

AIX 5L

Technical Preview



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0.0 Overview

The next generation of AIX® -- AIX 5L -- is a unique and open enterprise class UNIX® operating system incorporating technology from software developers around the world. AIX 5L provides customers with the benefits of business flexibility and performance for both IBM POWER and Intel® Itanium™ processors, with Linux affinity.

This paper contains a technical description of the fourth quarter 2000 deliverable for the AIX 5L for POWER Version 5.0 Early Adopters Release (AIX 5L for POWER) and the AIX 5L for Itanium-based systems Version 5.0 Software Developers Release (AIX 5L for Itanium-based systems). The initial offering of AIX 5L on POWER will be distributed as a no-charge i-listed PRPQ with limited¹ support (e-fix only; no PTFs; only critical problems preventing application certification; 8:00 AM - 5:00 PM Central, Monday through Friday, excluding holidays; Supportline contract required) through normal channels until the next release is available, at which time all support for this initial release will end. AIX 5L for Itanium-based systems is covered under the terms and conditions of the beta program. This initial release of AIX 5L for POWER or Itanium-based systems is not part of the software subscription program. The AIX Bonus Pack will not be part of this initial release however a new Expansion Pack will be included for both the POWER and Itanium-based platforms. The AIX Fast Connect file and print server will be included for this time only in the AIX 5L Early Adopters Release on POWER.

1.0 System Support

1.1 POWER System Support

AIX 5L supports:

- RS/6000® 6015 Model 066 (40P)
- RS/6000 7006 Models 41T, 41W, 42T, 42W
- RS/6000 7008 Models M20, M2A
- RS/6000 7009 Models C10, C20
- RS/6000 7010 Models 120, 130, 140, 150, 160
- RS/6000 7011 Models 220, 22G, 22S, 22W, 230, 23E, 23S, 23T, 23W, 250, 25E, 25F, 25S, 25T, 25W
- RS/6000 7012 Models 320, 32E, 32H, 340, 34H, 350, 355, 360, 365, 36T, 370, 375, 37T, 380, 390, 397, 39H, G02, G30, G40
- RS/6000 7013 Models 520, 52H, 530, 53E, 53H, 540, 550, 55E, 55L, 55S, 560, 56F, 570, 57F, 580, 58F, 58H, 590, 591, 595, 59H, J01, J30, J40, J50, S70, S7A
- RS/6000 7014 Models S00, T00
- RS/6000 7015 Models 930, 950, 95E, 970, 97B, 97E, 97F, 980, 98B, 98E, 98F, 990, 99E, 99F, 99J, 99K, R10, R20, R21, R24, R30, R3U, R40, R4U, R50, R5U, R00, S70, S7A
- RS/6000 7017 Models S70, S7A, S80
- RS/6000 7024 Models E20, E30
- RS/6000 7025 Models F30, F40, F50, H50, H70, F80, H50
- RS/6000 7026 Models H10, H50, H70, H80, M80
- RS/6000 7030 Models 397, 3AT, 3BT, 3CT
- RS/6000 7043 Models 140, 150, 240, 260, 270
- RS/6000 7044 Models 170, 270
- RS/6000 7046 Model B50
- RS/6000 7202 Models 900
- RS/6000 7248 Models 100, 120, 132
- RS/6000 7317 Models F3L

¹ For a complete description of the program terms, refer to the License Information document for AIX 5L for POWER Version 5.0

1.2 Itanium-based System Support

AIX® 5L supports

Intel Lion system as a reference platform

The following Intel platform providers have given their endorsement for AIX 5L on their future Itanium-based platforms.

- IBM (NUMA-Q, Netfinity)
- Compaq
- BULL
- Unisys
- Samsung
- ICL
- ACER
- Celia

1.3 POWER and Itanium-based System Support

AIX 5L Configuration Manager allows multiple device configuration methods to run in parallel during reboot. This option may produce a faster reboot when multiple devices such as SCSI disks, TTYs, and multiport asynchronous adapters are connected to an RS/6000 system. However, a serialization mechanism will be used when the configuration manager recognizes that new devices are added to the system, and will sequentially configure these new devices. This function is available on POWER platform only.

With the AIX 5L Diagnostic package, system administrators can keep track of diagnostic activity on the systems by using the Diagnostic Event Log. This log can be viewed by using the Display Previous Diagnostic Results task under Diagnostics. Tasks and service aids under diagnostics have been ordered alphabetically to improve ease-of-use.

A diagnostic exerciser for memory is available on both POWER and Itanium-based platforms to enhance problem determination. In addition, system administrators can take advantage of the processor exerciser offered on the POWER platform.

2.0 I/O Support

2.1 I/O Support on POWER

AIX 5L on POWER supports the following I/O with both the 64-bit and 32-bit kernel unless otherwise indicated:

Storage interfaces

- Gigabit Fibre Channel
- External Fibre disk & tape subsystems (2104-E10/E20/F10/F20, 2102-F10/D00, 2103-H07, 2108-G07/R03, 2109-S08/S16, 3590 tape, etc.)
- Ultra SCSI SE and Ultra SCSI Differential
- SCSI Disk drives
- External SCSI Disk subsystems (2104-DL1/TL1, 2104-E10/E20/F10/F20, 7134, 7137, 7135, 7131-105, 7027, 7203, 7204)
- External Ultra3 subsystem (DU3/TU3)
- External SCSI Tape & Optical subsystems (too numerous to list)
- SCSI Tape Drives (1/4 inch, 4mm, 8mm, etc.)
- SCSI CDROMs
- Diskette Drive

- PCI Dual Channel Ultra2 SCSI Adapter
- PCI 3-Channel Ultra2 SCSI RAID Adapter
- PCI 4-Channel Ultra3 SCSI RAID Adapter
- Older Fast/Wide SCSI adapters (2408, 2409, 6208, 6209)
- SCSI-2 Fast/Wide PCI RAID Adapter
- SSA Advanced SerialRAID Adapter
- SSA Advanced SerialRAID Plus Adapter
- SSA Disk drives
- Existing AIX Version 4.3.3 MCA adapters

Communications and connectivity (PCI bus type)

- EIA RS232D/EIA RS422A
- Token-Ring PCI 4/16 Adapter
- 4-port 10/100 Mbps Ethernet
- IBM Ethernet 10/100 Mbps
- 10/100/1000 Base-T Ethernet PCI Adapter
- 3Com Ethernet 10/100 Mbps (32-bit Kernel only)
- Gigabit Ethernet
- FDDI 100 Mbps (32-bit Kernel only)
- ATM 155 Mbps
- Turboways 622 Mbps PCI MMF ATM Adapter
- SP System Attachment
- X.25 (32-bit Kernel only and excludes Artic960Hx 4-port PCI)
- 2port Multiprotocol PCI Adapter (SDLC)
- Existing AIX Version 4.3.3 MCA adapters (except Artic960 adapters)

Specialized adapters

- IBM POWER GXT130P Graphics Accelerator
- PCI Cryptographic Coprocessor

2.2 I/O Support on Itanium-based systems

AIX 5L on Itanium-based systems supports:

Base

- Generic ATAPI LS120 floppy drive
- Generic SCSI CDROM (external IBM 7210-015 CD-ROM drive);
- Generic ATAPI CDROM (TEAC CD-224EA CD-ROM drive)
- Generic SCSI CD Burner (External YAMAHA CRW4416SX)
- Generic Keyboard, Mouse PS/2
- Generic Serial Port 16550 UART
- Generic SCSI Tape Drive (8mm external 5GB (IBM 7208-011), 4mm external 4GB (IBM 7206-005))
- Generic SCSI Disk Drive (Quantum QM309100KN-LW 9.0GB; IBM 18.0 GB and 9.0 GB SCSI drives)
- Generic Fibre Channel Disk

Parallel SCSI interfaces

- PCI Ultra SCSI SE and Ultra SCSI Differential (LSI 53C875)
- PCI Ultra SCSI SE and LVD (Qlogic QLA 1280)
- PCI Dual Channel Ultra2 adapter (Qlogic QLA 12160A)
- PCI Dual Channel Ultra2 adapter (LSI SYM53C896A)

Fibre Channel

- Emulex SCSI LP7000E, LP8000 and LP9000 with IBM FC Storage Subsystems (including Shark subsystem) and EMC attachment

Display

- ATI 2D graphics Rage 128 VGA display: G's ,P's series NFB

Network

- Intel Pro100+ Serv 10/100 Ethernet adapter with UDI Device Driver
- IBM Phoenix 10/100 Ethernet adapter with IBM Native Device Driver
- Alteon GB Ethernet adapter (Fiber/Copper)
- IBM Token Ring 4/16M Cricketstick adapter

TTY

- Digi 8/128 port Async Card IBMPCI 8/128 RAN boxes

3.0 Base Operating System

3.1 NFS Statd Multithreading

The status monitor provides a general framework for collecting network status information. Implemented as a daemon that runs on all NFS configured machines, the status monitor provides a simple protocol that allows applications to easily monitor the status of other machines. The existing statd facility provides for the automatic monitoring of both client and server NFS file system locks whenever a file within the monitored NFS file system is accessed. With lock recovery NFS servers can request previously established file locks from NFS clients. This process is performed by statd's communication with the lockd daemon on NFS servers after a system crash. When a NFS file lock is established by a client process, statd on the client will create a 0 byte file in the directory /var/statmon. The filename created is determined by the hostname of the NFS server. The server statd also creates a 0 byte file in /var/statmon/. The filename created is determined by the nodename of the client. In the event of a server crash, the statd daemon will read all the files under /var/statmon. The server statd will use the name of each file as the hostname of the client's to contact. The server statd notifies the client's statd daemon to tell its lockd daemon to reestablish all locks previously established on this server. During NFS lock recovery, the statd daemon on the client and server identify themselves using their nodename. The client's lockd daemon looks up its data structure of established locks and matches the servers nodename with established locks. The client then reestablishes the file locks that match the nodename of the server.

3.2 Deactivating Active Paging Spaces

This command provides new flexibility without rebooting when changing configurations, moving paging space to another drive, or dividing paging space up between drives. Until this release, allocated and activated paging space must stay active until the next re-boot. With this release, paging space can be deactivated without rebooting by using the new "swapoff" command. The new "shrinkps" command creates a new, temporary space, deactivates the original, changes the original to be smaller, reactivates it, and then deactivates the temporary space and returns it to logical volume status. The use of a shell script reduces the possibility of getting into an unbootable state because users will not be allowed to run out of adequate paging space. The script checks paging space actually in use and adds a buffer for paging space warning threshold.

3.3 Malloc Enhancements

AIX 5L provides an optional buckets-based extension of the default memory allocator (the malloc subsystem) that may improve performance for applications that issue large numbers of small allocation requests. Each bucket consists of a block of memory that is subdivided into a predetermined number of smaller allocatable blocks of uniform size. Organizing allocatable memory in this fashion often provides faster access for allocation requests falling within the range of sizes defined by the buckets. When this capability is enabled, allocation requests that fall within a predefined range of block sizes are processed by Malloc Buckets. All other requests (i.e. those that are outside the defined range of sizes) are processed in the usual manner by the default allocator. Up to 128 buckets are available per heap (refer to the Malloc Multiheap documentation for details on this capability). Number of buckets, bucket sizing factor and other configuration values are specified via an environment variable prior to process startup; more information on configuring the MALLOCTYPE and MALLOCBUCKETS environment variables is available in the book "General Programming Concepts: Writing and Debugging Programs".

3.4 SVR4 Printing Subsystem

AIX 5L provides the UNIX System V style file spooling subsystem is available as an administrator configurable option. Enabling this option allows users who are more comfortable with System V printer utilities to more easily use AIX 5L. On POWER, SVR4 is the printing system of choice while the existing printing capability is the default. SVR4 is the only printing system on AIX 5L on Itanium-based systems.

3.5 Multithreaded AutoFS

AIX 5L enhances AutoFS is enhanced to support multi-threaded automountd daemon. This allows automountd to provide more jobs than before. In addition to fulfilling mount requests, the new automountd handles requests such as lookup, umount requests, and autofsd readdir. It is also 64-bit enabled, which means it can be run in either the 32 or 64-bit kernel environments.

3.6 The /proc Filesystem

The /proc file system is a file system that provides access to the state of each process and thread in the system. The file system is mounted over /proc. Standard system call interfaces such as open(), read(), write(), lseek() are used to access /proc files. Programs such as debuggers can use /proc to control a process which is being debugged. /proc provides the ability to stop and start threads in a process, trace syscalls, trace signals, read and write virtual memory in a process, and other capabilities.

4.0 Scalability and Capacity

4.1 64-bit Kernel

AIX 5L provides a scalable, 64-bit kernel capable of supporting increased system resources and much larger application workloads on 64-bit hardware. In addition, the 64-bit kernel offers scalable kernel extension interfaces, allowing kernel extensions and device drivers to make full use of the kernel's system resources and capabilities.

The expanded capabilities of the 64-bit AIX 5L kernel improve the ability to run an expanding application workload on a single system. This ability is important for a number of reasons. First, data sharing and I/O device sharing are simplified if multiple applications can be run on the same system. Second, more powerful systems will reduce the number of systems needed by an organization, thereby reducing the cost and complexity of system administration.

Server consolidation and workload scalability will continue to require higher capacity hardware systems that support more memory and additional I/O devices. The 64-bit AIX 5L kernel is designed to support these requirements for years to come.

Kernel extensions and device drivers must be compiled in 64-bit mode to be loaded into the 64-bit kernel. The 64-bit AIX 5L kernel provides the environment for porting and developing kernel extensions.

The 64-bit AIX 5L kernel is the only kernel provided on Itanium-based systems. For POWER, both 32-bit and 64-bit kernels are provided. The 64-bit kernel can be installed and enabled on most 64-bit machines.

4.2 64-bit Application Scalability

AIX 5L provides a more scalable application binary interface (ABI) for 64-bit applications. This scalability is provided by changing the sizes of some fundamental data types for 64-bit applications, and will allow these applications to take advantage of the expanded capabilities of the AIX 5L 64-bit kernel. The scalable 64-bit ABI will be supported by the 32-bit kernel as well as the 64-bit kernel.

For example, the 64-bit kernel is designed to support file sizes larger than 1 terabyte. By using the scalable 64-bit ABI, 64-bit applications will be able to use existing interfaces to process these large files. Both Itanium-based systems and POWER will use the same 64-bit ABI, allowing source code for 64-bit applications to be shared between both platforms.

To take advantage of the scalability improvements to 64-bit programs, all 64-bit programs and libraries will have to be recompiled on AIX 5L. In addition, existing 32-bit kernel extensions and device drivers used by 64-bit applications may have to be modified in order to support the new 64-bit ABI.

4.3 Advanced Workload Manager

AIX 5L Workload Manager has been enhanced to provide the continuation of AIX 5L functions to manage subsets of workload and control subsets of total system resources. In AIX 5L, Workload Manager adds more sophistication to the externals for categorization of work in the system and for the specification of policy. In addition, AIX 5L Workload Manager will use an alternative approach to divide up system resources and schedule a portion of the installation's total workload against a subset of the system resources. Additional capabilities which Workload Manager offers are:

- Disk I/O Bandwidth, a new resource type, is introduced in addition to existing resources such as CPU cycles and real memory
- An Application Programming Interface (API) enables external applications to modify system behaviors
- System administrators can manually reclassify processes independent of the classification rules. This function enables multiple instances of the same application to exist in different classes. Using Application Tag API, applications such as DB2, Oracle and SAP can enable automatic assignment of multiple instances of the same application in different classes
- More application isolation and control
 - New subclasses add ten times the granularity of control (from 27 classes to 270 controllable classes)
 - System administrators can delegate subclass management to users or groups
- Now fully dynamic, AIX 5L Workload Management allows the entire configuration of AIX 5L Workload Management to be changed while it is running.
- Application path name -- wild card flexibility extended to user name and group name

These capabilities can be easily managed through Web-based System Manager, SMIT, shell scripts, or command line interfaces.

4.4 Very Large Program Support

AIX 5L for POWER offers new flexibility for 32-bit "maxdata" programs by allowing the segments of the data heap (up to 8 256MB segments) to be created dynamically. The large program support previously available did not allow data heap segments to be used for any other purpose, even if the data heap never grew large enough to use all the reserved segments. The Very Large Program Support will allow the data heap segments to be created dynamically. Until a segment is needed for the data heap, it may be used by shmat() and mmap(). In addition, when Very Large Program Support is enabled for an application, segments allocated by shmat() and mmap() are allocated in descending order instead of ascending order.

4.5 Very Large File Support

Cachefs is enhanced to work under 64-bit kernel, and will support large file systems. It will handle files larger than KGB, although the cache file does not have to be larger than KGB. As a result, data will be accessed faster.

4.6 JFS2 Support

JFS2 is a new file system type. It provides the capability to store much larger files than JFS. JFS2 is the only standard file system for the Itanium-based platform, while AIX 5L customers on the POWER platform have the choice of staying with JFS or taking advantage of the additional 64-bit functionality of JFS2. The following table provides a summary of the differences between JFS2 and JFS.

Functions	JFS2	JFS
Fragments/Block Size	512-4096 Block sizes	512-4096 Frags
Architectural Maximum File Size	4 Petabytes	64 GBytes
Maximum File Size Tested	1 Terabyte	64 GBytes
Architectural Maximum File System Size	4 Petabytes	1 Terabyte
Maximum File System Size	1 Tetabytes	1 Terabyte
Number of Inodes	Dynamic, limited by disk space	Fixed, set at file system creation
Directory Organization	B-tree	Linear
Online Defragmentation	Yes	Yes
namefs	Yes	Yes
DMAPI	Planned future release	Yes
Compression	No	Yes
Quotas	No	Yes
NUMA	Yes	No
Deferred Update	No	Yes
Available on Intel architecture	Yes	No
Available on POWER architecture	Yes	Yes

5.0 AIX System and Network Security

AIX 5L on both POWER and Itanium-based platforms contain the base operating system security features from previous releases of AIX. However, the new security functions listed in this section are initially only on POWER.

5.1 System Security

5.1.1 Native Kerberos V5 KDC Server / Client Support

Network Authentication Service is IBM's implementation of MIT's Kerberos V5 Release 1.1 network authentication service. Network Authentication Service negotiates authentication, and optionally encrypted, communication between two points on the Internet or between components on a system. Services provided will include the Generic Security Service Application Programming Interfaces (GSS-API) Version 2 and the key distribution server, cadmic. An RS/6000 system can be configured to use Network Authentication Service for user password authentication. Using Network Authentication Service for user password authentication will potentially make AIX 5L authentication inter operative with other systems that use MIT's Kerberos V5 based authentication.

Services are provided to allow AIX 5L to be configured to use Kerberos as the systems default authentication mechanism. When AIX 5L is configured to use Kerberos as the default authentication mechanism, all services that use the AIX 5L authenticate routine to gain system access will then go to the Kerberos server, KDC, to seek user authentication. The users successfully logged in will have a Ticket Granting Ticket (TAT). There will also be a service provided to migrate existing users to Kerberos authenticated users.

5.1.2 IBM SecureWay® Directory, Version 3.2

SecureWay directory V3, is an LDAP version 3 function that leverages the mission-critical enterprise strength of DB2 database technology with the flexibility of the LDAP directory standard with the following properties:

- provides search capability; searches on individual attributes of the objects
- scales from the small to large networks by effectively distributing directory data to multiple servers
- automatic replication of data; support of replication to make your information system more resistant to failure
- provides extensible schema; which enables application developers and administrators to extend the native directory schema set and implements new and customized directory objects as needed
- integrates with Domain Name Server (DNA); use DNA lookup capability to locate the directory service information; such as server hostname, service port, and protocol used

Enhanced SecureWay directory V3.2 supports the following additional enhancements:

Fine-grained Access Control

In addition to the current support of grant or deny access to a specific directory object or an entire directory sub tree, enhancement includes:

- ability to set Access Control Information (CAI) for a specific attribute.
- ability to allow/deny access which subjects (using entry Owner) can define the Aces.
- support IETF draft-ietf-ldapext-acl-model-04.txt for acl model

Performance Enhancement

- Add a true backup/restore directory content, including schema definitions and server configuration, by using DB2 utilities to enhance the performance of Backup/Restore. Existing import/export data to/from LDIF format is still supported for heterogeneous directory interoperability .
- "Unlimited" connection support with the enhancement of server threading model. This enhances the scalability with a pool of threads serving large number of connections (configurable) and also increases the performance by reducing the connection time by keeping a list of active threads pool that are used for subsequent connection request.

- Fast Server startup - to eliminate the first time slow server startup (after it is configured), use 'First Touch' mechanism such that the attribute table is not created until an entry is added that uses that attribute.

Event Notification Support

- To support the application notification of directory events. It can be used either for client caching function, or for any other management applications that requires a notification of directory event unfold. This is done by client registration to the directory event options such as 'Add', 'Delete', 'Modify' and 'ModifyRDN' or any other combinations, and Server will notify the client applications whenever an event of interest at or below the applications DN.

Security Audit Support

- Support of Directory Audit service to improve the security of directory server. System administrator can use this log facility to examine any suspicious pattern of activity in an attempt to detect a security violation. With time stamp and BindDN recorded in the audit log, the violator can be easily traced and detected.
- Audit plug-in support allows any applications to receive the audit data and filter to incorporate with other audit information. This feature allows the directory audit data to be a part of the centralized audit facility where the Enterprise application is based.

Transaction Support

- With LDAP extended support, a set of LDAP operation are performed as a unit of work for commit or rollback. This unit of work is committed to the database only when the EndTransaction-Commit is returned or it is rolled to the prior operation state. This transaction support is limited to a single connection to a single LDAP server, and a list of LDAP operations that forms a unit of work should be limited to the moderation (somewhat less than 100) number.

Kerberos V5 support

- Enhance LDAP operation to add Kerberos V5 and additional authentication mechanisms along with existing Secure Socket Layer (SSL) V3 based authentication using x509v3 public key certificates. The Kerberos authentication option is used for not only user authentication , but also used for the authentication option for the Server replication.
- Kerberos based authentication will enable LDAP applications and AIX 5L users to participate in a single-signon environment within the Kerberos realm. This enhancement will enforce network security by not transporting the password on the wire.
- Kerberos authentication is used for the authenticated referrals. This helps to secure/validate the LDAP referral operation by using Kerberos based authentication.
- By using Kerberos cross-realm authentication support, LDAP application can establish a transient trust with already established Kerberos authentication.

5.2 Network Security

5.2.1 PKCS Support

AIX 5L offers an implementation of the cryptographic API PKCS#11 version 2.01 on the POWER platform. PKCS#11 is a de facto industry standard for accessing cryptographic hardware devices. AIX 5L for POWER offers support for IBM 4758 model 2 cryptographic coprocessor under the operating system PKCS#11 shared object. The AIX 5L PKCS#11 implementation is enhanced to utilize future IBM cryptographic hardware devices through the same shared library. Application which are available to utilized PKCS#11 on AIX 5L include the iPlanet server suite on AIX 5L. For additional information on PKCS11, refer to the RSA Laboratories web site at: <http://www.rsasecurity.com/rsalabs/pkcs/pkcs-11/>

5.2.2 IP Key Encryption Security

The Internet Key Exchange protocol to provide Virtual Private Networking (VPN) support in AIX 5L has been enhanced to enable the use of Certificate Revocation Lists (CRL) when authenticating remote users or devices. This is an important improvement in improving scalability of VPNs through the use of Digital Certificates for a large number of users. When CRLs are used, digital certificates provide credentials for authentication, and individual users may be revoked by specifying their certificate number to the CRL. This simplifies network management by allowing one policy to be defined at the server, and verifying that the certificate is valid and not contained in the CRL. CRLs may be fetched through HTTP or LDAP using sock4 or socks5 protocol.

The user interface on AIX 5L Web-based System Manager for setting up tunnels has been streamlined and simplified. A full-function wizard guides the user through initial IKE tunnel definition. Policy information has been reorganized to make IP Security tunnel configuration more intuitive and require fewer steps.

Other IKE enhancements include the use of the commit bit to synchronize the use of Security Associations, the definition of default policies to simplify the configuration for networks using dynamic IP addresses or DHCP. System administrators can define a Virtual Private network by one policy and a list of group members, They can also define default policies to specify the security parameters that are to be used when the addresses are dynamically assigned.

IKE support has also been extended to include IP Version 6 protocols. Thus the IP Security functions for AIX 5L include the definition of static filters for IP Versions 4 and 6, manually and dynamically defined private tunnels using IP Security protocol over IP Version 4 and 6 networks.

5.2.3 Directory-based Resolvers

The name resolver routines have been enhanced to include resolving hostnames through a LDAP (Lightweight Directory Access Protocol) server. The ordering of name resolution services can be specified in any of the following:

- /etc/netsvc.conf file
- /etc/irs.conf file
- NSORDER environment variable.

For example, NSORDER=bind,ldap.

Schema defines the rules for ordering data on a LDAP server. The ibm-HostTable object class, the proposed schema, was accepted by the IBM SecureWay Directory product. A new command, hosts2ldif, was created to produce an LDIF (LDAP Data Interchange Format) file from /etc/hosts. This LDIF file is used to populate the hosts database on the LDAP server. The LDAP client uses /etc/resolv.ldap to access the information from the LDAP server.

6.0 Network Technology and Performance

6.1 IP Multipath Routing & Multiple Gateways with Dead Gateway Detection

Multipath routing is added in AIX 5L to allow users to specify multiple routes to a destination. The system administrator will have the options of either configuring multiple routes for load balancing or setting up alternative paths to direct network traffic when the best route can no longer perform its tasks. This new feature also allows a system administrator to define multiple default gateways. Furthermore, it increases network availability by detecting the failure of a "next-hop" gateway that is listed in its route cache and route data through alternative gateways that are specified. Configuring multiple gateways and using dead gateway detection and fail over for any route are optional features with administrators having the capability to not use them.

6.2 Web Serving Enhancements: Dynamic Content & Web Cache Enhancements

A set of APIs provided by Fast Response Cache Architecture (FRCA) enables e-business application to cache data such as web content in the Network Buffer Cache (NBC). Through these APIs, Web

Serving can be done in kernel via FRCA and NBC, thus, significantly reduces the path length and increases the performance of e-business applications, for example, Net.commerce and such. FRCA and NBC have also enhanced their capabilities from static data to dynamic generated data.

Persistent connection: FRCA will support Hypertext Transport Protocol (HTTP) version 1.1, a standard of IETF RFC, including the persistent connection aspect in the protocol.

6.3 Add libpcap APIs

This functionality helps enhance the robustness and ease of use in gathering network traffic data to improve problem determination for network applications. The Packet Capture Library, libpcap, provides a high level user interface to the Berkeley Packet Filter (BPF). The library provides user-level subroutines that interface with the BPF to allow users access for reading unprocessed network traffic. By utilizing the subroutines in libpcap, users can write customized applications that monitor and/or capture the network traffic that they need to want to examine.

6.4 Virtual IP Address (VIPA)

This capability allows system administrator to define a virtual IP address for a host, and from TCP connection standpoint, decouple the IP address associated with physical interfaces. As the result, the user connection should not be affected if some interfaces go down.

6.5 Quality of Service (QoS) Phase II

This function has been enhanced to allow system administrators to manage policies for the Quality of Service (QoS) Manager from the command line. Policies can be added, removed, modified and listed from the command line. Furthermore, it also adds the capability to specify priority for a policy. This is important when two or more overlapping policies are installed, the policies can be enforced in order of highest priority.

7.0 Storage

7.1 DMAPI - Data Management API

AIX 5L includes the implementation of the Data Management Application Programming Interface (DMAPI), as defined in the Open Group's Data Storage Management (XDSM) API specification. DMAPI is a technology which enables the development of relatively portable data management applications, such as hierarchical storage management (HSM), by providing the underlying Journaled File System support and programming interface for those applications. This API is available on the 32-bit kernel on the POWER platform only.

7.2 LVM Scalability - Variable LTG

Today the Logical Volume Manager (LVM) shipped with all versions of AIX 5L has a constant max transfer size of 128K which is known within LVM as the Logical Track Group (LTG). Enhancements are provided to allow a Volume Group (VG) LTG size to be specified at VG creation time and also to change the LTG size of an existing volume group.

Different LTG sizes of 128K, 256K, 512K and 1024K are now supported, and verification for the sizes of 512K and 1024K are underway. The different LTG sizes pend on the max transfer size of the member disks of the volume group.

7.3 Logical Volume Manager (LVM) Mirror Write Consistency

The Mirror Write Consistency (MWC) ensures data consistency on logical volumes in case of system crash occurs during mirrored writes. The existing method achieves this by logging when a write occurs. The LVM makes an update to a log (the MWC log) that identifies what areas of the disk are being updated before performing the write of the data. This results in a performance degradation during random writes. With AIX 5L, there are now two ways of handling MWC: Active and Passive. The existing method is Active MWC. The new MWC is called "Passive".

Passive MWC reduces the problem of having to update the MWC log on the disk. This method logs that the logical volume has been opened but does not log writes. If the volume group is not deactivated before a reboot (i.e., crash), then the LVM starts a forced synchronization of the entire logical volume when the system restarts. Data consistency exists for reads that occur during the synchronization so that applications can start using the data as soon as the volume group is varied on.

The Active MWC method (the existing MWC) is still supported, and is the default mode when a mirrored logical volume is created, but the new Passive MWC method should result in better random write performance on mirrored logical volumes when compared to the Active MWC method.

7.4 Hot Spare Disk Support in Volume Group

The LVM previously shipped with AIX takes no action when partitions go stale or disks go missing other than logging an error in the error log. Logical volume manager's ability of optionally providing hot spare disks within a volume group and automatically synchronizing stale partitions helps to increase the availability of mirrored data. In addition, the logical volume manager will attempt to reactivate a disk which is missing. If the disk can not be restarted, then its mirror copy will be migrated to a hot spare disk if such disk with proper size exists.

7.5 Hot Spot Management in Logical Volume Group

LVM provides an ability to move the physical partitions (smallest possible data unit in a volume group) to any member disk of the volume group. Sometimes it is necessary to migrate the partitions to new disk for maintenance (disk replacement etc.). This migration may also achieve performance gain for the i/o if there happened to be high traffic partitions all located on a single disk and some were migrated to other member disks. Currently there are no tools at LVM level that will identify the partitions by the number of I/Os. There are other tools that could provide similar information like iostat, filemon etc., but they do not directly identify the partitions at the LVM level. Hot spot management provides two commands - one that will identify the hot spots and another that migrates the hot spot to a different location.

8.0 Reliability, Availability & Serviceability (RAS)

8.1 Recover from System Hangs

This shdaemon command function aids system administrators by providing a SMIT-configurable mechanism to detect system hangs and initiate the configured action. When a system hang occurs, one of the following actions can take place:

- Error messages will be displayed to notify system administrators (default = off)
- Error messages will be logged in the error report (default = off)
- A high priority login is created so that system administrator can login and perform problem determination. This option is turned on by default
- Specific commands will be executed according the configuration setup (default = off)
- Systems will be rebooted based on system configuration setup (default = off)

System administrators can set up these actions with appropriate priority and turn them on as needed. An additional benefit of the tool is that it can be set with a threshold low enough that when it's hit, it generates a log entry. The frequency of log entries can provide an idea of saturation and resource utilization.

8.2 Error Log Scalability Enhancements & Error Thresholding/Activity Counters

In AIX 5L, enhancements are made to the error log to detect consecutive duplicate errors and help prevent the error log from being overloaded. These enhancements provide a mechanism to keep track of the number of times an exactly identical error at the bit level occurring within a time limit period. An entry will be added to the error log along with the number of occurrences for this error. Examples of anticipated use include floppy drive not ready, external drive off line, and Ethernet card unplugged or bad line. Note that disk errors and device errors contain sense data so the messages will be different and no valuable data of this nature should be lost. This function is automatically turned on.

8.3 Automatic Dump Analysis

This tool enables accelerated customer support with less customer dialog time. The Automatic Dump Analysis tool is capable of automatically examining a dump and pulling out (in text) interesting information for forwarding to IBM support as an e-mail attachment. This will allow dumps to be diagnosed without having to send the entire dump in, and will allow diagnosis activities to get an early start while we wait for large dumps to be sent in (via FTP or overnight tape delivery).

8.4 Error Log Retrieval API for Diagnostics

As part of the error log analysis performed by diagnostics, it currently calls the `errpt` command with the `-g` flag to get the raw data for each error log entry. This data is parsed and then put into a data structure for use by the calling application. AIX 5L provides the calling application an application programming interface (API) to get data from the error log. This new method for obtaining the data from applications is faster and cleaner compared to the `errpt raw` mode.

With this enhancement error reports will contain BOTH the error report and what the diagnostics analysis is. In the past, the error report only showed the error and a separate command was needed to see the diagnostic analysis. With this change the error report will include the diagnostic analysis for errors that have been analyzed. This may include such errors as disk errors, network controller errors, and other hardware errors. Diagnostic analysis will give some indication of whether the hardware needs replacing or the error may be safely ignored.

8.5 Dump Reliability Improvements

System dump capability has been improved to increase the reliability. The improvements will help to ensure that system dumps are consistent and reliable for easy problem determination.

As dumps approach 2GB in uncompressed state, there are increasing situations where dumps are incomplete or unavailable to Support Line. This improvement adds compression as soon as possible, and adds a cron job to estimate dump size and send an error message recommending a larger dump device when it is appropriate. Because paging space is the default dump device, this enhancement helps avoid the problem of insufficient paging space for dumps. The "snap" command is being modified to eliminate an additional copy of the dump when it gathers files for its image, thereby reducing the space required to take a snap image.

8.6 Generate Core Files without Requiring Process Termination

AIX 5L provides a capability to generate a core file for an application without requiring application termination. This capability helps increase the application availability as well as serviceability.

9.0 Development and Performance Tools

9.1 Performance Analysis Tools Enhancements

The Performance Analysis Tools in AIX 5L adds the following new tools:

- **truss** allows the tracing of all system calls made and signals received by a command or an existing process.
- **alstat** is a new tool which reports alignment exception statistics. This tool can be used to detect performance degradations caused by misaligned data or code.

A new set of APIs is available to provide access to Performance Monitor data on selected processor type such as 604, 604e, POWER3, POWER3-II, RS64-II and RS64-III.

In addition, the Performance Analysis Tools adds the following enhancements:

- **emstat** is a newly supported tool to report emulation exception statistics. It can be used to detect performance degradation caused by emulated code, for instance code compiled for POWER and running on latest PowerPC processors.
- **filemon** has been enhanced to process off-line trace files to allow reports from busiest systems to be processed as well.
- **gennames** is a newly documented utility which support off-line analysis of trace files by the filemon, netpmon, pprof and tprof analysis tools.
- **iostat** now provides adapter and system level throughput statistics.
- **netpmon** now can process off-line trace files to improve usability and scalability on larger systems. This tool has also been enhanced to support all current adapters.
- **rmss** is updated to support larger memory systems and the 64-bit kernel.
- **svmon** has been enhanced to support Workload Management tier, superclass and subclass reports. Additionally, it has been updated to support the 64-bit kernel.
- **topas** has been updated with NFS and SMP statistics, support for Workload Manager classes, and a new full screens for process and WLM views.
- **vmstat** has been enhanced with a new I/O view for displaying an alternative set of columns focused on I/O activity.

For AIX 5L on Itanium-based systems, tprof, gennames, and truss are available. Also, performance commands for AIX 5L on POWER and Itanium-based systems, such as iostat, vmstat, sar, prof, and gprof are available.

The following analysis tools are available on POWER only: emstat, alstat, filemon, fileplace, netpmon, pprof, rmss, svmon and topas.

The following tools have been withdrawn in AIX 5L: bf(bigfoot), bfrpt, stem and syscalls. Consult the man pages for svmon and truss for similar functionality supported by these tools.

9.2 Inventory Scout

Inventory Scout searches the user's system for microcode levels and compares those levels with an IBM database of latest levels. When used with web-based Microcode Discovery Service, an html report is generated for the user and includes links to the latest levels of microcode for the system (with exception of SP systems).

Inventory Scout gathers Vital Product Information (VPD) from the user's machine and when used with web-based VPD Capture Service uploads it to the IBM MRPD database. This VPD will be helpful in determining the correct components to ship when a Miscellaneous Equipment Specification (MES) upgrade is ordered.

9.3 Additional Administrative Tools

Several new enhancements for administrators have been added:

- An additional option with the sar command: the -d option provides useful statistics such as throughput and average queue depth. Many of these statistics were previously provided with the AIX "iostat" command. The new -d option is added to AIX 5L for compatibility with other UNIX operating systems.
- The "restore" command is enhanced to maintain the non-sparseness of the database files similar to the "tar" command. This command introduces a new flag "e" to maintain the sparseness of database files after they are restored. The new command option successfully generates the file(s) as "non-sparse" on output if specified and "sparse" by default if not specified.
- The startup and shutdown utilities have been expanded to now log their activities in much more detail when logging is enabled. This allows easier service and maintenance.

9.4 IBM AIX Developer Kit, JAVA™ 2 Technology Edition, Version 1.3.0

Java 2 Standard Edition V1.3 comes with a host of enhancements to Java classes and APIs, including the user interface, graphics, sound, networking and math libraries. Of course, IBM's implementations, which are fully compliant with J2SE 1.3, have these enhancements too. IBM AIX Developer Kit, Java™ 2 Technology Edition, version 1.3 has been engineered to with the following features to deliver high performance and scalability to the most demanding e-business applications:

- The latest version of Just-In-Time compiler version 3.6 with Mixed Mode Interpreter (for selective compilation of frequently executed code)
- Efficient management of large Java heaps through optimized object allocation and efficient garbage collection
- Efficient and granular lock implementation
- Efficient exploitation of native AIX threads
- Robust networking supporting a large number of concurrent connections

Other highlights of the IBM AIX Developer Kit, Java™ 2 Technology Edition, version 1.3 are:

- Remote Method Invocation-Internet Inter-Object Request Broker Protocol (RMI-IIOP) extends the base JAVA RMI to perform communication using the Common Object Broker Architecture (CORBA) standard Internet Inter-ORB Protocol (IIOP). For more information, see <http://www.ibm.com/java/jdk/rmi-iiop/index.html>
- Java Naming and Directory Interface (JNDI) provides a unified interface to enterprise directory services such as CORBA's Common Object Services Naming Service, the Java RMI Registry and Lightweight Directory Access Protocol (LDAP).
- Security - Java Authentication and Authorization Service (JAAS), a major security component, provides a security model for the Java platform, which permits access to Java controlled resources based on the identity of the user on whose behalf the Java program is running, rather than the source of the code.
- Re-engineered Java VM from IBM - One of the major aspects of the re-engineering is a separation of the code base into components, with clearly defined interfaces between them. With the re-engineering of the JVM, it is possible to add significant serviceability aids to the core of Java technology.
- JDBC/ODBC Bridge allows access to databases with ODBC drivers.
- Java Communications API version 2.0 allows Java applications to access RS232 serial ports and IEEE 1284 parallel ports. For more information, see <http://www.javasoft.com/products/javacomm/>.
- Java Plug-In allows applets running in AIX's Netscape Communicator 4.7x web browser to run using AIX Java version 1.3.0.
- IBM Big Decimal Extension adds decimal floating point extension to Java's BigDecimal class. For more information see <http://www.ibm.com/java/jdk/decimal/>.

Additional information about IBM AIX Developer Kit, Java™ 2 Technology Edition, version 1.3 is available at : <http://www.developer.ibm.com/java/j2/index.html>. IBM AIX Developer Kit, Java™ 2 Technology Edition, version 1.3 is also available on the web at <http://www.ibm.com/java/jdk/aix>

9.5 Expanded tar/cpio Formats

A new archive format "pax", compatible with the proposed IEEE POSIX 1003.2b standard, is added to the existing "pax" archive utility. This format is 64-bit ready, fully extensible and customizable by users for their own additional file information. It supports:

- large files with greater 2GB file size
- meta-data for internationalization to customize handling of files written in different code sets and character sets
- customer-specified meta-data per file or per archive to customize handling of file access, specify file ownership, control information displayed in the archive's table of contents, suppress undesired information, and govern handling of symbolic links

Furthermore, this archive format can even be read by older pax and tar utilities.

10.0 System Management

10.1 Hindi Enablement

AIX 5L adds basic enablement and locale support for Hindi. Hindi characters can be entered, viewed and printed from an RS/6000 workstation. This enablement provide printing capability for the following printers: 4332 Network Printer also called as Info Print 32 , 6400 Line Matrix Printer, and 4247 Multi-Form Printer. This support is initially on POWER only.

10.2 Additional Locales

New locales are introduced in AIX 5L. Most of these are variations of existing locales, but may have slight differences from a neighbor. For example, AIX currently supports de_DE and de_CH locales for Germany and Switzerland, but does not support de_AT for Austria nor de_LU for Luxembourg.

AIX 5L on Itanium-based systems is initially limited to ja-JP, Ja_JP, zh_TW, ru_RU.

10.3 Web-based System Manager

Web-based System Manager for AIX 5L represents a significant advance over previous releases by providing a new management console capable of managing multiple hosts. As in previous releases, Web-based System Manager applications can be accessed from PC-clients running Web-browsers such as Netscape Navigator or Microsoft® Internet Explorer that accept the Java plug-in. These applications can also be accessed either locally or remotely without a Web-browser on AIX 5L graphical workstations. The new functions include:

- A new unified management console for AIX 5L administration: Web-based System Manager provides a single console and application suite for AIX 5L running on RS/6000 POWER architecture and AIX 5L on Intel Itanium processors.
- Enhanced scalability of the graphical user interface: Web-based System Manager for AIX 5L includes a number of features to deal with large numbers of managed objects.
- Enhanced ease of management and usability: The AIX 5L version of Web-based System Manager further simplifies administrative tasks through improvements in task design, new user interface features and enhanced user assistance technology. This version also improves the accessibility of the console to users with disabilities.
- Simplified log on: The console and management infrastructure provides features to reduce the need to logon to multiple systems.

- Persistent and more flexible user customization options. Administrator preferences such as the choice of managed resources that are presented are customizable and persistent over management sessions.
- Dynamic monitoring, notification, and control: The Remote Monitor Control subsystem is a powerful and flexible monitoring system that supports dynamic status updates, e-mail notification, and unattended responses to system events. This function is available only on the POWER platform.

10.4 Web-based System Manager Application Support

A rich set of Web-based System Manager plug-ins will be shipped with AIX 5L. All of the application function of prior releases will be included with new functions and enhancements. The complete set of application functions will include:

- **Backups:** A task-oriented plug-in for performing back up and restores. Supported tasks will include backup and restore operations for the system (mksysb), volume groups, logical volumes, file systems, and individual files.
- **Custom Tools:** The Custom Tools plug-in enables users to add new tools to the Web-based System Manager console. Two types of tools can be defined: Web-tools and command tools. Web-tools are defined by a URL and launch a browser when invoked. Command tools refer to any action that can be invoked by a command on the managed host. This could be a simple AIX 5L command or an application program. Actions that generate their own user interface (e.g., a Motif-based application) can be launched as a custom tool only when the client is running on the managed host. Once defined, tools appear as icons in the Custom Tools container. The user can define unique icons and descriptive text for each tool.
- **Devices:** Displays the inventory of physical and logical devices and their status. Both physical (organized by system connections) and logical (categorical) views are provided. The Devices plug-in furthers error-free system management with significant design enhancements for RAID. New features include an easy to use PCI Hot Plug configuration wizard which allows quick configuration of all PCI Hot Plug devices within your system.
- **File Systems:** This plug-in permits the management of Journaled File System, JFS2, CD-ROM file systems, Network File System, and Cache File Systems.
- **Network:** The Network plug-in provides user interfaces for configuring and managing network communications. It includes configuration and management of TCP/IP, PPP, NIS, NIS+, and Virtual Private Networks (VPN). The SNMP plug-in provides both SNMP configuration and monitoring capabilities.
- **Network Install Manager (NIM):** The NIM plug-in performs network installations of the base operating system and applications. NIM includes the ability to define groups of machines for common install operations. This function is initially available only on the POWER Platform.
- **PC Services:** PC Services enables AIX 5L to provide file and print services to Microsoft Windows™ using the IBM Fast Connect server.
- **Printers:** A choice of either of two print subsystems will be provided with AIX 5L for POWER. With the traditional AIX print subsystem, plug-ins are provided for managing printers, print servers, queues and jobs. In addition, a limited set of functions are available for the new System V print subsystem. Only the SVR4 print subsystem is supported on AIX 5L for Itanium-based systems.

- **Processes:** With the Processes plug-in, administrators can view details, kill and reprioritize executing processes. Processes may be displayed in a sortable and filterable table or in a tree that shows child-parent relationships.
- **Software:** The software plug-in allows the administrator to view installed software, reject or commit installed software, and to install new software.
- **System Environments:** The System Environments plug-in provides access to basic operating system properties and utilities such as time and date, language utilities, and shutdown.
- **Users and Groups:** The Users and Groups plug-in provides management capabilities for users, groups, and administrative roles. The users and groups plug-ins can be used to define and manage disk quotas.
- **Volumes:** This release will include several significant enhancements which will allow the administrator to designate disks as "hot spares" for volume groups, thus minimizing the need to bring the system down due to a disk failure, manage and monitor disk I/O bottlenecks for increased system performance with "Hot Spot Management", and dynamically de-allocate paging spaces which will reduce system downtime. Additional enhancements are included in the volumes application for those working with "Big" Volume Groups.
- **Workload Manager:** Workload Manager helps ensure that executing processes obtain the appropriate level of access to system resources such as memory, CPU, and disk I/O. AIX 5L Workload Management will include a number of significant enhancements over prior releases.
- **Monitoring:** The Monitoring plug-in is for the management of the RSCT (Reliable Scalable Cluster Technology) subsystem. With the plug-ins contained in this application, the administrator can view, modify, or create new conditions to monitor and new responses to conditions. The Events plug-in provides a convenient log of events that have occurred on the managed system. This function is available only on the POWER platform.

10.5 Accessibility (CI162) Enablement to Web-based System Manager Framework and Applications

Work is being done to make Web-based System Manager more accessible to users with disabilities. It includes:

- Exploitation of the Java Accessibility APIs
- Providing improved keyboard support, including menu shortcuts and mnemonics, allowing the user to use Web-based System Manager without a mouse
- Setting focus and providing keyboard navigation in dialogs
- Providing text descriptions for all icons and labels in Web-based System Manager

These enhancements are intended to start making Web-based System Manager compliant with the new requirements of the Rehabilitation Act Amendments of 1998, Section 508: Electronic and Information Technology, which requires US Federal Government agencies to procure and deploy accessible computer software and hardware. Section 508 compliance is planned to become a requirement for Federal bids beginning in mid-2001.

11.0 Interoperability

11.1 Fast Connect File and Print Services

AIX Fast Connect, initially on POWER only, adds file and print serving for Windows® and OS/2® clients to AIX 5L. It supports widely used SMB/CIFS protocol using TCP/IP. Windows and OS/2 clients come enabled for SMB/CIFS over TCP/IP i.e. no add-on software is needed for the client PCs.

AIX Fast Connect release 3.0 includes significant new function, manageability enhancements, increased performance and Windows 2000 support. Furthermore, it now implements User Name mapping i.e. Client User Names are not required to be same as AIX 5L user names. This feature accommodates clients user naming rules which could be different from AIX 5L. AIX Fast Connect maintains name mappings which can be configured from command line or SMIT. This feature supports mapping of multiple PC user names to single AIX 5L user name giving flexibility to the administrator in managing access of resources on AIX 5L.

NT password encryption support is now added, which offers higher level of security by allowing mixed case and longer passwords. AIX Fast Connect DCE/DFS integration feature now supports encrypted passwords in addition to plain text passwords which offers higher security and eliminates the need for modifying Windows clients to enable plain text passwords.

This release of AIX Fast Connect adds support of Windows Terminal Server (WTS). WTS makes Windows 2000 server multi-user. In addition, WTS can also map network drives to AIX 5L using Fast Connect thus provide access to AIX 5L resources to its own clients.

AIX Fast Connect servers are enhanced to provide detailed information about connected sessions including files open by individual users. An administrator can force a session to close or even a file to close. This function is supported through the command line. Graphical access to these functions provided through Web-based System Manager. Further manageability enhancements include Web-based System Manager for AIX 5L support, which makes managing Fast Connect easier.

Number of options which used to be server wide, now can be configured on per share basis offering additional flexibility to the administrators.

Number of performance enhancements are added. Most significant is directory search caching. Search requests are one of the most expensive operation, in terms of system resources. Therefore, based on customer environment, it can show significant performance increase.

AIX Fast Connect now supports share level security which some of the existing AIX Connections customers use and now require in Fast Connect. Capability to send messages to PC clients, is added as well.

11.2 Linux Affinity

With this release starts the enhancements aimed to make moving between Linux and AIX 5L as simple as possible. The AIX 5L binaries for the most common Linux and Open Source utilities, applications, and libraries, including such packages as RPM, GNU tools, Apache, GNOME, KDE, and Samba are planned to be available via the Web in December 2000.

[12.0 Publications](#)

The current documentation library contains information common to both the POWER and Itanium-based platforms, as well as information specific to one platform or the other.

The following books are new additions to the documentation library:

- Performance Management Guide
- Reliable Scalable Cluster Technology Resource Monitoring and Control Guide and Reference
- Web-based System Manager Administration Guide
- Device Driver Kit for the Itanium-based platform

Publications can be viewed using the Documentation Library Service which offers easier access to online documentation with a single integrated graphical user interface. This capability is available only on POWER and in English in the initial release of AIX 5L. This user interface allows users to read, navigate, and search online HTML documentation. Also supported is the capability to print a complete book version of HTML format currently shipped with AIX. This serves customers who want to view books online as well as read documents in hard copy format.

[13.0 Bonus Pack and Expansion Pack](#)

Currently the initial release of AIX 5L will not ship a Bonus Pack for either POWER or Itanium-based systems. However there are AIX 5L Expansion Packs.

AIX 5L Expansion Packs complement the operating system by providing encryption support, a browser to view on-line html publications and a http server to serve on-line publication pages and support Web-based System Manager. One Expansion Pack is included with every shipment of AIX 5L when media is selected.

The AIX 5L initial release for POWER Expansion Pack contains:

Encryption Support For SecureWay Directory Version 3.2 which includes:

- **SecureWay-SSL Version 4.0** which provides 56-bit encryption
- **SecureWay Directory Server and Client Utilities for Maximum Encryption Version 3.2** which provides 128-bit and Triple DES encryption
- **SecureWay Directory Client Software Developer Kit (SDK) Encryption Version 3.2** which provides 40-bit, 56-bit, and 128-bit encryption for the IBM SecureWay Directory Version 3.2 SDK supporting Java Naming and Directory Interface (JNDI)
- **Network Authentication Service Version 1.1** is a network authentication protocol based on the IETF RFC 1510 standards protocol for "The Kerberos V5 Network Authentication Service" includes the Generic Security Service Application Program interfaces (GSS-API) and the key distribution center (KDC) server which allows AIX 5L middleware and external application writers to use authenticated message flow between their respective components.
- **IBM IP Security Version 5.0** provides encryption for 56-bit, and Triple DES support for the AIX 5L IP security enhancements.
- **AIX Certificate And Security Support Version 5.0** provides support for the AIX 5L IP security enhancements for the storage of certificates.

- **Web-based System Manager Security Version 5.0** 128-bit encryption. Helps provide for the secure operation of the Web-based System Manager servers and clients. Based on Public Key encryption, the Secure Socket Layer (SSL) protocol, and standard AIX 5L login security.
- **Netscape Communicator 4.75** with 128-bit encryption. Components of Netscape Communicator include: Netscape Navigator®, Netscape Messenger™ (Netscape Mail), Composer™ (Netscape Web page publishing), and Newsgroups.
- **IBM HTTP Server Version 1.3.12**, (powered by Apache). IBM has enhanced the Apache HTTP Server with performance and SSL for secure transactions. And when serving static content, the HTTP Server may also see up to 40% performance improvement when used with the in-kernel HTTP Get Engine in AIX 5L.

The AIX 5L initial release for Itanium-based systems Expansion Pack contains:

- **Netscape Communicator 4.75** with 56-bit encryption. Components to of Netscape® Communicator include: Netscape Navigator® Netscape Messenger™ (Netscape Mail), Composer™ (Netscape Web page publishing), and Newsgroups.
- **Apache HTTP Server Version 1.3.12**

14.0 Technical Information

AIX 5L for POWER supports systems with at least 64 MB of physical memory, 512 MB of initial disk paging space, and requires 344 MB disk storage for the operating system for a total of 856 MB of disk storage.

AIX 5L for Itanium-based platforms supports systems with at least 128 MB of physical memory, 512 MB of initial disk paging space, and requires 384 MB disk storage for the operating system for a total of 896 MB of disk storage.

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