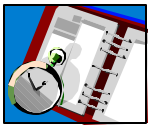
AIX - A Beginner's Look

UserBlue - San Fransisco, CA
August 18-21, 2002



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Special Notices (Cont.)

AGENDA

- AIX RoadMap - Release Summary & Overview
- Overview of Differences
- Managing AIX
  - Tools & Workload Manager
  - Logical Volume Manager (LVM)
  - Installation & Maintenance
  - Devices
  - Backup and Restore
  - SYS V & Linux Affinity
  - Performance

AIX Roadmap

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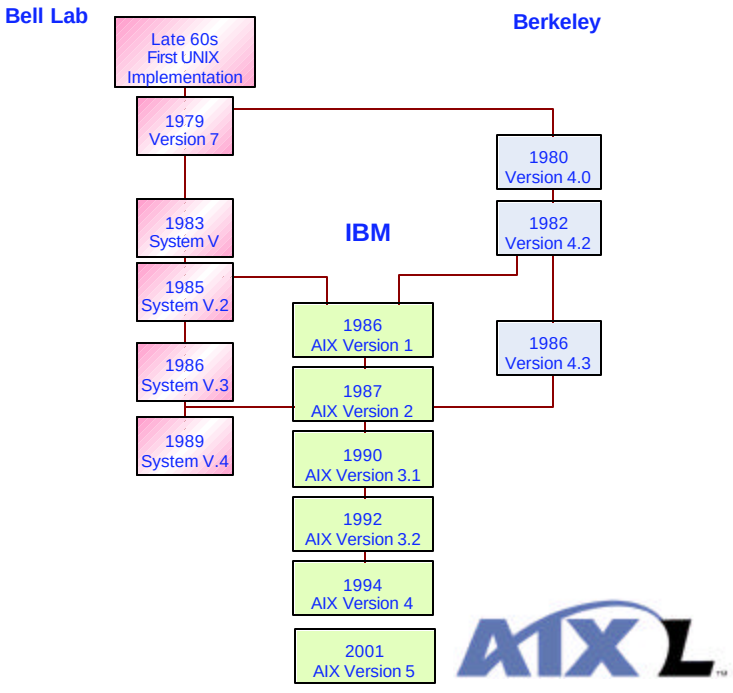
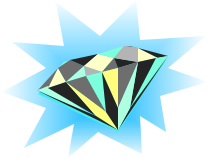
AIX History

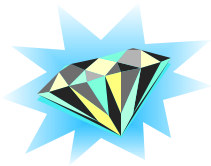


What makes up AIX?



- Virtual Memory Management by VMM
- Journaled File system (JFS) & JFS2
- Default Shell - KORN
- Persistent data managed by Object Data Manager ODM
- Desktop Interface easily controlled (X,CDE,Gnome, KDE, other)
- System Resource Manager Interface SRC
- SYSV R4 Affinity / Linux Affinity - *in base product*
- System management - SMIT / Web-SM *in base product*
- Performance Utilities - *in base product*
- Logical Volume Manager - *in base product*
- Workload Manager - *in base product*
- Device Configuration through Configuration Manager
- Diagnostics, FFDC, System Management Services SMS

What makes up AIX (cont) ?



- Kernel Debugger - kdb
- Virtual Memory Management - vmtune
- Network Options - 'no -a' NFS Options 'nfso -a'
- Performance Tools
  - topas
  - filemon
  - netpmon
  - lvmstat
  - profiling - tprof, pprof, gprof
  - perfpmr
- Networking
  - Dead Gateway Detection
  - ViPA
  - Multipath Routing w/ Cost Attribution

What's New in AIX 5L

- TCP/IP:
  - Dead Gateway Detection
  - Mutipath Routing with Cost Attribution
  - ViPA support (virtual addressing)
- WLM:
  - I/O subsystem's managed in addition to memory and CPU
- SYS V value-add:
  - SYS V Packaging
  - SYS V Print Subsystem
  - TRUSS
  - /proc filesets

What's New in AIX 5L

- TOOLS:
  - WLM improvements
  - Resource Monitoring
  - Kernel Debugger
- Performance:
  - Tools added - pprof, topas, lvmstat, wlmstat, lpstat
  - Tools enhanced - iostat, vmstat, profiling, wlm etc.
- e-Liza focus
  - Self-Optimizing
  - Self-Healing
  - Self-Managing

High-level Comparison: AIX, HP, and SUN

Tools to manage:

	AIX	HP	SUN
Administration	SMITTY SMIT WSM Command line	SAM Command line	admintool Command line Sun Management Center (SMC)
Distributed Distribution	Network Installation Manager (NIM)	Ignite Server	Jumpstart Server
Workload	Workload Manager (WLM)	Workload Manager (WLM)	Solaris Resource Manager (SRM)
Backup	mksysb savevg/restvg	dumpfs backup / fbackup	ufsdump backup
Cloning/ Online Backup	alternate disk installation/ cloning/ online jfs backup	copyutil /make_recovery / vxdump	/ dd / vxdump

BSD vs SYSV

- System Resource Controller (SRC)
- rc.tcpip rc.inetd rc.nfs
- alog & errpt /var/adm/ras
- Logical Volume Mgr

- /etc/rc.d
- start/kill scripts
- syslogd
- More traditional fixed partitions

AIX COMMAND REFERENCE

	list ls	create mk	change ch	remove rm
User Management				
Users	lsuser	mkuser	chuser	rmuser
Groups	lsgroup	mkgroup	chgroup	rmgroup
Roles	lsrole	mkrole	chrole	rmrole
Configuration				
Configuration data	lscfg -cvp			
Devices	lsdev -CH			
System data	lsconf			
SysResource Controller	lssrc -a			
Paging	lsps			
Microcode	lsmcode			
Logical Volume Manager				
Physical Volumes	lspv		chpv	
Logical Volumes	lslv	mklv	chlv	rmlv
File Systems	lsfs	mkfs	chfs	rmfs
Volume Groups	lsvg	mkvg		
Logical Volume Copies	mklvcopy	chlvcopy	rmlvcopy (split)	
Backup				
System Backup(rootvg)		mksysb		
Other Volume Group	savevg / restvg			

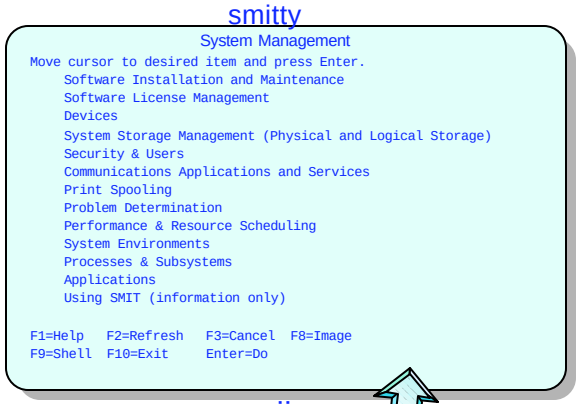
AIX TOOLS

AIX Tools Discussed

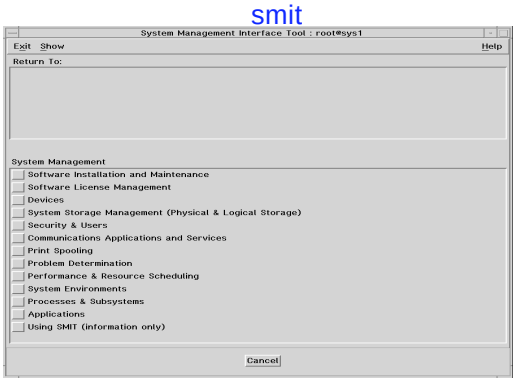
- Systems Management Tool and Web-Based SM
- Object Data Manager (ODM)
- Logical Volume Manager (LVM)
- Network Installation Manager (NIM)
- Installation Tools
- Performance Tools

Management Tools in AIX

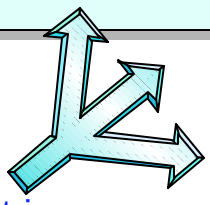
smitty



smit



ascii

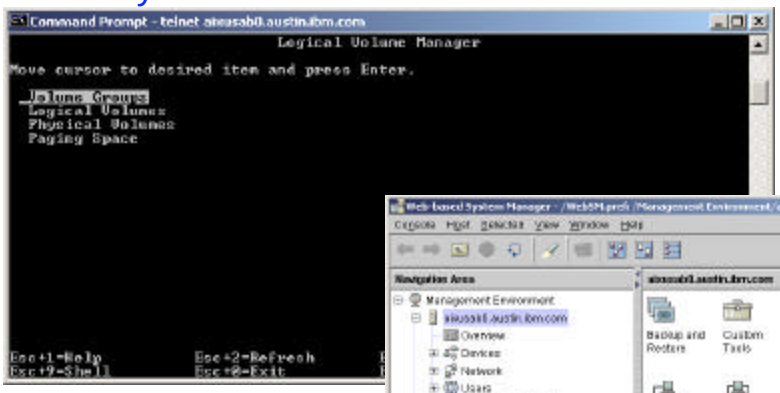


wsm

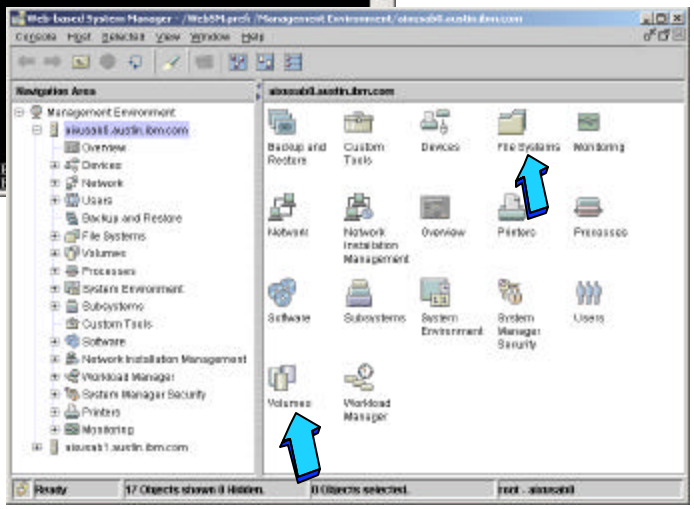
AIX has several built-in management tool options either GUI or ASCII based

Logical Volume Manager

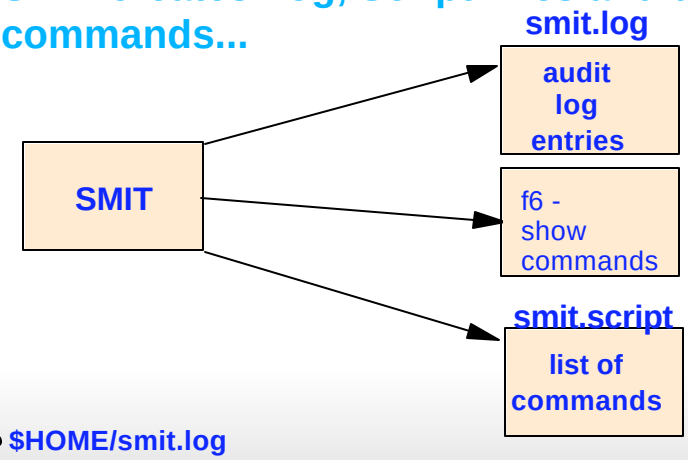
smitty lvm



wsm



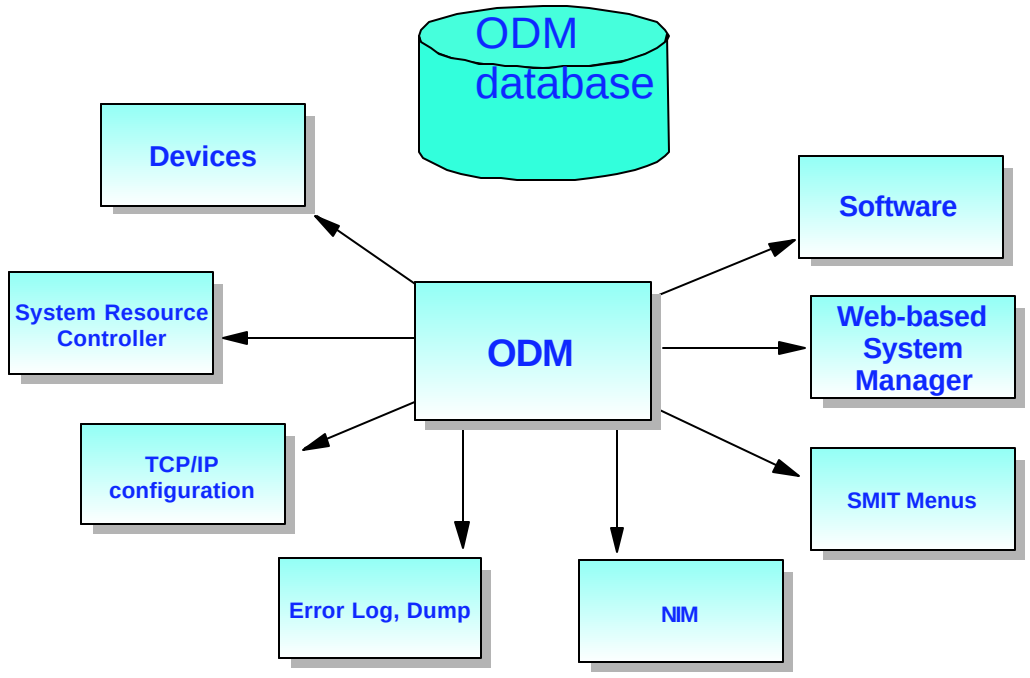
SMIT creates Log, Script Files and demonstrates commands...



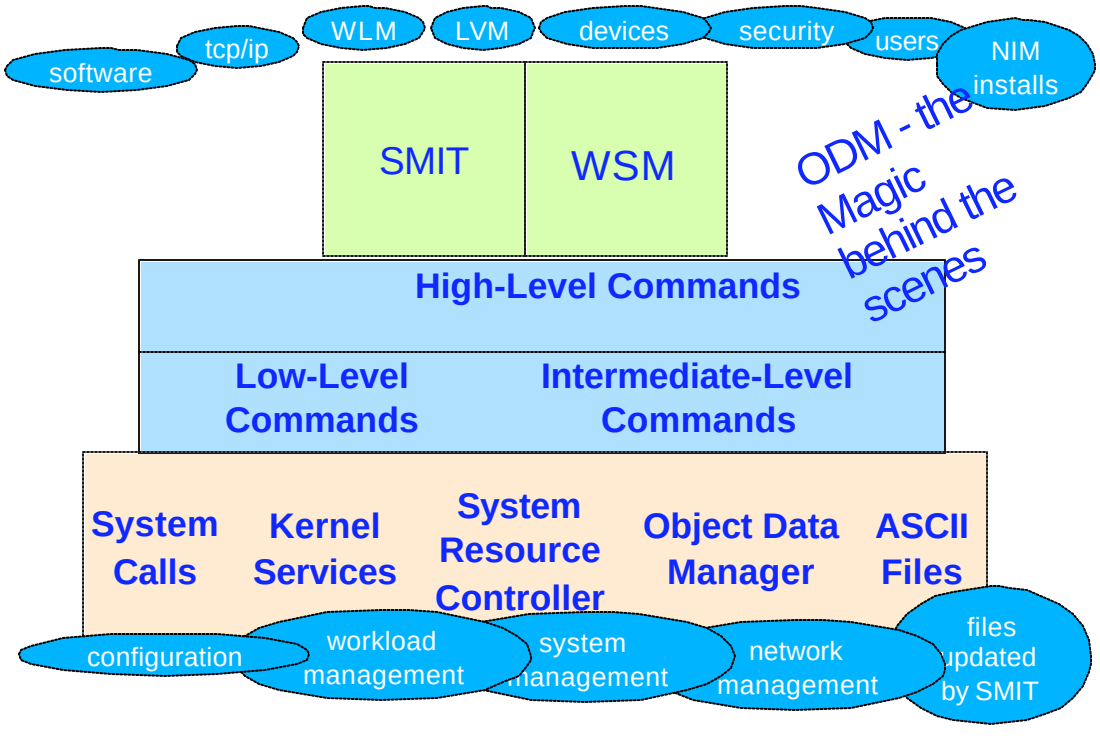
- **$HOME/smit.log**
  Keeps a log of all menu and dialog screens visited, all commands executed and their output. Also records any errors during the SMIT session.

- **$HOME/smit.script**
  Shell script containing all AIX commands executed by SMIT.

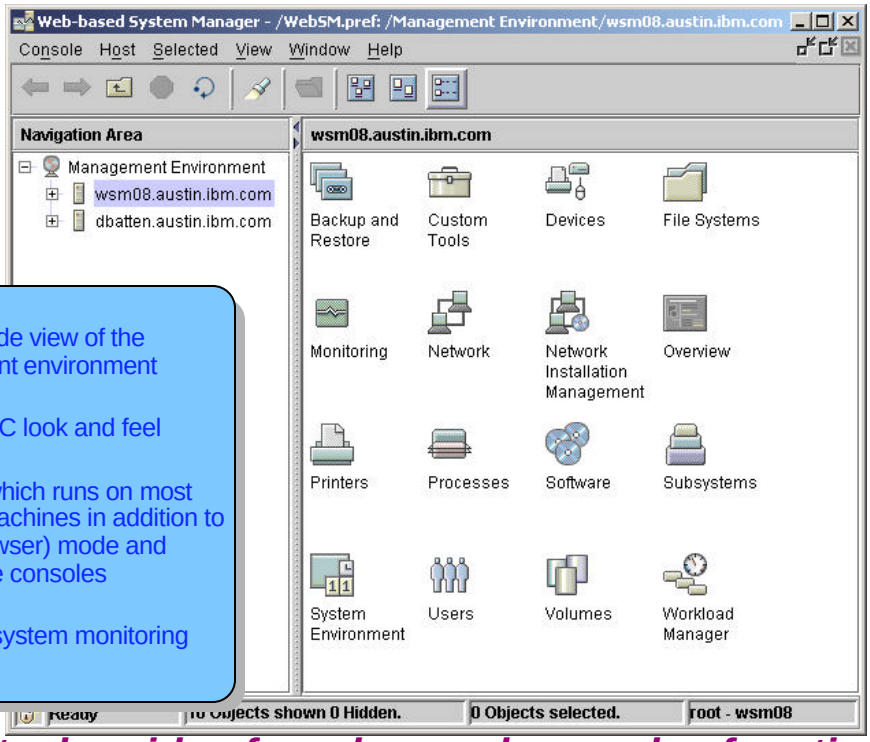
Data Managed by the ODM



AIX Administration



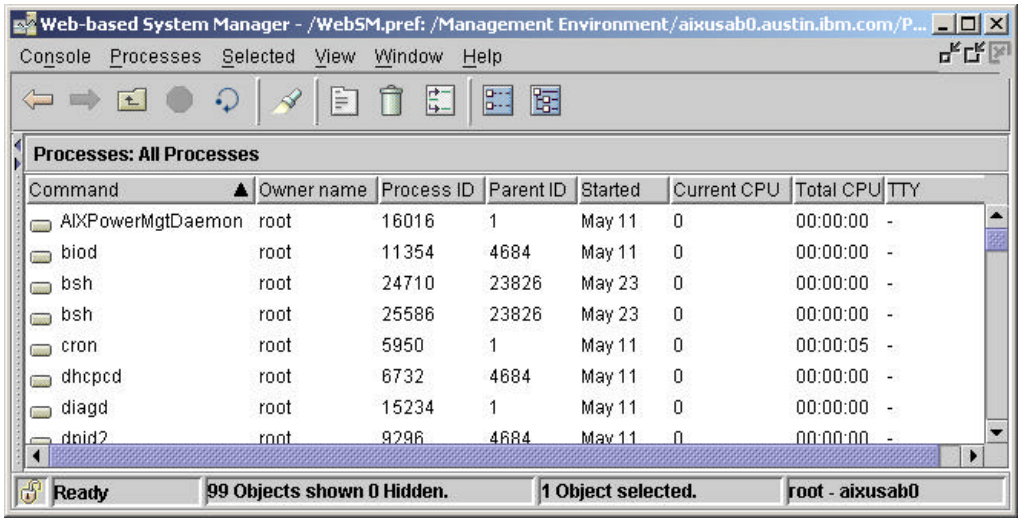
WSM Management Tool



- Multiple Node view of the management environment
- Common PC look and feel
- PC Client which runs on most windows machines in addition to applet (browser) mode and stand-alone consoles
- Advanced system monitoring capablility

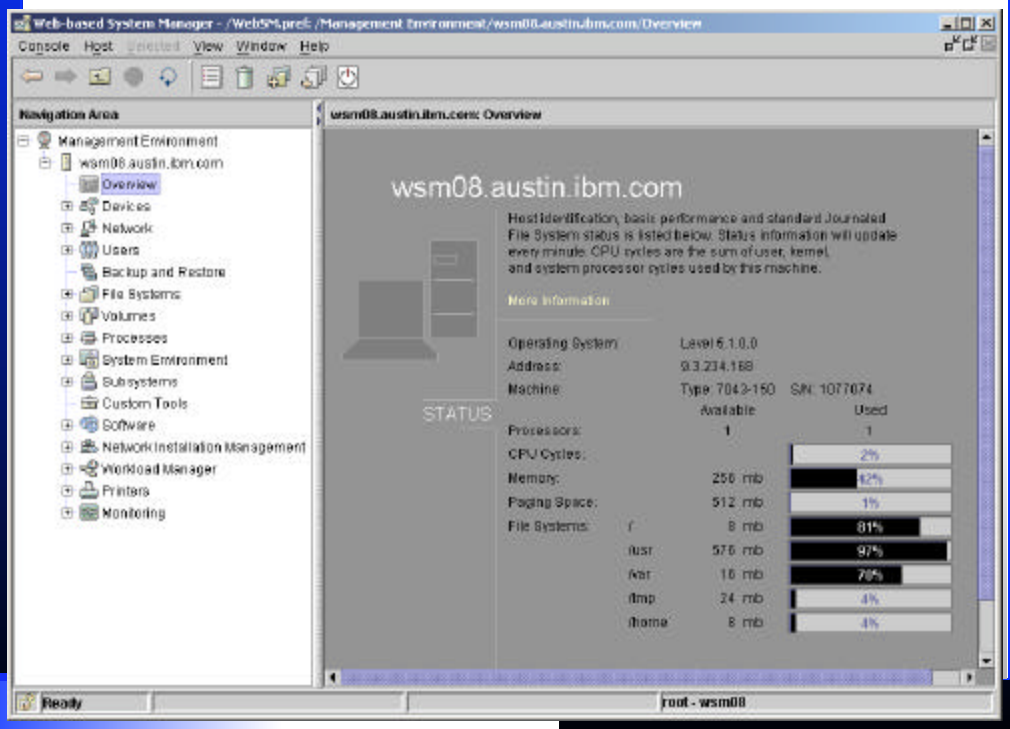
Provides task guides for advanced, complex functions

WSM Processes and Subsystems



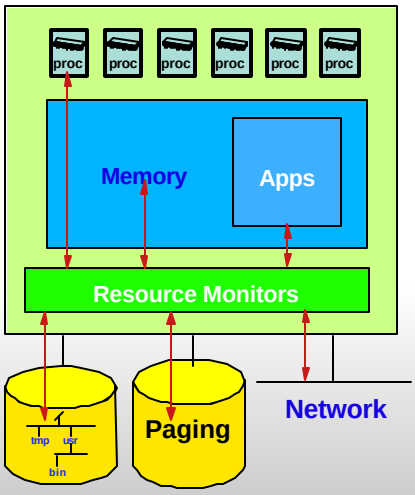
The Processes application gives a tabled view of all the data related to a running process such as Owner name, Process ID, Parent ID, Date started, Current CPU usage and Total CPU usage. More detailed information such as segment number of process stack, size of kernal stack, number of page ins caused by page faults can be found on the properties page for each individual process.

Web-based System Manager in AIX 5L (Host Overview)



Resource Management and Control

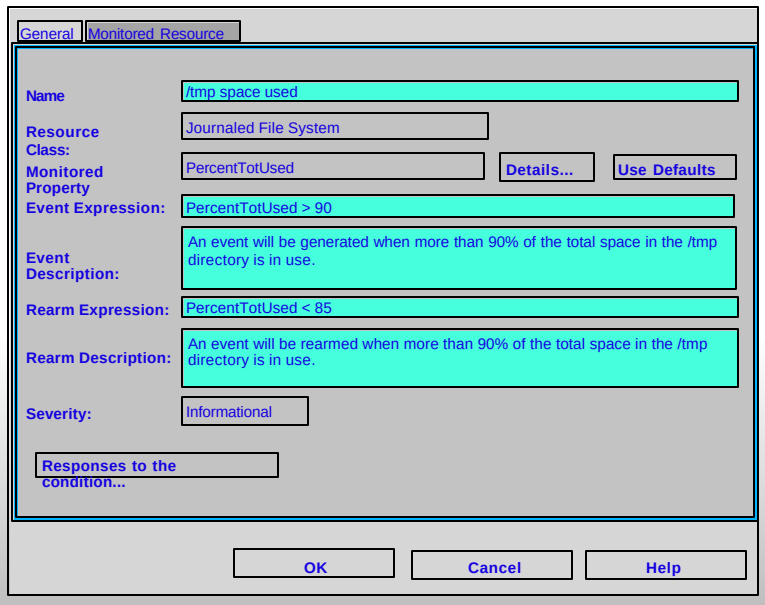
- **Resource Monitoring and Control**
  - Integrated into AIX 5.1 - Free
  - 84 predefined conditions
  - 8 predefined responses
  - Site defined conditions and responses
- **Resource Monitors**
  - Network adapters
  - Disk, paging and file systems
  - Processor statistics
  - System wide status
  - Program statistics
- **Responses**
  - Run a command
  - Send an e-mail
  - Broadcast a message
  - Log an entry



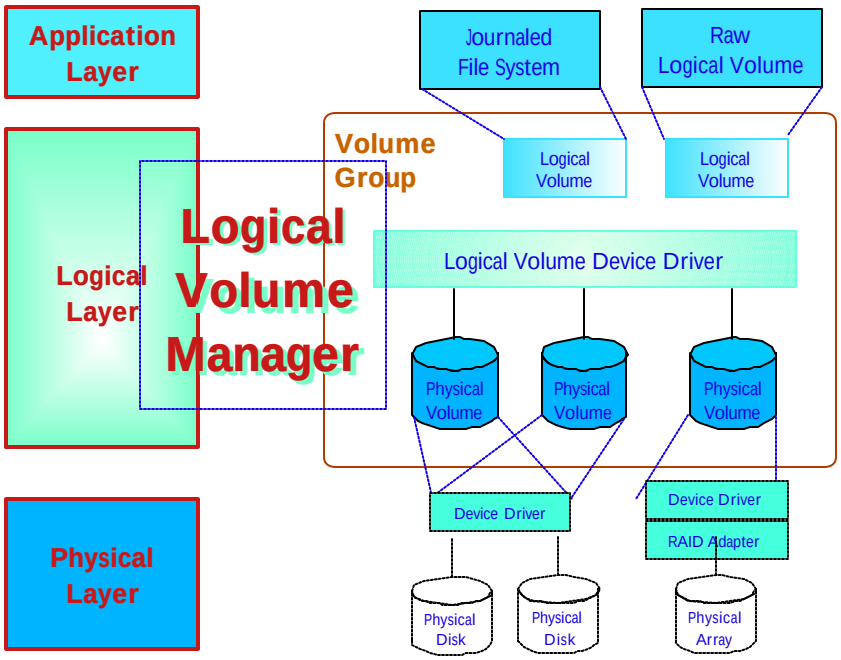
Resource Management and Control

- **Host Resource:**
  - Paging space
  - Virtual memory
  - Real memory
  - Disk I/O
  - CPU
- **JFS File System Resource**
  - Percent space used
  - Percent of i-nodes used
  - Mounted|unmounted state
- **Network device Resources**
- **Xmit, Receive rates, errors**
- **Paging Device Resource**
  - Offline alert
  - % free
- **Physical Volume Resource**
  - Data rate
  - % busy
- **Processor Resource**
  - % Kernel, wait, user, idle
- **Program Resource**
  - Process end alert

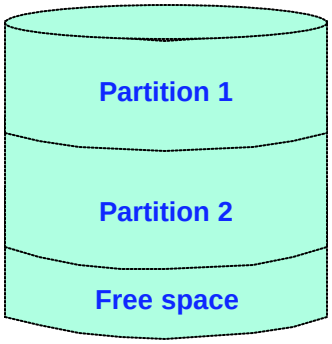
Resource Monitoring and Control



Logical Volume Manager



Traditional UNIX Storage vs. Logical Volume Manager (LVM)

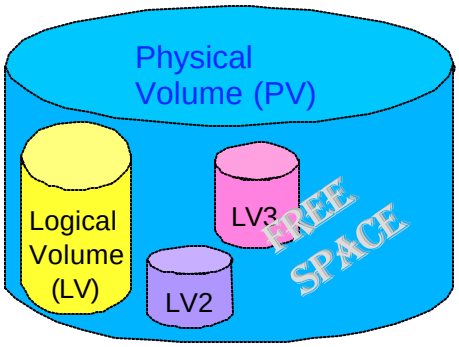


PROBLEMS:

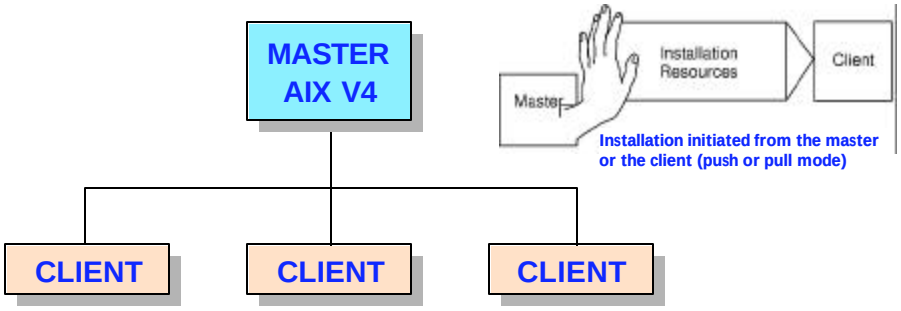
- Fixed partitions
- Expanding size of the partition
- Limits size of file system and files
- Contiguous data requirement
- Advance Planning arduous

LVM SOLUTIONS:

- Solve noncontiguous space problems
- Logical volumes(LV) can span disks
- LVs can be dynamically increased
- Logical volumes can be mirrored
- Hard disks easily added to a system
- Logical volumes can be relocated

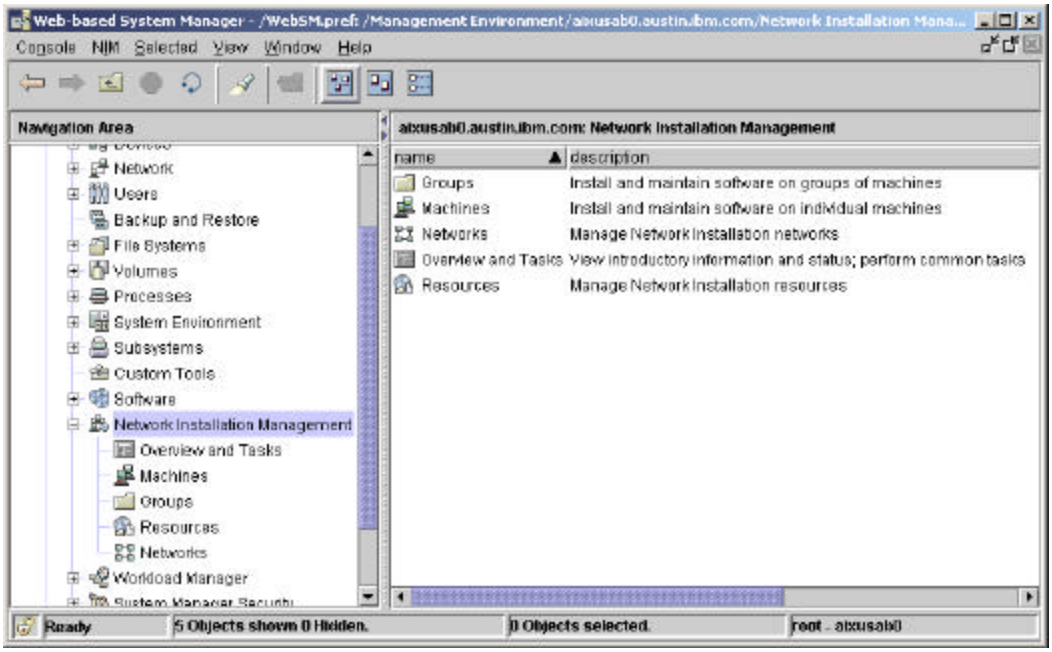


What is NIM?



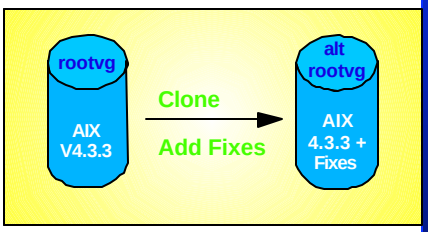
- NIM
  - Does Network Installation Management
  - Part of AIX V4 and expanded in capability in AIX 5L
  - Uses Object Terminology to describe environment
  - All tasks through WSM GUI or SMIT or command line

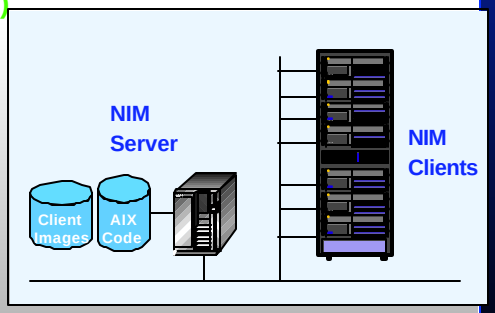
NIM on WSM



AIX Installation Tools

- **Alternate AIX Install Disk**
  - Install AIX clone & fixes
  - Reboot to new level when convenient
  - Reboot to old level without restore
  - Reduces maintenance window
- **Bootable OS backup (mksysb)**
  - Integrated into AIX - Free
  - Create customized system backup for easy restore
- **Network Installation Manager (NIM)**
  - Centrally install and update AIX
  - Eliminate media maintenance
  - Multiple AIX levels are supported
  - Enforce OS consistency

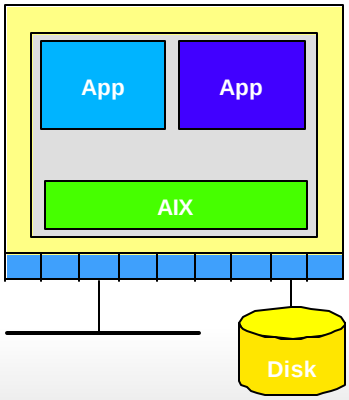




AIX Performance Tools

Application
- prof
- tprof
- pprof
- gprof
- iprof
- truss
- locktrace
- fdpr

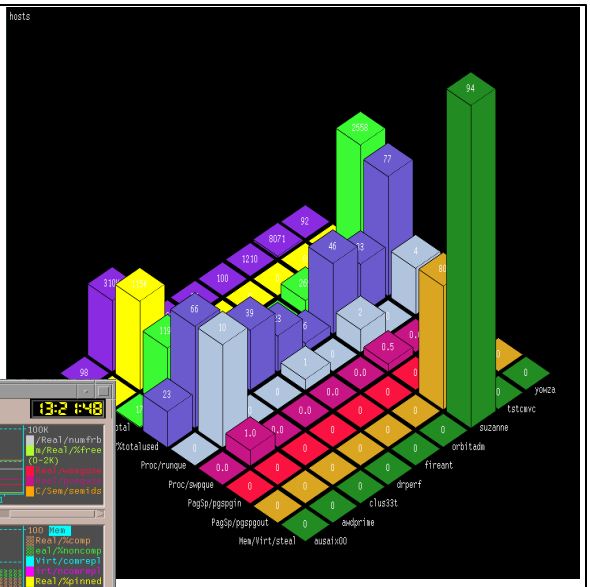
Network
- netpmon
- netstat
- enstat
- atmstat
- fddistat
- nfsstat
- tokstat
- iptrace
- traceroute
- no
- nfso
- ifconfig
- ipdump
- ipfilter
- gennames



Storage
- filemon
- fileplace
- iostat
- lvmstat

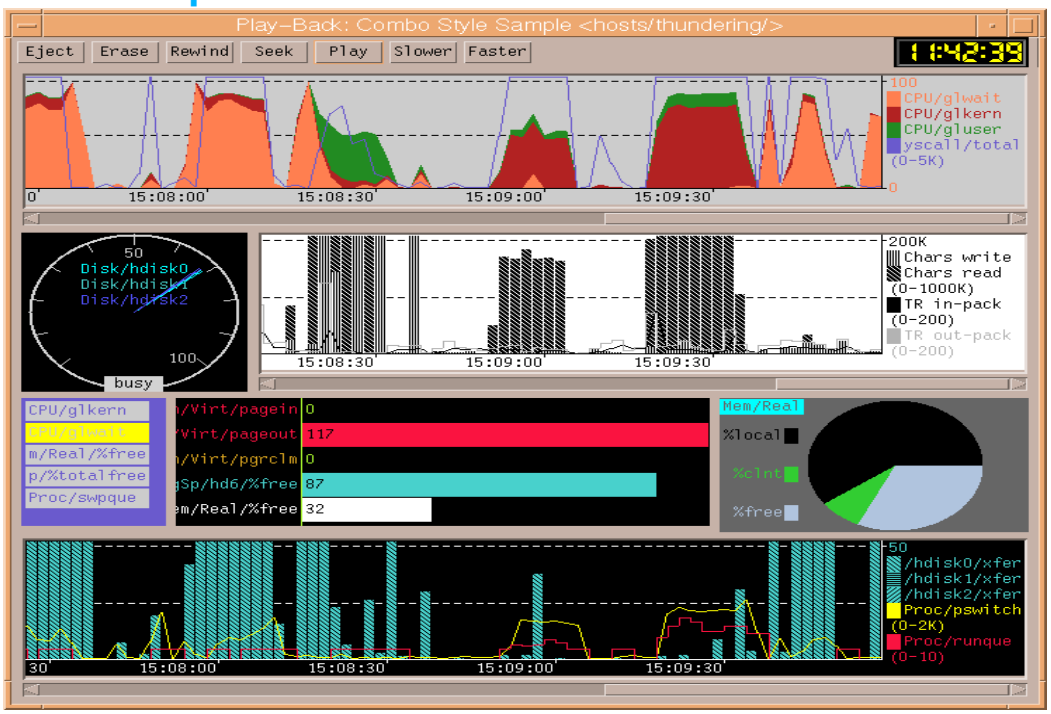
AIX / Memory / CPU
- sar / sa1 / sa2 / sa
- schedtune
- stem
- time / timex
- svmon
- topas (top)
- vmstat
- rmss
- lockstat
- vmtune
- pdt
- emstat
- trace
- alstat
- wlmstat / wlmmon

Performance ToolboX can depict multiple systems and present a one-stop view to monitor....



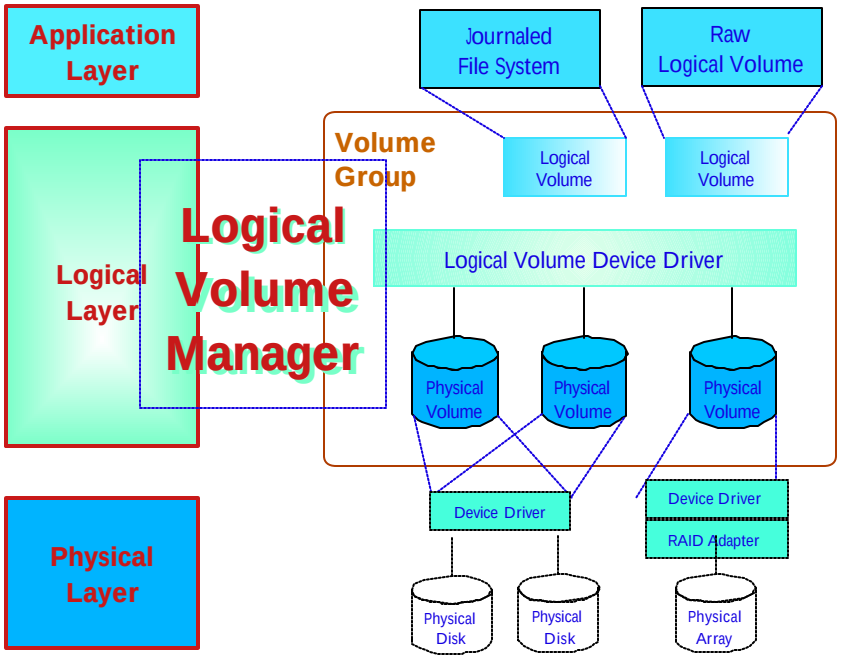
Performance ToolboX lets you analyze what occurred during the slowdown last week.

Performance ToolboX can provide tailored views for different departments.



AIX - Logical Volume Manager (LVM)

Logical Volume Manager



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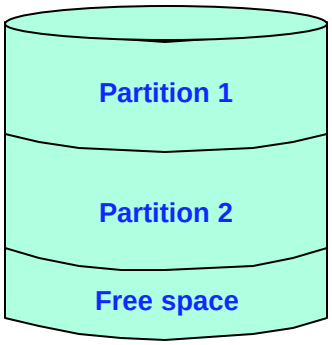

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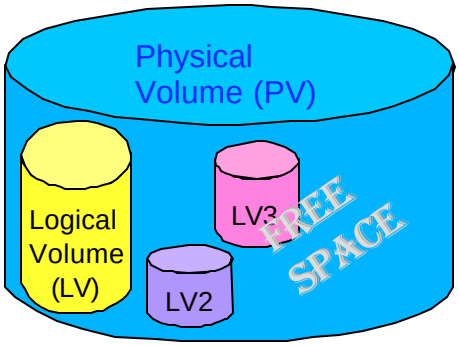
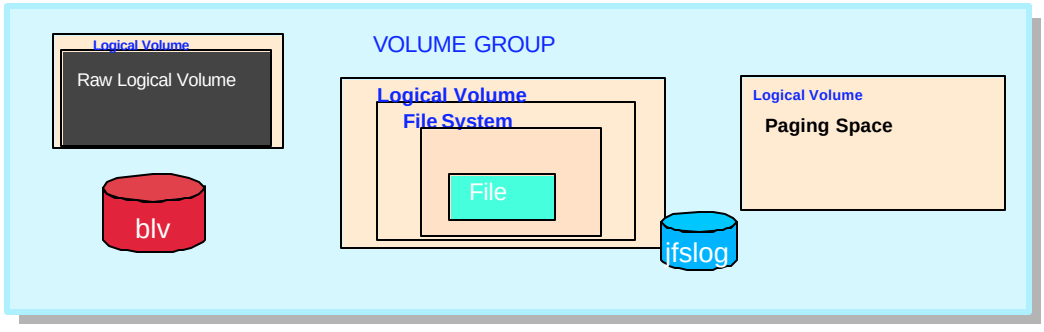
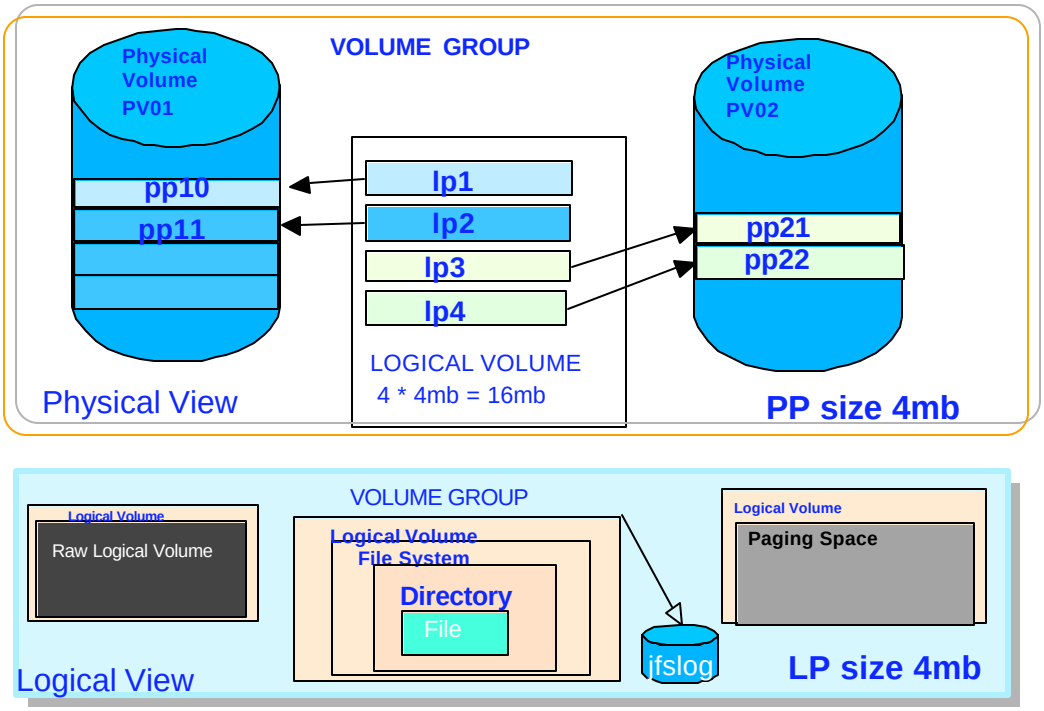


Logical Volumes

- A logical volume may contain:
  - Journaled file system (for example: dev/hd4)
  - Paging space (/hev/hd6)
  - Journal log (/dev/hd8)
  - Boot Logical Volume (/dev/hd5)
  - Nothing (raw device)

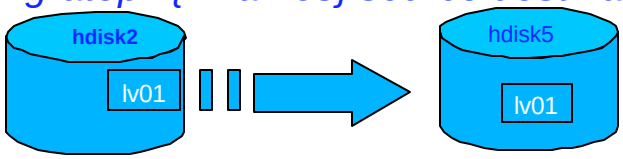


Physical and Logical Views of a Volume Group

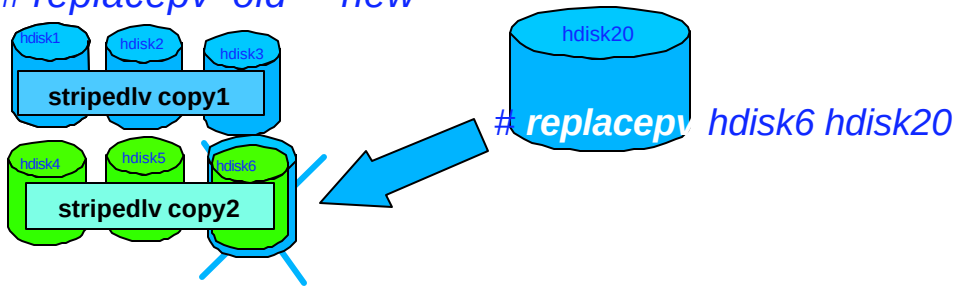


Data Movement is easily accomplished due to LVM

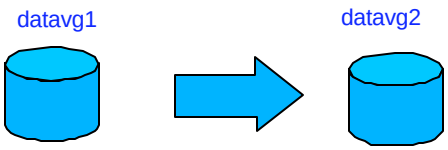
 # migratepv {lvnames} source destination



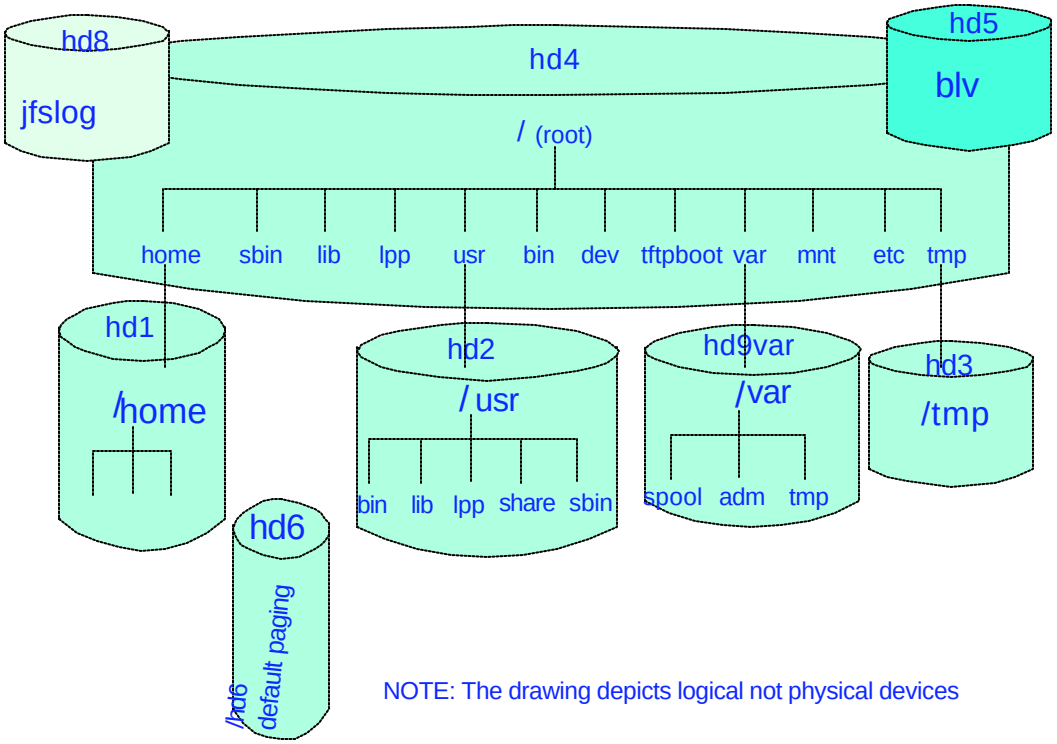
 # replacepv old new



 # cplv -v old new



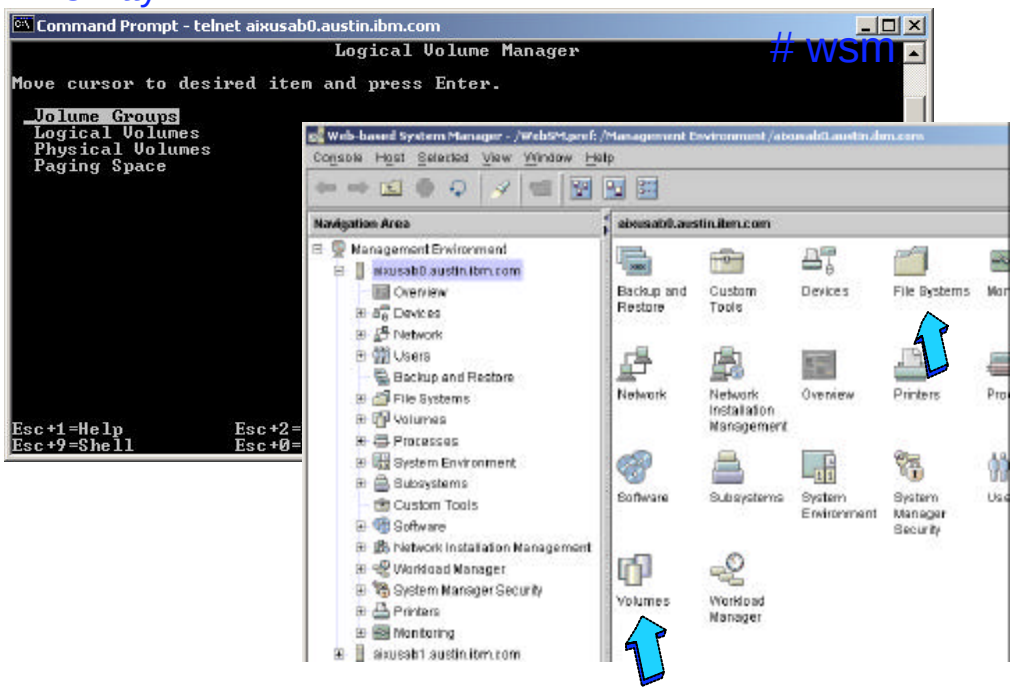
Standard Logical Volumes in AIX



NOTE: The drawing depicts logical not physical devices

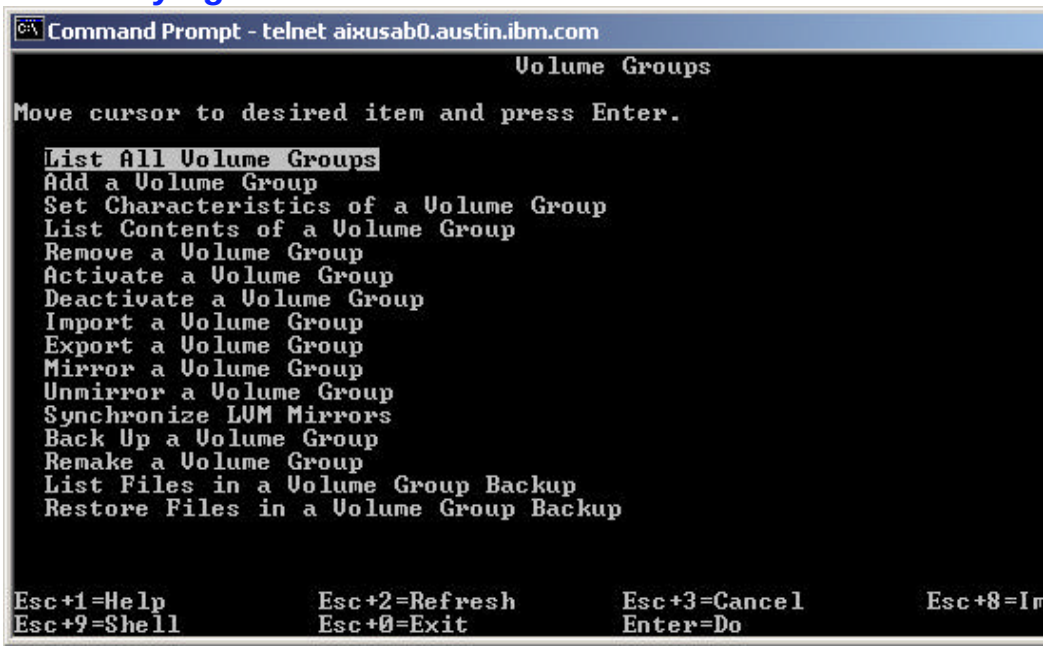
Logical Volume Manager

smitty lvm



SMIT Volume Groups Menu

 # smitty vg



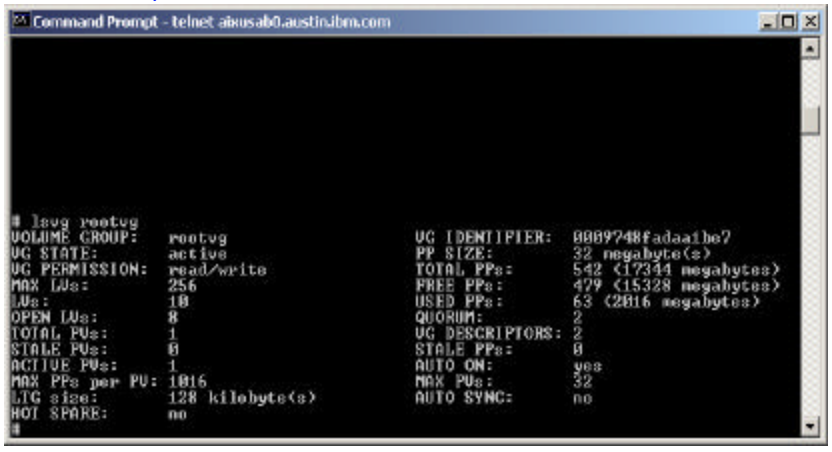
Listing Volume Group Information

- List All Volume Groups

```
# lsvg
rootvg
payrollvg
# lsvg   -o
rootvg
```

- List Contents of a Volume Group

 # lsvg rootvg



SMIT Logical Volumes Menu

 # smitty lv

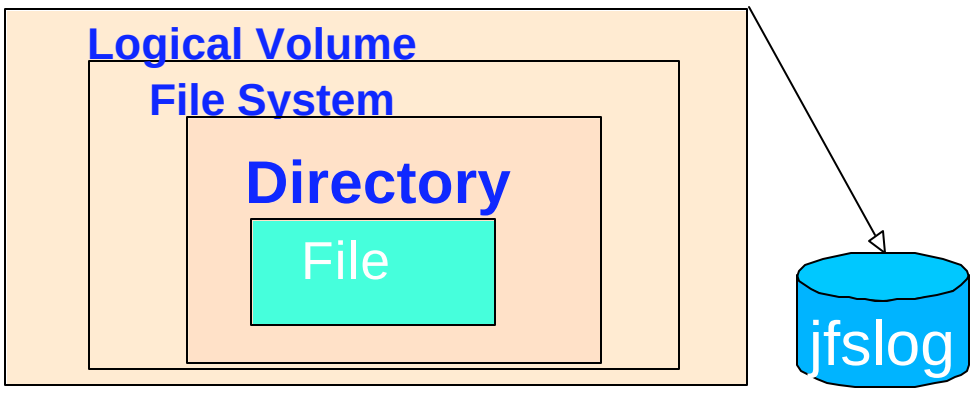
Logical Volumes

Move cursor to desired item and press Enter.

List all Logical Volumes by Volume Group
Add a Logical Volume
Set Characteristics of a Logical Volume
Show Characteristics of a Logical Volume
Remove a Logical Volume
Copy a Logical Volume

F1=Help F2=Refresh F3=Cancel F8=Image
F9=Shell F10=Exit Enter=Do

FILESYSTEMS



JFS and JFS2 Support

Journal File System Specifications

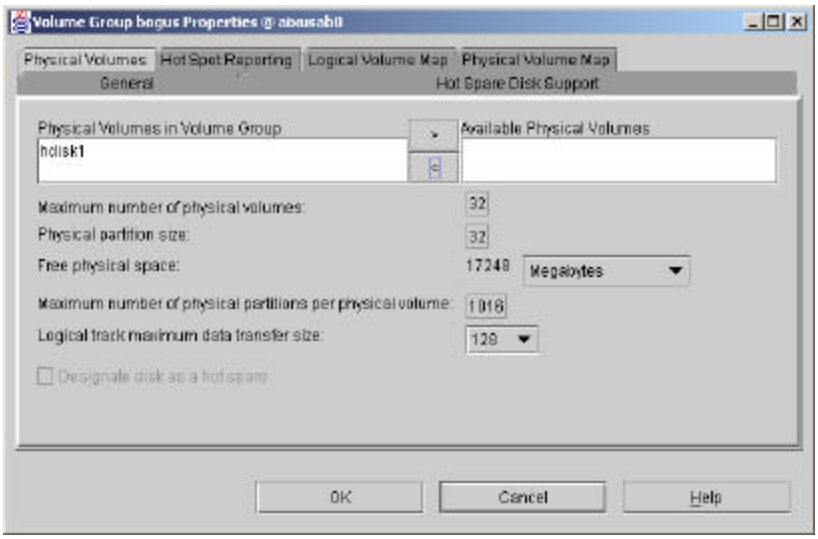
Functions	JFS2	JFS
Fragments/Block Size	512-4096 Block sizes	512-4096 Fragments
Architectural Maximum File Size	4 Petabytes	64 GBytes
Maximum File Size Tested	1 Terabyte	64 GBytes
Architectural Maximum File System Size	4 Petabytes	1 Terabyte
Maximum File System Size Tested	1 Tetabytes	1 Terabyte
Number of Inodes	Dynamic, limited by disk space	Fixed, set at file system creation
Directory Organization	B-tree	Linear
Online Defragmentation	Yes	Yes
Compression	No	Yes
Default Ownership at Creation	root.system	sys.sys
Location of Logs	Internal/External	External
Integrated into AIX 5L at no Charge	Yes	Yes

- A pv belongs to at most 1 vg
- A pv must belong to a vg to be recognized
- There is one pp and lp size per vg.
- PP & LP sizes are equal within a vg.
- VGDA & VGSA are equal within a vg.

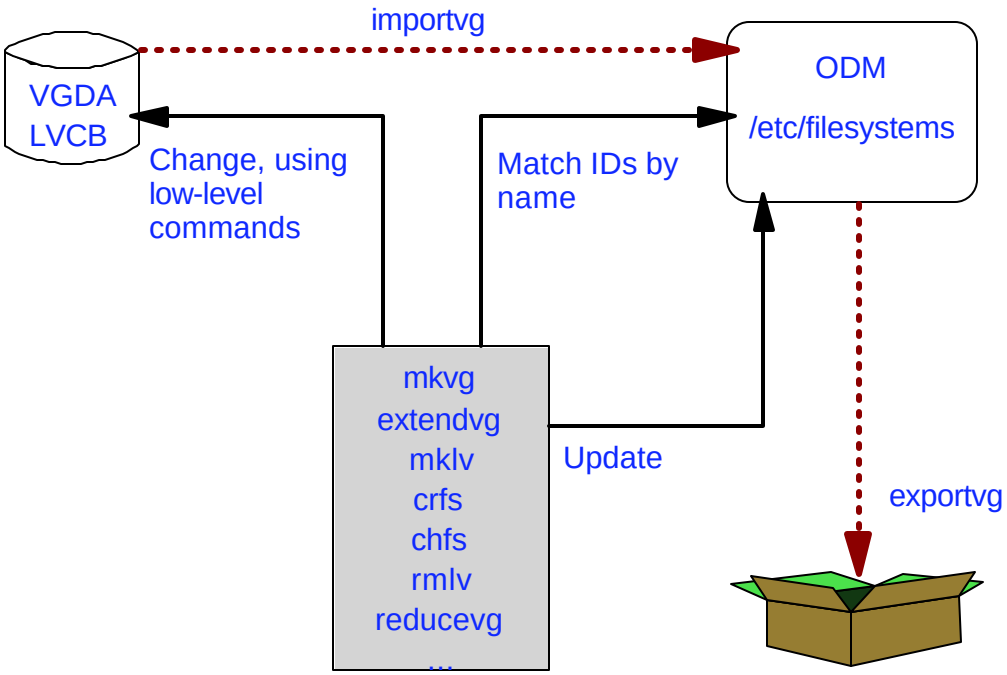
Note: JFS Maximum File Size can be affected by nbpi & fragmenting

Hot Spare Policy

Hot Spare policies for a Volume Group, in Web-based System Manager can be defined at Volume Group Creation time or after the Volume Group has been created. Once a Volume Group has been created, you can add a hot spare by adding additional physical disks to the volume group and selecting the option 'Designate disk as a hot spare'.

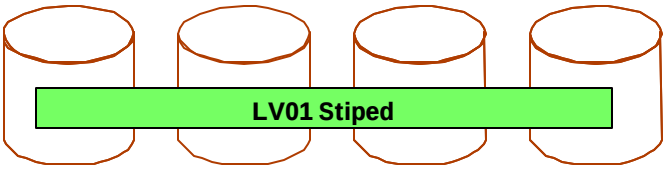


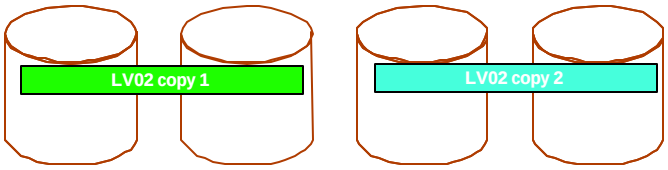
Exporting and Importing Volume Groups

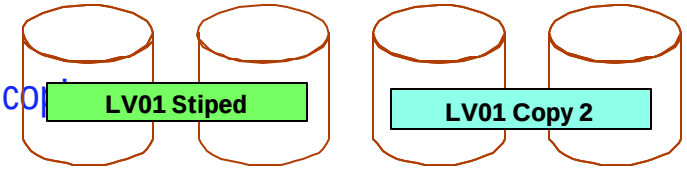


Striping VS Mirroring

- Striping
  - OS RAID 0
  - LV based
  - Stripe size from 4KB to 128KB
- Mirroring
  - OS RAID 1
  - LV based
  - mirror write consistency
  - up to 3 mirrored co
- RAID 0 + 1
  - Mirroring a Striped Drive







FileSystem Support

Open interface called VFS (Virtual FileSystem)

- Journaled FileSystem
  - Online JFS Backup
- CDRom FileSystem
  - Recordable CD capability for generating AIX system backups 

- Andrew FileSystem
- Distributed FileSystem 

  - DCE/DFS integration for AIX Fast Connect.
- Network FileSystem
- General Parallel FileSystem
  - SP Product....Needs to sit on an SP but can be accessed from anywhere

AIX - Installation & Maintenance

AIX Expansion Pack - Bonus Pack

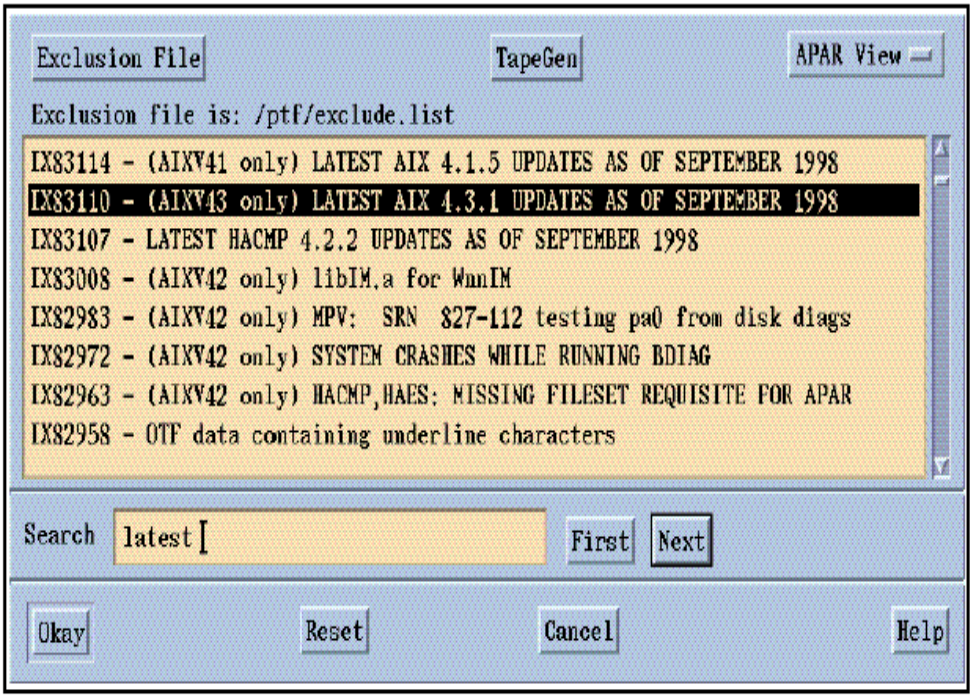
- Complement the AIX product offering.
  - no additional charge
  - Can be ordered or updated separately
  - Available at current level at no additional charge
- Updated versions are published with new releases
  - Pack announcements not tied to AIX.
- Content can vary by country or geography.

Typical releases include:

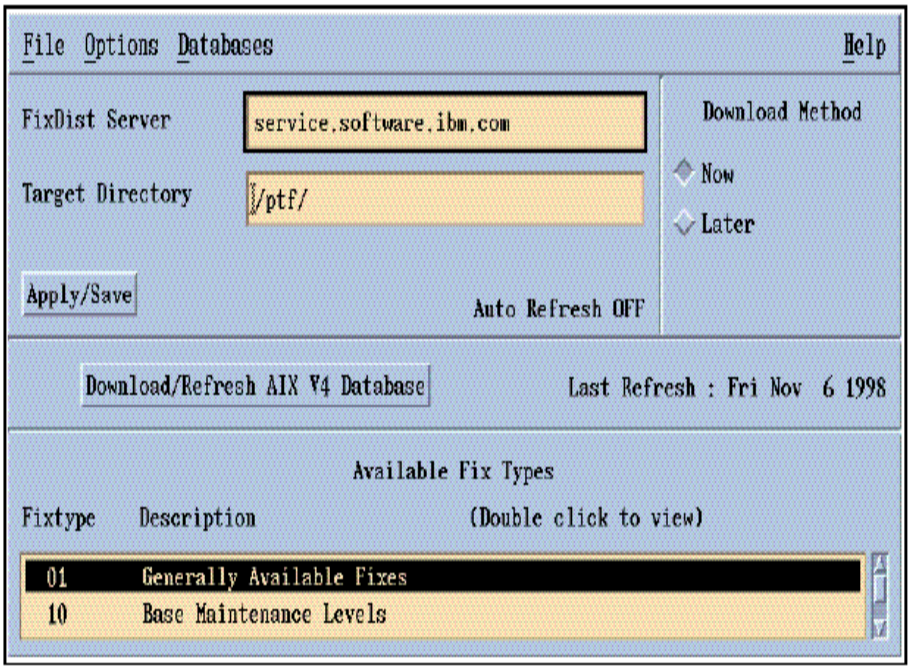
- Development tools
- Software supporting e-business
- Interoperability
- Browsers
- Java and Internet application development
- Evaluation software
- Network management utilities
- Country-specific security encryption

http://www.ibm.com/servers/aix/products/aixos/bonus

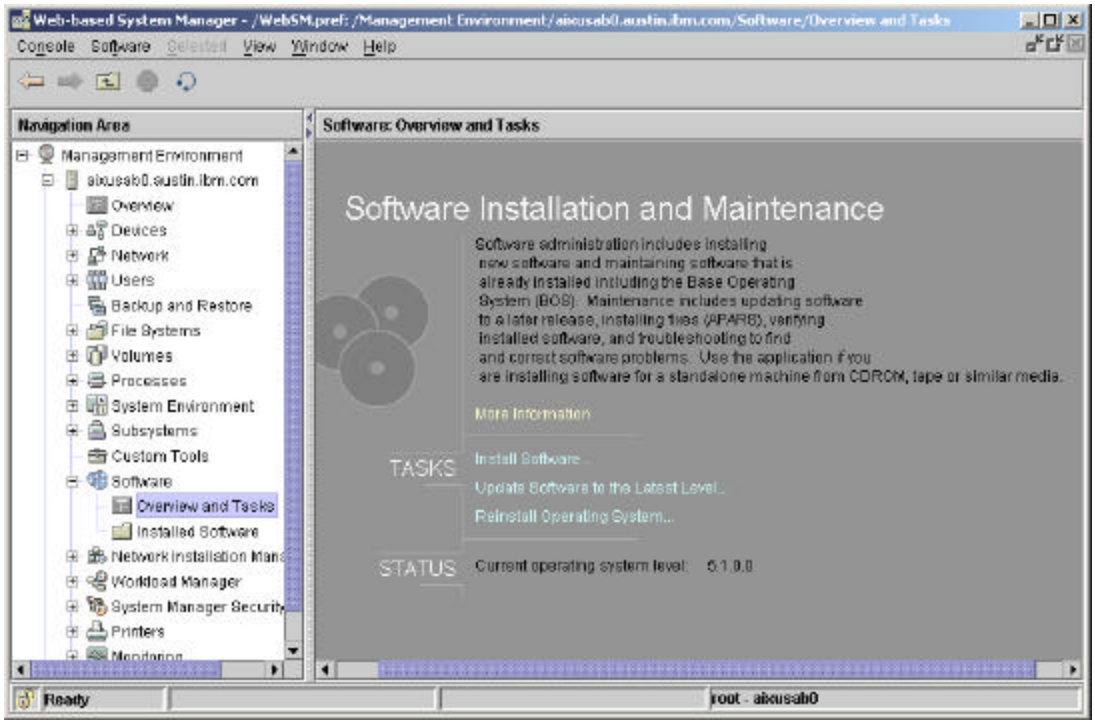
FIXDIST



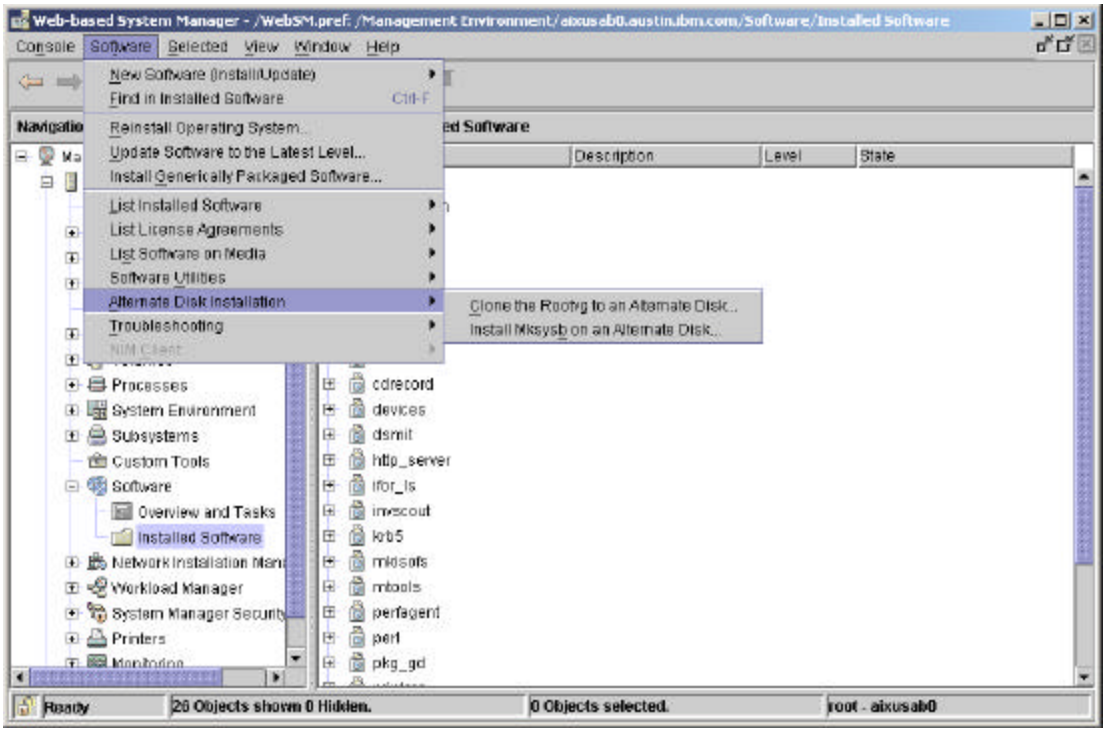
FIXDIST



WSM - Install and Update Software

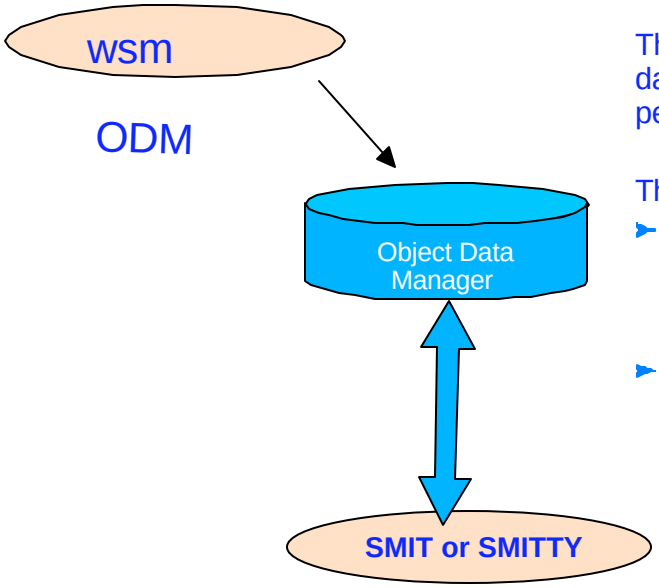


Software Installation and Maintenance-WSM



AIX - Devices

The Object Data Manager's Role



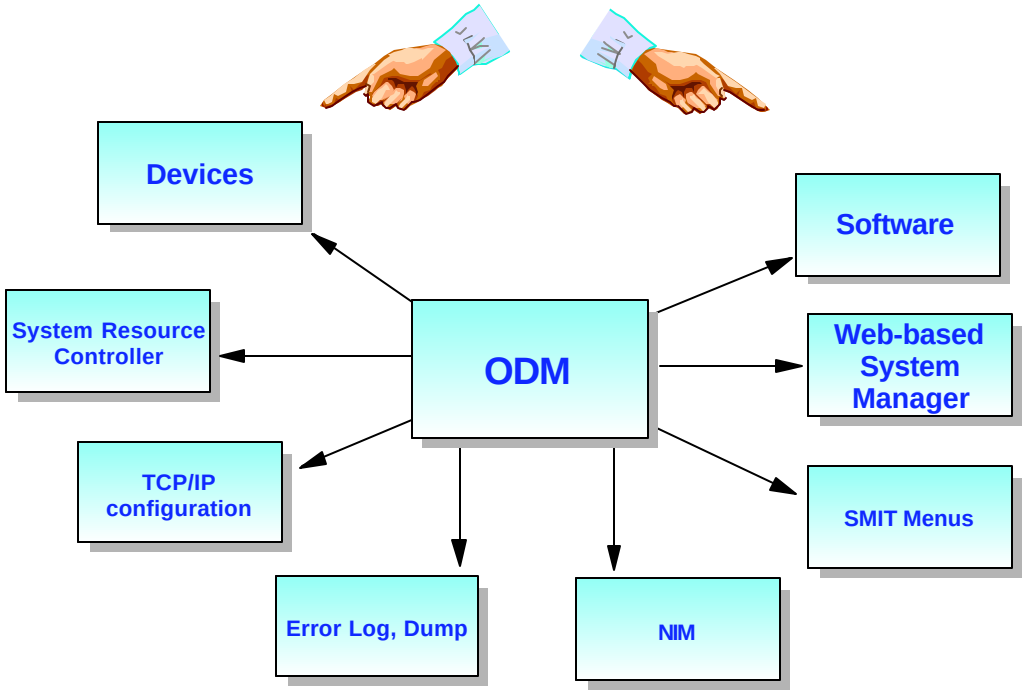
The ODM is simply a database to hold persistent data.

The ODM:

- holds information about devices, software, configuration etc.,
- is automatically updated by SMIT and WSM

wsm and smit run the appropriate commands to update the ODM automatically

Data Managed by the ODM



Device Configuration Database

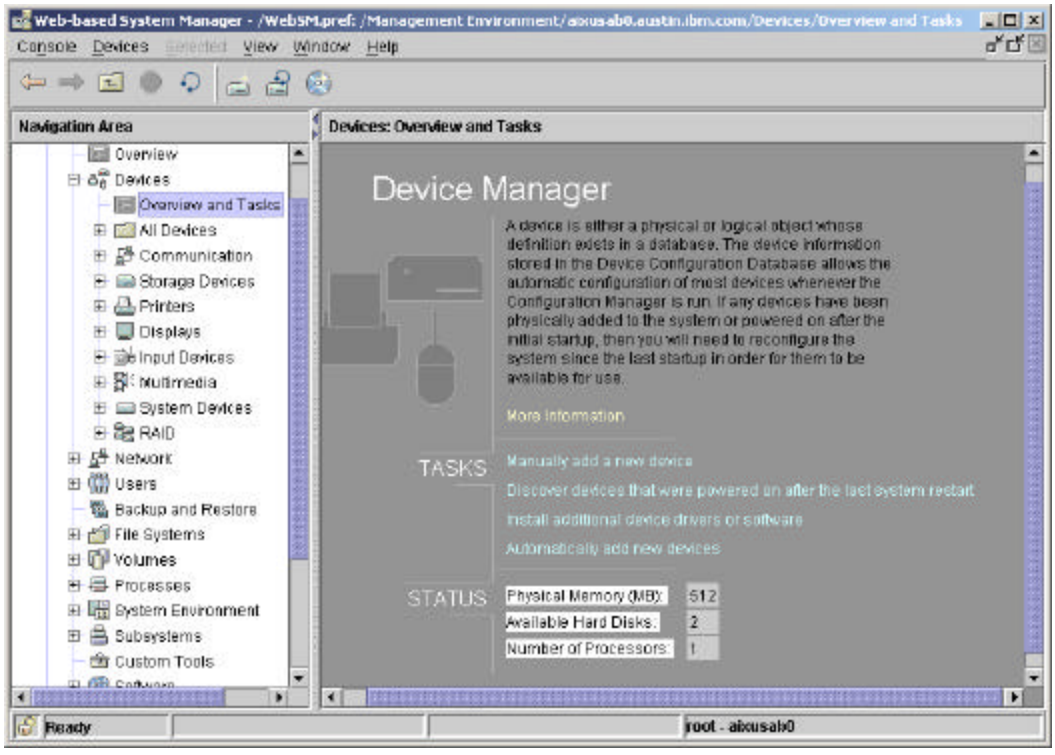
Predefined Configuration Database

Name	Type	Subclass	Description
memory	totmem	sys	Memory
tape	4mm4gb	scsi	4.0 GB 4mm Tape Drive
disk	osdisk	scsi	Other SCSI Disk Drive
adapter	22100020	pci	IBM PCI Ethernet Adapter (22100020)
adapter	14101800	pci	IBM PCI Tokenring Adapter (14101800)
adapter	ppa	isa_sio	Standard I/O Parallel Port Adapter
adapter	isa_keyboard	isa_sio	Keyboard Adapter
lft	lft	node	Low Function Terminal Subsystem
diskette	fd	siofd	Diskette Drive
printer	ibm4019	parallel	IBM 4019 LaserPrinter

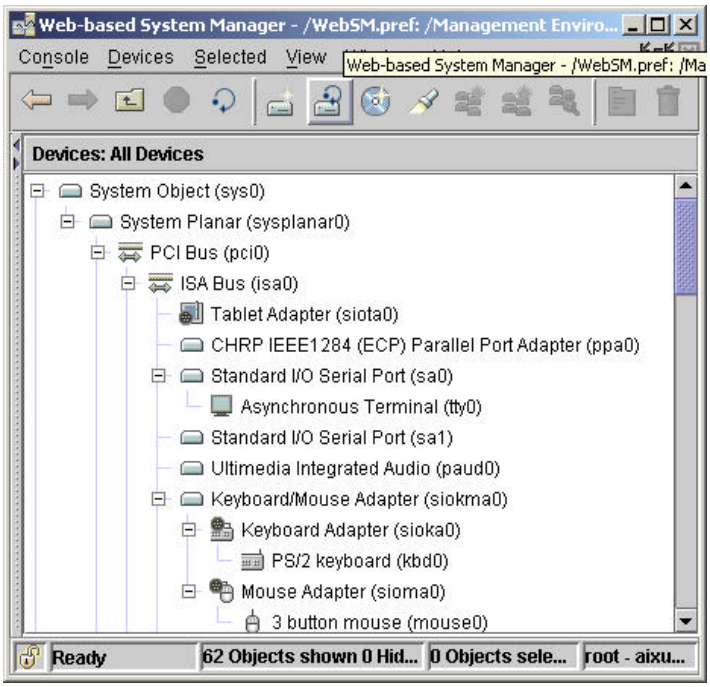
Customized Configuration Database

Name	Status	Location	Description
sa0	Available	01-C0	Standard I/O Serial Port 1
sioka0	Available	01-F0	Keyboard Adapter
rmt0	Available	04-C0-00-3,0	4.0 GB 4mm Tape Drive
hdisk0	Available	04-C0-00-4,0	16 Bit SCSI Disk Drive
hdisk1	Available	04-C0-00-5,0	16 Bit SCSI Disk Drive
mem0	Available	00-00	Memory
tok0	Available	04-03	IBM PCI Tokenring Adapter (14101800)

WSM Devices

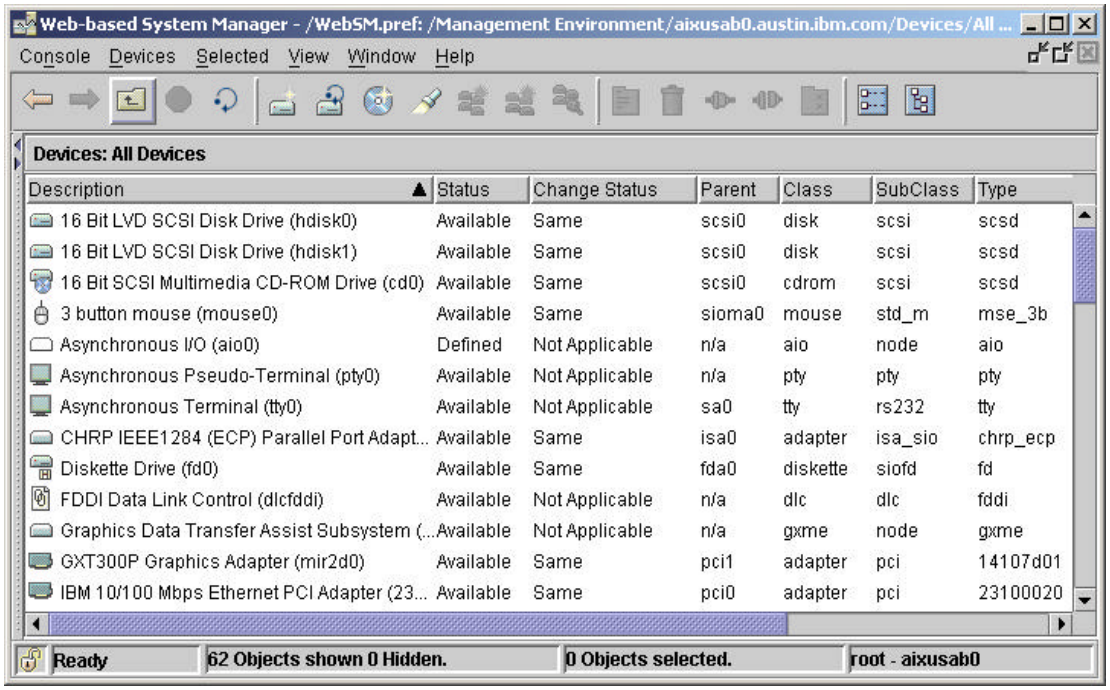


WSM Devices Application



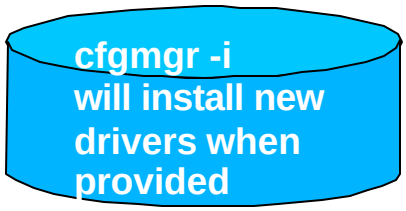
WSM can display the installed devices in a hierarchical tree view showing the logical and physical connections along with their ODM names.

WSM Devices



Self-Configuring Devices

- Configuration manager (**cfgmgr**) automatically configures detectable devices in the system during system boot or run time
- Self-configurable devices store a unique identifying code in ROM chips
- **cfgmgr** (which runs at IPL) reads the identifying number and searches in the ODM in the Predefined Database for the necessary programs to configure the device
- External devices must be powered on before **cfgmgr** runs



AIX - Backup & Restore

Creating a System Backup: mksysb

smitty mksysb

Back Up the System

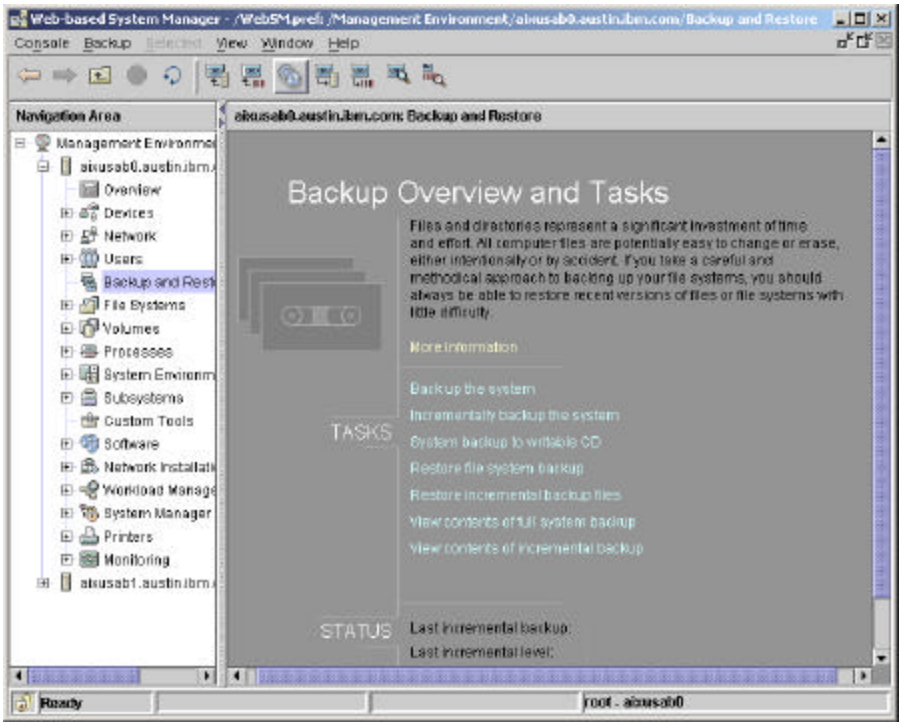
Type or select values in entry fields.
Press Enter AFTER making all desired changes.

[Entry Fields]

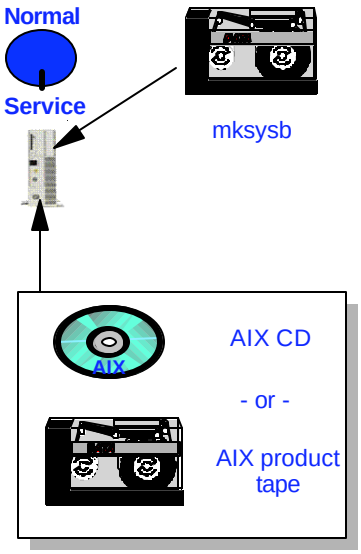
WARNING: Execution of the mksysb command will result in the loss of all material previously stored on the selected output medium. This command backs up only rootvg volume group.

* Backup DEVICE or FILE	[ ]	+/
Create MAP files?	no	+
EXCLUDE files?	no	+
List files as they are backed up?	no	+
Generate new /image.data file?	yes	+
EXPAND /tmp if needed?	no	+
Disable software packing of backup?	no	+
Number of BLOCKS to write in a single output (Leave blank to use a system default)	[ ]	#

Creating a System Backup: mksysb Cont.....



Cloning Systems Using mksysb Tapes



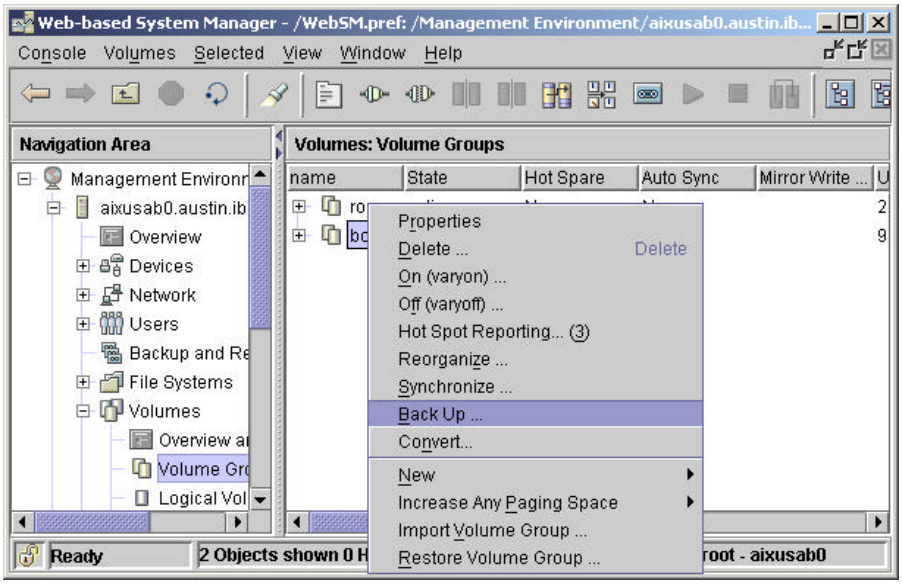
1. Insert the mksysb tape and the AIX CD (same AIX level!)
2. Boot from the AIX CD (*)
3. "Install from a System Backup":

   Missing device support is installed from the AIX CD

(*): If no AIX CD available, use an AIX product tape, but check bosinst.data:

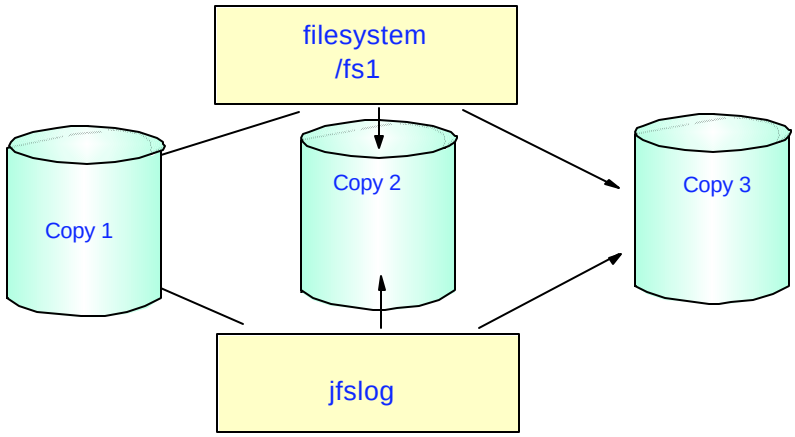
bosinst.data:
SWITCH_TO_PRODUCT_TAPE=yes

Saving a non-rootvg Volume Group - WSM



To save a non root volume group in WSM, select the volume group, right
click and select the backup option

Online JFS Backup




```
# lsvg -l newvg
newvg:
LV NAME     TYPE   LPs  PPs  PVs  LV STATE      MOUNT POINT
loglv00     jfslog    1    3    3    open/syncd    N/A
lv03        jfs    1    3    3    open/syncd    /fs1
```

AIX - SYSV & Linux Affinity

SYSV Affinity Features

- New SVR4 based commands
  - Examples: rmtcpip, prtconf, truss
- New SVR4 based subsystems
  - Examples: /proc, SVR4 print, /etc/rc.d/rc startup scripts
- Documentation and guides
  - AIX to Solaris Quickstart task guide
  - Veritas to AIX LVM and Filesystem whitepapers
  - Solaris commands man pages mapped to AIX command man pages
- Enable use of Open Source tools - 300+ tool in *Linux Toolbox for AIX*
  - Examples: lsof, gzip
- Education and Training
  - AIX for UNIX Administrators
  - AIX 5L Porting: Solaris to AIX Hands-on Workshop
  - AIX Version 5L Basics

SYSV Affinity Features

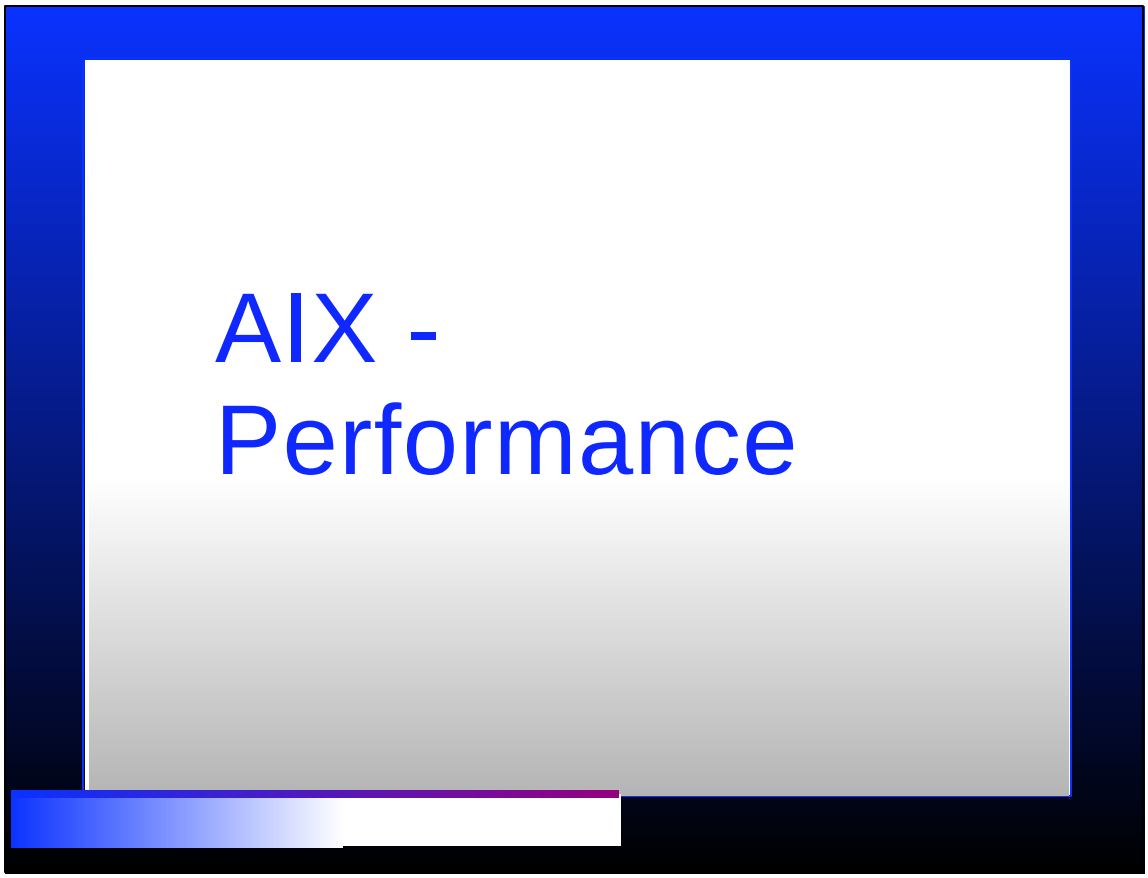
- /proc
  - Contains state information about processes and threads in the system
- truss
  - Traces process' system calls and signals
- run level script
  - /etc/rc.d/rc
  - /etc/rc.d/rc<runlevel#>.d
  - /etc/inittab
  - Default run level is 2 (Solaris is 3 and Linux is 5)
- prtconf / lsconf
  - Displays system configuration information
- rmtcpip /sysunconfig
  - Removes network configuration information

Linux Toolbox for AIX

> 300 Open source tools pre-built and delivered via CD & Web

- Application Development
  - gcc, g++, gdb, rpm, cvs, automake, autoconf, libtool, bison, flex, gettext
- Desktop Environments
  - Gnome and KDE-2
- GNU base utilities
  - gawk, m4, indent, sed, tar, diffutils, fileutils, findutils, textutils, grep, sh-utils
- Programming Languages
  - guile, python, tcl/tk, rep-gtk
- System Utilities
  - emacs, vim, bzip2, gzip, git, elm, ncftp, rsync, wget, lsof, less, samba, zip, unzip, zoo
- Graphics Applications
  - ImageMagick, transfig, xfig, xpdf, ghostscript, gv, mpage,Gimp
- Libraries
  - ncurses, readline, libtiff, libpng, libjpeg, slang, fnlib, db, gtk+, qt
- System Shells
  - bash2, tcsh, zsh
- Window Managers
  - enlightenment, sawfish

http://www-1.ibm.com/servers/aix/products/aixos/linux/index.html

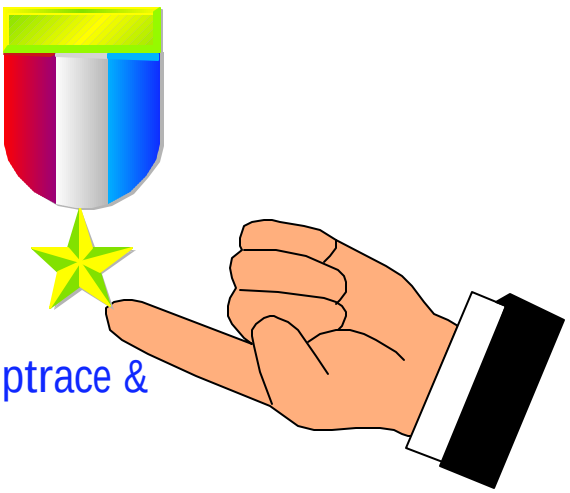


Performance Tools to manage AIX:

Standard UNIX tools iostat, vmstat, sar, netstat, /proc, truss - downloaded tools : netperf, top, monitor,	ALL
Added Tools trace utilities, filemon, topas, bf, fdpr, svmon, vmtune, no, nfso	AIX has incorporated most of its popular performance toolbox tools into the core product.
Functionality discussed	Due to a dynamic rebuild of the kernel, most AIX tuning functions can be effected without a reboot.

Utilize the standard UNIX tools available

- sar -d & -P all
- truss
- /proc
- netstat/nfsstat
- vmstat
- iostat
- tcp tools (traceroute, iptrace & ipdump, ndd etc)
- ps



Then add all the AIX tools!

Disk & I/O

filemon
lvm mapping
lvmstat
fileplace
wlmstat
wlmmon
pprof

CPU / Kernel & General

topas
wlmstat
wlmmon
xmperf / PTX
tprof, pprof,

Memory

vmtune
svmon
wlmstat
wlmmon
tprof
paging controls

Applications

Profiling:
tprof
pprof
fdpr
bf

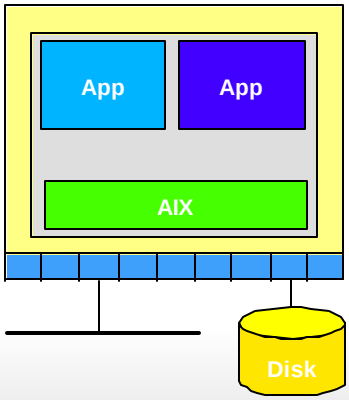
Networking

iptrace
ipdump
ipfilter
gennames
netpmon
'no' & 'nfso'

AIX Performance Value Adds

Application
- prof
- tprof
- pprof
- gprof
- iprof
- truss
- locktrace
- fdpr

Network
- netpmon
- netstat
- enstat
- atmstat
- fddistat
- nfsstat
- tokstat
- iptrace
- traceroute
- no
- nfso
- ifconfig
- ipdump
- ipfilter
- gennames



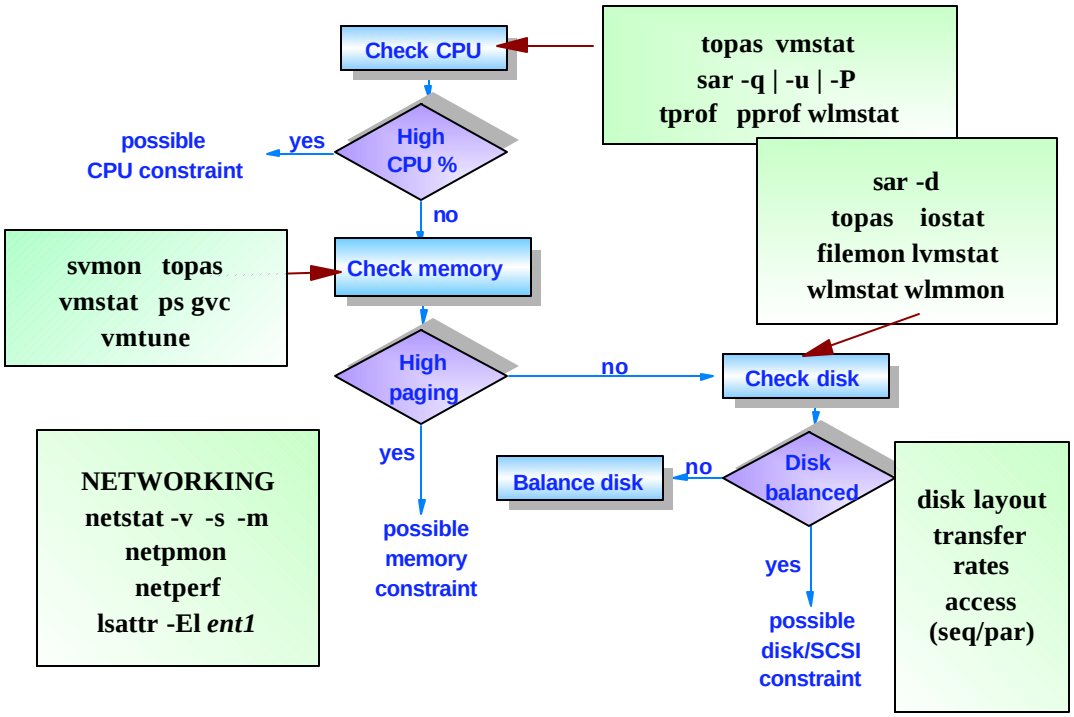
Storage
- filemon
- fileplace
- iostat
- lvmstat

AIX / Memory / CPU
- sar / sa1 / sa2 / sa
- schedtune
- stem
- time / timex
- svmon
- topas (top)
- vmstat
- rmss
- lockstat
- vmtune
- pdt
- emstat
- trace
- alstat
- wlmstat / wlmmon

Monitoring & Tuning by System resources

	CPU	Memory Subsystem	I/O Subsystem	Network Subsystem
Monitoring	vmstat, iostat	vmstat	vmstat, iostat	netstat, nfsstat
	ps, pstat topas	ps, lsps	lsps	lsattr
	sar	svmon	lspv, lslv, lsvg	ifconfig
	crash, kdb	wlmstat, wlmmon	filemon	iptrace
	wlmstat, wlmmon	topas	lvextend, reorgvg	netpmon
	lockstat, syscalls		fileplace	ipfilter
	gprof, prof, tprof		lsattr, lsdev	netperf *
	time, timex		lvmstat	topas
	uptime, rup		topas	
PTX	PTX	PTX	PTX	PTX
	trace, trcrpt	trace, trcrpt	trace, trcrpt	trace, trcrpt
Tuning	schedtune	vmtune, schedtune	vmtune	no, nfso
	chdev	chdev, mkps	chdev	chdev
	nice, renice	chps, mkps	migratepv	ifconfig
	bindprocessor	rmss	chlv, chvg	
	fdpr	fdpr	reorgvg	
	pstat			

Basic Performance Analysis



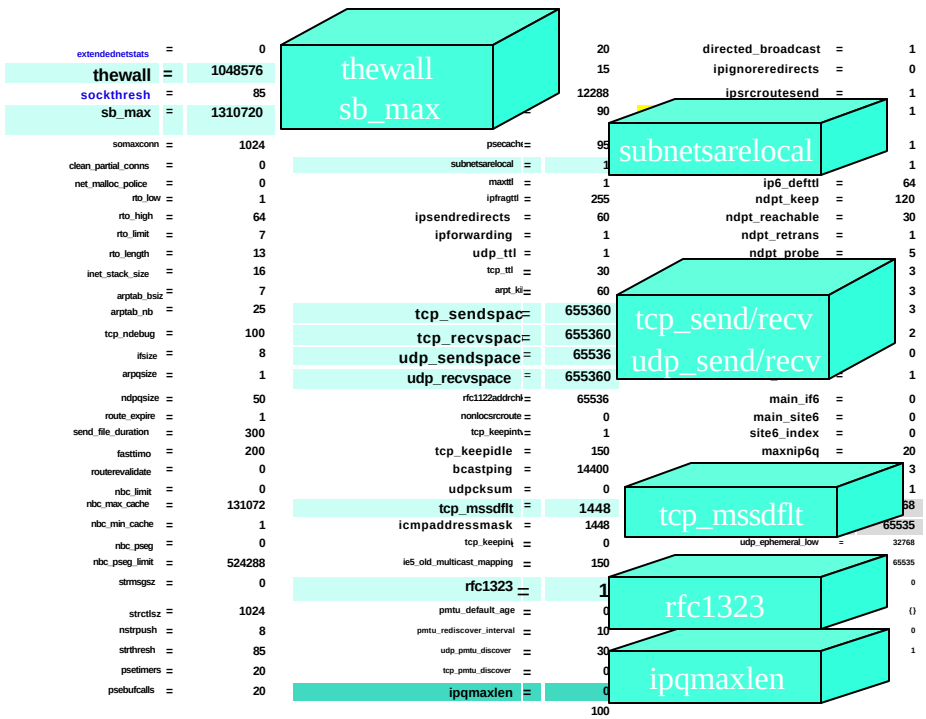
Network Options

Network options are set by executing the command:

```
no -a
```

These options are dynamic, therefore should be placed where they will be re-executed on boot. e.g., an /etc/rc.tune file or /etc/rc.local

Some Important Tunables



Tuning the Virtual Memory Manager

VMM is tuned using the following command:

/usr/sample/kernel/vmtune

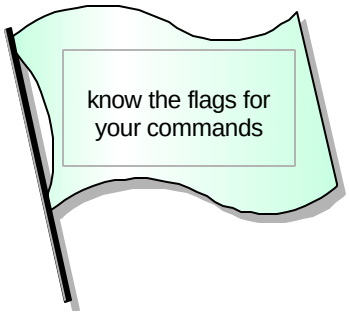
vmtune options are dynamic, therefore should be placed where they will be re-executed on boot. e.g., an /etc/rc.tune file or /etc/rc.local

Virtual Memory Manager can be utilized to tune sequential read ahead/write behind/memory utilization and more

VMTUNE

```
# /usr/samples/kernel/vmtune
vmtune:  current values:
    -p          -P          -r          -R          -f          -F          -N          -W
minperm  maxperm  minpgahead maxpgahead  minfree  maxfree  pd_npages maxrandwrt
  52221    208884          2           8         120         128      524288          0

   -M         -w        -k        -c          -b          -B          -u          -l        -d
maxpin npswarn npskill numclust numfsbufs hd_pbuf_cnt lvm_bufcnt lrubucket defps
209704   8192     2048        1         93          64           9      131072      1

          -s                -n          -S          -L          -g          -h
sync_release_ilock  nokilluid  v_pinshm  lgpg_regions  lgpg_size  strict_maxperm
          0                 0          0           0           0           0

number of valid memory pages = 262129       maxperm  = 79.7% of real memory
maximum pinable = 80.0% of real memory      minperm   = 19.9% of real memory
number of file memory pages = 101009        numperm   = 38.5% of real memory

*  nokillroot 4.3.3.0, nokilluid 4.3.3.2 >
```

There's more to NETSTAT then -rn!

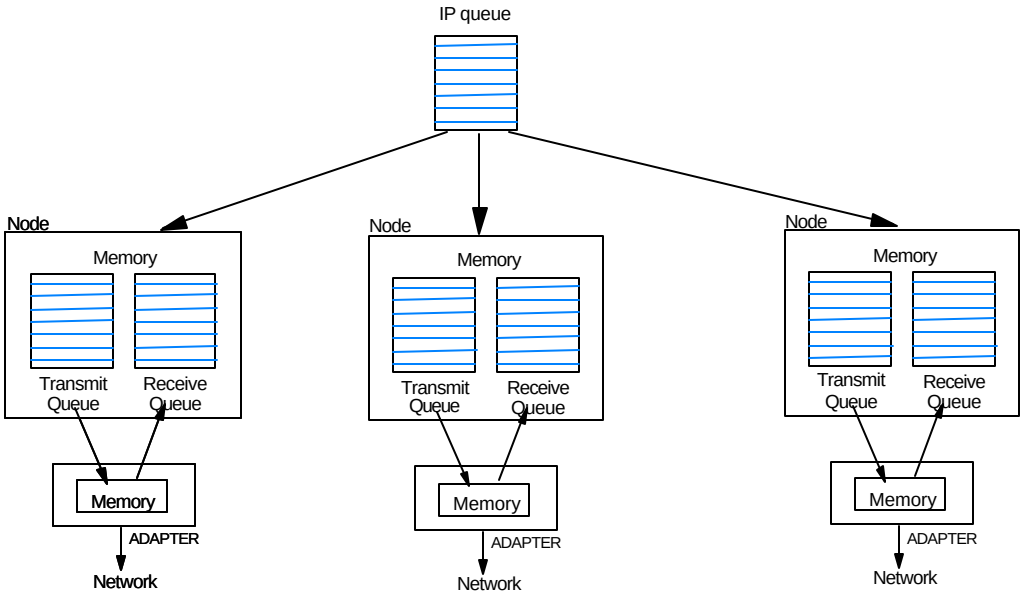


- netstat -v
- netstat -in
- netstat -s
- netstat -m
- netstat -rn
- netstat -p ip
- netstat -p udp

- check for overflow
- check for balance & errors
- check for dropped
- check for mbuf use
- check for routing
- check for ipintq errors
- check for socket buffer overflows

Ipqueue value when multiple adapters are used

lsattr -El *ent0*



netstat -p IP | grep ipintq

AIX Tools: tprof

```
# tprof -x sleep 60
# more _prof.all
```

This file is created by tprof

```
   Process         PID    TID    Total  Kernel   User   Shared  Other
         wait      516    517     6855    6855      0        0      0
netscape_aix4    23494  40015      201      27     29      145      0
        lslpp    17566  43613       11       5      4        2      0

   Process        FREQ   Total  Kernel   User   Shared   Other
         wait        1    6855    6855      0        0       0
netscape_aix4        5     961     122    139      700       0
          ksh       46      77      64      7        6       0
```

Transaction Profiling

AIX Tools: svmon

```
# svmon -G
```

Global report

memory			in use				pers			pg space	
size	in use	free	pin	work	pers	clnt	work	pers	clnt	size	in use
65536	31520	33149	3229	22051	9469	0	3229	0	0	131072	321

Sizes are in # of 4K frames

Top 3 users of memory

```
# svmon -Pt3
```

Pid	Command	Inuse	Pin	Pgspace	64-bit
14428	netscape_aix4	11591	1955	161	N
19162	netscape_aix4	10355	1955	161	N
16882	X	10170	1959	161	N

AIX Tools: filemon

filemon -o fmout ← Starts monitoring disk activity

trcstop ← Stops monitoring and creates report
more fmout

Most Active Logical Volumes

util	#rblk	#wblk	KB/s	volume	description
0.03	3368	888	26.5	/dev/hd2	/usr
0.02	0	1584	9.9	/dev/hd8	jfslog
0.02	56	928	6.1	/dev/hd4	/

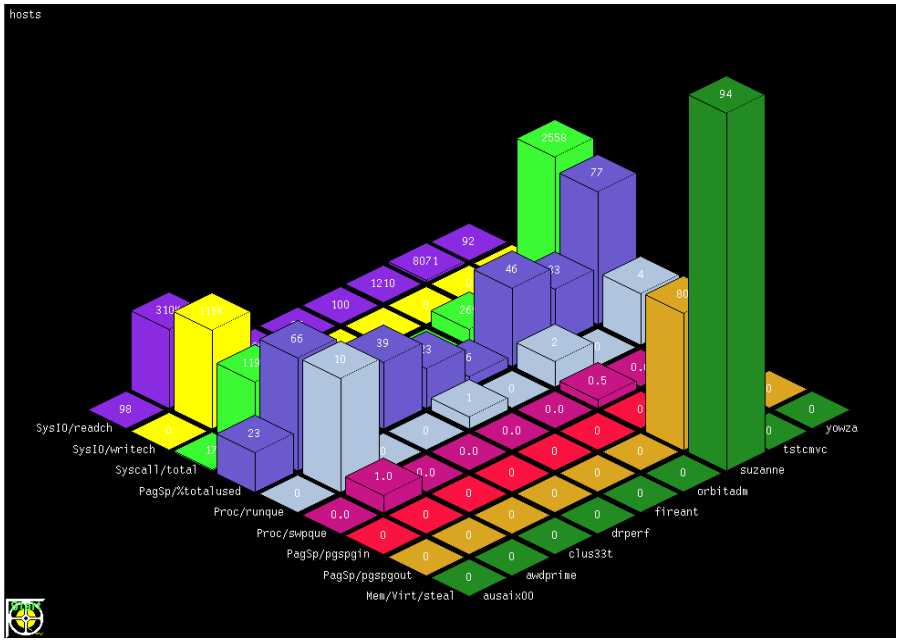
Most Active Physical Volumes

util	#rblk	#wblk	KB/s	volume	description
0.10	24611	12506	231.4	/dev/hdisk0	N/A
0.02	56	8418	52.8	/dev/hdisk1	N/A

Example nfso -a listing

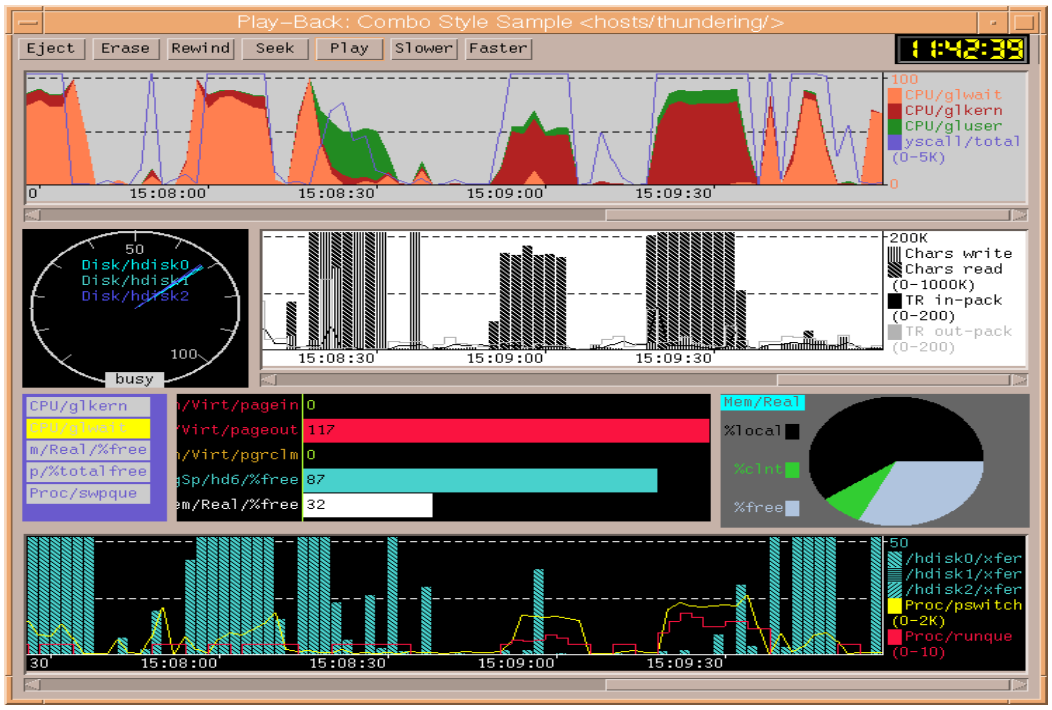
```
                portcheck = 0
                udpchecksum = 1
                nfs_socketsize = 262144
                nfs_tcp_socketsize = 262144
                nfs_setattr_error = 0
                nfs_gather_threshold = 4096
                nfs_repeat_messages = 0
                nfs_udp_duplicate_cache_size = 0
                nfs_tcp_duplicate_cache_size = 0
                nfs_server_base_priority = 0
                nfs_dynamic_retrans = 1
                nfs_iopace_pages = 0
                nfs_max_connections = 0
                nfs_max_threads = 8
                nfs_use_reserved_ports = 0
                nfs_device_specific_bufs = 1
                nfs_server_clread = 1
                nfs_rfc1323 = 1
                nfs_max_write_size = 0
                nfs_max_read_size = 0
                nfs_allow_all_signals = 0
```

Performance ToolboX Snapshots



Performance ToolboX Snapshots

Performance ToolboX Snapshots



AIX rated 'outperform'

- ★ TOOLS, TOOLS, & TOOLS
- ★ TUNING
- ★ INTEGRATION
- ★ NETWORKING
- ★ RELIABILITY
- ★ SUPPORT

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