IBM OS/400 Version 5 Release 1 Delivers Enhancements that Add Power to IBM @server iSeries

Overview

OS/400 V5R1 gives you one of the most flexible application environments in the industry with support for Linux, Lotus® Domino™, Java™, Microsoft™ Windows™, UNIX®, and IBM @server iSeries applications, combining high availability with superior workload management and logical partitions.

With OS/400 V5R1, a business can simply and rapidly deploy e-business applications with seamless integration of existing applications and data. With extensions to its robust security and networking options, OS/400 V5R1 enables business-to-business connectivity through the supply chain and to customers.

The face of OS/400 is forever changed with extensive graphical interface enhancements providing visualization, wizards, and integration for simplicity of advanced operations from PCs and pervasive or mobile devices. Operating your iSeries server has never been this simple.

OS/400 V5R1 and iSeries deliver robust reliability and scalability for the fast growing, open-source Linux environment. Now the next generation of Web-enabled Linux applications can be quickly deployed and managed in a single, partitioned server alongside current business applications.

With dynamic and granular logical partitions, OS/400 V5R1 makes it easier than ever to manage multiple applications in a single server. Also, iSeries can now provide a storage area network (SAN) for directly attached Windows 2000 Servers.

New high-availability options include faster, less expensive system-to-system clustering options and the ability to switch applications, data, and resources between two iSeries servers.

In addition, V5R1 includes a broad range of enhancements for e-business and application enablement, security, TCP/IP, database, Java, directory services, OS/400 PASE, Internet printing, and many more.

Key Prerequisites

All iSeries and AS/400® RISC models.

Planned Availability Date

May 25, 2001

At a Glance

V5R1 OS/400 enhancements:

- Linux
  - New, scalable, and reliable
- Logical Partitions (LPAR)
  - Shared processors, dynamic resource movement
- Windows Server Integration
  - iSeries as storage area network (SAN) for Windows Servers
  - Scalable with direct attach xSeries
- Significantly Advanced User Interface
  - Single and multiple systems; local and remote
- Wireless Capabilities Built In
  - XML enablers and extensions to database
- HSL Clustering
  - Lower cost and easier high availability
- OS/400 PASE
  - 64-bit support
- Extensive e-business enhancements
  - Security, TCP/IP, Database, Java, Directory Services, Internet Printing, and ESP

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Linux

IBM is committed to supporting your choice of platform and operating systems — a commitment we have extended to include Linux, the open-source operating system. Linux will enable a new stream of e-business applications that complement the strengths of the iSeries as an integrated core business solution. Linux can benefit from important strengths and reliability features of the iSeries architecture.

iSeries has been enhanced to support Linux running in a secondary logical partition. The primary partition must run OS/400 V5R1 and can support up to 31 Linux partitions depending on the iSeries model. Selected new processor features for iSeries Model 270, 820, and 840 servers1 will allow Linux to run in a shared processor pool, where one processor can be shared between four OS/400s and Linux partitions. On existing n-way processor features for iSeries Model 820, 830, and 840 servers2 Linux requires a minimum of one processor per Linux environment. iSeries LPAR gives you the flexibility to move processor and memory resources between Linux partitions. This movement requires a restart of the affected Linux partitions.

iSeries Linux partitions also support a wide selection of I/O options. A Linux partition can utilize the new Virtual LAN capability to establish multiple high-speed TCP/IP connections between logical partitions without additional communication hardware. iSeries disk and removable media devices can be configured for Linux partitions using the OS/400 Network Server Description (NWSD) commands to deliver a simple, flexible, and integrated storage solution. Additionally, Linux can utilize selected iSeries I/O adapters (IOAs) and devices directly. These configuration options enable a wide selection of iSeries solutions.

To enable Linux to run on iSeries, IBM has made contributions to the open-source 32-bit kernel Version 2.4 for PowerPC®. IBM is currently working with the Linux community to create Linux distributions for iSeries. IBM plans to support selected Linux distributions running on iSeries in the second half of 2001.

**Windows Server Integration Enhancements**

iSeries is enhanced with additional Windows server integration facilities. These enhancements enable iSeries to support larger and more complex Windows applications and offer additional tools to help reduce the cost of managing Windows server environments.

**Attachment of N-Way xSeries Servers:** iSeries now supports the attachment of n-way xSeries servers via the High Speed Link. With the new Integrated xSeries Adapter, selected xSeries servers running Windows 2000 Server can be utilized to extend Windows application scalability, while retaining the storage consolidation and systems management advantages of the Integrated xSeries Server.

**Enhanced Hardware Support:** Enhancements for the Integrated xSeries Server includes support for up to 32 servers on selected iSeries models, support for the 1 GB Ethernet LAN adapter, and support for the iSeries DVD device.

**Operations Navigator Support for Windows Disk and User Management:** Additional facilities have been added to Operations Navigator for managing Integrated xSeries Servers and xSeries servers directly attached to iSeries via the Integrated xSeries Adapter. In addition to server management, Operations Navigator now supports disk...
and user management for these Windows servers. Enhancements include the capability to create, delete, copy, link, unlink, and show status for Windows server disks. Administrators can also manage OS/400 user profiles that are enrolled into a Windows server environment.

**Increased Storage Capacity and Availability:** iSeries SAN support for Windows servers has also been enhanced. For Windows 2000 Servers, the number of storage spaces that can be defined has increased from a maximum of 16 to 32. With a storage space supporting up to 64 GB of disk, each Windows server can now access approximately 2 TB of disk space. Up to 16 of these storage spaces can be added without requiring a shut down of Windows 2000 Server.

**Improved Availability via Independent Auxiliary Storage Pools (IASPs):** With the introduction of IASPs, additional availability options are available for the integrated Windows environments. Since the Windows operating system and data can be installed in an IASP, the storage spaces associated with Integrated xSeries Servers or direct attached xSeries servers can be switched to another iSeries server with a duplicate hardware environment.

For more information, refer to Hardware Announcement 101-119, dated April 23, 2001.

**Advanced User Interface**

V5R1 delivers two times more advanced GUI function to iSeries and AS/400 customers than the previous release. Operations Navigator is significantly expanded in this release with industry-leading, integrated systems management via easy-to-use graphical interface.

**Operations Navigator:** Systems management function now delivered via easy-to-use Operations Navigator GUI include:

- Work management (active jobs, subsystems, job queues, memory pools)
- Backup and Recovery (BRMS GUI plug-in)
- LPAR
- System values, including system comparison and update via Management Central
- Distributed user/group administration via Management Central
- Licensed program and fix creation, distribution, and installation via Management Central
- Enhancements to performance monitors and collection services to graph extended time periods
- New monitors and events for managing jobs and messages
- Complete DASD management: Disk balancing, compression, management of disk pools, and units
- Simple two-node cluster configuration
- Integrated xSeries Server: Windows user/group and disk administration
- Database Navigator gives you a pictorial view of the database showing the relationships between objects
- Graphical command prompting
- TaskPads, a user interface extension that allows easy access to key administrative tasks

Other ease-of-use initiatives for V5R1 include the addition of numerous GUI extensions to existing Operations Navigator functions, the creation of numerous configuration and administration wizards (many of which are in the new GUI areas listed above), and a new iSeries Information Center — online documentation available on the Web or CD.

**Management Central-Pervasive:** Management Central-Pervasive (MC-Pervasive) allows iSeries network administrators to keep an eye on their iSeries or AS/400 servers while they are away from their workstation or office. Using an Internet-capable cellular phone, PDA with a wireless modem, or a Web browser, administrators can monitor and manage their iSeries systems.

V5R1 enhancements for MC-Pervasive include:

- Additional support for system performance monitoring
- Monitor specific jobs and servers on multiple systems
- Monitor message queues on multiple systems
- Holds, releases, or ends a job on any endpoint system
- Run commands on any system or group of systems
- Manage Integrated xSeries servers
  - View status of Integrated xSeries servers
  - Startup/Shutdown of Integrated xSeries servers
  - Run Windows commands
  - Monitor Integrated xSeries events (routed to an iSeries message queue)
- Read-only mode for selected users

These additional V5R1 enhancements are available via an English-only PTF. Customers interested in using Pervasive need to refer to the following IBM Web site to obtain the PTF numbers to load the code and MRI for Pervasive:


**EZ Setup for V5R1:** In V5R1, EZ Setup is extended to include:

- Installing and configuring Domino for iSeries
- Configuring LDAP service
- Configuring HTTP (using the Internet Connection Setup wizard)
- Installing Information Center
- Configuring the Extreme Support Connection

EZ Setup now provides a complete set-up path for many users and allows one to go from out-of-box to serving a business in one quick and easy path. EZ Setup is now a part of iSeries Client Access Express and is on the "Setup and Operations" CD-ROM (shipped with all orders).

**Information Center for iSeries:** The Information Center for iSeries provides the starting point for finding iSeries technical information and is available on a CD-ROM shipped with OS/400. It is also on the Internet at:

http://www.ibm.com/eserver/iseries/sftsol/infocenter

In V5R1, the Supplemental Library on PDF is integrated with the Information Center to give you a one-stop place to get technical information. You can search the PDF and HTML files in one search at the Internet site. In V5R1, the Information Center install provides a wizard to install the Information Center to an intranet server from the iSeries.
The wizard can even configure your HTTP server and set up search on the intranet.

Extensible Markup Language (XML) Enablers

XML is one of the key technologies fueling growth of e-business and mobile e-business solutions. XML is becoming the standard way to represent data in a portable, reusable format for use in a number of solutions ranging from B2B solutions that link together trading partners to pervasive computing applications, which connect mobile devices such as cell phones to core business solutions.

IBM and iSeries are committed to supporting XML. This support is demonstrated by the suite of XML application enablers delivered with OS/400 in V5R1, providing a core of XML services for applications to build on. The XML application enablers provided in V5R1 include:

- XML parsers for use with Java and C++ applications. XML parsers are a common building block that XML-based solutions use to work with data in XML format.
- XML parsing interfaces for procedural languages such as RPG, COBOL, and C. These interfaces open the realm of XML to existing solutions, providing an easy path to extend these solutions with XML support.
- Extensible Stylesheet Language (XSL) processor used to apply XSL stylesheets to transform an XML document into another markup language format. XSL stylesheets are the standard way to convert data between two XML document types and are commonly used to convert XML data to HTML for presentation in a Web browser environment.

OS/400 Cluster Resource Services

Clustering, initially introduced in V4R4, expands the underpinning to improve overall availability of your critical resources beyond what you can achieve in a single system environment. Additional significant functions are expanded with V5R1 that allow even more flexibility and improved availability. New capabilities include:

- IASPs — allow you to take data offline and bring data online independent of the System ASP and other User ASPs.
- System services in support of Option 41, HA Switchable Resources — allows you to define device domains and to use resilient device cluster resource groups containing independent ASPs.
- HSL OptiConnect is supported as a cluster communications fabric (in addition to what was previously supported).
- Options to adjust the tuning and configuration parameters of your cluster to better match your communications environment.
- Journaling of IFS objects, data areas and data queues, and options to reduce the amount of data journaled.

HA Switchable Resources, OS/400 Option 41

HA Switchable Resources, a new chargeable option of OS/400, gives you the capability to achieve a highly available environment using switchable resources. The resources are physically switched between systems so that only one copy of the resource is required. Included as part of Option 41 are:

- Switchable Independent ASPs — allows you to move the data to a backup system to keep the data constantly available. The data is contained in a collection of switchable disk units such as an I/O tower.
- IBM Cluster Management Utility — allows you to create and manage a simple two-node, switched disk cluster. The utility includes wizards and help text that simplify the tasks involved in defining and managing the cluster.

To define switchable independent ASPs or to use the IBM Cluster Management Utility, you must have OS/400 Option 41, HA Switchable Resources installed on your system. You also must have a valid license key for Option 41.

For information on HA Switchable Resource hardware features, refer to Hardware Announcement 201-117, dated April 23, 2001.

Reference Information

- IBM @server iSeries V5R1 Software Terms/Ordering Information/Prices
  Refer to Software Announcement 201-114, dated April 23, 2001.
- IBM @server iSeries V5R1 LPs and LPOs
- IBM @server iSeries Enhancements
- IBM @server iSeries Dedicated Server for Domino Enhancements
- IBM Integrated xSeries Adapter for iSeries
- IBM @server iSeries V5R1 Overview

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Addtional Significant Enhancements in OS/400® V5R1

- OS/400 PASE — 64-bit support
- HTTP Server for iSeries — enhancements to improve performance and availability and enhanced search capabilities
- Security
  - Enhanced system integrity with digital signature and object signing
  - Easier to use Digital Certificate Manager
  - Enhanced password protection
- TCP/IP
  - New Dynamic Domain Name Server
  - iSeries now supports Network Quality of Service
  - Security and ease-of-use enhancements
- Database
  - Business-to-business enablement is enhanced with distributed database enhancements, moving business logic into the database, enhanced database access from Windows™ clients, and improved performance
- Java™
  - Functional and performance enhancements for Toolbox for Java
  - Developer Kit for Java provides concurrent support for three major versions of Java and performance enhancements
- Directory Services
  - Supports SecureWay® Directory Version 3.2
  - Added security auditing
  - Automatic configuration
- Internet Printing
  - Internet Printing Protocol support
  - PSF/400 enhancements
  - Unicode (UCS-2) print capabilities
- Extreme Support Personalized (ESP)
  - More flexibility for Universal Connection
  - Simplified PTF notification and delivery
  - Changed APAR and PTF prefixes

OS/400 PASE

OS/400 PASE, option 33 of the operating system, is an integrated component of OS/400 that adds in V5R1 a subset of AIX® Version 4.3.3 functionality to support running UNIX® applications. OS/400 PASE is supported on all iSeries models, and any AS/400e™ server Models 6xx or Sxx, or later.

OS/400 PASE applications run directly on the hardware and take advantage of OS/400 services such as file systems, security, and DB2 UDB®. OS/400 PASE applications run in a normal OS/400 job and are managed using standard OS/400 operations and management facilities.

Some of the significant enhancements to OS/400 PASE in V5R1 include:

- Support of the AIX Version 4.3 64-bit application model
- National Language Version (NLV) enablement
- Documentation for OS/400 PASE run time, shells, and utilities in the IBM iSeries Information Center
- Header and export files for OS/400 PASE extensions now packaged with option 33
- SQL Call Level Interface (CLI) server mode support
- Additional locales, run-time APIs, and utilities
- Updated versions of the AIX C++ and FORTRAN language run-time libraries

More information on OS/400 PASE can be found at:

http://www.redbooks.ibm.com (Search on PASE)

http://www.iseries.ibm.com/developer/factory/pase

IBM iSeries Information Center

IBM HTTP Server for iSeries

IBM HTTP Server for iSeries supports new enhancements that improve performance and availability of the HTTP servers. These enhancements include:

- Triggered Cache Manager (TCM) gives you a mechanism to cache dynamically-generated Web pages. TCM allows a Web designer to build dynamic pages and will only update the cache when the underlying data changes, thereby improving the performance of a Web site.
- Highly Available Web server takes advantage of iSeries Clustering technology and makes it possible to build a highly available Web site, improving the availability of business-critical Web applications built with Common Gateway Interface (CGI) programs. This enhancement is only available on the original IBM HTTP Server.

New Search enhancements that improve the search capabilities of the HTTP server include:

- Support for Web crawling allows documents at remote Web sites to be downloaded to a local directory to be used in creating a search index.
- Thesaurus support allows search terms to be expanded with related terms for better search results.

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Many search usability improvements are added to allow search results to be sorted by rating, title, or document date. Also supported is the ability to do searches within search results.

Enhancements:
The user interface for DCM is redesigned malicious, is also being used by the operating system to have been changed since it was signed. This added layer of software and to ensure that the software has not been signed. This added layer of protection against altered software, unintentional or malicious, is also being used by the operating system to protect itself from unauthorized changes.

Digital Certificate Manager (DCM) Restructure and Enhancements: The user interface for DCM is redesigned to improve functionality and ease-of-use. Enhancements include support for:
- Certificate extensions
- Storing the certificate private keys using the IBM Cryptographic Coprocessor (4758)
- Certificate Revocation Lists (CRLs)
- Digitally signing objects and verifying the signature
- Creating certificates using a Public Key Infrastructure for X.509 (PKIX) Certificate Authority (CA)
- Adding and removing applications that use certificates

Program Creation Data Retained: Program creation data will be retained even when observable information is removed for programs created for V5R1. If observable information is removed, the creation data cannot be retrieved by any supported interface, but the system licensed internal code will be able to use it to recreate the program. This new function gives customers more control over the programs they choose to put on their systems, because they can cause programs to be recreated as part of the restore process. This program recreation choice is expressed by specifying the FRCOBJCVN(*YES *ALL) parameter on the RSTOBJ or RSTLIB commands. Recreating a program takes advantage of hardware changes and enhancements in optimizing translator technology. Recreating a program may also enhance its integrity because recreation removes any alterations that may have been made to its executable instructions.

Programs that include creation data and are found to have been altered in certain ways are recreated automatically when they are restored onto a system, to further reduce the potential for security or integrity exposures. This action also occurred on previous releases of OS/400, but its effectiveness should be improved now that more programs will include creation data.

Enhanced Password Protection: Support is added to the system to enable case sensitive user profile passwords up to 128 characters in length with a larger character set. This support provides greater security for the user profile password. It is enabled via a new system value called QPWDVLVL. The default value of the QPWDVLVL system value is zero. It maintains previous release compatibility of 10 character passwords. Before taking advantage of the longer passwords, it is recommended you review the security reference manual for a complete description of the potential compatibility arrangements when using the new support.

TCP/IP Enhancements
TCP/IP Simplification Extensions: OS/400 Domain Name System (DNS) services are enhanced significantly in this release. The new V5R1 OS/400 DNS services are based on the widely used industry-standard DNS reference implementation known as BIND version 8.2. Topping the list of enhancements are the new dynamic update capabilities, which have transformed the DNS into a Dynamic DNS (DDNS). Combined with enhancements made to the iSeries Dynamic Host Configuration Protocol (DHCP) server that allow it to be configured to send dynamic DNS update transactions, iSeries now supports an integrated Dynamic IP solution that automatically manages TCP/IP addresses and their associated DNS host names on your networks.

Network Quality of Service (QoS): In V5R1, iSeries gives you the ability to control and manage TCP/IP traffic in the network and take advantage of the leading-edge networking Quality of Service (QoS) functions contained in routers and switches. The iSeries QoS functions for managing TCP/IP traffic give you the ability to drop, mark, and shape TCP/IP traffic based on the QoS policy being applied. In addition, QoS admission control capability is added for controlling bandwidth management requests. The QoS functions supported are:
- Resource Reservation Protocol (RSVP) including an iSeries RSVP agent
- RSVP APIs (X/Open standard APIs) for applications
- Differentiated Services (DiffServ)
- QoS policies based on the TCP/IP 5-tuple (Source IP address, Destination IP address, Source Port, Destination Port, and Protocol), address ranges, and wild-cards. This support includes a policy agent, and a wizard-based GUI in Operations Navigator for configuring the QoS policies.
- QoS monitoring APIs and a GUI for monitoring the effectiveness of your QoS policies.

Applications Performance and Security Enhancements to:
- OS/400 File Transfer Protocol (FTP)
- OS/400 Simple Mail Transport Protocol (SMTP)
- OS/400 Telnet

Network Security and Virtual Private Networking (VPN): iSeries VPN support, introduced in V4R4, is enhanced with additional security, greater reliability, improved performance, and is easier to use. Operations Navigator is redesigned to intuitively navigate VPN configurations, and you can use the VPN wizard to setup and implement
your network security policy. Digital certificates add a scalable and secure mechanism for cryptographic operations, and in V5R1 you can now use them in your VPN configurations to authenticate the identities of the VPN endpoints. An integral part of iSeries VPN is IP Packet Filtering, and in V5R1 this component is enhanced to allow filter activation and deactivation on a per-interface basis.

**Networking Software Management and System Setup:**
Several TCP/IP management enhancements in V5R1 give the network administrator more control when monitoring their TCP/IP network and troubleshooting networking problems. The enhancements include:

- A graphical version of network status (NetStat) that includes the ability to map a socket connection to a list of jobs for that connection.
- The ability to trace the route a TCP/IP packet will take through the network (TrcRoute — includes a TrcRoute CL command).
- Address resolution protocol (ARP) cache monitoring.

**Internet Setup Wizard:**
The iSeries Internet Setup Wizard simplifies the steps required to connect your iSeries to the Internet and provide application and Web serving. The wizard allows you to connect your iSeries to an ISP over a dial-up connection or directly through a LAN connection. The Wizard can also connect your intranet iSeries to the Internet through a firewall or router and allow for Web and application serving by the iSeries over that connection.

**TCP/IP Performance Improvements:**
TCP/IP performance needs to keep pace with the new emerging workloads that go beyond the raw throughput of a single connection. The Domino™ server and Web servers need fast throughput as well as quick connection establishment for the thousands of connections. Through continued performance tuning and path-length reductions, improvements have been obtained for throughput rates, multiprocessor scalability, and connection establishment abilities.

**TCP/IP Availability Improvements**

- Enhancements to STRTCPSVR and STRTCPIFC to start all servers and interfaces that had been configured to automatically start when TCP/IP is started.
- Duplicate IP address detection.
- Netstat connection information yields a way to link to the job associated with that connection.

**Point-to-Point (PPP) Connectivity Enhancements:**
Operations Navigator enhancements improve the ease-of-use when configuring and managing PPP connectivity. Significant enhancements in function and the GUI capabilities improve the iSeries PPP connectivity.

**Operations Console**
Operations Console is Windows-based communications software that provides a single connectivity solution for all platform management applications including legacy 5250 console support, a remote control panel GUI, and the Operations Navigator/Management Central platform management applications. Connectivity choices include null-modem, cable-connected async communications, dial-up async communications, and now Ethernet/Token-Ring Local Area Networking with V5R1. Additional new features include:

- A simplified setup and configuration process that checks PC software requisites and troubleshoots connectivity problems.
- Remote “Virtual” control panels for LPAR secondary partitions.
- Enhanced security model with data encryption and PC device authentication for LAN environments.

PC5250 supports the LAN connectivity option of Operations Console and supports a version of SSL implemented by Operations Console that supports device authentication, but without the use of certificates.

**DB2 UDB for iSeries Enhancements**

Business-to-business enablement is the theme of the key enhancements for DB2® UDB for iSeries in V5R1. Following are the new functions:

- Improved distributed database support. Now DRDA® running over TCP/IP allows transactions, which span databases, to be committed or rolled back by using two-phase commit protocols. Another key DRDA enhancement is the ability to return multiple result sets from iSeries servers to clients for improved performance.

- Enhancements to move more business logic into the database. Triggers can now be written in the SQL language. SQL triggers can be specified at the column, row, and statement level. The number of triggers allowed on a single table, whether written in SQL or a high-level language, is increased to 300. Triggers on read or fetch actions have also been added. Triggers can also now be suspended. In addition, user-defined functions can now be written in Java and the SQL built-in functions TIMESTAMPDIFF, PI, SPACE, GRAPHIC, MIDNIGHT_SECONDS, JULIAN_DAY, DAYOFWEEK_ISO, and WEEK_ISO are added.

- Improvements in query support are added. Join operators are enhanced by the addition of RIGHT OUTER JOIN and RIGHT EXCEPTION. Scalar subselects, subselects that return a single column for a single row, can now also be specified in the select list.

- Operations Navigator is enhanced with a new Database Navigator interface that displays the relationship among relational objects such as tables, views, and indexes. Another enhancement to the Operations Navigator interface is the ability to generate the SQL statements used to create a database object regardless if it was created with SQL or not.

- Data definition language (DDL) is also enhanced. A new LIKE clause on CREATE TABLE provides a way to create a table with column definitions like another table or tables. New journal entries are added in V5R1 for DDL operations enabling third-party code to use these entries to replay DDL operations.

- The maximum size of large objects stored in a column is increased from 15 MB to 2 GB and the maximum total size for all large objects for a table row is increased from 1.5 MB to 3.5 GB. The size of a single non-distributed table is also increased to 1 TB. In addition, DB2 UDB for iSeries supports the ability to optionally minimize the size of journal entries.

- For B2B between iSeries and Microsoft™ Windows clients, the ODBC driver for DB2 UDB for iSeries is enhanced with ODBC 3.5 support and support for
Microsoft Transaction Server (MTS). MTS support enables DB2 UDB for iSeries to participate in transactions involving two-phase commit coordinated through MTS. ODBC 3.5 support also delivers support for Unicode.

- Performance enhancements to DB2 UDB for iSeries were also added for V5R1.
  - The maximum number of rows that should be returned by a query can be specified.
  - Optimization of queries involving more than 32 files is improved.
  - Pattern and escape character on a LIKE predicate can now be specified as expressions and they no longer are a cause for making an open data path (ODP) for a cursor nonreusable.
  - Estimates of key ranges are cached to improve query optimization time.

**Java**

**Toolbox for Java enhancements**: Toolbox for Java is enhanced in V5R1 in function and performance.

**Function**

- A new set of classes in the resource package provide a generic framework and consistent programming interface for working with various iSeries objects.
- Bidirectional text conversion between iSeries and Java formats is now supported.
- JDBC 2.0 Optional Package extensions are now supported.
- A new set of classes in the reportwriter package provide a programming interface for creating formatted documents in Adobe’s PDF format or documents that can be sent directly to HP PCL printers attached directly to the iSeries or to the network.
- A new set of print classes that enable Java applications to write data to iSeries spool files in the form of records and use existing iSeries formatting tools to format the records of data to be printed.
- Classes are included to work with iSeries environment variables.
- Classes in the HTML package are improved to increase the variety of HTML tags you can include in your Java programs.
- Classes are included to configure AS/400® NetServer.

**Performance**

- The performance of converting text between Unicode and EBCDIC is improved.
- Classes are included to manage a pool of connections to the iSeries.
- When running on the iSeries JVM, CommandCall, and ProgramCall now optionally stay on thread instead of performing the function via a call to a server.
- The performance of listing files in the integrated file system of the iSeries is improved.

Plus much more. The Toolbox runs on Java-compatible JVMs running 1.1.8, 1.2.2 or 1.3. Toolbox source is available via the JTOpen project. For more information, access the Toolbox Web page:

http://www.ibm.com/iseries/toolbox

**Developer Kit for Java Updates**: Options for Java 1.1.8 and Java2 Standard Editions (J2SE) 1.2.2 and 1.3.0 are shipped with the V5R1 Developer Kit for Java, providing concurrent support for all three major versions of Java (1.1, 1.2, and 1.3).

Performance enhancements in V5R1 include:

- Improved garbage collection (GC) parallelism
- Improved code optimizations and heap allocations, including cross-jar inlining
- JDBC and floating-point improvements; improvements of up to 30% have been seen in some workloads

Several limits to growth have been enhanced, most notably, the maximum object size has increased from 16 MB to 32 GB.

Operations Navigator enhancements include support for displaying the properties of Java classes and jar files, the ability to compile Java files, interactive support for Input and Output, as well as automating RAWT connections when launching Java programs from Operations Navigator.

For additional Java information, including service requirements, refer to the online publication IBM Developer Kit for Java from the following iSeries Book Server at:


**Directory Services**

OS/400 Directory Services in V5R1 now supports SecureWay Directory Version 3.2. Examples of SecureWay products dependent on the directory for some of their distributed functions are:

- WebSphere™ Commerce Suite
- WebSphere Application Server
- SecureWay Policy Director
- IBM MQ Series
- IBM HTTP Server

Version 3.2 of the SecureWay Directory provides the following industry-leading innovations:

- Support for Kerberos protocol (server and client) — supporting authentication utilizing Kerberos.
- GSKit 4.0 — the server and client is upgraded to use GSKit 4.0 as the SSL provider.
- Fine grain access control — allows the management of access down to the individual attribute level. A directory administrator may now control who may see individual attributes for each entry within the directory.
- “Unlimited” Connections — allows a much larger number of clients to connect to a server, which reduces the number of servers required.
- Transaction support — allows an application interface to include more than a single LDAP operation in a transaction with the server.
- Event notification — allows a server to notify a registered client that an entry in the directory tree has been changed, added or deleted, at or below the specified DNs for the event types of interest.
In addition to the SecureWay Directory V3.2 updates, the following enhancements are made for Directory Services on OS/400:

- Security auditing was added to LDAP for administrators that want to audit LDAP operations to the server.
- The Directory Services server is automatically configured on the system when either the directory server or publishing is not already configured and when no LDAP DNS information can be found.
- Directory Services has moved to the base operating system. OS/400 — Directory Services, option 32, still exists for compatibility, but the LDAP function is now in the base.

**Internet Printing**

**Print and e-Print for iSeries:** V5R1 provides a wide range of new capabilities that enable the iSeries to address the print and communications requirements of e-business and network applications. Those capabilities include:

- Support for PDF
- Dynamic e-mail of printed output
- Internet Print Protocol (IPP)
- New printing architectures for Java applications
- Support for Unicode
- Comprehensive transforms for printed data

These enhancements are available with OS/400, PSF/400, and a new iSeries product, Infoprint® Server for iSeries.

Refer to Software Announcement 201-122, dated April 23, 2001.

**Internet Printing Server for iSeries:** The IPP defines an industry-standard method of delivering print jobs using Internet technologies providing for Web-enabled print around the world. The IPP protocol was developed by the Printer Working Group, a consortium of all major companies involved in network printing. IPP is fast becoming the single standard interface for printing on the Internet, with broad vendor implementation and customer acceptance.

The IPP Server for iSeries, included in OS/400, provides an IPP Version 1.0 compatible print server for the iSeries. This means the iSeries will accept IPP print requests and then serve the print file to the designated printer via traditional means. Thus, even if a printer does not actually support IPP, the iSeries will accept IPP requests for that printer and then print to that printer with other protocols. The IPP Server for iSeries allows business travelers, telecommuters, and anyone working remotely to submit and manage print jobs on a distant iSeries.

IPP is built on top of HTTP, which in turn runs over TCP/IP. Customers can now use the same print solution on local area networks, intranets, and the Internet. The same process used to send a print document to the department printer down the hall can be used to send the document to the corporate printer across the country.

The IPP Server for iSeries provides security features for user authentication and encryption of print jobs using Secure Sockets Layer 3 (SSL).

**PSF/400 Enhancements:** The iSeries printer file and Data Description Specifications (DDS) are enhanced to enable you to:

- Specify whether line data print applications that use a page definition should have their output converted to Advanced Function Printer Data Stream (AFPDS) before the data is placed on OS/400 spool
- Specify extended color models with COLOR, BOX, and LINE keywords
- Specify shading with the BOX keyword
- Use constant text with POSITION keyword
- Specify horizontal font point size (in addition to vertical point size) on FONT, FNTCHRSET, CDEFNT, and IGCCDDEFNT keywords
- Specify Australian Postal and Royal Mail (Dutch KIX extension) barcodes; allow barcode height to be specified in inches or centimeters

PSF/400 is also enhanced to provide:

- New printer timer on the PSF configuration object that allows you to specify how long to wait for a response from a TCP/IP attached printer and new options on automatic session recovery.
- An option to use DBCS simulation fonts instead of the DBCS raster fonts specified in the data stream when printing the spooled file. DBCS simulation fonts are outline fonts positioned like raster fonts. This allows the use of outline fonts to print applications that use DBCS raster fonts.
- Enhancements to line data processing and page definitions to support record formatting. Record format page definitions allow an application to specify a format identifier with each set of object data written out. The format identifier specifies a specific layout format (similar to a DDS record format) in a page definition.
- Enabling function to convert spool files to Portable Data Format (PDF) and store the resulting PDF in the Integrated File System (IFS). The PDF file may optionally be e-mailed using the OS/400 system distribution directory. This function also requires Infoprint Server for iSeries.

**New support for LDAP Directories:** New support has been added to allow information about iSeries printers and NetServer print shares to be published into LDAP directories. This allows the user to write applications that query the LDAP directory for iSeries printer information such as a printer’s location or capabilities. It also allows the user to configure iSeries printers directly on their Windows 2000 desktop by using the Add Printer wizard available in Windows 2000 and specifying that the information necessary to configure the printer be obtained from the Windows 2000 Active Directory.

**Unicode (UCS-2) Print Data Streams, Fonts, and Printers:** This support gives OS/400 users the ability to print Unicode (UCS-2) data on existing printer hardware. Support for Unicode printing is limited to Unicode code points that represent font glyphs. Any Unicode semantics are lost. Two methods are provided to achieve Unicode printing for DDS printer files:

- Unicode data can be mapped to selected single- or double-byte EBCDIC encodings before placing the data onto spool.

• Alternately the Unicode data can be spooled directly into AFP™ files to be processed by PSF/400 or Host Print Transform, using the AFP Unicode Font resource product (5799-GHJ) via a PRPQ available through your IBM representative.

Enhanced Chinese Language Support

OS/400 V5R1 provides enhanced Chinese language support. In addition to existing GB 2312 and GBK character support, OS/400 V5R1 is enabled to support 6,582 Unicode Extension-A and 1,948 non-Han characters (Mongolian, Uygur, Tibetan, and Yi). Customers who plan to use this enhanced language support must apply PTF SE01058. The planned availability date for this PTF is May 25, 2001.

ESP

The iSeries ESP initiative helps you easily manage your system, streamline your support, and reduce risk for your business. ESP is total solutions support, personalized for you in the form you need it. ESP involves support over the Internet, voice, and on-site support, along with support integrated into the product.


Function previously announced and available via a PTF is now part of OS/400 V5R1.

In V5R1, new ESP capabilities include Internet support and support integrated into OS/400.

More Flexibility for Universal Connection: IBM gives you more options for Electronic Customer Support (ECS) and Electronic Service Agent™ connectivity through Universal Connection. In addition to dial-up support over TCP/IP via ATT Global Network Services, with V5R1 the Universal Connection also supports Internet connections using a VPN. This can be used for:

• Direct Internet connection through the integrated modem with an Internet Service Provider (ISP) of your own choosing or through higher speed connections (T1, T2, Ethernet-attached cable or DSL modems).

• Connection through a firewall via your VPN gateway.

IBM offers connections through VPN to provide secure connections over the Internet.

The Universal Connection enables a variety of ESP support tools that report inventories of software and hardware on your machine to IBM so you can get personalized electronic support based on your system data. This helps streamline your support process so you can spend more time running your business rather than maintaining your systems. You control the transmission of data to use (what and when it is sent) and we secure your customer data behind a firewall and use the data to appropriately provide you our world class, personalized support. Personalized data enabled by the Universal Connection includes:

• Electronic Service Agent Inventory: Collects machine inventory of hardware, installed software, performance data, and fix levels. This information enables us to:
  - Simplify hardware and software upgrades
  - Assist you in the placement of new I/O features
  - Identify fixes that apply to your system
  - Provide you proactive advice on how you can avoid performance problems through an analysis of your current system performance

• Electronic Customer Support (ECS): Allows you to electronically report problems and receive fixes that apply to your system from your iSeries.

• Electronic Service Agent Problem Reporting: Allows for real-time monitoring of system hardware to report automatically critical errors and monitor for pending errors.

The ability to configure VPN connections is enabled in Client Access Family Service Pack 1, available at:
http://www.as400.ibm.com/clientaccess/casp

To take advantage of these capabilities, use the EZ Setup wizard at system setup, or use the ESP wizard, located under Management Central in Operations Navigator.

For additional detail on these new ESP functions, refer to:

Simplified Ordering with Software Upgrade Assistant (SUA): SUA is a Web-based tool that simplifies some software upgrade orders. If the customer has Software Subscription and is registered through IBM Electronic Services, they can use SUA to directly order release upgrades based on the software subscription they have and the products they want upgraded.

SUA is updated to reflect new or changed iSeries and AS/400e software. The capability to use SUA for upgrades to V5R1 is planned to be available later this year. Refer to the availability schedule for product support updates and V5R1 support, and to learn more about SUA at:

http://www.ibm.com/eserver/iseries/software/suaweb.htm

To use SUA, go to:
http://www.ibm.com/services/electronic/

Simplify/Improve PTF Notification/Delivery: V5R1 introduces several changes for PTF management:

• The ability to electronically download Group PTFs from IBM Service.

• Two new commands are available to manage cover letters on the system. Copy PTF Cover Letter (CPYPPTFCVR) and Display PTF Cover Letter (DSPPTFCVR). These allow users to copy cover letters from media without having to load the PTFs and provide the capability to filter the list of cover letters based on a set of attributes and status (for example, view all the cover letters that have special instructions).

• Progress indicators during PTF load and apply processing include progress indicators when PTFs are being applied or removed during the IPL.

• PTFs can now be defined to have a new attribute called preconditions. A precondition identifies a job, subsystem, or object that cannot be active when the PTF is applied or removed immediately. The system will detect this and prevent the PTF from being processed when the precondition is active.

http://www.as400.ibm.com/clientaccess/casp
Byte Stream Files that can now be Memory Mapped to

- Deadlock detection that helps diagnose applications with conflicting lock ordering.
- Byte Stream Files that can now be Memory Mapped to allow for even faster access to file data.

Additional performance trace points that aid in the management of performance of the Integrated File System.

AS/400 NetServer

AS/400 NetServer is enhanced so that the iSeries can operate as the Logon Server for Windows clients. The iSeries can be used to authenticate logging onto Windows, provide the home directory, and logon scripts to the Windows user. Additionally, Windows user profiles including Desktop, Start Menu, Favorites, and policies can be stored and retrieved from an iSeries server. A Windows NT™ or Windows 2000 server is no longer needed in the network to provide these functions.

AS/400 NetServer dramatically reduces the number of times that OS/400 user profiles become disabled due to Windows programmatically attempting invalid signons to access the OS/400 without compromising security. Additionally, when users do cause their user profiles to become disabled due to several attempts with different invalid passwords, AS/400 NetServer provides new GUI support through a Disabled User ID’s menu item off the AS/400 NetServer menu of Operations Navigator to reenable those user profiles. This support has also been made available through an API on OS/400. These changes can reduce the number of times that user profiles become disabled and improve the ease with which disabled users can be managed.

iSeries has enhanced the allowable characters in a password and the length of a password to be more compatible with Windows. This helps customers who like to have their Windows and iSeries passwords match. AS/400 NetServer also provides support for the NTLMV2 password hash that the Windows PCs can be configured to use to provide better password protection on the network.

User IDs longer than 10 characters are now truncated to 10 characters when checking for an iSeries user ID instead of being rejected. Now a userid such as Administrator on Windows would be the same as ADMINISTR on the iSeries. This should help compatibility between Windows and iSeries user IDs.

A new AS/400 NetServer Setup Wizard is now part of Operations Navigator that guides you through setting up your AS/400 NetServer based on the types of Client Access clients being used. This new Setup Wizard also helps the user configure logon support.

AS/400 NetServer now supports access to files larger than 2 GB in the Integrated File System.

Through Operations Navigator and APIs, a new Session Identifier can be used to allow better management and tracking of AS/400 NetServer sessions. This is extremely important in a Windows Terminal Serving environment where many users have sessions through a single Windows system. Now sessions can be ended or properties observed on single sessions rather than all the sessions coming from a single system.

NT Background services can now access the AS/400 NetServer without user intervention.

Printer Shares can now be published in Directory Services (LDAP) for use by Windows 2000 systems using Active Directory to find printers.
Also, various performance and scalability improvements help customers consolidate file and print serving on an iSeries server.

**ILE C and C++ Teraspace Enhancements**

Teraspace is temporary storage that provides up to a terabyte of contiguous, private storage to an OS/400 job. C and C++ programs can now optionally obtain their static and automatic storage from teraspace. A new lightweight, 8-byte pointer is now available for accessing teraspace. Use of 8-byte pointers can improve execution performance and reduce the memory footprint of pointer-intensive applications. Together, teraspace working storage and 8-byte pointers significantly ease the porting of certain applications to iSeries.

The UNIX memory mapped file APIs (such as mmap and munmap) are also implemented. These provide efficient memory mapped access to large files through teraspace.

**Improved C/C++ and Java Performance**

Enhancements to compiler optimizations ensure that programs leverage the latest hardware and software features. Compiler optimization for the iSeries servers is taken to the next step with the introduction of state-of-the-art analysis techniques that extend optimizations across procedures and *MODULE object boundaries. Interprocedural analysis (IPA) has the potential to significantly improve the execution performance of applications written in ILE C and ILE C++.

**Spool File Enhancements**

**More spooled files allowed for a job:** Customers have been reaching the limit of 9,999 spooled files per job. This limit has now been increased to 999,999 spooled files. This is controlled system wide via a system value QMAXSPLF. Because of the increase in the number of spooled files per job, various interfaces had to change to accommodate the larger spooled file number (four to six digits). This could result in the need for applications changes. The customer needs to review the iSeries Memorandum to Users before using the new function (the system default is to retain the old limit of 9,999 spooled files per job).

**Now you can find a spooled file just created with superb accuracy:** Customers have had difficulty determining the fully qualified job name of a spooled file when the spooled file gets created under a QPRTRJT job. This situation occurs when a job has changed from the original user to another user profile. Support has been added to create a data queue entry each time a spooled file is created within the user profile. Support has been added to create a data queue entry each time a spooled file is created within the user profile. The data queue support is enabled through the use of environment variables. Customers should refer to the Printer Device Programming manual for more details (this support has PTFs all the way back to V4R2).

**Programmatically monitor your remote writers:** Customers need the ability to monitor status of a remote writer. The retrieve writer information API QSPRWRTRI has been enhanced to allow retrieval of remote writer information. This enables customers to write programs that can monitor and manage remote writers.

**Retrieve a list of spooled files much more quickly:** Performance for listing of spooled files is greatly improved. Changes are made to enable retrieving a list of spooled files more quickly.

**Increased Maximum Capacities**

V5R1 provides enhanced system scalability by increasing the following maximum capacities:

- Jobs on the system tripled to support up to 480,000 jobs.
- Spool files per job increased 100 times to support up to 999,999 spool files.
- Libraries in the user portion of the library list increased 10 times to support up to 250 libraries. There are compatibility considerations for application programs that retrieve library lists and are not prepared for the longer lists. For more details, refer to the Memo to Users.
- User profiles that can be saved tripled to support up to 340,000 profiles.
- Private authorities that can be saved increased 25 times to support up to five million private authorities for each saved user profile.
- Database physical file size doubled to support up to a 1 terabyte physical file.

**Optical Enhancements**

In V5R1, the following enhancements are provided to support Optical Removable Media (Magneto Optical (MO), Write Once Read Many (WORM), CD-ROM, and DVD-RAM):

- Enhanced data caching when processing files on optical volumes formatted with Universal Disk Format (UDF). This will improve performance and functionality while at the same time reducing overhead.
- Improved performance for incremental copies using Copy Optical (CPYOPT).
- Improved reliability and performance of Duplicate Optical (DUPOPT) utility for optical volumes formatted with High Performance Optical File System (HPOFS).
- Improved file creation performance.
- Allow Remove Optical Cartridge (RMVOPTCTG) for optical volumes in CD-ROM and DVD-RAM devices.
- Increase the maximum optical file size accessible through HFS or IFS from 4,294,705,152 bytes (4 GB) to 1 terabyte.
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make the tape library ready by closing the door, and the save or restore operation will not be cancelled unless the operator replies with a Cancel to an inquiry message sent after the 10 minute wait. This change reduces the chance that a long running save or restore operation will be ended before it completes.

**New Trace Job Facility**

A new job trace facility introduces several changes needed in TRCJOB. The new job trace support should be used instead of TRCJOB. The new job trace facility includes four new CL commands (STRTRC, ENDTRC, PRTTRC, and DLTTRC) and includes the following enhancements:

- Significantly improved performance, particularly when tracing ILE programs
- Improved reporting information, including finer time granularity and additional I/O information
- Eliminates the need to STRSRVJOB on jobs to trace
- Can trace multiple jobs with one command, including a generic job set
- Increased buffer size for collecting trace information to 4 GB

**Cryptographic Coprocessor Enhancements**

In V5R1, there are new capabilities associated with the Cryptographic Coprocessors. The new capabilities are the following:

- The maximum number of Cryptographic Coprocessors per system is increased to eight (from three).
- A new GUI is available to set-up and manage your Cryptographic Coprocessors.
- The Cryptographic Coprocessor can now be used with OS/400’s secure sockets layer (SSL) support — dramatically off-loading SSL crypto processing, thereby freeing your system processor to handle more secure Web server sessions. The Cryptographic Coprocessor’s feature numbers 4801 and 4802 also provide a FIPS 140-1 Level 3 certified key storage for your cryptographic keys.

**International Components for Unicode**

The International Components for Unicode, option 39 of OS/400, is a C and C++ library that adds robust and full-featured Unicode support. It provides internationalization utilities for writing global applications in ILE programming languages.

As companies weave e-Commerce on a global scale into their fundamental business processes, their prospective customers, established customers, and active business partners can take advantage of increased revenue, decreased expenses, and better customer communications and savings through software internationalization.

Software internationalization is the development process using libraries, like the International Components for Unicode (ICU) libraries, that enable one single program to work with text in any language, for any place in the world. For example, instead of having software versions for ten different countries, you can use the ICU support to create one version that can work seamlessly and transparently in ten different and unique countries.

The ICU components are an integral part of software development because they hide the cultural nuances and technical complexities of locale-specific software requirements. These complexities provide critical functionality for applications but they do not burden the application developer with the tremendous effort and high cost to build them.

For more information about ICU, refer to:

http://oss.software.ibm.com/icu/

**Education Support**

Call IBM Education and Training at 800-IBM-TEACH (426-8322) for education catalogs, schedules, and enrollments.

Find additional information on iSeries and AS/400 products, education support, and service offerings on the Internet.

Product and technical information can be found via:

- IBM iSeries home page:
  http://www.ibm.com/eserver/iseries
- IBM Redbooks®:
  http://www.redbooks.ibm.com
- IBM Information Center:
  http://www.ibm.com/eserver/iseries/infocenter
- Service Offerings at IBM Support:
  http://www.ibm.com/server/support
- Education at IBM Global Campus:

**Offering Information**

Product information is available through Offering Information (OITOOL) at:

http://www.ibm.com/wwoi

**Publications**

A hardcopy of the *Software Installation Guide* (SC41-5120) is shipped with this program.

Documentation to support the product is provided in the iSeries Information Center, which is shipped on CD-ROM (SK3T-4091) with the OS/400 licensed program. The Information Center is also available on the Internet at:

http://www.ibm.com/eserver/iseries/infocenter
Technical Information

**Hardware Requirements:** V5R1 will run on all iSeries and AS/400 RISC systems.

V5R1 requires a minimum main memory size of 128 MB and recommended minimum disk size of 8 GB.

For OS/400 V5R1, an additional 90MB of free disk space is required as compared to V4R5 for V5R1 installation and an additional 270 MB of free disk space is required as compared to V4R4 for V5R1 installation. The total disk space for OS/400 will vary from approximately 350 MB to 1 GB.

**Software Requirements:** All iSeries and AS/400 licensed programs must be at a release level supported by the V5R1 operating system.

**Compatibility:** Single step upgrades are available from V4R4 and V4R5.

With OS/400 V5R1, you can create and save objects, and interoperate with systems that run:
- V4R4
- V4R5

Planning Information

**iSeries Planning Information Web Site:** This site contains information such as Product Previews, Statements of Direction, and products no longer supported on a release, with mitigation plans, as available.

http://www.ibm.com/servers/eserver/iseries/support/planning

**Direct Customer Support:** Direct customer support is provided by iSeries Support Line. This fee service enhances customers’ productivity by providing voice and electronic access into the IBM support organization. iSeries Support Line will help answer questions pertaining to usage, and suspected software defects for eligible products.

Installation and technical support is provided by Global Services. For more information call 800-IBM-4YOU (426-4968).

**Security, Auditability, and Control**

OS/400 uses the security and auditability features of the OS/400 operating system.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communication facilities.

Ordering Information

Refer to Software Announcement 201-114, dated April 23, 2001.

Terms and Conditions

Refer to Software Announcement 201-114, dated April 23, 2001.