



# AIX - A Beginner's Look

UserBlue - San Francisco, CA

August 18-21, 2002



## Special Notices

This presentation was produced in the United States. IBM may not offer the products, programs, services or features discussed herein in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the products, programs, services, and features available in your area. Any reference to an IBM product, program, service or feature is not intended to state or imply that only IBM's product, program, service or feature may be used. Any functionally equivalent product, program, service or feature that does not infringe on any of IBM's intellectual property rights may be used instead of the IBM product, program, service or feature.

Information in this presentation concerning non-IBM products was obtained from the suppliers of these products, published announcement material or other publicly available sources. Sources for non-IBM list prices and performance numbers are taken from publicly available information including D.H. Brown, vendor announcements, vendor WWW Home Pages, SPEC Home Page, GPC (Graphics Processing Council) Home Page and TPC (Transaction Processing Performance Council) Home Page. IBM has not tested these products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

IBM may have patents or pending patent applications covering subject matter in this presentation. The furnishing of this presentation does not give you any license to these patents. Send license inquiries, in writing, to IBM Director of Licensing, IBM Corporation, New Castle Drive, Armonk, NY 10504-1785 USA.

**All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only. Contact your local IBM office or IBM authorized reseller for the full text of a specific Statement of General Direction.**

The information contained in this presentation has not been submitted to any formal IBM test and is distributed "AS IS". While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. The use of this information or the implementation of any techniques described herein is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. Customers attempting to adapt these techniques to their own environments do so at their own risk.

IBM is not responsible for printing errors in this presentation that result in pricing or information inaccuracies.

The information contained in this presentation represents the current views of IBM on the issues discussed as of the date of publication. IBM cannot guarantee the accuracy of any information presented after the date of publication.

All prices shown are IBM's suggested list prices; dealer prices may vary.

IBM products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

## Special Notices (Cont.)

Information provided in this document and information contained on IBM's past and present Year 2000 Internet Web site pages regarding products and services offered by IBM and its subsidiaries are "Year 2000 Readiness Disclosures" under the Year 2000 Information and Readiness Disclosure Act of 1998, a U.S. statute enacted on October 19, 1998. IBM's Year 2000 Internet Web site pages have been and will continue to be our primary mechanism for communicating year 2000 information. Please see the "legal" icon on IBM's Year 2000 Web site ([www.ibm.com/year2000](http://www.ibm.com/year2000)) for further information regarding this statute and its applicability to IBM.

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

The following terms are registered trademarks of International Business Machines Corporation in the United States and/or other countries: ADSTAR, AIX, AIX/6000, AIXwindows, AS/400, C Set++, CICS, CICS/6000, DB2, DYNIX/ptx, ESCON, IBM, Information Warehouse, Intellistation, IQ-Link, LANStreamer, LoadLeveler, Magstar, MediaStreamer, Micro Channel, MQSeries, Net.Data, Netfinity, NUMA-Q, OS/2, OS/400, OS/390, Parallel Sysplex, POWERparallel, RS/6000, S/390, Service Director, System/390, ThinkPad, TURBOWAYS, VisualAge. The following terms are trademarks of International Business Machines Corporation in the United States and/or other countries: AIXPVM, Application Region Manager, AS/400e, CommandPoint, DB2 OLAP Server, DB2 Universal Database, DEEP BLUE, e-business (logo), eNetwork, GigaProcessor, HACMP/6000, Intelligent Miner, Network Station, NUMACenter, POWER2 Architecture, PowerPC 604, ptx/ADMIN, ptx/CLUSTERS, ptx/AGENT, ptx/EFS, ptx/SVM, ptx/XWM, SequentLINK, SmoothStart, SP, Videocharger, Visualization Data Explorer, WebSphere. A full list of U.S. trademarks owned by IBM may be found at <http://ipswwww.nas.ibm.com/wpts/trademarks/trademar.htm>.

Microsoft, Windows, Windows NT and the Windows logo are trademarks or registered trademarks of Microsoft Corporation in the United States, other countries, or both. UNIX is a registered trademark in the United States and other countries licensed exclusively through The Open Group. Java and all Java-based trademarks and logos are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both. Lotus, and Lotus Notes are trademarks or registered trademarks of Lotus Development Corporation. Tivoli, TME, TME 10 and TME 10 Global Enterprise Manager are trademarks of Tivoli Systems, Inc. Other company, product and service names may be trademarks or service marks of others.

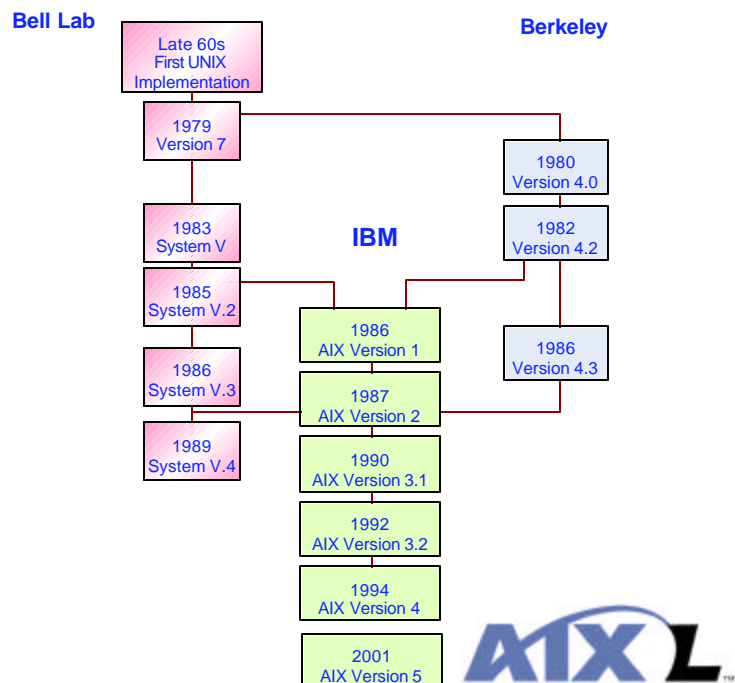
## AGENDA

- 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

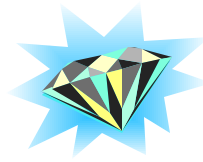
## AIX Roadmap

Page deleted for CD creation and printing  
IBM Confidential

## AIX History



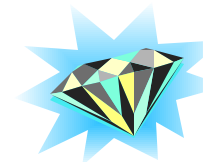
## What makes up AIX?



- 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



### ■ 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



### ■ 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

Distributed Distribution

Workload

Backup

Cloning/ Online Backup

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

## BSD vs SYSV

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| ■ System Resource Controller (SRC) | ■ /etc/rc.d                         |
| ■ rc.tcpip rc.inetd rc.nfs         | ■ start/kill scripts                |
| ■ alog & errpt<br>/var/adm/ras     | ■ syslogd                           |
| ■ Logical Volume Mgr               | ■ More traditional fixed partitions |

## AIX COMMAND REFERENCE

### User Management

Users  
Groups  
Roles

### Configuration

Configuration data  
Devices  
System data  
SysResource Controller

### Paging

### Microcode

### Logical Volume Manager

Physical Volumes  
Logical Volumes  
File Systems  
Volume Groups  
Logical Volume Copies

### Backup

System Backup(rootvg)  
Other Volume Group

list  
ls

create  
mk

change  
ch

remove  
rm

lsuser lsgroup lsrole	mkuser mkgroup mkrole	chuser chgroup chrole	rmuser rmgroup rmrole
lscfg -cvp lsdev -CH lsconf lssrc -a lsps lsmcode			
lspv lslv lsfs lsvg mklvcopy	mkiv mkfs mkvg chlvcopy	chpv chlv chfs rmlvcopy (split)	rmlv rmfs
savevg / restvg	mksysb		

# 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

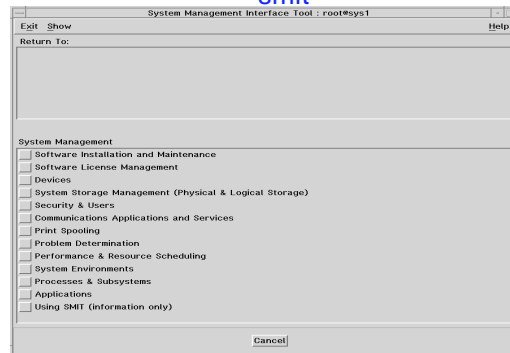
**smit**

System Management

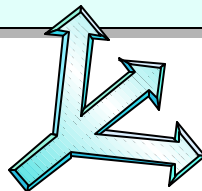
Move cursor to desired item and press Enter.  
Software Installation and Maintenance  
Software License Management  
Devices  
System Storage Management (Physical and Logical Storage)  
Security & Users  
Communications Applications and Services  
Print Spooling  
Problem Determination  
Performance & Resource Scheduling  
System Environments  
Processes & Subsystems  
Applications  
Using SMIT (information only)

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

**smit**



**ascii**



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

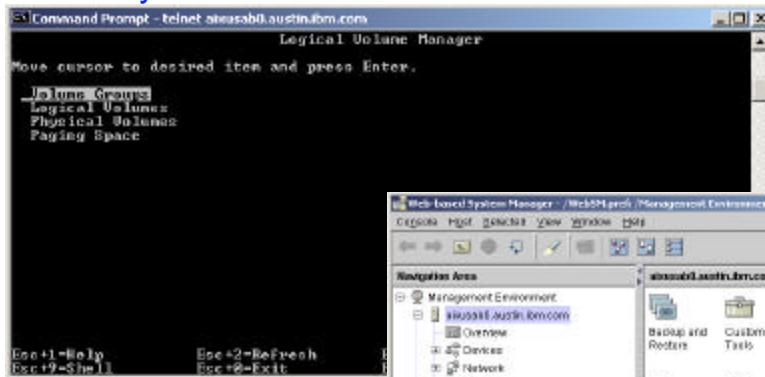
**wsm**



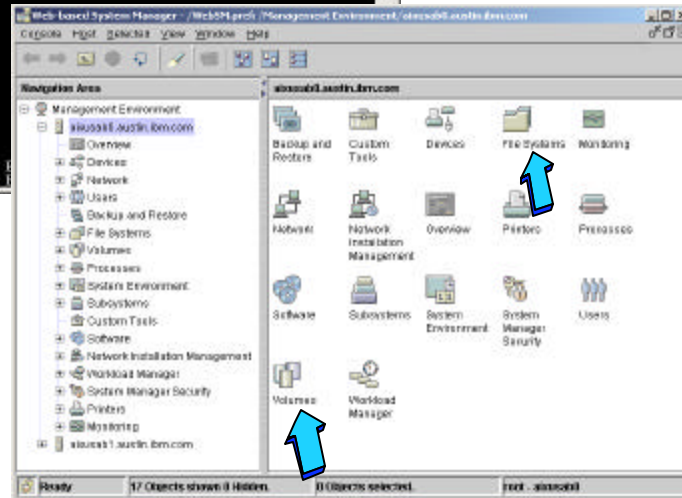


## Logical Volume Manager

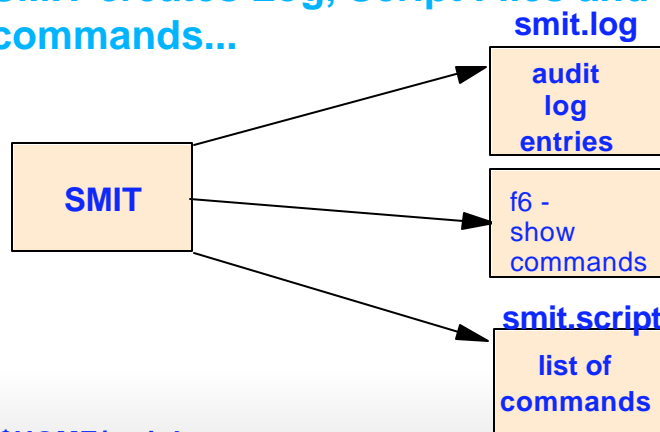
# smitty lvm



# wsm



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



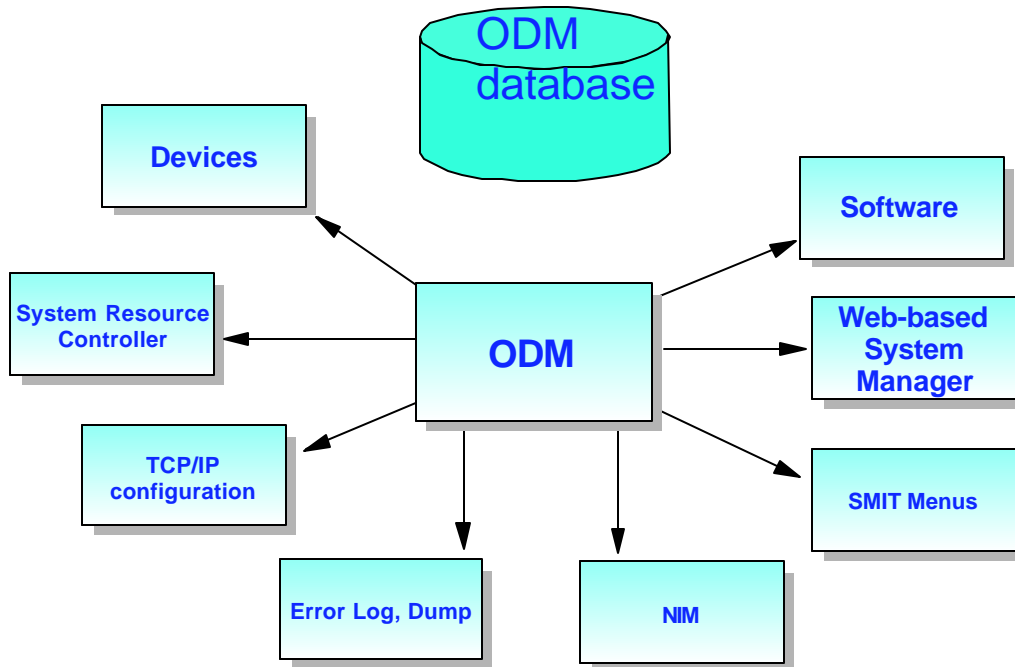
- **\$HOME/smit.log**

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

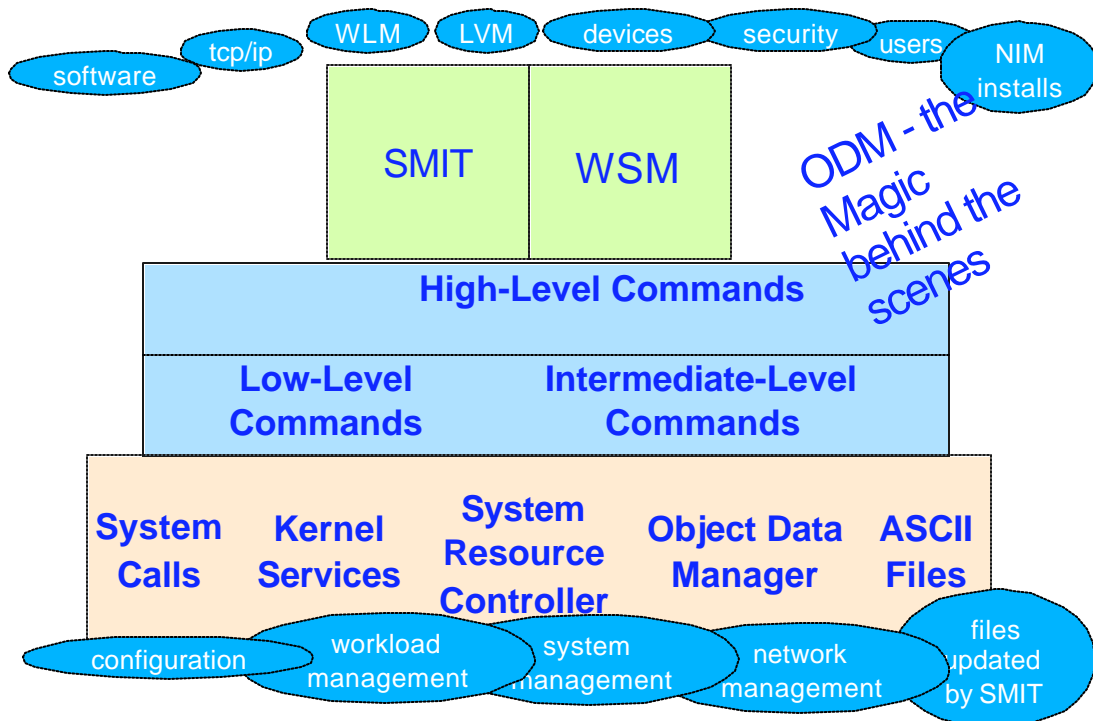
- **\$HOME/smit.script**

Shell script containing all AIX commands executed by SMIT.

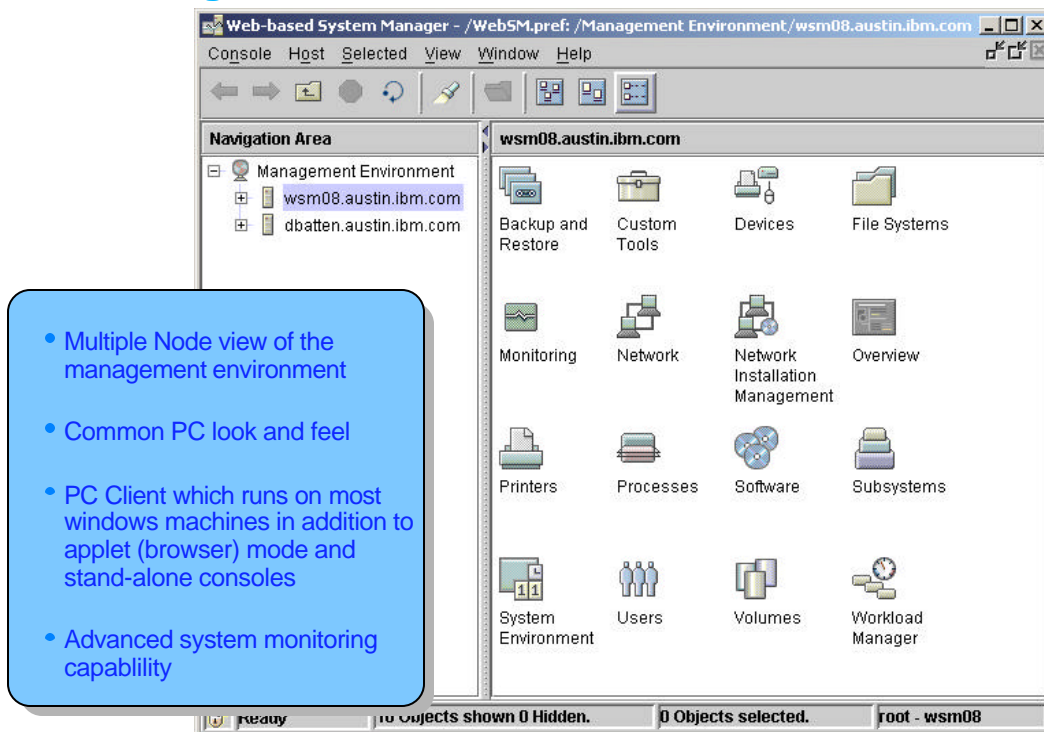
## Data Managed by the ODM



## AIX Administration



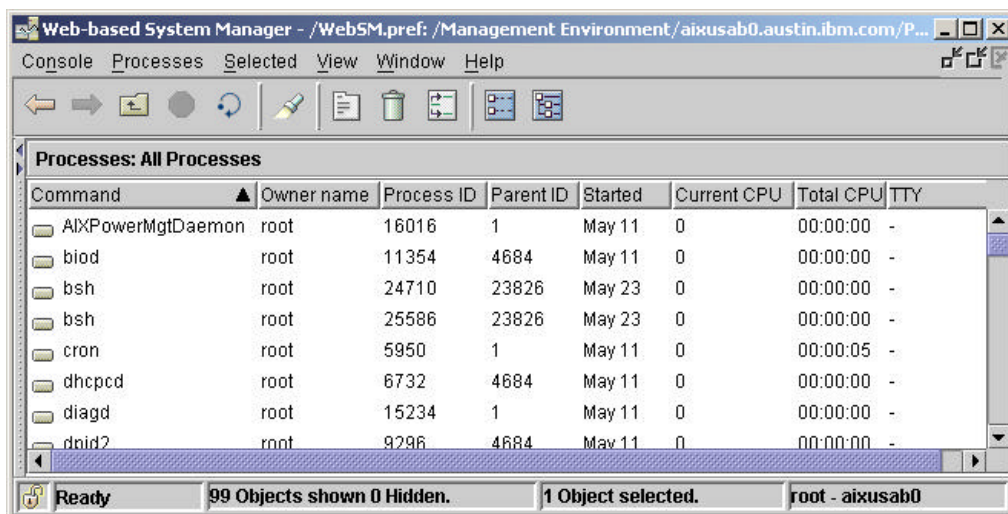
## WSM Management Tool



- 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 capability

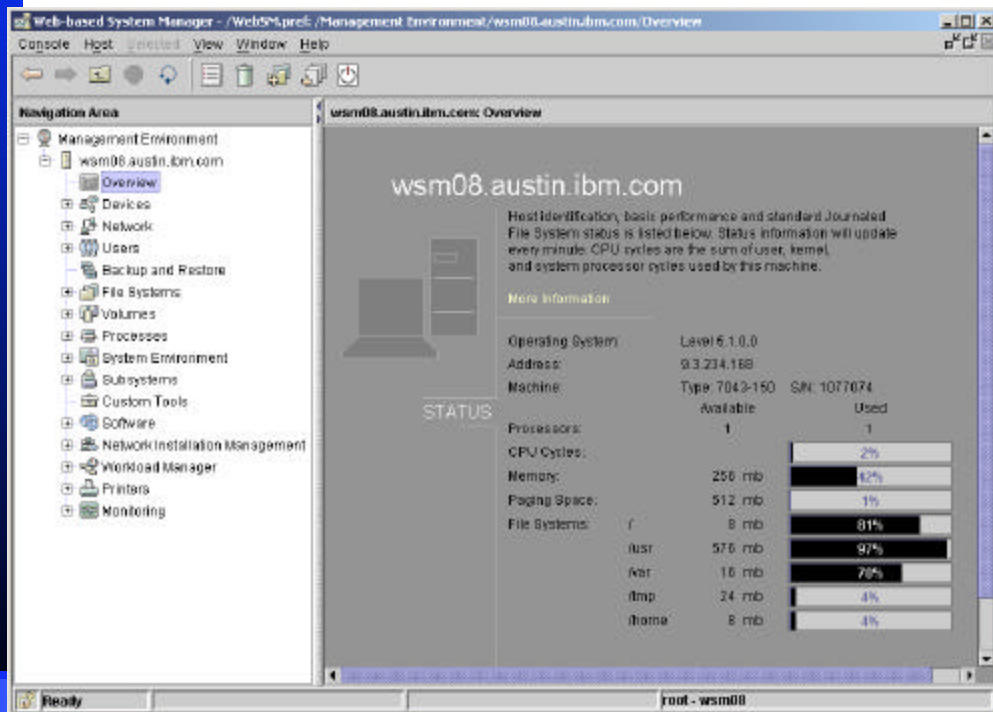
*Provides task guides for advanced, complex functions*

## WSM Processes and Subsystems



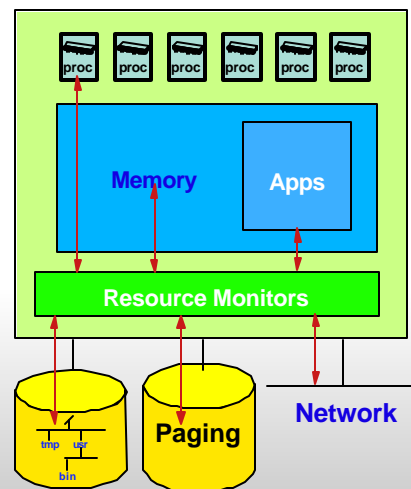
The Processes application gives a tabled view of all the data related to a running process such as Owner name, Process ID, Parent ID, Date started, Current CPU usage and Total CPU usage. More detailed information such as segment number of process stack, size of kernel stack, number of page ins caused 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

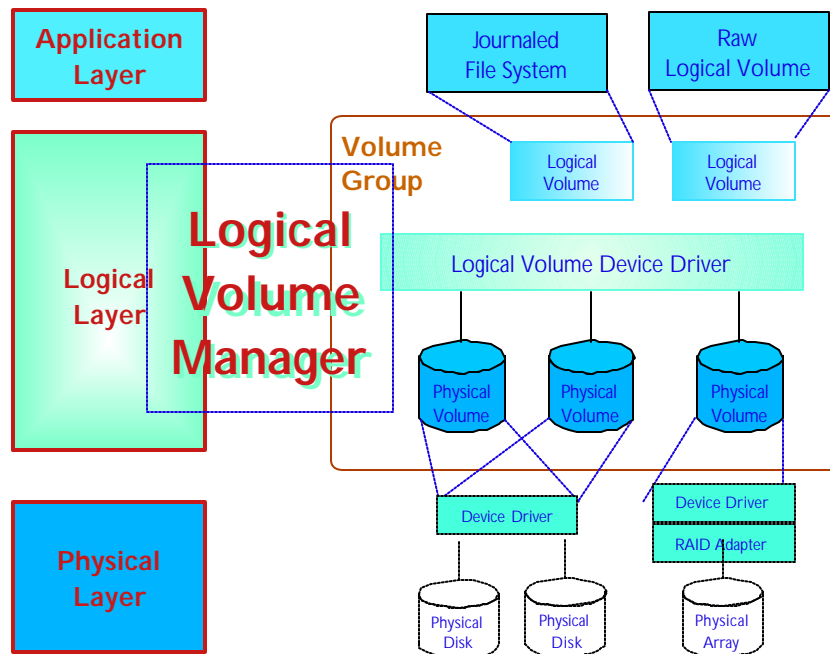
- Process end alert

## Resource Monitoring and Control

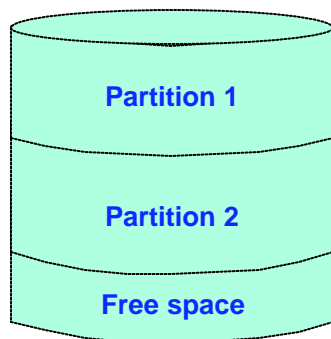
The screenshot shows a dialog box titled "Resource Monitoring and Control" with a "Monitored Resource" tab selected. The dialog contains the following fields and buttons:

- Name:** /tmp space used
- Resource:** Journaled File System
- Class:** Monitored Property
- Monitored Property:** PercentTotUsed
- Event Expression:** PercentTotUsed > 90
- Event Description:** An event will be generated when more than 90% of the total space in the /tmp directory is in use.
- Rearm Expression:** PercentTotUsed < 85
- Rearm Description:** An event will be rearmed when more than 90% of the total space in the /tmp directory is in use.
- Severity:** Informational
- Responses to the condition...** (button)
- Buttons:** OK, Cancel, Help

## Logical Volume Manager



## Traditional UNIX Storage vs. Logical Volume Manager (LVM)

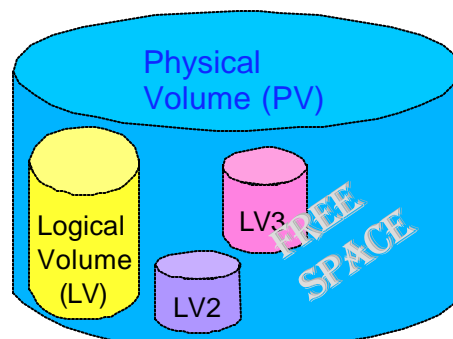


### PROBLEMS:

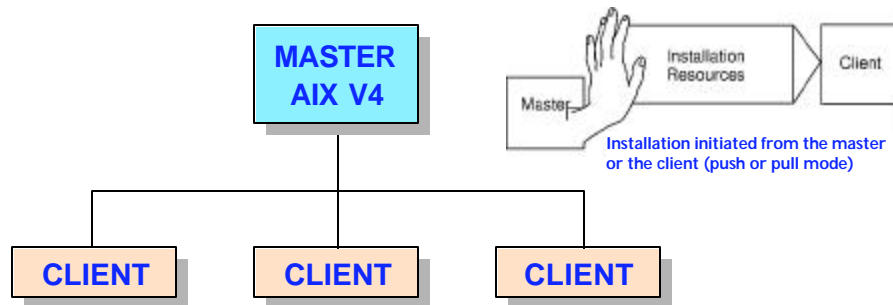
- Fixed partitions
- Expanding size of the partition
- Limits size of file system and files
- Contiguous data requirement
- Advance Planning arduous

### 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



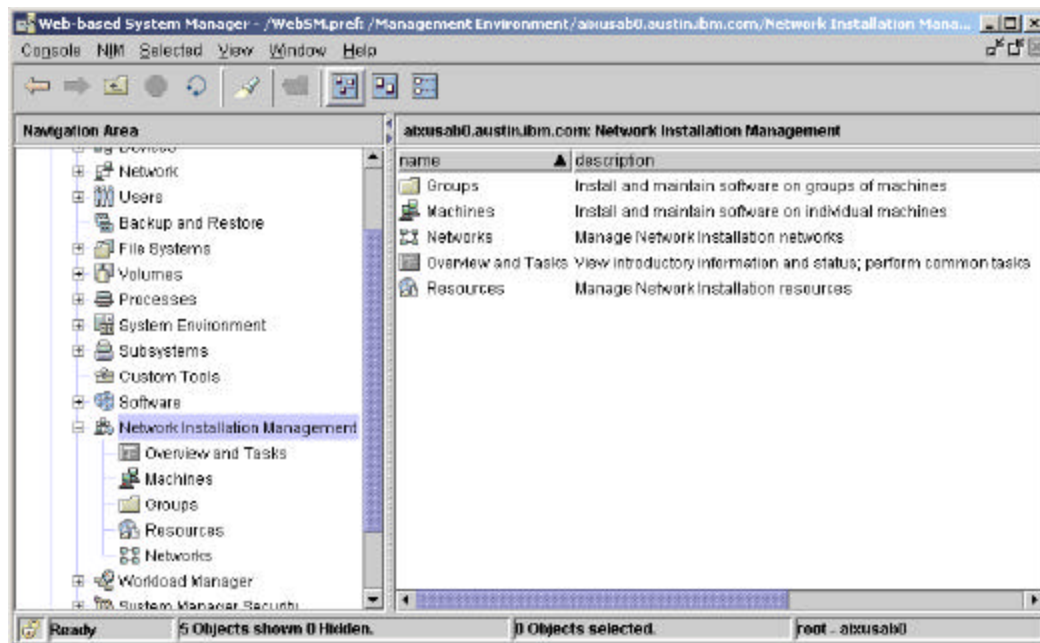
## What is NIM?



### ■ 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

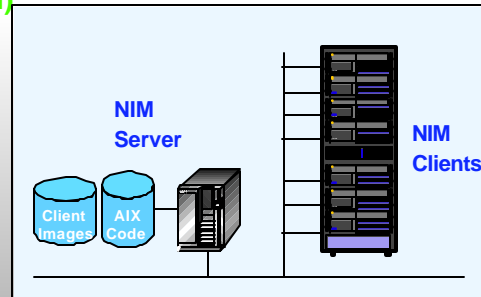
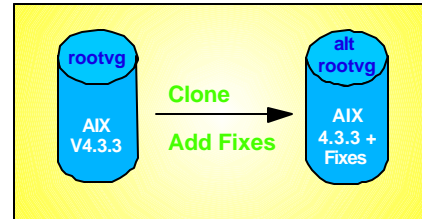
- Install AIX clone & fixes
- Reboot to new level when convenient
- Reboot to old level without restore
- Reduces maintenance window

### ▶ 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



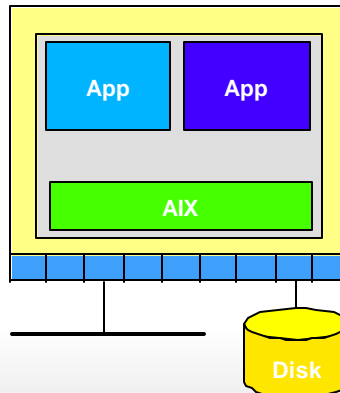
## AIX Performance Tools

### Application

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

### Network

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



### Storage

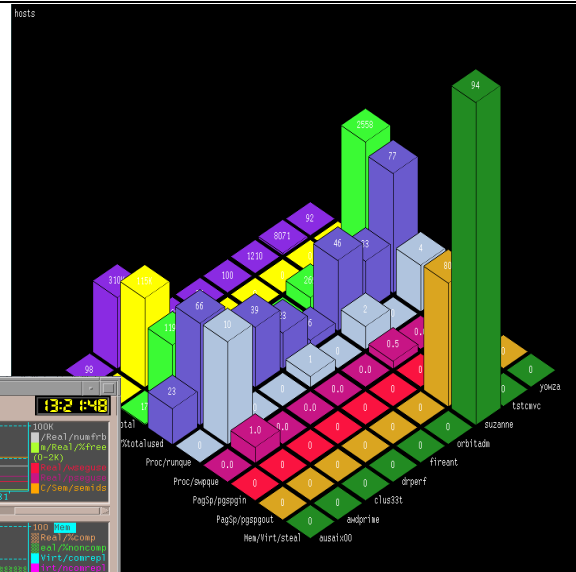
- filemon
- fileplace
- iostat
- lvmstat

### 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....



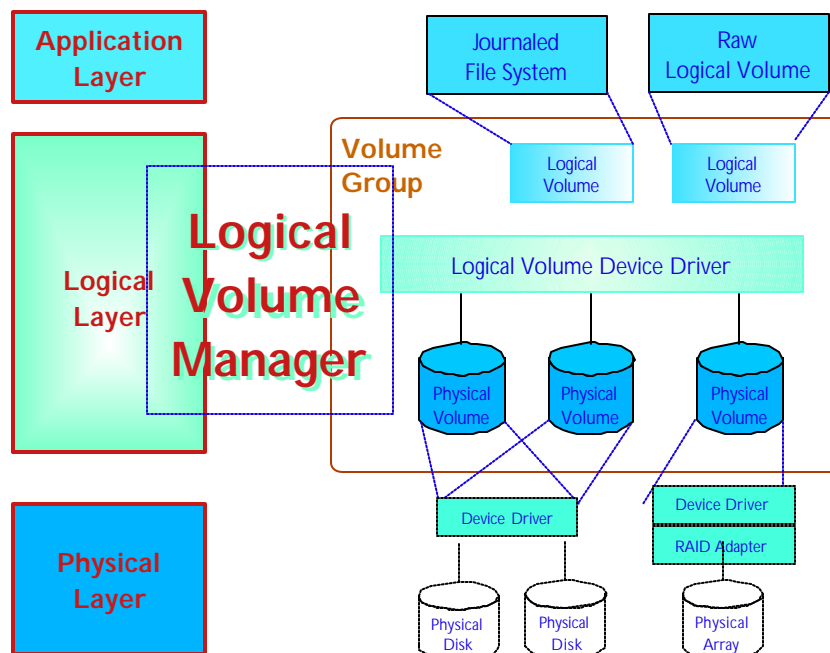
Performance ToolboX  
lets you analyze what  
occurred during the  
slowdown last week.

Performance ToolboX can provide tailored views for  
different departments.

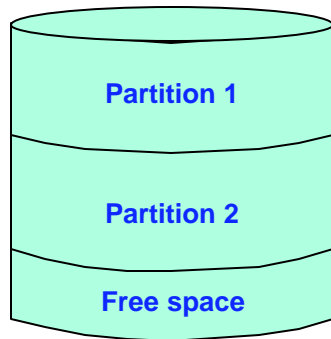


# AIX - Logical Volume Manager (LVM)

## Logical Volume Manager



## Traditional UNIX Storage vs. Logical Volume Manager (LVM)

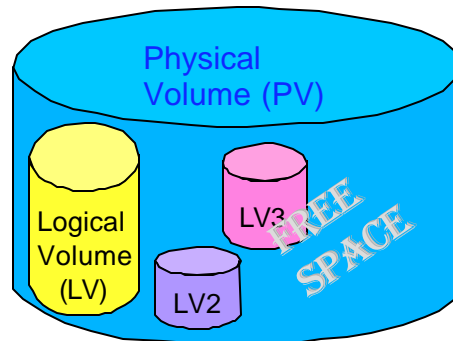


### PROBLEMS:

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

### LVM SOLUTIONS:

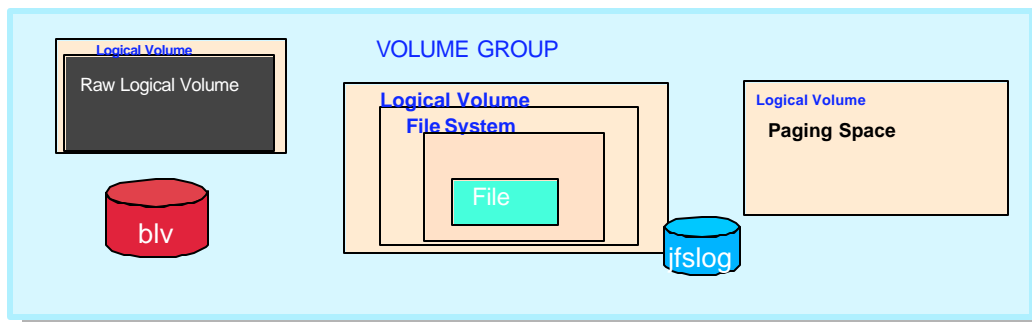
- ✦ Solve noncontiguous space problems
- ✦ Logical volumes(LV) can span disks
- ✦ LVs can be dynamically increased
- ✦ Logical volumes can be mirrored
- ✦ Hard disks easily added to a system
- ✦ Logical volumes can be relocated



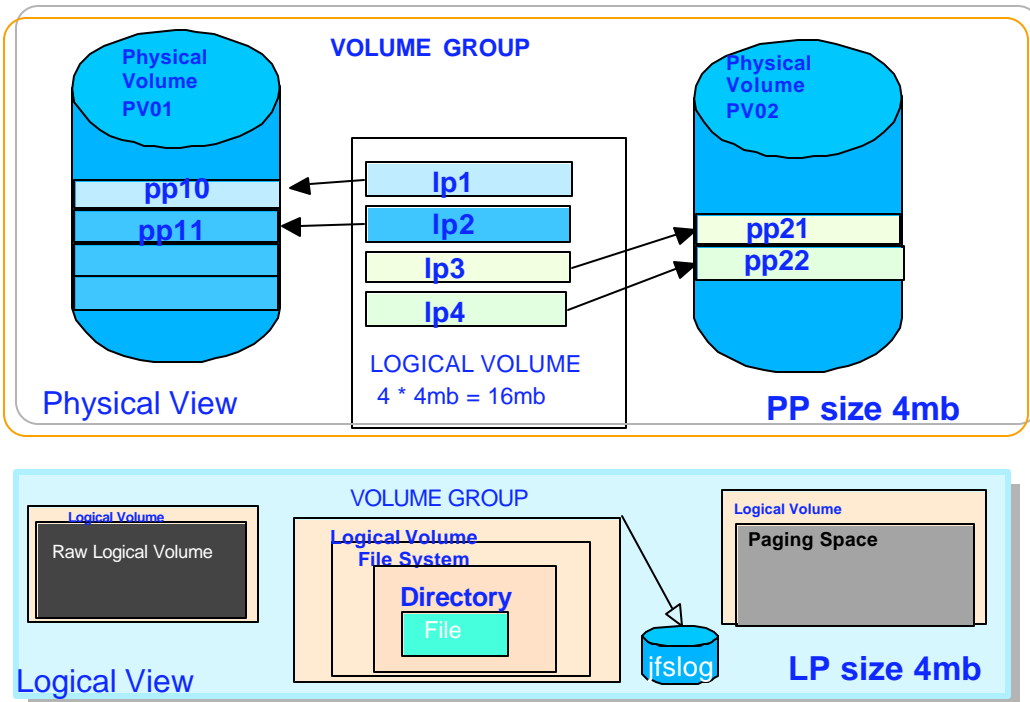
## Logical Volumes

■ 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)

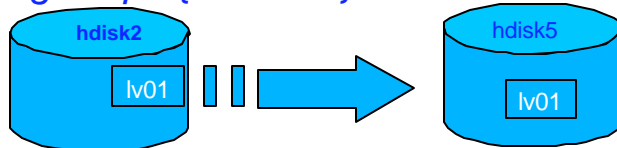


## Physical and Logical Views of a Volume Group

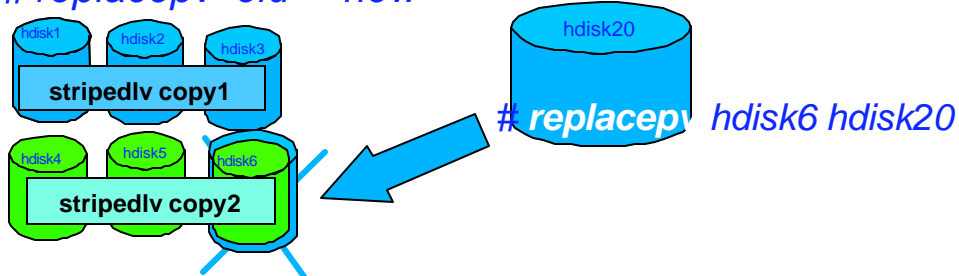


## Data Movement is easily accomplished due to LVM

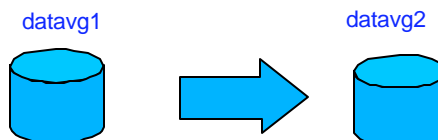
`# migratepv {lvnames} source destination`



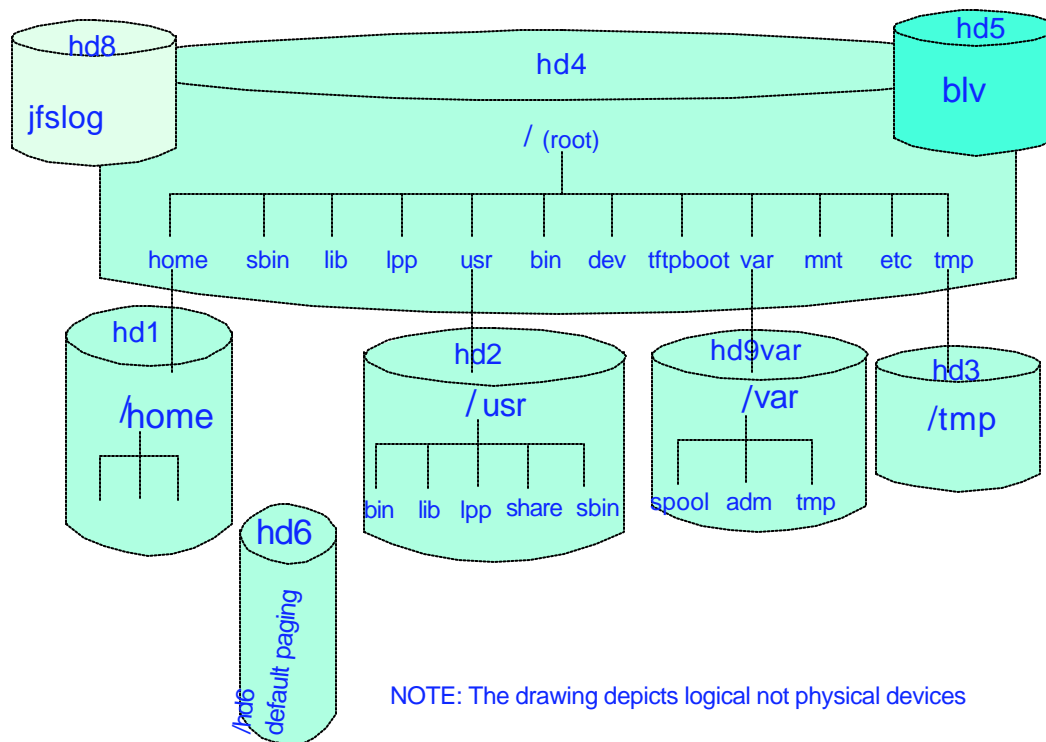
`# replacepv old new`



`# cplv -v old new`

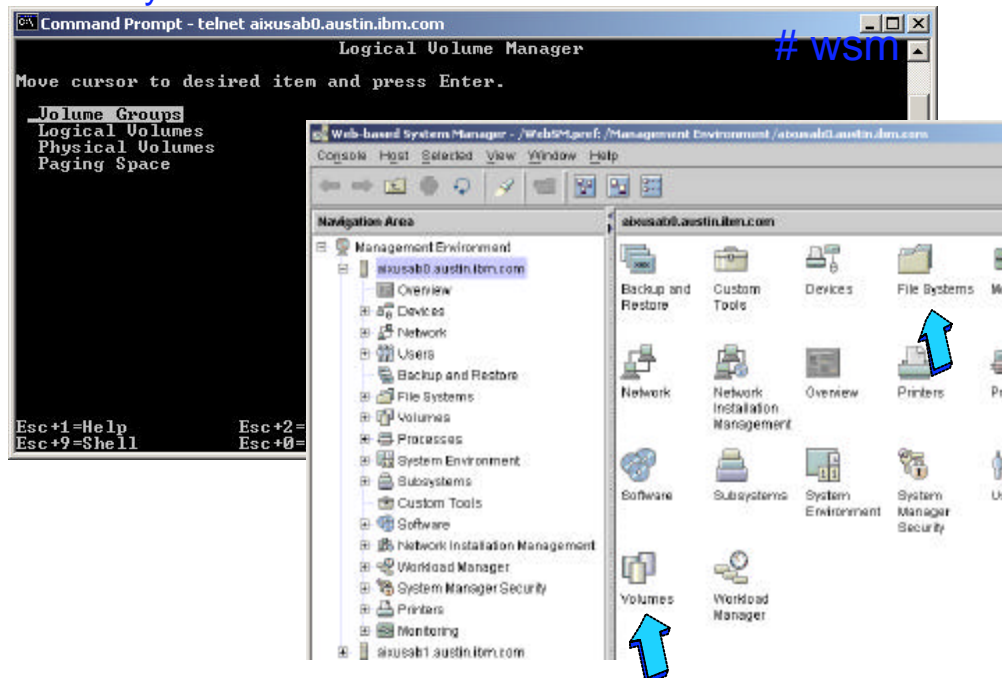


## Standard Logical Volumes in AIX



## Logical Volume Manager

# smitty lvm



## SMIT Volume Groups Menu

### # smitty vg

```
Command Prompt - telnet aixusab0.austin.ibm.com

Volume Groups

Move cursor to desired item and press Enter.

List All Volume Groups
Add a Volume Group
Set Characteristics of a Volume Group
List Contents of a Volume Group
Remove a Volume Group
Activate a Volume Group
Deactivate a Volume Group
Import a Volume Group
Export a Volume Group
Mirror a Volume Group
Unmirror a Volume Group
Synchronize LVM Mirrors
Back Up a Volume Group
Remake a Volume Group
List Files in a Volume Group Backup
Restore Files in a Volume Group Backup

Esc+1=Help      Esc+2=Refresh    Esc+3=Cancel    Esc+8=Im
Esc+9=Shell     Esc+0=Exit      Enter=Do
```

## Listing Volume Group Information

- List All Volume Groups

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

- List Contents of a Volume Group

```
# lsvg rootvg
```

```
Command Prompt - telnet aixusab0.austin.ibm.com

# lsvg rootvg
VOLUME GROUP: rootvg
UG STATE: active
UG PERMISSION: read/write
MAX LUs: 256
LUs: 18
OPEN LUs: 8
TOTAL PUs: 1
STALE PUs: 0
ACTIVE PUs: 1
MAX PPs per PU: 1016
LTG size: 128 kilobyte(s)
HOT SPARE: no
UG IDENTIFIER: 8889748fadaa1be7
PP SIZE: 32 megabyte(s)
TOTAL PPs: 542 (17344 megabytes)
FREE PPs: 479 (15328 megabytes)
USED PPs: 63 (2016 megabytes)
QUORUM: 2
UG DESCRIPTORS: 2
STALE PPs: 0
AUTO ON: yes
MAX PUs: 32
AUTO SYNC: no
```

## 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

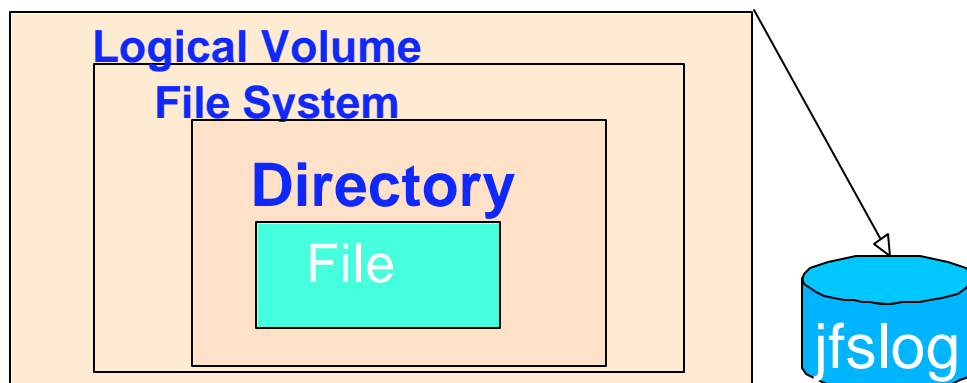
F8=Image

F9=Shell

F10=Exit

Enter=Do

## FILESYSTEMS



# JFS and JFS2 Support

## Journal File System Specifications

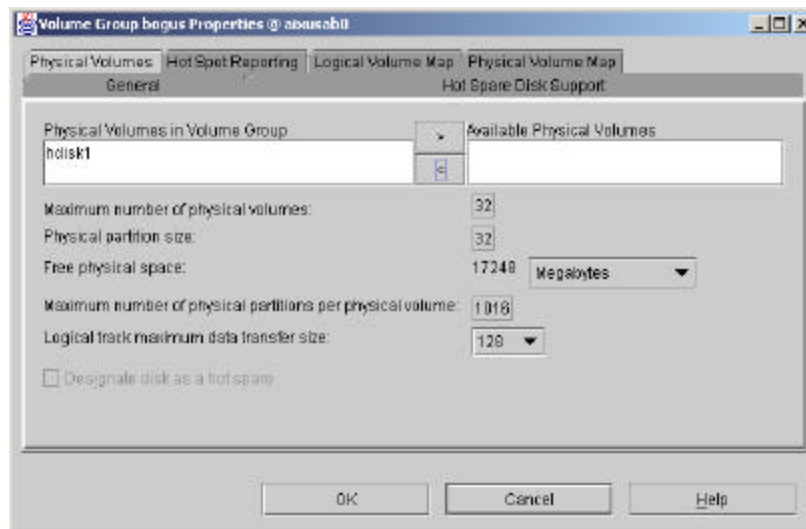
Functions	JFS2	JFS
Fragments/Block Size	512-4096 Block sizes	512-4096 Fragments
Architectural Maximum File Size	4 Petabytes	64 GBytes
Maximum File Size Tested	1 Terabyte	64 GBytes
Architectural Maximum File System Size	4 Petabytes	1 Terabyte
Maximum File System Size Tested	1 Terabyte	1 Terabyte
Number 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

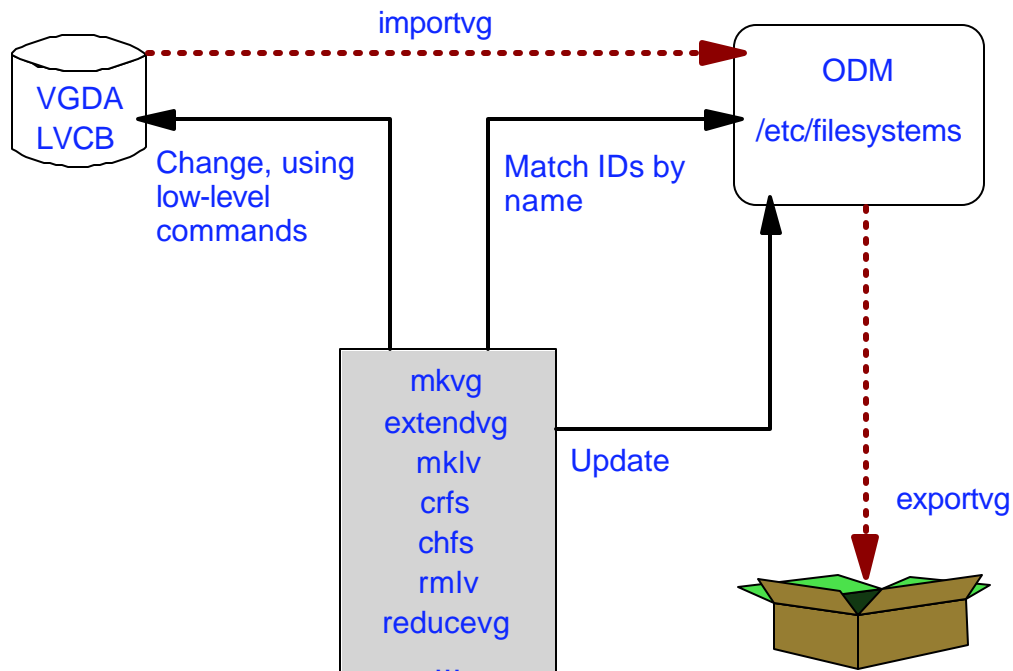
## Hot Spare Policy

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'.





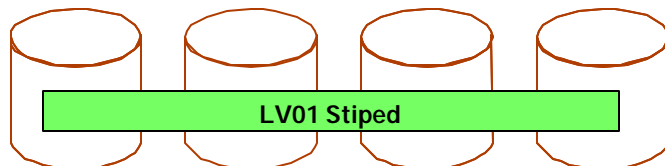
## Exporting and Importing Volume Groups



## Striping VS Mirroring

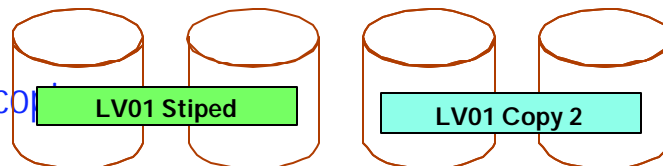
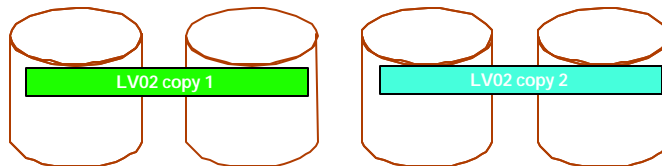
### Striping

- ▲ OS RAID 0
- ▲ LV based
- ▲ Stripe size from 4KB to 128KB



### Mirroring

- ▲ OS RAID 1
- ▲ LV based
- ▲ mirror write consistency
- ▲ up to 3 mirrored copies



### 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

Exclusion File      TapeGen      APAR View ▾

Exclusion file is: /ptf/exclude.list

IX83114 - (AIXV41 only) LATEST AIX 4.1.5 UPDATES AS OF SEPTEMBER 1998

**IX83110 - (AIXV43 only) LATEST AIX 4.3.1 UPDATES AS OF SEPTEMBER 1998**

IX83107 - LATEST HACMP 4.2.2 UPDATES AS OF SEPTEMBER 1998

IX83008 - (AIXV42 only) libIM.a for WnnIM

IX82983 - (AIXV42 only) MPV: SRN 827-112 testing pa0 from disk diags

IX82972 - (AIXV42 only) SYSTEM CRASHES WHILE RUNNING BDIAG

IX82963 - (AIXV42 only) HACMP,HAES: MISSING FILESET REQUISITE FOR APAR

IX82958 - OTF data containing underline characters

Search latest [      ]      First      Next

Okay      Reset      Cancel      Help

## FIXDIST

File Options Databases Help

FixDist Server  Download Method  
☐ Now  
☐ Later

Target Directory

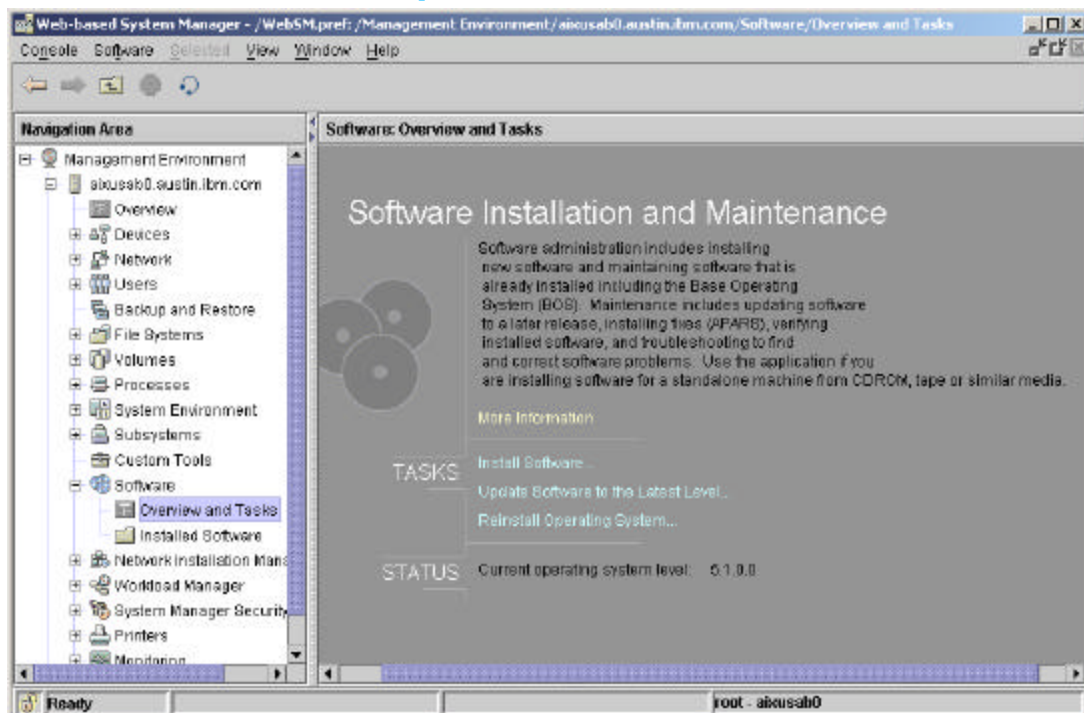
Auto Refresh OFF

Last Refresh : Fri Nov 6 1998

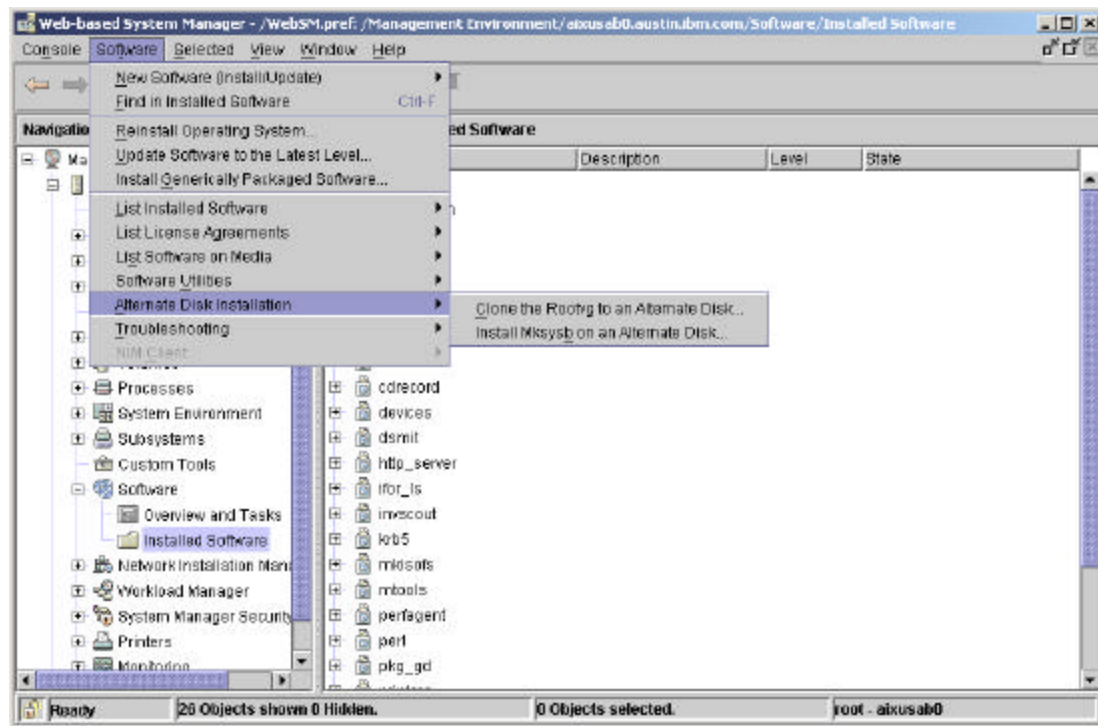
Available Fix Types

Fixtype	Description	(Double click to view)
01	Generally Available Fixes	
10	Base Maintenance Levels	

## WSM - Install and Update Software

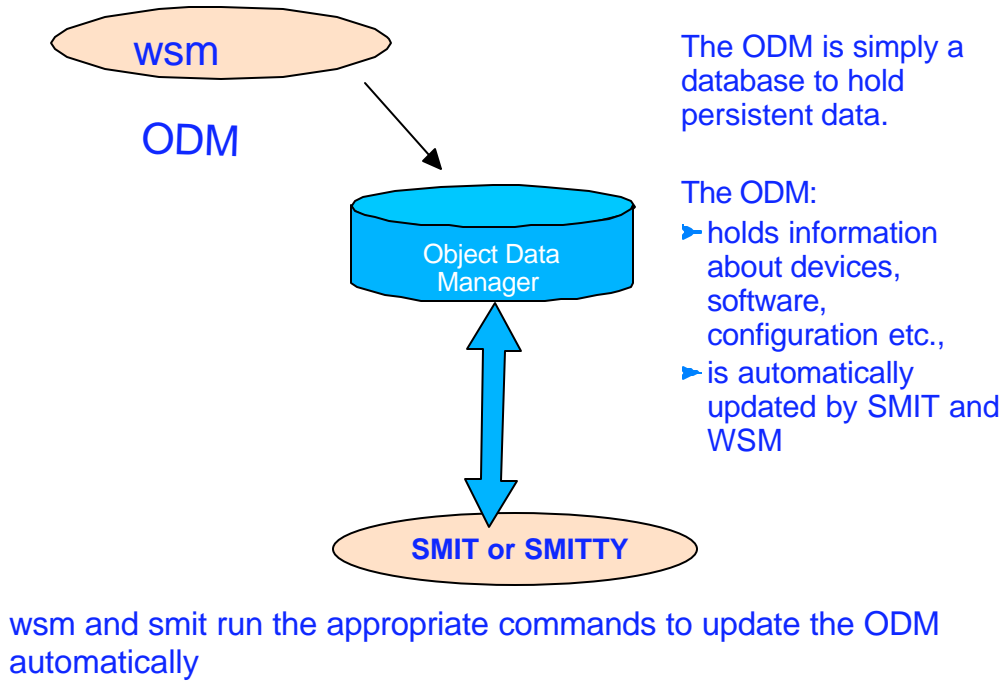


## Software Installation and Maintenance-WSM

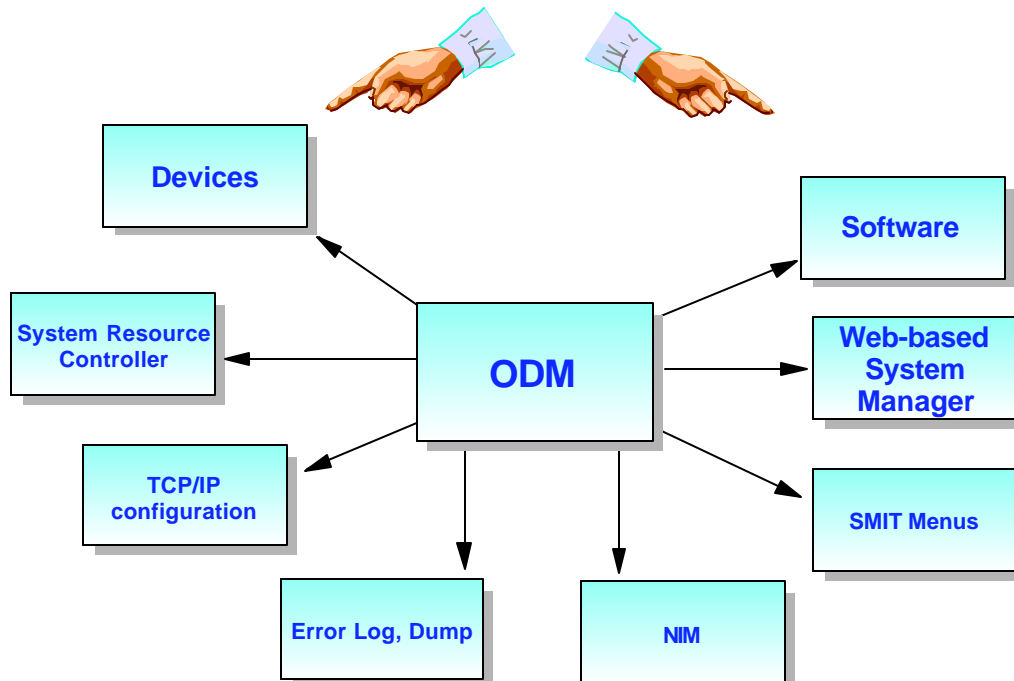


AIX -  
Devices

## The Object Data Manager's Role



## Data Managed by the ODM



## Device Configuration Database

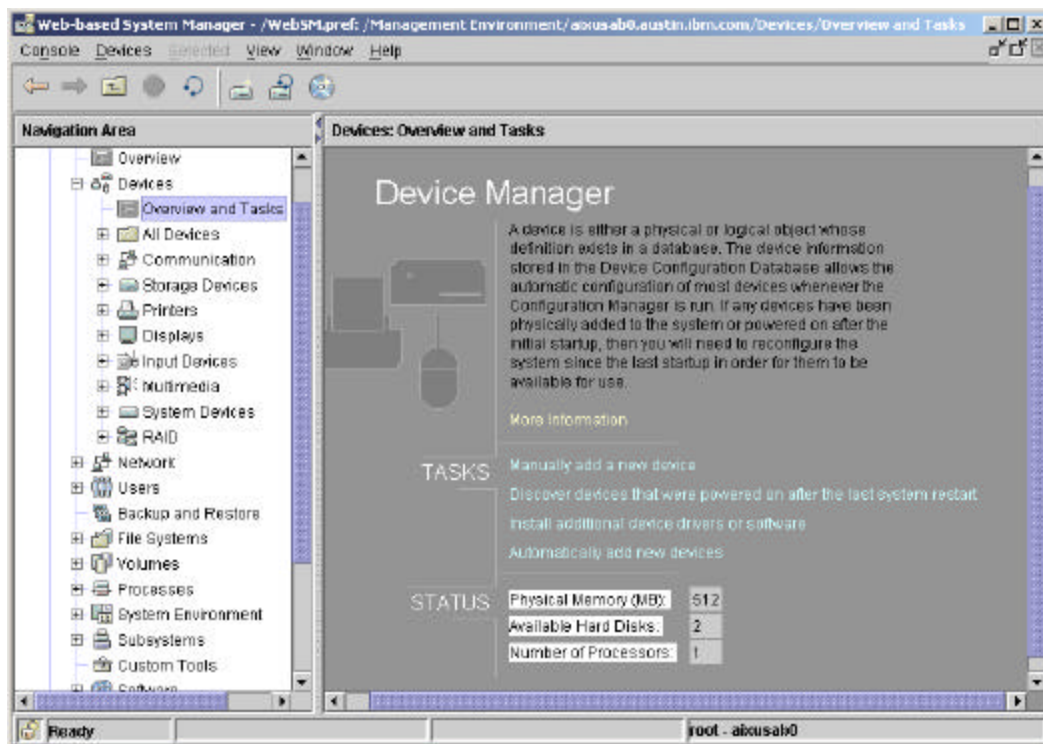
### Predefined Configuration Database

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

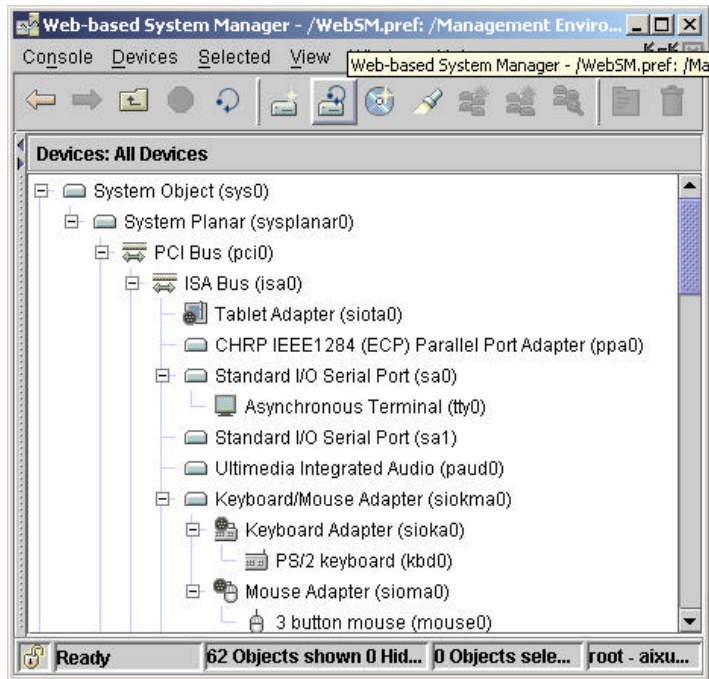
Name	Status	Location	Description
sa0	Available	01-C0	Standard I/O Serial Port 1
sioka0	Available	01-F0	Keyboard Adapter
rmt0	Available	04-C0-00-3,0	4.0 GB 4mm Tape Drive
hdisk0	Available	04-C0-00-4,0	16 Bit SCSI Disk Drive
hdisk1	Available	04-C0-00-5,0	16 Bit SCSI Disk Drive
mem0	Available	00-00	Memory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

## WSM Devices



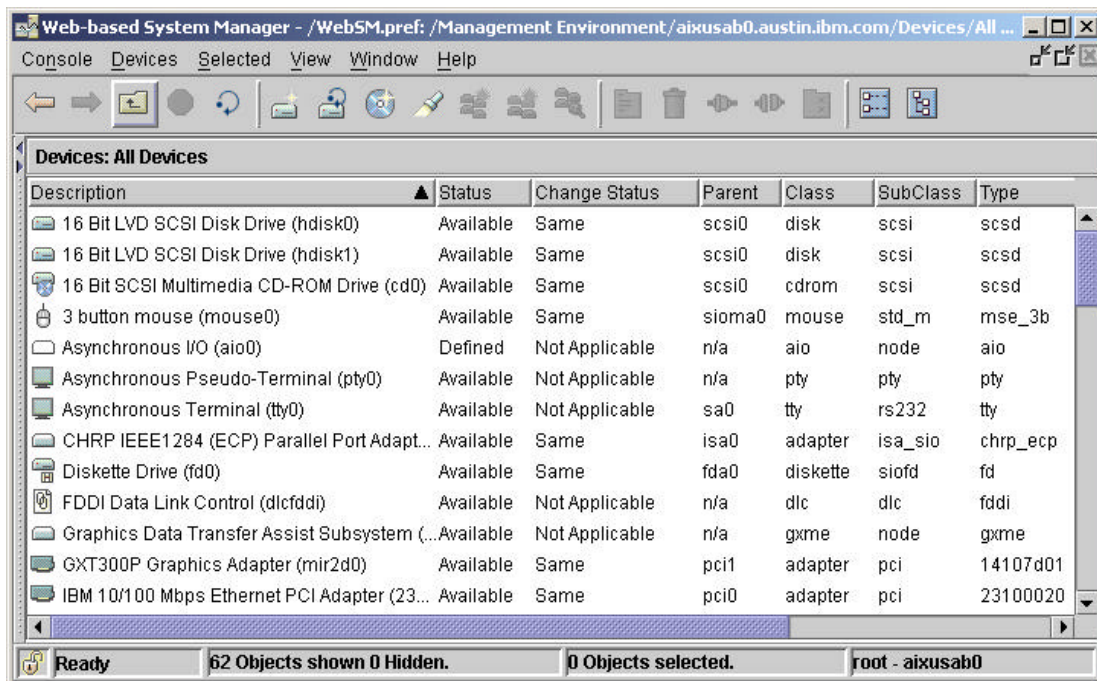


## WSM Devices Application



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

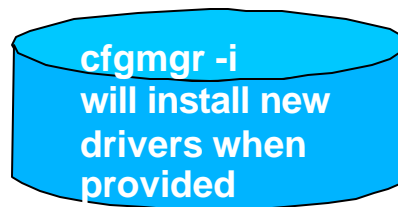
## WSM Devices





## 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

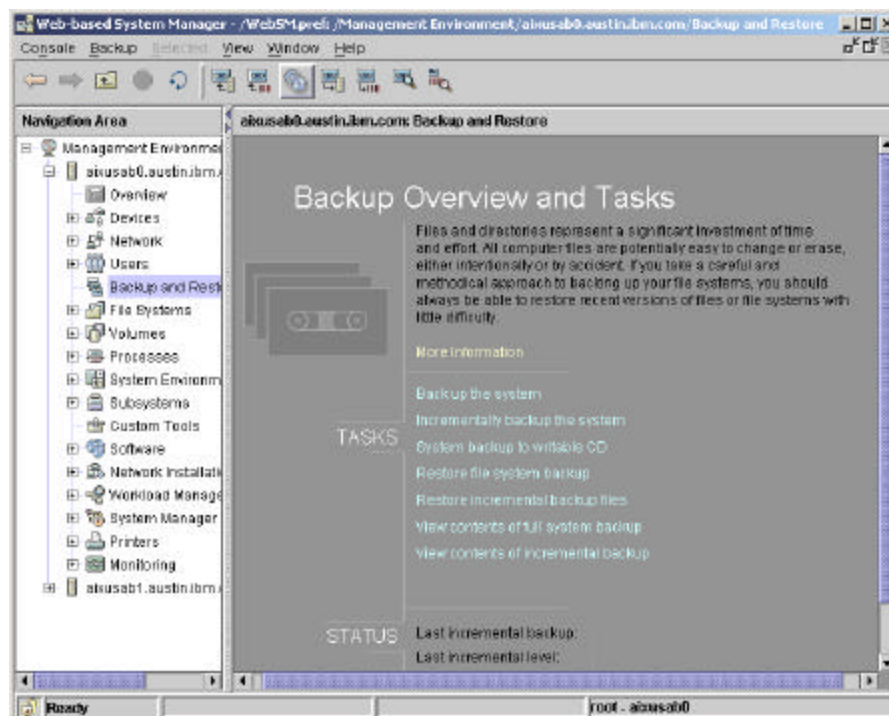
Type or select values in entry fields.  
Press Enter AFTER making all desired changes.

[Entry Fields]

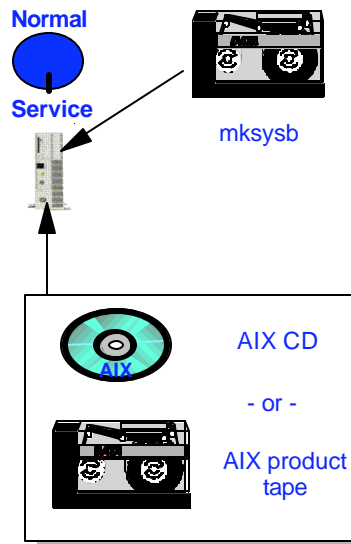
WARNING: Execution of the mksysb command will result in the loss of all material previously stored on the selected output medium. This command backs up only rootvg volume group.

* 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



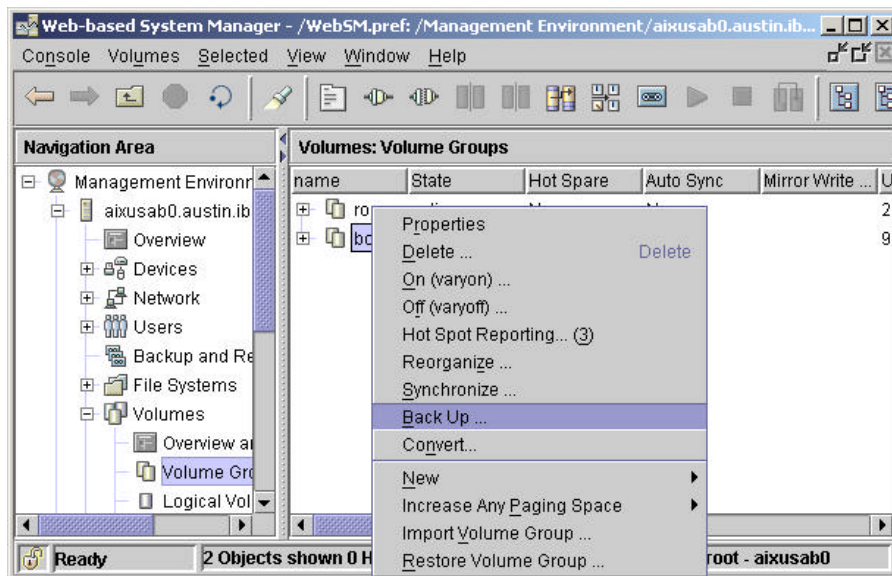
1. Insert the mksysb tape and the AIX CD (same AIX level!)
2. Boot from the AIX CD (\*)
3. "Install from a System Backup":

Missing device support is installed from the AIX CD

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

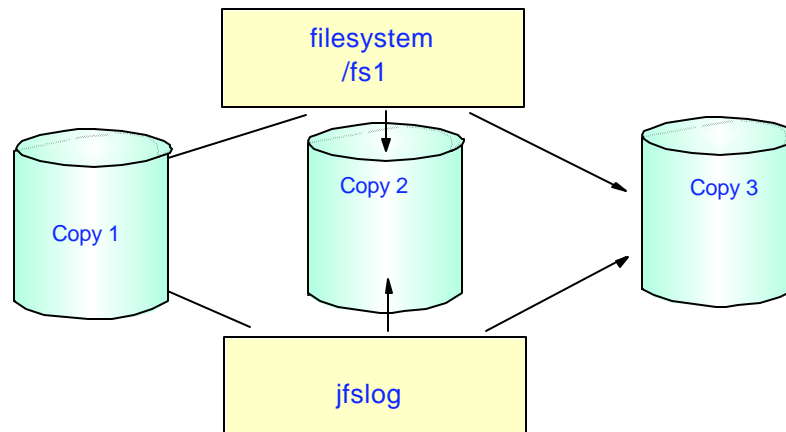
bosinst.data:  
SWITCH\_TO\_PRODUCT\_TAPE=yes

## 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>

# AIX - Performance

# Performance Tools to manage AIX:

## Standard UNIX tools

iostat, vmstat, sar, netstat, /proc, truss -

downloaded tools : netperf, top, monitor,

**Added Tools** trace utilities,  
filemon, topas, bf, fdpr, svmon, vmtune,  
no, nfsd

## Functionality discussed

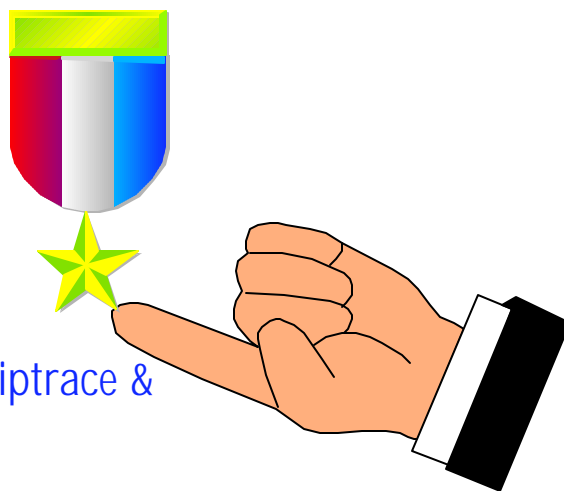
ALL

AIX has incorporated most of its popular performance toolbox tools into the core product.

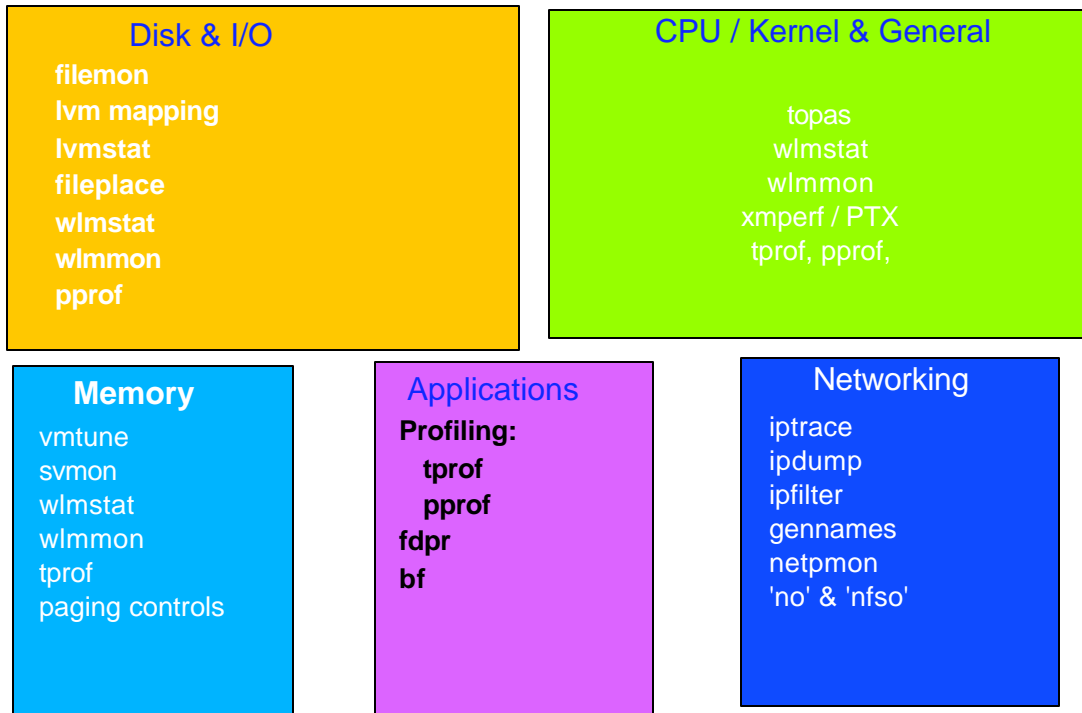
Due to a dynamic rebuild of the kernel, most AIX tuning functions can be effected without a reboot.

## Utilize the standard UNIX tools available

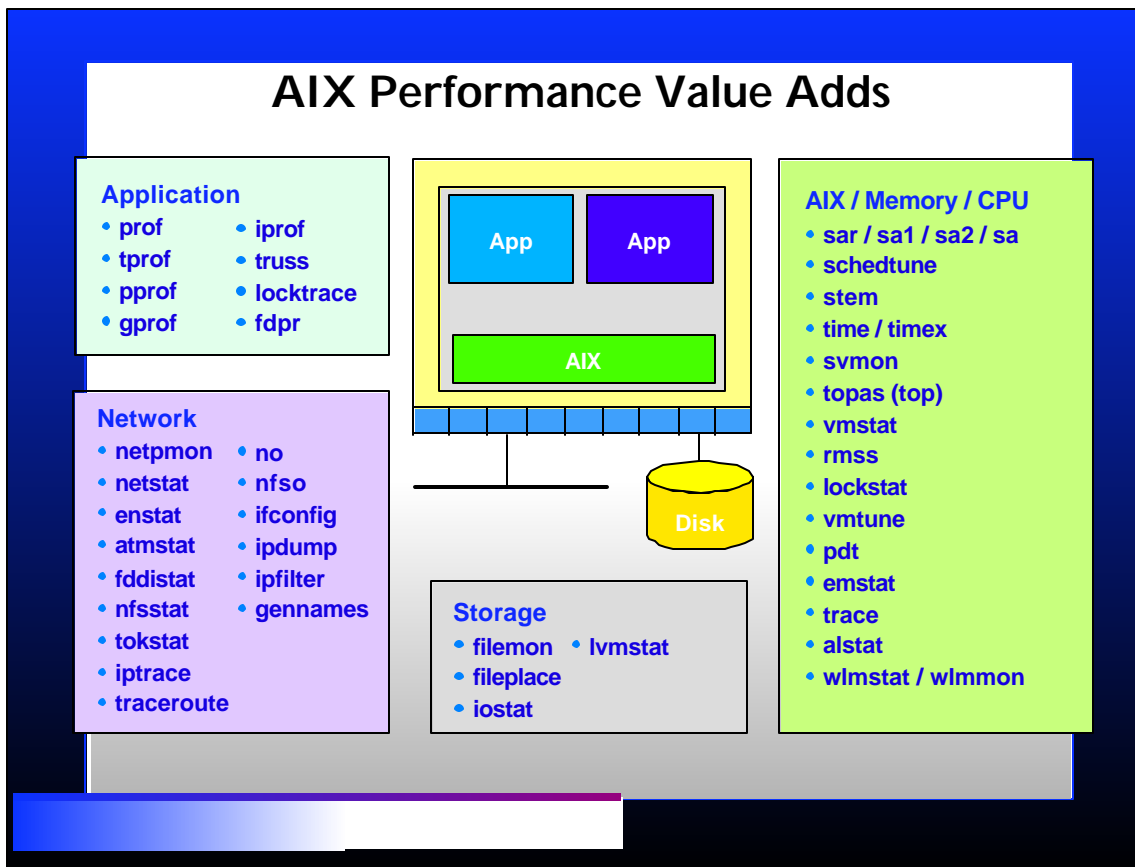
- sar -d & -P all
- truss
- /proc
- netstat/nfsstat
- vmstat
- iostat
- tcp tools (traceroute, iptrace & ipdump, ndd etc)
- ps



## Then add all the AIX tools!



## AIX Performance Value Adds

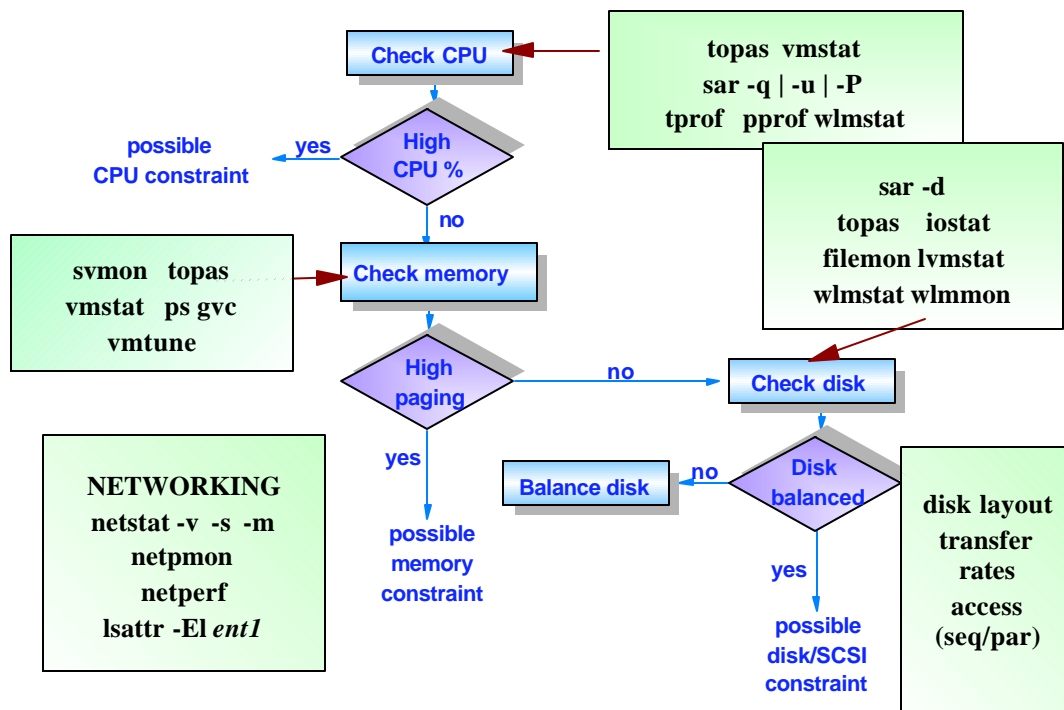




## Monitoring & Tuning by System resources

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

Parameter	Value
extendednetstats	0
thewall	1048576
socktresh	85
sb_max	1310720
somasconn	1024
clean_partial_conns	0
net_malloc_policy	0
rtol_low	1
rtol_high	64
rtol_limit	7
rtol_length	13
inet_stack_size	16
arptab_bsize	7
arptab_nib	25
tcp_ndebbug	100
ifsize	8
arpqsize	1
ndpqsize	50
route_expire	1
send_file_duration	300
fasttimo	200
routevalidate	0
nbc_limit	0
nbc_max_cache	131072
nbc_min_cache	1
nbc_pseg	0
nbc_pseg_limit	524288
strmsgsz	0
strictaz	1024
natrpush	8
strthresh	85
pselimers	20
psebufoalls	20
psecach	95
subnetsarelocal	1
maxttl	1
ipfragttl	255
ipsendredirects	60
ipforwarding	1
udp_ttl	1
tcp_ttl	30
arpt_kil	60
tcp_sendspace	655360
tcp_recvspace	655360
udp_sendspace	65536
udp_recvspace	65536
rfc1122addrch	65536
nonlocsrcroute	0
tcp_keepin	1
tcp_keepidle	150
bcastping	14400
udpcsum	0
tcp_mssdflt	1448
icmppaddressmask	1448
tcp_keepinj	0
le5_old_multicast_mapping	150
rfc1323	1
pmtu_default_age	0
pmtu_rediscover_interval	10
udp_pmtu_discover	30
tcp_pmtu_discover	0
ipqmaxlen	100
directed_broadcast	1
ipignoreredirects	0
ipscroutesend	1
ip6_defmtl	64
ndpmt_keep	120
ndpmt_reachable	30
ndpmt_retrans	1
ndpmt_probe	5
main_if6	0
main_site6	0
site6_index	0
maxnip6q	20
tcp_mssdflt	1448
udp_ephemeral_low	32768
rfc1323	1
ipqmaxlen	100

## 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  
maximum pinable = 80.0% of real memory  
number of file memory pages = 101009

maxperm = 79.7% of real memory  
minperm = 19.9% of real memory  
numperm = 38.5% of real memory

\* nokillroot 4.3.3.0, nokilluid 4.3.3.2 >

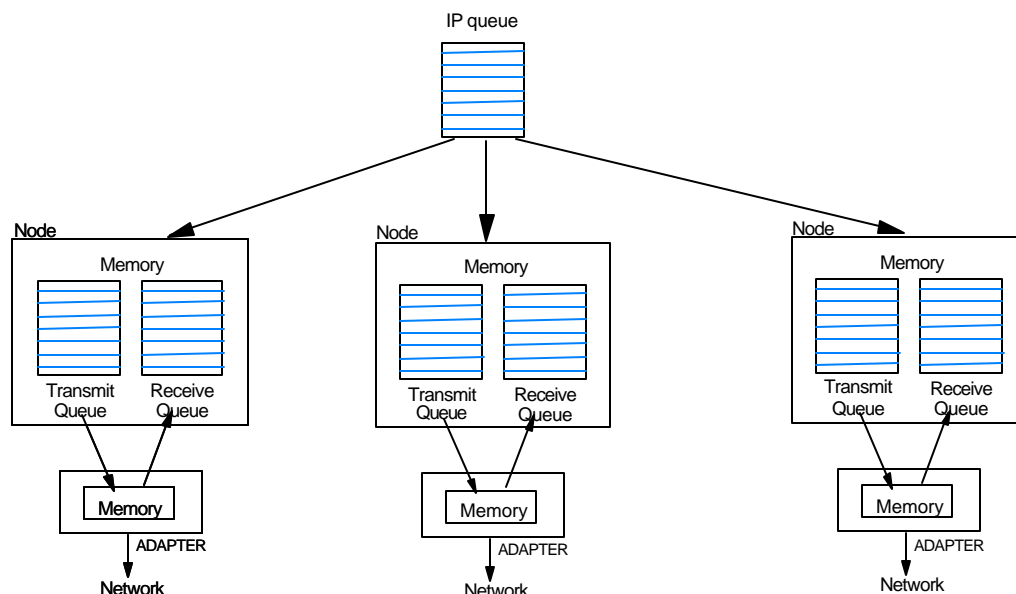
## There's more to NETSTAT then -rn!

know the flags for  
your commands

- 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

<u>Process</u>	<u>PID</u>	<u>TID</u>	<u>Total</u>	<u>Kernel</u>	<u>User</u>	<u>Shared</u>	<u>Other</u>
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

<u>Process</u>	<u>FREQ</u>	<u>Total</u>	<u>Kernel</u>	<u>User</u>	<u>Shared</u>	<u>Other</u>
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	dnt	work	pers	dnt	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  
# more fmout

Stops monitoring and  
creates report

### 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	/

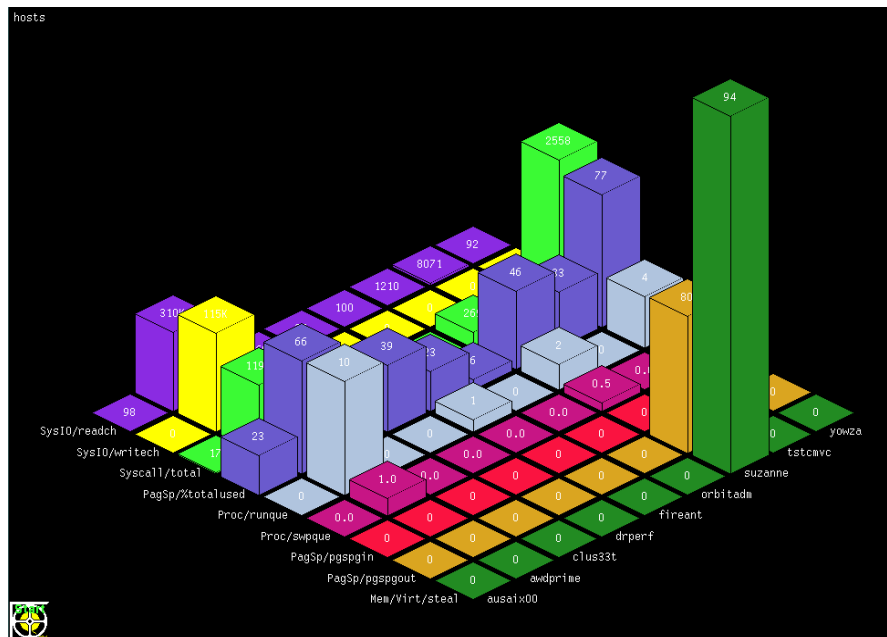
### Most Active Physical Volumes

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

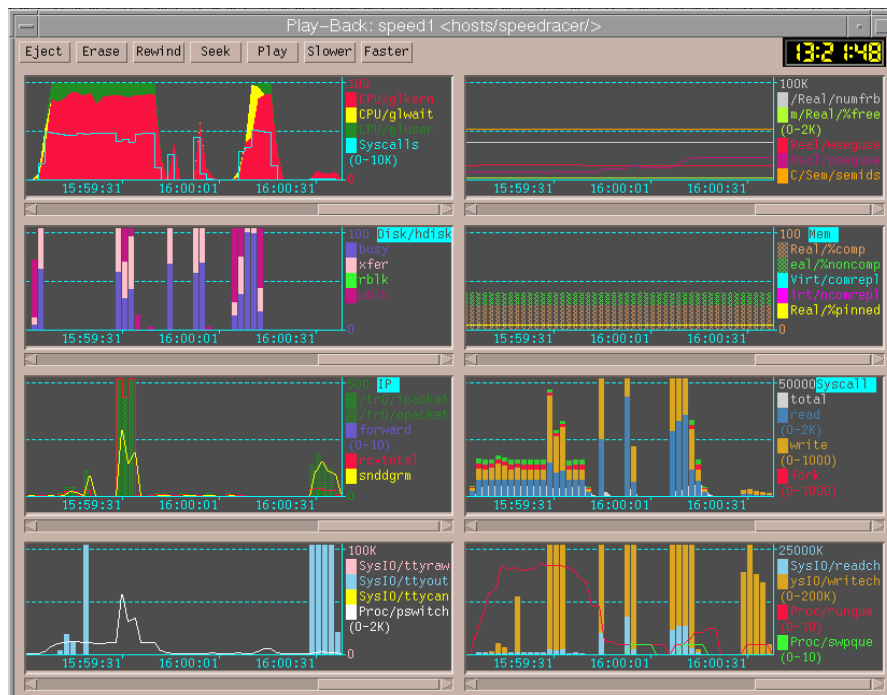
## Example nfso -a listing

```
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_cread = 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 



Continuing  
feedback from the  
User Community



+

Partnerships with  
our customers and  
ISV's



= Understanding  
integrated  
solutions!

