AIX, VIOS and HMC
Facts and Features

Ravi G Singh
Consulting IT Specialist – System p
rsingh@us.ibm.com

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AIX 6.x and 5.x Facts and Features

Announcement/Offering	5.1	5.2	5.3	6.1
General availability	2001-05-04	2002-10-18	2004-08-20	2007-11-06
Withdrawn from marketing	2005-04-29	2008-07-08	TBA	TBA
Withdrawn from support	2006-04-01	2009-04-30	TBA	TBA
Latest Technology Level (TL)	5100-09	5200-10	5300-08	6100-01
Price included with H/W	Yes	Yes	No	No

Hardware Support	5.1	5.2	5.3	6.1
POWER6	N	Y-p570	Y	Y
POWER5	N	Y	Y	Y
POWER4	Y	Y	Y	Y
POWER3	Y	Y	Y	N
PowerPC970	Y	Y	Y	Y
RS64, 604	Y	Y	Y	N
Kernel Support UP & MP – Note 28 and 35	32b, 64b UP & MP	32b, 64b UP & MP	32b, 64b MP	64b MP
CHRP	Y	Y	Y	Y
PCI and MCA	Y	N	N	N
Max. Processors	32	32	64-P5 & P6	64-P5 & P6
HMT	Y	Y	N	N
SMT	N	N	Y-P5, P6	Y-P5, P6
CUoD				
Permanent	Y	Y	Y	Y
Mobile - SOD	N	N	N	Y
CoD - Temporary				
Utility CoD	N	N	Y	Y
Reserve CoD for shared proc pool	N	N	Y	N
On/Off CoD post pay	Y	Y	Y	Y
Trial CoD	Y	Y	Y	Y
Capacity BackUp (CBU)	Y	Y	Y	Y
Vector Support (AltiVec)	N	N	Y-P6	Y-P6
Decimal Floating Point	N	N	Y-P6	Y-P6

Virtualization	5.1	5.2	5.3	6.1
Micro-partitions max.-Note10	N	N	254-P5	254-P5, P6
Virtualization – Processors, Memory, IO, Network and storage	N	N	Y-P6,P5	Y-P6,P5
Dedicated Processor Sharing	N	N	Y-P6	Y-P6
Multiple Shared processor pool	N	N	Y-P6	Y-P6
Virtual Partition memory or Shared Memory pool - SOD	N	N	N	Y-P6
Virtual I/O server	N	N	Y	Y

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IBM Virtualization Manager				Y
Integrated Virtualization Manager (IVM) – Note 24	N	N	Y-P5	Y
Partition Load Manager (PLM)	N	Y-ML F	Y	N
Virtual Ethernet – Note 13	N	N	Y-P5	Y
Integrated Virtual Ethernet (IVE) – Note 38	N	N	Y-P6	Y-P6
WPARs (Max 8192 active)	N	N	No	Y>=P4
WPAR Manager	N	N	N	Y
Live Applicatiion Mobility	N	N	N	Y>=P4
Live Partition Mobility	N	N	Y-P6	Y-P6
Partition Hibernation - SOD	N	N		

LPAR	**5.1**	**5.2**	**5.3**	**6.1**
DLPAR-Processors, Memory and I/O slots	N	Y	Y	Y
Multiple Instances of AIX on a Single rootvg – Note23	N	N	Y	Y
Maximum LPARs – Note10	32	64	254	254
Max. Virtual processors/LPAR - Note 19	N	N	64	64
Min. memory/LPAR in MB-Note12	256	256	128	128
Memory incr./decrement in MB	256	256	16	16
Application & LPAR Accounting	N	N	Y	

I/O	**5.1**	**5.2**	**5.3**	**6.1**
Infiniband (PCI & GX) – Note 22	N	N	Y-64b	Y
PCIe	N	Y-p570	Y	Y
PCI-X	Y	Y	Y	Y
High Performance Switch (HPS)	N	Y	Y	
IP over FC, iSCSI	N	Y-ML03	Y	Y
MPIO	N	Y	Y	Y
DMP-IO SCSI	N	Y	Y	
Virtual I/O and Ethernet	N	N	Y	Y
I/O Drawer Dynamic Configuration	N	N	Y	Y

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MEMORY	5.1	5.2	5.3	6.1
Max. Real Server Memory in GB-Note10	512	1024	2048-64b 96-32b	4096
Max Memory supported	16TB	16TB	16TB	32TB
4KB, 64KB, 16MB & 16GB Memory page – Note 26	N	Y	64b-Dynamic	Dynamic
Dynamic Variable page size (4K to 64K) for data, heap, stack and shared memory	N	N	N	Y-P6
CUoD (Permanent) – P4, P5, P6	N	Y	Y	Y
Reserve CoD	N	N	N	N
On/Off CoD post pay – P5, P6		Y	Y	Y
Trial CoD) – P4, P5, P6		Y	Y	Y
Capacity BackUp (CBU)	Permanent	Permanent	Permanent	N
Address Space segments	Unlimited	Unlimited	Unlimited	Unlimited
Data heap Segment size in GB – Note 33	2	3.25	3.25-32b Pbytes-64b	3.25-32b Pbytes-64b
Program size in 256MB segments	10	13	13-32b 64M-64b	13-32b 64M-64b

System Management & RAS	5.1	5.2	5.3	6.1
WLM- CPU, Memory, I/O - TOD Management	N N	Y Y	Y Y	Y Y
Multiple instances of AIX in one rootvg (multibos)	N	N	Y	Y
Thin Server & Common boot image – Note30	N	N	Y	
NIM GUI Installer	Y N	Y N	Y N	Y+NFS4 Y
Dump analysis	Y	Y	Y	Y
Live System Dump – Note 34 Mini Dump Parallel Dump Component Dump & dumpctrl FW assisted dump Systemp dump on reset	N	N	 Y Y N N Y	 Y Y Y-P6 Y Y
DVD Support for system dump	N	N	Y	Y
Probevue	N	N	N	Y
System hang detection	Y	Y	Y	Y
Dynamic Processor deallocation	N	Y	Y	Y
Dynamic Processor sparing	N	Y	Y	Y
Kernel Recovery (4KB stack/ thread, 64KB stack/processor	N	N	N	Y
Concurrent AIX Updates – eFix	N	N	N	Y
Concurrent Firmware upgrade	N	Y-P5	Y-P5 & P6	Y-P5 & P6
EEH	Y	Y	Y	Y
FFDC enhancements - LMT, CT®, and RTEC – Note 37	N	LMT	Y	Y
FFDC OS	N	N	Y	Y
Processor instruction retry	N	Y-P6	Y-P6	Y-P6
Alternate Processor recovery	N	Y-P6	Y-P6	Y-P6
Cold Node repair - Note 43	N	N	Y-P6	Y-P6
Hot Node Add - Note 43	N	N	Y-P6	Y-P6
Hot node repair - Note 43	N	N	Y-P6	Y-P6

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PCI adapter hot swap	Y	Y	Y	Y
Dynamic bit-steering (Sparing)	N	N	Static-P5	Y
Memory page deallocation	N	N	Y	Y
Memory/Storage Keys Application	N	N	Y-P6	Y-P6
Memory/Storage Keys Kernel	N	N	N	Y-P6

X11/CDE	**5.1**	**5.2**	**5.3**	**6.1**
X Release	X11R6.1	X11R6.1	X11R6.1	X11R7.1
GNOME Desktop	N	N	Y-V2.4	

TCP/IP and networking	**5.1**	**5.2**	**5.3**	**6.1**
IP	V4/V6	V4/V6	V4/V6	V4/V6
IPv6 RFC 4007 and RFC 4443	N	N	N	Y
DHCP			V4/V6	V4/V6
Sendmail	8.11.0	8.11.0	8.13.14 8.11.6p2	8.13.14
BIND	8.8.0, 4.9.3	9.02.0, 8.8.0, 4.9.3	9.02.0, 8.8.0	9.02, 8.8
Multipath routing and DGD, VIPA	Y	Y	Y	Y
SLP V2 and SCTP – Note 3	N	N	Y	Y
SNMP	V1	V3	V3	V3
NFS NFSV3 with Kerberos (krb5, krb5i, and krb5p) NFS-statd Threading AutoFs Network Caching daemon netcd CIO & DIO for client NFS Proxy Serving with Caching	V2 & 3 N Mutli Mutli N N N	V2 & 3 N Mutli Mutli N N N	V2,3 & 4 Y Mutli Mutli N Y-V3, V4 Y	V2,3 & 4 Y Mutli Mutli Y Y-V3, V4 Y
Max for thewall	Note 6	Note 6	Note 6	Note 6
Max. no. of interfaces for ENT	1024	1024	No limit	No limit
Isno tuning level	interface	interface	interface	interface
Etherchannel (EC) Dynamic Adapter membership – Note 44	N	Y	Y	Y
Max no. of ENT adapters per EC	8	8	8	8
Max no. of EC per system	8	8	256	256
Network Data Administration Facility (NDAF)	N	N	Y	Y
TLS (Secure ftpd RFC 4217)	N	N	N	Y
RFC1323 enabled by default – Note 42	N	N	N	Y
Default biod daemons	6	6	6	32
IGMPv3 RFC3376 – Note39	N	N	N	Y
IP over Fibre Channel	N	Y	Y	Y

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Security & Compliance	5.1	5.2	5.3	6.1
CAPP/EAL4+ - Note31	N	Y	Y	Y
LSLPP/EAL4+ - Note31		Y	Y	Y
UNIX03	N	Y-ML04	Y	
UNIX98 & C99		Y		
ISO/IEC 9899:1999		Y	Y	
IEEE 1003.1-2001		Y	Y	
PAM		Y	Y	
Kerberos		V5	V5	V5
POSIX Realtime API	N	Y-ML03	Y	
No. of logged users max			32,767	
User/group name length (chars)	8	8	255	255
Max. Group line length (chars)	16000	16000	16000	16000
Password length (chrs)	8	8	Upto 255	Upto 255
Loadable Password Algorithm (LPA) - Note 40	N	N	Y	Y
RBAC	N	N	N	Y
Stack Execution Disable (SED)	N	N	Y	Y
Trusted AIX	N	N	N	Y
AIXPert SOX-COBIT compliance	N N	N N	Y N	Y+LDAP Y
Trusted Execution (TE)	N	N	N	Y
Secure by Default (SbD)	N	N	N	Y
File Permissions Manager (fpm)	N	Y	Y	Y
Encryption Support	PKCS11, CCS	PKCS11, CCS	PKCS11, Crypto Lib	PKCS11, Crypto Lib
Network Authentication Service RFC 1510	N	N	N	Y-1.4.0.7

LVM	5.1	5.2	5.3	6.1
Max PVs in a VG	128	128	1024	1024
Max LVs in a VG – Note 5	512	512	4095	4095
Max LPs/LV	32,512	32,512	32,512	32,512
Max PPs/disk	Note 5	Note 5	Note 5	Note 5
PP Size in GB	1	1	128	128
Max PPs/VG	130,048	130,048	2048K	2048K
Hot spare disk in a VG	Y	Y	Y	Y
Logical Track Grp Size (LTG) KB	128-1024	128-1024	Variable	Variable
AIO – Legacy and POSIX command to tune	Legacy lsattr	Both lsattr	Both aioo	Both ioo
Paging space Increase/Decrease	Incr only	Both	Both	Both
Paging space garbage collection - Note 41	N	N	Y	Y
Boot image Size – Note 27	12MB	12MB	32MB	32MB

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FILE SYSTEM	5.1	5.2	5.3	6.1
Filesystem Architectural Max	4PB	J2-4PB J-16TB/64b J-1TB/32b	J2-4PB	J2-4PB
Filesystem Max tested – Note 20	J2-1TB J-1TB	J2-16TB J-1TB	J2- 32TB	J2- 32TB
File Size Architectural Max		J2-1PB J-64GB	J2-1PB J-64GB	J2-1PB J-64GB
File size Max tested	J2-1TB J-64GB	J2-16TB J-64GB	J2-16TB J-64GB	J2-16TB J-64GB
File Descriptors or open files	3,145,728	3,145,728	3,145,728	
File Descriptors/process	32,768	65,534		
Max. sub directories/dir–J & J2	32, 766	32, 766	32, 766	
Max file system i-nodes for j2	Dynamic	Dynamic	Dynamic	Dynamic
JFS and JFS2 – Note 20	Both	Both	Both	Both
JFS2 Quota	N	N	Y	
JFS2 Shrink	N	N	Y	Y
RAM disk or cachefs in GB	2	> 2	> 2	> 2
Outline JFS2log Max Inline JFSl2og Max	1GB 32MB	Dynamic 32b-1GB 64b-64GB 256KB to 16GB	Dynamic	Dynamic
Disable JFS2 logging	N	N	N	Y-J2
Snapshot generations	15	15	15	64
CDROM FS DVDRAM FS	Y N	Y Y	Y Y	Y Y
Freeze and Thaw – Note 29	N	N	Y	
Encrypted File system (EFS)	N	N	N	Y-J2

SEMAPHORES	5.1	5.2	5.3	6.1
Max Semaphore IDs	131,072	131,072	128K-32b 1024K-64b	128K-32b 1024K-64b
Max Semaphores per semph. ID	65,535	65,535	65,535	65,535
Semaphore Max value	32,767	32,767	32,767	32,767
MESSAGE QUEUES				
Max Message size	4MB	4MB	4MB	4MB
Max bytes on queue	4MB	4MB	4MB	4MB
Max message queue IDs	131,072	131,072	128K-32b 1024K-64b	128K-32b 1024K-64b
Max messages per queue ID	524,288	524,288	524,288	524,288
SHARED MEMORY				
Max Segment size , 32b process	2GB	2GB	2GB	2GB
Max Segment size , 64b process	64GB	1TB	1TB-32b 32TB-64b	1TB-32b 32TB-64b
Max Shared memory IDs	131,072	131,072	128K-32b 1024K-64b	128K-32b 1024K-64b
Max segments/process 64b	268435456	268435456	268435456	268435456
Max segments/process 32b	11	11	11	11

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KERNEL/PROCESS/TUNING	5.1	5.2	5.3	6.1
Max Threads/process	32,767	32,767	32,767	32,768
Limit max Threads/process and max processes/user (chuser and ulimit commands)	N	N	N	Y
Max Processes/system		256,000		
Memory/Storage Keys Application	N	N	Y-P6	Y-P6
Memory/Storage Keys Kernel	N	N	N	Y-P6
Resources (/etc/security/limits) CPU time File size Stack Size Memory Size Open Files Data Size Core Size		 2^31-1 4,194,303 523,264 2^31-1 2^31-1 4,194,303 2^31-1	 2^31-1 2^31-1 2^31-1 2^31-1 2^31-1 2^31-1 2^31-1	
Restricted tuneables – Note 34	N	N	N	Y
Out of the box Perf Tuning VMM, AIO and Oracle – Note36	N	N	N	Y
Solution Performance Tuning – Note 36	N	N	N	Y
I/O Pacing tuning level	System	System	Filesystem	Filesystem
I/O pacing enabled by default	N	N	N	Y
minpout/maxpout	0/0	0/0	0/0	4096/8192
minperm/maxperm/maxclient	20/80/80	20/80/80	20/80/80	03/90/90
lru_file_repage page_steal_method	1 0	1 0	1 0	0 1
Memory Affinity (To disable vmo -o memory_affinity=0)	N	Y	Y	Y
Max. no. of devices – Note 32		5K	25K	25K
ksh	ksh93/ ksh88	ksh93/ ksh88	ksh93/ ksh88	ksh93/ ksh88

Expansion pack/Web download /Documentation – Note9	5.1	5.2	5.3	6.1
RSCT	NA	2.3.9.0 2.3.7.1	2.4.5.0 2.4.3.1	2.5.0.0
OpenSSH	3.8.0.0	4.3.0.52 4.1.0.52, 3.8.0.52, 3.7.0.52	4.3.0.53 4.1.0.53, 3.8.0.53	4.5.0.53
Adobe Acrobat Reader	5.09	5.09	N/A	N/A
IBM HTTP Server 128-bit	1.3.19.4	2.0.47.1, 1.3.19.4	2.0.47.1	2.0.47.1
Netscape Communicator 128-b	4.8	4.8/7.0	7.0	
Mozilla Mozilla FireFox 64b	1.7.5, 1.4.2	1.7.13, 1.7.5, 1.4.2 1.5.0.6	1.7.13, 1.4.2 1.5.0.6	1.17.13 1.5.0.12
Cryptographic Library	NA	5.2-256-bit	5.3	6.1

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Perl	5.6.0	5.8.0	5.8.2	5.8.2
Documentation Library	Y	Y	Y	
AIX Information Center	Y	Y	Y	Y
IBM Director Server IBM Director Console IBM Director Agent	N N N	5.1 5.1 5.2, 5.1	5.2, 5.1 5.1 5.2, 5.1	5.2
IBM Systems Director Console	N	N	N	Y
Active Energy Manager (AEM)	N	N	3.1-P6	3.1-P6
Service Agent	3.3	3.3	3.3	6
JDK				
Supported Version/Release	142, 131	5, 142, 131	5, 142, 131	6, 5, 142

Licensed Software Support	**5.1**	**5.2**	**5.3**	**6.1**
VisualAge C++	6.0.0/5.0.2	6.0.0/5.0.2	6.0	
XL C/C++	8.0, 7.0	9.0, 8.0, 7.0	10.1, 9.0, 8.0, 7.0	10.1
C for AIX	6.0.0/5.0.2	6.0.0/5.0.2	6.0	
XL C	8.0, 7.0	9.0, 8.0, 7.0	10.1, 9.0, 8.0, 7.0	10.1
XL Fortran	10.1, 9.1, 8.1, 7.1.1	11.1, 10.1, 9.1, 8.1, 7.1.1	12.1, 11.1, 10.1, 9.1, 8.1.1	12.1
COBOL	2.0	2.0	2.0	
PL/1	2.0	2.0	2.0	
AIXlink/X.25	2.1	2.1, 2.0.2	2.1, 2.0.2	2.1
AIX Fast Connect	3.2.0, 3.1.2	3.2.0, 3.1.2	3.2.0	3.2.0
Communication Server	6.1	6,3, 6.1	6.3, 6.1.0.5	
DCE	3.1-32b	3.2, 3.1-32b	3.2	
DFS			3.1	
CSM-Mgmt. Server – Note25 CSM-managed Nodes – Note 25	N >=1.3	1.6, 1.5, 1.4.1, 1.3.3 1.6, 1.5, 1.4.1, 1.3.3	1.6, 1.5, 1.4.1, 1.3.3 1.6, 1.5, 1.4.1, 1.3.3	1.7-P6
GPFS Ver Max Filesystem size – Note 7	2.1	3.1,2.3, 2.2, 21	3.1, 2.3	3.2.1-P6
PSSP – Note17	3.4 or 3.5	3.5	N	N
HACMP	5.2, 5.1, 4.5, 4.4.1,	5.4, 5.3, 5.2, 5.1, 4.5	5.4, 5.3, 5.2, 5.1	5.4, 5.3
eWLM Server Agent	N	N 2.1	2.1 2.1	

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AIX 4.x Facts and Features

Announcement/Offering	4.1.4/5	4.2.0	4.2.1	4.3.1	4.3.2	4.3.3
General availability	25-Apr-97		25-Apr-97	24-Apr-98	23-Oct-98	17-Sep-99
Withdrawn from marketing	31-Dec-98		31-Dec-99		Sep-99	30-Jun-03
Support withdrawn	31-Mar-99		31-Mar-00	31-Dec-01	31-Dec-01	31-Dec-03
Latest Maintenance Level (ML)						4330-11
Hardware Support						
CHRP	Y	Y	Y	Y	Y	Y
PCI, MCA	Y	Y	Y	Y	Y	Y
LVM						
Max PVs in a VG	32	32	32	32	128	128
Max LVs in a VG	256	256	256	256	512	512
Max PPs/disk	1016	1016	Note 5	Note 5	Note 5	Note 5
Max PPs/LV						
Max Major nos.	256	256	256	256	256	
Max VMM Mapped devices	512	512	512	512	512	
Hot spare disk in a VG						No
Logical Track Grp Size (LTG) KB						128
AIO	Legacy	Legacy	Legacy	Legacy	Legacy	Legacy
Paging space Increase/Decrease	Incr only	Incr only	Incr only	Incr only	Incr only	Incr only
FILE SYSTEM						
Filesystem Architectural Max	64GB	128GB	1TB	1TB		1TB
Filesystem Max tested						1TB
File Size Architectural Max	2GB	64GB	64GB	64GB	64GB	64GB
File size Max tested						64GB
File Descriptors or open files	200,000	200,000	200,000	1000,000	1,048,576	1,048,576
File Descriptors/process	2,000	2,000	2,000	32,767	32,767	32,768
Max file system inodes			2^24	2^24		
Max file system fragments			2^28	2^28		
JFS and JFS2	JFS	JFS	JFS	JFS	JFS	JFS
RAM disk or cachefs in GB						2
Outline JFSlog Max	256MB	256MB	256MB	256MB	256MB	1GB
Inline JFSlog Max						32MB
MEMORY						
Real Memory	2GB	4GB	4GB	16GB	32GB	96GB
Size of Executable in Bytes				7*2^56		
Size of Text, Data & BSS in Bytes				7*2^56		
Symbol Values (address)	2^32	2^32	2^32	2^64		
Address Space segments	256MBx16	256MBx16	256MBx16	256MBx16	256MBx16	256MBx16
Data heap Segment size	2GB	2GB	2GB	2GB	2GB	2GB
Program size in 256MB segments	10	10	10	10	10	10
SEMAPHORES						
Max Semaphore IDs	4,096	4,096	4,096	4,096	131,072	131,072
Max Semaphores per ID	65,535	65,535	65,535	65,535	65,535	65,535
Semaphore Max value	32,767	32,767	32,767	32,767	32,767	32,767

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Announcement/Offering	4.1.4/5	4.2.0	4.2.1	4.3.1	4.3.2	4.3.3
MESSAGE QUEUES						
Max Message size	65,535	65,535	65,535	65,535	4MB	4MB
Max bytes on queue	65,535	65,535	65,535	65,535	4MB	4MB
Max message queue IDs	4,096	4,096	4,096	4,096	131,072	131,072
Max messages per queue ID	8,192	8,192	8,192	8,192	524,288	524,288
	4.1.4/5	**4.2.0**	**4.2.1**	**4.3.1**	**4.3.2**	**4.3.3**
SHARED MEMORY						
Max Segment size , 32-bit	256MB	256MB	256MB	2GB	2GB	2GB
Max Segment size , 64-bit	NA	NA	NA	2GB	2GB	2GB
Max Shared memory IDs	4,096	4,096	4,096	65,538	131,072	131,072
Max segments/process 64b						268435456
Max segments/process	10	10	10	11	11	11
Min. segment size	1	1	1	1	1	1
KERNEL/PROCESS						
Max Kernel Threads/process	512	512	512	32,767	32,767	32,767
Max Threads/System			262,143	262,143		512,000
Max processes/user	65,538	65,538	131,072	131,072	131,072	
Max Processes/system	131,072	131,072	131,072	131.072	131,072	170,000
Max concurrent groups/process	32	32	32	32	32	32
Max for thewall	64MB	64MB	64MB	128MB	Note6	Note6
ksh			ksh88	ksh88	ksh88	ksh88
Core File naming	core	core	core	core	core	core
TCP/IP and networking						
IP	V4	V4	V4	V4/V6	V4/V6	V4/V6
Sendmail		8.7	8.7	8.8.8	8.8.8	8.9.3
BIND			4.9.3	8.1.1	8.8	
Multipath routing and DGD, VIPA	No	No	No	No	No	No
SNMP	V1	V1	V1	V1	V1	V1
NFS-statd Threading AutoFs						Single Single
X11						
X Release						X11R6.1
Security						
C2		Yes	Yes	Yes	Yes	Yes
JDK						
Supported Version/Release						131, 130, 122, 118
New Features/Enhancements						
WLM- CPU, Memory I/O						Y N
Bonus and Expansion Pack						
Adobe Acrobat Reader IBM HTTP Server 128-bit Netscape Communicator 128-b JDK Cryptographic Library						4.05 1.3.12.4 4.79 1.3.1 5.5.3.75

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Licensed Software Support						
VisualAge C++ C for AIX XL Fortran AIXlink/X.25 AIX Fast Connect Communication Server DCE						6.0/5.0/3.6 8.1/7.1.1 3.1.1 6.1

VIOS Facts and Features

Features	V1.1	V1.2	V1.3	V1.4	V1.5
General availability	2005.04	2005.10	2006.07	2007.06	2007.11
Latest Fix pack					2.1
Hardware Support					
P6	N	N	N	Y	Y
P5	Y	Y	Y	Y	
P4, P3	N	N	N	N	N
JS21	N	Y	Y	Y	
AIX	5.3	5.3	5.3	>=5.3	>=5.3
Virtualization					
Dedicated LPAR Shared Processor LPAR	Y Y	Y Y	Y Y	Y Y	Y Y
Multiple Shared Processor pools	Y	Y	Y	Y-P6	Y-P6
Shared Dedicated processor Capacity	Y	Y	Y	Y-P6	Y-P6
Integrated Virtualization Manager – Note 38	Y	Y	Y	Y	Y
IVM – DLPAR (Proc & Memory)	N	N	Y	Y	Y
IVM - IVE,+ Dedicated I/O + New features	N	N	N	N	Y
Shared Ethernet	Y	Y	Y	Y	Y
SEA Failover	N	Y	Y	Y	Y
VSCSI disk image (cpbd)	N	N	N	N	Y
VSCSI for LUN and LV	Y	Y	Y	Y	Y
VSCSI for Filesystem	N	N	N	N	Y
Virtual Ethernet	Y	Y	Y	Y	Y
Network bandwidth apportioning for SEA	N	N	N	N	Y
IPV6	N	N	N	N	Y
GVRP (GARP VLAN Registration Protocol	N	N	N	Y	Y
Live Partition Mobility	N	N	N	Y	Y
Maximum VIOS	10	10	10	10	10
LDAP	N	N	N	Y	Y
SNMP	N	N	N	Y	Y
SPT	N	N	N	Y	Y
CIM (Common Inf. Model)	N	N	N	Y	Y
Expansion Pack	N	N	N	N	Y
SAS and SATA	N	N	N	Y	Y

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Features	V1.1	V1.2	V1.3	V1.4	V1.5
System Management					
Performance Management topas, viostat, fcstat, svmon, vmstst	N	N	Y	Y	Y
IBM Tivoli Integration - TSM, ITUAM, TADDM, ITM, TPC – Tivoli Productivity Center	N	N	N	N	Y
Browser based HMC GUI	N	N	N	Y	Y
Storage Support nSeries, NetApp, iSCSI and Fibre Channel attach	N	N	N	Y	Y
SAS and SATA	N	N	N	Y	Y

IBM Tivoli Integration:
IBM Tivoli Monitoring
IBM Tivoli Storage Manager
IBM Tivoli Usage and Accounting Manager
IBM Tivoli Application Dependency Discovery Manager
IBM Tivoli Productivity Center

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HMC and Firmware Facts & Features

HMC Code	V3R3.x	V4R5.x	V5R1.x	V5R2.x	V6R1.x	V7R3.x
General availability	2005.07.12	2005.06.06	2005.10.14	2006.02.28	2006.08.22	2007.06.10
Latest Maintenance Level (ML)	R3.7 2006.03.31	R5.0 2005.06.06	R1.1 2006.01.12	R2.1 2006.04.19	R1.3 2007.09.26	R3.3.0 2008.04
Max. managed systems Max. LPARs – Note18	32 64 for 7315	48 254	48 254	48 254	48 254	48 254
Hardware Support						
7042-C07 for P5, P5+, P6						Y
7310-C06 for P5					Y	Y - Opt
7042-CR4 & C06 –P6, P5					N	Y
7310-CR4 for P5					Y	Y – Opt
7310-C04 for P5		Y	Y	Y	Y	Y – Opt
7310-CR3 for P5		Y	Y	Y	Y	Y – Opt
7310-C03 for P5		Y	Y	Y	Y	Y – Opt
7310-CR2 for P5		Y	Y	Y	Y	Y - Opt
7315-C04 for P4	Y					N
7315-CR3 for P4	Y					N
7315-C03 for P4	Y					N
7315-CR2 for P4	Y					N
7315-C02		Y	Y	Y	Y	N
7315-C01		Y	Y	Y	Y	N
6878 V3						N
POWER6 (P6)						Y
POWER5 (P5)	N	Y	Y	Y	Y	Y
POWER4 (P4)	Y	N	N	N	N	N
CFM Support – Note 21	N	Y	Y	Y	Y	
Recommended - Sys FW BPA		SF230 BP230	SF235 BP235	SF240 BP240	SF240 BP240	SF240 BP240
Browser based GUI	N	N	N	N	N	IE >=6.0 or FF>= 1.506

HMC Support URLs

https://www14.software.ibm.com/webapp/set2/sas/f/hmc/home.html
http://www14.software.ibm.com/webapp/set2/sas/f/power5cm/supportedcode.html
http://www14.software.ibm.com/webapp/set2/firmware/gjsn

Firmware Levels

- GA3–SF222, GA4–SF225, GA5–SF230, GA6-SF235, GA7-SF240 (last release for P5).
- Proxy-HTTP support for call-home is provided in 01SF240-258 (GA7SP3) and HMC V6.1.

http://www14.software.ibm.com/webapp/set2/firmware/gjsn
http://www14.software.ibm.com/webapp/set2/sas/f/power5cm/home.html

Firmware Naming: PPNNSSS_FFF_DDD
PP – Package Identifier: 01 – Managed System, 02 – Power Subsystem
NN – Platform and class: EL – Low End, EM – Mid Range, EH – High End, EB – Bulk Power
SSS – Release indicator, FFF – Current Fix pack, DDD – Last Disruptive Fixpack
An installation is disruptive if:
_ The release levels (*SSS*) of currently installed and new firmware are different.
_ The service pack level (*FFF*) and the last disruptive service pack level (*DDD*) are equal in new firmware.
Otherwise, an installation is concurrent if:
_ The service pack level (*FFF*) of the new firmware is higher than the service pack level currently installed on the system and the above conditions for disruptive installation are not met.

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Power 5 HMC port information

Port	Protocol	Application	Enabled by Default	Modification allowed in Network Config	Security	Notes
9090, 9940, 30000 –to- 30009	tcp tcp	WebSM WebSM	no	yes	SSL	Listen only Pair of ports used
22 1024-65535	tcp tcp	ssh ssh	no	yes	3DES	HMC Admin WS
512 & 514 1024-65535	tcp tcp	rexec rexec				HMC Admin WS
1024-65535 808	tcp tcp	Inventory Scout				HMC LPARs
80	tcp	http	yes	yes		
443	tcp	https	yes	yes	SSL	
657 697 1697	udp/tcp udp/tcp	RMC RMC	yes	yes		DLPAR LPARs ???
9,920	tcp	FCS	yes	yes		Call Home
9,900	udp	FCS	yes	yes		Call Home
4,411	tcp	Web server	yes	yes		InfoCenter (V4)
4,412	tcp	Web server	yes	yes		InfoCenter (V5)
9,443	tcp	Secure Web Server	yes	yes	SSL	Remote ASM(V5)
9,735	tcp	Vtty	yes	yes		
2300, 2301	tcp	I5250 console	yes	yes	2301- SSL	
6,000	tcp	X11	yes	no	Xhost -	
5,988	tcp	CIM	yes	yes	SSL	CIMOM provides inf. to CIM clients
9197, 9198	tcp	CIM Indication	yes	yes	SSL	
123	udp	NTP	no	yes		
1,701	udp	l2tp	yes	yes		
427	udp	SLP	no	yes		Used in Cluster
2,049	tcp	NFS	no	no		
69	tcp	TFTP	no	no		
n/a	icmp	Ping	yes	yes		
500, 4500	udp	IPSec	no	no		VPN

HBA/FC Adapter Features

FC	Gb/Sec	Ports	Part #
5773	4	2	PCIe
5774	4	1	PCIe
5758 1905	4 4	1 1	03N5014, 03N5005
5759 1910	4 4	2 2	10N8620, 03N5029, 03N5020
5716 1957 1977	2 2 2	1 1 1	80P4543,03N6441,03N7069 03N4698,03N6440,03N7068 80P6101, 80P6455, 03N6439, 03N7067
6239	2	1	00P4295, 80P4381, 80P6415
6228	2	1	03N2452, 09P0102, 00P2995, 09P5079, 00P4494, 09P5080, 80P3388, 80P4383
6227	1	1	09P4038, 09P1162, 03N4167, 24L0023

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Notes

1. SOD – Statement of Direction, DGD-Dead Gateway Detection, VIPA-Virtual IP Address, WLM-Work Load Manager.
2. J-JFS, J2-JFS2, HMT-Hardware Multi Threading, SMT–Simultaneous Multi Threading.
CAPP/EAL4+: Controlled Access Protection Profile and Evaluation Assurance Level 4+ (CAPP/EAL4+)
3. SLP – Service Location Protocol, SCTP – Stream Control Transmission Protocol
4. SUMA – System Update Management Assistant for policy based automatic download of updates.
5. Max PPs/disk: It is a combination of PVs in a VG. Alternatives are 32 disks with 1016 PPs, 1 disk with 1016*32 PPs, 16 disks with 1016*2 PPs.

In AIX 53, Scalable VG removes the limit on the no. of PPs in a PV instead the limit is at the VG level.

VG type	Maximum PVs	Maximum LVs	Maximum PPs per VG	Maximum PP size
Normal VG	32	256	32512 (1016 * 32)	1 GB
Big VG	128	512	130048 (1016 * 128)	1 GB
Scalable VG	1024	4096	2097152	128 GB

Limitations for Logical Storage Management

Category	Limit
Volume group	• 255 volume groups for the 32 bit kernel • 4096 volume groups for the 64 bit kernel **Note:** The device table on the 64 bit kernel restricts the number of active major numbers to 1024. Consequently, the number of active volume groups is restricted to less than 1024 volume groups.
Physical volume	(MAXPVS/volume group factor) per volume group. MAXPVS is 32 for a standard volume group, 128 for a big volume group, and 1024 for a scalable volume group.
Physical partition	Normal and Big Volume groups: (1016 x volume group factor) per physical volume up to 1024 MB each in size. Scalable volume groups: 2097152 partitions up to 128 GB in size. There is no volume group factor for scalable volume groups.
Logical volume	MAXLVS per volume group, which is 255 for a standard volume group, 511 for a big volume group, and 4095 for a scalable volume group.

6. Max value for thewall : AIX5.1 and later – smaller of ½ of RAM or 64GB for 64b kernel, smaller of ½ of RAM or 1GB for 32b kernel, 1GB or half the memory for CHRP, 256MB or ½ the memory for non CHRP.
7. Tested max. GPFS filesystem size: depends on the block size of the filesystem
- 16 KB block size, one or more filesystems with a total size of 1 TB mounted.
- 64 KB block size, one or more filesystems with a total size of 10 TB mounted
- 256 KB or greater block size, one or more filesystems with a total size of not greater than 200 TB where no single filesystem exceeds 100 TB mounted.
- GPFS 2.3 or later, file system architectural limit 2^99 bytes, GPFS 2.2 file system architectural limit 2^51 bytes (2 Petabytes) Current tested limit approximately 2 PB.
- No. of filesystems: GPFS v3.1.0.5 or later 64, GPFS v3.1.0.1 thru v3.1.0.4 32 GPFS v2.3 all service levels 32.

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- No. of files in a filesystem: The architectural limit of the number of files in a file system is determined by the file system format. For file systems created prior to GPFS V2.3, the limit is 268,435,456. For file systems created with GPFS V2.3 or later, the limit is 2,147,483,648. Please note that the effective limit on the number of files in a file system is usually lower than the architectural limit, and could be adjusted using the **-F** option of the mmchfs command.
- Disk size: The maximum disk size supported by GPFS depends on file system format and the underlying device support. For file systems created prior to GPFS version 2.3, the maximum disk size is 1 TB due to disk format limitations. For file systems created with GPFS 2.3 or later, these limitations have been removed, and the maximum disk size is only limited by the device driver support.
AIX 5L with 64-bit kernel, GPFS supports disks larger than 2 TB (provided the disk device supports it), up to the operating system limit. On other supported platforms, GPFS supports disks up to 2 TB in size.
8. IBM's intent is to offer this feature in future and a statement of direction only.
9. Bonus Pack withdrawn as of May 21, 2004, products that previously existed on the AIX 5L Bonus Pack now resides on the AIX 5L Expansion Pack or the Web Download Pack.
10. Maximum limit depends on the pSeries server Type-Model, no. of processors and memory configured.
11. Designed to be compliant.
12. If system firmware and HMC code is pre 10/2002, then minimum physical memory for each partition is 1 GB.
13. VELAN/VEL - Virtual Ethernet LAN, SEA-Shared Ethernet Adapter in a VIO, No. of SEA/VIO – unlimited, 16 VE trunk adapter/SEA, 20 VLAN/VE trunk adapter, 320 VLAN/physical ENT, 256 Virtual Ethernet connects/LPAR.
17. PSSP 3.5 support is withdrawn effective Apr 30, 2008.
18. Maximum limit depends on the Power Systems/System p/pSeries server Type-Model, pl. refer to the announcement letters or HMC code information URL for specifics.
19. Physical, Logical and Virtual Processors:

Processor Terminology	Dedicated Partition	Micro-Partition
Physical Processors (PhPr) in the server or CEC.	Total no. of Processors configured in the server including COD option, LiPr+COD processors in the server. *Example: If a server is configured with a total of 64 processors, 32 Licensed and 32 COD. PhPr is 64.*	Total no. of Processors configured in the server including COD option, LiPr+COD processors in the server. *Example: If a server is configured with a total of 64 processors, 32 Licensed and 32 COD. PhPr is 64.*
Licensed Processors (LiPr) in the server or CEC.	No. of Processors Licensed, max 64. *Example: A server configured with a total of 64 processors, 32 Licensed and 32 COD. LiPr is 32.*	No. of Processors Licensed, max 64. *Example: A server configured with a total of 64 processors, 32 Licensed and 32 COD. LiPr is 32.*
Shared Processors (ShPr) in a pool or Dedicated Processors (DePr) in a dedicated LPAR	No. of LiPr allocated to a dedicated LPAR, max 64. *Example: Out of 32 LiPr, if 8 processors allocated, DePr is 8.*	No. of LiPr allocated to a shared processor pool, max 64. *Example: Out of 32 LiPr, if 8 processors allocated, ShPr is 8.*
Virtual Processors (ViPr) in a LPAR	Ratio of 1 to 1 with the DePr, can range from one to DePr. *Example: If DePr is 8, ViPr can be from 1 to 8. Let ViPr be 8.*	Ratio of 10 to 1 with the ShPr, can range from 1 to ShPr upto a max. of 64. *Example: If ShPr is 8, ViPr can be from 1 to 64. Let ViPr be 8.*
Logical Processors SMT on (LoPr-On) in a LPAR	Ratio of 2 to 1 with ViPr, LoPr-On is 2xViPr upto a max of 128. *Example: DePr is 8, LoPr-On is 16.*	Ratio of 2 to 1 with ViPr, LoPr-On is 2xViPr upto a max of 128. *Example: ViPr is 8, LoPr-On is 16.*
Logical Processors SMT off (LoPr-Off) in a LPAR	Ratio of 1 to 1 with ViPr, LoPr-Off is 1 x ViPr upto a max of 64. *Example: ViPr is 8, LoPr-Off is 8.*	Ratio of 1 to 1 with ViPr, LoPr-Off is 1 x ViPr upto a max of 64. *Example: ViPr is 8, LoPr-Off is 8.*
Entitled Capacity	DePr	ShPr
No. of processors in the	ViPr	ViPr

LPAR (No. of procs shown in
lscfg or lsdev commands)

20. **JFS2 filesystem size depends on the block size.**

Filesystem Block Size	Max. Filesystem Size in TB
512	4
1024	8
2048	16
4096	32

Functions	JFS2	JFS
Fragments and block size	Block sizes (bytes): 512, 1024, 2048, 4096 Maximum file system size in terabytes (TBs): 4, 8, 16, 32	Fragment sizes (bytes): 512, 1024, 2048, 4096 Maximum file system size in gigabytes (GBs): 128, 256, 512, 1024
Maximum file system size	32 TBs	1 TB
Minimum file system size	16 MBs	Not Applicable
Maximum file size	16 TBs	Approximately 63.876 GBs
Number of i-nodes	Dynamic, limited by disk space	Fixed, set at file system creation
Directory organization	B-tree	Linear
Compression	No	Yes
Quotas	Yes	Yes
Error logging	Yes	Yes

21. HMC V4 R5.0 and FW 01SF230_120_120 are the minimum code levels required to support CFM and IO Drawer concurrent maintenance. P5-570 and 59x also require power subsystem code at 02BP230_125 prior to upgrading LIC.

22. **IB HCA Speeds & Feeds**
1x-2.5 Gb/sec, 4x-10 Gb/sec, 12x-30Gb/sec, DDR-60Gb/sec, QDR-120Gb/sec
IBM IB HCAs - PCI-4x only, GX-4x & 12x with Virtualization across 64 LPARs. There are two InfiniBand device drivers: one for the GX bus and the one for the PCIX bus. Both of these device drivers support only 64-bit kernel mode. Concurrent mode diagnostic support for the PCIX adapter is not provided.

23. **Multiple Instances of AIX on a Single Root Volume Group** In AIX 5.3, the root user can create multiple instances of AIX on a single root volume group (rootvg). A new utility, /usr/sbin/multibos, is supplied in AIX 5L with 5300-03 to create and manage a new instance of the operating system within the running rootvg. The multibos utility provides the root user operations to setup, access, maintain, update, and customize this new instance of the Base Operating System (BOS). The result of creating a new instance of the BOS with multibos is a rootvg with two distinct and bootable instances of the operating system within a single rootvg. The running instance, called the active BOS, can be in production while multibos operations are used to modify the non-running instance, called the standby BOS. The multibos command and corresponding man page in the *AIX 5L Version 5.3 Commands Reference* incorrectly lists the supported level for multibos as 5300-02. You must run multibos with maintenance level 5300-03. For more detailed information, refer to the latest /usr/lpp/bos/README.multibos file, the multibos man page, and documentation regarding multibos in the AIX Information Center.

24**. IVM – Integrated Virtualization Manager**
IVM may be used to complete the following tasks:

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 Create and manage logical partitions
 Configure the virtual Ethernet networks
 Manage storage in the Virtual I/O Server
 Create and manage user accounts
 Create and manage serviceable events through Service Focal Point
 Download and install updates to device microcode and to Virtual I/O Server software
 Back up and restore logical partition configuration information
 View application logs and the device inventory

Restrictions and Limitations

Because the Integrated Virtualization Manager provides a subset of the HMC functionality, there are some key restrictions and limitations that are worth highlighting.

 Full dynamic LPAR support for VIOS partition only: Dynamically adding or removing memory or processing resources from a running client partition is not supported with the IVM. The partition should be powered off first. Keep in mind that the POWER5 Hypervisor allows partitions to use more than their entitled processing capacity via the shared processing pool, lessening the importance of processing dynamic LPAR in most environments.

 All physical I/O is owned by the VIOS partition: This statement means that the VIOS partition is a single point of failure - if it fails, all client partitions will also fail as their virtual disk, optical, and Ethernet devices will not be accessible.

 Limited service function: There is no call-home support, and concurrent maintenance support is limited to adapters owned by the VIOS.

 No redundant VIOS partition support: Because all physical I/O must be owned by a single partition, it is not possible to have more than one VIOS partition for redundancy.

25. CSM limitations and FAQ

http://www14.software.ibm.com/webapp/set2/sas/f/csm/documentation
http://www14.software.ibm.com/webapp/set2/sas/f/csm/home.html

26. **Supported Memory page sizes (Ref AIX 6.1 Performance Management):**

AIX supports up to four different page sizes, but the actual page sizes supported by a particular system will vary based on processor type. The following table lists the page sizes supported by AIX and required System p™ hardware:

Page Size	Required Hardware	Requires User Configuration	Restricted	Kernel
4KB	ALL	No	No	64 & 32
64KB	IBM POWER5+™ or later	No	No	64 only
16MB	POWER4™ or later	Yes	Yes	64 & 32
16GB	POWER5+ or later	Yes	Yes	64 only

Segment Base Page Size	Supported Page Sizes	Minimum Required Hardware
4 KB	4 KB/64 KB	POWER6
64 KB	64 KB	POWER5+
16 MB	16 MB	POWER4
16 GB	16 GB	POWER5+

Configuring the number of large pages: Use the **vmo** command to configure the number of 16 MB large pages on a system. The following example allocates 1 GB of 16 MB large pages:

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```
# vmo -r -o lgpg_regions=64 -o lgpg_size=16777216
```
In the above example, the large page configuration changes will not take effect until you run the **bosboot** command and reboot the system. On systems that support dynamic logical partitioning (DLPAR), the **-r** option can be omitted from the above command to dynamically configure 16 MB large pages without rebooting the system.

Configuring the number of huge pages: Huge pages must be configured through a system's Hardware Management Console (HMC).

1. On the managed system, go to **Properties** → **Memory** → **Advanced Options** → **Show Details** to change the number of 16 GB pages.
2. Assign 16 GB huge pages to a partition by changing the partition's profile.

The specific page sizes supported on a system depends on a system's processor type. You can use the **pagesize -af** command to display all of the virtual memory page sizes supported by AIX on a system. You can specify the page sizes to use for three regions of a process's address space using an environment variable or settings in an application's XCOFF binary with the **ldedit** or **ld** commands as shown in the following table:

Region	ld / ldedit option	LDR_CNTRL environment variable	Description
Data	-bdatapsize	DATAPSIZE	Initialized data, bss, heap
Stack	-bstackpsize	STACKPSIZE	Initial thread stack
Text	-btextpsize	TEXTPSIZE	Main executable text

For example, the following command causes **mpsize.out** to use 64 KB pages for its data, 4 KB pages for its text, and 64 KB pages for its stack on supported hardware:
$ LDR_CNTRL=DATAPSIZE=64K@TEXTPSIZE=4K@STACKPSIZE=64K mpsize.out Unless page sizes are selected using one of the above mechanisms, a process will continue to use 4 KB pages for all three process memory regions by default. In addition to these three memory regions of a process's address space, you can select the page size for system V shared memory regions by using the **SHM_PAGESIZE** command to the **shmctl()** system call. The 4 KB and 64 KB page sizes are intended to be general-purpose, and no system configuration changes are necessary to enable a system to use these page sizes. The 16 MB large page size and 16 GB huge page size are intended only to be used in very high performance environments, and a system administrator must configure a system to use these page sizes. Furthermore, the support for 16 MB large pages and 16 GB huge pages is limited. 16 MB large pages are only supported for process data and shared memory, and 16 GB huge pages are only supported for shared memory. The **ps -Z** command displays the page sizes being used for the data, stack, and text memory regions of a running process. The **vmstat** command is enhanced to display information about multiple page sizes. The **-p** and **-P** options to the **vmstat** command displays VMM statistics for each supported page size. Finally, the following **vmo** command can be used to disable all kernel support for 64 KB and 16 GB pages: vmo -r -o vmm_mpsize_support=0

27. **Maximum size of boot image increased:** For AIX 5L Version 5.3, the maximum size of the boot image has changed from the previous value of 11,984 KB (12 MB minus 16 KB) to 31,984 KB (32 MB minus 16 KB).

28. **Kernel Support**: The AIX 5L operating system previously contained both a uniprocessor 32-bit kernel and a 32-bit multiprocessor kernel. Effective with AIX 5L Version 5.3, the operating system supports only the multiprocessor kernel. The AIX 5L Version 5.3 32-bit multiprocessor kernel supports the following systems: RS/6000, System p, or OEM hardware based on the Common Hardware Reference Platform (CHRP) architecture, regardless of the number of processors. The maximum real memory supported by a 32-bit kernel system (or partition) is 96 GB. AIX 5L Version 5.2 is the last release of AIX that supports the uniprocessor 32-bit kernel.

The AIX 5L Version 5.3 kernels provide the same functionality, regardless of which kernel is being used. The 32-bit and 64-bit kernel systems have common base libraries, commands, utilities, and header files. Differences between 32-bit and 64-bit kernel systems are limited to the following:

System and I/O Support. The 64-bit kernel limits support to 64-bit POWER-based systems, while the 32-bit kernel supports both 32-bit and 64-bit POWER-based systems. In addition, the 64-bit kernel does not support all I/O that is supported by the 32-bit kernel.
Application Support. The 64-bit kernel supports both 32-bit and 64-bit applications. Application source and binaries are portable between AIX 5L Version 5.3 64-bit and 32-bit kernel systems, in the absence of any application dependencies on internal kernel details or on kernel extensions that are not supported under the 64-bit kernel but are supported under the 32-bit kernel.

- **Binary Compatibility.** Binary compatibility is provided for 32-bit applications running on earlier versions of AIX on POWER-based systems, except for applications linked statically or applications dependent on undocumented or unsupported interfaces. In addition, some system file formats have changed, and 32-bit applications processing these files might need to be recompiled.
- **Application Scalability.** AIX 5L Version 5.3 provides a more scalable application binary interface (ABI) for 64-bit applications. To take advantage of the scalability improvements to 64-bit programs, all 64-bit applications and libraries must be recompiled on AIX 5L Version 5.3. In addition, existing 32-bit kernel extensions and device drivers used by 64-bit applications might have to be modified in order to support the new 64-bit ABI.v

Kernel Extensions. Kernel extensions for the 64-bit kernel run in 64-bit mode and have the scalability of the larger kernel address space. Some kernel services available in the 32-bit kernel are no longer provided by the 64-bit kernel, so existing 32-bit kernel extensions may have to be ported in order to be used with the 64-bit kernel. Existing 32-bit kernel extensions continue to be supported by the 32-bit kernel, but these kernel extensions are not usable by the 64-bit kernel. Not all of the kernel extensions supported for the 32-bit kernel are supported for the 64-bit kernel, particularly the device drivers for the I/O.
Dual-mode Kernel Extensions. AIX 5L Version 5.3 supports dual-mode kernel extensions, which can be loaded by a common configuration method, regardless of which kernel is being used. A dual-mode kernel extension is an archive file that contains both the 64-bit and 32-bit versions of the kernel extension as members.

Installation and Enablement. The 32-bit and 64-bit kernels are provided as part of the AIX 5L Version 5.3 base media and are installed on all supported hardware systems. The default kernel enabled during installation is dependent on the hardware system being installed. On POWER5 systems, the 64-bit kernel is enabled during base system installation. On all other systems, the 32-bit kernel is enabled. However, you can override this default option at installation time through the system installation panels. You can switch between the 32-bit and 64-bit kernels without reinstalling the operating system. 1. Modify the **/usr/lib/boot/unix** directory and the **/unix** directory to be a symbolic link to the binary for the desired kernel. 2. Run the **bosboot** command to write a new system boot image. 3. Reboot the system. The path name of the 64-bit kernel is **/usr/lib/boot/unix_64**, and the path name of the multiprocessor versions of the 32-bit kernel is **/usr/lib/boot/unix_mp**.

29. **JFS2 file system freeze and thaw feature:** A new feature for the JFS2 file system is added to AIX 5L Version 5.3 with the 5300-01 Recommended Maintenance package. This feature provides an external interface whereby an application can request that a JFS2 file system freeze, or stay quiescent. After the freeze operation, the file system must remain quiescent until it is thawed or until the specified timeout has past. The request for freeze or thaw can be performed from the command or from the API as follows:
Command: chfs -a freeze=<timeout or "off"> <*file system name*> , chfs -a refreeze=<timeout> <*file system name*>
API: fscntl() fscntl(vfs, FSCNTL_FREEZE, (caddr_t)timeout, 0); fscntl(vfs, FSCNTL_REFREEZE, (caddr_t)timeout, 0); fscntl(vfs, FSCNTL_THAW, NULL, 0);

30. **Common Boot Image Management**
_ **New commands and new SMIT interfaces**
– mkts, swts, dbts, lsts, rmts, mkcosi, cpcosi, chcosi, lscosi, and rmcosi
_ **New functionality**
– Clone a common image and modify the clone image.
– Allow a thin server to switch to a different common image

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– Specify a time to switch to different common OS image.
– Backup user data in /home, /tmp, and certain files in /root and restore this data after switching new common image.
– Allow thin servers to run a debug boot
– Reduced user interface complexity

31. **Security Certifications:**
> Labeled Security Protection Profile (LSPP) to meet the assurance requirements of Evaluation Assurance Level 4 augmented (EAL4+).
> Controlled Access Protection Profile (CAPP) under the Common Criteria for Information Security Evaluation (CC) at the Evaluation Assurance Level 4+ level (EAL4+).

http://www-03.ibm.com/servers/aix/products/aixos/certifications/

32. **Ref: AIX 6.1 Operating system and device management, SC23-6605, Page 262**
Devices include hardware components such as, printers, drives, adapters, buses, and enclosures, as well as pseudo-devices, such as the error special file and null special file. Device drivers are located in the **/usr/lib/drivers** directory. The number of devices that AIX can support can vary from system to system, depending on several important factors. The following factors have an impact on the file systems that support the devices:

- Configuring a large number of devices requires storage of more information in the ODM device-configuration database. It can also require more device special files. As a result, more space and more i-nodes are required of the file system.
- Some devices require more space than others in the ODM device-configuration database. The number of special files or i-nodes used also varies from device to device. As a result, the amount of space and i-nodes required of the file system depends on the types of devices on the system.
- Multipath I/O (MPIO) devices require more space than non-MPIO devices because information is stored in the ODM for the device itself as well as for each path to the device. As a rough guideline, assume that each path takes up the space of one-fifth of a device. For example, an MPIO device with five paths will have the space equivalent to two non-MPIO devices.
- AIX includes both logical devices and physical devices in the ODM device-configuration database. Logical devices include volume groups, logical volumes, network interfaces, and so on. In some cases, the relationship between logical and physical devices can greatly affect the total number of devices supported. For example, if you define a volume group with two logical volumes for each physical disk that is attached to a system, this will result in four AIX devices for each disk. On the other hand, if you define a volume group with six logical volumes for each physical disk, there will be eight AIX devices for each disk. Therefore, only half as many disks could be attached.
- Changing device attributes from their default settings results in a larger ODM device-configuration database and could lead to fewer devices that can be supported.
- More devices require more real memory.

With AIX 5.2 and the minimum RAM file system size, it is likely that up to 5000 AIX devices can be configured. With the maximum RAM file system size, it is likely that up to 25,000 AIX devices could be configured. These numbers include both physical and logical devices. Depending on the various factors mentioned in this section, your system might be able to configure more or fewer devices than this number. With a large number of devices in the system, the longer configuration time contributes to a longer boot time.

33. **Memory Segments**

- **32 bit address space**: 16x256 MB for 32 bit, max shared memory segments is 11 or 2.75GB

Seg 0 : Kernel text & data	Seg 3 to C & E : Shared memory segments for user processes
Seg 1 : User Process text	Seg D : Shared library text
Seg 2 : User data, heap & stack,	Seg F : Per process shared library data

- **64 address space**

(0 - 4 GB) - First 16 segments are exempt from general use to keep compatibility with 32-bit user process model.
(4 GB - 448 PB) -Application text, data, and heap, (448 - 512 PB) - Default shared memory segments,
(512 - 576 PB) - Privately loaded objects, (576 - 640 PB) - Shared text and data
(640 - 960 PB) - System reserved, (960 PB - 1 EB) - User process stack
(Ref: Developing and Porting C and C++ Applications on AIX and General Programming Concepts: Writing and Debugging Programs).

34. **AIX 6.1 Features**

• **Role Based Access Control (RBAC):** Role Based Access Control (RBAC) is designed to improve security and manageability by allowing administrators to delegate system administrative duties to nonroot users. RBAC in AIX has been enhanced to provide very fine granular authorizations that by name identify the privileged operation which they control. These authorizations can be used to create the required roles necessary and assign those roles to the users required to manage the system. Such nonroot users will be able to assume the role and perform the allowed privileged operations.

• **File Permission Manager (FPM):** **fpm** can reduce the security risk of the set UID permissions by removing these permissions. The command can be run at different levels with a flag to indicate the security levels of high, medium, or low.

• **Secure FTP:** AIX V6 introduces a secure flavor of **ftp** (and **ftpd**), based on OpenSSL, using Transport Layer Security (TLS) (This extension to FTP is defined in RFC 4217) to encrypt both the command and the data channel. TLS is a cryptographic protocol that provides secure communication between clients and servers. This enables any user on the system to exchange files in a secure manner if their counterpart offers this extension as well.

• **Trusted AIX:** Trusted AIX extends the security capabilities of the AIX operating system by supplying integrated multi-level security. Trusted AIX is implemented as an installation option that can provide the highest levels of label-based security to meet critical government and private industry security requirements. Trusted AIX is the feature that provides the framework for Mandatory Access Controls and Labeled Security. The roots of Mandatory Access Control (MAC) systems come from the Department of Defense Orange book standards developed in 1985.

• **Encrypted File Systems (EFS):** The IBM Journaled Filesystem Extended (JFS2) provides for even greater data security with the addition of a new capability to encrypt the data in a filesystem. Clients can select from a number of different encryption algorithms. The encrypted data can be backed up in encrypted format, reducing the risk of data being compromised if backup media is lost or stolen. The JFS2 encrypting filesystem can also prevent the compromise of data even to root-level users.

• **Enhancements to the AIX Security Expert:** The AIX Security Expert was introduced with Technology Level 5 update to the AIX V5.3 operating system, and provides clients with the capability to manage more than 300 system security settings from a single interface and the ability to export and import those security settings between systems. AIX 6 includes an enhancement to the Security Expert to store security templates in a Lightweight Directory Protocol (LDAP) directory for use across a client's enterprise.

AIX V6 comes with one predefined policy for assisting in SOX-COBIT compliancy setups and checks. The IT industry often uses COBIT IT Governance (Control Objectives for Information and related Technology, which is a set of best practices for IT management created by the Information Systems Audit and Control Association (ISACA) and the IT Governance Institute (ITGI) in 1992) as the *de facto* standard to comply with the Internal Controls Section 404 of the Sarbanes-Oxley[1] (SOX) act of 2002 (a United States federal law passed in response to a number of major corporate and accounting scandals).

• **Trusted Execution (TE):** The Trusted Execution feature provides for an advanced mechanism for checking and maintaining system integrity. A signature (SHA256/RSA) database for the important system files is created automatically as part of regular AIX install.
The TE tool can be used to check the integrity of the system against the database. Also administrators can define policies such that the loads of files listed in the database are monitored and execution/loads not allowed if hashes do not match. Additionally, administrators can lock the signature database or the files in the database from being modified by any one in the system, including root.

• **Secure by Default (SbD):** The AIX 6 installation process will offer a new option, Secure by Default, that installs only the minimal number of services to provide the maximum amount of security. The Secure by Default option works particularly well when used in conjunction with the AIX Security Expert to only enable the system services required for the system's intended purpose.

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• **Continuous availability:** AIX 6 includes many mainframe-inspired continuous availability features, including:
– **Concurrent AIX updates:** Concurrent AIX updates provides a new capability to deliver some kernel updates as Interim Fixes that will not require a system reboot to be put into effect. This new capability will provide IBM with a tool to reduce the number of unplanned outages required to maintain a secure, reliable system.
– **Kernel Storage Keys:** Kernel exploitation of the POWER6™ processor storage key feature brings a mainframe-inspired reliability capability to the UNIX market for the first time. Storage keys can reduce the number of intermittent outages associated with undetected memory overlays inside the kernel. Applications can also use the POWER6 storage key feature to increase the reliability of large, complex applications running under the AIX V5.3 or AIX V6.1 operating systems.
– **Dynamic tracing with probevue:** AIX 6 will provide a new dynamic tracing capability that can simplify debugging complex system or application code without requiring code changes and recompilation. This dynamic tracing facility will be introduced via a new tracing command, probevue, that allows a developer or system administrator to dynamically insert trace breakpoints in existing code without having to recompile the code. A developer or system administrator can use probevue to dynamically place probes in existing code, and specify the data to be captured at probe point.
– **Live dump:** AIX 6 continues to build upon the first failure data capture and nondisruptive service aid features introduced in prior AIX releases. A new live dump feature allows selected subsystems to dump their memory state and traces to the filesystem for subsequent service analysis, without requiring a full system dump and outage.
> Minidump facility, starting with AIX V5.3 TL03
The minidump is a small compressed dump that is stored to NVRAM when the system crashes or a dump is initiated, and then written to the error log on reboot. It can be used to see some of the system state and do some debug in the case that a full dump is not available. It can also be used to get a quick snapshot of a crash without having to transfer the entire dump from the crashed system.
> Parallel dump, starting with AIX V5.3 TL05
A new optimized compressed dump format is introduced in AIX V5.3 TL05. The dump file extension for this new format is still .BZ. Parallel dumps are produced automatically when supported by the AIX release. In this new compressed dump file, the blocks are compressed and unordered: this unordering feature allows multiple processors to dump in parallel sub-areas of the system. Thus, when a system dump happens on a multiprocessor system, the time to produce the dump image is now I/O bound limited and so greatly reduced.
This new file format for parallel dump is no more readable with usual uncompress and zcat commands: the new dmpuncompress command must be used. In order to increase dump reliability, a new -S checking option, to be used with the -L option for the statistical information on the most recent dump is also added to sysdumpdev command. The -S option scans a specific dump device and see if it contains a valid compressed dump.
> Component Dump facility, starting with AIX V6
The enterprise Reliability Availability Serviceability strategy is to maintain the continuous availability of System p servers through extended key error detection and recovery capabilities implementing mainframe-like features for the hardware, AIX operating system, and also for external third party software. In order to provide a granular approach to RAS, enterprise RAS defines a component framework where AIX and third party software can register components that enable their specific RAS features such as trace, dump and error checking features.
The Component Trace facility (CT), like the Run-Time Error checking (RTE) facility have been implemented for the AIX Operating system components with AIX V5.3 TL05. For additional information on these facilities, see AIX 5L Differences Guide: Version 5.3 Addendum, SG24-7414. The Component Dump acility (CD) for the AIX operating system components is now introduced with AIX Version 6.
> Live Dump Facility, starting with AIX V6
Live dumps are small dumps that do not require a system restart. The Live Dump facility uses the Component Dump implementation to dump only AIX components, registered as a live dump enabled component, named a Live
dump aware component. Software or system administrators can initiate Live Dumps while the system is running: planned downtime is no longer necessary to dump a system. Moreover, because selective dump aware components can be chosen, Live dump facility reduce significantly the time to dump and the size requirement for dump files.
> Firmware-Assisted Dump Facility, starting with AIX V6
The firmware-assisted dump means that AIX dump is taken while the partition is restarting. This increases reliability of a partition system dump by minimizing the work done by the failing operating system and let it done by the new restarting instance. The firmware is involved to preserve memory area across the reboot.

The dumpctrl command is a new integrated interface to manage the various dump formats.
With AIX Version 6, the implementation of the AIX dump components provides an enhanced dump

granularity and allows to dump these components without requiring any reboot. Thus, this new dump capability, based on these components, is called live dump. Before AIX Version 6, the only supported type of dump was the system dump that requires a reboot afterwards. As shown in Figure 4-2 on page 106, to manage the attributes of these two different types of dumps, AIX provides a unified user-interface he dumpctrl command to manage both:
> The traditional dump also named system dump that requires a reboot,
> The live dump, based on the new dump components, is implemented with the component infrastructure that allows to take a dump while the server is running.

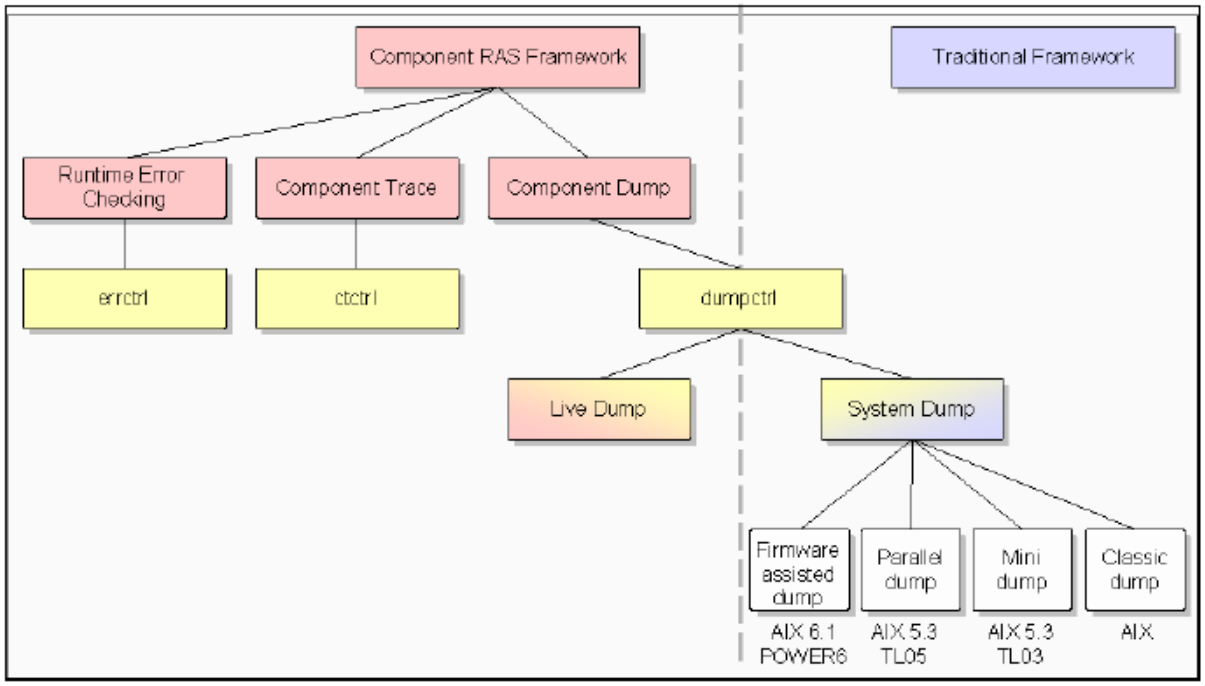

Figure 4-9 Overview of all dump capabilities

• **Improving manageability:** AIX 6 includes many new capabilities to improve the manageability of the AIX operating system, including NFSv4 support for the Network Installation Manager (NIM), a new, graphical installation tool and a new graphical systems console, the Systems Director Console for AIX. The Systems Director Console for AIX provides a responsive Web access to common systems management ools such as the Systems Management Interface Tool (SMIT) and offers integration into the IBM Systems Director. The Systems Director Console for AIX is included with AIX 6.

* **The raso command tunables**
With the **raso** command, you can manage reliability, availability, and serviceability parameters. The following new tunables are introduced to change the behavior of the recovery manager. All recovery tunables are restricted and should not be changed unless requested by the IBM service support.

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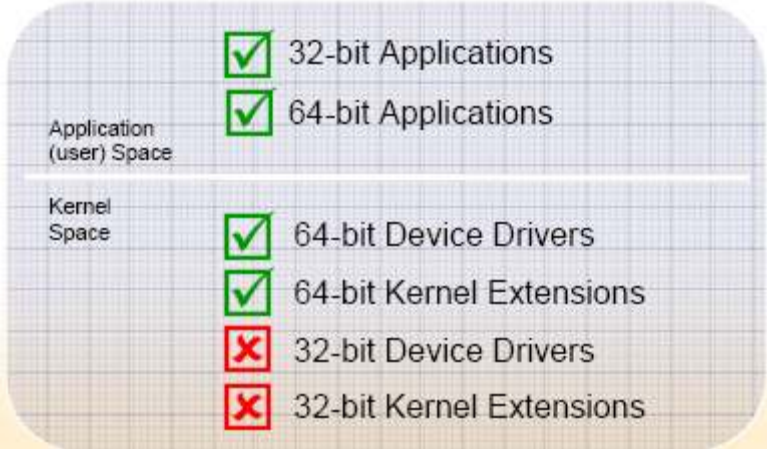
Table 4-8 raso tunables for kernel error recovery

Tunable	Description
recovery_framework	With the recovery_framework tunable you can enable or disable the kernel error recovery. A system reboot is required for the change to take effect. The default state is disabled.
recovery_action	The recovery_action tunable allows you to temporarily disable the kernel error recovery without a system reboot. If an kernel error occurs the system will be halted without any recovery attempts. This option only has an effect if the recovery_framework parameter is enabled. Setting the recovery_action parameter to the halt system value does not provide any performance improvement.
recovery_debugger	The recovery_debugger tunable parameter allows the kdb (kernel debugger) to be invoked when recovery actions occur. This tunable is intended for debugging only by the IBM service support.

*** Restricted tuneables:** Since AIX 5.3, six tuning commands (vmo, ioo, schedo, raso, no, and nfso) have a unified behavior and syntax. Beginning with AIX Version 6, some tunables are now classified as restricted use tunables. They exist and must be modified primarily for specialized intervention by the development support or development teams.
As these parameters are not recommended for end user modification, they are no longer displayed by default but only with the -F option (force) on the command. Thus, in SMIT and Web-based System Manager they have no visibility by default. Refer AIX 6.1 Differences Guide for details.

35: **Only 64b Kernel in AIX 6.1**: AIX 6.1 kernel will provide 32 bit binary compatibility for applications running on AIX 5L on POWER4 systems and later**. The** 32-bit kernel will no longer be available with AIX 6, 32-bit kernel extensions and device drivers will not run and this does not affect support for user space 32 and 64 bit applications.



In previous AIX versions multiple kernels were shipped. The important milestones are:
1993) AIX V4.1 introduces multiprocessor kernel (unix_mp).
2000) AIX V5.0 introduces the 64-bit kernel (unix_64).
2004) The uniprocessor kernel (unix_up) has been removed in AIX V5.3. In AIX V5.3 and AIX V5.2 ML 5200-03 the 64-bit kernel was installed by default on POWER5 and newer systems.

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2007) The 32-bit kernel is removed in AIX V6.1
Beginning with AIX V6.1, the AIX operating system will simplify its kernel environment by providing only the 64-bit kernel. Device drivers and kernel extensions that are 32-bit only are not supported. Dual-mode (32/64-bit) kernel extensions built on AIX 5L will continue to run on AIX V6.1 but only in 64-bit mode. AIX V6.1 is binary compatible to both 32-bit and 64-bit applications created in previous AIX 5L versions. Further information and a list of restrictions are published on the IBM AIX Binary compatibility site:
http://www-03.ibm.com/systems/p/os/aix/compatibility/index.html

36: **Solution Performance Tuning (out of the box performance, Ref – AIX 6.1 Differences Guide):**
– Selected changes to AIX tuning defaults to optimize on common System p workloads
– Primarily expected to benefit workloads sensitive to VMM tuning
– Based on extensive benchmarking and tuning experience from AIX performance
– New categorization of tunables into restricted and non-restricted types

Table 6-1 Default tunable values for the vmo command

vmo tunable name	AIX 5.2/5.3 default values	AIX 6 default values
minperm%	20	3
maxperm% (R)[a]	80	90
maxclient% (R)[a]	80	90
lru_file_repage (R)[a]	1	0
page_steal_method (R)[a]	0	1

a. (R) means that it is a restricted use tunable

Table 6-2 minpout/maxpout values within AIX releases

sys0 tunable name	AIX 5.2/5.3 default values	AIX V6 default values
minpout	0	4096
maxpout	0	8193

Table 6-3 Values range for each AIO subsystem tunables

Tunable name	Restricted	Type	Default	Minimum	Maximum
fastpath	Yes	Boolean	On		
fsfastpath	Yes	Boolean	On		
kprocprio	Yes	Value	39	0	254
multitidsusp	Yes	Boolean	On		
sample_rate	Yes	Value	5	1	86,400
samples_per_cycle	Yes	Value	6	1	131,072
maxreqs	No	Value	65,536	AIO_MAX	1,048,576
maxservers	No	Value	30	1	20,000
minservers	No	Value	3	0	maxservers
server_inactivity	No	Value	300	1	86,400

37: **Advanced First Failure Data Capture features**
AIX 5L Version 5.3 with the 5300-05 Technology Level package provides many advanced First Failure Data Capture (FFDC) features. These features include Lightweight Memory Trace (LMT), Component Trace (CT®), and Run-Time Error Checking (RTEC). These features are enabled by default, at levels that provide valuable FFDC information with minimal performance impacts. The advanced FFDC features can

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be individually manipulated. To enable or disable all three advanced FFDC features, enter the following command: smit ffdc You can then choose to enable or disable FFDC features. Note that a **bosboot** and reboot are required to fully enable or disable all FFDC features. Any change to LMT will not take effect until the next boot.

System trace The system trace facility has been enhanced to support process and thread-based tracing. You can restrict the tracing to a process and capture the events in relation to the process for better debugging. For more information, see the **trace** command documentation. The **trace** command supports settings of larger trace buffers for regular users. For more information, see the **trcctl** command documentation. The system trace can be used to trace processor utilization register (PURR) to provide more accurate event timings in a shared processor partition environment.

Lightweight Memory Trace The Lightweight Memory Trace (LMT) provides system trace information for First Failure Data Capture (FFDC). It is a constant kernel trace mechanism that records software events occurring during system life. The system activates LMT at initialization, then tracing runs continuously. Recorded events are saved into per processor memory trace buffers. There are two memory trace buffers for each processor, one to record common events, and one to record rare events. The memory trace buffers can be extracted from system dumps and accessed on a live system by service personnel. The impact on the throughput of a kernel-intensive benchmark is one percent, and is much less for typical user workloads. LMT requires the consumption of a small amount of pinned kernel memory. The default amount of memory required for the trace buffers is calculated based on factors that influence software trace record retention. For the 64-bit kernel, the default calculation is additionally limited such that no more than 1/128th of system memory can be used by LMT, and no more than 256 MB by a single processor. The 32-bit kernel uses the same default buffer memory size calculation, but restricts the total memory allocated for LMT (all processors combined) to 16 MB. The 64-bit kernel resizes the LMT trace buffers in response to dynamic reconfiguration events, the 32-bit kernel does not. The following table shows some examples of default LMT memory consumption:

Machine	Number of CPUs	System Memory	Total LMT Memory: 64-bit Kernel	Total LMT Memory: 32-bit Kernel
POWER3™ (375 MHz CPU)	1	1 GB	8 MB	8 MB
POWER3 (375 MHz CPU)	2	4 GB	16 MB	16 MB
POWER5 (1656 MHz CPU, SPLPAR, 60% ent cap, SMT)	8 logical	16 GB	120 MB	16 MB
POWER5 (1656 MHz CPU)	16	64 GB	512 MB	16 MB

To determine the amount of memory being used by LMT, enter the following shell command: echo mtrc | kdb | grep mt_total_memory The **raso** tunable command can be used to disable LMT. It can also be used to increase or decrease the memory trace buffer sizes. For more information, see the **raso** command documentation.

Component Trace The Component Trace (CT) facility provides system trace information for specific system components. This information allows service personnel to access component state information through either in-memory trace buffers or through traditional AIX system trace. CT is enabled by default. The use of in-memory CT buffers can be persistently disabled across reboots by using the **ctctrl -P memtraceoff** command. CT can be persistently enabled by running the **ctctrl -P memtraceon** command. **Note:** A **bosboot** is required to make the command persistent on the next boot Information on these and other CT commands can be found in the **ctctrl** command documentation.

Run-Time Error Checking The Run-Time Error Checking (RTEC) facility provides service personnel with a method to manipulate debug capabilities that are already built into product binaries. RTEC provides service personnel with powerful first failure data capture and second failure data capture error detection features. All Run-Time Error Checking can be persistently disabled across reboots by running the **errctrl -P errcheckoff** command. RTEC can be re-enabled persistently by running the **errctrl -P errcheckon** command. **Note:** A **bosboot** is required to make the command persistent on the next boot. For more

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information on the **errctrl** command, see *AIX 5L Version 5.3 Commands Reference, Volume 2*. RTEC features include: 1. **Xmalloc debug** In AIX 5L Version 5.3 with 5300-05 Technology Level, random sampling of xmalloc allocations is enabled to catch memory leaks, buffer overruns and accesses to freed data. Xmalloc debug is similar to the previous memory overlay detection system (MODS). To specifically disable the xmalloc debug RTEC feature, run the **errctrl errcheckoff -c alloc.xmdbg -r** command. To enable xmalloc debug, run the **errctrl errcheckon -c alloc.xmdbg -r** command. For more information, see the MODS and **errctrl** command documentation. 2. **Excessive Interrupt Disablement Detection** The Excessive Interrupt Disablement Detection mechanism in AIX can detect whether or not privileged code remains disabled for interrupts for too long. Because excessive disablement might lead to performance problems, AIX writes an error log record to report this detection: IDENTIFIER TIMESTAMP T C RESOURCE_NAME DESCRIPTION A2205861 0705170705 P S SYSPROC Excessive interrupt disablement time Report these error logs to IBM service. The detailed report contains additional information including a stack traceback and LMT (trace) data that can be used by IBM to identify the source of the problem.

Only one period of interrupt disablement that exceeds .5 seconds is logged per boot (default). Note that each of these error log entries might identify a unique potential problem. These error reports are persistently disabled if RTEC is globally disabled. On a per-boot basis, disablement detection can be disabled by running the following command: errctrl errcheckoff -c proc.disa Finally, the following functions can be called from a disabled code section of a detected kernel extension to exempt the section from future excessive disablement reporting: disablement_checking_suspend disablement_checking_resume For more information about disablement checking, see "disablement_checking_suspend Kernel Service" and "disablement_checking_resume Kernel Service" in the *AIX 5L Version 5.3 Technical Reference: Kernel and Subsystems Volume 1*. Also see the **errctrl** command documentation.
Other RAS enhancements The **chcore** command provides for management of location of core files. For more information, see the **chcore** command documentation. AIX error logging now supports up to 4096 bytes of event data (see the **/usr/include/sys/err_rec.h** file). However, this size error log entry is intended only for restricted system use and general error log entries should continue to contain 2048 bytes or less of event data. While up to 4096 bytes of detail data is allowed, this size entry may be truncated across a reboot in certain circumstances. The largest detail data size guaranteed not to be truncated is 2048 bytes. A large error log entry reduces the non-volatile storage available to the system dump facility in the event of a system crash.

Note 38: Restrictions using HEA under EtherChannel
Host Ethernet Adapter logical ports are only supported under EtherChannel if all adapters within the EtherChannel are HEA logical ports (including the backup adapter, if any). Consequently, having HEA logical port adapters intermixed with physical Ethernet adapters or Virtual I/O Ethernet Adapters in the same EtherChannel is not supported.

When using multiple HEA logical ports as primary adapters in an EtherChannel, the physical ports associated with the HEA logical ports must also be placed in an EtherChannel in the Ethernet switch. Consequently, all partitions that use HEA logical ports going to the same HEA physical ports must also be placed in an EtherChannel.
For example, assume that Partition 1 is configured as follows:
* A logical HEA port out of physical HEA port 0
* A logical HEA port out of physical HEA port 1
* An EtherChannel created using the logical HEA ports listed above

If another partition on the same system that needs to use a logical HEA port out of physical HEA port 0 or out of physical HEA port 1, you must create an EtherChannel for the partition over both of the logical HEA ports, similar to the configuration of Partition 1. Attempting to use either of those logical HEA ports as stand-alone in other partitions might cause connectivity problems, because packets might not be delivered to the correct logical HEA port.

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The aforementioned configuration restriction does not exist for using logical HEA ports in a Network Interface Backup configuration (1 primary and 1 backup), since the physical HEA ports do not require specific configuration on the Ethernet switch.

38. Security Features and threats (Ref: Advanced Security SG24-7430)

Table 1-1 Threats and countermeasures

Threat	Feature	Notes
System Integrity	Trusted Execution	Ensures binaries are not altered and no execution of malicious code occurs.
	AIX Security Expert	Reduces exposures by setting security policy.
	Trusted AIX	Trusted computing base fundamental to Multilevel System
Unauthorized Access	AIX Security Expert	Sets policies for network, passwords.
	Role Based Access Control	Fine-grained control on privileged operations.
	Secure by Default	Reduces network access.
	File Permission Manager	Reduces setuid bits.
	Encrypted File System	Files not readable by unauthorized users.
Unauthorized System Administrator Access	Role Based Access Control	Divides root into separate roles and sets privileges for processes.
	Trusted AIX	Removes the concept of root.
Threat	**Feature**	**Notes**
Violation of Site Security Policy	AIX Security Expert	Centralized policy.
	Trusted AIX	Mandatory access controls with no concept of root.
User Accounting	AIX Security Expert	Enables Auditing if not already enabled.
	Trusted AIX	Auditing required.

39. IGMP: Internet Group Management Protocol (IGMP) is the protocol used by hosts and multicast routers to establish multicast group memberships within a physical network. It allows hosts to participate in IP multicasting according to RFC 1112, where the basics and specifics are described. A sender does not have to be a member of a multicast group to send packets to such a group. The IGMP protocol allows routers to act as members of one or more multicast groups, performing both the *multicast router part* and *group member part* of the protocol.

AIX V6.1 provides the host side function and group member part of the IGMP Version 3 (IGMPv3) protocol. The AIX V6.1 IGMPv3 implementation adheres to RFC 3376 and includes the new Socket Interface Extensions for Multicast Source Filters. The AIX V6.1 IGMPv3 implementation allows backward compatibility

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with the previous two versions of the protocol, IGMP version 1 (IGMPv1) and IGMP version 2 (IGMPv2), as they are supported in AIX 5L releases.

40. Loadable Password Algorithm:

New secure password hash algorithms

Table 8-12 lists all the supported algorithms and their characteristics.

Table 8-12 Algorithms and their characteristics

Algorithm	Maximum password length	Length of Salt, base 64	Iterations	Length of hashed string, base 64	Maximum Length of Hashed Password, base 64
crypt	8	2-char (12-bit)	25 (built-in)	11-char (64-bit)	13-char (76-bit)
MD5	255	2 to 8-char (48-bit)	1000 (built-in)	22-char (128-bit)	37-char ({smd5}salt$hashed_str)
SHA1	255	8 to 24-char	2^4 to 2^{31} (cost is 4 to 31)	27-char (160-bit)	62-char ({ssha1}nn$salt$hashed_str)
SHA256	255	8 to 24-char	2^4 to 2^{31} (cost is 4 to 31)	43-char (256-bit)	80-char ({ssha256}nn$salt$hashed_str)
SHA512	255	8 to 24-char	2^4 to 2^{31} (cost is 4 to 31)	86-char (512-bit)	123-char ({ssha256}nn$salt$hashed_str)
Blowfish	72	22-char	2^4 to 2^{31} (cost is 4 to 31)	32-char (192-bit)	69-char ({ssha256}nn$salt$hashed_str)

The following example of /etc/security/login.cfg shows that the administrator chose to use the "ssha256" LPA
as the system wide password encryption algorithm:

```
shells = /bin/sh,/bin/bsh,/bin/csh,/bin/ksh,/bin/tsh,/bin/ksh93,/usr/bin/sh,/usr,
/bin/bsh,/usr/bin/csh,/usr/bin/ksh, /usr/bin/tsh,/usr/bin/ksh93,/usr/bin,
/rksh,/usr/bin/rksh93,/usr/sbin/uucp/uucico,/usr/sbin/sliplogin,/usr/sb
in/snappd
maxlogins = 32767
logintimeout = 60
maxroles = 8
auth_type = STD_AUTH
pwd_algorithm = ssha256
```

Note 41: **Paging space garbage collection:** Starting with AIX 5.3, you can use the paging space garbage collection feature to free up paging-space disk blocks under certain conditions so that you do not have to configure as much paging space as the amount of virtual memory used for a particular workload. The garbage collection feature is only available for the deferred page space allocation policy. **Garbage collection on paging space blocks after a re-pagein** The method of freeing a paging-space disk block after a page has been read back into memory from paging space is employed by default. The reason that

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this is not freed up for every re-pagein is because leaving the blocks in paging space provides better performance in the case of unmodified working storage pages that are stolen by the LRU daemon. If pages are stolen, it is not necessary to perform the re-pageout function. You can tune the following parameters with the **vmo** command: npsrpgmin**,** npsrpgax, rpgclean, rpgcontrol.

Note 42: Network tuning:
Use the following settings to enable **rfc1323** if the MTU size is 4096 bytes or larger and to set the **tcp_sendspace** and **tcp_recvspace** values to at least 128 KB for high speed adapter (gigabit or faster). Very high speed adapters are set to 256 KB. A ″blank″ value means the option is not set so it would inherit the global ″no″ setting.

Interface	Speed	MTU	tcp_sendspace	tcp_recvspace rfc1323	tcp_nodelay	tcp_mssdflt
lo0 (loopback)	N/A	16896	131072	131072	1	
Ethernet	10 or 100 (Mbit)					
Ethernet	1000 (Gigabit)	1500	131072	165536	1	
Ethernet	1000 (Gigabit)	9000	262144	131072	1	
Ethernet	1000 (Gigabit)	1500	262144	262144	1	
Ethernet	1000 (Gigabit)	9000	262144	262144	1	
EtherChannel	Configures based on speed/MTU of the underlying interfaces.					
Virtual Ethernet	N/A	any	262144	262144	1	
InfiniBand	N/A	2044	131072	131072	1	

Device	Speed	MTU size	tcp_sendspace	tcp_recvspace	sb_max[1]	rfc1323
Token Ring	4 or 16 Mbit	1492	16384	16384	32768	0
Ethernet	10 Mbit	1500	16384	16384	32768	0
Ethernet	100 Mbit	1500	16384	16384	65536	0
Ethernet	Gigabit	1500	131072	65536	131072	0
Ethernet	Gigabit	9000	131072	65535	262144	0
Ethernet	Gigabit	9000	262144	131072[2]	524288	1
Ethernet	10 Gigabit	1500	131072	65536	131072	0
Ethernet	10 Gigabit	9000	262144	131072	262144	1
ATM	155 Mbit	1500	16384	16384	131072	0
ATM	155 Mbit	9180	65535	65535[3]	131072	0
ATM	155 Mbit	65527	655360	655360[4]	1310720	1
FDDI	100 Mbit	4352	45056	45056	90012	0
Fiber Channel	2 Gigabit	65280	655360	655360	1310720	1

Table 9. Adapters and their available options, and system default settings

Adapter type	Feature code	TCP checksum offload	Default setting	TCP large send	Default setting
GigE, PCI, SX & TX	2969, 2975	Yes	OFF	Yes	OFF
GigE, PCI-X, SX and TX	5700, 5701	Yes	ON	Yes	ON
GigE dual port PCI-X, TX and SX	5706, 5707	Yes	ON	Yes	ON
10 GigE PCI-X LR and SR	5718, 5719	Yes	ON	Yes	ON
10/100 Ethernet	4962	Yes	ON	Yes	OFF
ATM 155, UTP & MMF	4953, 4957	Yes (transmit only)	ON	No	N/A
ATM 622, MMF	2946	Yes	ON	No	N/A

Note 43: Hot-Node add, Cold-node repair, Hot-node repair (Ref Power 595 announcement and the White paper Highly Available IBM Power Systems Servers for Business-Critical Applications):

- The capability to add additional processor books to POWER6 processor-based 595 systems without powering down (Hot-node Add)
- The capability to reactivate a POWER6 595 processor book that has been repaired without powering down (Cold-node Repair)
- The capability to: 1) deactivate, 2) repair components or add memory, and then 3) reactivate a POWER6 595 processor book or POWER6 570 node1 without powering down (Hot-node Repair).
- If the POWER6 570 node being repaired is driving the system clocks, then that node must be repaired via Cold-node Repair.

These capabilities are planned to be provided at no additional charge to POWER6 Power 595 and Power 570 clients via a system firmware upgrade by the end of 2008.

Note 44: Beginning with AIX 5L Version 5.2 with the 5200-03 Recommended Maintenance package, Dynamic Adapter Membership functionality is available. This functionality allows you to add or remove adapters from an EtherChannel without having to disrupt any user connections.

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