   ```
   useFIPS=true
   ```
2. In the **`profile_root/properties/ssl.client.props`** file, set the following parameters:
   - **com.ibm.security.useFIPS**=*true*

- **com.ibm.ssl.protocol**=*SSL_TLS*

3. If you have an administrative client that uses a SOAP connector, add the following line to the **profile_root/properties/soap.client.props** file:

   ```
   com.ibm.ssl.contextProvider=IBMJSSEFIPS
   ```

4. Edit the SDK java.security file located in the `WASHOME/java/jre/lib/security` directory to insert the **IBMJCEFIPS** provider (**com.ibm.crypto.fips.provider.IBMJCEFIPS**). **IBMJCEFIPS** must precede the **IBMJCE** provider in the provider list.

   The following is an example of the edited SDK java.security file:

   ```
   security.provider.1=com.ibm.crypto.fips.provider.IBMJCEFIPS
   security.provider.2=com.ibm.crypto.provider.IBMJCE
   security.provider.3=com.ibm.jsse.IBMJSSEProvider
   security.provider.4=com.ibm.jsse2.IBMJSSEProvider2
   security.provider.5=com.ibm.security.jgss.IBMJGSSProvider
   security.provider.6=com.ibm.security.cert.IBMCertPath
   security.provider.7=com.ibm.crypto.pkcs11.provider.IBMPKCS11
   security.provider.8=com.ibm.security.cmskeystore.CMSProvider
   security.provider.9=com.ibm.security.jgss.mech.spnego.IBMSPNEGO
   ```

   The following is an example of the edited java.security file if you are using the Oracle Java SE Development Kit:

   ```
   security.provider.1=sun.security.provider.Sun
   security.provider.2=com.ibm.crypto.fips.provider.IBMJCEFIPS
   security.provider.3=com.ibm.crypto.provider.IBMJCE
   security.provider.4=com.ibm.jsse.IBMJSSEProvider
   security.provider.5=com.ibm.jsse2.IBMJSSEProvider2
   security.provider.6=com.ibm.security.jgss.IBMJGSSProvider
   security.provider.7=com.ibm.security.cert.IBMCertPath
   security.provider.8=com.ibm.i5os.jsse.JSSEProvider
   #security.provider.8=com.ibm.crypto.pkcs11.provider.IBMPKCS11
   security.provider.9=com.ibm.security.jgss.mech.spnego.IBMSPNEGO
   ```

5. Restart the WebSphere Application Server.

Note: For additional information about WebSphere Application Server and FIPS, see the WebSphere Application Server documentation.

Unconfiguring the FIPS provider: To unconfigure the FIPS provider, reverse the changes that you made in "Configuring embedded WebSphere Application Server for FIPS" on page 207. After you reverse the changes, verify that you have made the following changes to the ssl.client.props, soap.client.props, and java.security files:

- In the ssl.client.props file, change the com.ibm.security.useFIPS value to false.
- In the java.security file, change the FIPS provider to a non-FIPS provider.
- If you are using the SDK java.security file, change the first provider to a non-FIPS provider as shown in the following example:

  ```
  #security.provider.1=com.ibm.crypto.fips.provider.IBMJCEFIPS
  security.provider.1=com.ibm.crypto.provider.IBMJCE
  security.provider.2=com.ibm.jsse.IBMJSSEProvider
  security.provider.3=com.ibm.jsse2.IBMJSSEProvider2
  security.provider.4=com.ibm.security.jgss.IBMJGSSProvider
  security.provider.5=com.ibm.security.cert.IBMCertPath
  #security.provider.6=com.ibm.crypto.pkcs11.provider.IBMPKCS11
  ```

- If you are using the Oracle JDK java.security file, change the third provider to a non-FIPS provider as shown in the following example:

  ```
  security.provider.1=sun.security.provider.Sun
  security.provider.2=com.ibm.security.jgss.IBMJGSSProvider
  #security.provider.3=com.ibm.crypto.fips.provider.IBMJCEFIPS
  security.provider.3=com.ibm.crypto.provider.IBMJCE
  ```

```
security.provider.4=com.ibm.jsse.IBMJSSEProvider
security.provider.5=com.ibm.jsse2.IBMJSSEProvider2
security.provider.6=com.ibm.security.cert.IBMCertPath
#security.provider.7=com.ibm.crypto.pkcs11.provider.IBMPKCS11
```

- This step applies only if you added the default JSSE socket factories parameters to the SDK java.security file as described in "Configuring DB2 for FIPS." If you added them, remove the following parameters:

```
ssl.SocketFactory.provider=com.ibm.jsse2.SSLSocketFactoryImpl
ssl.ServerSocketFactory.provider=com.ibm.jsse2.SSLServerSocketFactoryImpl
```

Configuring the Tivoli event integration facility port

The Tivoli event integration facility port for SSL, **eventProcessorEIRSSLPort**, is used in event management. For the Tivoli event integration facility port to communicate in FIPS mode, you must first configure embedded WebSphere Application Server for FIPS. See "Configuring embedded WebSphere Application Server for Tivoli Workload Scheduler" on page 207.

To configure the Tivoli event integration facility port for SSL, perform the following steps:

1. Set the global option for the port using optman. Set the port as follows:

   `eventProcessorEIFSSLPort / ef =` *`portnumber`*

   where *portnumber* is the port number of any free port on your network.
2. To update the Symphony file, run **`JnextPlan -for 0000`**.
3. Restart the EventProcessor using the **`conman stopevtp`** and **`conman startevtp`** commands.
4. Restart the Tivoli Workload Scheduler monitoring engine with the conman commands, **`stopmon`** and **`startmon`**.

Configuring DB2 for FIPS

| To configure DB2 for FIPS compliance, perform one of the following procedures depending on the DB2 version you are using:

- "Configuring DB2, version 9.5"
- "Configuring DB2, version 9.7, fix pack 2 and later" on page 211
- "Configuring the DB2 connection to Tivoli Workload Scheduler" on page 213

Note: If you want to create your own DB2 certificates, see the DB2 documentation.

Configuring DB2, version 9.5

To configure DB2 version 9.5, for FIPS compliance, perform the following procedure:

1. Ensure that the path to the GSKit libraries is included in the relevant environment variables. The names of the environment variables vary depending on the operating system, as follows:

   UNIX and Linux
   : LIBPATH, LD_LIBRARY_PATH, or SHLIB_PATH environment variables. Specify this information in the .profile file for the DB2 instance owner.

   Windows
   : PATH environment variable. For example, `c:\Program Files\IBM\gsk7\lib`.

GSKit is automatically included when you install the DB2 database system.

On Windows 32-bit operating systems
: the GSKit libraries are located in C:\Program Files\IBM\GSK8\lib. In this case, the system PATH must include C:\Program Files\IBM\GSK8\lib.

On Windows 64-bit operating systems
: the 64-bit GSKit libraries are located in C:\Program Files\IBM\GSK8\lib64 and the 32-bit GSKit libraries are located in C:\Program Files (x86)\IBM\GSK8\lib.

On UNIX and Linux operating systems,
: the GSKit libraries are located in sqllib/lib. Therefore, the LIBPATH, SHLIB_PATH or LD_LIBRARY_PATH environment variables must include sqllib/lib.

On non-Windows operating systems
: the DB2 database manager installs GSKit locally, and for a given instance, the GSKit libraries might be located in sqllib/lib or sqllib/lib64.

2. In **INSTHOME**, create the file `SSLconfig.ini` as follows:

   UNIX and Linux
   : **`INSTHOME/cfg/SSLconfig.ini`**

   Windows
   : **`INSTHOME/SSLconfig.ini`**

   where INSTHOME is the home directory of the instance. It is recommended that file permission is set to limit access to the SSLconfig.ini file because the file contains sensitive data, for example, password information.

   The following is an example of an SSLconfig.ini file:

   ```
   DB2_SSL_KEYSTORE_FILE=/tools/keystores/DB2/TWSClientKeyStore.kdb
   DB2_SSL_KEYSTORE_PW=yyyyy
   DB2_SSL_LISTENER=nnnnn
   DB2_SSL_KEYSTORE_LABEL=zzzzz
   ```

   where
   - *TWSClientKeyStore.kdb* is the fully-qualified file name of the KeyStore that stores the DB2 certificate, and the trusted certificates, for example the certificates for the eWAS server to connect to. This KeyStore can be the same on you specified in the localopts parameters. See “Setting localopts parameters for FIPS” on page 207. Note that it must be recognized by the JKS WebSphere Application Server certificate.
   - *yyyy* is the password of the KeyStore that stores the Server Certificate.
   - *nnnnn* is the port number used by DB2 . This port must be the same port as the SSL port.
   - *zzzzz* is the label for the Server Certificate.
3. Configure SSL with the command **`db2set DB2COMM=SSL`**.

   Note: During the installation of a Tivoli Workload Scheduler master domain manager or backup master domain manager, it is necessary to enable the DB2 TCPIP port. DB2 can support both TCP/IP and SSL communications protocols at the same time. The DB2 administrator can set the TCPIP port with the command **`db2set DB2COMM=TCPIP, SSL`**. Use this command if you are installing a Tivoli Workload Scheduler master domain manager or backup master domain manager and already have a FIPS-enabled instance of DB2. After installation, you can choose to reset DB2COMM with only SSL.

4. Insert the following default JSSE socket factories parameters in the java.security file of the Tivoli Workload Scheduler WebSphere Application Server:

   ```
   ssl.SocketFactory.provider=com.ibm.jsse2.SSLSocketFactoryImpl
   ssl.ServerSocketFactory.provider=com.ibm.jsse2.SSLServerSocketFactoryImpl
   ```
5. Restart DB2.

Note: It is not necessary to update the DB2 JVM. This is because you already updated the JVM of the embedded WebSphere Application Server in the procedure described in "Configuring embedded WebSphere Application Server for FIPS" on page 207.

For more information about how to configure DB2 to be FIPS compliant, see the DB2 documentation that describes how to configure Secure Sockets Layer (SSL) support in a DB2 instance.

Configuring DB2, version 9.7, fix pack 2 and later

To configure DB2, version 9.7, fix pack 2 and later, for FIPS compliance, perform the following procedure:

1. Ensure that the path to the GSKit libraries is included in the relevant environment variables. The names of the environment variables vary depending on the operating system, as follows:

   UNIX and Linux
   LIBPATH, LD_LIBRARY_PATH, or SHLIB_PATH environment variables. Specify this information in the .profile file for the DB2 instance owner.

   Windows
   PATH environment variable. For example, `c:\Program Files\IBM\gsk7\lib`.

   GSKit is automatically included when you install the DB2 database system.

   On Windows 32-bit operating systems
   the GSKit libraries are located in C:\Program Files\IBM\GSK8\lib. In this case, the system PATH must include C:\Program Files\IBM\GSK8\lib.

   On Windows 64-bit operating systems
   the 64-bit GSKit libraries are located in C:\Program Files\IBM\GSK8\lib64 and the 32-bit GSKit libraries are located in C:\Program Files (x86)\IBM\GSK8\lib.

   On UNIX and Linux operating systems,
   the GSKit libraries are located in sqllib/lib. Therefore, the LIBPATH, SHLIB_PATH or LD_LIBRARY_PATH environment variables must include sqllib/lib.

   On non-Windows operating systems
   the DB2 database manager installs GSKit locally, and for a given instance, the GSKit libraries might be located in sqllib/lib or sqllib/lib64.

2. To set up your DB2 server for SSL support, log in as the DB2 instance owner and set the following configuration parameters and the **DB2COMM** registry variable. Use the **db2 update dbm cfg** ***parameter_name*** **using** ***parameter_value*** command, where

   parameter_name
      Is the name of the parameter to be set.

   parameter_value
      Is the value of the parameter to be set.

   a. Set the **ssl_svr_keydb** configuration parameter to the fully qualified path of the key database file. For example:

      ```
      C:\TWS\installations\tws850cli\TWS\ssl\gskit\TWSClientKeyStore.kdb
      ```

      where:

      TWSClientKeyStore.kdb
         Is the fully-qualified file name of the KeyStore that stores the DB2 certificate, and the trusted certificates, for example the certificates for the eWAS server to connect to. This KeyStore can be the same one you specified in the localopts parameters. See "Setting localopts parameters for FIPS" on page 207. Note that it must be recognized by the JKS WebSphere Application Server certificate.

      If **ssl_svr_keydb** is null (unset), SSL support is not enabled.

   b. Set the **ssl_svr_stash** configuration parameter to the fully qualified path of the stash file. For example:

      ```
      C:\TWS\installations\tws850cli\TWS\ssl\gskit\TWSClientKeyStore.sth
      ```

      If **ssl_svr_stash** is null (unset), SSL support is not enabled.

   c. Set the **ssl_svr_label** configuration parameter to the label of the digital certificate of the server. If **ssl_svr_label** is not set, the default certificate in the key database is used. If there is no default certificate in the key database, SSL is not enabled. For example:

      ```
      "client"
      ```

   d. Set the **ssl_svcename** configuration parameter to the port that the DB2 database system listens on for SSL connections. If TCP/IP and SSL are both enabled (the **DB2COMM** registry variable is set to 'TCPIP, SSL'), set **ssl_svcename** to a different port than the port to which **svcename** is set. The **svcename** configuration parameter sets the port that the DB2 database system listens on for TCP/IP connections. If you set **ssl_svcename** to the same port as **svcename**, neither TCP/IP or SSL are enabled. If **ssl_svcename** is null (unset), SSL support is not enabled.

      Note:

         1) In HADR environments, do not set **hadr_local_svc** on the primary or standby database system to the same value as you set for **ssl_svcename**. Also, do not set **hadr_local_svc** to the same value as **svcename**, or **svcename** plus one.

         2) When the **DB2COMM** registry variable is set to 'TCPIP,SSL', if TCPIP support is not properly enabled, for example due to the **svcename** configuration parameter being set to null, the error SQL5043N is returned and SSL support is not enabled.

   e. (Optional) If you want to specify which cipher suites the server can use, set the **ssl_cipherspecs** configuration parameter. If you leave **ssl_cipherspecs** as null (unset), this allows GSKit to pick the strongest available cipher suite that is supported by both the client and the server.

f. Add the value SSL to the **DB2COMM** registry variable. For example:

```
db2set -i db2inst1 DB2COMM=SSL
```

The database manager can support multiple protocols at the same time. For example, to enable both TCP/IP and SSL communication protocols:

```
db2set -i db2inst1 DB2COMM=SSL,TCPIP
```

where:

db2inst1
Is the DB2 instance name.

Note: During the installation of a Tivoli Workload Scheduler master domain manager or backup master domain manager, it is necessary to enable the DB2 TCPIP port. DB2 can support both TCP/IP and SSL communications protocols at the same time. The DB2 administrator can set the TCPIP port with the command **`db2set DB2COMM=TCPIP, SSL`**. Use this command if you are installing a Tivoli Workload Scheduler master domain manager or backup master domain manager and already have a FIPS-enabled instance of DB2. After installation, you can choose to reset DB2COMM with only SSL.

g. Restart the DB2 instance. For example:

```
db2stop
db2starts
```

3. Insert the following default JSSE socket factories parameters in the java.security file of the Tivoli Workload Scheduler WebSphere Application Server:

```
ssl.SocketFactory.provider=com.ibm.jsse2.SSLSocketFactoryImpl
ssl.ServerSocketFactory.provider=com.ibm.jsse2.SSLServerSocketFactoryImpl
```

4. Restart DB2.

Note: It is not necessary to update the DB2 JVM. This is because you already updated the JVM of the embedded WebSphere Application Server in the procedure described in “Configuring embedded WebSphere Application Server for FIPS” on page 207.

For more information about how to configure DB2 to be FIPS compliant, see the DB2 documentation that describes how to configure Secure Sockets Layer (SSL) support in a DB2 instance.

Configuring the DB2 connection to Tivoli Workload Scheduler

After configuring DB2, you must configure Tivoli Workload Scheduler to communicate with the new settings of DB2. Perform the following procedure:

1. Modify the DB2 DataSource properties in wastools by running **`showDataSourceProperties`** and **`changeDataSourceProperties`** to include the following parameters:

```
DB2Type4PortNumber=nnnnn
DB2Type4SslConnection=true
```

where *nnnnn* is the SSL DB2 port number.

2. Restart the WebSphere Application Server.

Using Dynamic Workload Console and FIPS

To ensure that you connect to Dynamic Workload Console using FIPS, perform the following:

1. Enable Transport Layer Security (TLS) in your browser as follows:
   - To enable TLS in Internet Explorer, open the browser and click **Tools > Internet Options**. On the Advanced tab, select **Use TLS 1.0**.
   - To enable TLS in Mozilla Firefox, open the browser and click **Tools >Options >Advanced**. On the Encryption tab, select **Use TLS 1.0**.
   - To enable TLS on other internet browsers, see the product documentation for that browser.
2. Depending on your configuration, perform one of the following procedures:

   If you have a standalone instance of Dynamic Workload Console on embedded WebSphere Application Server:

   a. Configure FIPS on the embedded WebSphere Application Server of Dynamic Workload Console. See "Configuring embedded WebSphere Application Server for FIPS" on page 207.
   b. Restart the embedded WebSphere Application Server.

   If you have an instance of Dynamic Workload Console that shares an instance of Tivoli Workload Scheduler embedded WebSphere Application Server:

   a. Ensure that the Tivoli Workload Scheduler embedded WebSphere Application Server is FIPS-compliant. See "Configuring embedded WebSphere Application Server for FIPS" on page 207.
   b. In the Tivoli Workload Scheduler wastools, run **showDataSourceProperties** to ensure the following parameters are set:
      ```
      DB2Type4PortNumber=nnnnn
      DB2Type4SslConnection=true
      ```
      where *nnnnn* is the SSL DB2 port number.
   c. Restart the embedded WebSphere Application Server.

   If you have Dynamic Workload Console on an external WebSphere Application Server:

   a. Ensure that the WebSphere Application Server is FIPS-compliant. See "Configuring embedded WebSphere Application Server for FIPS" on page 207.

   | **If you have Dynamic Workload Console with a DB2 settings repository:**

   a. | Ensure that DB2 is FIPS-compliant. See "Configuring DB2 for FIPS" on page 209.
   b. | To ensure the required SSL connection between DB2 and Dynamic Workload Console, perform the following procedure:
      1) | Go to the Tivoli Workload Scheduler wastools directory and modify the TDWCDataSource properties to include the following parameters:
         ```
         useSslConnection=true
         deleteAndRecreate=true
         databasePort=nnnnn
         ```
         | where *nnnnn* is the SSL DB2 port number.

2) Run **installTDWCDataSource** by entering the following commands:

UNIX and Linux operating systems
InstallTDWCDataSource.sh TDWCDataSource.properties

Windows operating systems
InstallTDWCDataSource.bat TDWCDataSource.properties

c. Restart the embedded WebSphere Application Server.

3. If you are using Dynamic workload broker, set a secure connection by performing the following:
   a. In Dynamic Workload Console, access Tivoli Dynamic Workload Broker and expand the **Configuration** menu.
   b. Click **Server Connections**.
   c. In the Server Connections screen, select **Use Secure Connection**.
   d. Click **OK**.

Note: To enable communication between Dynamic Workload Console and DB2, configure the Java system properties in Dynamic Workload Console to use the trustStore. To do this, set the following Java system properties:

```
javax.net.ssl.trustStore
javax.net.ssl.trustStorePassword
```

For more information, see the DB2 documentation.

Configuring dynamic workload broker for FIPS

If you are using the dynamic workload broker component in your network, perform the following configurations:

- Configure the ita.ini file of every agent that will communicate with the dynamic workload broker component. Ensure that the ssl_port is set and set fips_enable = 1.
- If you are using Dynamic Workload Console, set a secure connection by performing the following:
  1. In Dynamic Workload Console, access dynamic workload broker and expand the **Configuration** menu.
  2. Click **Server Connections**.
  3. In the Server Connections screen, select **Use Secure Connection**.
  4. Click **OK**.

Configuring batch reports for FIPS

To configure batch reports for FIPS compliance, perform the following steps:

- Import the FIPS certificate from the database server to a Java trustStore on the client. Use the Java keytool utility to import the certificate into the trustStore.
- Edit the SDK java.security file located in the `INSTALL_DIR/java/jre/lib/security` directory to insert the **IBMJCEFIPS** provider (**com.ibm.crypto.fips.provider.IBMJCEFIPS**). **IBMJCEFIPS** must precede the **IBMJCE** provider in the provider list.

  The following is an example of the edited SDK java.security file:

```
security.provider.1=com.ibm.crypto.fips.provider.IBMJCEFIPS
security.provider.2=com.ibm.crypto.provider.IBMJCE
security.provider.3=com.ibm.jsse.IBMJSSEProvider
security.provider.4=com.ibm.jsse2.IBMJSSEProvider2
security.provider.5=com.ibm.security.jgss.IBMJGSSProvider
security.provider.6=com.ibm.security.cert.IBMCertPath
security.provider.7=com.ibm.crypto.pkcs11.provider.IBMPKCS11
security.provider.8=com.ibm.security.cmskeystore.CMSProvider
security.provider.9=com.ibm.security.jgss.mech.spnego.IBMSPNEGO
```

The following is an example of the edited java.security file if you are using the Oracle Java SE Development Kit:

```
security.provider.1=sun.security.provider.Sun
security.provider.2=com.ibm.crypto.fips.provider.IBMJCEFIPS
security.provider.3=com.ibm.crypto.provider.IBMJCE
security.provider.4=com.ibm.jsse.IBMJSSEProvider
security.provider.5=com.ibm.jsse2.IBMJSSEProvider2
security.provider.6=com.ibm.security.jgss.IBMJGSSProvider
security.provider.7=com.ibm.security.cert.IBMCertPath
security.provider.8=com.ibm.i5os.jsse.JSSEProvider
#security.provider.8=com.ibm.crypto.pkcs11.provider.IBMPKCS11
security.provider.9=com.ibm.security.jgss.mech.spnego.IBMSPNEGO
```

- Verify that the `keystore.type` parameter is the same as the value specified for `type` of the `keystore` in the `config.file`. The default value is `JKS`.

Configuring LDAP for FIPS

To be FIPS-compliant if you are using an LDAP server, before configuring LDAP, edit the security.xml file. Edit the following value:

```
"com.ibm.ssl.contextProvider" value="IBMJSSEFIPS"
```

Finding the GSKit version on agents running on UNIX and Linux operating systems

To find which version of GSKit runs on your agent, run the `gsk7ver` command.

On UNIX and Linux, you can optionally run the `ita_props.sh` script to set the environment to `/usr/Tivoli/TWS/GSKit/7d/bin`, so that you can run this command directly without having to specify the relative path.

Chapter 8. Data maintenance

This chapter describes how to maintain your Tivoli Workload Scheduler database and other data files. The database is hosted on either the DB2 or Oracle RDBMS infrastructure, as you determined when you installed it. You should use the documentation of DB2 or Oracle for general instructions on database maintenance. This chapter describes the maintenance activities that are specific to Tivoli Workload Scheduler.

It comprises the following sections:
- "Maintaining the database"
- "Maintaining the file system" on page 220
- "Administrative tasks - DB2" on page 225
- "Administrative tasks - Oracle" on page 231
- "Migrating data from DB2 to Oracle and *vice versa*" on page 233
- "Upgrading your database" on page 247
- | "Keeping track of database changes using audit reports" on page 263

Maintaining the database

This section discusses the following:
- Backing up and restoring files in the Tivoli Workload Scheduler databases. See "Backing up and restoring."
- Ensuring that a backup master domain manager is as up-to-date as possible. See "Using a backup master domain manager with a backup database."
- Maintaining the performance level of the Tivoli Workload Scheduler databases. See "Reorganizing the database" on page 219.

Backing up and restoring

To minimize downtime during disaster recovery, back up your master data files frequently to either offline storage or a backup master domain manager.

Backing up the database to offline storage

Run a frequent backup of the database to offline storage. Follow the instructions in the DB2 or Oracle documentation, as appropriate.

Tivoli Workload Scheduler is supplied with a utility that can be used for backup. It is called **`tws_inst_pull_info`**. Its primary use is as a tool to gather Tivoli Workload Scheduler information for IBM Software Support in the event of any problems arising. However, it can equally be used as a backup tool. It backs up the database (DB2 only), the configuration files and the log files.

This tool is described in *Tivoli Workload Scheduler: Troubleshooting Guide* and gives full details of what files are backed up, how to take a backup, and how to restore from one.

Using a backup master domain manager with a backup database

Set up a backup master domain manager that accesses a different database than the master domain manager, and get your database administrator to set up a mirror of the master domain manager's database onto the backup master domain manager's database. In this way your backup master domain manager not only receives copies of all the processing messages, as is provided for by the setting of the *FullStatus* attribute on the backup master domain manager, but is also able to access the mirrored database. The mirror frequency must be set high enough to match the frequency with which you change the database.

For more information about how to use a backup master domain manager, see "Changing a domain manager or dynamic domain manager" on page 269.

Backing up the configuration files

The configuration files used by Tivoli Workload Scheduler are found in the following places:

<TWA_home>/**TWS**
: For the user options file, `useropts`.

<TWA_home>/TWS/*.*
: For the `localopts`, `Sfinal`, `Security` and `*.msg` files

<TWA_home>/TWS/mozart/*.*
: This directory contains the following files:

  `runmsgno`
  : This is used for the allocation of unique prompt numbers. On the master domain manager this file should not be edited manually. On other workstations it can be edited only in the circumstances described in the *Tivoli Workload Scheduler: Troubleshooting Guide*. This file does not need to be backed up.

  `globalopts`
  : This is used to store a copy of three of the global properties stored in the database. If you have used versions of Tivoli Workload Scheduler prior to version 8.3 you will probably remember that it was an editable file that contained the global options. It is no longer used for this purpose. It must be edited only in the circumstances described in "Changing a master domain manager" on page 270. This file should be backed up if it is edited.

<TWA_home>/eWAS/profiles/TIPProfile/properties
: For the application server configuration file, `TWSConfig.properties`

<TWA_home>/eWAS/profiles/TIPProfile/config
: This contains the other configuration files for the embedded WebSphere Application Server. Do not back them up manually. A utility to back them up is described in "Application server - configuration files backup and restore" on page 307.

<TWA_home>/TWS/schedForecast
: For forecast plan files.

<TWA_home>/TWS/schedlog
: For archived plan files.

<TWA_home>/TWS/schedTrial
: For trial plan files.

A detailed list of all files is not supplied, as there are too many files. Back up all the files in these directories.

Note: The **tws_inst_pull_info** tool (described in the *Tivoli Workload Scheduler: Troubleshooting Guide*) is provided for sending information to support, but can also be used to perform a backup of a DB2 database and some of the configuration files.

Backing up log files

Make a regular offline backup of all log files, identifying them from the information given in the section on log and trace files in the *Tivoli Workload Scheduler: Troubleshooting Guide*.

If you use **tws_inst_pull_info** for backup (see the documentation in the same guide), you do not need to separately backup these files.

Reorganizing the database

The database requires routine maintenance, as follows:

DB2 The DB2 database has been set up to maintain itself, so there is little user maintenance to do. Periodically, DB2 checks the database by running an internal routine. DB2 determines when this routine must be run using a default policy. This policy can be modified, if need be, or can be switched off so that DB2 does not perform internal automatic maintenance. Using the statistical information that DB2 discovers by running this routine, it adjusts its internal processing parameters to maximize its performance.

This routine has also been made available for you to run manually in the case either where you feel that the performance of DB2 has degraded, or because you have just added a large amount of data , and anticipate performance problems. The routine is imbedded in a tool called **dbrunstats**, which can be run to improve performance while DB2 is processing data without causing any interruption.

It is also possible to physically and logically reorganize the database using the **dbreorg** script. This effectively recreates the *tablespace* using its internal algorithms to determine the best way to physically and logically organize the tables and indexes on disk. This process is time-consuming, and requires that Tivoli Workload Scheduler is down while it is run, but it does provide you with a freshly reorganized database after major changes.

The use of these tools is described in “Administrative tasks - DB2” on page 225.

These tools are implementations of standard DB2 facilities. If you are an expert user of DB2 you can use the standard facilities of DB2 to achieve the same results. For details go to the Information Center for DB2, version 9.5, at: http://publib.boulder.ibm.com/infocenter/db2luw/v9r5//index.jsp.

Oracle For Oracle databases see the Oracle maintenance documentation.

Oracle 10g by default has an internally scheduled procedure to collect database statistics: if the default schedule is not changed, Oracle 10g will automatically optimize its performance by running this procedure daily. Oracle 9i does not have the same schedule by default, but could be set up to do so.

Maintaining the file system

Some of the file systems and directories need periodic maintenance. The details are given under the following topics:

- "Avoiding full file systems"
- "Log files and archived files" on page 223
- "Temporary files" on page 225
- "Managing event message queue file sizes" on page 225

Avoiding full file systems

Perhaps the most important maintenance task to perform is that of regularly controlling the file system or systems where Tivoli Workload Scheduler is installed, particularly on the master domain manager.

Tivoli Workload Scheduler has a number of files that can grow in size, either with more extensive use, such as the Symphony file, or in the event of network problems, such as the message files. If the Symphony file, in particular, cannot be expanded to contain all the required records, it might become corrupted. If this happens on a fault-tolerant agent or on a domain manager other than the master domain manager, there is a recovery procedure (see the *Tivoli Workload Scheduler: Troubleshooting Guide*). If the Symphony file on the master domain manager is corrupted, you have no alternative but to restart Tivoli Workload Scheduler, losing the current plan's workload.

It is thus *most important* that you monitor the available space on the file system of the master domain manager where the Symphony file is generated, to ensure that there is always sufficient space for it to expand to cover any workload peaks, and also that there is sufficient space for message files to expand in the event of network problems. Your experience with your workload and your network will guide you to determine what are the acceptable limits of available disk space.

The approximate size of the Symphony file can be estimated in advance. It contains items related both to the plan (see Table 46) and to the database (see Table 47 on page 221). Estimate how many items you have in each category, multiply them by the indicated size in bytes, and sum them to find the approximate Symphony file size:

Table 46. Algorithm for calculating the approximate size of the plan data in the Symphony file

Data in Symphony file from the current plan	Bytes per instance
Per job stream instance:	512
Per job instance:	512
Per job "docommand" string > 40 bytes:	The length of the "docommand" string
Per ad hoc prompt:	512
Per file dependency:	512
Per recovery prompt:	512
Per recovery job:	512

Table 47. Algorithm for calculating the approximate size of the database data in the Symphony file

Data in Symphony file from the database (on the master domain manager)	Bytes per instance
Per workstation:	512
Per resource:	512
Per Windows user:	256
Per prompt:	512
If the global option `ignoreCalendars` is set to *off*, per calendar:	512

If you find that disk space is becoming too limited, and you cannot dynamically extend it, you must create a backup master domain manager with much more space on its file system and then use the **`switchmgr`** command so that the backup becomes your new domain manager. Instructions on how to do this for any domain manager are given in "Changing a domain manager or dynamic domain manager" on page 269, and in particular for a master domain manager, in "Changing a master domain manager" on page 270.

Monitoring the disk space used by Tivoli Workload Scheduler

You can use event-driven workload automation (EDWA) to monitor the disk space used by Tivoli Workload Scheduler and to start a predefined set of actions when one or more specific events take place. You can use EDWA to monitor the used disk space, to verify that there is enough space to generate the Symphony and log files, and to allow the product to work correctly. For more information about event-driven workload automation, refer to *Tivoli Workload Scheduler: User's Guide and Reference*.

The following .XML file contains the definition of a sample event rule to monitor the disk filling percentage. This event rule calls the MessageLogger action provider to write a message in a log file in an internal auditing database. If the condition described in the rule is already existing when you deploy the rule, the related event is not generated. For more information about the MessageLogger action provider, refer to *Tivoli Workload Scheduler: User's Guide and Reference*::

```
<?xml version="1.0"?>
<eventRuleSet  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="http://www.ibm.com/xmlns/prod/tws/1.0/event-management/rules"
  xsi:schemaLocation="http://www.ibm.com/xmlns/prod/tws/1.0/event-management/rules
   http://www.ibm.com/xmlns/prod/tws/1.0/event-management/rules/EventRules.xsd">
 <eventRule name="FILESYSTEMFULL" ruleType="filter" isDraft="yes">
  <eventCondition name="twsDiskMonEvt1" eventProvider="TWSApplicationMonitor" eventType="TWSDiskMonitor">
   <scope>
    * Disk is filling up
   </scope>
   <filteringPredicate>
    <attributeFilter name="FillingPercentage" operator="ge">
     <value>filling_percentage</value>
    </attributeFilter>
    <attributeFilter name="Workstation" operator="eq">
     <value>workstation_name</value>
    </attributeFilter>
    <attributeFilter name="SampleInterval" operator="eq">
     <value>sample_interval</value>
    </attributeFilter>
    <attributeFilter name="MountPoint" operator="eq">
     <value>mount_point</value>
    </attributeFilter>
   </filteringPredicate>
  </eventCondition>
  <action actionProvider="MessageLogger" actionType="MSGLOG" responseType="onDetection">
   <scope>
    OBJECT=ADWDAD MESSAGE=Disk is filling up
   </scope>
   <parameter name="ObjectKey">
    <value>object_key</value>
   </parameter>
   <parameter name="Severity">
    <value>message_severity</value>
   </parameter>
   <parameter name="Message">
    <value>log_message</value>
   </parameter>
  </action>
 </eventRule>
```

where:

filling_percentage
Is the filling percentage. Supported operators are as follows:

ge causes the event generation when the disk filling percentage increases over the threshold value. The event is generated only the first time the specified disk filling percentage is reached. If you restart the SSM agent and the filling percentage is higher than the threshold value, the event is generated again. Table 48 provides an example in which the **ge** operator is set to 70%.

Table 48. Example for the ge operator

Mailbox name	Filling percentage	Action
Sample (0)	>= 70%	event not generated
Sample (0)	< 70%	event not generated
Sample (n-1)	< 70%	event not generated
Sample (n)	>= 70%	event generated
Sample (n+1)	>= 70%	event not generated

le causes the event generation when the disk filling percentage decreases under the threshold value. The event is generated only the first time the specified disk filling percentage is reached. If you restart the SSM agent and the filling percentage is lower than the threshold value, the event is not generated until the filling percentage increases over the threshold value and then decreases under it again. Table 49 provides an example in which the **le** operator is set to 50%:

Table 49. Example for the le operator

Mailbox name	Filling percentage	Action
Sample (0)	<= 50%	event not generated
Sample (0)	> 50%	event not generated
Sample (n-1)	> 50%	event not generated
Sample (n)	<= 50%	event generated
Sample (n+1)	<= 50%	event not generated

workstation_name
: Is the workstation on which the event is generated.

sample_interval
: Is the interval, expressed in seconds, for monitoring the disk filling percentage.

mount_point
: Is the mount point of the file system where Tivoli Workload Scheduler is installed, for example: "C:" on Windows systems or "/" on UNIX systems.

object_key
: Is a key identifying the object to which the message pertains.

message_severity
: Is the severity of the message.

log_message
: Is the message to be logged.

Log files and archived files

Log files are produced from a variety of Tivoli Workload Scheduler activities. Other activities produce files which are archived after they have been used. The details are given in Table 50:

Table 50. Log and trace file maintenance

Activity	Description	Location	Maintenance method
Process	Each Tivoli Workload Scheduler process logs its activities, writing them in log and trace message files:		

	Log messages
	
	These are messages intended for use directly by you, and provide information, errors and warnings about the processes.
		netman
		`<`*`TWA_home`*`>/TWS/stdlist/logs/<`*`yyyymmdd`*`>_NETMAN.log`
		Other processes
		`<`*`TWA_home`*`>/TWS/stdlist/logs/<`*`yyyymmdd`*`>_TWSMERGE.log`
		This is the default situation. You can set an option in the `localopts` file to create separate log files for the major processes.
			`rmstdlist`

	Trace messages
	
	These are messages written when a problem occurs that you can probably not solve without the assistance of IBM Software Support.
		netman
		`<`*`TWA_home`*`>/TWS/stdlist/traces/<`*`yyyymmdd`*`>_NETMAN.log`
		Other processes
		`<`*`TWA_home`*`>/TWS/stdlist/traces/<`*`yyyymmdd`*`>_TWSMERGE.log`
		This is the default situation. You can set an option in the `localopts` file to create separate trace files for the major processes.	

Master domain manager job management	The job manager process on the master domain manager archives the previous period's `Symphony` file.	`<`*`TWA_home`*`>/TWS/schedlog`	Manual

Table 50. Log and trace file maintenance (continued)

Activity	Description	Location	Maintenance method
Job	Each job that runs under Tivoli Workload Scheduler control creates an output file. These files are archived.	`<TWA_home>/TWS/stdlist/<date>` where *<date>* is in the format `yyyy.mm.dd`	**`rmstdlist`**
Forecast and trial plan creation	The creation of forecast and trial plans writes to a log file.	**Trial** `<TWA_home>/TWS/schedTrial/*.log` **Other processes** `<TWA_home>/TWS/schedForecast/*.log`	Manual
Audit	The audit facility writes log files.	`<TWA_home>/TWS/audit`	Manual
DB2 UDB	DB2 logs its activities.	Information about the location and viewing method for DB2 log files is supplied in the DB2 documentation. Go to the Information Center for DB2 (see *Tivoli Workload Automation: Publications* for the link). The main file to control is the `db2diag.log` file, which is the most important DB2 diagnostic file, which, without intervention, grows endlessly with no reuse of wasted space. This does not apply, however, to the database log files used by Tivoli Workload Scheduler, which are set up for circular reuse of disk space, so they don't grow in size over a maximum value.	See the DB2 documentation.
Oracle database	Oracle logs its activities.	See the Oracle documentation.	See the Oracle documentation.
The embedded WebSphere Application Server	The application server writes log files	`<TWA_home>/eWAS/profiles/TIPProfile/logs/` `ffdc` `server1`	Manual
Netcool SSM monitoring agent	The agent writes log files	`<TWA_home>/ssm/Log/` `ssmagent.log` `traps.log`	Manual
Other	Other activities also write trace and log files.	`<TWA_home>/TWS/methods`	Manual

The easiest method of controlling the growth of these directories is to decide how long the log files are needed, then schedule a Tivoli Workload Scheduler job to remove any files older than the given number of days. Use the **`rmstdlist`** command for the process and job log files, and use a manual date check and deletion routine for the others. Make sure that no processes are using these files when you perform these activities.

See the *Tivoli Workload Scheduler: User's Guide and Reference* for full details of the **`rmstdlist`** command.

Note: The **rmstdlist** command might give different results on different platforms for the same scenario. This is because on UNIX platforms the command uses the *–mtime* option of the **`find`** command, which is interpreted differently on different UNIX platforms.

Temporary files

The Tivoli Workload Scheduler master domain manager uses temporary files, located in `<TWA_home>/TWS/tmp` or `/tmp` and named `TWS<XXXX>`, when compiling new production control databases. These files are deleted when compiling is complete.

This directory also contains the Tivoli Workload Scheduler installation files and log files.

Managing event message queue file sizes

This publication contains the following information with respect to managing event message queue file sizes:

- See "Planning space for queues" on page 168 to learn about planning space for message event queues (and also how to use **`evtsize`** to resize the queues
- See "Managing the event processor" on page 297 to learn about managing the EIF event queue
- See "Disk Space" on page 323 to learn about the impacts that increased fault tolerance can have on message queues
- See "Workload spreading" on page 320 to learn about how to avoid bottlenecks in the `Mailbox.msg` queue.

Administrative tasks - DB2

This section describes how to perform some specific administrative tasks on DB2, as follows:

- "Changing DB2 passwords"
- "Locating the DB2 tools"
- "User permissions for running the DB2 tools" on page 226
- "Administering the DB2 maintenance feature" on page 226
- "Reorganizing the DB2 database" on page 228
- "Monitoring the lock list memory" on page 229

Changing DB2 passwords

To change passwords used by DB2 other than the <*TWS_user*> password or the passwords of the user IDs used by Tivoli Workload Scheduler to access the database (see "Changing key Tivoli Workload Scheduler passwords" on page 274) follow the instructions in the DB2 documentation; they do not directly impact Tivoli Workload Scheduler.

Locating the DB2 tools

Tivoli Workload Scheduler is supplied with a small set of tools that you use to perform the following administrative tasks for DB2:

- Run the DB2 statistics program, to maximize the performance of DB2 (dbrunstats). See "Running DB2 maintenance manually" on page 227 for a full description of how to use the tool.

- Reorganize the database (dbreorg). See “Reorganizing the DB2 database” on page 228 for a full description of how to use the tool.

Find these tools in the following directory:

```
<TWA_home>/TWS/dbtools/db2/scripts
```

Note: The tools in this directory include some that are for the use of IBM Software Support:

dbcatalog
dbsetup

Do not run these scripts. To do so might damage or overwrite the data in your database.

User permissions for running the DB2 tools

The DB2 tools must be run by a user who has the following permissions:

- DB2 administrator permissions – the user must be defined to DB2 as a DB2 Administrator
- Full access (777) to the Tivoli Workload Scheduler installation directory

Administering the DB2 maintenance feature

At installation, DB2 automatic maintenance is switched on, which means that DB2 periodically checks to see if it needs to collect new database statistics, so that it can perform the maintenance, adjusting the performance parameters to maximize performance.

This section describes how to administer the automatic maintenance, by changing how and when it is run, switching it off and on again, and running it manually. See the following:

- “Modifying the DB2 automatic maintenance policy”
- “Switching off automatic maintenance”
- “Switching on automatic maintenance” on page 227
- “Running DB2 maintenance manually” on page 227

Modifying the DB2 automatic maintenance policy

To know when and how the statistics used by the automatic maintenance must be collected, DB2 uses a default policy, which can be customized. The procedure is as follows:

1. Right-click the database in the DB2 Control Center and select **Configure Automatic Maintenance** from the context menu.
2. Follow the instructions in the wizard, modifying any of the default policy parameters that you think might improve the way DB2 chooses when to run the automatic maintenance.

Switching off automatic maintenance

If you want to take full manual control of the database, switch off the automatic maintenance as follows:

1. Check that the user who is going to run the procedure has the appropriate rights (see “User permissions for running the DB2 tools”)
2. On the DB2 server computer, open a DB2 shell, as follows:

   UNIX Follow these steps:

   a. Issue the command **su - db2inst1**, or change to the subdirectory `sqllib` of the home directory of the owner of the DB2 instance (by default *db2inst1*)
   b. Launch the command **. ./db2profile**

   Windows
   Select from the **Start** menu, **Programs** → **IBM DB2** → **Command Line Tools** → **Command Window**

3. Check that the command shell is correctly initialized by issuing the command **db2**, and checking that the command is recognized.
4. Issue the command **quit** to leave the DB2 Processor mode.
5. Issue the following command:

   ```
   db2 UPDATE DB CFG FOR <database_name> USING AUTO_MAINT OFF
   ```

   where <*database_name*> is the name of the Tivoli Workload Scheduler database (the installed default name is *TWS*; supply this value unless you have changed it).
6. To make the changes effective, either disconnect and reconnect all the DB2 clients, or restart the DB2 instance (using **db2stop** and **db2start**).

Switching on automatic maintenance

To switch the automatic maintenance back on again, do as follows:

1. Check that the user who is going to run the procedure has the appropriate rights (see "User permissions for running the DB2 tools" on page 226)
2. On the DB2 server computer, open a DB2 shell, as follows:

   UNIX Follow these steps:
   a. Issue the command **su - db2inst1**, or change to the subdirectory `sqllib` of the home directory of the owner of the DB2 instance (by default *db2inst1*)
   b. Launch the command **. ./db2profile**

   Windows
   Select from the **Start** menu, **Programs** → **IBM DB2** → **Command Line Tools** → **Command Window**

3. Check that the command shell is correctly initialized by issuing the command **db2**, and checking that the command is recognized.
4. Issue the command **quit** to leave the DB2 Processor mode.
5. Issue the following command:

   ```
   db2 UPDATE DB CFG FOR <database_name> USING AUTO_MAINT ON
   ```

   where <*database_name*> is the name of the Tivoli Workload Scheduler database (the installed default name is *TWS*; supply this value unless you have changed it).
6. To make the changes effective, either disconnect and reconnect all the DB2 clients, or restart the DB2 instance (using **db2stop** and **db2start**).

Running DB2 maintenance manually

This section describes how to perform the DB2 maintenance process on demand, instead of waiting for DB2 to do it according to its automatic maintenance policy. The process is run by the tool **dbrunstats** which you can run whenever you need to, without stopping DB2 or interrupting its processing.

To run this tool, follow this procedure:

1. Locate the DB2 tools: see "Locating the DB2 tools" on page 225.

2. Check that the user who is going to run the procedure has the appropriate rights (see “User permissions for running the DB2 tools” on page 226)
3. Open a DB2 shell, as follows:

   UNIX Follow these steps:

   a. Issue the command **`su - db2inst1`**, or change to the subdirectory `sqllib` of the home directory of the owner of the DB2 instance (by default *db2inst1*)
   b. Launch the command **`. ./db2profile`**

   Windows
   Select from the **Start** menu, **Programs** → **IBM DB2** → **Command Line Tools** → **Command Window**
4. Check that the command shell is correctly initialized by issuing the command **`db2`**, and checking that the command is recognized.
5. Issue the command **`quit`** to leave the DB2 Processor mode.
6. From within the shell, change to the directory `<`*`TWA_home`*`>/TWS/dbtools/db2/scripts`
7. Run the script:

   UNIX **`dbrunstats.sh database [user [password]]`**

   Windows
   `dbrunstats database [user [password]]`

   where:

   database
   The name of the database:
   - If you are running this from the computer where the DB2 server is installed, the installed default name is *TWS*. Supply this value unless you have changed it.
   - If you are running this from the computer where the DB2 client is installed, the installed default name is *TWS_DB*. Supply this value unless you have changed it.

   user The DB2 administration user. If this is omitted the ID of the user running the command will be used.

   password
   The password of the DB2 administration user. If this is omitted it will be requested interactively.

   The script runs, giving you various messages denoting its progress and successful conclusion. At the end (it is not particularly time-consuming) the database performance parameters have been reset to maximize performance.

Reorganizing the DB2 database

Using this tool, the database physically reorganizes the data tables and indexes, optimizing disk space usage and ease of data access. The process is time-consuming, requires that the database is backed up, and that Tivoli Workload Scheduler is stopped. However, at the end you have a database that is completely reorganized.

To reorganize the database follow this procedure:

1. Back up the Tivoli Workload Scheduler database. Use the method described in “Backing up the database to offline storage” on page 217.

2. Stop all Tivoli Workload Scheduler processes. See "Unlinking and stopping Tivoli Workload Scheduler" on page 283 for full details.
3. Check that the user who is going to run the procedure has the appropriate rights (see "User permissions for running the DB2 tools" on page 226)
4. Open a DB2 shell, as follows:

   UNIX Follow these steps:

   a. Issue the command **`su - db2inst1`**, or change to the subdirectory `sqllib` of the home directory of the owner of the DB2 instance (by default *db2inst1*)
   b. Launch the command **`. ./db2profile`**

   Windows
   Select from the **Start** menu, **Programs** → **IBM DB2** → **Command Line Tools** → **Command Window**
5. Check that the command shell is correctly initialized by issuing the command **`db2`**, and checking that the command is recognized.
6. Issue the command **`quit`** to leave the DB2 Processor mode.
7. From within the shell, change to the directory `<TWA_home>/TWS/dbtools/db2/scripts`
8. Run the script:

   UNIX **`dbreorg.sh database [user [password]]`**

   Windows
   `dbreorg database [user [password]]`

   where:

   database
   The name of the database:
   - If you are running this from the computer where the DB2 server is installed, the installed default name is *TWS*. Supply this value unless you have changed it.
   - If you are running this from the computer where the DB2 client is installed, the installed default name is *TWS_DB*. Supply this value unless you have changed it.

   user The DB2 administration user. If this is omitted the ID of the user running the command will be used.

   password
   The password of the DB2 administration user. If this is omitted it will be requested interactively.

   The script runs, giving you various messages denoting its progress and successful conclusion.
9. Restart Tivoli Workload Scheduler.

Monitoring the lock list memory

If the memory that DB2 allocates for its lock list begins to be fully used, DB2 can be forced into a "*lock escalation*", where it starts to lock whole tables instead of just individual table rows, and increasing the risk of getting into a deadlock.

This happens especially when there are long transactions, such as the creation or extension of a plan (production, trial, or forecast).

To avoid this problem occurring, set the automatic notification in the DB2 Health Center, so that you can be advised of any lock list problems building up.

However, if you think that deadlock situations have been occurring, follow this procedure to verify:

1. With the WebSphere Application Server active, log on as DB2 administrator to the DB2 server, for example,

   su - db2inst1
2. Run the following command to determine where the Tivoli Workload Scheduler database is located:

   db2 list active databases

   The output might be as follows:
   ```
   Database name                   = TWS
   Applications connected currently = 2
   Database path                   = /home/db2inst1/db2inst1/NODE0000/SQL00002/
   ```
3. Run:

   cd <Database path>/db2event/db2detaildeadlock
4. Connect to the Tivoli Workload Scheduler database, for example:

   db2 connect to TWS
5. Flush the event monitor that watches over deadlocks (active by default) with the following:

   db2 flush event monitor db2detaildeadlock
6. Disconnect from the database with:

   db2 terminate
7. Obtain the event monitor output with:

   db2evmon -path . > deadlock.out

   The file `deadlock.out` now contains the complete deadlock history since the previous flush operation.
8. To find out if there have been deadlocks and when they occurred, run:

   grep "Deadlock detection time" deadlock.out

   The output might be as follows:
   ```
   Deadlock detection time: 11/07/2008 13:02:10.494600
   Deadlock detection time: 11/07/2008 14:55:52.369623
   ```
9. But the fact that a deadlock occurred does not necessarily mean that the lock list memory is inadequate. For that you need to establish a relationship with lock escalation. To find out if there have been lock escalation incidents prior to deadlocks, run:

   grep "Requesting lock as part of escalation: TRUE" deadlock.out

   The output might be as follows:
   ```
   Requesting lock as part of escalation: TRUE
   Requesting lock as part of escalation: TRUE
   ```
   If there has been lock escalation related to deadlocks, it is a good idea to modify the values of the following parameters.

   LOCKLIST
      This configures, in 4KB pages, the amount of memory allocated to locking management

MAXLOCKS
This configures the percentage of the memory that a single transaction can use, above which DB2 escalates, even though the memory might not be full

10. To determine the values currently being applied to the Tivoli Workload Scheduler database, do the following:

    ```
    db2 get db cfg for TWS | grep LOCK
    ```

    The output might be as follows:

    ```
    Max storage for lock list (4KB)              (LOCKLIST) = 8192
    Percent. of lock lists per application       (MAXLOCKS) = 60
    Lock timeout (sec)                        (LOCKTIMEOUT) = 180
    ```

    The example shows the typical output for the Tivoli Workload Scheduler database if no modification has taken place to these values:
    - "8192" = 4KB x 8192 pages = 32 MB of memory
    - "60" = 60% – the percentage of memory that a single transaction can occupy before triggering an escalation
    - "180" = 3 minutes of timeout for the period a transaction can wait to obtain a lock
11. The most straightforward action to take is to double the amount of memory to 64MB, which you do with the command:

    ```
    db2 update db cfg for TWS using LOCKLIST 16384 immediate
    ```
12. Alternatively, you can set DB2 to automatically modify the LOCKLIST and MAXLOCKS parameters according to the amount of escalation being experienced and the available system memory. This self-tuning is a slow process, but adapts the database to the needs of the data and the available system configuration. It is done by setting the values of these parameters to AUTOMATIC, as follows:

    ```
    db2 update db cfg for TWS using LOCKLIST AUTOMATIC immediate
    ```

    DB2 responds with messages telling you that MAXLOCKS has also been set to AUTOMATIC:

    ```
    SQL5146W "MAXLOCKS" must be set to "AUTOMATIC" when "LOCKLIST" is
    "AUTOMATIC".
    "MAXLOCKS" has been set to "AUTOMATIC"
    ```

    Note: The self-tuning facility is only available from V9.1 of DB2.

Administrative tasks - Oracle

This section describes how to perform some specific administrative tasks for the Oracle database.
- "Changing the Oracle access password" on page 232
- "Locating the Oracle tools" on page 232
- "Maintaining the Oracle database" on page 232
- "Obtaining information about the Tivoli Workload Scheduler databases installed on an Oracle instance" on page 232
- "User permissions for running the Oracle tools" on page 233
- "Changing the Oracle host name, port, or database name" on page 291

Changing the Oracle access password

This is described as part of the process of changing the password for a master domain manager or backup master domain manager. See “Changing key Tivoli Workload Scheduler passwords” on page 274.

Locating the Oracle tools

Tivoli Workload Scheduler is supplied with a small set of tools that you use to perform the following administrative tasks for Oracle:

- Grant the user permissions for the Dynamic Workload Console views (`dbgrant`). See the Dynamic Workload Console online help for full details.
- Migrating from DB2 to Oracle or vice versa (`prepareSQLScripts`, `createdb_root_ora`, `updateSetupCmdLine`). See “Migrating data from DB2 to Oracle and *vice versa*” on page 233 for full details.

Locate these tools in the following directory:

```
<TWA_home>/TWS/dbtools/oracle/scripts
```

Note: The directory also includes some scripts that are only for the use of IBM Software Support:

dbmigrate
dbpartition
dbsetup
dbupgrade
launchdb_root_ora
_migratedb_root_ora

Do not run these scripts. To do so might damage or overwrite the data in your database.

Maintaining the Oracle database

Like DB2, Oracle has a routine that regularly maintains the database. Similarly, this too can be run manually. The tool is invoked as follows:

```
dbms_stats.gather_schema_stats<schema_owner>
```

See the Oracle documentation for full details of how and when to run it.

Obtaining information about the Tivoli Workload Scheduler databases installed on an Oracle instance

To determine which Tivoli Workload Scheduler databases are installed on an Oracle instance, do the following:

```
su - oracle (UNIX only)
sqlplus system/<system_password>@<service_name>
SQL> select * from all_tws_schemas;
```

The output should look like the following:

```
SCHEMA_NAME
------------------------------
MDL
mdm85TWS_user
```

Note:

1. More than one instance of Tivoli Workload Scheduler can be shared in one instance of Oracle, using different schemas.
2. In Oracle, the concept of "schema" and "user" are the same, so dropping an Oracle schema means dropping an Oracle user, which you do as follows:

   ```
   SQL> drop user MDL cascade;
   ```

User permissions for running the Oracle tools

The Oracle tools must be run by a user who has the following permissions:

- Oracle administrator permissions – the user must be defined to Oracle as an administrator
- Full access (777) to the Tivoli Workload Scheduler installation directory

Migrating data from DB2 to Oracle and *vice versa*

This section applies to Tivoli Workload Scheduler master domain managers and backup masters. It documents how to migrate the Tivoli Workload Scheduler data from one RDBMS to another.

There are two ways to accomplish the migration. You can use either way to migrate your data from DB2 to Oracle or vice versa.

Parallel data migration
The migration is between two instances of Tivoli Workload Scheduler, one that uses DB2 while the other uses Oracle

Reconfiguration
The database is migrated from one RDBMS support mechanism to another, and Tivoli Workload Scheduler instance is re-configured to point to a different database without installing another instance.

Note: Neither of these procedures migrate the following information from the source database:

- The pre-production plan
- The history of job runs and job statistics
- The state of running event rule instances. This means that any complex event rules, where part of the rule has been satisfied prior to the database migration, are generated after the migration as new rules. Even if the subsequent conditions of the event rule are satisfied, the record that the first part of the rule was satisfied is no longer available, so the rule will never be completely satisfied.

The following sections describe the migration procedures.

- "Parallel data migration from DB2 to Oracle" on page 234
- "Parallel data migration from Oracle to DB2" on page 235
- "Reconfiguration from DB2 to Oracle" on page 237
- "Reconfiguration from Oracle to DB2" on page 242

Parallel data migration from DB2 to Oracle

With the following steps all scheduling object definitions and global options can be migrated from the DB2 database of a Tivoli Workload Scheduler version 8.5 instance to the Oracle database of another instance.

1. Fresh-install another instance of a Tivoli Workload Scheduler version 8.5 master domain manager and make it point to an Oracle database.
2. Use **`composer`**, the Dynamic Workload Console to define this instance as a fault-tolerant agent in the database of the current master domain manager that points to DB2.
3. On the master domain manager that points to DB2 run the `dataexport` command or script to export all scheduling object definitions and global options from DB2. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler home directory.

   Run `dataexport` from a Windows or UNIX command prompt as follows:

   ```
   dataexport <source_dir> <export_dir>
   ```

   where:

   source_dir
   : The installation directory of the instance of Tivoli Workload Scheduler version 8.5 that points to the DB2 database.

   export_dir
   : The directory where the export files are to be created.

   For example:

   ```
   dataexport.cmd F:\TWS85\twsDB2user F:\TWS85\export
   ```

   The object definitions and the global options are retrieved from the DB2 database and placed in the `F:\TWS85\export` directory.
4. Verify the following files were created in `export_dir`:
   - calendars.def
   - jobs.def

     Note: The record length supported by DB2 is 4095 characters, but it decreases to 4000 characters with Oracle. When you migrate your job definitions to Oracle, any job scripts or commands exceeding 4000 characters in length are not migrated. In such case, the data import utility replaces the job definition with a dummy job definition and sets the job priority to 0, guaranteeing that successors are not run.
   - globalOpts.def
   - erules.def
   - parms.def
   - prompts.def
   - resources.def
   - scheds.def
   - topology.def
   - users.def (includes encrypted user passwords)
5. On the master domain manager that points to DB2 do the following:
   a. Ensure that the carry forward option is set to `ALL`. Run:

      ```
      optman chg cf=ALL
      ```
   b. Add the new instance (that you installed in step 1 and that you momentarily defined as a fault-tolerant agent) in the current plan. To do this, run:

```
JnextPlan -for 0000
```

c. Check that the new instance was linked by running:

```
conman sc
```

6. On the new instance run the `dataimport` command or script to import all scheduling object definitions and global options to the Oracle database. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler home directory.

   Run `dataimport` from a Windows or UNIX command prompt as follows:

   ```
   dataimport <source_dir> <export_dir>
   ```

   where:

   source_dir
   The installation directory of the new instance of Tivoli Workload Scheduler version 8.5 pointing to the Oracle database.

   export_dir
   The directory from where the export files are to be read from. This directory is the same `export_dir` directory specified for `dataexport`.

   For example:

   ```
   dataimport.cmd F:\TWS85\twsORACLEuser F:\TWS85\export
   ```

   The object definitions and the global options are retrieved from the `F:\TWS85\export` directory and stored in the Oracle database.

7. On the master domain manager that points to DB2 run the `conman switchmgr` command to make the Tivoli Workload Scheduler instance pointing to Oracle as the acting master domain manager. For information on this command see *User's Guide and Reference*.

You have now completed the data migration steps.

Parallel data migration from Oracle to DB2

With the following steps all scheduling object definitions and global options can be migrated from the Oracle database of a Tivoli Workload Scheduler version 8.5 instance to the DB2 database of another instance (freshly installed or upgraded to version 8.5).

1. On the current master domain manager pointing to the Oracle database run the `dataexport` command or script to export all scheduling object definitions and global options. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler home directory.

   Run `dataexport` from a Windows or UNIX command prompt as follows:

   ```
   dataexport <source_dir> <export_dir>
   ```

   where:

   source_dir
   The installation directory of the instance of Tivoli Workload Scheduler that points to the Oracle database.

   export_dir
   The directory where the export files are to be created.

   For example:

   ```
   dataexport.cmd F:\TWS85\twsORACLEuser F:\TWS85\export
   ```

The object definitions and the global options are retrieved from the Oracle database and placed in the `F:\TWS85\export` directory.

2. Verify the following files were created in `export_dir`:
   - calendars.def
   - erules.def
   - jobs.def
   - globalOpts.def
   - parms.def
   - prompts.def
   - resources.def
   - scheds.def
   - topology.def
   - users.def (includes encrypted user passwords)
3. Fresh-install another instance of Tivoli Workload Scheduler version 8.5 or upgrade an existing instance to version 8.5 making it point to a DB2 database.
4. Use composer or the Dynamic Workload Console to define this instance as a fault-tolerant agent in the database of the master domain manager that points to Oracle.
5. On the current master domain manager that points to Oracle do the following:
   a. Ensure that the carry forward option is set to `ALL`. Run:
      ```
      optman chg cf=ALL
      ```
   b. Add the new instance (that you installed in step 3 and that you momentarily defined as a fault-tolerant agent) in the current plan. To do this, run:
      ```
      JnextPlan -for 0000
      ```
   c. Check that the new instance was linked by running:
      ```
      conman sc
      ```
6. On the new instance run the `dataimport` command or script to import all scheduling object definitions and global options to DB2. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler home directory.

   Run `dataimport` from a Windows or UNIX command prompt as follows:
   ```
   dataimport <source_dir> <export_dir>
   ```
   where:

   source_dir
      The installation directory of the instance of Tivoli Workload Scheduler that points to the DB2 database.

   export_dir
      The directory from where the export files are to be read from. This directory is the same `export_dir` directory specified for `dataexport`.

   For example:
   ```
   dataimport.cmd F:\TWS85\twsDB2user F:\TWS85\export
   ```
   The object definitions and the global options are retrieved from the `F:\TWS85\export` directory and stored in the DB2 database.
7. On the master domain manager that points to Oracle run the `conman switchmgr` command to make the Tivoli Workload Scheduler instance pointing to DB2 as the acting master domain manager. For information on the `switchmgr`command see *User's Guide and Reference*.

You have now completed the data migration steps.

Reconfiguration from DB2 to Oracle

With the following steps all scheduling object definitions and global options can be migrated from the DB2 database of a Tivoli Workload Scheduler version 8.5 master domain manager and made to point to an Oracle database.

1. Run the `dataexport` command or script to export all scheduling object definitions and global options from DB2. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler version 8.5 home directory.

   Run `dataexport` from a Windows or UNIX command prompt as follows:

   ```
   dataexport <source_dir> <export_dir>
   ```

   where:

   source_dir
   The Tivoli Workload Scheduler version 8.5 installation directory.

   export_dir
   The directory where the export files are to be created.

   For example:

   ```
   dataexport.cmd F:\TWS85\tws85user F:\TWS85\tws85user\export
   ```

   The object definitions and the global options are retrieved from the DB2 database and placed in the `F:\TWS85\tws85user\export` directory.
2. Verify the following files were created in `export_dir`:
   - calendars.def
   - erules.def
   - jobs.def
   - globalOpts.def
   - parms.def
   - prompts.def
   - resources.def
   - scheds.def
   - topology.def
   - users.def (includes encrypted user passwords)
3. Stop the WebSphere Application Server using the **`conman stopappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
4. Run `prepareSQLScripts.bat (.sh)` to customize the SQL scripts with the parameters needed to create the Tivoli Workload Scheduler schema in the Oracle database. Find this file in the *`TWA_home`*`/TWS/dbtools/oracle/scripts` directory.

   Run `prepareSQLScripts` from a Windows or UNIX command prompt as follows:

   - From a UNIX shell run:

     ```
     prepareSQLScripts
        -dbRoot <dbRoot>
        -dbName <dbName>
        -twsDbUser <twsDbUser>
        -twsDbPassword <twsDbUser_password>
        [-tempDir <tempDir>]
        [-dataTablespace <dataTablespace_name>]
        [-logTablespace <logTablespace_name>]
     ```

```
    [–tempTablespace <tempTablespace_name>]
    [-companyName <companyName>]
    [-masterDmName <masterDmName>]
    [-eifPort <eifPort>]
```

- From a Windows command prompt run:

```
cmd /K prepareSQLScripts
   -dbRoot <dbRoot>
   -dbName <dbName>
   -twsDbUser <twsDbUser>
   -twsDbPassword <twsDbUser_password>
   [-tempDir <tempDir>]
   [-dataTablespace <dataTablespace_name>]
   [-logTablespace <logTablespace_name>]
   [–tempTablespace <tempTablespace_name>]
   [-companyName <companyName>]
   [-masterDmName <masterDmName>]
   [-eifPort <eifPort>]
```

where:

dbRoot
: The path where the RDBMS software is installed - the *Oracle home* directory.

dbName
: The name of the database.

twsDbUser
: The database user for Tivoli Workload Scheduler.

twsDbPassword
: The password of this user.

tempDir
: The directory where the temporary files created by this process are placed. On Windows the default is `<`*`drive`*`>\Documents and Settings\<`*`current_user`*`>\Local Settings\Temp`.

dataTablespace
: The name of the table space for the Tivoli Workload Scheduler data. The default is `USERS`. If you provided a different value at installation time, enter that value again.

logTablespace
: The name of the table space for the Tivoli Workload Scheduler log. The default is `USERS`. If you provided a different value at installation time, enter that value again.

tempTablespace
: The name of the table space for temporary data. The default is `TEMP`. If you provided a different value at installation time, enter that value again.

companyName
: The name of your company. The default is `MYCOMPANY`. If you provided a different value at installation time, enter that value again.

masterDmName
: The name of the master domain. The default is `MASTERDM`. If you provided a different value at installation time, enter that value again.

eifPort
: The EIF port. The default is `31123`. If you provided a different value at installation time, enter that value again.

For example:

```
cmd /K prepareSQLScripts.bat -dbRoot D:\Oracle
                       -dbName TWS
                       -twsDbUser tws85User
                       -twsDbPassword mypassw0rd
```

The SQL scripts are customized to create an Oracle schema named `tws85user` on the `TWS` database. The names of the table spaces are the defaults: `USERS` and `TEMP`.

5. Run `createdb_root.bat (.sh)` to create the database and schema following the specifications of the previous step. Find this file in the *`tempDir`*`/TWA/tws85/scripts` directory, where *tempDir* is the parameter you specified in step 4 on page 237.

   Run `createdb_root` as follows:

   - From a UNIX shell, run:

     ```
     createdb_root
        <netService>
        <oracleAdmin>
        <oracleAdminPassword>
        <twsDbUser>
        <twsDbPassword>
        <isBackupManager>
        <isPartitioned>
     ```

   - From a Windows command prompt, run:

     ```
     cmd /K createdb_root
        <netService>
        <oracleAdmin>
        <oracleAdminPassword>
        <twsDbUser>
        <twsDbPassword>
        <isBackupManager>
        <isPartitioned>
     ```

   where:

   netService
   The net service name required to connect to the Oracle database.

   oracleAdmin
   The user ID of the Oracle database administrator.

   oracleAdminPassword
   The password for `oracleAdmin`.

   twsDbUser
   The owner of the Tivoli Workload Scheduler schema that you specified also in step 4 on page 237.

   twsDbPassword
   The password for `twsDbUser` that you specified also in step 4 on page 237.

   isBackupManager
   Specify `TRUE` if you are migrating a backup master domain manager. Specify `FALSE` otherwise.

   isPartitioned
   Specify `TRUE` if the Oracle `Partitioning` feature is enabled for the database. Specify `FALSE` otherwise.

   For example:

   ```
   createdb_root TWS SYSTEM passw1rd tws85user passw0rd FALSE TRUE
   ```

creates a database schema named `tws85user` on the `TWS` database.

If something goes wrong and you have to rerun this step after finding (and fixing) the error, you must first log in to the database as the administrator and drop the *twsDbUser* (`tws85user` in the example).

6. Change the data source properties from DB2 to Oracle using the `changeDataSource.bat (.sh)` command or script to switch the data source in WebSphere Application Server from DB2 to Oracle.

   See "Changing data source properties" on page 286 for details on how to use the command.

   a. Clear the values of the following properties:

      ```
      DB2Type4JndiName
      DB2Type4DatabaseName
      DB2Type4ServerName
      DB2Type4PortNumber
      ```

      Note: For the property `DB2Type4JndiName` replace the value with any character or string to nullify it.

   b. Set these properties to the following values:

      ```
      OracleType2JndiName=jdbc/twsdb
      OracleType2DatabaseName=the Oracle instance name
      OracleType2PortNumber=the Oracle listener port number
      ```

   c. Set the JDBC driver path for the Oracle database to `ORACLE_JDBC_DRIVER_PATH=`*`Oracle_home`*`/jdbc/lib` and the Oracle instance type and name to `ORACLETYPE2URL=JDBC:ORACLE:OCI:@`*`instance_name`*

7. Use the `changeSecurityProperties.bat (.sh)` command or script to change the following security settings (see "Changing the security settings" on page 296 for details on using the command):

   j2cUserid

   Write the value you used for `twsDbUser` in `prepareSQLScripts`.

   j2cPassword

   Write the password for the `twsDbUser`.

   Note: After you updated these two values, make sure that you also erase all the other lines in the security properties file before you export it again with the `changeSecurityProperties` command. Failure to do so will result in all the passwords contained in the file being saved as strings of asterisks (*).

8. Modify the `TWSConfig.properties` file located in the *`TWA_home`*`/eWAS/profiles/TIPProfile/properties` directory. Take the comment marks off the following lines and edit them as shown:

   ```
   com.ibm.tws.dao.rdbms.rdbmsName = Oracle
   com.ibm.tws.dao.rdbms.modelSchema = <twsDbUser>
   com.ibm.tws.dao.rdbms.eventRuleSchema=<twsDbUser>
   com.ibm.tws.dao.rdbms.logSchema=<twsDbUser>
   ```

   where `twsDbUser` is the owner of the Tivoli Workload Scheduler schema that you specified also in the previous steps.

9. For UNIX only: run the `updateSetupCmdLine.sh` command or script to set the paths for the new database in the WebSphere Application Server profile. Locate this script in the `<`*`TWA_home`*`>/TWS/dbtools/oracle/scripts` directory. The syntax is as follows:

   ```
   updateSetupCmdLine.sh -installRoot <TWA_home> -dbRoot <DB_home>
   ```

where:

–installRoot <*TWA_home*>
: The installation directory of Tivoli Workload Scheduler.

–dbRoot <*DB_home*>
: The installation directory of the database.

10. Start the WebSphere Application Server using the **`conman startappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
11. Manually copy the master domain manager definition from the `topology.def` file you exported in step 1 on page 237 (you can find it in `export_dir`) and use `composer new` to add it in the Oracle database.
12. Run `dataimport` to import all scheduling object definitions and global options to the Oracle database. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler home directory.

    Run `dataimport` from a Windows or UNIX command prompt as follows:

    ```
    dataimport source_dir export_dir
    ```

    where:

    source_dir
    : The Tivoli Workload Scheduler installation directory.

    export_dir
    : The directory from where the export files are to be read from. This directory is the same `export_dir` directory specified for `dataexport`.

    For example:

    ```
    dataimport.cmd F:\TWS85\tws85user F:\TWS85\tws85user\export
    ```

    The object definitions and the global options are retrieved from the `F:\TWS85\tws85user\export` directory and stored in the new Oracle database.
13. Run the following command to set the carry forward option to ALL:

    ```
    optman chg cf=ALL
    ```
14. Update the Symphony file by creating a plan with 0 extension period that begins at the end of the current plan:

    ```
    JnextPlan -from start_time -for 0000
    ```

    where *start_time* is the date and time when the current plan ends.

You have now completed the reconfiguration steps.

To migrate a backup master domain manager, perform the following steps:
- Stop the WebSphere Application Server using the **`conman stopappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
- Run steps 6 on page 240, 7 on page 240, 9 on page 240
- Start the WebSphere Application Server using the **`conman startappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
- Set the `isBackupManager` parameter of the `createdb_root` command (script) to `TRUE`.

Reconfiguration from Oracle to DB2

With the following steps all scheduling object definitions and global options can be migrated from the Oracle database of a Tivoli Workload Scheduler version 8.5 master domain manager and made to point to a DB2 database.

1. Run the `dataexport` command or script to export all scheduling object definitions and global options from Oracle. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler version 8.5 home directory.

   Run `dataexport` from a Windows or UNIX command prompt as follows:

   ```
   dataexport <source_dir> <export_dir>
   ```

   where:

   source_dir
      The Tivoli Workload Scheduler version 8.5 installation directory.

   export_dir
      The directory where the export files are to be created.

   For example:

   ```
   dataexport.cmd F:\TWS85\tws85user F:\TWS85\tws85user\export
   ```

   The object definitions and the global options are retrieved from the Oracle database and placed in the `F:\TWS85\tws85user\export` directory.
2. Verify the following files were created in `export_dir`:
   - calendars.def
   - erules.def
   - jobs.def
   - globalOpts.def
   - parms.def
   - prompts.def
   - resources.def
   - scheds.def
   - topology.def
   - users.def (includes encrypted user passwords)
3. Stop WebSphere Application Server as described in “Application server - starting and stopping” on page 300.
4. Run `prepareSQLScripts.bat (.sh)` to customize the SQL scripts with the parameters needed to create the Tivoli Workload Scheduler database in DB2. Find this file in the `*TWA_home*/TWS/dbtools/db2/scripts` directory.

   Run `prepareSQLScripts` from a Windows or UNIX command prompt as follows:

   - From a UNIX shell run:

     ```
     prepareSQLScripts
        -dbRoot <dbRoot>
        -dbName <dbName>
        -dbLocalAdmin <dbLocalAdmin>
        -twsDbUser <twsDbUser>
        [-tempDir <tempDir>]
        [-dataTablespace <dataTablespace_name>]
        [-dataTablespacePath <dataTablespacePath>]
        [-logTablespace <logTablespace_name>]
        [-logTablespacePath <logTablespacePath>]
        [–tempTablespace <tempTablespace_name>]
     ```

```
   [–userTempTablespace <userTempTablespace_name>]
   [-companyName <companyName>]
   [-masterDmName <masterDmName>]
   [-eifPort <eifPort>]
```

- From a Windows command prompt run:

```
cmd /K prepareSQLScripts
   -dbRoot <dbRoot>
   -dbName <dbName>
   -dbLocalAdmin <dbLocalAdmin>
   -twsDbUser <twsDbUser>
   [-tempDir <tempDir>]
   [-dataTablespace <dataTablespace_name>]
   [-dataTablespacePath <dataTablespacePath>]
   [-logTablespace <logTablespace_name>]
   [-logTablespacePath <logTablespacePath>]
   [–tempTablespace <tempTablespace_name>]
   [–userTempTablespace <userTempTablespace_name>]
   [-companyName <companyName>]
   [-masterDmName <masterDmName>]
   [-eifPort <eifPort>]
```

where:

dbRoot
The path where the RDBMS software is installed.

dbName
The name of the database.

dbLocalAdmin
The user ID of the local database administrator.

twsDbUser
The database user for Tivoli Workload Scheduler.

tempDir
The directory where the temporary files created by this process are placed. On Windows the default is `<`*drive*`>\Documents and Settings\<`*current_user*`>\Local Settings\Temp`.

dataTablespace
The name of the table space for the Tivoli Workload Scheduler data. The default is `TWSDATA`. If you provided a different value at installation time, enter that value again.

dataTablespacePath
The path of the table space for the Tivoli Workload Scheduler data.

logTablespace
The name of the table space for the Tivoli Workload Scheduler log. The default is `TWSLOG`. If you provided a different value at installation time, enter that value again.

logTablespacePath
The path of the table space for the Tivoli Workload Scheduler log files.

tempTablespace
The name of the table space for temporary data. The default is `TEMP`. If you provided a different value at installation time, enter that value again.

userTempTablespace
: The name of the table space for temporary user data. The default is `USERTEMP`. If you provided a different value at installation time, enter that value again.

companyName
: The name of your company. The default is `MYCOMPANY`. If you provided a different value at installation time, enter that value again.

masterDmName
: The name of the master domain. The default is `MASTERDM`. If you provided a different value at installation time, enter that value again.

eifPort
: The EIF port. The default is 31123. If you provided a different value at installation time, enter that value again.

For example:

```
cmd /K prepareSQLScripts.bat -dbRoot D:\DB2
                      -dbName TWS
                      -dbLocalAdmin db2admin
                      -twsDbUser tws85User
```

The SQL scripts are customized to create a database named `TWS` in DB2 for user `tws85user`. The names of the table spaces are the defaults: `TWSDATA`, `TWSLOG`, `TEMP` and `USERTEMP`.

5. Run `createdb_root.bat (.sh)` to create the database following the specifications of the previous step. Find this file in the *tempDir*`/TWA/tws85/scripts` directory, where *tempDir* is the parameter you specified in step 4 on page 242.

   Run `createdb_root` as follows:
   - From a UNIX shell, run:
     ```
     createdb_root
        <dbName>
        <isClientInstallation>
        <dbNodeName>
        <hostName>
        <srvPortNumber>
        <db2Admin>
        <db2AdminPwd>
        <instanceName>
        <isBackupManager>
     ```
   - From a Windows command prompt, run:
     ```
     cmd /K createdb_root
        <dbName>
        <isClientInstallation>
        <dbNodeName>
        <hostName>
        <srvPortNumber>
        <db2Admin>
        <db2AdminPwd>
        <instanceName>
        <isBackupManager>
     ```

   where:

   dbName
   : The name of the DB2 database. The maximum length is 5 characters.

   isClientInstallation
   : The value is:
     - `TRUE` if the database is a DB2 client.

- FALSE if the database is a DB2 server.

dbNodeName
The name of the DB2 node.

hostName
The host name of the computer where DB2 is to be installed.

srvPortNumber
The TCP/IP port number used to communicate with the DB2 server. The default is 50000.

db2Admin
The user ID of the DB2 administrator.

db2AdminPwd
The password for db2Admin.

instanceName
The name of the DB2 server instance.

isBackupManager
Specify TRUE if you are migrating a backup master domain manager. Specify FALSE otherwise.

For example:

```
createdb_root TWS FALSE TWS_ND myhost 50000 db2admin passw1rd DB2 FALSE
```

creates a database named TWS on a DB2 server instance named DB2.

6. Use the changeDataSource.bat (.sh) command or script to switch the data source in WebSphere Application Server from Oracle to DB2.

   See "Changing data source properties" on page 286 for details on how to use the command.

   a. Clear the following properties:

   ```
   OracleType2JndiName
   OracleType2DatabaseName
   OracleType2ServerName
   OracleType2PortNumber
   ```

   b. Set the following properties:

   ```
   DB2Type4JndiName
   DB2Type4DatabaseName
   DB2Type4ServerName
   DB2Type4PortNumber
   ```

   c. Set the JDBC driver path for the DB2 in both DB2_JDBC_DRIVER_PATH and DB2UNIVERSAL_JDBC_DRIVER_PATH (the path is the same for both properties).
7. Reset to a name of your choice the ...JndiName property of the RDBMS from which you are changing.
8. Set to jdbc/twsdb the ...JndiName property of the new RDBMS
   - See that the following properties are set:
     – For DB2:

     ```
     DB2Type4JndiName
     DB2Type4DatabaseName
     DB2Type4ServerName
     DB2Type4PortNumber
     ```
9. Run the changeSecurityProperties.bat (.sh) command or script to change the following security settings:

   j2cUserid
   Write the value you used for twsDbUser in prepareSQLScripts.

j2cPassword
Write the password for `twsDbUser`.

Note: After you updated these two values, make sure that you also erase all the other lines in the security properties file before you export it again with the `changeSecurityProperties` command. Failure to do so will result in all the passwords contained in the file being saved as strings of asterisks (*).

See "Changing the security settings" on page 296 for details.

10. Modify the `TWSConfig.properties` file located in the `*TWA_home*/eWAS/profiles/TIPProfile/properties` directory. Comment the following four lines:

```
com.ibm.tws.dao.rdbms.rdbmsName = Oracle
com.ibm.tws.dao.rdbms.modelSchema = <twsDbUser>
com.ibm.tws.dao.rdbms.eventRuleSchema
com.ibm.tws.dao.rdbms.logSchema
```

where `twsDbUser` is the owner of the Tivoli Workload Scheduler Oracle schema.

11. For UNIX only: run the `updateSetupCmdLine.sh` command or script to set the paths for the new database. Locate this script in the `<TWA_home>/TWS/dbtools/db2/scripts` directory. The syntax is as follows:

```
updateSetupCmdLine.sh -installRoot <TWA_home> -dbRoot <DB_home>
```

where:

–installRoot <*TWA_home*>
The installation directory of Tivoli Workload Scheduler.

–dbRoot <*DB_home*>
The installation directory of the database.

12. Start the WebSphere Application Server using the **`conman startappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
13. Manually copy the master domain manager definition from the `topology.def` file you exported in step 1 on page 242 (you can find it in `export_dir`) and use `composer new` to add it in the DB2 database.
14. Run `dataimport` to import all scheduling object definitions and global options to DB2. Find this file in the `bin` subdirectory of the Tivoli Workload Scheduler home directory.

Run `dataimport` from a Windows or UNIX command prompt as follows:

```
dataimport source_dir export_dir
```

where:

source_dir
The Tivoli Workload Scheduler installation directory.

export_dir
The directory from where the export files are to be read from. This directory is the same `export_dir` directory specified for `dataexport`.

For example:

```
dataimport.cmd F:\TWS85\tws85user F:\TWS85\tws85user\export
```

The object definitions and the global options are retrieved from the `F:\TWS85\tws85user\export` directory and stored in the new DB2 database.

15. Run the following command to set the carry forward option to ALL:
    ```
    optman chg cf=ALL
    ```
16. Update the Symphony file by creating a plan with 0 extension period that begins at the end of the current plan:
    ```
    JnextPlan -from start_time -for 0000
    ```
    where *start_time* is the date and time when the current plan ends.

You have now completed the reconfiguration steps.

To migrate a backup master domain manager, perform the following steps :
- Stop the WebSphere Application Server using the **`conman stopappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
- Perform steps 6 on page 245 to 11 on page 246.
- Start the WebSphere Application Server using the **`conman startappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
- Set the `isBackupManager` parameter of the `createdb_root` command (script) to `TRUE`.

Upgrading your database

If you want to upgrade your database, change the instance owner, or relocate it to a different host, the procedure for upgrading your database, changing the instance owner, or relocating it, is as follows:
1. If you are changing DB2, check the *node directory* and *database directory* and make a note of the current configuration. To do this, issue the following commands at the DB2 command-line:
   ```
   db2 list node directory show detail

   db2 list database directory
   ```
   where the `show detail` attribute is specified to give the full information in the directory.

   Make a note of the displayed details.
2. Stop the application server, using the command
   ```
   stopWas -direct -user <user> -password <password>
   ```
3. Make the upgrade, instance owner change, or relocation, of the database following the instructions from your database supplier.
4. If you have changed the database host, port, or database name, you will need to update the application server's data source properties, as described in "Changing the database host name, port, or database name" on page 285.
5. If you have changed the database access credentials, you will need to update the application server's security properties, as described in "Changing the security settings" on page 296.
6. Reconfigure the database for Tivoli Workload Scheduler, as follows:

   DB2

   a. Check the *node directory* and *database directory*, as you did in step 1

   b. If necessary, modify the data displayed by these commands to match the data you noted in step 1 on page 247. If you are not certain of how to do this, contact IBM Software Support for assistance.

Oracle Check the Oracle Listener and make sure that the service name is correctly specified.

7. Restart the database.
8. Restart the application server, using the command:

```
startWas -direct -user <user> -password <password>
```

Auditing facilities

Describes the audit facilities to track changes in the database and the plan, as well as those that track changes to objects involved in dynamic workload scheduling.

Audit trails are useful to check enforcement and effectiveness of IT controls, for accountability, and vulnerability and risk analysis. IT organizations can also use auditing of security-related critical activities to aid in investigations of security incidents. When a security incident occurs, audit trails enable analysis of the history of activities (who did what, when, where, and how) that occurred prior to the security incident, so appropriate corrective actions can be taken. For these reasons, audit trails might need to be archived and accessible for years.

The auditing logs are created in XML format and can be viewed with a standard text editor or parsed using third-party utilities.

You can also view the auditing logs using the Log and Trace Analyzer (LTA), a component of the IBM Autonomic Computing Toolkit. In general, the Log and Trace Analyzer is used for importing and correlating different logs generated by different products. The Log and Trace Analyzer can be very useful in correlating auditing logs with other logs from different sources, such as databases (DB2, Oracle), WebSphere Application Server, and the operating system. See the Engine Log Analyzer section on the *Tivoli Workload Scheduler Troubleshooting* for details.

Two separate audit trail facilities are provided:
- Database and plan change tracking - see “Database and plan audit”
- Tracking of changes to scheduling objects to support dynamic workload scheduling - see “Dynamic workload scheduling audit” on page 254

Database and plan audit

An auditing option is available to track changes to the database and the plan. It is disabled by default. It is described in these sections:
- “How audit works”
- “Enabling the audit feature” on page 249
- “Audit log header format” on page 249
- “Audit log body format” on page 250
- “Sample audit log entries” on page 253

How audit works

The storage of audit records varies depending on whether you maintain trails for the database or the plan. You have the following options:

database auditing

You can track changes to the database in a file, in the database itself, or in both. All user modifications are logged, including the current definition of each modified database object. If an object is opened and saved, the action is logged even if no modification has been done.

plan auditing

You can track changes to the plan in a file. All user modifications to the plan are logged. Actions are logged whether they are successful or not.

Each audit log provides audit information for one day, from 00:00:00 UTC to 23:59:59 UTC regardless of the timezone of the local workstation, but the log file is only created when an action is performed or the WebSphere Application Server is started.

The files are called `yyyymmdd`, and are created in the following directories:

`<`*`TWA_home`*`>/TWS/audit/plan`

`<`*`TWA_home`*`>/TWS/audit/database`

Audit entries are logged to a flat text file on individual workstations in theTivoli Workload Scheduler network. This minimizes the risk of audit failure due to network issues. The log formats are the same for both plan and database in a general sense. The logs consist of a header portion which is the same for all records, an action ID, and a section of data which varies according to the action type. All data is kept in clear text and formatted to be readable and editable from a text editor such as **`vi`** or **`notepad`**.

Note: For **`modify`** commands, two entries are made in the log for resources, calendars, parameters and prompts. The **`modify`** command is displayed in the log as a combination of the **`delete`** and **`add`** commands.

Enabling the audit feature

The auditing option is enabled by setting the following two entries in the global options, using **`optman`**:

```
enPlanAudit = 0|1
enDbAudit = 0|1
```

A value of *1* (one) enables auditing and a value of *0* (zero) disables auditing. Auditing is disabled by default on installation of the product.

To initiate database auditing, you must shut downTivoli Workload Scheduler completely. When you restart Tivoli Workload Scheduler, the database audit log is initiated. Plan auditing takes effect whenJnextPlan is run.

Audit log header format

Each log file starts with a header record that contains information about when the log was created and whether it is a plan or database log.

The header record fields are separated by vertical bars (|), as follows:

```
HEADER|<GMT_date>|<GMT_time>|<local_date>|<local_time>|<object_type>| >
<workstation>|<user_ID>|<version>| <level>
```

Log Type
HEADER

GMT Date
The GMT date when the log file was created.

GMT Time
The GMT time when the log file was created.

Local Date
The local date when the log file was created. The local date is defined by the time zone option of the workstation.

Local Time
The local time when the log file was created. The local time is defined by the time zone option of the workstation.

Object Type
DATABASE for a database log file and PLAN for a plan log file.

Workstation Name
The Tivoli Workload Scheduler workstation name for which this file was created. Each workstation in the Tivoli Workload Scheduler network creates its own log.

User ID
The Tivoli Workload Scheduler user ID that created the log file.

Version
The version of the file.

Level The logging level.

Audit log body format

The audit log formats are basically the same for the plan and the database. The log consists of a header portion, an action ID, and data sections that vary with the action type. The data is in clear text format and each data item is separated by a vertical bar (|).

The log file entries are in the following format:

```
<log_type>|<GMT_date>|<GMT_time>|<local_date>|<local_time>|<object_type>| >
<action_type>|<workstation>|<user_ID>|<object_name>|<action_data_fields>
```

The log files contain the following information:

log_type
Displays an eight character value indicating the source of the log record. The following log types are supported:

CONMAN
conman command text

DATABASE
Database action

HEADER
The log file header

MAKESEC
makesec run

PARMS
Parameter command text

PLAN Plan action

RELEASE
release command text

STAGEMAN
stageman run

GMT_date
Displays the GMT date the action was performed. The format is *yyyymmdd* where *yyyy* is the year, *mm* is the month, and *dd* is the day.

GMT_time
Displays the GMT time the action was performed. The format is *hhmmss* where *hh* is the hour, *mm* is the minutes, and *ss* is the seconds.

local_date
Displays the local date the action was performed. The local date is defined by the time zone option of the workstation. The format is *yyyymmdd* where *yyyy* is the year, *mm* is the month, and *dd* is the day.

local_time
Displays the local time the action was performed. The local time is defined by the time zone option of the workstation. The format is *hhmmss* where *hh* is the hour, *mm* is the minutes, and *ss* is the seconds.

object_type
Displays the type of the object that was affected by an action, from the following:

DATABASE
Database definition (for header only)

DBCAL
Database calendar definition

DBDOMAIN
Database domain definition

DBJBSTRM
Database job stream definition

DBJOB
Database job definition

DBPARM
Database parameter definition

DBPROMPT
Database prompt definition

DBRES
Database resource definition

DBSEC
Database security

DBUSER
Database user definition

DBVARTAB
Database variable table definition

DBWKCLS
Database workstation class definition

DBWKSTN
Database workstation definition

PLAN Plan (for header only)

PLDOMAIN
Plan domain

PLFILE
Plan file

PLJBSTRM
Plan job stream

PLJOB
Plan job

PLPROMPT
Plan prompt

PLRES
Plan resource

PLWKSTN
Plan workstation

action_type
Displays what action was performed on the object. The appropriate values for this field are dependent on which action is being performed.

For the plan, the <action_type> can be ADD, DELETE, MODIFY, or INSTALL.

For the database, the ADD, DELETE and MODIFY actions are recorded for workstation, workstation classes, domains, users, jobs, job streams, calendars, prompts, resources and parameters in the database.

The <action_type> field also records the installation of a new Security file. When **makesec** is run, Tivoli Workload Scheduler records it as an INSTALL action for a Security definition object.

LIST and DISPLAY actions for objects are not logged.

For parameters, the command line with its arguments is logged.

workstation
Displays the Tivoli Workload Scheduler workstation from which the user is performing the action.

user_ID
Displays the logon user who performed the particular action. On Windows operating systems, if the user who installed WebSphere Application Server was a domain user, for Log Types **stageman** and **conman** this field contains the fully qualified user ID *domain\user*.

object_name
Displays the fully qualified name of the object. The format of this field depends on the object type as shown here:

DATABASE
N/A

DBCAL
<calendar>

DBDOMAIN
<domain>

DBJBSTRM
<workstation>#<job_stream>

DBJOB
<workstation>#<job>

DBPARM
<workstation>#<parameter>

DBPROMPT
<prompt>

DBRES
<workstation>#<resource>

DBSEC
N/A

DBUSER
[*<workstation>#*]*<user>*

DBVARTAB
<variable_table>

DBWKCLS
<workstation_class>

DBWKSTN
<workstation>

PLAN N/A

PLDOMAIN
<domain>

PLFILE
<workstation>#<path>(*<qualifier>*)

PLJBSTRM
<workstation>#<job_stream_instance>

PLJOB
<workstation>#<job_stream_instance>.<job>

PLPROMPT
[*<workstation>#*]*<prompt>*

PLRES
<workstation>#<resource>

PLWKSTN
<workstation>

action_data_fields
Displays the action-specific data fields. The format of this data is dependent on the <action_type> field.

Sample audit log entries:

This is a sample database audit log:

```
HEADER  |20080207|084124|20080207|094124|DATABASE|      |WK1|         | | |Version=A1.0| Level=1

DATABASE|20080207|084124|20080207|094124|DBRES   |ADD   |WK1|operator1| |res=WK1#RESOURCE    |

DATABASE|20080207|100524|20080207|110524|DBWKSTN |MODIFY|WK1|operator1| |ws=TIVOLI10         |

DATABASE|20080207|100525|20080207|110525|DBWKSTN |MODIFY|WK1|operator1| |ws=ASLUTRI1         |

DATABASE|20080207|100525|20080207|110525|DBWKSTN |MODIFY|WK1|operator1| |ws=WK1              |

DATABASE|20080207|100526|20080207|110526|DBDOMAIN|MODIFY|WK1|operator1| |dom=MASTERDM        |

DATABASE|20080207|100610|20080207|110610|DBWKSTN |MODIFY|WK1|operator1| |ws=TIVOLI10         |

DATABASE|20080207|100610|20080207|110610|DBWKSTN |MODIFY|WK1|operator1| |ws=ASLUTRI1         |

DATABASE|20080207|100611|20080207|110611|DBWKSTN |MODIFY|WK1|operator1| |ws=WK1              |

DATABASE|20080207|100611|20080207|110611|DBWKSTN |ADD   |WK1|operator1| |ws=WK2              |

DATABASE|20080207|100612|20080207|110612|DBDOMAIN|MODIFY|WK1|operator1| |dom=MASTERDM        |
```

This is a sample plan audit log:

```
HEADER  |20080207|100758|20080207|110758|PLAN    |       |WK1|admin| |     |Version=A1.0|Level=1

STAGEMAN|20080207|100758|20080207|110758|PLAN    |INSTALL|WK1|admin| |C:\IBM\TWS\oper1\Symphony|
                     AWSBHV030I The new Symphony file is installed.

STAGEMAN|20080207|100758|20080207|110758|PLAN    |INSTALL|WK1|admin| |C:\IBM\TWS\oper1\Sinfonia|
                  AWSBHV036I Multi-workstation Symphony file copied to C:\IBM\TWS\oper1\Sinfonia

STAGEMAN|20080207|100758|20080207|110758|ADITLEVL|MODIFY |WK1|admin| |                         |
                     AWSBHV077I Audit level changing from 0 to 1.

CONMAN  |20080207|100800|20080207|110800|PLWKSTN |MODIFY |   |admin| |WK1                      |
                     continue & start

CONMAN  |20080207|100941|20080207|110941|PLWKSTN |MODIFY |   |admin| |SLUTRI1                  |
                     limit cpu=slutri1;10

PLAN    |20080207|101018|20080207|111018|PLWKSTN |MODIFY |WK1|oper1| |WK1                      |
                     limit cpu=SLUTRI1;20

PLAN    |20080207|101028|20080207|111028|PLDOMAIN|MODIFY |WK1|oper1| |ECCOLO                   |
                     reply ECCOLO;yes
```

A **ResetPlan** command run against the current production plan is stored in the plan audit log file as follows:

```
STAGEMAN|20080207|100758|20080207|110758|PLAN|DELETE|WK1|admin|
     |/home/WK1/schedlog/M200803140127|
                     AWSBHV025I The old Symphony file renamed /home/WK1/schedlog/M200803140127
```

Dynamic workload scheduling audit

Description

When you select the dynamic scheduling capability at installation time, the auditing feature is automatically installed. By default, the auditing feature is disabled.

Auditable events are as follows:

JobDefinitionAuditEvent
: Maintains a track of operations performed on job definitions.

JobLogAuditEvent
: Maintains a track of operations performed on job logs.

JobAuditEvent
: Maintains a track of operations performed on jobs.

ResourceAuditEvent
: Maintains a track of operations performed on resources.

RelationshipAuditEvent
: Maintains a track of operations performed on relationships between resources.

RecoveryActionAuditEvent
: Maintains a track of operations performed on recovery actions.

HistoryDataAuditEvent
: Maintains a track of operations performed on historical data.

To configure the auditing of events, enable the auditing feature and optionally change the default values in the configuration file to define event types to be audited. The configuration file is located in the following path:

`TWA_home\TDWB\config\audit.properties`

Configuring the audit

Configure one or more of the properties in the `audit.properties` file to enable and configure auditing:

audit.enabled
: Specifies whether the auditing feature is enabled or disabled. The default value is false. Supported values are as follows:

  false The auditing feature is not enabled.

  true The auditing feature is enabled.

  onSecurityEnabled
  : The auditing feature is enabled if global security is enabled on the WebSphere Application Server.

audit.consumer.file.auditFilePrefix
: Specifies the file prefix for the auditing log file. The file name is defined using the file prefix plus the _audit*N*.log suffix, where *N* is a progressive number. If you want the date and time of the file creation specified in the file prefix, use the default format: ‘tdwb_'yyyy-MM-dd. For instance, using the default prefix ‘tdwb_'yyyy-MM-dd generates the tdwb_2010-12-20_audit*N*.log family of files. Note that the text between single quotes (') is not processed by the program and remains unchanged. This format creates a different file for each day the auditing feature is enabled. Also, changing the prefix to ‘tdwb_'yyyy-MM generates the tdwb_2010-12_audit*N*.log family of files. This format creates a different file for each month the auditing feature is enabled.

  You can modify this format as desired to create files on a weekly, monthly or yearly basis, depending on your auditing requirements. Depending on the date and time format you choose, the maximum size and number of log files vary. The maximum size and number of log files are defined using the **audit.consumer.file.maxFileSize** and **audit.consumer.file.maxAuditFiles** properties respectively. Use these three parameters to control the size of the audit logs stored. For example, using the default values for these parameters, then every day you will have a maximum of 10 MB x 100 files each day. Once the maximum is reached, the first file created is overwritten. If you want use less space to store audit logs, you can decided to change the maximum number of files or only have files on a monthly basis, by specifying the format for the `audit.consumer.file.auditFilePrefix` property as ‘tdwb_'yyyy-MM.

audit.consumer.file.auditFileLocation
Specifies the path where the log files are created. The default path is `/audit`.

audit.consumer.file.maxFileSize
Specifies the maximum size in bytes of the log files. When a file reaches the maximum size, a new log file is created. The default value is 10000000 bytes (10 MB). This is also the highest supported value.

audit.consumer.file.maxAuditFiles
Specifies the maximum number of files with a specific prefix. When all files reach the maximum size and the maximum number of files is exceeded, the oldest file with a specific prefix is overwritten. The default value is 100 files. This is also the highest supported value.

Configuring dynamic audit events

The following table lists the supported actions and properties for each event with the related default values. You can configure these values in the `audit.properties` file.

Table 51. Auditable event properties

Event	Action	Property	Default value
JobDefinitionAuditEvent	create	audit.tdwb.JobDefinitionAuditEvent.create.enabled	true
	delete	audit.tdwb.JobDefinitionAuditEvent.delete.enabled	true
	get	audit.tdwb.JobDefinitionAuditEvent.get.enabled	true
	query	audit.tdwb.JobDefinitionAuditEvent.query.enabled	false
	update	audit.tdwb.JobDefinitionAuditEvent.update.enabled	true
JobLogAuditEvent	get	audit.tdwb.JobLogAuditEvent.get.enabled	true
JobAuditEvent	cancel	audit.tdwb.JobAuditEvent.cancel.enabled	true
	get	audit.tdwb.JobAuditEvent.get.enabled	true
	query	audit.tdwb.JobAuditEvent.query.enabled	false
	submit	audit.tdwb.JobAuditEvent.submit.enabled	true
ResourceAuditEvent	create	audit.tdwb.ResourceAuditEvent.create.enabled	true
	delete	audit.tdwb.ResourceAuditEvent.delete.enabled	true
	query	audit.tdwb.ResourceAuditEvent.query.enabled	false
	resume	audit.tdwb.ResourceAuditEvent.resume.enabled	true
	suspend	audit.tdwb.ResourceAuditEvent.suspend.enabled	true
	update	audit.tdwb.ResourceAuditEvent.update.enabled	true

Table 51. Auditable event properties (continued)

Event	Action	Property	Default value
RelationshipAuditEvent	create	audit.tdwb.RelationshipAuditEvent.create.enabled	true
	delete	audit.tdwb.RelationshipAuditEvent.delete.enabled	true
	query	audit.tdwb.RelationshipAuditEvent.query.enabled	false
RecoveryActionAuditEvent	invoke	audit.tdwb.RecoveryActionAuditEvent.invoke.enabled	true
HistoryDataAuditEvent	move	audit.tdwb.HistoryDataAuditEvent.move.enabled	true

By default, auditing is disabled for query actions, while all the other actions are enabled. If the auditing feature is disabled, all properties are ignored.

Log file specifications

The elements used in the auditing log files are extensions to the Common Base Event (CBE) schema. The types and elements listed below are available in the auditing log files. Supported action types for each element are listed in Table 51 on page 256.

Action

Represents the action that is being taken. Each auditable event supports a different set of possible actions. See Table 51 on page 256. The Action type contains the following element:

Table 52. Elements in Action type

Element name	Element description	Always returned in the output
Action	The action type that is being taken on thedynamic workload broker object.	Yes

ObjectInfoList

Represents a list of dynamic workload broker objects. The `ObjectInfoList` type contains the following element:

Table 53. Elements in ObjectInfoList type

Element name	Element description	Always returned in the output
objectInfo	The class of the object being involved in the action	Yes

ObjectInfo

Represents information about a dynamic workload broker object in an `objectInfoList` type or in another `objectInfo` element. The `ObjectInfo` type contains the following elements:

Table 54. Elements in ObjectInfo type

Element name	Element description	Always returned in the output
objectClass	The class of the object being involved in the action.	Yes
objectName	The name of the dynamic workload broker object.	Only if available

Table 54. Elements in ObjectInfo type (continued)

Element name	Element description	Always returned in the output
objectNamespace	The namespace of the dynamic workload broker object.	Only if available
objectType	The type of the dynamic workload broker object.	Only if available
objectAlias	The alias of the dynamic workload broker object.	Only if available
objectIdentifier	The unique identifier of the dynamic workload broker object.	Only if available
objectRole	The role of the dynamic workload broker object, if any. For instance a Resource can have the source or destination role in a relationship	Only if available
objectSubmitterType	The type of the component which submitted the operation. The component is one of the following: • Tivoli Dynamic Workload Broker Console • Command line • Dynamic workload broker workstation • Third party utility	Only if available
objectInfo	A child `objectInfo` object. For instance, a relationship is always related to two resources.	Only if available

Outcome

Defines the outcome of a security event. The Outcome type contains the following elements:

Table 55. Elements in Outcome type

Element name	Element description	Always returned in the output
result	The status of the event. This information can be used when filtering the information in the log file.	Yes
failureReason	Additional information on the outcome of the operation.	Yes, if the operation was unsuccessful.

UserInfoList

Represents a list of `userInfo` elements, each representing the list of users in the delegation chain. The `UserInfoList` type contains the following element:

Table 56. Elements in UserInfoList type

Element name	Element description	Always returned in the output
objectInfo	An array of Information about each user in the delegation chain. The first `userInfo` element identifies the user which authenticated first. The last `userInfo` element identifies the user with whose credentials the action is being taken.	Yes

UserInfo

Represents information about a user. Elements of this type return information about the user involved in the operation being audited. The `UserInfo` type contains the following element:

Table 57. Elements in UserInfo type

Element name	Element description	Always returned in the output
UserInfo	The username provided to dynamic workload broker for authentication.	Yes

How to perform queries on log files

Log files can be very long and detailed. When you view your log files with the Log and Trace Analyzer, you can apply one or more queries to filter information in the file and make searches faster. You can use the following queries to filter only the relevant information or you can create your own queries depending on your requirements. The following queries are written in XPath query language.

- To filter all the events generated by a specific user:

  /CommonBaseEvent [extendedDataElements/children[@name='*userInfo*' and values='*username*']]
- To filter all the events related to a specific object class:

  /CommonBaseEvent [extendedDataElements//children[@name='objectClass' and values='Resource]]
- To filter all the events related to a specific object:

  //CommonBaseEvent [extendedDataElements//children[@name='objectName' and values='myresource']/../children[@name='objectClass' and values='Resource']]
- To filter all the events related to a specific action:

  /CommonBaseEvent [extendedDataElements[@name='action' and values='uninstall']]
- To filter all the events with SUCCESSFUL outcome:

  /CommonBaseEvent [extendedDataElements/children[@name='result' and values='SUCCESSFUL']]

The following query returns all create actions:

```
/CommonBaseEvent[ extendedDataElements[@name = 'action' and values = 'create']]
```

You can export this query into an XML file as follows:

```
<?xml version="1.0" encoding="UTF-8"?><cbeviewer_configuration>
<logParserSets>
   <logParserSet  description="Parser for CBE log"
                  id="com.ibm.cbeviewer.parsers.cbeLogParserSet"
                  label="Common Base Event log"
                  parentId="com.ibm.cbeviewer.parsers.jdLogParserSet"/>
   <logParserSet  description="Parser for CEI Server"
                  id="com.ibm.cbeviewer.parsers.ceiLogParserSet"
                  label="Common Event Infrastructure server"
                  parentId="com.ibm.cbeviewer.parsers.jdLogParserSet"/>
   <logParserSet description="Other parsers"
                  id="com.ibm.cbeviewer.parsers.otherParsersLogParserSet"
                  label="Other parsers"/>
</logParserSets>
<recent_expressions>
     <xpath name="All Create Events">
     /CommonBaseEvent[ extendedDataElements[@name = 'action' and values = 'create']]
     </xpath>
</recent_expressions></cbeviewer_configuration>
```

The following is a short example of a log file:

```
<CommonBaseEvent
      creationTime="2007-06-06T14:26:23.311Z"
      extensionName="TDWB_JOB_AUDIT_EVENT"
      globalInstanceId="CEFC6DD156CA54D902A1DC1439E6EC4ED0"
      sequenceNumber="1"
      version="1.0.1">
   <extendedDataElements
         name="userInfoList"
         type="noValue">
      <children
            name="userInfo"
            type="string">
         <values>UNAUTHENTICATED</values>
      </children>
   </extendedDataElements>
   <extendedDataElements
         name="action"
         type="string">
      <values>submit</values>
   </extendedDataElements>
   <extendedDataElements
         name="outcome"
         type="noValue">
      <children
            name="result"
            type="string">
         <values>SUCCESSFUL</values>
      </children>
   </extendedDataElements>
</CommonBaseEvent>
```

Examples

The following examples describe a standard usage of the auditing feature.

In the following example, user `root` successfully retrieves the definition of a job named **MyTestJob** using the `jobstore` command.

```
<CommonBaseEvent
      creationTime="2007-06-21T16:05:19.455Z"
      extensionName="TDWB_JOB_AUDIT_EVENT"
      globalInstanceId="CE8F5E102AE3419AF7A1DC201135463A40"
      sequenceNumber="188"
      version="1.0.1">
   <extendedDataElements
```

```
      name="userInfoList"
      type="noValue">
   <children
         name="userInfo"
         type="string">
      <values>root</values>
   </children>
</extendedDataElements>
<extendedDataElements
      name="action"
      type="string">
   <values>get</values>
</extendedDataElements>
<extendedDataElements
      name="outcome"
      type="noValue">
   <children
         name="result"
         type="string">
      <values>SUCCESSFUL</values>
   </children>
</extendedDataElements>
<extendedDataElements
      name="objectInfoList"
      type="noValue">
   <children
         name="objectInfo"
         type="noValue">
      <children
            name="objectClass"
            type="string">
         <values>Job</values>
      </children>
      <children
            name="objectName"
            type="string">
               <values>MyTestJob</values>
      </children>
      <children
            name="objectIdentifier"
            type="string">
         <values>3ebf6d62-0b83-3270-9b83-83c393e9cbca</values>
      </children>
      <children
            name="objectSubmitterType"
            type="string">
         <values>TDWB CLI</values>
      </children>
   </children>
</extendedDataElements>
<extendedDataElements
      name="CommonBaseEventLogRecord:sequenceNumber"
      type="long">
    <values>80808</values>
</extendedDataElements>
<extendedDataElements
      name="CommonBaseEventLogRecord:threadID"
      type="int">
   <values>280</values>
</extendedDataElements>
<sourceComponentId
      application="JobManagement"
      component="None"
      componentIdType="Application"
      location="tdws08"
      locationType="Hostname"
      subComponent="None"
      threadId="Default : 84"
      componentType="http://www.ibm.com/namespace/autonomic/Tivoli_componentTypes"/>
<situation
      categoryName="ReportSituation">
      <situationType
            xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
            xsi:type="ReportSituation"
            reasoningScope="INTERNAL"
            reportCategory="SECURITY"/>
   </situation>
</CommonBaseEvent>
```

In the following example, user `testuser` tries deleting a job instance named **MySecondJob** using the appropriate command line. The operation fails because the job was submitted by another user. Deleting jobs submitted by other users requires `Operator` or `Administrator` rights. For more information on access rights, see *IBM Tivoli Workload Scheduler: Scheduling Workload Dynamically* or *IBM Tivoli Workload Scheduler: Administration Guide*.

```
<CommonBaseEvent
      creationTime="2007-06-21T16:05:32.746Z"
      extensionName="TDWB_JOB_AUDIT_EVENT"
      globalInstanceId="CE8F5E102AE3419AF7A1DC20113D32BB20"
      sequenceNumber="189"
      version="1.0.1">
   <extendedDataElements
         name="userInfoList"
         type="noValue">
      <children
            name="userInfo"
            type="string">
         <values>testuser</values>
      </children>
   </extendedDataElements>
   <extendedDataElements
         name="action"
         type="string">
      <values>cancel</values>
   </extendedDataElements>
   <extendedDataElements
         name="outcome"
         type="noValue">
      <children
            name="result"
            type="string">
         <values>UNSUCCESSFUL</values>
      </children>
      <children
            name="failureReason"
            type="string">
         <values>userNotAuthorized</values>
      </children>
   </extendedDataElements>
   <extendedDataElements
         name="objectInfoList"
         type="noValue">
      <children
            name="objectInfo"
            type="noValue">
         <children
               name="objectClass"
               type="string">
            <values>Job</values>
         </children>
         <children
               name="objectName"
               type="string">
            <values>MySecondJob</values>
         </children>
         <children
               name="objectIdentifier"
               type="string">
            <values>a05732c8-c008-3103-afd1-84b567d78de7</values>
         </children>
```

```
                <children
                      name="objectSubmitterType"
                      type="string">
                   <values>TDWB CLI</values>
                </children>
             </children>
          </extendedDataElements>
          <extendedDataElements
                name="CommonBaseEventLogRecord:sequenceNumber"
                type="long">
             <values>80964</values>
          </extendedDataElements>
          <extendedDataElements
                name="CommonBaseEventLogRecord:threadID"
                type="int">
             <values>292</values>
          </extendedDataElements>
          <sourceComponentId
                application="JobManagement"
                component="None"
                componentIdType="Application"
                location="tdws08"
                locationType="Hostname"
                subComponent="None"
                threadId="Default : 91"
                componentType="http://www.ibm.com/namespace/autonomic/Tivoli_componentTypes"/>
          <situation
                categoryName="ReportSituation">
             <situationType
                   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
                   xsi:type="ReportSituation"
                   reasoningScope="INTERNAL"
                   reportCategory="SECURITY"/>
          </situation>
       </CommonBaseEvent>
```

Keeping track of database changes using audit reports

To keep always track of the changes that impact objects stored in the database, you can use the following audit reports, which can be run in batch mode using the command line interface:

General audit report
The report provides information about objects that have been modified in the database. More specifically, it details who made the change, on which objects, and when.

Details report
The report provides further details about the changes implemented. It specifies who made the change, on which objects, when, and what has been changed. More specifically it shows the object definition before and after the change.

A sample business scenario

The administrator of an insurance company needs to keep track of all the changes impacting the insurance policies, conditions and terms of all the customers registered in the company database. To do it, the administrator periodically runs the audit general and details reports.

To satisfy this request, he creates an audit general report that provides details about which TWS objects have been modified in the database, who modified them and on which date. Then, to find out more details about the changes, he also creates an audit details report.

To accomplish his task, he runs the following steps:

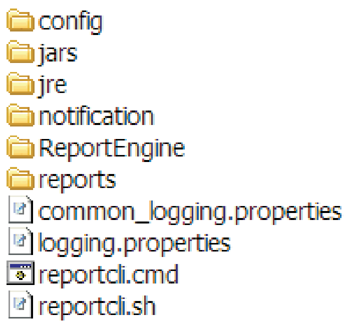
1. He customizes the property files related to the audit reports, specifying the format and content of the report output.
2. He schedules jobs to obtain the reports:
   a. The first job generates an audit to be saved locally.
   b. The second job runs a detail report overnight to retrieve more details about the specific changes implemented. The report output is sent using an mail to the analyst. The information collected is used to keep all the insurance branch offices updated with any change and news.
3. The administrator adds the two jobs to a job stream scheduled to run weekly and generates the plan.

Setting up for command line reporting

Before running these reports you must perform a few setup steps:

1. The software needed to run these reports is contained in a package named `TWSBatchReportCli` included in the Tivoli Workload Scheduler installation image, in the `TWSBatchReportCli` directory. If you plan to run them from within a scheduled job, extract the package file on one of the platforms listed in http://www.ibm.com/support/docview.wss?rs=672&uid=swg27020800

   After extracting the package, you obtain the following file structure:

   
   config
   jars
   jre
   notification
   ReportEngine
   reports
   common_logging.properties
   logging.properties
   reportcli.cmd
   reportcli.sh

   Because the native UNIX tar utility does not support long file names, if you are extracting the files on AIX®, Solaris, or HP-UX systems, ensure that the latest GNU version of tar (gtar) is installed to extract the files successfully.

   Note:

   a. Make sure you run the following commands in the directory where you extracted the files:

      On UNIX

      ```
      chmod -R +x *
      chown -R username *
      ```

      On Windows

      Ensure Tivoli Workload Scheduler is installed.

      ```
      setown -u username *
      ```

      Where *username* is the Tivoli Workload Scheduler user that will run the reports.

   b. If you plan to schedule jobs that run these reports, the system where you extract the package must be accessible as network file system from a fault-tolerant agent defined in the local scheduling environment.

2. Configure the template file `.\config\common.properties` specifying the information to:
   a. Connect to the database where the historical data are stored.
   b. Set the date and time format, including the time zone. The file `.\config\timezone.txt` contains a list of time zones supported by Tivoli Workload Scheduler and the information on how to set them. The time zone names are case sensitive.
   c. Make available the report output on the URL specified in **ContextRootUrl** field. This is an example of configuration settings:

```
####################################################################
# HTTP Server information
####################################################################

 #Specify the context root where the report will be available
 #To leverage this possibility it needs to specify in the report output dir
 #the directory that is referred by your HTTP Server with this contect root

 ContextRootUrl=http://myserver/reportoutput
```

      In this case make sure that the *output_report_dir* specified when running the reports command points to the same directory specified in the **ContextRootUrl**.
   d. Send the report output using a mail. This is an example of configuration settings:

```
####################################################################
# Email Server configuration
####################################################################
 PARAM_SendReportByEmail=true

 #SMTP server
 mail.smtp.host=myhost.mydomain.com
 #IMAP provider
 mail.imap.socketFactory.fallback=false
 mail.imap.port=993
 mail.imap.socketFactory.port=993
 #POP3 provider
 mail.pop3.socketFactory.fallback=false
 mail.pop3.port=995
 mail.pop3.socketFactory.port=995

 ####################################################################
 # Email properties
 ####################################################################
 PARAM_EmailFrom=user1@your_company.com
 PARAM_EmailTo=user2@your_company.com,user3@your_company.com
 PARAM_EmailCC=user4@your_company.com
 PARAM_EmailBCC=user5@your_company.com
 PARAM_EmailSubject=Test send report by email
 PARAM_EmailBody=This is the report attached
```

   An explanation of all the customizable fields is contained in the template file.

Running audit reports from the command line

To run audit report on the database, you must first enable the audit feature and configure the audit options described in "Global options - detailed description" on page 13.

The `\reports\templates` directory contains a sample template file for each type of report.

Before running any of these reports make sure you customize the corresponding template file, either `ad.properties` or `ag.properties`.

In that file, named *report_name*`.properties`, you can specify:

- The information to display in the report header.
- How to filter the information to display the expected result.
- The format and content of the report output.

For more information about the specific settings see the explanation provided in the template file beside each field.

After you set up the environment as it is described in "Setting up for command line reporting" on page 264, and you configured report template file, use the following syntax to run the report:

reportcli **-p** *report_name.property*
    [**-o** *output_report_dir*]
    [**-r** *report_output_name*]
    [**-k** key=*value*]
    [**-k** key=*value*]
    ....

where:

-p *report_name.property*
: Specifies the path name to the report template file.

-o *routput_report_dir*
: Specifies the output directory for the report output.

-r *report_output_name*
: Specifies the name of the report output.

-k key=*value*
: Specifies the value of a settings. This value override the corresponding value, if defined, in the `common.properties` file or in the *report_name*`.properties` file.

Examples:

1. In this example the `reportcli.cmd` is run with the default parameter:
```
reportcli.cmd -p D:\ReportCLI\TWSReportCli\reports\templates\ag.properties
-r audit1
```
2. In this example the `reportcli.cmd` is run using the `-k` parameter to override the values set for **PARAM_DateFormat** in the `.\config\common.properties` file:
```
reportcli.cmd -p D:\ReportCLI\TWSReportCli\reports\templates\ag.properties
-r audit2 -k PARAM_DateFormat=short
```
3. In this example the `reportcli.cmd` is run using the `-k` parameter to override he format specified for the report output in the `.properties` file:
```
./reportcli.sh -p /TWSReportCli/REPCLI/reports/templates/ag.properties
-r audit3 -k REPORT_OUTPUT_FORMAT=html -k OutputView=charts
```

Note: If the report is run through a Tivoli Workload Scheduler job, the output of the command is displayed in the job output.

Chapter 9. Administrative tasks

This chapter describes how to perform some specific administrative tasks on Tivoli Workload Scheduler, as follows:

The tasks

"Changing a domain manager or dynamic domain manager" on page 269
Change a domain manager or dynamic domain manager, either in the event of the failure of the computer where it is installed, or as part of a planned replacement activity.

"Changing a master domain manager" on page 270
Change a master domain manager, either in the event of the failure of the computer where it is installed, or as part of a planned replacement activity.

"Changing key Tivoli Workload Scheduler passwords" on page 274
Change the password of the TWS_user, or any other of the users that have an infrastructure role in Tivoli Workload Scheduler.

"Unlinking and stopping Tivoli Workload Scheduler" on page 283
The correct procedure to unlink the master domain manager from its agents and stop the master processing.

"Changing the database host name, port, or database name" on page 285
If you need to change the host, port or name of the database, effect the change in the application server, where the data source configuration is maintained.

"Changing the workstation host name or IP address" on page 291
Change the host name or IP address of a workstation.

"Changing the security settings" on page 296
If you need to update the properties that define your SSL connection or authentication mechanism, you need to make the changes in the embedded WebSphere Application Server

"Managing the event processor" on page 297
If you are using event-driven workload automation, you will need to perform periodic maintenance on the event processor.

"Starting, stopping, and displaying dynamic workload broker status" on page 298
The procedure to start or stop dynamic workload broker.

Application server tasks
The following tasks might need to be performed on the application server:

"Application server - starting and stopping" on page 300
How to stop and start the application server when you need to.

"Application server - automatic restart after failure" on page 301
The application server is managed by a utility that restarts it if it stops for any reason (subject to a configurable policy). This section describes how to modify the policy and deal with any situations that the policy cannot handle.

"Application server - encrypting the profile properties files" on page 305
: Several of the application server configuration files contain passwords. To avoid that these remain in the files in plain text, run a utility to encrypt them.

"Application server - updating the Windows services after modifications" on page 305
: On Windows, after changing certain data you must also update the Windows service that runs the embedded WebSphere Application Server.

"Application server - updating the SOAP properties after changing the WebSphere Application Server user or its password" on page 306
: On UNIX or Linux operating systems, if you have changed the user ID or the password of the WebSphere Application Server administration user either for Tivoli Workload Scheduler or the Dynamic Workload Console, you must also update the SOAP client properties.

"Application server - configuration files backup and restore" on page 307
: The application server configuration manages the data source and security aspects of your Tivoli Workload Scheduler environment. The files should be regularly backed up and when necessary can be restored.

"Application server - changing the host name or TCP/IP ports" on page 308
: If you need to change the host or ports used by the application server, follow the correct procedure.

"Application server - changing the trace properties" on page 311
: The application server has a trace facility. This section describes how to increase the trace level to obtain more information for troubleshooting, and how to reduce the level to improve performance.

Changing the application server properties

Several of the above tasks require you to run a common procedure whereby you:

1. Run a utility that displays a set of current application server properties and saves them to a file
2. Edit the file to change the properties
3. Run another procedure to update the application server with the changed properties

This procedure is fully described in "Application server - using the utilities that change the properties" on page 312

Application server utilities reference information

Some reference information on the application server utilities is also provided in "Application server utilities" on page 313. For further reading, see *IBM Redbooks®: WebSphere Application Server V6 System Management & Configuration Handbook*.

Changing a domain manager or dynamic domain manager

A domain manager or dynamic domain manager might need to be changed because you want it to run on a different workstation, or it might be forced on you as the result of network linking problems or the failure of the domain manager or dynamic domain manager workstation itself. This section, and its subsections, describes how to prepare for and use a backup domain manager or dynamic domain manager. However, if the domain manager to be changed is a master domain manager, there are some specific additional steps to perform; see "Changing a master domain manager" on page 270.

Running without a domain manager has the following effects:

- Agents and subordinate domain managers cannot resolve inter-workstation dependencies, because activity records broadcast by the master domain manager are not being received.
- The upward flow of events is interrupted. This impacts events that report the status of jobs, job streams and dependencies defined on workstations in the Tivoli Workload Scheduler network hierarchy under the failed domain manager.
- Standard agents that are hosted by the failed domain manager cannot perform any processing, since they depend on the domain manager for all scheduling and job launching.

If the problem is expected to be of short duration, you can wait for the problem to be resolved and Tivoli Workload Scheduler will recover on its own, as described in the *Tivoli Workload Scheduler: Troubleshooting Guide* in the section about network linking problems. If you are uncertain about the duration, or if you want to restore normal agent operation, you must switch to a backup, as described in the following sections.

Choosing a backup domain manager or backup dynamic domain manager

Being prepared for network problems makes recovery easier. Set up a backup domain manager or backup dynamic domain manager respectively for each domain manager or dynamic domain manager in your network to more easily ensure that Tivoli Workload Scheduler peak job scheduling loads are met. Choose any fault-tolerant agent in the domain to be a backup domain manager or backup dynamic domain manager.

Setting up a backup domain manager

Ensure that the *FullStatus* mode is selected in the backup domain manager or backup dynamic domain manager workstation definition.

Also ensure that the backup domain manager is synchronized with respect to time with the domain manager. The most secure way is to use a Network Time Protocol Server to control the time on both systems, with the same repeat interval.

Network security

Network security is enforced using IP address validation. As a consequence, workstation linking (*autolink* option or **`link`** command) might fail if an agent has an old `Symphony` file that does not contain the new domain manager. If a connection fails, remove the old `Symphony` file on the agent and retry the connection.

Switching a domain manager

Use one of these procedures when you have a short-term loss of a domain manager.

Using the command line
See the procedure described under the **switchmgr** command in the *Tivoli Workload Scheduler: User's Guide and Reference*.

Using the Dynamic Workload Console
1. Launch the Dynamic Workload Console
2. Connect to the engine of the current domain manager
3. Select **All workstations in Plan**
4. Select the workstation you want to become the domain manager
5. Click the **More** action
6. Select **Become Domain Manager**.
7. Click **OK**.

Domain managers remain switched until you perform another switch manager operation, or run **JnextPlan**. To return to the original domain manager without running **JnextPlan**, repeat this procedure.

Switching a dynamic domain manager

Use the procedure described in "Switching a master domain manager or dynamic domain manager" on page 273 when you have a short-term loss of a dynamic domain manager. The configuration information defined in the dynamic workload broker installed with the dynamic domain manager is automatically saved in the Tivoli Workload Scheduler database. When you switch to the backup dynamic domain manager, this information is automatically applied to the backup dynamic domain manager.

Changing a master domain manager

If you lose or want to plan to change a master domain manager, all the comments in the section "Changing a domain manager or dynamic domain manager" on page 269 apply, but in addition consider the following:

Choosing a workstation for backup master domain manager

Since you must transfer files between the master domain manager and its backup, the workstations must have compatible operating systems. Do not combine UNIX with Windows workstations, and in UNIX, do not combine big-endian workstations (HP-UX, Solaris, and AIX) with little-endian workstations (most Intel-based operating systems, including Windows and Linux).

See the *Tivoli Workload Scheduler: Planning and Installation Guide* for details of the prerequisite requirements of a backup master domain manager.

Promoting an agent to backup master domain manager

It is the normal process to install a backup master domain manager when you set up your scheduling network. However, if you have not done so, and decide later that you need a backup master domain manager, you have two options:

- Install a backup master domain manager on a system that is not currently in the workload scheduling network. Follow the instructions in the *Tivoli Workload Scheduler: Planning and Installation Guide*

- Promote an agent to backup master domain manager. This option is time-consuming and requires you to interrupt your workload scheduling activities, but if you want to do it, follow the procedure described in this section

You *cannot* promote an agent to backup master domain manager, using a command or procedure that allows continuity of workload scheduling activities.

Instead, if you need to change an agent workstation to become the backup master domain manager, you must interrupt the workload scheduling activities. The procedure is as follows:

1. Check that the workstation satisfies the prerequisites for a backup master domain manager
2. If it does, stop and disable all workload scheduling operations on the workstation
3. Uninstall the agent, following the instructions in the *Tivoli Workload Scheduler: Planning and Installation Guide*
4. Install the backup master domain manager on the system where the agent was installed, following the instructions in the *Tivoli Workload Scheduler: Planning and Installation Guide*
5. Ensure that the database entry for the workstation is correct for a backup master domain manager (see the *Tivoli Workload Scheduler: User's Guide and Reference* for information about the workstation definition
6. Define and start any workload scheduling operations you require on the workstation in its new role.

Setting up a backup master domain manager

Ensure that the master domain manager and the backup master domain manager have *FullStatus* turned on in the workstation definition. This is important if you need to resort to long-term recovery, where the backup master domain manager generates a `Symphony` file (runs JnextPlan). If *FullStatus* is not turned on, the former master domain manager shows up as a regular fault-tolerant agent after the first occurrence of JnextPlan. During normal operations, the JnextPlan job automatically turns on the *FullStatus* flag for the master domain manager, if it is not already turned on. When the new master domain manager runs JnextPlan, it does not recognize the former master domain manager as a backup master domain manager unless the flag is enabled. The former master domain manager does not have an accurate `Symphony` file when the time comes to switch back.

Also ensure that the backup master domain manager is synchronized with respect to time with the master domain manager. The securest way is to use a Network Time Protocol Server to control the time on both systems, with the same repeat interval.

Copying files to use on the backup master domain manager

To back up the important master domain manager files to the backup master domain manager, use the following procedure:

1. Copy the `Security` file on the master domain manager to the `<`*`TWA_home`*`>/TWS` directory on the backup master domain manager. Add a suffix to the file so that it does not overwrite the backup master domain manager's own Security file, for example, `Security_from_MDM`.
2. Copy all files in the `<`*`TWA_home`*`>/TWS/mozart` directory.

3. Copy the `localopts` file (see "Setting local options" on page 23 for the location). Add a suffix to the file so that it does not overwrite the backup master domain manager's own `localopts` file; for example, `localopts_from_MDM`.

This procedure must be performed each production period, or whenever there are significant changes to any objects. It can be incorporated into a script.

In addition to these required files, you might also want to copy the following:
- Any scripts you might have written.
- Archived Symphony files, for reference.
- Log files, for reference.

Note: Another approach could be to place all of the above files on a separately mountable file system, that could easily be unmounted from the master domain manager and mounted on the backup master domain manager in the event of need. You would almost certainly want to backup these files in addition, to protect against loss of the separately mountable file system.

To prevent the loss of messages caused by a master domain manager error, you can use the fault-tolerant switch-manager facility.

Switching a master domain manager

Use the procedure described in "Switching a domain manager" on page 270 when you have a short-term loss of a master domain manager.

Master domain managers remain switched until you perform another switch manager operation. To return to the original master domain manager, repeat this procedure before the next production period turnover, unless you do not expect the master domain manager to be available for the next production period turnover (final job stream and JnextPlan job). In this case, use the procedure in the following section.

Extended loss or permanent change of master domain manager

Use the following procedure to switch to the backup if the original master domain manager is not expected to return to service before the next new production period turnover (final job stream and JnextPlan job). For UNIX, use forward slashes in path names.

1. Use the conman **stop** function to stop Tivoli Workload Scheduler on the master domain manager and its backup.
2. If you copied the `Security` file from the master domain manager to the backup master domain manager *with a suffix*, now delete the backup master domain manager's own `Security` file and rename the `Security` file with the suffix as just `Security`.
3. If you copied the `localopts` file from the master domain manager to the backup master domain manager *with a suffix*, now merge the backup master domain manager's own `localopts` file with the `localopts` file from the master domain manager. Look at each property in turn and determine which version you want to keep on what is going to be your new master domain manager. For example, the property *thiscpu* needs to be the one from the backup master domain manager, but the options for controlling how the processes run can be taken from the master domain manager.

4. On the backup master domain manager cancel the *final* job stream in the Symphony file (it refers to the next production period's JnextPlan on the old master domain manager).
5. On the backup master domain manager, use composer to modify any important job streams that run on the master domain manager, in particular the *final* job stream. For each of these, change the workstation name to the name of the backup.
6. Change the workstation definition of the master domain manager from *manager* to *fault-tolerant agent*.
7. Change the workstation definition of the backup master domain manager from *fault-tolerant agent* to *manager*.

   Note: These two steps must be done in the order given, as the system will not allow you to have two *managers* at the same time.
8. On the backup master domain manager, edit the `<TWA_home>/TWS/mozart/globalopts` file and change the *master* option to the name of the backup master domain manager workstation (this is used mainly for reports production)
9. Use the conman **switchmgr** function to switch to the backup master domain manager. See "Switching a domain manager" on page 270.
10. Submit a new *final* job stream to the new master domain manager (old backup master domain manager).
11. Run **`JnextPlan`** on the new master domain manager to generate the new `Symphony` file.
12. Remember to log on to the backup master domain manager when opening the Dynamic Workload Console, first defining a new engine to access it.
13. If the old master domain manager has failed or is being replaced, you can now delete its workstation definition and remove it from the network.

Switching a master domain manager or dynamic domain manager

Switching a master domain manager or dynamic domain manager affects the running dynamic workload broker server.

The installation of a master domain manager or dynamic domain manager and of its backup workstations includes also the installation of a dynamic workload broker server.

Before you switch your master domain manager or dynamic domain manager to a backup workstation, you must stop the dynamic workload broker server. After the switch has completed, you must start the dynamic workload broker server on the new master domain manager or dynamic domain manager. The process is not automatic and you must ensure that you avoid having two concurrently active servers.

If you have to switch the master domain manager or dynamic domain manager because the system running the current workstation failed, make sure that also the dynamic workload broker server is down, in which case, you only need to start the new dynamic workload broker server after switching the master.

If you switch the master domain manager or dynamic domain manager for any other reason than a system failure, and you are switching to a backup workstation while the system running the current master domain manager or dynamic domain manager is up, you risk having two concurrently active servers. This is why it is important that you stop the current dynamic workload broker server before you switch, and that you start the new instance after the backup workstation takes over.

Here is the procedure to follow every time you switch the master domain manager or dynamic domain manager if you run dynamic scheduling in your network:

1. If the dynamic workload broker server on the current master domain manager or dynamic domain manager is still running, stop it. Use wastool **stopBrokerApplication.sh** on UNIX and Linux or **stopBrokerApplication.bat** on Windows as follows:

   ```
   stopBrokerApplication -user username -password password [-port portnumber]
   ```

   where *username* and *password* are the credentials used at installation. The parameter *portnumber* is optional. If it is not specified, the default is used.
2. Switch the master domain manager or dynamic domain manager to a backup workstation. Use either the `conman switchmgr` command or the Dynamic Workload Console. For more information, see the section about the `switchmgr` command in *Tivoli Workload Scheduler: User's Guide and Reference*.
3. Start the dynamic workload broker server running with the new workstation. Use wastool **startBrokerApplication.sh** on UNIX and Linux or **startBrokerApplication.bat** on Windows as follows:

   ```
   startBrokerApplication -user username -password password [-port portnumber]
   ```

   where *username* and *password* are the credentials used at installation. The parameter *portnumber* is optional. If it is not specified, the default is used.

Changing key Tivoli Workload Scheduler passwords

When you change passwords for key users in your Tivoli Workload Scheduler environment, there are various operations to perform, depending on which user's password is being changed, the type of operating system on which it is deployed, and the type of Tivoli Workload Scheduler node where the password is being changed. You can perform these operations manually, or you can use the **changePassword** script described in "Using the changePassword script" on page 282 to accomplish the necessary operations automatically.

If you decide to proceed manually, the following pages describe what you have to do if the passwords of any of the following users change:

Tivoli Workload Scheduler instance owner
The <*TWS_user*> (the instance owner) of a Tivoli Workload Scheduler component (on Windows only).

WebSphere Application Server user
The WebSphere Application Server user (as identified by the WebSphere Application Server tools) which authenticates the <*TWS_user*> being used by Tivoli Workload Scheduler components.

The database user (J2C) of a Tivoli Workload Scheduler component:

DB2 If you are using a DB2 database, this is the user ID used to access DB2.

Note: This is different according to whether you have the server or the client installed:

DB2 Server installed
The DB2 administration user (local) is used.

DB2 Client installed
The Tivoli Workload Scheduler DB2 user on the remote server is used.

Oracle If you are using an Oracle database, the Oracle schema owner user.

Note: The Oracle schema owner is not an operating system ID. Even if it has the same value as an operating system ID on the same computer, it is completely separate, and the passwords are changed separately.

Streamlogon user
The streamlogon user of any job run in the Tivoli Workload Scheduler environment (jobs running on Windows only)

For all other users of Tivoli Workload Scheduler, no action is required if their passwords change.

If you use the **changePassword** script, the password changes and corresponding operations are performed automatically. For detailed information about the script, refer to "Using the changePassword script" on page 282. If you decide to proceed manually, consult Table 58 to determine if a change of password requires actions to be taken for a role on the different Tivoli Workload Scheduler components. Look up the role and the component and determine from the corresponding table cell where the changes must be made:

- If the cell contains a "✓", make the change on the system where the indicated component is running
- If the cell contains "MDM", make the change on the master domain manager to which the component belongs

Table 58. If and where password changes are required

Role	MDM	BKM	FTA	FTA + CONN
Tivoli Workload Scheduler instance owner (Windows)	✓	✓	✓	✓
WebSphere Application Server user	✓	✓		✓
Database user	✓	✓		
Streamlogon user (Windows)	✓	✓	MDM	MDM

For example, if you are the TWS_user (the instance owner) of a fault-tolerant agent, you need to implement the password change on the system where the fault-tolerant agent is installed, but if you are also the streamlogon user of jobs running on that system, the changes required for the new password must be applied at the master domain manager to which the fault-tolerant agent belongs.

If you are not certain which user role you are playing, consult "Determining the role of the user whose password has changed" on page 276.

When you have determined what role you are playing, determine if you need to take any actions, and if so, where, by consulting "Determining the actions to take" on page 277.

Determining the role of the user whose password has changed

Use the following procedure to determine which role or roles the user whose password has changed is playing.

Attention: A user might have more than one role, in which case you must follow more than on procedure to change the password

1. Check if the user is the Tivoli Workload Scheduler instance owner:

Windows
Check if the user whose password is to be changed is the user that owns the *Tivoli Workload Scheduler for <TWS_user>* service.

UNIX Run the following command:

```
ps -ef | grep netman
```

If the user whose password has changed matches the user ID revealed by the above, the user is the *Tivoli Workload Scheduler instance owner*.

2. Check if the user is the WebSphere Application Server user or the database user, or both:

1. Log on to the computer where Tivoli Workload Scheduler is installed as the following user:

   UNIX root

   Windows
   Any user in the *Administrators* group.
2. Access the directory: `<TWA_home>/wastools`
3. From that same directory run the following script:

   UNIX **`showSecurityProperties.sh > <output_file.txt>`**

   Windows
   `showSecurityProperties.bat > <output_file.txt>`

   Note: This command might display a message from the application server (WASX7357I:) in the output file. You can ignore this message.
4. Open *<output_file.txt>* in a text editor.
5. Check the value of the key: `activeUserRegistry`. Depending on the value, check if the user whose password has changed is one of the ID keys:

Table 59. Values of `activeUserRegistry` to check

Value of activeUserRegistry key:	User ID key to check:	Password to change
LocalOS	LocalOSServerID	LocalOSServerpassword
`LDAP`	LDAPServerid	LDAPPassword

   If the user whose password has changed matches the appropriate ID key, the user is the *WebSphere Application Server user*
6. Check the value of the key `j2cUserid` . If the user whose password is to be changed matches this key, the user is the *database user*.

Note: If the user is the Oracle schema owner, the password must also be changed within Oracle (see the Oracle documentation).

3. Check if the user is a streamlogon user

Using **composer** or the Dynamic Workload Console, check if the user is identified as a Windows user. If so, the user is a *streamlogon user*.

When you have determined which roles the user plays, see Table 58 on page 275 to determine if and where the password change must be implemented, and then "Determining the actions to take."

Determining the actions to take

Consult Table 60 to determine which actions you need to perform for a change of password:

Table 60. Password change actions

	TWS instance owner (Windows only)	**WebSphere Application Server user**	**Database user**	**Streamlogon user (Windows only)**
"Action 1 - change the WebSphere Application Server user ID password" on page 278		✓ (1)		
"Action 2 - change password used by command-line clients to access the master domain manager" on page 279		✓		
"Action 3 - change password used by fault-tolerant agent systems to access the master domain manager (for conman)" on page 279		✓		
"Action 4 - update the engine connection parameters in the GUIs" on page 280		✓		
"Action 5 - change the j2c user ID password" on page 280			✓ (1)	
"Action 6 - update SOAP properties" on page 281		✓		
The following step only applies to passwords of users on Windows computers				
"Action 7 - Windows - update Windows services" on page 281	✓	✓		
"Action 8 - change the Tivoli Workload Scheduler Windows user definition" on page 281				✓

Note:

1. If the user is both the WebSphere Application Server user *and* the database user, the changes made by running **changeSecurityProperties** can be performed as one action, modifying both passwords with the same value.

Action 1 - change the WebSphere Application Server user ID password

Use the **`changeSecurityProperties`** utility to change the WebSphere Application Server user ID password.

The procedure requires you to create a text file of the current security properties, edit the file, stop the application server, run the utility and restart the application server.

Note: You might have already created the text file while determining your role (see "Determining the role of the user whose password has changed" on page 276).

Find information about how to do this as follows:

- "Application server - using the utilities that change the properties" on page 312 gives a generic description of the procedure for making any change to the WebSphere Application Server properties
- "Changing the security settings" on page 296 gives reference information about the utility
- When editing the text file of the current security properties, Locate either `LocalOSServerpassword` or `LDAPPassword`, depending on the type of authentication you are using (see Table 59 on page 276), and change the password to the new value, in plain text.

Note:

1. If the user is both the WebSphere Application Server user *and* the database user, you can change the properties for both in the same action. See "Action 5 - change the j2c user ID password" on page 280. for details of the property to change.
2. The **`changeSecurityProperties`** utility might display a message from the application server (WASX7357I:). You can ignore this message.
3. When you supply a password in a text file for **`changeSecurityProperties`**, there is a small security exposure. When you enter a password in the file, the password is entered in clear (unencrypted). After you have run **changeSecurityProperties**, the password remains in clear in the text file you have edited, but if you run **showSecurityProperties** the password is output encrypted. Thus, your potential security exposure is limited to the time from when you entered the password in the text file until when you manually deleted the text file after using **`changeSecurityProperties`**.

Attention: if you subsequently want to change *other* parameters and do *not* want to change any passwords, you must do one of the following before running **changeSecurityProperties**:

- Resupply the passwords in clear
- Comment the password properties
- Delete the password properties

This is to avoid that the row of asterisks is applied as the password.

Note that if you run **showSecurityProperties** and see that any password in the encrypted form is shown as a sequence of 5 asterisks (*), this is wrong. A maximum of 3 asterisks is supported. Sequences of 5 asterisks are not supported and your passwords, encrypted as such, are ignored. If this happens, reset the password to a shorter one.

Action 2 - change password used by command-line clients to access the master domain manager

If you have changed the password of the WebSphere Application Server user that command-line clients use to connect to the master domain manager, the connection parameters must be updated.

Follow this procedure:

1. Identify all systems that have a command line client remote connection defined with the master domain manager
2. On these workstations, open the user options files (one for each user). The default file name is `<User_home>/.TWS/useropts`, but if you have more than one instance of Tivoli Workload Scheduler on a system, you might have implemented separate user options files to make separate connections, in which case consult the *useropts* key in the `localopts` file on each instance to determine the name of the specific `useropts` file for that instance.
3. For each file, locate the password key (encrypted) and change its value to that of the new password in plain text, enclosed in double quotes. The password is saved in clear, but will be encrypted at first logon of the User ID.
4. Save the files.
5. Check if the following file exists: `<Root_home>/.TWS/useropts`. If it does, change the password in the same way.

Action 3 - change password used by fault-tolerant agent systems to access the master domain manager (for conman)

If you have changed the password of the WebSphere Application Server user that is used by fault-tolerant agents with an HTTP or HTTPS connection defined in the local options that points to the master domain manager, the connection parameters must be updated.

Follow this procedure:

1. Identify all fault-tolerant agents with an HTTP or HTTPS connection defined in the local options that points to the master domain manager.
2. On these workstations, open the user options file `<Root_home>/.TWS/useropts`

3. Locate the password key (encrypted) and change its value to that of the new password in plain text, enclosed in double quotes. The password is saved in clear, but will be encrypted at first logon of the User ID.
4. Save the file.

Action 4 - update the engine connection parameters in the GUIs

If you have changed the password of the WebSphere Application Server user that is used by the Dynamic Workload Console to connect to the distributed engine, the engine connection parameters must be updated, as follows:
1. On each instance of the Dynamic Workload Console locate the page where you modify the distributed engine connection parameters
2. Change the password and submit the page.

Action 5 - change the j2c user ID password

Use the **`changeSecurityProperties`** utility to change the j2c database user ID password.

The procedure requires you to create a text file of the current security properties, edit the file, stop the application server, run the utility and restart the application server.

Note: You might have already created the text file while determining your role (see "Determining the role of the user whose password has changed" on page 276).

Find information about how to do this as follows:
- "Application server - using the utilities that change the properties" on page 312 gives a generic description of the procedure for making any change to the WebSphere Application Server properties
- "Changing the security settings" on page 296 gives reference information about the utility
- When editing the text file of the current security properties, Locate the `j2cPassword` and change the password to the new value, in plain text.

Note:
1. If the user is both the WebSphere Application Server user *and* the database user, you can change the properties for both in the same action. See "Action 1 - change the WebSphere Application Server user ID password" on page 278. for details of the property to change.
2. The **`changeSecurityProperties`** utility might display a message from the application server (WASX7357I:). You can ignore this message.
3. When you supply a password in a text file for **`changeSecurityProperties`**, there is a small security exposure. When you enter a password in the file, the password is entered in clear (unencrypted). After you have run **changeSecurityProperties**, the password remains in clear in the text file you have edited, but if you run **showSecurityProperties** the password is output encrypted. Thus, your potential security exposure is limited to the time from when you entered the password in the text file until when you manually deleted the text file after using **`changeSecurityProperties`**.

Attention: if you subsequently want to change *other* parameters and do *not* want to change any passwords, you must do one of the following before running **changeSecurityProperties**:

- Resupply the passwords in clear
- Comment the password properties
- Delete the password properties

This is to avoid that the row of asterisks is applied as the password.

Action 6 - update SOAP properties

After the password of the WebSphere Application Server administration user has been modified, it is important to change the SOAP client properties using the **`updateWas.sh/.bat`** script (see "Application server - updating the SOAP properties after changing the WebSphere Application Server user or its password" on page 306 for full details). For example:

```
updateWas.sh -user john.smith@domain.com -password zzzz
```

where the**`user`** and **`password`** options are the user that is authorized to stop the WebSphere Application Server.

Stop and restart WebSphere Application Server using the **`stopappserver`** and **`startappserver`** commands to make the change effective.

Action 7 - Windows - update Windows services

On Windows, the <*TWS_user*> account is used to start the following services:

- Tivoli Token Service for <*TWS_user*>
- Tivoli Workload Scheduler for <*TWS_user*>
- IBM WebSphere Application Server V7.0 - <*TWS_user*>.

The password must be updated in the properties of these services, or they are not able to start at next reboot. This is done as follows:

1. Stop all Tivoli Workload Scheduler processes. See "Unlinking and stopping Tivoli Workload Scheduler" on page 283 for details.
2. Locate the script **`updateWasService.bat`** in the `<`*`TWA_home`*`>/wastools` directory.
3. Run **`updateWasService.bat`**, as described in "Application server - updating the Windows services after modifications" on page 305, giving the new password as the <*WAS_user_password*>.
4. Restart all Tivoli Workload Scheduler processes using the **`StartUp`** command.

Action 8 - change the Tivoli Workload Scheduler Windows user definition

If the user ID is used within Tivoli Workload Scheduler to run jobs, follow this procedure:

1. Run the **`composer modify user`** command. The user details of the selected user are written to a temporary file, which is opened.
2. Edit the password field so that it contains the new password value delimited by double quote characters (").
3. Save the file, and the contents are added to the database.

4. To make the change immediately effective in the current plan, issue the **conman altpass** command.

For the full syntax of these commands see the *Tivoli Workload Scheduler: User's Guide and Reference*.

Using the changePassword script

Use the **changePassword** script from the <*TWA_home*>/wastools directory to change the passwords of any of the following users:

- Tivoli Workload Scheduler instance owner (<*TWS_user*>)
- WebSphere Application Server user
- Database (J2C) user for either Oracle or DB2
- Streamlogon user (Windows only)

If required, the script performs the necessary changes to the *useropts* file and stops and restarts the WebSphere Application Server. You can run this script from your master domain manager or Tivoli Workload Scheduler agent. The script determines the role of the users for which the password must be changed and performs the checks and actions of the manual procedure described in actions 1 through 8. Run the script as follows:

UNIX

```
changePassword.sh  -user <USERID>
                     -password <PASSWORD>
                     [-wasuser <WASUSER>]
                     [-waspassword <WASPASSWORD>]
                     [-usroptshome <HOMEDIR>]
```

Where the arguments are as follows:

–user <*USERID*>
This argument is mandatory. Specify the user whose password you are changing.

–password <*PASSWORD*>
This argument is mandatory. Specify the new password for the user.

–wasuser <*WASUSER*>
This argument is optional. Specify the WebSphere Application Server user. By default, the <*USERID*> value is used.

–waspassword <*WASPASSWORD*>
This argument is optional. Specify the WebSphere Application Server user password. By default, the <*PASSWORD*> value is used. The <*WASUSER*> and <*WASPASSWORD*> values are ignored if the WebSphere Application Server is not present on this instance or if the script is running for a Tivoli Workload Scheduler instance.

–usroptshome<*HOMEDIR*>
This argument is optional. The script searches for the USEROPTS file in the *TWA_home*/.*TWS*WebSphere Application Server directory. This argument is ignored if the script is not running for a Tivoli Workload Scheduler instance.

Windows

```
changePassword.bat  -user <USERID>
                      -password <PASSWORD>
                      [-srvuser <SRVUSERID>]
```

```
                    [-srvpassword <SRVPASSWORD>]
                    [-wasuser <WASUSERID>]
                    [-waspassword <WASPASSWORD>]
                    [-usroptshome <HOMEDIR>]
                    [-streamlogonws <WS>]
                    [-streamlogondm <DOMAIN>]
```

Where the arguments are as follows:

–user <*USERID*>
: This argument is mandatory. Specify the user whose password you are changing.

–password <*PASSWORD*>
: This argument is mandatory. Specify the new password for the user.

–srvuser <*SRVUSERID*>
: This argument is optional. Specify the Windows service user. If you are running the script for a Tivoli Workload Scheduler instance, the value specified here is the same as the Tivoli Workload Scheduler user. By default, the <*USERID*> value is used.

–srvpassword <*SRVPASSWORD*>
: This argument is optional. The password of the Windows service user. By default, the <*PASSWORD*> value is used.

–wasuser <*WASUSER*>
: This argument is optional. Specify the WebSphere Application Server user. By default, the <*USERID*> value is used.

–waspassword <*WASPASSWORD*>
: This argument is optional. Specify the WebSphere Application Server user password. By default, the <*PASSWORD*> value is used. The <*WASUSER*> and <*WASPASSWORD*> values are ignored if the WebSphere Application Server is not present on this instance or if the script is running for a Tivoli Workload Scheduler instance.

–usroptshome<*HOMEDIR*>
: This argument is optional. The script searches for the `USEROPTS` file in the *`TWA_home/.TWS`*WebSphere Application Server directory. By default, the home directory of the user running the script is used.

–streamlogonws<*WS*>
: This argument is optional. The script updates the Windows user definition for the `<WS>#<DOMAIN>/<USER>` user in the Tivoli Workload Scheduler database. By default, the Windows user definition for the `<USER>` is updated. The update is performed only if the tool is running on the master domain manager in a Windows environment.

–streamlogondm<*DOMAIN*>
: This argument is optional. Specify the domain of the user specified for the `<USER>`.

Unlinking and stopping Tivoli Workload Scheduler

Before you perform an upgrade or uninstall, install a fix pack, or perform maintenance activities, ensure that all Tivoli Workload Scheduler processes and services are stopped. Follow these steps:

1. If you have jobs that are currently running on the workstation, wait for them to finish. To determine which are not finished, check for jobs that are in the *exec*

state. When there are no jobs in this state, and you have allowed sufficient time for all events to be distributed in your network, you can continue with the rest of the procedure.

2. If the workstation that you want to stop is not the master domain manager, unlink the workstation by issuing the following command from the command line of the master domain manager:
   ```
   conman "unlink workstationname;noask"
   ```
3. All Tivoli Workload Scheduler processes on the workstation must then be stopped manually. From the command line, while logged on as the <*TWS_user*>, use the following command:
   ```
   conman "stop;wait"
   ```
4. From the command line, stop the netman process as follows:

   UNIX Run:
   ```
   conman "shut"
   ```
   Note: Do not use the UNIX **kill** command to stop Tivoli Workload Scheduler processes.

   Windows
   Run the `shutdown.cmd` command from the Tivoli Workload Scheduler home directory.
5. If the workstation is at V8.4 or higher, stop the SSM agent, as follows:
   - On Windows, stop the Windows service: Tivoli Workload Scheduler SSM Agent (for <*TWS_user*>).
   - On UNIX, run **stopmon**.
6. If you are updating an agent, remove (unmount) any NFS mounted directories from the master domain manager.
7. If you are upgrading an installation that includes the connector, stop the connector.
8. Stop the WebSphere Application Server using the **conman stopappserver** command (see "Starting and stopping the application server and **appservman**" on page 303)

To verify if there are services and processes still running, complete the following steps:

UNIX Type the command:
```
ps -u <TWS_user>
```
Verify that the following processes are not running: netman, mailman, batchman, writer, jobman, JOBMAN, stageman, logman, planman, monman, ssmagent.bin, and appservman.

Windows
Run **Task Manager**, and verify that the following processes are not running: netman, mailman, batchman, writer, jobman, stageman, JOBMON, tokensrv, batchup, logman, planman, monman, ssmagent, and appservman.

Also, ensure that no system programs are accessing the directory or subdirectories, including the command prompt and Windows Explorer.

Changing the database host name, port, or database name

To change the database host name, port, or database name, the procedure differs, depending on whether the database is on DB2 or Oracle:
- "Change the DB2 host name, port, or database name"
- "Changing the Oracle host name, port, or database name" on page 291

Change the DB2 host name, port, or database name

If you need to change the DB2 host name, port, or database name, use the **changeDataSourceProperties** utility to reflect these changes in the application server on the master domain manager.

When you installed Tivoli Workload Scheduler, the default database name that was used for the creation of the database was *TWS* (which you might have changed). You also supplied the port and the host name of the DB2 server. If you want to change any of these details, you must do the following:

1. Stop DB2 and Tivoli Workload Scheduler
2. Use the facilities of DB2 (see DB2 documentation for details) or the operating system to change the database name, port or host name.
3. Change the configuration of the Tivoli Workload Scheduler application server so that it points correctly to the changed DB2 configuration.

   The procedure requires you to stop the application server, create a text file of the current data source properties, edit the file, run the utility and restart the application server. Find information about how to do this as follows:
   - "Application server - using the utilities that change the properties" on page 312 gives a generic description of the procedure for making any change to the WebSphere Application Server properties
   - "Changing data source properties" on page 286 lists all the data source properties and gives other reference information about the utility
   - When editing the text file of the current data source properties:
     a. Edit the text file and locate the following properties:
     ```
     ################################################################
     # DB2 Type4 Resource Properties
     ################################################################
     DB2Type4DatabaseName=TWS
     DB2Type4ServerName=localhost
     DB2Type4PortNumber=50083
     ```
     b. Set the following entries:

     DB2Type4DatabaseName
        The new name of the Tivoli Workload Scheduler database.

     DB2Type4ServerName
        The new DB2 server host name.

     DB2Type4PortNumber
        The new DB2 server port.

     When you change a DB2 server port, you must also modify the configuration of the node where the Tivoli Workload Scheduler was cataloged:
     – If you are working with a DB2 client, open a command line session and log in as DB2 Administrator, then run the following commands:

```
DB2 CLIENT
db2 uncatalog node <TWSDBNAME>_ND
db2 catalog tcpip node <TWSDBNAME>_ND remote <HOSTNAME>
server <NEWPORT>
```

– If you are working with a DB2 server, open a command line session and log in as DB2 Administrator, then run the following commands :

```
DB2 SERVER
db2 uncatalog node LBNODE
db2 catalog tcpip node LBNODE remote 127.0.0.1 server <NEWPORT>
```

Do not change any other properties.

Note: The utility might display a message from the application server (WASX7357I:). You can ignore this message.

4. Start DB2 and Tivoli Workload Scheduler.

This script can also be used to change other data source properties. However, if you do so, Tivoli Workload Scheduler might not work correctly. You are advised to make any other changes only under the instructions of IBM Software Support, to correct specific problems. One of those specific problems could be the need to resolve problems with the JBDC driver, see “Resolving problems with the JDBC driver” on page 289.

Changing data source properties

You run the **changeDataSourceProperties** script on the master domain manager to change the data source properties of the RDBMS in use with the master domain manager. You are required to update the data source properties in the following cases:

- You migrate your data from an Oracle database to DB2 using the reconfiguration method.
- You change the database name, server, host, or port.
- You change the path to the JDBC driver of the RDBMS.

The procedure for running the script is described in detail in “Application server - using the utilities that change the properties” on page 312, but in summary you do the following:

- Run **showDataSourceProperties.sh (.bat) > my_file_name** to obtain the current properties
- Edit *my_file_name*
- Run **changeDataSourceProperties.sh (.bat) my_file_name**

Note: *my_file_name* must be the fully qualified path of the file.

The change utility calls the **wsadmin** utility by running **ChangeDataSourceProperties.jacl** with the properties file as input.

Only the WebSphere Application Server resources.xml are affected by this script. The full path of the file is:

```
<TWA_home>/eWAS/profiles/TIPProfile/config/cells/DefaultNode/nodes/
   DefaultNode/servers/server<n>/resources.xml
```

The following is an example of the properties that can be changed with this utility. Only some of the options listed are currently in use by Tivoli Workload Scheduler.

```
################################################################
JDBC Path Variables
################################################################
```

```
ORACLE_JDBC_DRIVER_PATH=
DB2_JDBC_DRIVER_PATH=c:/ibm/sqllib/java
DB2UNIVERSAL_JDBC_DRIVER_PATH=c:/ibm/sqllib/java


################################################################
DB2 Type2 Resource Properties
################################################################
DB2Type2JndiName=
DB2Type2Description=
DB2Type2ConnectionAttribute=cursorhold=0
DB2Type2EnableMultithreadedAccessDetection=false
DB2Type2Reauthentication=false
DB2Type2JmsOnePhaseOptimization=false
DB2Type2DatabaseName=TWSZ_DB
DB2Type2PreTestSQLString=SELECT 1 FROM SYSIBM.SYSDUMMY1


################################################################
DB2 Type4 Resource Properties
################################################################
DB2Type4JndiName=jdbc/twsdb
DB2Type4DatabaseName=TWSZ
DB2Type4DriverType=4
DB2Type4ServerName=myhost.mydomain.com
DB2Type4PortNumber=50000
DB2Type4SslConnection=false
DB2Type4Description=
DB2Type4TraceLevel=
DB2Type4TraceFile=
DB2Type4FullyMaterializeLobData=true
DB2Type4ResultSetHoldability=2
DB2Type4CurrentPackageSet=
DB2Type4ReadOnly=false
DB2Type4DeferPrepares=true
DB2Type4CurrentSchema=
DB2Type4CliSchema=
DB2Type4RetrieveMessagesFromServerOnGetMessage=true
DB2Type4ClientAccountingInformation=
DB2Type4ClientApplicationInformation=
DB2Type4ClientUser=
DB2Type4ClientWorkstation=
DB2Type4CurrentPackagePath=
DB2Type4CurrentSQLID=
DB2Type4KerberosServerPrincipal=
DB2Type4LoginTimeout=0
DB2Type4SecurityMechanism=
DB2Type4TraceFileAppend=false
DB2Type4CurrentFunctionPath=
DB2Type4CursorSensitivity=
DB2Type4KeepDynamic=
DB2Type4CurrentLockTimeout=
DB2Type4EnableMultithreadedAccessDetection=false
DB2Type4Reauthentication=false
DB2Type4JmsOnePhaseOptimization=false
DB2Type4PreTestSQLString=SELECT 1 FROM SYSIBM.SYSDUMMY1
DB2Type4DbFailOverEnabled=false
DB2Type4ConnRetriesDuringDBFailover=100
DB2Type4ConnRetryIntervalDuringDBFailover=3000
# DB2Type4IsolationLevel can be one of the following:
#       CURSOR_STABILITY or READ_STABILITY
DB2Type4IsolationLevel=CURSOR_STABILITY


################################################################
Oracle Type2 Resource Properties
################################################################
```

```
OracleType2JndiName=
OracleType2DriverType=
OracleType2URL=jdbc:oracle:oci:@ORCL
OracleType2DatabaseName=
OracleType2ServerName=
OracleType2PortNumber=1521
OracleType2OracleLogFileSizeLimit=0
OracleType2OracleLogFileCount=1
OracleType2OracleLogFileName=
OracleType2OracleLogTraceLevel=INFO
OracleType2OracleLogFormat=SimpleFormat
OracleType2OracleLogPackageName=oracle.jdbc.driver
OracleType2TNSEntryName=
OracleType2NetworkProtocol=
OracleType2DataSourceName=
OracleType2LoginTimeout=
OracleType2Description=
OracleType2EnableMultithreadedAccessDetection=false
OracleType2Reauthentication=false
OracleType2JmsOnePhaseOptimization=false
OracleType2PreTestSQLString=SELECT 1 FROM DUAL
OracleType2DbFailOverEnabled=false
OracleType2ConnRetriesDuringDBFailover=100
OracleType2ConnRetryIntervalDuringDBFailover=3000


################################################################
Oracle Type4 Resource Properties
################################################################
OracleType4JndiName=
OracleType4DriverType=
OracleType4URL=jdbc:oracle:thin:@//localhost:1521/ORCL
OracleType4DatabaseName=
OracleType4ServerName=
OracleType4PortNumber=1521
OracleType4OracleLogFileSizeLimit=0
OracleType4OracleLogFileCount=1
OracleType4OracleLogFileName=
OracleType4OracleLogTraceLevel=INFO
OracleType4OracleLogFormat=SimpleFormat
OracleType4OracleLogPackageName=oracle.jdbc.driver
OracleType4TNSEntryName=
OracleType4NetworkProtocol=
OracleType4DataSourceName=
OracleType4LoginTimeout=
OracleType4Description=
OracleType4EnableMultithreadedAccessDetection=false
OracleType4Reauthentication=false
OracleType4JmsOnePhaseOptimization=false
OracleType4PreTestSQLString=SELECT 1 FROM DUAL
OracleType4DbFailOverEnabled=false
OracleType4ConnRetriesDuringDBFailover=100
OracleType4ConnRetryIntervalDuringDBFailover=3000
```

When you change data source properties, observe the following rules:

- If a property is not provided in the properties file, the current value is not changed
- If a property is provided with a non-blank value, the current value is updated.
- If a property is provided with a blank value, the setting is set to blank if the property is classified as erasable or left unchanged if not.
- Always use type 4 data sources for DB2 and type 2 data sources for Oracle.
- Set the appropriate JDBC driver path variable for the RDBMS of your choice.

- For DB2, the JDBC driver is located in the java subfolder of the sqllib directory. For example:

  ```
  DB2_JDBC_DRIVER_PATH=c:/program files/ibm/sqllib/java
  ```

  or

  ```
  DB2UNIVERSAL_JDBC_DRIVER_PATH=c:/program files/ibm/sqllib/java
  ```
- For Oracle, it is located in the jdbc/lib subfolder of the Oracle home directory. For example:

  ```
  ORACLE_JDBC_DRIVER_PATH=C:/Oracle/product/10.2.0/db_1/jdbc/lib
  ```

• Make sure that the data source JNDI name is always set to jdbc/twsdb in the ...JndiName property of the RDBMS you use. If you change the RDBMS, proceed as follows:
  1. Reset to a name of your choice the ...JndiName property of the RDBMS from which you are changing.
  2. Set to jdbc/twsdb the ...JndiName property of the new RDBMS.

• See that the following properties are set:
  - For DB2:

    ```
    DB2Type4JndiName
    DB2Type4DatabaseName
    DB2Type4ServerName
    DB2Type4PortNumber
    ```
  - For Oracle:

    ```
    OracleType2JndiName
    OracleType2DatabaseName
    OracleType2ServerName
    OracleType2PortNumber
    ```

Displaying the current data source properties: To display the current properties, use the following utility:

UNIX **showDataSourceProperties.sh**

Windows
 showDataSourceProperties.bat

Resolving problems with the JDBC driver

Tivoli Workload Scheduler is supplied using the JDBC driver type 4 for DB2 and type 2 for Oracle. However, each can use the other driver type, if necessary. IBM Software Support might ask you to change to this driver. This section tells you how.

Attention: This procedure must only be performed under the control of IBM Software Support.

To change the driver you need to change the data source properties following the procedure described in "Changing the database host name, port, or database name" on page 285. However, the parameters that you change are different. This is an example of the type 4 and type 2 parameters for DB2:

JDBC driver type 4 parameters

```
################################################################
# DB2 Type4 Resource Properties
################################################################
DB2Type4JndiName=jdbc/twsdb
DB2Type4DatabaseName=TWSZ
DB2Type4DriverType=4
DB2Type4ServerName=myhost.mydomain.com
DB2Type4PortNumber=50000
```

```
DB2Type4SslConnection=false
DB2Type4Description=
DB2Type4TraceLevel=
DB2Type4TraceFile=
DB2Type4FullyMaterializeLobData=true
DB2Type4ResultSetHoldability=2
DB2Type4CurrentPackageSet=
DB2Type4ReadOnly=false
DB2Type4DeferPrepares=true
DB2Type4CurrentSchema=
DB2Type4CliSchema=
DB2Type4RetrieveMessagesFromServerOnGetMessage=true
DB2Type4ClientAccountingInformation=
DB2Type4ClientApplicationInformation=
DB2Type4ClientUser=
DB2Type4ClientWorkstation=
DB2Type4CurrentPackagePath=
DB2Type4CurrentSQLID=
DB2Type4KerberosServerPrincipal=
DB2Type4LoginTimeout=0
DB2Type4SecurityMechanism=
DB2Type4TraceFileAppend=false
DB2Type4CurrentFunctionPath=
DB2Type4CursorSensitivity=
DB2Type4KeepDynamic=
DB2Type4CurrentLockTimeout=
DB2Type4EnableMultithreadedAccessDetection=false
DB2Type4Reauthentication=false
DB2Type4JmsOnePhaseOptimization=false
DB2Type4PreTestSQLString=SELECT 1 FROM SYSIBM.SYSDUMMY1
DB2Type4DbFailOverEnabled=false
DB2Type4ConnRetriesDuringDBFailover=100
DB2Type4ConnRetryIntervalDuringDBFailover=3000
# DB2Type4IsolationLevel can be one of the following:
#       CURSOR_STABILITY or READ_STABILITY
DB2Type4IsolationLevel=CURSOR_STABILITY
```

JDBC Driver type 2 parameters

```
################################################################
# DB2 Type2 Resource Properties
################################################################
DB2Type2JndiName=
DB2Type2Description=
DB2Type2ConnectionAttribute=cursorhold=0
DB2Type2EnableMultithreadedAccessDetection=false
DB2Type2Reauthentication=false
DB2Type2JmsOnePhaseOptimization=false
DB2Type2DatabaseName=TWSZ_DB
DB2Type2PreTestSQLString=SELECT 1 FROM SYSIBM.SYSDUMMY1
```

Switching drivers or changing the JNDI name: The data source JNDI name must be unique. In the above examples the JNDI name for driver 4 is set to the correct value. To switch drivers, modify the parameters so that the values are reversed, as follows:

```
Example 1: default values for the JNDI name:

#DB2Type4JndiName=jdbc/twsdb

...

#DB2Type2JndiName=jdbc/twsdb2



Example 2: switched values for the JNDI name:
```

```
#DB2Type4JndiName=jdbc/twsdb2

...

#DB2Type2JndiName=jdbc/twsdb
```

To change the driver names to a different value, see the following:

```
Example 3: different values for the JNDI name:

#DB2Type4JndiName=jdbc/twsdb_test4

...

#DB2Type2JndiName=jdbc/twsdb_test2
```

Changing the Oracle host name, port, or database name

If you need to change the Oracle host name, port, or database name, you can normally manage the change within Oracle. This is because WebSphere Application Server points at the Oracle service where these items are defined. See the Oracle documentation for information on how to change them.

However, the properties that you are changing might be defined in `<TWA_home>/eWAS/profiles/TIPProfile/properties/TWSConfig.properties`. In this case you must ensure that they are changed here, as well. The properties in question are:

```
com.ibm.tws.dao.rdbms.rdbmsName = ORACLE
com.ibm.tws.dao.rdbms.modelSchema = <TWS_Oracle_User>
com.ibm.tws.dao.rdbms.eventRuleSchema = <TWS_Oracle_User>
com.ibm.tws.dao.rdbms.logSchema = <TWS_Oracle_User>
```

Changing the workstation host name or IP address

When you change the host name, the IP address or both on the workstations of your Tivoli Workload Scheduler environment to have it function properly, you must report the changed value on:

- The WebSphere Application Server if the following components changed the host name, the IP address or both:
  - Master domain manager
  - Backup master domain manager
  - Connector or z/OS connector
  - Dynamic Workload Console

  For more information see “Reporting the changes in the WebSphere Application Server configuration file” on page 292.
- The following components if the workstation where you installed the RDBMS changed the host name, the IP address or both:
  - Master domain manager
  - Backup master domain manager
  - Dynamic domain manager
  - Backup dynamic domain manager

  For more information see “Reporting the changed host name or IP address of the workstation where you installed the RDBMS” on page 293.
- The workstation definitions if you installed the following components:
  - Master domain manager
  - Backup master domain manager
  - Dynamic domain manager

– Backup dynamic domain manager
– Fault-tolerant agent and standard agent
– Domain manager

For more information see "Reporting the changed host name or IP address in the workstation definition" on page 294.

Reporting the changes in the WebSphere Application Server configuration file

If the following components changed the host name or IP address you must report the changed value in the WebSphere Application Server configuration file, performing the following steps:
- Master domain manager
- Backup master domain manager
- Connector or z/OS connector
- Dynamic Workload Console

1. Stop the WebSphere Application Server.
2. Obtain the changed host name, IP address, or both.
3. Run the **showHostProperties** tool by redirecting the output to a text file to obtain the current properties.
4. Open the file and go to the Host Configuration Panel.

   Below an example of the section you have to refer to:

```
################################################################
# Host Configuration Panel
################################################################
# Old Hostname
oldHostname=myoldhost.romelab.ibm.it.com
# New Hostname
newHostname=mynewhost.romelab.ibm.it.com.....

################################################################
Ports Configuration Panel
################################################################
bootPort=41117
bootHost=myhost.mydomain.com
soapPort=41118
soapHost=myhost.mydomain.com
httpPort=41115
httpHost=*
httpsPort=41116
httpsHost=*
adminPort=41123
adminHost=*
adminSecurePort=41124
adminSecureHost=*
sasPort=41119
sasHost=myhost.mydomain.com
csiServerAuthPort=41120
csiServerAuthHost=myhost.mydomain.com
csiMuthualAuthPort=41121
csiMuthualAuthHost=myhost.mydomain.com
orbPort=41122
orbHost=myhost.mydomain.com
```

5. Verify that the value for the properties listed below were changed with the actual values:
   - Old Hostname
   - New Hostname
   - The host names for the specific port properties

If this values are different from the actual host name or IP address values, proceed with Step 6. If this values are not changed skip the steps below.

6. Modify the values of the properties by running the **changeHostProperties** tool. For more information, see “Application server - changing the host name or TCP/IP ports” on page 308.
7. Restart the WebSphere Application Server if you do not need to perform the RDBMS changes. To perform the RDBMS changes, see “Reporting the changed host name or IP address of the workstation where you installed the RDBMS.”
8. Propagate the changes to the interfaces as follows:

   Address of the master domain manager changes
   - On each fault-tolerant agent, dynamic agent, and standard agent you configured to connect to the **comman** command line, update the **host** parameter present in the "Attributes for CLI connections" section in the `localopts` file. Usually you have the **host** parameter defined in the `localopts` file of the workstations you use to submit predefined jobs and job streams (sbj and sbs commands).
   - On every command line client, update the **host** parameter present in the "Attributes for CLI connections" section in the `localopts` file.
   - On the Dynamic Workload Console update the engine connections.

   Address of the Dynamic Workload Console changes
   Notify all the users of the new web address.

Reporting the changed host name or IP address of the workstation where you installed the RDBMS

If you changed the host name or IP address in the workstation where you installed the RDBMS, contact your database administrator to reconfigure your RDBMS to use the new host name or IP address. If you are using DB2, see the procedure described in https://www-304.ibm.com/support/docview.wss?uid=swg21258834.

Propagate the changes to the following components by performing the steps below:
- Master domain manager
- Backup master domain manager
- Dynamic domain manager
- Backup dynamic domain manager

1. Stop the WebSphere Application Server.
2. Run the **showDataSourceProperties** tool by redirecting the output to a text file to obtain the current properties.
3. Open the file and identify the database section where the *databasetype*Type*n*JndiName property is equal to **jdbc/twsdb**.

   where *databasetype* is the database you are using, for example DB2, and *n* can be 2 or 4.

   Below an example of the section you have to refer to if you are using DB2:
   ```
   ################################################################
   DB2 Type4 Resource Properties
   ################################################################
   DB2Type4JndiName=jdbc/twsdb
   DB2Type4DatabaseName=TWSZ
   DB2Type4DriverType=4
   DB2Type4ServerName=myhost.mydomain.com
   .....
   ```

4. Verify the value of the *databasetype*Type*n*ServerName property. If this value is changed proceed with Step 5. If this value is not changed skip the steps below.
5. Modify the *databasetype*Type*n*ServerName=*value* property by running **changeDataSourceProperties**. For more information, see "Changing the database host name, port, or database name" on page 285.
6. To use the:

   Dynamic Workload Console reports

   Update the database connections.

   Command line reports

   Update the following section of the <*report_home*>\config\common.properties file

   ```
   ######################################################################
   # DATABASE PROPERTIES
   ######################################################################
   # Specify the host name or TCP/IP address of the database,
   # its port number and name.
   DatabaseHostname=<hostname>
   DatabasePort=50000
   DatabaseName=TWS
   ........................
   ```

   Where <*report_home*> is the directory where you extract the package.
7. Restart the WebSphere Application Server.

Reporting the changed host name or IP address in the workstation definition

Run this procedure if you changed the host name or IP address on the following components:
- Master domain manager
- Backup master domain manager
- Fault-tolerant agent and standard agent
- Domain manager

To modify the host name or the IP address on the workstation definition, perform the following steps:
1. Use **composer** or the Dynamic Workload Console to check the workstation definition stored in the database for the Tivoli Workload Scheduler instance installed on the workstation where the IP address or the host name changed.
2. Verify the **node** attribute contains the new host name or IP address. If this value is changed proceed with Step 3. If this value is not changed skip the steps below.
3. Change the value of the **node** parameter with the new value.
4. Refresh the new workstation definition into the plan. Do it immediately if you are changing the host name or the IP address of a master domain manager or a domain manager. If you are changing them on a workstation that is not a master domain manager or a domain manager you can wait the next scheduled plan generation to refresh your workstation definition in the Symphony file. In this case during this production day you cannot run jobs on this workstation. To generate the plan, perform the following steps:
   a. Run **optman ls** and take note of the actual value of the **enCarryForward** parameter.

b. If this value is not set to **all**, run

   ```
   optman chg cf=ALL
   ```

   to set it to **all**
c. Add the new workstation definition to the plan, by running:

   ```
   JnextPlan –for 0000
   ```
d. Reassign the original value to the **enCarryForward** parameter.

Reporting the changed host name or IP address of the dynamic workload broker server

The dynamic workload broker server is a component that Tivoli Workload Scheduler installs when you install the following components:
- Master domain manager
- Backup master domain manager
- Dynamic domain manager
- Backup dynamic domain manager

If you changed the host name or the IP address on the dynamic workload broker server, or if you installed a new one run the procedure described in "Reporting the changes in the WebSphere Application Server configuration file" on page 292.

If you changed the host name or the IP address on a master domain manager or backup master domain manager and you ran the "Reporting the changes in the WebSphere Application Server configuration file" on page 292 procedure, skip this section.

If you changed the host name or the IP address on the dynamic domain manager or backup dynamic domain manager you do not need to change the definition of your broker workstation (type **broker**), because the value of the **node** attribute is set to the *localhost* value to allow to switch between the dynamic workload broker server and its backup.

After you ran the procedure, propagate the changes to the dynamic agent and update the **ResourceAdvisorURL** property in the `JobManager.ini` file on each agent connected to that dynamic workload broker server, by performing the following steps:
1. Run the following command to stop the agent:

   ```
   ShutDownLwa
   ```
2. Edit the `JobManager.ini` file and change the host name or the IP address in the **ResourceAdvisorURL** property.
3. Run the following command to start the agent:

   ```
   StartUpLwa
   ```

Perform the following changes:
1. Open the `JobDispatcherConfig.properties` file and change the value of the **JDURL=https://*host_name*** property to reflect the new host name or IP address.
2. Open the `CliConfig.properties` file and change the value of the **ITDWBServerHost=/*host_name*** property to reflect the new host name or IP address.
3. Open the `ResourceAdvisorConfig.properties` file and change the value of the **ResourceAdvisorURL=https://*host_name*** property to reflect the new host name or IP address.

4. From the <*TWA_home*>/`TDWB/bin` directory, run the following command:

   On Windows operating systems:
   ```
   exportserverdata.bat
   ```

   On UNIX and Linux operating systems:
   ```
   exportserverdata.sh
   ```

   This command extracts a list of URIs (Uniform Resource Identifier) of all the dynamic workload broker instances from the Tivoli Workload Scheduler database and copies them to a temporary file. By default, the list of URIs is saved to the `server.properties` file, located in the current directory.
5. Change all the entries that contain the old host name to reflect the new host name.
6. Place the file back in the database, by running the following command:

   On Windows operating systems:
   ```
   importserverdata.bat
   ```

   On UNIX and Linux operating systems:
   ```
   importserverdata.sh
   ```
7. Stop the dynamic workload broker, by running the following command:
   ```
   StopBrokerApplication
   ```
8. Start the dynamic workload broker, by running the following command:
   ```
   StartBrokerApplication
   ```

Reporting the changed host name or IP address of the dynamic agent

If you changed the host name or the IP address on the workstation where you installed the dynamic agent, the changes are automatically reported stopping and starting the agent using the following commands:
1. To stop the agent:
   ```
   ShutDownLwa
   ```
2. To start the agent:
   ```
   StartUpLwa
   ```

Note: Do not modify manually the value of the **node** parameter in the dynamic agent workstation definition.

Changing the security settings

This section describes how to modify the security settings of Tivoli Workload Scheduler. It has the following topics:

Use the **`changeSecurityProperties`** script to change various security settings on the application server. Those relating to SSL are described in Chapter 7, “Setting connection security,” on page 183. Those relating to the passwords of the database access users are described in “Changing key Tivoli Workload Scheduler passwords” on page 274. Other items, such as the active user registry and the local operating system ID and password, can also be changed.

The procedure requires you to stop the application server, create a text file of the current security properties, edit the file, run the utility and restart the application server. Find information about how to do this as follows:

- "Application server - using the utilities that change the properties" on page 312 gives a generic description of the procedure for making any change to the WebSphere Application Server properties
- To determine which properties need to be changed see the following topics:
  - Chapter 5, "Configuring authentication," on page 139, for information about which properties to change to modify your user registry configuration for user authentication
  - "Interface communication" on page 192, for information about which properties to change to configure SSL communication between the different interfaces and the Tivoli Workload Scheduler engine
  - "Migrating data from DB2 to Oracle and *vice versa*" on page 233, for information about which properties to change when migrating your database from one database platform to another
  - "Changing key Tivoli Workload Scheduler passwords" on page 274, for information on how to use the properties to determine the required procedure for changing key passwords
- When editing the text file of the current security properties, do as follows:
  1. Edit the text file and locate the properties you need to change
  2. Make any changes to these properties that are necessary.

     Do not change any other properties.

  Note:

  1. The utility might display a message from the application server (WASX7357I:). You can ignore this message.
  2. When you supply a password in a text file for `changeSecurityProperties`, there is a small security exposure. When you enter a password in the file, the password is entered in clear (unencrypted). After you have run **changeSecurityProperties**, the password remains in clear in the text file you have edited, but if you run **showSecurityProperties** the password is output encrypted, as a row of asterisks. Thus, your potential security exposure is limited to the time from when you entered the password in the text file until when you manually deleted the text file after using `changeSecurityProperties`.

     Attention: if you want to change parameters *other* than passwords, and do *not* want to change a password, you must do one of the following before running **changeSecurityProperties**:
     - Resupply the passwords in clear
     - Comment the password properties
     - Delete the password properties

     This is to avoid that the row of asterisks is applied as the password.

Managing the event processor

The only maintenance issue for the event processor is the management of the EIF event queue, `cache.dat`. The event queue is circular, with events being added at the end and removed from the beginning. However, if there is no room to write an event at the end of the queue it is written at the beginning, overwriting the event at the beginning of the queue.

To increase the size of the event processor queue, follow this procedure:

1. At the workstation running the event processor, locate the file:

   `<*TWA_home*>/eWAS/profiles/TIPProfile/temp/TWS/EIFListener/eif.templ`
2. Edit the file and locate the keyword:

   `BufEvtMaxSize`
3. Increase the value of this keyword, according to your requirements.
4. Stop and restart the WebSphere Application Server using the **`conman stopappserver`** and **`conman startappserver`** commands (see "Starting and stopping the application server and **appservman**" on page 303).

Starting, stopping, and displaying dynamic workload broker status

To start or stop dynamic workload broker, use the **`startBrokerApplication`** or **`stopBrokerApplication`** commands on the active master domain manager. Since these commands are processed asynchronously, the **`brokerApplicationStatus`** command allows you to check the status of dynamic workload broker following a start or a stop. Ensure that WebSphere Application Server is running and proceed as follows:

Starting dynamic workload broker

Use **`startBrokerApplication.sh`** on UNIX and Linux or **`startBrokerApplication.bat`** on Windows as follows:

startBrokerApplication -user *username* -password *password* [-port *portnumber*]

where *username* and *password* are the credentials used during the installation. The parameter *portnumber* is optional. If it is not defined, the default is used.

Stopping dynamic workload broker

1. Use **`stopBrokerApplication.sh`** on UNIX and Linux or **`stopBrokerApplication.bat`** on Windows as follows:

   stopBrokerApplication -user *username* -password *password* [-port *portnumber*]

   where *username* and *password* are the credentials used during the installation. The parameter *portnumber* is optional. If it is not defined, the default is used.
2. Run the **`link`** command. If you do not run this command, the dynamic workload broker server is automatically linked ten minutes after the stop operation.

Displaying dynamic workload broker status

Use **`brokerApplicationStatus.sh`** on UNIX and Linux or **`brokerApplicationStatus.bat`** on Windows as follows:

brokerApplicationStatus -user *username* -password *password* [-port *portnumber*]

where *username* and *password* are the credentials used during the installation. The parameter *portnumber* is optional. If it is not defined, the default is used.

Automatically initializing Tivoli Workload Scheduler instances

On UNIX systems, you can ensure that your Tivoli Workload Scheduler instances are automatically initialized during operating system startup by adding a Tivoli Workload Scheduler service to the init process of your operating system. To do so, you can use the sample start script `twa_initd` located in *TWA_home*/config and add it to the appropriate run level after customizing it as necessary.

Perform the following steps:

1. Copy, rename, and edit the `twa_initd` script based on your requirements. Provide the following information, depending on the operating system you use:

   Required-Start
   On Linux systems, specify the precondition services

   Default-Start
   On Linux systems, specify the required runlevels. For example, specify runlevels 2, 3, and 5.

   TWS_HOME
   On all Supported UNIX systems, specify the fully qualified path to the Tivoli Workload Scheduler instance you want to start.

2. Save the edited file to the appropriate system-dependent folder, as follows:

   Supported Linux operating systems
   Save the script in the /etc/init.d folder and register the service using the **insserv -v *script_name*** command.

   Supported AIX operating systems
   Copy the script to the appropriate rc*runlevel*.d folder. Rename the script according to the runlevel script definition. For example, S*sequence_numberservice_name*, as in S10tws860ma.

   Supported Solaris operating systems
   Save the script in the /etc/init.d folder and link the script to an appropriate file in the rc*runlevel*.d folder. For example, S*sequence_numberservice_name*, as in S10tws860ma.

   Supported HP-UX operating systems
   Save the script in the /sbin/init.d folder and link the script to an appropriate file in the rc*runlevel*.d folder. or example, S*sequence_numberservice_name*, as in S10tws860ma.

For more information about the **inittab, init.d, insserv** , and **init** commands, see the reference documentation for you operating system.

The following example shows a customized script:

```
#!/bin/sh
####################################################################
# Licensed Materials - Property of IBM
# Restricted Materials of IBM
# 5698-WSH
# (C) Copyright IBM Corp. 1998, 2011 All Rights Reserved.
# US Government Users Restricted Rights - Use, duplication or
# disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
###################################################################

### BEGIN INIT INFO
# Provides:       tws860ma
# Required-Start: network
# Default-Start:  2 3 5
# Description:    TWS service
### END INIT INFO

# Specify the fully qualified path name of the TWS Installation to start
#
TWS_HOME=/opt/IBM/TWA/TWS

TWS_START_SCRIPT=${TWS_HOME}/StartUp

if [ -f ${TWS_START_SCRIPT} ]
then
  case "$1" in
    start)
      echo -n "Starting Tivoli Workload Scheduler instance"
      ${TWS_START_SCRIPT}
      exit $?
    ;;
  *)
    echo "Usage: $0 {start}"
    exit 1
    ;;
  esac
else
  exit 5
fi
```

Application server tasks

The following application server tasks might need to be performed:

Application server - starting and stopping

Use the **startappserver** and **stopappserver** commands or the equivalent from the Dynamic Workload Console to start or stop the embedded WebSphere Application Server. (see *Tivoli Workload Scheduler: User's Guide and Reference* for a description of these commands.)

These commands also stop **appservman**, the service that monitors and optionally restarts the application server.

If you do not want to stop **appservman**, you can issue **startWas** or **stopWas**, supplying the **–direct** argument.

The full syntax of **startWas** and **stopWas** is as follows:

UNIX

Start the application server

```
startWas.sh  [-direct]
```

Stop the application server

```
stopWas.sh  [-direct]
         -user <user_ID>
          -password <password>
```

Note: The above syntax for stopping the embedded WebSphere Application Server is applicable only if all components are integrated with your Tivoli Workload Scheduler environment. If your Dynamic Workload Console or z/OS Connector are not integrated (they do not share the same WebSphere Application Server with your Tivoli Workload Scheduler installation), you must use the following syntax:

```
stopWas.sh -direct
          -user <user_ID>
           -password <password>
```

where the **-direct** argument is mandatory.

Windows

Start the application server

```
startWas.bat [-direct]
             [-service <service_name>]
             [-options <parameters>]
```

Stop the application server

```
stopWas.bat [-direct]
            [-service <service_name>]
            [-wasHome <installation_directory>]
            [-options <parameters>]
```

where the arguments are as follows:

–direct
: Optionally starts or stops the application server without starting or stopping the application server monitor **`appservman`**.

  For example, you might use this after changing some configuration parameters. By stopping WebSphere Application Server without stopping **`appservman`**, the latter will immediately restart WebSphere Application Server, using the new configuration properties. This argument is mandatory on UNIX when the product components are not integrated.

–options *<parameters>*
: Optionally supplies parameters to the WebSphere Application Server **`startServer`** or **`stopServer`** commands. See the WebSphere Application Server documentation for details.

–password *<password>*
: Defines the password to be used when stopping the application server on UNIX.

–service *<service_name>*
: Defines the WebSphere Application Server service name, if it is not the default value of `IBM WebSphere Application Server V6 - <TWS_user>`

–user *<user_ID>*
: Defines the user ID to be used when stopping the application server on UNIX.

–wasHome *<installation_directory>*
: Defines the WebSphere Application Server installation directory, if it is not the default value.

Application server - automatic restart after failure

If you experience any problems with the application server failing, a service is available that not only monitors its status, but can also restart it automatically in the event of failure. The service is called **`appservman`**, and it is enabled and controlled by the local options on the computer where the application server is running.

The following sections describe the service, how it works, and how it is controlled:

- "**Appservman** - how it works"
- "Controlling **appservman**"
- "Starting and stopping the application server and **appservman**" on page 303
- "Monitoring the application server status" on page 304
- "Obtaining information about application server failures" on page 305
- "Events created by appservman" on page 305

Appservman - how it works

Appservman is a service that starts, stops and monitors the application server. It also optionally restarts the application server in the event that the latter fails. **Appservman** can be controlled not just from nodes running the application server, but also from any other node running **conman**.

It is launched as a service by **netman** when starting Tivoli Workload Scheduler, and it itself then launches the application server. **Netman** also launches it when the **conman startappserver** command is run.

Appservman is stopped when Tivoli Workload Scheduler is shutdown. In addition, **Netman** stops both the application server and **appservman** when you use the **conman stopappserver** command, or, on Windows only, when you issue the **Shutdown –appsrv** command.

While it is running **appservman** monitors the availability of the application server, sending events that report the status of the application server. If the automatic restart facility is enabled, and the application server fails, the service determines from the restart policy indicated in the `localopts` options if it is to restart the application server. If the policy permits, it will restart the application server, and send events to report its actions.

The WebSphere Application Server utilities **startWas** and **stopWas** by default start and stop the application server and **appservman** using the **startappserver** and **stopappserver** commands. However, these utilities can be instructed to start and stop the application server without stopping **appservman** by using the **startWas** and **stopWas** utilities with the **–direct** option.

Controlling appservman

Appservman is controlled by the following local options (in the `localopts` file):

Appserver auto restart

Determines if the automatic restart facility is enabled.

The default is *yes*. To disable the option set it to *no*.

Appserver check interval

Determines how frequently the service checks on the status of the application server. You should not set this value to less than the typical time it takes to start the application server on the computer.

The default is every 5 minutes.

Appserver min restart time

Determines the minimum time that must elapse between failures of the application server for the automatic restart to work. This option stops **appservman** from immediately restarting the application server if it fails on initial startup or when being restarted.

The default is 10 minutes.

Appserver max restarts

Determines the maximum number of times that **`appservman`** will automatically restart the application server within a time frame determined by you (Appserver count reset interval).

The default is 5 restarts.

Appserver count reset interval

Determines the time frame for the maximum number of restarts (Appserver max restarts).

The default is 24 hours.

Appserver service name

This is used in Windows only. It is generated as follows:

```
IBMWAS61Service - <TWS_user>
```

How to use the options: The default settings are a good starting point. Follow the indications below if you are not satisfied that the settings are maintaining the correct availability of the application server:

- If the application server is not restarting after failure, check the following:
  - That the *Appserver auto restart* is set to *yes*.
  - That the *Appserver check interval* is not set to too high a value. For example, if this value is set to *50* minutes, instead of the default *5*, an early failure of the application server might wait 45 minutes before being restarted.
  - That *Appserver min restart time* is sufficient for the application server to fully restart. If, when the server checks the status of the application server, it finds that the application server is still starting up, in some circumstances it is not able to distinguish the starting-up state from the failed state, will report it as failed, and try and restart it again. With the same result. This will continue until *Appserver max restarts* is exceeded. If this is the case, make *Appserver min restart time* larger.
- If the application server is failing infrequently, but after several failures is not restarting, set the *Appserver max restarts* option to a higher value or the *Appserver count reset interval* to a lower value, or both. In this case it might be advantageous to study the pattern of failures and tailor these options to give you the required availability

Starting and stopping the application server and appservman

If you need to stop and restart the application server, for example to implement a change in the application server configuration, use the following commands:

stopappserver[*domain*!]*workstation* [;wait]

This command stops the application server and **`appservman`**. You can optionally stop the application server on a remote workstation. The optional **`;wait`** parameter tells **`conman`** to suspend processing until the command reports that both the application server and the service have stopped.

startappserver[*domain*!]*workstation* [;wait]

This command starts the application server and **`appservman`**. You can optionally start the application server on a remote workstation. The optional **`;wait`** parameter tells **`conman`** to suspend processing until the command reports that both the application server and the service are up and running.

To stop and start the application server without stopping **`appservman`**, see "Application server - starting and stopping" on page 300.

Configuring user and password for running conman stopappserver

When you run **conman stopappserver**, the appserverman process first checks if WebSphere Application Server can retrieve the user's credentials (username and password) from the soap.client.props file located in the WebSphere Application Server profile. If the check is negative, appserverman reads them from the useropts file of the user and runs the stopServer.sh (bat) script to pass them to WebSphere Application Server.

To be able to run **conman stopappserver**, you must therefore complete one of the following two customization procedures to provide the user credentials to WebSphere Application Server:

- Customize the user name (com.ibm.SOAP.loginUserid) and password (com.ibm.SOAP.loginPassword) properties in the soap.client.props file located in:

```
TWS_home/appserver/profiles/twsprofile/properties/     (Version 8.4 and earlier master)
TWS_home/appserver/profiles/twsconnprofile/properties/ (Version 8.4 and earlier agents)
TWA_home/eWAS/profiles/TIPProfile/properties/          (Version 8.5 and later master and agents)
```

  You must also:

  1. Set property com.ibm.SOAP.securityEnabled to true in the same file to enable the SOAP client security
  2. Run the encryptProfileProperties.sh script to encrypt the password. See the Tivoli Workload Scheduler *Administration Guide* for more information on this application server tool.

- Customize the Attributes for conman (CLI in version 8.4) connections section in the localopts file by specifying the details of the connector or of the master domain manager.

  You must also:

  1. Create (or customize if already present) the useropts file manually, adding the USERNAME and PASSWORD attributes for the user who will run **stopappserver**. Make sure the useropts file name is entered in the USEROPTS key in the Attributes for conman (CLI) connections section. See the *Administration Guide* for further details.
  2. Encrypt the password in the useropts file simply by running **conman**.

Monitoring the application server status

To see the current status of the application server at any time view the STATE field in the workstation details.

This field contains a string of characters that provide information about the statuses of objects and processes on the workstation. The state of the application server is a one-character flag in this string, which has one of the following values if the application server is installed:

```
[A|R]
```

where:

A The WebSphere Application Server is running.

R The WebSphere Application Server is restarting.

If the application server is down or if it was not installed, neither value of the flag is present in the STATE entry.

Obtaining information about application server failures

`Appservman` does not provide information about why the application server has failed. To obtain this information, look in the application server log files (see the *Tivoli Workload Scheduler: Troubleshooting Guide*).

Events created by appservman

`Appservman` sends an event called *ApplicationServerStatusChanged* from the `TWSObjectsMonitor` provider to the configured event monitoring process every time the status of the application server changes.

Application server - encrypting the profile properties files

You use the **`encryptProfileProperties`** script to encrypt passwords in the following embedded WebSphere Application Server property files:

- `*TWA_home*/eWAS/profiles/TIPProfile/properties/soap.client.props`
- `*TWA_home*/eWAS/profiles/TIPProfile/properties/sas.client.props`
- `*TWA_home*/eWAS/profiles/TIPProfile/properties/sas.stdclient.properties`
- `*TWA_home*/eWAS/profiles/TIPProfile/properties/sas.tools.properties`

where *PROFILE* can be one of the following:

Component	PROFILE
Master domain manager	twsprofile
Distributed connector	twsconnprofile
z/OS connector	twszconnprofile

An example of when you might use the encryption function is when creating SSL key-stores. You would type the passwords in the key-stores and then encrypt them using the **`encryptProfileProperties`** script. See *Tivoli Workload Scheduler: Planning and Installation Guide*.

The script uses **`PropFilePasswordEncoder.bat`**. Restart the server for the changes to take effect.

Encrypt properties uses the following syntax:

```
encryptProfileProperties.bat (.sh)
```

Application server - updating the Windows services after modifications

If you have modified any of the following, you must update the Windows service that runs the application server:

- The user ID and password of the local operating system user that runs the application server process
- The installation directory of the embedded WebSphere Application Server
- The directory where the Tivoli Workload Scheduler application server profile is stored

To update the service, run the **`updateWasService`** command from the `<*TWA_home*>/wastools` directory.

Note: You can also use this command to change the way that the application server is started.

At runtime, the script calls **WASService.exe**.

updateWasService

Format

updateWasService –userid <*TWS_user*> –password <*TWS_user_password*>
```
       [–wasuser <WAS_user> –waspassword <WAS_user_password>]
       [–startType {automatic | manual | disabled}]
        [–wasHome <WebSphere_install_directory>]
        [–profilePath <server_profile_directory>]
```

Parameters

–userid <*TWS_user*> –password <*TWS_user_password*>
Supply the <*TWS_user*> and its password.

[–wasuser <WAS_user> –waspassword <WAS_user_password>]
The user that the local operating system uses to run the application process is set by default to the <*TWS_user*>. If you want to change it to a different user and password, supply this parameter.

Note: Due to a known problem with this utility, when you change the password you must first use the Windows facility for changing the password, as described in "Action 7 - Windows - update Windows services" on page 281, and then run this utility, giving the new password you have just set as the <*WAS_user_password*>.

[–startType {automatic | manual | disabled}]
The application server starts automatically by default, when the computer is started. If you want to have a different behavior supply this parameter.

[–wasHome <WebSphere_install_directory>]
If you have changed the name of the installation directory of the embedded WebSphere Application Server, supply this parameter indicating the new name.

[–profilePath <server_profile_directory>]
If you have changed the name of the directory where the Tivoli Workload Scheduler application server profile is stored, supply this parameter indicating the new name.

Application server - updating the SOAP properties after changing the WebSphere Application Server user or its password

If you have changed the user ID or the password of the WebSphere Application Server administration user either for Tivoli Workload Scheduler or the Dynamic Workload Console, you must also update the SOAP client properties.

To update the properties, run the **updateWas.sh/.bat** command from the <*TWA_home*>/wastools directory.

After using this command you must restart the application server.

updateWas.sh

Format

updateWas.sh –user <*new_WAS_admin_user*> –password <*password*>

Parameters

–user <*new_WAS_admin_user*> **–password** <*password*>
: Supply the user and password of the new WebSphere Application Server administration user that you want to be configured as the credentials in the SOAP client properties.

Application server - configuration files backup and restore

The application server has configuration files, which should be backed up whenever you change them. Use the **backupConfig** script in the <*TWA_home*>/wastools directory.

The files are restored, if necessary, using the **restoreConfig** script in the same directory.

There is no need to stop the application server to perform the backup, but you must stop and restart the server if you have restored the files from a previous backup.

For further information, see the *IBM Redbooks: WebSphere Application Server V6 System Management & Configuration Handbook*.

Backup usage

Backup uses the following syntax:

```
backupConfig.bat [backup_file]
                 [-nostop]
                 [-quiet]
                 [-logfile file_name]
                 [-replacelog]
                 [-trace]
                 [-username user_ID]
                 [-password password]
                 [-profileName profile]
                 [-help]
```

The following is an example of **backupconfig.bat**:

```
C:\Program Files\ibm\TWA0\wastools>backupConfig.bat
ADMU0116I: Tool information is being logged in file
           C:\Program Files\ibm\TWA0\eWAS\profiles\TIPProfile\logs\
           backupConfig.log
ADMU0128I: Starting tool with the twsprofile profile
ADMU5001I: Backing up config directory
           C:\Program Files\ibm\TWA0\eWAS\profiles\TIPProfile\config to file
           C:\Program Files\ibm\TWA0\wastools\WebSphereConfig_2005-12-12.zip
ADMU0505I: Servers found in configuration:
ADMU0506I: Server name: server1
ADMU2010I: Stopping all server processes for node DefaultNode
ADMU0512I: Server server1 cannot be reached. It appears to be stopped.
................................................................
ADMU5002I: 137 files successfully backed up
```

Restore usage

Restore uses the following syntax:

```
restoreConfig.bat backup_file
                  [-location restore_location]
                  [-quiet]
                  [-nowait]
                  [-logfile file_name]
                  [-replacelog]
                  [-trace]
```

```
[-username user_ID]
[-password password]
[-profileName profile]
[-help]
```

The following is an example of **restoreConfig.bat**:

```
C:\Program Files\ibm\TWA0\wastools>restoreConfig.bat WebSphereConfig_2005-12-11.zip
ADMU0116I: Tool information is being logged in file
           C:\Program Files\ibm\TWA0\eWAS\profiles\TIPProfile\logs\
           restoreConfig.log
ADMU0128I: Starting tool with the twsprofile profile
ADMU0505I: Servers found in configuration:
ADMU0506I: Server name: server1
ADMU2010I: Stopping all server processes for node DefaultNode
ADMU0512I: Server server1 cannot be reached. It appears to be stopped.
ADMU5502I: The directory C:\Program Files\ibm\TWA0\eWAS\profiles\TIPProfile\config
           already exists; renaming to
           C:\Program Files\ibm\TWA0\eWAS\profiles\TIPProfile\config.old
ADMU5504I: Restore location successfully renamed
ADMU5505I: Restoring file WebSphereConfig_2005-12-11.zip to location
           C:\Program Files\ibm\TWA0\eWAS\profiles\TIPProfile\config
..................................................................
ADMU5506I: 127 files successfully restored
ADMU6001I: Begin App Preparation -
ADMU6009I: Processing complete.
```

Application server - changing the host name or TCP/IP ports

To modify the host name of the computer where the application server is installed, or the TCP/IP ports it uses, run the **changeHostProperties** script.

The procedure requires you to stop the application server, create a text file of the current host properties, edit the file, run the utility and restart the application server. Find information about how to do this as follows:

- "Application server - using the utilities that change the properties" on page 312 gives a generic description of the procedure for making any change to the WebSphere Application Server properties
- "Changing host properties" on page 309 lists all the host properties and gives other reference information about the utility
- When editing the text file of the current host properties, do as follows:
  1. Edit the text file and locate the following properties:

```
################################################################
# Host Configuration Panel
################################################################

# Old Hostname
oldHostname=myoldhost.mydomain.com

# New Hostname
newHostname=myhost.mydomain.com

################################################################
Ports Configuration Panel
################################################################
bootPort=41117
bootHost=myhost.mydomain.com
soapPort=41118
soapHost=myhost.mydomain.com
httpPort=41115
httpHost=*
httpsPort=41116
httpsHost=*
```

```
adminPort=41123
adminHost=*
adminSecurePort=41124
adminSecureHost=*
sasPort=41119
sasHost=myhost.mydomain.com
csiServerAuthPort=41120
csiServerAuthHost=myhost.mydomain.com
csiMuthualAuthPort=41121
csiMuthualAuthHost=myhost.mydomain.com
orbPort=41122
orbHost=myhost.mydomain.com
```

The rules for changing these values are as follows:

– To change the host name, supply both `oldHostname` and `newHostname`. Also check that the values of `bootHost` and `csiServerAuthHost` are set correctly (normally to the new host name).
– If you change the host name, the old host port settings are used, unless you specifically change them.
– If you do not supply a port number it is not changed.

Do not change any other properties.

Note: The utility might display a message from the application server (WASX7357I:). You can ignore this message.

Changing host properties

You use the **`changeHostProperties`** script to change the workstation host name in the WebSphere Application Server configuration files, or the TCP/IP ports used by WebSphere Application Server. To change or disable TCP/IP Ports see “Disabling TCP/IP ports” on page 310.

The procedure for running the script is described in detail in “Application server - using the utilities that change the properties” on page 312, but in summary you do the following:

- Run **`showHostProperties.sh (.bat) > my_file_name`** to obtain the current properties
- Edit *`my_file_name`*
- Run **`changeHostProperties.sh (.bat) my_file_name`**

Note: *my_file_name* must be the fully qualified path of the file.

The change utility calls the **`wsadmin`** utility by running **`ChangeHostProperties.jacl`** with the properties file as input.

Only the WebSphere Application Server `serverindex.xml` configuration file is affected by this script. The path of the file is:

```
TWA_home/eWAS/profiles/TIPProfile/config/cells/DefaultNode/nodes/
DefaultNode/serverindex.xml
```

where <*profile*> is one of **`twsprofile`**, **`twsconnprofile`**, or **`twszconnprofile`** for the master domain manager, the distributed connector and the z/OS connector respectively.

The following is a list of the properties that can be changed with this utility:

```
################################################################
# Host Configuration Panel
################################################################

# Old Hostname
oldHostname=myoldhost.romelab.ibm.it.com

# New Hostname
newHostname=mynewhost.romelab.ibm.it.com

################################################################
Ports Configuration Panel
################################################################
bootPort=41117
bootHost=myhost.mydomain.com
soapPort=41118
soapHost=myhost.mydomain.com
httpPort=41115
httpHost=*
httpsPort=41116
httpsHost=*
adminPort=41123
adminHost=*
adminSecurePort=41124
adminSecureHost=*
sasPort=41119
sasHost=myhost.mydomain.com
csiServerAuthPort=41120
csiServerAuthHost=myhost.mydomain.com
csiMuthualAuthPort=41121
csiMuthualAuthHost=myhost.mydomain.com
orbPort=41122
orbHost=myhost.mydomain.com
```

All of the properties in the properties file are optional. When you are modifying the properties file you should be aware of the following:

- When **oldHostname** and **newHostname** are provided (these settings must be provided together), the host property related to each port is updated when it has not been provided in the properties file and the current value matches **oldHostname**
- Port settings are updated only if they are provided in the properties file
- A port-specific host setting, such as **httpHost** is not updated if not specified except when its current setting matches **oldHostname**
- An empty setting is considered as not provided

Disabling TCP/IP ports: Using the **changeHostProperties** script you can also disable some TCP/IP ports by setting the value of the following corresponding properties to **false**. If you are using Secure Sockets Layer Communication (SSL) in your network, disabling the non-secure HTTP and Administrative Console ports will ensure that only encrypted communication occurs in your network. By default these ports are all enabled. To disable them use the following properties:

httpEnabled
: To disable the `httpPort`.

httpsEnabled
: To disable the `httpsPort`.

adminEnabled
: To disable the `adminPort`.

adminSecureEnabled
: To disable the `adminSecurePort`.

Displaying the current host properties: To display the current properties, use the following utility:

UNIX **`showHostProperties.sh`**

Windows
: **`showHostProperties.bat`**

Application server - changing the trace properties

You can use the **`changeTraceProperties`** script to change the embedded WebSphere Application Server trace properties.

The script calls the **`wsadmin`** utility by running the **`ChangeServerTracing.jacl`** with a properties file whose template is `TracingProps.properties`.

See the *Tivoli Workload Scheduler: Troubleshooting Guide* for full details on how to change the trace settings.

The properties file defines the following trace modes:

```
wsmm_odr=com.ibm.ws.xd.comm.*=all:com.ibm.wsmm.grm.Controller=
all:com.ibm.ws.xd.work*
=all:com.ibm.ws.xd.arfm.*=all:com.ibm.wsmm.policing.*
=all:com.ibm.wsmm.xdglue.*
=all:com.ibm.ws.odc.ODCTreeImpl$Save=all
wsmm_node=com.ibm.ws.xd.comm.*=all:com.ibm.ws.xd.placement*
=all:com.ibm.ws.xd.arfm.*=all
reset=*=info
wsmm007=com.ibm.wsmm.policing.*=all
dcs=DCS=finest:RMM=finest
ham=hamanageditem=all
tcpdcs=DCS=finest:RMM=finest:com.ibm.ws.tcp.channel.*=finest
tcp=com.ibm.ws.tcp.channel.*=finest
vizcache=com.ibm.ws.xd.visualizationengine.cacheservice.cacheimpl.*=all
runtime=com.ibm.ws.console.xdruntime.*=all
proxy=com.ibm.ws.console.proxy.*=all
placement=com.ibm.ws.xd.placement*=all=enabled
charting=com.ibm.ws.console.chart.*=all
dwlm=com.ibm.ws.dwlm.*=all
operationalpolicy=com.ibm.ws.xd.operationalpolicymonitor.*=all
wsmm_na=*=info:com.ibm.ws.xd.comm.*=all:com.ibm.ws.xd.placement*
=all:com.ibm.ws.xd.workprofiler.*=all:com.ibm.ws.xd.arfm.*=
all:com.ibm.ws.dwlm.*
=all:com.ibm.ws.xd.hmm.*=all:com.ibm.ws.xd.admin.utils.*
=all:com.ibm.ws.clustersensor.impl.*
=all:com.ibm.ws.xd.placement.memory.profiler.impl.*=off
wsmm_o=*=info:com.ibm.ws.xd.comm.*=all:com.ibm.wsmm.grm.Controller=
all:com.ibm.ws.xd.workprofiler.*
=all:com.ibm.ws.xd.arfm.*=all:com.ibm.wsmm.policing.*=
all:com.ibm.wsmm.xdglue.*
=all:com.ibm.ws.dwlm.*=all:com.ibm.ws.dwlm.client.*=off
dmgr=com.ibm.ws.odc.*=
all:com.ibm.ws.xd.visualizationengine.cacheservice.cacheimpl.
DeploymentTargetCache*
=all
grid=grid.capacityplacement=all
webcontainer=com.ibm.ws.webcontainer.*=all:com.ibm.ws.http.*=all
odc=com.ibm.ws.odc.*=all:com.ibm.ws.dwlm.client.*=
all:com.ibm.ws.xd.dwlm.client.*
=all:com.ibm.ws.proxy.*=all
wssec_all=com.ibm.ws.security.*=all
```

```
wssec_tws_all=com.ibm.ws.security.*=all:com.ibm.tws.*=all
tws_all=com.ibm.tws.*=all
tws_alldefault=com.ibm.tws.*=error=enabled
tws_db=com.ibm.tws.dao.model.*=all:com.ibm.tws.dao.rdbms.*=all
tws_planner=com.ibm.tws.planner.*=all:com.tivoli.icalendar.*=
all:com.ibm.tws.runcycles.*
=all:com.ibm.tws.conn.planner.*=all:com.ibm.tws.cli.planner.*=all
tws_cli=com.ibm.tws.cli.*=all:com.ibm.tws.objects.*=all
tws_utils=com.ibm.tws.util.*=all
tws_conn=com.ibm.tws.conn.*=all:com.ibm.tws.objects.*=
all:com.ibm.tws.updatemanager.*
=all:com.ibm.tws.dao.plan.*=all
tws_secjni=com.ibm.tws.audit.*=all:com.ibm.tws.security.*=all
active_correlation=com.ibm.correlation.*=all
tws_jni=TWSJNI=all
tws_all_jni=com.ibm.tws.*=all:TWSJNI=all
tws_all_act=com.ibm.tws.*=all:com.ibm.correlation.*=all
tws_broker_all=com.ibm.scheduling.*=all:TWSAgent=all
tws_broker_rest=com.ibm.scheduling.jobmanager.rest.*=all
tws_engine_broker_all=com.ibm.tws.*=all:com.ibm.scheduling.*=
all:TWSAgent=all
tws_bridge=TWSAgent=all
tws_db_transactions=com.ibm.tws.planner.currentplan.PlannerEngine=
all:com.ibm.tws.dao.rdbms.util.DatabaseTransaction=all
```

You can define other trace modes and update `TracingProps.properties` or create a new properties file.

Two settings that must not be changed are the server name (default **`server1`**), and the node (default **`DefaultNode`**).

WebSphere Application Server tools - reference

Application server - using the utilities that change the properties

This section documents a common procedure that you are advised to follow when using the following utilities:

- changeDataSourceProperties
- changeHostProperties
- changeSecurityProperties

To avoid the risk of changing a configuration value inadvertently, you should follow a procedure that creates a file containing the current properties, edit it to the values you require, and apply the changes. The details are as follows:

1. Log on to the computer where Tivoli Workload Scheduler is installed as the following user:

   UNIX root

   Windows
   Any user in the *Administrators* group.
2. Access the directory: `<`*`TWA_home`*`>/wastools`
3. Stop the WebSphere Application Server using the **`conman stopappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
4. From that same directory run the following script to create a file containing the current properties:

   UNIX **`show<property_type>Properties.sh > my_file_name`**

Windows

```
show<property_type>Properties.bat > my_file_name
```

where *<property_type>* is one of the following:

- DataSource
- Host
- Security

5. Edit `my_file_name` with a text editor. Check the start of the file. The command might have written a message from the application server (WASX7357I:) at the beginning of the file. Delete this message.
6. Change the value of the configuration parameters, according to your requirements. You do not need to supply all of the parameters in the file.
7. Save the file *my_file_name*.
8. Run the script:

   Windows

   ```
   change<property_type>Properties.bat my_file_name
   ```

   UNIX

   ```
   change<property_type>Properties.sh my_file_name
   ```

   where *<property_type>* is the same as used in step 4 on page 312, and *my_file_name* is the *fully qualified path* of the file containing the new parameters.

   The properties are updated, according to the rules given in the descriptions of each property type.
9. Start the WebSphere Application Server using the **`conman startappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
10. Check that the change has been implemented in Tivoli Workload Scheduler.

Understanding the templates

As indicated in the overview to these utilities, a template file of properties is supplied with the product for each of these utilities. However, this template file does not contain any of the configuration values that were created by the product installation process or any previous uses of the configuration utilities. If you decide to use the template instead of creating the properties document as described in step 4 on page 312, you must be careful to ensure that the values you enter in the file for every parameter are those that you require to be used by the application server.

Application server utilities

This section provides reference information about the utilities provided with the embedded WebSphere Application Server that supports Tivoli Workload Scheduler.

The utilities are a set of scripts based on Windows batch files, UNIX and Linux shell scripts, and WebSphere Jacl procedures. The scripts run the WebSphere Application Server embedded utilities that perform the reconfiguration. Many of them load configuration settings from a properties file. Templates for these files are also provided.

Tivoli Workload Scheduler installs the following Windows scripts:

- backupConfig.bat
- brokerApplicationStatus.bat
- changeBrokerSecurityProperties.bat

- changeDataSourceProperties.bat
- changeHostProperties.bat
- changePassword.bat
- changeSecurityProperties.bat
- changeTraceProperties.bat
- encryptProfileProperties.bat
- InstallOracledataSource.bat
- InstallTDWCdataSource.bat
- manage_ltpa.bat
- modifyThreadPool.bat
- restoreConfig.bat
- setEnv.bat
- showBrokerSecurityProperties.bat
- showDataSourceProperties.bat
- showHostProperties.bat
- showSecurityProperties.bat
- startBrokerApplication.bat
- startWas.bat
- stopBrokerApplication.bat
- stopWas.bat
- updateWas.bat
- updateWasService.bat

Tivoli Workload Scheduler installs the following UNIX and Linux scripts:
- backupConfig.sh
- brokerApplicationStatus.sh
- changeBrokerSecurityProperties.bat
- changeDataSourceProperties.sh
- changeHostProperties.sh
- changePassword.sh
- changeSecurityProperties.sh
- changeTraceProperties.sh
- createCustomRegistryforPAM.sh
- encryptProfileProperties.sh
- InstallOracledataSource.sh
- InstallTDWCdataSource.sh
- manage_ltpa.sh
- modifyThreadPool.sh
- restoreConfig.sh
- setEnv.sh
- showBrokerSecurityProperties.sh
- showDataSourceProperties.sh
- showHostProperties.sh
- showSecurityProperties.sh
- startBrokerApplication.sh

- startWas.sh
- stopBrokerApplication.sh
- stopWas.sh
- manage_ltpa.sh
- modifyThreadPool.sh
- InstallOracledataSource.sh
- updateWas.sh
- wasstart.sh

The following templates are installed for both Windows and UNIX operating systems:

- BrokerSecurityProps.properties
- DataSourceProps.properties
- HostConfigProps.properties
- SecurityProps_FULL.properties
- SecurityProps_TEMPLATE.properties
- TDWCDatasource.properties
- TracingProps.properties

See "Application server - using the utilities that change the properties" on page 312 to understand how the templates should be used.

Chapter 10. Performance

This chapter provides information about issues that impact performance. Use this information both to prevent problems occurring and to help resolve problems that have occurred.

The topics discussed are as follows:

- "Network traffic"
- "Tracing"
- "Logging" on page 318
- "Maintaining the database" on page 318
- "Symphony file sizing" on page 318
- "Tuning a UNIX domain manager to handle large numbers of fault-tolerant agents" on page 318
- "Tuning job processing on a workstation" on page 318
- "Tuning the database" on page 319
- "Tuning the embedded WebSphere Application Server" on page 319
- "Too many manual job submissions" on page 320
- "Too many file dependency checks" on page 320
- "Workload spreading" on page 320
- "Improving job-processing performance" on page 320
- "Mailbox caching - advantages and disadvantages" on page 321
- "Setting the synch level parameter" on page 322
- "The fault-tolerant switch manager - impact on performance" on page 322
- "Scalability" on page 323
- "Multiple Dynamic Workload Console production plan reports" on page 328
- "Dynamic Workload Console - adjusting session timeout settings" on page 329

Network traffic

A full description of how a Tivoli Workload Scheduler network is structured, and how the different nodes communicate, is provided at the beginning of Chapter 6, "Network administration," on page 159. In particular, see "Optimizing the network" on page 166, which explains how to design and operate your Tivoli Workload Scheduler network to maximize performance.

Tracing

The performance of any workstation can be impacted by the level of tracing it has to perform. The *Tivoli Workload Scheduler: Troubleshooting Guide* has a chapter which explains the diagnostic tools that are available, and within that chapter there is a section about the Tivoli Workload Scheduler In-flight Tracing utility, which, as well as discussing how the feature works, also describes how to customize it to enhance workstation performance.

The performance might also be impacted by the tracing activities on the WebSphere Application Server.

Logging

The performance of any workstation can be impacted by the way the Tivoli Workload Scheduler logging mechanism uses memory. The default settings applied in this version are designed to ensure the maximum performance. However, because these defaults are different from the defaults in earlier versions, if you are experiencing performance problems, it is advisable to check that these settings have not been in some way overwritten by the previous values. In the diagnostic tools chapter of *Tivoli Workload Scheduler: Troubleshooting Guide*, there is a section about CCLog, which, apart from discussing how to customize CCLog, also describes how to check the CCLog processing defaults.

Maintaining the database

Maintaining the database in a good state of organization is important to optimize performance. See "Reorganizing the database" on page 219 for details.

Symphony file sizing

To calculate the size of the Symphony file and understand its impact on performance, see "Avoiding full file systems" on page 220.

Tuning a UNIX domain manager to handle large numbers of fault-tolerant agents

The performance of domain managers on UNIX is impacted if they serve large numbers of fault-tolerant agents. Improvements can be obtained by modifying the kernel parameters. The precise settings differ according to operating system, and you might need to test different settings to obtain optimum performance.

The following is an example of the kernel settings for HP-UX to handle approximately 200 fault-tolerant agents:

```
max_thread_proc=256
nprocess=1800
maxusers=120
maxuprc=1700
nflocks=500
maxfiles=1024
```

Tuning job processing on a workstation

This section explains how to tune selected options in the Tivoli Workload Scheduler `localopts` file to improve Tivoli Workload Scheduler performance. These options control the period between successive instances of an activity. Table 61 on page 319 shows the activities to be tuned, the corresponding option that can be set in the `localopts` file, and how the changed value impacts performance.

Table 61. Options for tuning job processing on a workstation

Activity	Option	Impact on performance
batchman periodically scans the `Symphony` file for jobs ready to be processed.	***bm look***	In all these cases, a shorter time means more frequent scans, using more cpu resources, and impacting other processes that are running. However, it also means that for all activities waiting time is kept to a minimum. If throughput is important and the workstation has plenty of memory, try shortening the times. A longer period between successive activities means jobs take longer to run, because there are longer waits for each activity. However, the reduced frequency of the scans means that more memory is available for jobs because less is being used by these monitoring activities. Consider the meaning of the various options. If your objective is to run the jobs as quickly as possible, but you are not concerned about how quickly the information about completed jobs is distributed, you could reduce the wait periods for *bm look* and *jm read*, but increase the periods for the others. Alternatively, to speed up the overall job processing time (from initial job launch to the update with the completion status), you can tune *bm look*, *jm look*, and *mm read*.
jobman accesses the `Courier.msg` file to see if there are jobs that need to be launched.	***jm read***	
After having launched a job **jobman** checks periodically for job completion status.	***jm look***	
mailman looks periodically in the `Mailbox.msg` for completed jobs.	***mm read***	
batchman checks periodically in `Intercom.msg` for jobs that are complete so that it can update the `Symphony` file.	***bm read***	

If you decide to tune these setting do the following:

- Test the result in a test system before applying changes in your production environment. To get worthwhile results, the test environment must have the same characteristics as the production environment.
- Modify only the parameters that are necessary. It is better to modify one at a time and thoroughly test the change in performance, rather than changing all at once.
- Make a backup copy of the `localopts` file to ensure you can revert to the default options if necessary.

Stop and start the agent to activate changes applied to the `localopts` file.

Tuning the database

To learn about tuning the database, consult the relevant product documentation:

DB2 Go to hhttp://publib.boulder.ibm.com/infocenter/db2luw/v9r5/index.jsp, and select **Best practices**.

Oracle See the *Performance Tuning Guide* in the Oracle documentation set.

Tuning the embedded WebSphere Application Server

To learn about tuning the embedded WebSphere Application Server, consult the appropriate documentation.

Go to http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp, select **WebSphere Application Server (Distributed platforms and Windows), Version 7.0** and then **Tuning performance**.

Inadequate Java heap size

The default Java maximum heap size might be too small for your requirements. If you have any reason to suspect the performance of the embedded WebSphere Application Server, increase the heap size as described in "Increasing application server heap size" on page 324.

Too many manual job submissions

Tivoli Workload Scheduler is designed for maximum efficiency when handling jobs submitted using a scheduled plan. Consequently, it is less adapted to processing manually submitted jobs. Thus, performance can be improved by reducing the number of manually submitted jobs.

Too many file dependency checks

Each file dependency check has an impact on performance. If you design a plan that is constantly checking many file dependencies, you reduce the performance of the workstation where these jobs are being run.

If multiple "opens" files are being used as a dependency, use the "–a" (and) option. For example, to check if three home directories `/tom`, `/dick`, and `/harry` exist, before launching `myjob` issue the following:

```
job2 opens "/users" (-d %p/tom -a -d %p/dick -a -d %p/harry)
```

This checks for all three directories at the same time, instead of looking for each directory separately.

Other factors that impact performance when evaluating file dependencies are the **bm check** parameters in the `localopts` file. These are documented in the *Tivoli Workload Scheduler: Planning and Installation Guide* in the chapter on customization.

Workload spreading

Whatever jobs you have to schedule, try and spread them out through the production period so that there is no concentration in any one moment. Try also to avoid scheduling activities during times when normal user traffic in the network is very heavy, for example during the morning when users commence working and deal with accumulated emails.

Failure to do this might cause a bottleneck at the Mailbox.msg queue, which causes delays in updating the Symphony file, which in turn creates delays in the availability of job statuses to **conman**, the Dynamic Workload Console.

Improving job-processing performance

The processing and monitoring of jobs on a workstation is controlled primarily by various parameters in the `localopts` file and the global options maintained by **optman**. These parameters are described in the *Tivoli Workload Scheduler: Planning and Installation Guide*.

If you are experiencing problems of performance when processing and monitoring jobs, contact IBM Software Support for advice about how to tune these parameters in your particular environment to improve performance.

Mailbox caching - advantages and disadvantages

Mailman uses a parameter in the `localopts` file to decide whether to cache mailbox messages: *mm cache mailbox*. This section explains the advantages and disadvantages of the on and off settings of this parameter.

Setting the *mm cache mailbox* **parameter to** *no*

This means that mailman has to make a separate read action for each message before processing it, and then a separate delete action after successfully processing the message. The I/O activity in performing these activities one message at a time is proportionally high for the amount of data being read. This has an impact on performance. On the other hand, the processing is simple, in that each message is read, processed, and then removed from the mailbox. Any failure of the system at any point means that at most one message is replayed and no data is lost.

Setting the *mm cache mailbox* **parameter to** *yes* **(default)**

This means that mailman reads a block of messages into cache memory, processes all of the messages, and then deletes all of them from the mailbox. The advantage in I/O time is clear; reading and deleting a sequential set of messages in one action is a much more efficient use of I/O time, than reading and deleting them one-by-one, meaning improved performance.

However, if there is a failure of mailman or the operating system, the cache is lost. On restarting, mailman rereads the set of messages that were previously in cache, some of which might already have been processed. For example, if mailman reads a block of 32 messages into cache and has processed 30 of them when a problem occurs, when mailman is restarted it rereads those 32 records and has to process 30 duplicates before being able to continue where it stopped.

Most events deal with job state changes, and these events can be repeated without creating any problems, and the critical events mechanism is able to deal with the others. However, there is an impact on performance while this recovery processing is going on, and if the in-built mechanisms cannot handle the message duplication, a more serious error might occur, ultimately involving the full or partial loss of the mailbox contents.

The number of messages being read in one action is configurable, using the parameter *mm cache size*. The default value for this parameter is 32 messages, and the maximum is 512. Setting this parameter to a value higher than the default increases performance during correct working, but decreases the performance in the event of a failure, for the reasons stated above. In addition, the additional cache means that the memory required by the Tivoli Workload Scheduler engine also increases. If you have a workstation with limited memory, or memory-heavy applications running, it might be counterproductive to increase the mailbox cache because the operating system might have to start paging the cache memory.

In conclusion, the default setting maximizes performance; only if you start losing events should you set it to *no*.

Setting the synch level parameter

This section describes the impact of the different settings of the *synch level* parameter in the `localopts` file. The *synch level* parameter only impacts UNIX environments.

The I/O activity performed by the Tivoli Workload Scheduler engine in managing plans, job streams, and jobs, consists in reading from and writing to the `Symphony` file and the event files (`Mailbox.msg`, `Intercom.msg`, and `Courier.msg`). When Tivoli Workload Scheduler writes to these files it has more than a straightforward *write* operation to perform. For example, when it writes to the `Mailbox.msg` file it performs the actions described in the following pseudo code:

```
TWS_write_event_lock {
     Lock Mailbox to write
}

TWS_write_event_update {
     Check Available Space
     Write Header
     Write Record
     Update Write Pointer
     Unlock Mailbox
}
```

Each action requires one or more write accesses to the disk. The way these actions are performed with the different synch level options is as follows:

synch level = high
Each write operation on the event files is immediately physically written to disk. This has a heavy impact on performance caused by the high I/O dependency.

synch level = medium
Each write event is considered as a single operation. For example, while `TWS_write_event_lock` contains only one action, `TWS_write_event_update` comprises five actions. With `synch level` at *medium*, the five actions in this write event would be completed in one physical disk access, thus drastically reducing the I/O overhead.

synch level = low (default)
The operating system decides how and when to synchronize the data to disk. The impact of this option is more difficult to assess, because the rules are different for each operating system and file system.

The fault-tolerant switch manager - impact on performance

This section describes the impact that the enablement of the fault-tolerant switch manager feature has on the performance of the general architecture and the individual system. The fault-tolerant switch manager is enabled by setting the `enSwfaultTol` global option to *yes*. When it is set, the master domain manager distributes messages to all fault-tolerant agents with *FullStatus* set to *yes*.

Enabling this option impacts the following:

- Network traffic
- Disk space

Note: The fault-tolerant switch manager facility is only available if all of the workstations in the domain are at version 8.2, fix pack level 4, or higher.

Network Traffic

Network traffic is unchanged under normal conditions, but is increased during the replay phase, according to your choice and only under special conditions.

The replay phase is an essential part of the processing performed by the **`switchmgr`** command. It occurs when the new domain manager processes its Symphony file against its copies of the messages received, as it attempts to update its copy of the Symphony file.

Under normal conditions, the outbound reliability does not create any additional network traffic, because the messages are only stored for an eventual replay operation. The multiple inbound connections do not generate additional traffic because the traffic that was previously copied by the domain manager to the *FullStatus* member is now copied to the *FullStatus* members directly by the fault-tolerant agents.

During the replay phase, the connection protocol initiated by mailman on the backup domain manager includes a new phase for the replay of messages not sent by the failed domain manager. The impact of the message replay might be important, depending on the number of messages "trapped" in the old domain manager.

Disk Space

There are two places within the network where disk space use increases following the activation of the additional fault tolerance.

These places are as follows:

- On the single fault-tolerant agent. Here, in addition to the `tomaster.msg` queue, new queues are created for the other *FullStatus* fault-tolerant agents. These queues need not be considered, because the impact on a single agent is small.
- On the *FullStatus* fault-tolerant agents acting as backup domain managers. Here new ftbox message files are created. Upward traffic to the upper domain manager is in `ftbox/ftup.msg` and downward traffic to the lower domain manager is in `ftbox/ftdown.msg`.

Scalability

In an environment with large numbers of scheduling objects, the following impacts are felt:

- "Impact on **`JnextPlan`**"
- "Impact on reporting" on page 324
- "Impact on event rule deployment" on page 324

The resolution for these problems often includes making the following changes:

- "Increasing application server heap size" on page 324
- "Increasing maximum DB2 log capacity" on page 325

Impact on `JnextPlan`

The main impact on performance caused by a large network of workstations running many jobs over a production period of many days, is on **`JnextPlan`**. The key factor is the number of job stream instances that **`JnextPlan`** needs to handle. **`JnextPlan`** has to process each of these instances, and the time it takes to do so is a factor that can only be reduced by ensuring that the master domain manager and the database are on the most powerful computers possible, and that the communication, whether in local or remote, between the master domain manager and the database is maximized.

However, there are some specific measures that need to be taken as the number of jobs or job stream instances increases:

Number of jobs in the plan exceeds 40 000
In this event you need to increase the Java heap size used by the application server. The default is 512 MB, and you should at least double the heap size when job numbers exceed this level. Follow the procedure in "Increasing application server heap size."

You have a large number of job stream instances in the plan

DB2 The default DB2 transaction log files cannot handle more than the transactions generated by about 180 000 job stream instances. You need to change the parameters that control the log file sizes or the numbers of log files that can be created, or both. Follow the procedure in "Increasing maximum DB2 log capacity" on page 325.

Oracle The number of transactions that can be managed by the Oracle log files depends on the way the Oracle database is configured. See the Oracle documentation for more details.

Note: If circumstances change and the number of job stream instances handled by **`JnextPlan`** falls below about 180 000, consider resetting the log and application server heap size settings to their default values, to avoid performance problems.

Impact on reporting

When a report is being processed, extra memory is required to handle large numbers of scheduling objects. The critical point is approximately 70 000 objects. This problem can be handled by increasing the Java heap size used by the application server. Follow the procedure in "Increasing application server heap size."

Impact on event rule deployment

When deploying large numbers of event rules, extra memory is required. The critical point is approximately 8 000 rules. This problem can be handled by increasing the Java heap size used by the application server. Follow the procedure in "Increasing application server heap size."

Increasing application server heap size

Follow this procedure to increase the Java heap size:

1. Log on to the computer where Tivoli Workload Scheduler is installed as the following user:

   UNIX root

   Windows
   Any user in the *Administrators* group.
2. Access the directory: `<`*`TWA_home`*`>/wastools`

3. Stop the WebSphere Application Server using the **conman stopappserver** command (see "Starting and stopping the application server and **appservman**" on page 303)
4. Open the following file:

   ```
   <TWA_home>/eWAS/profiles/TIPProfile/config/cells/
   DefaultNode/nodes/DefaultNode/servers/server1/server.xml
   ```
5. Locate the following line:

   ```
   <jvmEntries xmi:id="..."
   verboseModeClass="false"
   verboseModeGarbageCollection="false"
   verboseModeJNI="false"
   initialHeapSize="16"
   maximumHeapSize="512"
   runHProf="false"
   hprofArguments=""
   debugMode="false"
   debugArgs="..."
   genericJvmArguments=""/>
   ```
6. Edit `maximumHeapSize="512"` and change it at least *1024*. This would double the maximum heap size from 512 MB to 1 GB. Ensure that the RAM usage of the computer can manage whatever increased size you choose. Save the file.
7. Start the WebSphere Application Server using the **conman startappserver** command (see "Starting and stopping the application server and **appservman**" on page 303)

Increasing maximum DB2 log capacity

The Tivoli Workload Scheduler DB2 database uses a transaction log the maximum size of which is fundamentally important for the successful running of **JnextPlan** on very large databases.

The default log consists of 40 primary log files, which are always present, and 20 secondary log files, created on demand. Each file is about 4 MB in size, so the maximum log capacity using all of the "secondary" log files as well as the primary files is (40 + 20) x 4 MB = 240 MB.

The log space used by **JnextPlan** is dependent on the size of the preproduction plan. Approximately every 1000 job stream instances generate transactions that occupy 1 MB of space in the log file. Thus, the log files by default have a maximum theoretical capacity of 240 000 job stream instances. However, in practice, you should allow for at least 25% more space than this algorithm indicates, so the capacity of the default log files is around 180 000 job stream instances.

If **JnextPlan** has neared or exceeded that level, you must make more log space available to DB2.

In addition to performing the above calculation, you can also determine the log space actually used by a specific instance of **JnextPlan** and base your log size requirement on that figure.

Determining actual DB2 log file usage

The following is the procedure to verify how much space was used by a successful instance of the **JnextPlan** command:

1. After **JnextPlan** has run, log on to the computer where the Tivoli Workload Scheduler DB2 server is installed, as the DB2 instance owner (UNIX) or DB2 Administrator (Windows).

2. Open a DB2 command line window or shell, as follows:

   UNIX Follow these steps:

   a. Issue the command **`su - db2inst1`**, or change to the subdirectory `sqllib` of the home directory of the owner of the DB2 instance (by default *db2inst1*)
   b. Launch the command **`. ./db2profile`**

   Windows
   Select from the **Start** menu, **Programs** → **IBM DB2** → **Command Line Tools** → **Command Window**
3. Run the following command:

   ```
   db2 "get snapshot for database on TWS" > snapdb.txt
   ```

   where "TWS" must be changed to the actual database name if different
4. Open the `snapdb.txt` file and look for a section like this:

   ```
            Log space available to the database (Bytes)= 244315359
            Log space used by the database (Bytes)     = 484641
            Maximum secondary log space used (Bytes)   = 0
            Maximum total log space used (Bytes)       = 581636
            Secondary logs allocated currently         = 0
   ```

   The value shown in "Maximum total log space used" is the actual space used for the DB2 logs. This space should be allocated to DB2 using primary log files only: therefore, you should change the number of primary log files and their size as necessary to meet this requirement as a minimum.

   In addition, you are recommended to allocate a secondary log space to DB2. A good choice for the secondary log files is half the number allocated for the primary files.

The snapshot command described in step 3 can be run at any time to keep track of the current usage of the DB2 log space, without a noticeable impact on performance. All metrics shown are useful to monitor the current allocation of DB2 primary and secondary logs at any time, and to determine any required changes.

Procedure for changing the maximum DB2 log capacity

Do this as follows:

1. Log on to the computer where the Tivoli Workload Scheduler DB2 server is installed, as the DB2 instance owner (UNIX) or DB2 Administrator (Windows).
2. Open a DB2 command line window or shell, as follows:

   UNIX Follow these steps:

   a. Issue the command **`su - db2inst1`**, or change to the subdirectory `sqllib` of the home directory of the owner of the DB2 instance (by default *db2inst1*)
   b. Launch the command **`. ./db2profile`**

   Windows
   Select from the **Start** menu, **Programs** → **IBM DB2** → **Command Line Tools** → **Command Window**
3. Run the following commands:

   ```
   db2 update db cfg for <database_name> using LOGFILSIZ <log_file_size>
   db2 update db cfg for <database_name> using LOGPRIMARY <primary_log_files>
   db2 update db cfg for <database_name> using LOGSECOND <secondary_log_files>
   ```

   where:

<database_name>
: The name of the database:
  - If you are running this from the computer where the DB2 server is installed, the installed default name is *TWS*. Supply this value unless you have changed it.
  - You are not recommended to run this procedure from the computer where the DB2 client is installed, but if you do so, the installed default name is *TWS_DB*. Supply this value unless you have changed it.

<log_file_size>
: The log file size in 4 KB pages. The default is 1000 (hence the default log file size of 4MB). Look in the DB2 documentation for details of the implications of choosing a larger or a smaller log file size. The maximum value is 262 144 (making the maximum log file size about 1 GB).

<primary_log_files>
: The number of primary log files. The default is 40. The total maximum number of log files that DB2 can handle (primary and secondary) is 256. Thus, there is a maximum limit of 256 GB for the log, or approximately 256 million job stream instances! (maximum 256 files x 1 GB maximum file size)

<secondary_log_files>
: The number of secondary log files. The default is 20. If there is enough free space on the file system, these additional log files are dynamically allocated by DB2 as needed (with a small impact on the performance of `JnextPlan`). Because these are only created if required, it is preferable to increase the number of secondary files, rather than the primary files. Typically, you allocate 50% of the primary log file value.

In making the calculation to allocate the log files, allow at least 25% more space than you think you require, to avoid that any slight miscalculation causes `JnextPlan` to fail.

Example: if you have determined from the procedure described in "Determining actual DB2 log file usage" on page 325 that `JnextPlan` has a current use of 320 MB, you could calculate as follows:

a. Increase 320 MB by 25%, giving 400 MB
b. Determine if you want more log files, or bigger log files, or both, by reference to the DB2 documentation. For example, you could choose to allocate 40 files with a size of 10 MB, 80 files with a size of 5 MB, or 100 files with a size of 4 MB. For the sake of this example, assume you have chosen 80 files with a size of 5 MB, so your LOGPRIMARY value will be 80.
c. Determine the log file size in 4 KB pages to give a log file size of 5 MB - your LOGFILSIZ value will thus be 1250.
d. Determine how many secondary log files are required. If you follow the 50% guideline you will need a LOGSECOND value of 40.

4. Log on to the computer where Tivoli Workload Scheduler is installed as the following user:

   UNIX root

   Windows
   : Any user in the *Administrators* group.
5. Access the directory: `<TWA_home>/wastools`

6. Stop the WebSphere Application Server using the **`conman stopappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)
7. On the computer where the DB2 server is installed, stop and start DB2, as follows:
   a. Ensure that no other applications are using this instance of DB2, or if they are that they can be stopped.
   b. Issue the following command:
      ```
      db2stop
      ```
   c. Issue the following command:
      ```
      db2start
      ```

   Note: It is strongly recommended that you stop and start DB2. If this is a problem for you, you must at least disconnect all applications from the DB2 instance and reconnect them. DB2 will apply the new parameters when you reconnect. If necessary, use the following command to force the disconnection of all open connections:
   ```
   db2 "force application all"
   ```
8. Start the WebSphere Application Server using the **`conman startappserver`** command (see "Starting and stopping the application server and **appservman**" on page 303)

Multiple Dynamic Workload Console production plan reports

From the Dynamic Workload Console you can launch production plan reports. These are heavy users of CPU time, and if they are requested for the entire plan, they can also take some considerable time to produce. If several are running at once, they can have a noticeable impact on the performance of the master domain manager.

If you notice a degradation of performance, you can determine if there are any reports running by checking for the report work files, as follows;

1. Navigate to the operating system's temporary directory
2. Look for files that have the following file name template:
   ```
   TWS-<sequential_number>-extr
   ```
   Each report currently in progress has one of these work files open. The files are removed when the report is completed.
3. Check the dates of these files, and consider only recent files (if a report fails during production at any time, its file remains in the temporary directory until the next reboot of the master domain manager or you run an operating system cleanup process that discards all files in the temporary directory).

There is no direct action to take, as you must wait until the report completes for the performance to recover.

However, if you note that large numbers of reports are being issued, it might indicate the following scenario:

1. A user issues a report request, expecting it to be available immediately
2. When the report does not appear immediately, the user things it has hung, closes and reopens the browser, and reissues the report. The closing of the browser does not stop the report production.

3. The user might repeat this action several times.

In this case, you can take action to remind the user that the production of large reports can be time-consuming, and that it always better to wait.

Dynamic Workload Console - adjusting session timeout settings

The value assigned to the session timeout settings defines after how many minutes a user is automatically logged out from the WebSphere Application Server. If you plan to perform long running operations, or to have many users connected concurrently to the Dynamic Workload Console, or expect to have low performance on the system where the Dynamic Workload Console is installed, you might want to increase these values.

Perform these steps to change the values assigned to the timeout settings:

1. Open the configuration file:

   ```
   <TWA_home>\eWAS\profiles\tdwc_profile
   \config\cells\tdwc_cell\nodes\tdwc_node\servers\tdwc_server\server.xml
   ```
2. In the file, search for `invalidationTimeout` in the following tag:

   ```
   <tuningParams xmi:id="TuningParams_1188622510500"
                        usingMultiRowSchema="false"
                        maxInMemorySessionCount="1000"
                        allowOverflow="true"
                        scheduleInvalidation="false"
                        writeFrequency="TIME_BASED_WRITE"
                        writeInterval="10"
                        writeContents="ONLY_UPDATED_ATTRIBUTES"
                        invalidationTimeout="30">
   ```

   This is the parameter that sets the HTTP session timeout. By default `invalidationTimeout` is set to 30, which means that a user is logged out automatically after 30 minutes of inactivity.
3. Set `invalidationTimeout` to an appropriate value for your environment and for the activities you plan to perform.
4. Save the file.
5. Open the configuration file:

   ```
   <TWA_home>\eWAS\profiles\tdwc_profile
   \config\cells\tdwc_cell\applications\isclite.ear\
                         deployments\isclite\deployment.xml
   ```
6. In the file, search for `invalidationTimeout` in the following tag:

   ```
   <tuningParams xmi:id="TuningParams_1188878529796"
                        usingMultiRowSchema="false"
                        maxInMemorySessionCount="1000"
                        allowOverflow="true"
                        scheduleInvalidation="false"
                        writeFrequency="TIME_BASED_WRITE"
                        writeInterval="10"
                        writeContents="ONLY_UPDATED_ATTRIBUTES"
                        invalidationTimeout="30">
   ```

   By default, `invalidationTimeout` is set to 30, which means that a user is logged out automatically after 30 minutes of inactivity.
7. Set `invalidationTimeout` to an appropriate value for your environment and for the activities you plan to perform.
8. Save the file.
9. Open the configuration file:

```
<TWA_home>\eWAS\profiles\tdwc_profile
\config\cells\tdwc_cell\security.xml
```

10. In the file, search for `timeout` in the following tag:

    ```
    <authMechanisms xmi:type="security:LTPA"
               xmi:id="LTPA_1" OID="oid:1.3.18.0.2.30.2"
               authContextImplClass="com.ibm.ISecurityLocalObjectTokenBaseImpl
    .WSSecurityContextLTPAImpl"
               authConfig="system.LTPA"
               simpleAuthConfig="system.LTPA"
               authValidationConfig="system.LTPA"
               timeout="120"
               keySetGroup="KeySetGroup_lab237165Node01_1">
    ```

    By default `timeout` is set to 120, which means that a user is logged out automatically after 120 minutes regardless of whether the user performed any actions on the WebSphere Application Server.
11. Set the timeout value in the following section of the file to an appropriate value for your environment and for the activities you plan to perform.
12. Save the file.
13. Restart the WebSphere Application Server.

Chapter 11. Availability

This chapter describes factors that might affect the availability of Tivoli Workload Scheduler on a workstation. It covers the following topics:

- "Resolving Windows user ID account"
- "Using a temporary directory on UNIX"

Resolving Windows user ID account

Tivoli Workload Scheduler needs to resolve the user ID account on Windows operating systems to verify the security information.

Windows users can be classified as domain users or local users. Domain users are defined in the domain controller, while local users are defined in the workstations of the network.

For a domain user, Tivoli Workload Scheduler requests the primary domain controller (or any domain controller for Windows 2000 or 2003 Active Directory), to identify an available domain controller. It then uses this domain controller identity to fill out the structure for the user.

For a local user, Tivoli Workload Scheduler makes a request to the local workstation. Generally, Tivoli Workload Scheduler specifies two cases: one for the Tivoli Workload Scheduler user and one for the streamlogon user.

The following is a list of steps that Tivoli Workload Scheduler performs to authenticate Windows users, and the APIs involved:

1. Tivoli Workload Scheduler looks up the user in the reference domain. For the domain user, the reference domain is the name of the Windows network. For the local user, it is the name of the local workstation.

   API: `LookupAccountName`.
2. If the user is a domain user, Tivoli Workload Scheduler asks the primary domain controller for any domain controller that is available to resolve the account for the user in the reference domain.

   API: `NetGetAnyDCName` for Windows or `DsGetDcName` for Windows 2000 or 2003.
3. Tivoli Workload Scheduler requests the domain controller (or the local workstation if the user is local) for information about the user.

   API: `NetUserGetInfo`.

   Note: On Windows 2000 and 2003, the permissions for this API are contained in the `BUILTIN\"Pre-Windows 2000 compatible access"` group.

Using a temporary directory on UNIX

When performing Tivoli Workload Scheduler operations on UNIX, temporary files are written to the temporary directory on the local workstation. Ensure that the <*TWS_user*> running operations has *read* and *write* access to this directory.

Notices

This information was developed for products and services offered in the U.S.A. IBM may not offer the products, services, or features discussed in this publication in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this publication. The furnishing of this publication does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785 U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

Intellectual Property Licensing
Legal and Intellectual Property Law
IBM Japan, Ltd.
1623-14, Shimotsuruma, Yamato-shi
Kanagawa 242-8502 Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement might not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

Trademarks

Index

Special characters

.jobmanrc 177
.rhost, file 177
$MASTER variable, resolve in mailman, local option 32

Numerics

2001, service in NetConf file 175
2002, service in NetConf file 175
2003, service in NetConf file 175
2004, service in NetConf file 175
2005, service in NetConf file 175
2006, service in NetConf file 175
2007, service in NetConf file 175
2008, service in NetConf file 175
2009, service in NetConf file 175
2010, service in NetConf file 175
2011, service in NetConf file 175
2012, service in NetConf file 175
2013, service in NetConf file 175
2014, service in NetConf file 175
2015, service in NetConf file 175
2016, service in NetConf file 175
2017, service in NetConf file 175
2018, service in NetConf file 175
2021, service in NetConf file 175
2022, service in NetConf file 175
2023, service in NetConf file 175
2501, service in NetConf file 175
2502, service in NetConf file 175
2503, service in NetConf file 175

A

access method, UNIX
  local 177
  remote 177
access to broker server
  restricting 197
access, remote, for command-line, configuring 70
accessibility xii
action, object type, defining access 122
Active Directory, configuring LDAP for 155
administrative tasks 267
  DB2 225
  Oracle 231
agent 270
agent process
  monitoring 165
agents
  critical, positioning 166
ah, global option 13
al, global option 13
altpass, command 274
application server
  administrative tasks 267
  automatic restart 301
  backup master domain manager setting, local option 31
  changing user password 274
  configuration backup and restore 307
application server *(continued)*
  configuration files: backup and restore 307
  configuration utilities: background 313
  encrypting profile properties 305
  host name, modify 308
  increase heap size 324
  master domain manager setting, local option 31
  monitor 301
  multiple instances on same system 88
  security settings, modify 296
  starting and stopping 300
  TCP/IP ports, modify 308
  tuning 319
  updating the SOAP properties after changing user or password 306
  updating the Windows service 305
  using utilities to change properties 312
  utilities 313
ApplicationServerStatusChanged event 305
approachingLateOffset, global option 13
appserver
  auto restart, local option 27
  check interval, local option 27
  count reset interval, local option 27
  max restarts, local option 27
  min restart time, local option 27
  service name, local option 27
appserverbox
  monitoring 170
appservman 301
  local options 302
  not stopping while stopping the application server 300
  run from conman, process 175
appservman process
  monitoring 165
archive settings for job data
  configuring 54
archived files 223
as, global option 13
at dependency, job streams without, preventing from starting, global option 18
audit
  database and plan 248
  directory
    as log file location 224
  directory for log files 249
  dynamic workload scheduling 254
  enabling 249
  header format 249
  initiate 249
  log files 249
  log format 250
  overview 248
  plan, enabling, global option 18
  restarting to initiate 249
audit management
  audit history maintenance, global option 13
  audit store type, global option 13
  database, enabling, global option 16
  specify cleanup frequency, global option 20

audit trails
  maintaining 248
auditHistory, global option 13
auditStore, global option 13
authentication
  configure using the Integrated Solutions Console 142
  federated user registry 140
authentication on SMTP connection, use, global option 22
authentication with broker server 197
authentication with dynamic domain manager 197
authentication, configuring 139
authorization with broker server 197
authorization with dynamic domain manager 197
authorization with master domain manager 197
auto link flag 161
auto restart, appservman 302
automatic maintenance, DB2
  administer 226
  modify policy 226
  running manually 227
  switch off 226
  switch on 227
automatic restart of application server 301
automatically grant logon as batch, global option 18
autostart monman, local option 27
availability 331
average run time calculation, weighting factor, global option 20

B

backing up
  log files 219
backup
  application server configuration 307
  backup master domain manager 217
  log files 217
  to offline storage 217
backup domain manager
  choosing 269
  configuring 269
  definition 160
  domain manager
    backup definition 160
  network security 269
  performance 322
  setting up 269
  switching 270
backup dynamic domain manager
  choosing 269
backup master domain manager
  backing up files to 217
  choosing 270
  configuring 271
  copying files to 271
  definition 160
  extended loss of 272
  permanent change 272
  promoting from agent 270
  setting up 271
  switching 272
backup master domain manager configuration 56
backupConfig, used to backup application server configuration 307
baseRecPrompt, global option 14
baseRecPropmt, additional prompts global option 19
batch reports
  configuring 215
batchman
  deadline, minimum wait to check , local option 27
  dependency status, wait to check, local option 27
  file, minimum wait to check , local option 27
  intercom.msg file, maximum wait to read, local option 28
  processes 162
  production control file, minimum wait to update, local option 28
  starting 163
  statistics reporting, enable, local option 28
  status messages, send to standard list, local option 28
  tuning 318
  until time, maximum wait to report expiry of, local option 28
batchman process
  monitoring 165
behind firewall
  extended agent 201
behindfirewall option 200
bindUser, global option 14
bm check deadline, local option 27
bm check file, local option 27
bm check status, local option 27
bm check until, local option 28
bm look, local option 28
bm read, local option 28
bm status, local option 28
bm verbose, local option 28
books
  See publications
bp, global option 14
broker backup configuration 273
broker components security
  defining 197
broker configuration
  modifying 56
broker configuration data 273
broker failover 273
broker server
  limiting access to 197
broker server configuration
  modifying 56
broker server security
  defining 197
broker switch 273
BrokerWorkstation.properties
  workload broker workstation configuration 56
bu, global option 14

C

cache.dat, increasing size of 297
caching mailbox 321
calendar, object type, defining access 120, 123
calendars, enabling the copying of into Symphony, global option 19
can be event processor, local option 28
caonly, SSL auth mode, local option 34
carry forward internetwork dependencies, global option 16
carry forward resource quantities, global option 16
carry forward, global option 15
carryStates, global option 14
CCLog
  shared memory management 318
centralized security 105

centralized security, global option 15
certificates 184
certification authority 185
cf, global option 15
changeDataSourceProperties script 285
changeDataSourceProperties, application server utility 286
changeHostProperties script 308
changeHostProperties, application server utility 309
changeSecurityProperties script 296
changeTraceProperties, application server utility 311
changing
  IP address or host name on the dynamic agent 296
  IP address or host name on the dynamic workload broker server 295
  WebSphere Application Server file 292
  workstation definition 294
  workstation host name or IP address 291
check interval, appservman 302
check status of remote job, process start 175
checkevtptroc, run from conman on a client, process 175
checks, file dependency, impacting performance 320
ci, global option 16
clbox
  monitoring 170
CLI
  default workstation when using, local option 30
  GSKit certificate keystore label, local option 28
  GSKit keystore file, local option 28
  GSKit keystore password file, local option 29
  host name when connecting from, local option 30
  is installed as, local option 30
  OpenSSL certificate file when using SSL with server, local option 29
  OpenSSL cipher class, local option 29
  OpenSSL trusted certificate directory when using SSL with server, local option 29
  OpenSSL, enabling SSL server authentication, local option 29
  port, local option 34
  protocol, local option 34
  proxy port, local option 34
  proxy, local option 34
  timeout, local option 38
  useropts file, local option 38
cli ssl certificate keystore label, local option 28
cli ssl cipher, local option 29
cli ssl keystore file, local option 28
cli ssl keystore pwd, local option 29
cli ssl server auth, local option 29
cli ssl server certificate, local option 29
cli ssl trusted dir, local option 29
cn, global option 14
command line
  See CLI
command line client
  configuring remote access 70
command-line prompt
  composer 30
  conman 30
commands
  console 74
  dumpsec 103
  evtsize 172
  makesec 104
  optman 7
  StartUp 164
commands and scripts
  .jobmanrc 177
  altpass 274
  appservman 301
  backupConfig 307
  changeDataSourceProperties 285
  changeHostProperties 308
  changeSecurityProperties 296
  dbexpand, impact on audit log file 252
  dbreorg 228
  dbrunstats 227
  evtsize
    to monitor queue sizes 169
  jobmanrc 177
  link 161
  makesec, impact on audit log file 252
  restoreConfig 307
  rmstdlist 223
  startappserver 301, 303
  StartUp 163
  startWas 300
  stopappserver 301, 303
  stopWas 300
  unlink
    usage 161
  updateWas 306
  updateWasService 305
communications in the network 160
companyName, global option 14
composer
  defining access for working with objects 120
  prompt, local option 30
configuration
  Dynamic Workload Console 83
  for LDAP 87
  for single sign-on 87
  ldap user registry 83
  user 84
  user's portfolio 84
configuration file, netman 175
configuration files
  application server, backup and restore 307
  backing up 218
configure
  authentication using the Integrated Solutions Console 142
  Tivoli Workload Scheduler to use LDAP 201
configuring
  archive settings for job data 54
  authentication 139
  global resource matching 52
  heartbeat signal 52
  J2EE communication channel 59
  J2EE jobs 59
  maximum number of results for global resource matching 52
  time interval for job allocation to resources 52
  time interval for notifications on resources 52
  time interval for retrying failed operations 54
  WebSphere Application Server 59
configuring Dynamic Workload Console
  global settings file 92
  settings repository 97
configuring reports
  DB2 database 97
  Oracle database 98
conman
  defining access for working with objects 120

conman *(continued)*
log type 250
prompt, local option 30
running appservman 175
running checkevtptroc on a client 175
running deployconf 175
running startappserver 175
running startevtptroc 175
running stopappserver 175
running stopevtptroc 175
running stopevtptroc on a client 175
running stopmon 175
running switchevtptroc 175
starting the find and return of a stdlist file 175
connection failed, wait to retry in netman, local option 33
connection parameters
configuring 70
connection to broker server
establishing 197
connectivity, impact on network 166
connector
refresh after changing auditing parameters 249
console command 74
console manager, start process 176
console messages and prompts 73
continue keyword 137
conventions used in publications xii
copying files to backup master domain manager 271
count reset interval, appservman 303
courier
monitoring 170
courier.msg file, wait to read in jobman, local option 31
cpu, object type, defining access 120
cpu, SSL auth mode, local option 35
critical agents, positioning 166
critical path processing, enabling, global option 19
cross dependencies notification
timeout 21
cs, global option 14
custom, authentication 140
customer support
See Software Support
customization 7

D

da, global option 16
data flows, planning for 168
data maintenance 217
data volumes, impact on network 166
database
back up
to backup master domain manager 217
to offline storage 217
directory for audit files 249
log type 250
maintenance 217
migrating from DB2 to Oracle and vice versa 233
name, change 285
reorganization 219
database and plan audit 248
database audit enabling, global option 16
database job
configuring 66
date format, local option 30
DB2
administrative tasks 225
DB2 *(continued)*
automatic maintenance
administer 226
modify policy 226
running manually 227
switch off 226
switch on 227
changing database user password 274
database name, change 285
host name, change 285
increase maximum log capacity 325
migrating to Oracle 233
monitoring the lock list memory 229
passwords not used by TWS, changing 225
port, change 285
reorganization 219
reorganize database 228
tools, locating 225
tuning 319
user permissions for running the tools 226
DB2 configuration
IBM Global Security Kit (GSKit) libraries 209
DB2 database
configuring reports 97
DB2, version 9.5
FIPS compliance 209
DB2, version 9.7, fix pack 2 and later
FIPS compliance 211
dbexpand, command, impact on audit log file 252
dbreorg, DB2 tool 228
dbrunstats, DB2 tool 227
DDM secure connection 197
deadline, minimum wait to check , local batchman option 27
deadlineOffset, global option 14
default ws, local option 30
definition
workstation changing 294
dependency checks, file, impacting performance 320
dependency status, batchman wait to check, local option 27
deploymentFrequency, global option 15
deplyconf, run from conman, process 175
df, global option 15
direct scheduling
J2EE jobs 59
directories
audit 224, 249
database 249
logs 223
methods 224
plan 249
schedForecast 224
schedlog 223
schedTrial 224
stdlist 224
tmp, as location for temporary files 225
traces 223
disk filling
monitoring 221
disk full
monitoring 221
disk space
maintaining enough available space 220
monitoring 221
used by backup domain manager impacting performance 323
dm.msg message queue 169
do, global option 14

domain
  definition 160
  master, definition 160
  parent, definition 160
  structure of, impact on critical agents 166
domain manager
  backup
    See backup domain manager
  backup master
    See backup master domain manager
  data flows 168, 169
  definition 160
  failure 269
  IP address validation 181
  log file maintenance 223
  loss of 269
  master
    See master domain manager
  mitigating loss of 269
  network planning, role of 166
  optimizing for critical activities 166
  positioning for critical activities 166
  role of in network planning 166
  running without 269
  switching 270
  temporary files 225
  without 269
domain user, resolving account in Windows 331
download scripts from z/OS master domain manager, starting process 175
DsGetDcName, API used to resolve Windows user ID account 331
dumpsec command 103
duration, job, long, threshold, global option 20
dynamic agent
  changing IP address or host name 296
dynamic agent configuration 56
dynamic agent logs encoding 43
dynamic agent logs setting 43
dynamic domain manager
  configuring the dynamic workload broker server 49
  defining broker connection 197
  defining SSL connection 197
  maintaining the dynamic workload broker server 50
dynamic domain manager configuration 56
dynamic workload broker
  start 298
  stop 298
dynamic workload broker security
  workload broker security roles and users and groups 67
dynamic workload broker server
  changing IP address or host name 295
  changing URI data 50
  configuring 49
  exportserverdata 50
  http communication 51
  https communication 51
  importserverdata 50
  maintaining 50
  unsecure communication 51
dynamic workload broker server on dynamic domain manager
  configuring 49
  maintaining 50
dynamic workload broker server on master domain manager
  configuring 49
  maintaining 50
Dynamic Workload Console
  accessibility xii
  authentication method 83
  configuration 77, 83
  configure to view reports 97
  launch in context 77
  local OS method 83
  multiple production plan reports, affecting performance 328
  PAM authentication method 83
Dynamic Workload Console authentication method
  configuring 83
Dynamic Workload Console SSL security
  keystore passwords 193
dynamic workload scheduling audit 254

E

ed, global option 16
education xii
ee, global option 19
eh, global option 17
EIF event queue, increasing size of 297
empty job streams, global option 16
enable list security check 17
enCarryForward, global option 15
enCentSec, global option 15
enCFinterNetworkDeps, global option 16
enCFResourceQuantity, global option 16
encrypting application server profile properties 305
encryption cipher classes
  EXP 29
  EXPORT40 29
  HIGH 29
  LOW 29
  MD5 29
  MEDIUM 29
  NULL 29
  SSLv3 29
  TLSv 29
encryption, strong, enabling, global option 19
enDbAudit, global option 16, 249
enEmptySchedsAreSucc, global option 16
enEventDrivenWorkloadAutomation, global option 16
enEventProcessorHttpsProtocol, global option 17
enExpandedResources, global option 17
enForecastStartTime, global option 17
engine
  administrative tasks 267
enLegacyId, global option 17
enLegacyStartOfDayEvaluation, global option 17
enListSecChk, global option 17
enLogonBatch, global option 18
enPlanAudit, global option 18, 249
enPreventStart, global option 18
enRetainNameOnRerunFrom, global option 18
enSSLFullConnection, global option 18
enStrEncrypt, global option 19
enSwfaultTol, global option 19
Enterprise Workload Manager
  resource assignment 54
  resource optimization 54
  resource weight 54
  retry on failure 54
enTimeZone, global option 19
enWorkloadServiceAssurance, global option 19
er, global option 17

error messages
  IP address validation 180
es, global option 16
event processor
  managing 297
event processor HTTPS protocol, global option 17
event processor, enabling workstation to be, local option 28
event rule management
  log history maintenance, global option 13, 20
  mail sender name, global option 21
  SMTP
    port, global option 22
    server name, global option 22
    use authentication, global option 22
    use SSL, global option 22
    use TLS, global option 23
    user name, global option 22
    user password, global option 22
  specify cleanup frequency, global option 20
  TEC server
    name, global option 23
    port, global option 23
event-driven workload automation enablement, global option 16
event, ApplicationServerStatusChanged 305
event, object type, defining access 125
eventProcessorEIFPort, global option 19
eventrule, object type, defining access 120
evtsize command 172
evtsize, command
  to monitor queue sizes 169
EXP, encryption cipher class 29
EXPORT40, encryption cipher class 29
exportserverdata 50
extended agent
  behind firewall 201
  definition 160
  jobs cannot launch 179
  overview 176
extRecPrompt, global option 19

F

failure of
  domain manager 269
  dynamic domain manager 269
  master domain manager 270
fault tolerant switch manager, enabling, global option 19
fault-tolerant agent
  backing up to, when used as backup master domain manager 217
  data flows 169
  definition 160
  promoting to backup master domain manager 270
fault-tolerant agent instances
  automatic initialization 299
fault-tolerant domain manager
  See domain manager
fault-tolerant switch manager
  See domain manager
fault-tolerant switch manager, impact on performance 322
federated user registry 140
file dependency checks impacting performance 320
file registry, authentication 140
file sets
  See files
file system
  See files
file, object type, defining access 125
files
  .rhost 177
  archived 224
  avoiding full file systems 220
  batchman minimum wait to check , local option 27
  configuration
    backing up 218
  forecast plan logs 224
  host.equiv 177
  job output, archived 224
  localopts 23
  log files
    backing up 217
  maintaining file system 220
  NetConf 175
  Security
    backing up 218
  Symphony
    archived 223
    IP address validation 179
    maximum number of records 176
    overview 160
    scanning by batchman 162
  temporary
    See temporary files
  trial plan logs 224
  useropts 41
filling mailboxes
  monitoring 170
filling message queues
  monitoring 170
final job stream, launch time, global option 23
FIPS compliance 201
  configuring batch reports 215
  database configuration 209
  DB2, version 9.5 209
  DB2, version 9.7, fix pack 2 and later 211
  EIF Listener port 209
  embedded WebSphere Application Server 207
  enabling using local option 36
  FIPS certificates 202
  localopts parameters 207
firewall bypass, starting 175
firewall support 200
flows, data, planning for 168
forecast plan logs 224
forecast start time enablement, global options 17
format, audit log files 250
fta.msg message queue 169
ftdown message queue, in backup domain manager 323
ftup message queue, in backup domain manager 323
full file systems, avoiding 220
FullStatus mode, setting 162

G

getaddrinfo() system call 179
global option descriptions
  approachingLateOffset 13
  auditHistory 13
  auditStore 13
  baseRecPrompt 14
  bindUser 14
  carryforward 15

global option descriptions *(continued)*
  carryStates 14
  companyName 14
  deadlineOffset 14
  deploymentFrequency 15
  enCentSec 15
  enCFinterNetworkDeps 16
  enCFResourceQuantity 16
  enDbAudit 16
  enEmptySchedsAreSucc 16
  enEventDrivenWorkloadAutomation 16
  enEventProcessorHttpsProtocol 17
  enExpandedResources 17
  enForecastStartTime 17
  enLegacyId 17
  enLegacyStartOfDayEvaluation 17
  enListSecChk 17
  enLogonBatch 18
  enPlanAudit 18
  enPreventStart 18
  enRetainNameOnRerunFrom 18
  enSSLFullConnection 18
  enStrEncrypt 19
  enSwfaultTol 19
  enTimeZone 19
  enWorkloadServiceAssurance 19
  eventProcessorEIFPort 19
  extRecPrompt 19
  ignoreCals 19
  logCleanupFrequency 20
  logHistory 20
  logmanMinMaxPolicy 20
  logmanSmoothPolicy 20
  longDurationThreshold 20
  mailSenderName 21
  maxLen 21
  minLen 21
  nt 21
  promotionOffset 21
  smtpServerName 22
  smtpServerPort 22
  smtpUserName 22
  smtpUserPassword 22
  smtpUseSSL 22
  smtpUseTLS 23
  startOfDay 23
  statsHistory 23
  TECServerName 23
  TECServerPort 23
  useAuthentication 22
global options
  optman command line 7
  time zone feature 75
global resource matching
  configuring 52
global settings
  configuration 92
glossary xii
GSKit
  certificate keystore label, local option 28, 35
  keystore file, local option 28
  keystore password file, local option 29
  SSL keystore file, local option 36
  SSL keystore password file, local option 36

H

header format, audit log records 249
header, log type 250
heap size, application server, increase 324
heartbeat signal
  configuring 52
HIGH, encryption cipher class 29
history, job statistics, global option 23
host name
  application server, modify 308
  changing on the dynamic agent 296
  changing on the dynamic workload broker server 295
  database, change 285
  impact of changing 181
host name or IP address
  changing 291
  changing WebSphere Application Server file 292
host, for extended agents, definition 160
host, when connecting from command line client, local option 30
host.equiv, file 177
HTTPS protocol for event processor, global option 17

I

IBM Global Security Kit (GSKit) libraries
  DB2 configuration 209
IBM Tivoli Directory Server 140
IBMWAS61Service 302
ic, global option 19
ignoreCals, global option 19
importserverdata 50
incoming message cache
  enable in mailman, local option 32
  resize in mailman, local option 32
indirect scheduling
  J2EE jobs 59
installation
  checking
    See installation, verifying
  directory 1
  steps
    See steps, installation
instance initialization 299
instances
  automatic initialization 299
Integrated Solutions Console
  configure authentication 142
intercom
  monitoring 170
intercom.msg file, batchman maximum wait to read, local option 28
Intercom.msg message queue 169
interface SSL security
  keystore passwords 193
internal Symphony table, determining the size of 176
IP address
  changing on the dynamic agent 296
  changing on the dynamic workload broker server 295
  impact of changing 181
  support for V6 179
  validation 179
is remote cli, local option 30
ISMP
  See InstallShield wizard

J

J2EE communication channel
  configuring 59
J2EE job
  configuring 66
J2EE jobs
  configuration for 59
  configuring 59
  direct scheduling 59
  enabling 59
  indirect scheduling 59
  JMS 59
  security settings 59
  supported operations 59
  WebSphere Application Server settings 59
J2EE jobs on agent
  configuration 60, 62, 63
J2EEJobExecutorConfig.properties
  configuring 60
J2SE
  See Java Runtime Environment
Java 2 Platform, Standard Edition
  See Java Runtime Environment
Java development kit
  See Java Runtime Environment
Java Development Kit
  See Java Runtime Environment
Java heap size, application server, increase 324
Java job
  configuring 66
Java Virtual Machine
  See Java Runtime Environment
Java Virtual Machine options 47
JDBC driver, resolving problems 289
JDK
  See Java Runtime Environment
jm job table size, local option 30
jm look, local option 30
jm nice, local option 30
jm no root, local option 30
jm promoted nice, local option 30
jm promoted priority, local option 31
jm read, local option 31
JMS
  J2EE jobs 59
JnextPlan
  impact on auditing 249
  when setting up a domain manager 271
JnextPlan, avoiding lock list memory problmes 229
job executors
  configuring 66
  Java options 47
job management tasks wait in jobman, local option 30
job output files, archived 224
job plug-ins
  configuring 66
  Java options 47
job status change notification
  timeout 21
job streams
  empty. behavior, global option 16
  more than 180 000, impacting DB2 log files 323
  naming in mixed environments, global option 17
  without at dependency, preventing from starting, global option 18
  without jobs. behavior, global option 16
job submissions, manual, impacting performance 320
job table, size of in jobman, local option 30
job times, minimum and maximum, logging and reporting, global option 20
job types with advanced options
  authorization for running 120
  configuration files 66
  configuring 66
  cpu access 120
  customizing 66
  defining access 120
  defining authorization 120
  Java options 47
job types with advanced options configuration files
  location 66
job, object type, defining access 120, 125
JobDispatcherConfig.properties
  job age in archive database 54
  job age in database 54
jobman
  tuning 318
jobman and JOBMAN
  courier.msg file, wait to read, local option 31
  job management tasks wait, local option 30
  launching by batchman 162
  nice value to apply to critical UNIX or Linux jobs, local option 30
  nice value to apply to UNIX or Linux jobs, local option 30
  priority value to apply to critical Windows jobs, local option 31
  root jobs, enabling the launch of, local option 30
  size of job table, local option 30
  starting 163
jobman process
  monitoring 165
jobmanrc 177
jobs
  failing to launch on extended agent 179
  improving processing performance 320
  late, when becoming, global option 13
  long duration threshold, global option 20
  more than 40 000, impacting Java heap size 323
  promotion of critical, eligibility for, global option 21
  retaining name on rerun, global option 18
  statistics history, global option 23
JRE
  See Java Runtime Environment
JVM
  See Java Runtime Environment
JVM options 47

L

late jobs, when becoming, global option 13
launch in context
  Dynamic Workload Console 77
lb, global option 18
lc, global option 20
ld, global option 20
LDAP
  authentication 140
  configuration 87
  configure Tivoli Workload Scheduler to use 201
ldap user registry
  configuration 83
le, global option 17
lh, global option 20
li, global option 17

Lightweight Directory Access Protocol
  See LDAP
link command, using 161
link flag, auto 161
link to non-responding workstation, wait to retry in mailman, local option 32
linking
  concept 161
Linux
  jobs, nice value to apply when critical, local option 30
  jobs, nice value to apply, local option 30
list permission
  enable option 17
lm, global option 20
local option descriptions
  appserver auto restart 27
  appserver check interval 27
  appserver count reset interval 27
  appserver max restarts 27
  appserver min restart time 27
  appserver service name 27
  autostart monman 27
  bm check file 27
  bm check status 27
  bm check until 28
  bm look 28
  bm read 28
  bm stats 28
  bm verbose 28
  can be event processor 28
  caonly 34
  cli ssl certificate keystore label 28
  cli ssl cipher 29
  cli ssl keystore file 28
  cli ssl keystore pwd 29
  cli ssl server auth 29
  cli ssl server certificate 29
  cli ssl trusted dir 29
  composer prompt 30
  conman prompt 30
  cpu 35
  date format 30
  default ws 30
  host 30
  is remote cli 30
  jm job table size 30
  jm look 30
  jm nice 30
  jm no root 30
  jm promoted nice 30
  jm promoted priority 31
  jm read 31
  local was 31
  merge stdlists 32
  mm cache mailbox 32
  mm cache size 32
  mm read 32
  mm resolve master 32
  mm response 32
  mm retry link 32
  mm sound off 32
  mm symphony download timeout 32
  mm unlink 32
  mozart directory 33
  nm mortal 33
  nm port 33
  nm read 33
local option descriptions *(continued)*
  nm retry 33
  nm SSL full port 33
  nm SSL port 33
  parameters directory 34
  port 34
  protocol 34
  proxy 34
  proxy port 34
  restricted stdlists 34
  SSL auth mode 34
  SSL auth string 35
  SSL CA certificate 35
  SSL certificate 35
  ssl certificate keystore label 35
  SSL encryption cipher 35
  SSL FIPS enabled 36
  SSL key 36
  SSL key pwd 36
  SSL keystore file 36
  SSL keystore pwd 36
  SSL random seed 36
  stdlist width 37
  string 35
  switch sym prompt 37
  sync level 37
  syslog local 37
  tcp connect timeout 37
  tcp timeout 37
  this cpu 37
  timeout 38
  unison network directory 38
  useropts 38
  wr enable compression 38
  wr read 38
  wr unlink 38
local options
  file example 24
  file template 24
  setting 23
  setting sysloglocal 74
  syntax 23
local OS on Dynamic Workload Console
  configuring 83
local OS on TDWC
  configuring 83
local OS, authentication
  for Tivoli Dynamic Workload Console on UNIX operating systems 140
local security 101
local user, resolving account in Windows 331
local was, local option 31
localopts
  nm ipvalidate 179
  option for setting synch level 322
  options for caching mailbox messages 321
  options used for tuning 318
  parameters for tuning mailman servers 174
  tuning for job-processing performance 320
  used for appservman 302
localopts file 23
lock list memory, DB2, monitoring 229
LOCKLIST, DB2 configuration parameter 229
log capacity, DB2, increase 325
log configuration
  Tivoli Workload Scheduler agent 43

log files
  audit
    format 250
    location 249
  backing up 219
  backup 217
  maintenance 223
logCleanupFrequency, global option 20
LOGFILSIZ, DB2 parameter 326
logging, impact on performance 318
logging.properties
  configuring 62
logHistory, global option 20
logmanMinMaxPolicy, global option 20
logmanSmoothPolicy, global option 20
logon as batch, granting automatically, global option 18
LOGPRIMARY, DB2 parameter 326
logs
  dynamic agent encoding 43
logs directory, as log file location 223
LOGSECOND, DB2 parameter 326
longDurationThreshold, global option 20
LookupAccountName, API used to resolve Windows user ID account 331
loss of
  domain manager 269
  dynamic domain manager 269
  master domain manager 270
LOW, encryption cipher class 29
lt, global option 20
LTPA keys
  sharing 87
LTPA token_keys
  using the same 88

M

mailbox
  monitoring 170
mailbox caching 321
mailbox files
  setting size 172
mailbox full
  monitoring 170
Mailbox.msg
  message queue 169
mailboxes
  monitoring 170
mailman
  $MASTER variable, resolve, local option 32
  caching 321
  determining the size of its internal Symphony table 176
  incoming message cache
    enable, local option 32
    resize, local option 32
  link to non-responding workstation, wait to retry, local option 32
  processes timing out 161
  servers
    configuring to maximize critical activities 166
    tuning 174
  starting 163, 175
  starting with demgr parameter 175
  tellop command, respond to, local option 32
  tuning 318
  unlink non-responding workstation, wait to, local option 32
mailman *(continued)*
  wait for connection, local option 32
  workstation not responding, wait to report, local option 32
mailman process
  monitoring 165
mailSenderName, global option 21
maintenance
  database 217
  DB2, automatic
    administer 226
    modify policy 226
    running manually 227
    switch off 226
    switch on 227
  Oracle database 232
makesec
  impact on audit log file 252
  log type 250
makesec command 104
manual job submissions impacting performance 320
manuals
  See publications
master domain manager
  backing up to backup master domain manager 217
  backup
    See backup master domain manager
  configuring the dynamic workload broker server 49
  defining broker connection 197
  defining SSL connection 197
  definition 160
  extended loss of 272
  failure 270
  loss of 270
  maintaining the dynamic workload broker server 50
  mitigating loss of 270
  permanent change 272
  running without 270
  switching 272
  without 270
master domain manager configuration 56
master domain, definition 160
master instances
  automatic initialization 299
max restarts, appservman 303
maximum and minimum job times, logging and reporting, global option 20
maximum number of results for global resource matching
  configuring 52
maximum records in Symphony file 176
maxLen, global option 21
MAXLOCKS, DB2 configuration parameter 229
MD5, encryption cipher class 29
MEDIUM, encryption cipher class 29
memory
  management by logging processes impacting performance 318
merge stdlists, local option 32
message caching 321
message level 74
message queues
  dm.msg 169
  fta.msg 169
  ftdown, in backup domain manager 323
  ftup, in backup domain manager 323
  in backup domain manager 323
  Intercom.msg 169

message queues *(continued)*
  Mailbox.msg 169
  monitoring 170
  tomaster.msg 169
methods directory, as log file location 224
Microsoft Windows Active Directory 140
migration
  of database (DB2 to Oracle and vice versa) 233
min restart time, appservman 302
minimum and maximum job times, logging and reporting, global option 20
minLen, global option 21
mitigating loss of
  domain manager 269
  dynamic domain manager 269
  master domain manager 270
mixed environments, naming of job streams in, global option 17
ml, global option 21
mm cache mailbox, local option 32
mm cache size, local option 32
mm read, local option 32
mm resolve master, local option 32
mm response, local option 32
mm retry link, local option 32
mm sound off, local option 32
mm symphony download timeout, local option 32
mm unlink, local option 32
Mm_unlink, localopts parameter 174
monbox
  monitoring 170
moncmd
  monitoring 170
monman
  autostart, local option 27
  starting process 175
monman process
  monitoring 165
mozart directory, local option 33
ms, global option 21

N

name, TEC server, global option 23
naming, of job streams in mixed environments, global option 17
NetConf, file 175
NetGetAnyDCName, API used to resolve Windows user ID account 331
netman
  configuration file 175
  connection failed, wait to retry, local option 33
  IP address validation 179
  port, local option 33
  quit when child processes stopped, local option 33
  SSL full port, local option 33
  SSL port, local option 33
  starting 163
  stop and start commands, wait to check for, local option 33
  support for Internet Protocol version 6 179
netman process
  monitoring 165
NetUserGetInfo, API used to resolve Windows user ID account 331
network
  capacity 166
network *(continued)*
  changes, impact of 181
  communications 160
  impact of changes 181
  IP address validation 179
  linking 161
  message queues, planning for 168
  monitoring for unlinked workstations 161
  operation 162
  optimizing 166
  overview 159
  processes 163
  structure, impact on critical agents 166
  support for Internet Protocol version 6 179
  traffic caused by backup domain manager impacting performance 323
  unlinking 161
network traffic 317
new executors
  authorization for running 120
  defining access 120
  defining authorization 120
nice value to apply to critical UNIX or Linux jobs in jobman, local option 30
nice value to apply to UNIX or Linux jobs in jobman, local option 30
nm ipvalidate, localopts parameter 179
nm mortal, local option 33
nm port, local option 33
nm read, local option 33
nm retry, local option 33
nm SSL full port, local option 33
nm SSL port, local option 33
nodename validation 179
normal run time calculation, weighting factor, global option 20
notificationTimeout, global option 21
nt, global option 21
NULL, encryption cipher class 29

O

object types, defining access to composer actions 120
offline storage, used for backup and restore 217
opens, file dependency 177
OpenSSL
  ca certificate file, local option 35
  certificate file, local option 35
  cipher class, local option 29
  enabling SSL server authentication, local option 29
  server certificate when using command-line client, local option 29
  SSL encryption cipher, local option 35
  SSL key file, local option 36
  SSL key password file, local option 36
  SSL random seed, local option 36
  trusted directory when using command-line client, local option 29
options, global 7
optman
  security settings 7
optman, enabling audit 249
Oracle
  administrative tasks 231
  changing user password 274
  database name, change 285
  host name, change 285

Oracle *(continued)*
  maintaining database 232
  migrating to DB2 233
  obtaining database information 232
  passwords not used by TWS, changing 232
  port, change 285
  reorganization 219
  running maintenance manually 232
  tools, locating 232
  tuning 319
  user permissions for running the tools 233
Oracle database
  configuring reports 98

P

pa, global option 18
parallel database migration (DB2 to Oracle and vice versa) 233
parameter, object type, defining access 128
parameters directory, local option 34
parent domain, definition 160
parms, log type 251
password for SMTP connection, global option 22
passwords
  other DB2, changing 225
  TWS_user, changing 274
performance
  fault-tolerant switch manager 322
  file dependency checks, too many 320
  impacted by multiple TDWC production plan reports 328
  job submissions, manual, too many 320
  job-processing, improving 320
  network 166
  too many file dependency checks 320
  too many manual job submissions 320
  tuning job processing on a workstation 318
  tuning on UNIX 318
  workload spreading 320
permissions, user
  for running DB2 tools 226
  for running Oracle tools 233
plan auditing, enabling, global option 18
plan directory for audit files 249
plan, log type 251
plan, preproduction, maximum length, global option 21
plan, preproduction, minimum length, global option 21
planned maintenance
  See maintenance
planning to minimize network message queues 168
Pluggable Authentication Module, using in TWS 157
po, global option 21
pobox
  monitoring 170
port
  SMTP server, global option 22
  SSL full , used by netman, local option 33
  SSL, used by netman, local option 33
  TEC server, global option 23
port for command line client, local option 34
port number, event processor, global option 19
port, database, change 285
port, for netman, local option 33
preproduction plan, maximum length, global option 21
preproduction plan, minimum length, global option 21
preventing job streams without at dependency from starting, global option 18
priority value to apply to critical Windows jobs in jobman, local option 31
private keys 184
problems
  See troubleshooting
process messages 73
process prompts 73
processes status
  monitoring 165
production control file, batchman minimum wait to update, local option 28
production plan reports, TDWC, affecting performance 328
production, managing on extended agents 179
profile properties, application server, encrypting 305
promoting an agent to backup master domain manager 270
promoting to backup master domain manager 270
promotion of critical jobs, eligibility for, global option 21
promotionOffset, global option 21
prompt, object type, defining access 120, 129
prompts, additional, global option 19
properties
  of application server, utilities for changing 312
protocol, local option 34
proxy port, local option 34
proxy, local option 34
ps, global option 18
publications xii

Q

queues, message
  See message queues
quit netman when child processes stopped, local option 33

R

r3batch extended agent, interaction process start 176
RACF, authentication 140
reconfiguration of database (DB2 to Oracle and vice versa) 233
release, log type 251
remote access for command-line, configuring 70
remote job, check status of, process start 175
remove
  See uninstallation
reorganize DB2 database 228
reorganizing database 219
report, object type, defining access 130
reports configuring
  DB2 database 97
  Oracle database 98
reports, configuring Dynamic Workload Console to view 97
required maintenance
  See maintenance
rerun jobs, retaining name, global option 18
resource access, global option 17
resource advisor agent 273
resource quantities carried forward, global option 16
resource, object type, defining access 120, 130
restart, automatic, of application server 301
restore
  application server configuration 307
restore of application server configuration 307
restore, from offline storage 217
restoreConfig, used to restore application server configuration 307

restricted stdlists, local option 34
restricting access to broker server 197
RHEL
  See Red Hat Enterprise Linux
rights, user
  for running DB2 tools 226
  for running Oracle tools 233
rmstdlist command
  used for archiving log files 223
role-based authorization with broker server 197
roles
  for Tivoli Dynamic Workload Broker 87
  for Tivoli Workload Scheduler 85
root jobs, enabling the launch of in jobman, local option 30
root user, changing password 274
rq, global option 16
rr, global option 18
run time (average) calculation, weighting factor, global option 20
running without
  domain manager 269
  dynamic domain manager 269
  master domain manager 270

S

sample audit log entries 253
sc, global option 17
scalability 323
schedlog directory, as log file location 223
schedule, object type, defining access 120, 130
schedules
  See job streams
scheduling events, communications 160
script
  webui 99
scripts
  See commands and scripts
sd, global option 23
se, global option 19
security
  centralized 105
  information, verifying in Windows 331
  local 101
  network, for backup domain manager 269
  overview 101
  specifying accesses 119
  specifying object types 113
  specifying objects 114
  specifying user attributes 108
  template file 106
security check when listing, global option 17
security file
  enabling centralized security, global option 15
security file, template 106
security level
  enabled 187
  force 187
  on 187
security settings, application server, modify 296
Security, file
  backing up 218
sender name, mail, event rule management, global option 21
server
  monitoring 170
server configuration
  ResourceAdvisorConfig.properties file 52
servers
  mailman
    configuring to maximize critical activities 166
    tuning 174
service
  Windows
    for the application server, updating 305
service name, appservman 303
services
  IBMWAS61Service 302
services (Windows)
  changing password 274
  for application server, update 305
  stopping 283
  Tivoli Workload Scheduler, configuring in NetConf file 175
setting the local options 23
setting the user options 41
settings repository
  configuration 97
sf, global option 18
sh, global option 23
showDataSourceProperties, application server utility 286
showHostProperties, application server utility 309
single sign-on
  configuration 87
  LTPA token_keys 88
sizing the internal Symphony table 176
SMTP
  authentication on connection, use, global option 22
  port, global option 22
  server name, global option 22
  SSL on connection, use, global option 22
  TLS on connection, use, global option 23
  user name for connection, global option 22
  user password for connection, global option 22
smtpServerName, global option 22
smtpServerPort, global option 22
smtpUseAuthentication, global option 22
smtpUserName, global option 22
smtpUserPassword, global option 22
smtpUseSSL, global option 22
smtpUseTLS, global option 23
sn, global option 22
soap.client.props
  configuring 63
sp, global option 22
space, disk
  See disk space
SSL
  authentication mode, local option 34
  authentication string, local option 35
  full connection enablement, global option 18
  full port, used by netman, local option 33
  GSKit keystore file when using command-line client, local option 28
  GSKit keystore label when using command-line client, local option 28
  GSKit keystore password file when using command-line client, local option 29
  GSKit, certificate keystore label, local option 35
  GSKit, SSL keystore file, local option 36
  GSKit, SSL keystore password file, local option 36
  OpenSSL CA certificate file, local option 35
  OpenSSL certificate file for communications with command-line client, local option 29
  OpenSSL certificate file, local option 35

SSL *(continued)*
  OpenSSL cipher class when using command-line client, local option 29
  OpenSSL trusted certificate directory for communications with command-line client, local option 29
  OpenSSL, enabling server authentication for command line client, local option 29
  OpenSSL, SSL encryption cipher, local option 35
  OpenSSL, SSL key file, local option 36
  OpenSSL, SSL key password file, local option 36
  OpenSSL, SSL random seed, local option 36
  port, used by netman, local option 33
SSL attributes
  configuring 187
SSL auth mode, local option 34
SSL auth string, local option 35
SSL CA certificate, local option 35
ssl certificate keystore label, local option 35
SSL certificate, local option 35
SSL communication
  enabled 187
  force 187
  on 187
SSL encryption cipher, local option 35
SSL FIPS enabled, local option 36
SSL key pwd, local option 36
SSL key, local option 36
SSL keystore file, local option 36
SSL keystore pwd, local option 36
SSL on SMTP connection, use, global option 22
SSL random seed, local option 36
SSL security
  HTTP/HTTPS 183
  keystore passwords 193
  overview 183
  RMI/IIOP 183
  topology connection 183
SSL support
  configuring 188
SSLv3, encryption cipher class 29
st, global option 17
stageman, log type 251
standard agent instances
  automatic initialization 299
standard agent, definition 160
start dynamic workload broker 273, 298
start-of-plan-period
  initialization, communications 160
startappserver 301, 303
  run from conman, process 175
startevtptroc, run from conman, process 175
starting the application server 300
startOfDay, global option 23
startOfDay, how evaluated in time zones, global option 17
StartUp
  used for starting netman 163
StartUp command 164
startWas command 300
statistics reporting by batchman, enable, local option 28
statsHistory, global option 23
status
  application server 304
status messages, batchman send to standard list, local option 28
stdlist directory
  information about extended agent jobs 177
  maintaining 224
stdlist width, local option 37
stdlist, merge console messages into, local option 32
stop and start commands, wait to check for in netman, local option 33
stop dynamic workload broker 273, 298
stopappserver 301, 303
  configure user credentials 304
  run from conman, process 175
stopevtptroc, run from conman on a client, process 175
stopevtptroc, run from conman, process 175
stopmon, run from conman, process 175
stopping
  services 283
stopping the application server 300
stopping workstations hierarchically, starting process 175
stopWas command 300
streamlogon, user 331
string, SSL auth mode, local option 35
strong encryption, enabling, global option 19
structure of network, impact on critical agents 166
submitting too many jobs manually, impact on performance 320
Sun
  See Solaris
Sun Java System Director Server 140
Sun One 140
sw, global option 19
switch dynamic workload broker instances 273
switch manager, fault tolerant, enabling, global option 19
switch manager, fault-tolerant
  See backup domain manager
switch sym prompt, local option 37
switchevtptroc, run from conman, process 175
switching a domain manager, short-term 270
switching a master domain manager
  long-term 272
  short-term 272
switching extended agents
  $manager keyword 112
  $master keyword 112
switching standard agents
  $manager keyword 112
  $master keyword 112
switching the dynamic domain manager
  broker instance switch 273
switching the dynamic workload broker 273
switching the master domain manager
  broker instance switch 273
switchmgr
  starting normal process 175
  starting process so that links are not started until event received 175
Symphony file
  archived 223
  enabling the copying of calendars into, global option 19
  IP address validation 179
  maximum number of records 176
  monitoring space used 220
  overview 160
  scanning by batchman 162
  support for Internet Protocol version 6 179
Symphony file download timeout, local option 32
Symphony table, internal, determining the size of 176
sync level, local option 37
synch level option, setting 322
syslog 73
syslog local, local option 37

sysloglocal options
  LOG_ERR 74
  LOG_INFO 74
  LOG_NOTICE 74
  LOG_WARNING 74

T

task executors
  configuring 66
tcp connect timeout, local option 37
tcp timeout, local option 37
TCP/IP ports, application server, modify 308
TDWC authentication method
  configuring 83
technical training xii
TECServerName, global option 23
TECServerPort, global option 23
tellop command, respond to in mailman, local option 32
temporary files 225
text files, used for backup and restore
  See files
th, global option 23
this cpu, local option 37
threshold, long job duration, global option 20
time interval for job allocation to resources
  configuring 52
time interval for notifications on resources
  configuring 52
time interval for retrying failed operations
  configuring 54
time zone feature, enabling, global option 19
time zones
  evaluating startOfDay, global option 17
timeout, local option 38
Tivoli Dynamic Workload Broker
  roles 87
Tivoli Dynamic Workload Console
  configuration 77
  defining access for working with objects 120
  modifying 83
Tivoli technical training xii
Tivoli Workload Automation
  hone installation path 2
  instance 1
Tivoli Workload Scheduler
  installation path 2
  preventing access 99
  roles 85
  security file 86
Tivoli Workload Scheduler agent
  log configuration 43
  trace configuration 44
Tivoli Workload Scheduler agent traces
  modifying 45
  viewing settings 45
Tivoli Workload Scheduler connector SSL security
  keystore passwords 193
Tivoli Workload Scheduler instances
  automatic initialization 299
  Tivoli Workload Scheduler service 299
Tivoli Workload Scheduler to use LDAP
  configure 201
tl, global option 23
TLS on SMTP connection, use, global option 23
TLSv, encryption cipher class 29
tmp directory, as location for temporary files 225
Tokensrv
  See Tivoli Token Service
tomaster
  monitoring 170
tomaster.msg message queue
  data flow 169
  in backup domain manager 323
tools
  database and plan 248
  dynamic workload scheduling 254
tp, global option 23
trace configuration
  Tivoli Workload Scheduler agent 44
traces directory, as trace file location 223
tracing 317
traffic caused by backup domain manager impacting performance 323
training
  technical xii
tree structure, impact on critical agents 166
trial plan logs 224
troubleshooting
  data flows 168
  message queues 168
ts, global option 15
tuning
  database 319
  job processing on a workstation 318
  localopts file, for job-processing performance 320
  mailman servers 174
  the application server 319
  UNIX operating systems 318
TWA_home 1
TWS disk space
  monitoring 221
TWS processes status
  monitoring 165
TWS_user
  changing password 274
  owning processes 163
  required security access for workload service assurance 133
TWSObjectsMonitor events, ApplicationServerStatusChanged 305
tz, global option 19

U

ua, global option 22
un, global option 22
unison network directory, local option 38
UNIX
  changing passwords on 274
  configuration for IP address validation 180
  extended agents 177
  jobs, nice value to apply when critical, local option 30
  jobs, nice value to apply, local option 30
  temporary directory, on UNIX, access rights 331
  tuning 318
  updating SOAP properties after changing application server user or password 306
unixlocl, access method 177
unixrsh, access method 177
unixssh, access method 177
unlink non-responding workstation, wait to in mailman, local option 32

unlink, command
usage 161
unlinking
concept 161
workstations 283
until time, batchman maximum wait to report expiry of, local option 28
up, global option 22
updateWas, using to update the SOAP properties after changing application server user or password 306
updateWasService
using to update the application server Windows service 305
us, global option 22
use LDAP
configure Tivoli Workload Scheduler to 201
used disk space
monitoring 221
user
configuration 84
portfolio 84
user name for SMTP connection, global option 22
user options
setting 41
syntax 41
user password for SMTP connection, global option 22
user permissions
for running DB2 tools 226
for running Oracle tools 233
user security
commands
dumpsec 103
makesec 104
local security 101
security file
access capabilities 119
modifying 102
sample 133
syntax 106
user qualification 111
variables 118
wildcards 108
security files 102
setting 101
userobj, object type, defining access 120, 131
useropts file 41
useropts, local option 38
users
domain, resolving account in Windows 331
local, resolving account in Windows 331
streamlogon 331
utilities
application server 313
changeDataSourceProperties 286
changeHostProperties 309
changeTraceProperties 311
defining access for working with objects 120
showDataSourceProperties 286
showHostProperties 309
utilities that change application server properties, using 312
utility commands
setting mailbox file size 172
starting up netman 164

V

validating IP address 179
variables
$MASTER, resolve, local option 32
vartable, object type, defining access 132
volumes, data, impact on network 166

W

wa, global option 19
wait for connection in mailman, local option 32
warning messages
IP address validation 180
Web User Interface
See Dynamic Workload Console
WebSphere Application Server
See also application server
configuring 59
WebSphere Application Server file
changing host name or IP address 292
webui
script 99
weighting factor for calculating average run time, global option 20
Windows
changing passwords on 274
jobs, nice value to apply when critical, local option 31
resolving user ID account 331
service
for the application server, updating 305
Windows OS
special characters, handling 73
without
domain manager 269
dynamic domain manager 269
master domain manager 270
workload
spreading to improve performance 320
workload automation, event-driven, enablement, global option 16
workload broker users and roles
mapping security roles in Websphere Application Server 67
modifying 67
workload broker workstation configuration
modifying 56
workload service assurance
approaching late offset, global option 13
deadline offset, global option 14
jobs eligible for promotion, global option 21
nice value to apply to critical UNIX or Linux jobs in jobman, local option 30
priority value to apply to critical Windows jobs in jobman, local option 31
required security access for TWS_user 133
workload service assurance, enabling, global option 19
workstation
application server status 304
changing host name or IP address 291
Tuning job processing on 318
workstation definition
changing 294
workstation not responding, wait to report in mailman, local option 32
workstations
default when using the command line client, local option 30
enabling to be event processor, local option 28
unlinking 283

wr enable compression, local option 38
wr read, local option 38
wr unlink, local option 38
Wr_unlink, localopts parameter 174
writer
  starting 163
  starting, for incoming mailman messages 175
  stopping, for incoming mailman messages 175
wsadmin utility 285

X

xl, global option 21
xp, global option 19

Z

z/OS Integrated Security Services LDAP Server 140

Product Number: 5698-WSH

Printed in USA

SC23-9113-03

Spine information:

IBM Tivoli Workload Scheduler **Version 8.6** **Administration Guide**