

AIX 7 with Technology Level 3 Expansion Pack

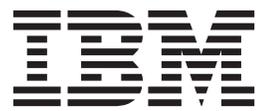
*Release Notes*





AIX 7 with Technology Level 3 Expansion Pack

*Release Notes*



**Note**

Before using this information and the product it supports, read the information in "Notices" on page 25.

**Fourth Edition (June 2014)**

This edition applies to IBM AIX 7 with Technology Level 3 and to all subsequent release and modifications until otherwise indicated in new editions.

© Copyright IBM Corporation 2012, 2014.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

---

# Contents

<b>About this document . . . . .</b>	<b>v</b>	Modern Cryptographic Library . . . . .	10
Highlighting . . . . .	v		
Case-sensitivity in AIX . . . . .	v	<b>IBM Tivoli Directory Server . . . . .</b>	<b>11</b>
ISO 9000. . . . .	v	Installation and configuration . . . . .	11
		Manual license acceptance . . . . .	11
<b>What's new . . . . .</b>	<b>1</b>	<b>IBM Security Directory Server and</b>	
		<b>GSKit fix for SSL issue. . . . .</b>	<b>13</b>
<b>Read this before installation . . . . .</b>	<b>3</b>		
		<b>IBM Network Authentication Service,</b>	
<b>Installation, migration, upgrade, and</b>		<b>Version 1.5.0.3 for AIX . . . . .</b>	<b>15</b>
<b>configuration information . . . . .</b>	<b>5</b>	Documentation . . . . .	15
Listing and previewing installation software. . . . .	5	Installation and configuration . . . . .	16
Listing and previewing software from the			
command line . . . . .	6	<b>IBM 64-bit SDK for AIX, Java</b>	
Listing and previewing software from the ASCII		<b>Technology Edition, Version 5. . . . .</b>	<b>17</b>
SMIT interface. . . . .	6		
		<b>IBM 32-bit SDK for AIX, Java</b>	
<b>AIX 7 with 7100-03 Expansion Pack</b>		<b>Technology Edition, Version 6. . . . .</b>	<b>19</b>
<b>security . . . . .</b>	<b>9</b>	<b>Java version 7.1 SR1 support in the</b>	
POWERS8 hardware cryptography capability and		<b>POWER8 environment . . . . .</b>	<b>21</b>
OpenSSL version 1.0.1.510 . . . . .	9		
AIX certificate and SSL Base Runtime . . . . .	9	<b>RSCT 3.1.5 CIM resource manager. . . . .</b>	<b>23</b>
Data Encryption Standard kernel extension 64-bit. . . . .	10		
Certificate Authentication Services. . . . .	10	<b>Notices . . . . .</b>	<b>25</b>
IP Filter converted to the AIX operating system . . . . .	10	Privacy policy considerations . . . . .	27
Network security options TCP Wrapper 1.1.0.0 . . . . .	10	Trademarks . . . . .	27
AIX Network Data Administration Facility . . . . .	10		
Required parameter setting for IBM Tivoli Directory			
Server version 6.3.0.24 when you use it with GSKit			
version 8.0.50.10. . . . .	10		



---

## About this document

The Release Notes topics include late technical information that is not included in other topics, and they highlight new functions for the IBM® AIX® 7 with Technology Level 3 licensed program.

---

## Highlighting

The following highlighting conventions are used in this document:

<b>Bold</b>	Identifies commands, subroutines, keywords, files, structures, directories, and other items whose names are predefined by the system. Bold also identifies graphical objects such as buttons, labels, and icons that the you select.
<i>Italics</i>	Identifies parameters whose actual names or values are to be supplied by the user.
Monospace	Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or information you type.

---

## Case-sensitivity in AIX

Everything in the AIX operating system is case-sensitive, which means that it distinguishes between uppercase and lowercase letters. For example, you can use the **ls** command to list files. If you type **LS**, the system responds that the command is not found. Likewise, **FILEA**, **FiLea**, and **filea** are three distinct file names, even if they reside in the same directory. To avoid causing undesirable actions to be performed, always ensure that you use the correct case.

---

## ISO 9000

ISO 9000 registered quality systems were used in the development and manufacturing of this product.





---

## What's new

### October 2014

If you are using a Network File System (NFS) with Kerberos 5 authentication, you must upgrade the Modern Cryptographic Library from version 6.1.0.2 to version 6.1.0.3.

### June 2014

The following information is new in this version of the release notes:

- Java™ 7.1 SR1 is tested and verified in the POWER8™ environment.
- POWER8 systems contain an in-core cryptographic function that can be used with the Open Secure Sockets Layer (OpenSSL) version 1.0.1.510 fileset and AIX 7 with 7100-03 with service pack 3. There are some changes and restrictions to the OpenSSL fileset that apply if you use the POWER8 in-core cryptographic function.
- IBM Security Directory Server (formerly known as IBM Tivoli® Directory Server) might require a GSKit fix for an issue with Secure Sockets Layer (SSL) function.

### November 2013

The following information is new in this version of the release notes:

- The Java7 content is now provided with the AIX base operating system package. The base package for this release contains Java7 software, at version 7.0.0.100.
- IBM Tivoli Directory Server version 6.3.0.17, or later, might require a manual license agreement acceptance when you install the software.
- Updated the Open Secure Sockets Layer version from 0.9.8.2400 to 1.0.1.500.
- Updated the RSCT Common Information Model resource manager from 3.1.4 to 3.1.5.
- Added a restriction for using GSKit version 8.0.50.10 with IBM Tivoli Directory Server version 6.3.0.24.



---

## Read this before installation

This software might contain errors that can result in a critical business impact. Before using this software, you must install the latest available fixes. You can obtain fixes from the Fix Central website (<http://www.ibm.com/support/fixcentral>).

The Expansion Pack DVD contains programs that are provided by IBM and other program suppliers. Each program is licensed under the terms and conditions of that specific program. These terms and conditions can vary depending on the specific program or the program supplier. Specific information about the content of this DVD and the terms and conditions under which these programs are licensed are contained in a readme file on the media.

To obtain the content and Terms and Conditions information:

1. Log in as the root user.
2. Insert the DVD into the media drive. If your media drive is not `/dev/cd0`, substitute the correct device name and type the following commands:

```
mount -v cdrfs -o ro /dev/cd0 /mnt
cp /mnt/README* /tmp
umount /mnt
```

The `/tmp/README` and `/tmp/README.html` files contain the content or the Terms and Conditions under which these programs are licensed. View this information by using a web browser, or run the **more** command or the **pg** command.

Softcopy documentation for each product is included with the product. These Release Notes supplement the product documentation by outlining the steps for getting started and by pointing you to more product information.



---

## Installation, migration, upgrade, and configuration information

The AIX 7 with 7100-03 Expansion Pack Release Notes include information that helps you install the products that are included on the AIX 7 with 7100-03 Expansion Pack. To view the most current version, see AIX Expansion Pack Release Notes in the AIX 7.1 Information Center ([http://pic.dhe.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.ntl/releasenotes\\_kickoff.htm](http://pic.dhe.ibm.com/infocenter/aix/v6r1/topic/com.ibm.aix.ntl/releasenotes_kickoff.htm)).

The AIX 7 with 7100-03 Expansion Pack is included with the AIX 7 with 7100-03 operating system as a vehicle for delivering new IBM and non-IBM products. Most AIX 7 with 7100-03 Expansion Pack products can be installed by using normal installation methods. Some Expansion Pack products cannot be installed by using normal installation methods. Their installation procedures are provided under their product descriptions.

The AIX 7 with 7100-03 Expansion Pack might include products that contain a cryptographic function that is subject to special export-licensing requirements by the US Department of Commerce. Import restrictions can also apply to certain countries. Different packages of the AIX 7 with 7100-03 Expansion Pack accommodate varying country export or import restrictions. To determine which package is appropriate for you, review the Ordering Information which is located in the Expansion Pack announcement. Contact your IBM representative or IBM Business Partner to determine which type of encryption you are entitled to receive.

The contents of the Expansion Pack vary over time. New software products can be added, changed, or removed. Changes to the content of the AIX 7 with 7100-03 Expansion Pack are announced either as part of an AIX announcement or independently of the release announcement.

Unless otherwise indicated, products can be installed from the DVD by using the System Management Interface Tool (SMIT). For more information about installing products, see the Installation and migration topic in the AIX 7.1 Information Center (<http://publib.boulder.ibm.com/infocenter/aix/v7r1/index.jsp?topic=/com.ibm.aix.install/doc/insgdrf/insgdrf-kickoff.htm>).

---

## Listing and previewing installation software

You can list the available software products, packages, and filesets on AIX media, which can be a DVD or directory. The output shows the available packages and filesets on the media. The descriptions are provided at the fileset level.

You can perform a preview installation before doing the actual installation. A preview installation provides the preinstallation information that occurs during a regular installation, except that no software is installed.

When you select a package or fileset to be installed with the preview installation process, you see a list that contains all of the requisite packages and filesets needed by the selected package or fileset to be successfully installed.

Other information generated during the preinstallation process concerns the file system-size checking. The file systems are checked to ensure that there is enough free space available to install the selected package or fileset.

You can list the software and use the previewing software functions from the command line or the SMIT interface.

## Listing and previewing software from the command line

1. Log in as the root user.
2. To list the software on the first DVD of the base media, insert the DVD into the media drive, and type the following command:

```
installp -ld/dev/cd0 | pg
```

A list similar to the following is displayed:

```
fileset Name                Level                I/U Q Content
=====
ICU4C.adt                    2.8.0.0             I  N usr
#  ICU Application Developer's Toolkit

ICU4C.man.en_US              2.8.0.0             I  N usr
#  ICU Manual Pages - U.S. English
```

3. To perform a preview installation at the command line, use the **-p** flag with the **installp** command. For example, to preview the installation of the ICU4C.adt fileset, enter the following command from the command line:

```
installp -aXgq -p -d/dev/cd0 ICU4C.adt
```

The preview option displays the requisite filesets, that are to be installed and the system resources that are being used.

## Listing and previewing software from the ASCII SMIT interface

1. Log in as the root user.
2. From the command line, enter `smitty install_update`.
3. Select **Install Software**.
4. Press F4 (List) to list the available input devices and select the appropriate one, or type the input device name in the blank field. Press Enter to continue.
5. In the **SOFTWARE to Install** field, press F4 (List) to list all available software on the selected media.
6. Scroll through the list of software by using the arrow keys or the Page Up or Page Down keys.

**Note:** The following listing shows the available software packages and filesets for that software product.

If the fileset is preceded by a plus sign (+), it is available to be installed. If the fileset is preceded by an at sign (@), the fileset is already installed.

For example, in the following output example, the software product is ICU4C:

```
ICU4C.adt                                ALL
+ 2.8.0.0  ICU Application Developer's Toolkit

ICU4C.man.en_US                           ALL
+ 2.8.0.0  ICU Manual Pages - U.S. English

ICU4C.rte                                  ALL
+ 2.8.0.0  International Components for Unicode
```

The three packages are **ICU4C.adt**, **ICU4C.man.en\_US**, and **ICU4C.rte**. The fileset in the **ICU4C.adt** package is the ICU Application Developer's Toolkit at the 2.8.0.0 level. The descriptions for the software product are provided at the fileset level. There is often more than one fileset per package.

7. Select the package or fileset you want to install and press the F7 (Edit). Press Enter to continue.
8. To preview the installation of the package or fileset that you selected, press the Tab key and select **yes** in the **PREVIEW only?** field. Press Enter to continue.

**Note:** To obtain detailed information about the installation, select **yes** in the **DETAILED output?** field. The filesets being installed are displayed in parentheses.





---

## AIX 7 with 7100-03 Expansion Pack security

This section lists security restrictions and limitations for the AIX 7 with 7100-03 Expansion Pack.

---

### POWER8 hardware cryptography capability and OpenSSL version 1.0.1.510

The OpenSSL version 1.0.1.510 fileset and AIX 7 with 7100-03 and service pack 3 can use the in-core cryptographic function that is available with POWER8 systems. To use this function, the following conditions must be met:

- Any existing applications that use an older version of the OpenSSL fileset must be recompiled with the latest headers and relinked to the newer 1.0.0 libraries that are included with the OpenSSL 1.0.1.510 fileset.
- Applications that use the **dlopen** function to load the 0.9.8 version of the OpenSSL library must be reconfigured to load the 1.0.0 version of the OpenSSL library.
- After you recompile an application to use the newer libraries, it can run on hardware that is older than POWER8 and with AIX Technology Levels that are older than 7.1 with service pack 3 only if that system has the OpenSSL 1.0.1.510 fileset installed.

Only the following algorithms in the OpenSSL 1.0.1.510 fileset use the POWER8 in-core cryptographic capabilities:

- AES-128-CBC
- AES-192-CBC
- AES-256-CBC
- AES-128-ECB
- AES-192-ECB
- AES-256-ECB
- SHA224
- SHA256
- SHA384
- SHA512

**Note:** Applications that use prior versions of the OpenSSL fileset will continue to function and use the OpenSSL default software cryptographic modules on the POWER8 system. The OpenSSL 0.9.8 libraries are also included as part of the OpenSSL 1.0.1.510 fileset to allow compatibility with earlier versions.

See the AIX Web Download Pack Programs website ([https://www14.software.ibm.com/webapp/iwm/web/reg/download.do?source=aixbp&lang=en\\_US&S\\_PKG=openssl&cp=UTF-8&dmethod=http](https://www14.software.ibm.com/webapp/iwm/web/reg/download.do?source=aixbp&lang=en_US&S_PKG=openssl&cp=UTF-8&dmethod=http)) to download the latest versions of the OpenSSL fileset.

---

### AIX certificate and SSL Base Runtime

The AIX Certificate and SSL Base Runtime (GSKIT) program provides libraries that are necessary to enable Secure Socket Layer (SSL) communications with Tivoli Directory Server.

To configure SSL communication with Tivoli Directory Server Version 6.1 and Version 6.2, you must install GSKIT Version 7.0.

To configure SSL communication with Tivoli Directory Version 6.3, you must install GSKIT Version 8.0.

---

## Data Encryption Standard kernel extension 64-bit

With the Data Encryption Standard (DES) kernel extension, `nfs_kdes_full.ext`, you can now use 64-bit kernels. This extension uses secure Network File System (NFS) by encrypting time stamps sent between the client and the server, which allows each Remote Procedure Call (RPC) message to be authenticated.

For more information about this extension, see the Network File Systems security topic in the AIX 7.1 Information Center ([http://pic.dhe.ibm.com/infocenter/aix/v7r1/topic/com.ibm.aix.security/doc/security/secure\\_nfs.htm](http://pic.dhe.ibm.com/infocenter/aix/v7r1/topic/com.ibm.aix.security/doc/security/secure_nfs.htm)).

The DES encryption kernel extension is available from the `des` fileset on the AIX Expansion Pack.

---

## Certificate Authentication Services

Certificate Authentication Services are not included with the AIX 7 with 7100-03 operating system.

---

## IP Filter converted to the AIX operating system

IP Filter, Version 5.3.0.0 open source software is converted to the AIX operating system. The IP Filter software package can be used to provide network address translation (NAT) or firewall services. For more information about licensing, see the IP Filter website (<http://coombs.anu.edu.au/~avalon/>).

---

## Network security options TCP Wrapper 1.1.0.0

TCP Wrapper is a simple open source tool to monitor and control incoming network traffic. For more information about the TCP Wrapper, see the Wietse's tools and papers website (<ftp://ftp.porcupine.org/pub/security/index.html>).

---

## AIX Network Data Administration Facility

The AIX Network Data Administration Facility (AIX NDAF) for AIX 7 with 7100-03 is not on the Expansion Pack media. It is on the base media.

---

## Required parameter setting for IBM Tivoli Directory Server version 6.3.0.24 when you use it with GSKit version 8.0.50.10

GSKit version 8.0.50.10 is included on the AIX 7 with 7100-03 Expansion Pack media. When you run GSKit version 8.0.50.10 with IBM Tivoli Directory Server version 6.3.0.24 with the **ICC\_IGNORE\_FIPS** parameter is set to a value of *yes*, the IBM Tivoli Directory Server does not start. To avoid this issue, set the **ICC\_IGNORE\_FIPS** parameter to *no* by entering the following command:

```
export ICC_IGNORE_FIPS=no
```

---

## Modern Cryptographic Library

The Modern Cryptographic Library is updated from version 6.1.0.2 to version 6.1.0.3.

The updates for Modern Cryptographic Library version 6.1.0.3 include the following **modcrypt** filesets:

- **modcrypt.base.lib**
- **modcrypt.base.includes**

The updated **modcrypt** filesets are required if the ACF and PKCS11 device driver version 7.1.3.30 (**security.acf** fileset) is installed on your system and you are using a Network File System (NFS) with Kerberos 5 authentication. If your system does not meet these requirements, it fails when the NFS **gssd** daemon starts.

---

## IBM Tivoli Directory Server

For the latest information about the IBM Tivoli Directory Server that uses Lightweight Directory Access Panel (LDAP) product, see the Tivoli Directory Server website (<http://www.ibm.com/software/tivoli/products/directory-server>).

---

### Installation and configuration

The following IBM Tivoli Directory Server Version 6.2 cryptography filesets are no longer provided on the AIX Expansion Pack media:

- `idsldap.clt_max_crypto32bit62`
- `idsldap.clt_max_crypto64bit62`
- `idsldap.srv_max_cryptobase64bit62`
- `idsldap.webadmin_max_crypto62`

These filesets are provided on the AIX 7 base install media starting with the 7100-02 media.

The IBM Tivoli Directory Server Version 6.3 cryptography filesets are provided on the AIX Expansion Pack media.

For information specific to IBM Tivoli Directory Server installation and configuration, see Tivoli Directory Server, a developerWorks® website (<https://www.ibm.com/developerworks/wikis/display/tivolidoccentral/Tivoli+Directory+Server>).

You can use the Web Administration Tool on the AIX operating system. You can install the Web Administration Tool on a system with or without the client or server.

---

### Manual license acceptance

- | You might have to manually accept the license terms when you install IBM Tivoli Directory Server version 6.3.0.17, or later, with the AIX operating system. The installation process stops until the license terms are accepted, which prevents an unattended installation when the license is not already installed.
- | For more information, see License acceptance required for TDS 6.3.0.17 (or later) (<http://www.ibm.com/support/docview.wss?uid=swg21612037>).



---

## IBM Security Directory Server and GSKit fix for SSL issue

IBM Security Directory Server, formerly known as IBM Tivoli Directory Server, is affected by a problem that is related to the Secure Sockets Layer (SSL) implementation. Some conditions can cause the processor utilization to rapidly increase, resulting in a denial of service.

If your GSKit is older than the corresponding levels that are in the following list, update your GSKit to the specified version, or later. To determine which version of the GSKit component is installed, enter the following command:

```
ls1pp -l |grep -i gsk
```

The fixes for the GSKit components can be downloaded at the following websites:

### **GSKit V7.0.4.50**

<http://www.ibm.com/support/docview.wss?uid=swg21672724>

### **GSKit V8.0.14.43**

[http://www.ibm.com/support/fixcentral/swg/selectFixes?product=ibm/Tivoli/IBM+Global+Security+Kit&release=All&platform=All&function=fixId&fixids=8.0.14.\\*-GSKIT-AIX\\*&includeSupersedes=0](http://www.ibm.com/support/fixcentral/swg/selectFixes?product=ibm/Tivoli/IBM+Global+Security+Kit&release=All&platform=All&function=fixId&fixids=8.0.14.*-GSKIT-AIX*&includeSupersedes=0)

### **GSKit V8.0.50.20**

<http://www.ibm.com/support/docview.wss?uid=swg21672724>

When you are using GSKitV8, your IBM Security Directory Server or IBM Tivoli Directory Server must be at version 6.3.0.26 or higher. This version avoids a compatibility issue between the IBM Security Directory Server component and the new GSKitV8 fix packs. To determine the installed version of the IBM Security Directory Server, enter the following command:

```
ls1pp -l |grep idsldap
```



---

# IBM Network Authentication Service, Version 1.5.0.3 for AIX

IBM Network Authentication Service, Version 1.5.0.3 for the AIX environment is a network-authentication protocol based on the IETF RFC 1510 standards protocol for the Kerberos V5 IBM Network Authentication Service. The IBM Network Authentication Service includes the Generic Security Service API (GSSAPI), the Key Distribution Center (KDC) server, and the server. With IBM Network Authentication Service, AIX middleware and external application writers can use authenticated and optionally encrypted message flow between their respective components.

---

## Documentation

Read the *README.lang* file for IBM Network Authentication Service, Version 1.5 before you configure or use the program, where *lang* is one of the following language locales:

- Chinese (Simplified)
- Chinese (Traditional)
- English
- Korean
- Portuguese (Brazilian)

The *README.lang* file for the AIX environment is located in the `/usr/lpp/krb5` directory after the `krb5.client.rte` fileset is installed from the `krb5.client` client installation package. The *README.lang* file can also be viewed by using the SMIT **list\_media\_info** command to list supplemental fileset information about the installation media for the `krb5.client.rte` fileset.

Documentation for IBM Network Authentication Service is available in the *README.lang* installation packages, where *lang* is one of the following language locales:

- en\_US (US English)
- Ja\_JP (Japanese)
- ko\_KR (Korean)
- zh\_CN (Simplified Chinese)

The documentation is in both HTML and PDF files. Install the `krb5.doc.lang.html` fileset for access to HTML documents and the `krb5.doc.lang.pdf` fileset for access to PDF documents.

The *IBM Network Authentication Service Version 1.5 Administrator's and User's Guide* is installed in the following directories:

- HTML

`/usr/lpp/krb5/doc/html/lang/ADMINGD`

- PDF

`/usr/lpp/krb5/doc/pdf/lang/ADMINGD`

The *IBM Network Authentication Service Version 1.5 Application Development Reference* is installed in the following directories:

- HTML

`/usr/lpp/krb5/doc/html/lang/APDEVREF`

- PDF

## **Installation and configuration**

The *IBM Network Authentication Service Version 1.5 Administrator's and User's Guide* details the installation and configuration procedures for the product.



---

## IBM 64-bit SDK for AIX, Java Technology Edition, Version 5

IBM 64-bit SDK for AIX, Java Technology Edition, Version 5 is released in Java5\_64.\* filesets. For more information about this version, see the `/usr/java5_64/docs/sdkguide.aix64.htm` file.

To determine whether a more recent service refresh is available, complete the following steps:

1. Go to the developerWorks website at <https://www.ibm.com/developerworks/java/jdk/aix/service.html>.
2. Click **Fix Info** in the Java 5 64-bit row.



---

## IBM 32-bit SDK for AIX, Java Technology Edition, Version 6

IBM 32-bit SDK for AIX, Java Technology Edition, Version 6 is released in Java6.\* filesets. For more information about this version, see the `/usr/java6/docs/sdkguide.aix32.htm` file.

To determine whether a more recent service refresh is available, complete the following steps:

1. Go to the developerWorks website at <https://www.ibm.com/developerworks/java/jdk/aix/service.html>.
2. Click **Fix Info** in the Java 6 32-bit row.



---

## **Java version 7.1 SR1 support in the POWER8 environment**

- | Java version 7.1 SR1 is provided on the AIX Expansion Pack media. This version of Java is tested in the
- | POWER8 environment.



---

## RSCT 3.1.5 CIM resource manager

The Common Information Model (CIM) resource manager is a Resource Monitoring and Control (RMC) resource manager that enables RMC to be used to query system configuration through CIM classes. CIM resource manager is contained in the `rsct.exp` package.

After installation, the CIM resource manager readme file is found in the `/usr/sbin/rsct/README/rsct.exp.README` directory.

For more information about the CIM resource manager, see the Administering RSCT topic in the AIX 7.1 Information Center ([http://pic.dhe.ibm.com/infocenter/aix/v7r1/index.jsp?topic=/com.ibm.aix.rsct314.admin/idrsct\\_admin\\_kickoff.htm](http://pic.dhe.ibm.com/infocenter/aix/v7r1/index.jsp?topic=/com.ibm.aix.rsct314.admin/idrsct_admin_kickoff.htm)).





---

## Notices

This information was developed for products and services offered in the U.S.A. This material may be available from IBM in other languages. However, you may be required to own a copy of the product or product version in that language in order to access it.

IBM may not offer the products, services, or features discussed in this document 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 document. The furnishing of this document does not grant 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 character set (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.  
19-21, Nihonbashi-Hakozakicho, Chuo-ku  
Tokyo 103-8510, 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 may 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.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Corporation  
Dept. LRAS/Bldg. 903  
11501 Burnet Road  
Austin, TX 78758-3400  
U.S.A.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

#### COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

© (your company name) (year). Portions of this code are derived from IBM Corp. Sample Programs. © Copyright IBM Corp. \_enter the year or years\_.

If you are viewing this information softcopy, the photographs and color illustrations may not appear.

---

## Privacy policy considerations

IBM Software products, including software as a service solutions, (“Software Offerings”) may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering’s use of cookies is set forth below.

This Software Offering does not use cookies or other technologies to collect personally identifiable information.

If the configurations deployed for this Software Offering provide you as the customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, see IBM’s Privacy Policy at <http://www.ibm.com/privacy> and IBM’s Online Privacy Statement at <http://www.ibm.com/privacy/details> the section entitled “Cookies, Web Beacons and Other Technologies” and the “IBM Software Products and Software-as-a-Service Privacy Statement” at <http://www.ibm.com/software/info/product-privacy>.

---

## Trademarks

IBM, the IBM logo, and [ibm.com](http://www.ibm.com) are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at Copyright and trademark information at [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml).

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.







Printed in USA