



Introduction to HP-UX System Administration

Module 1

H3064S F.00



Course Audience

This fast-paced 5-day course is the first of two courses HP offers to prepare new UNIX administrators to successfully manage an HP-UX server or workstation.

The course assumes that the student has experience with general UNIX user commands.

Course Agenda

Day 1:

- Introduction to HP-UX Administration
- Creating and Managing User Accounts
- Customizing User Accounts
- Navigating the HP-UX File System

Day 2:

- Configuring Hardware
- Configuring Device Files
- Configuring Disk Devices
- File System Concepts

Day 3:

- Creating and Mounting File Systems
- Maintaining File Systems
- Backing up File Systems
- Scheduling cron Jobs
- Managing Swap Space

Day 4:

- Managing Printers
- Accessing the System Console
- Booting PA-RISC Systems
- Booting Integrity Systems

Day 5:

- Configuring the 11i v2 Kernel
- Managing Software with SD-UX
- Managing Patches with SD-UX
- Installing the OS with Ignite-UX

HP-UX System Administration Resources

In addition to the traditional UNIX man pages, HP provides a number of resources that you can use to learn more about your HP-UX system.

HP's product website:

<http://www.hp.com>

HP's IT Resource Center:

<http://itrc.hp.com>

HP's documentation website:

<http://docs.hp.com>

HP's software download website:

<http://software.hp.com>

HP Education Services:

<http://www.hp.com/education>

Independent HP users' group:

<http://interex.org>

HP-UX System Administration via SAM

For the beginning HP-UX System Administrator, SAM provides a simple mechanism for accomplishing basic HP-UX system administration tasks.

Advantages

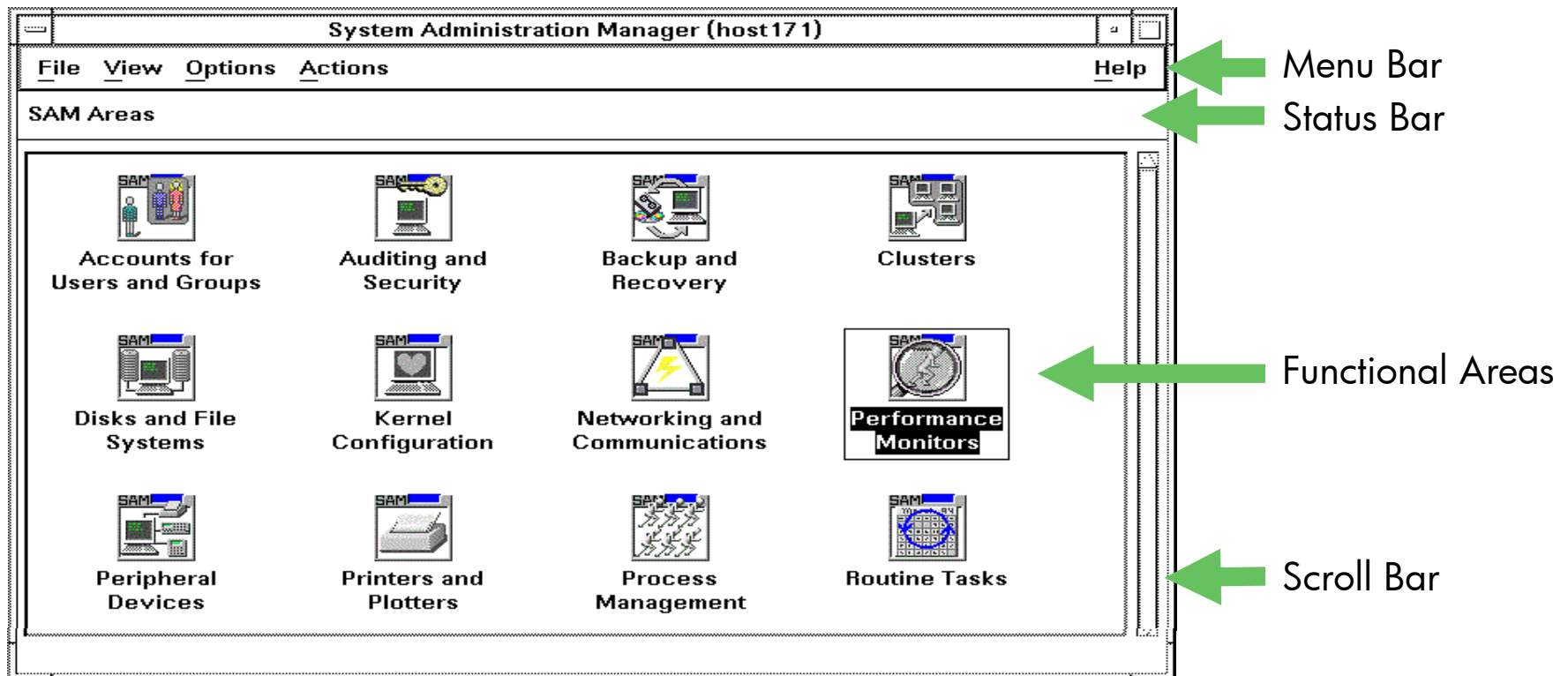
- SAM simplifies complex administration tasks
- SAM minimizes potential for errors
- SAM provides a built-in help utility

Disadvantages

- SAM is less flexible than manual configuration
- SAM generally isn't helpful in some troubleshooting situations

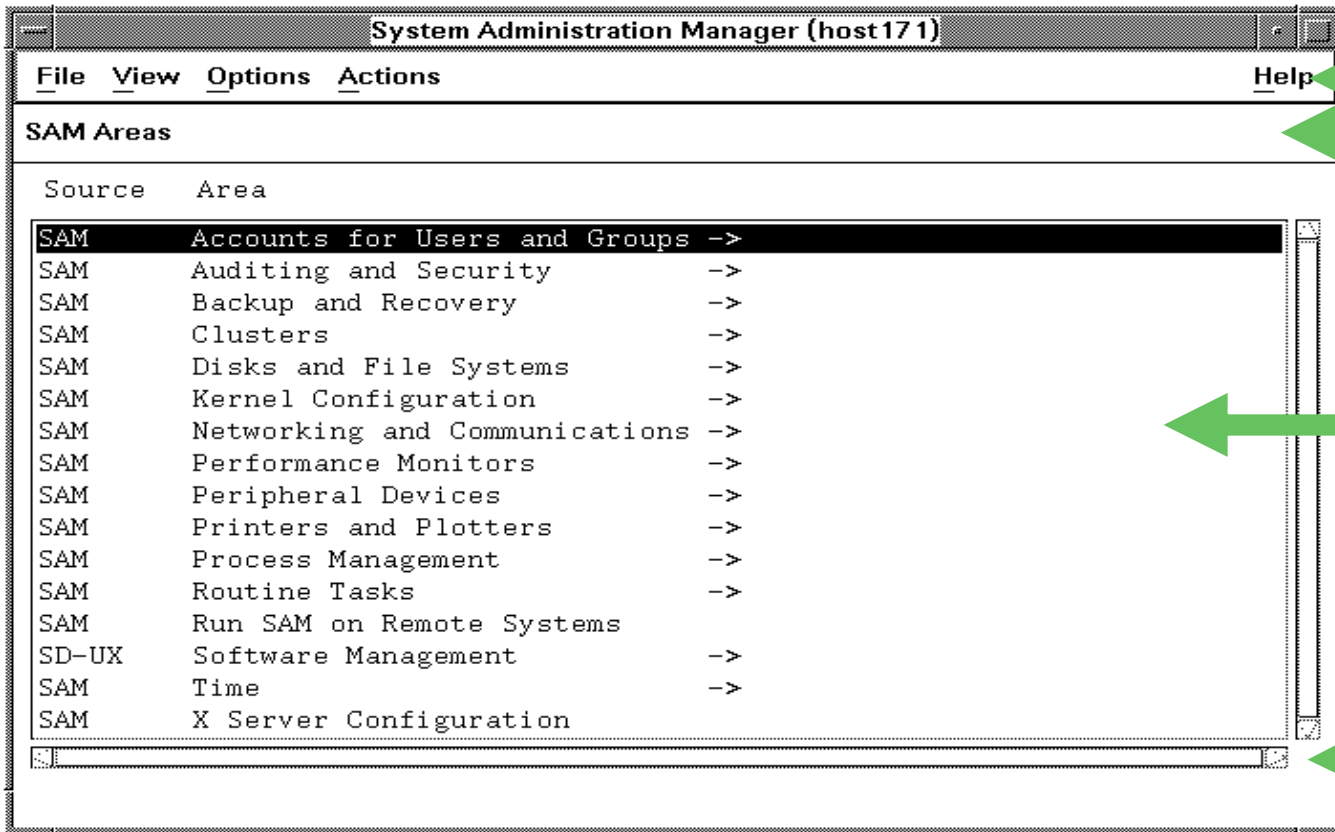
Using the SAM GUI

If you have a graphical display and your DISPLAY variable is set, run sam to access the SAM Graphical User Interface (GUI)



Using the SAM TUI

If your DISPLAY variable isn't set, sam will launch a Terminal User Interface (TUI).



The screenshot shows the System Administration Manager (SAM) TUI interface. The window title is "System Administration Manager (host171)". The menu bar includes "File", "View", "Options", "Actions", and "Help". Below the menu bar is a status bar labeled "SAM Areas". The main content area displays a list of functional areas, each with a "Source" and an "Area" column. The "Accounts for Users and Groups" area is selected and highlighted. A scroll bar is visible on the right side of the list.

Annotations with green arrows point to the following components:

- Menu Bar
- Status Bar
- Functional Areas
- Scroll Bar

Source	Area
SAM	Accounts for Users and Groups ->
SAM	Auditing and Security ->
SAM	Backup and Recovery ->
SAM	Clusters ->
SAM	Disks and File Systems ->
SAM	Kernel Configuration ->
SAM	Networking and Communications ->
SAM	Performance Monitors ->
SAM	Peripheral Devices ->
SAM	Printers and Plotters ->
SAM	Process Management ->
SAM	Routine Tasks ->
SAM	Run SAM on Remote Systems
SD-UX	Software Management ->
SAM	Time ->
SAM	X Server Configuration

Lab activity







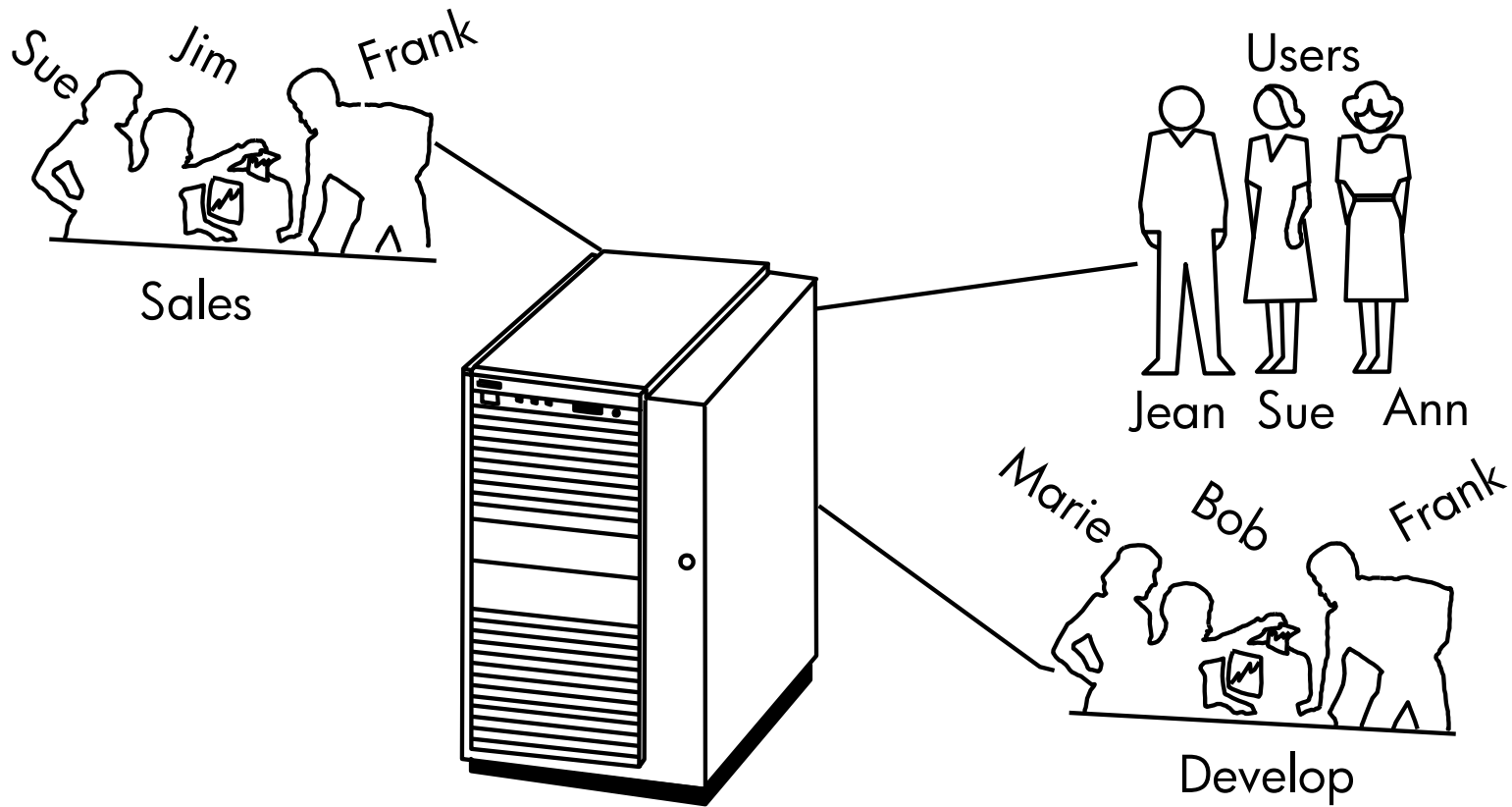
Creating and Managing User Accounts

Module 2

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Users and Groups — Access to System and Data



What Defines a User Account?

/etc/passwd

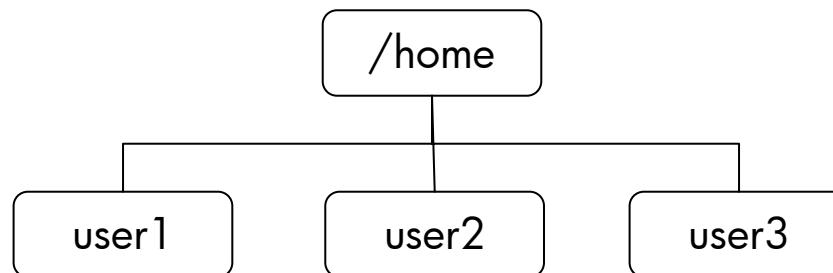
```
user1:x:1001:20:111-1111:/home/user1:/usr/bin/sh
user2:x:1002:20:222-2222:/home/user2:/usr/bin/sh
user3:x:1003:20:333-3333:/home/user3:/usr/bin/sh
```

/etc/shadow (optional)

```
user1:btp2SLRCK70es:1001:::::::::
user2:btp2SLRCK70es:1002:::::::::
user3:btp2SLRCK70es:1003:::::::::
```

/etc/group

```
users::20:
accts::1001:user1,user2
sales::1002:user1,user2,user3,user4,user5,user6
```



The /etc/passwd File

/etc/passwd contains a one-line definition of each valid user account

/etc/passwd (r--r--r--)

```
root:qmAj8as.,8a3e:0:3:::/bin/sh
daemon:*:1:5:::/sbin/sh
user1:AdOK60AazRgXU:1001:1001:111-1111:/home/user1:/usr/bin/sh
user2:AdOK60AazRgXU:1002:1001:222-2222:/home/user2:/usr/bin/sh
user3:AdOK60AazRgXU:1003:1001:333-3333:/home/user3:/usr/bin/sh
```



Username



Password



UID



GID



Comments



Home Directory



Shell

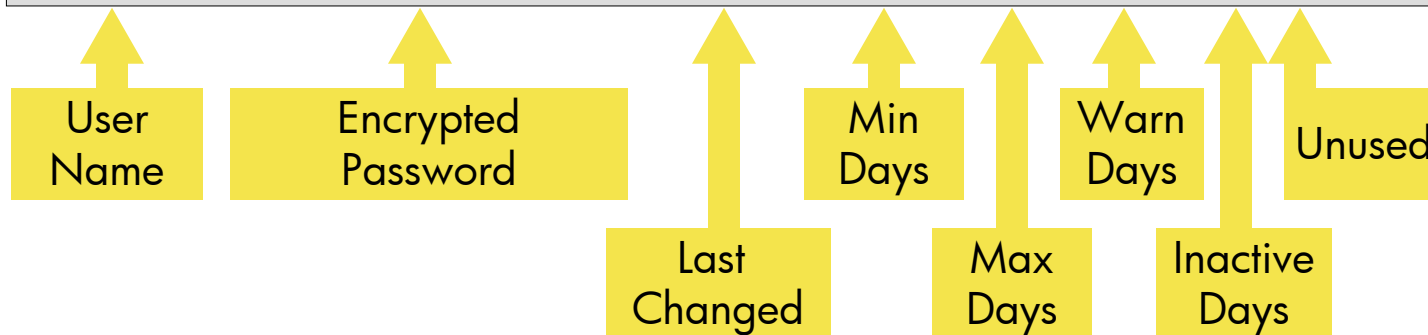
- ✓ Use /usr/sbin/vipw to edit /etc/passwd
- ✓ Use /usr/sbin/pwck to check the /etc/passwd file syntax

The /etc/shadow File

- Passwords can optionally be stored in /etc/shadow
- /etc/shadow is more secure than /etc/passwd

/etc/shadow (r-----)

```
user1:AdOK60AazRgXU:12269:70:140:70:35:::
```



- ✓ Install the ShadowPassword product (not necessary on 11i v2)
- ✓ Use /usr/sbin/pwck to verify your current /etc/passwd file syntax
- ✓ Use /usr/sbin/pwconv to move passwords from /etc/passwd to /etc/shadow
- ✓ Use /usr/sbin/pwunconv to move passwords back to /etc/passwd

The /etc/group File

- /etc/passwd determines a user's primary group membership
- /etc/group determines a user's secondary group memberships

```
other::1:root,daemon,uucp,sync
users::20:
accts::1001:user1,user2
sales::1002:user1,user2,user3,user4,user5,user6
```



- ✓ Use /usr/bin/vi to edit /etc/group
- ✓ Use /usr/sbin/grpck to check the /etc/group file syntax

Creating User Accounts

- Use `useradd` or `SAM` to create new user accounts
- Use `passwd` or `SAM` to define passwords for new users

Create a user account:

```
# useradd -o -u 101 \           # define the UID
    -g users \                 # define the primary group
    -G class,training \       # define secondary groups
    -c "student user" \       # define the comment field
    -m -d /home/user1 \       # make a home directory for the user
    -s /usr/bin/sh \          # define the default shell
    -e 1/2/2006 \             # define an account expiration date
    user1                     # define the username
```

Set a password for the new account:

```
# passwd user1                # interactively specify a password or...
# passwd -d user1             # set a null password
# passwd -f user1             # force a password change at first login
```


Modifying User Accounts

- The administrator can use `usermod`, `passwd`, and `SAM` to modify user accounts
- Users can modify some attributes of their own accounts via `passwd`, `chsh`, and `chfn`

Modify a user account (Administrators):

<code># passwd user1</code>	<i># change the user's passwd</i>
<code># usermod -l user01 user1</code>	<i># change the user's username</i>
<code># usermod -o -u 101 user01</code>	<i># change the user's UID</i>
<code># usermod -g users user01</code>	<i># change the user's primary group</i>
<code># usermod -G class,training user01</code>	<i># change the user's secondary group(s)</i>
<code># usermod -c "student" user01</code>	<i># change the user's comment field</i>
<code># usermod -m -d /home/user01 user01</code>	<i># move the user's home directory</i>
<code># usermod -s /usr/bin/ksh user01</code>	<i># change the user's default shell</i>
<code># usermod -e 1/2/2006</code>	<i># change the user's account expiration</i>

Modify a user account (Users):

<code>\$ passwd</code>	<i># change the user's password</i>
<code>\$ chsh user01 /usr/bin/ksh</code>	<i># change the user's shell</i>
<code>\$ chfn user01</code>	<i># change the user's comment field</i>

Deactivating User Accounts

- Deactivating a user account prevents the user from logging in
- However, the user's entry remains in the `/etc/passwd` file and can be reactivated
- The user's files can be left as-is, removed, or transferred to another user

Deactivate a user account

```
# passwd -l user1
```

Reactivate a user account

```
# passwd user1
```

Remove a user's home directory

```
# rm -rf /home/user1
```

Or... Remove the user's files from every directory

```
# find / -user user1 -type f -exec rm -i +
```

```
# find / -user user1 -type f -exec rmdir +
```

Or... Transfer ownership to a different user

```
# find / -user user1 -exec chown user2 +
```

Removing User Accounts

- Removing a user removes the user from `/etc/passwd` and `/etc/group`
- The user's files can be left as-is, removed, or transferred to another user

Delete a user account, but leave the user's files untouched

```
# userdel user1
```

Delete a user account and remove the user's home directory

```
# userdel -r user1
```

Or... Remove the user's files from every directory

```
# find / -user user1 -type f -exec rm -i +
```

```
# find / -user user1 -type f -exec rmdir +
```

Or... Transfer ownership to a different user

```
# find / -user user1 chown user2 +
```

Find files owned by non-existent users or groups

```
# find / -nouser -exec ll -d +
```

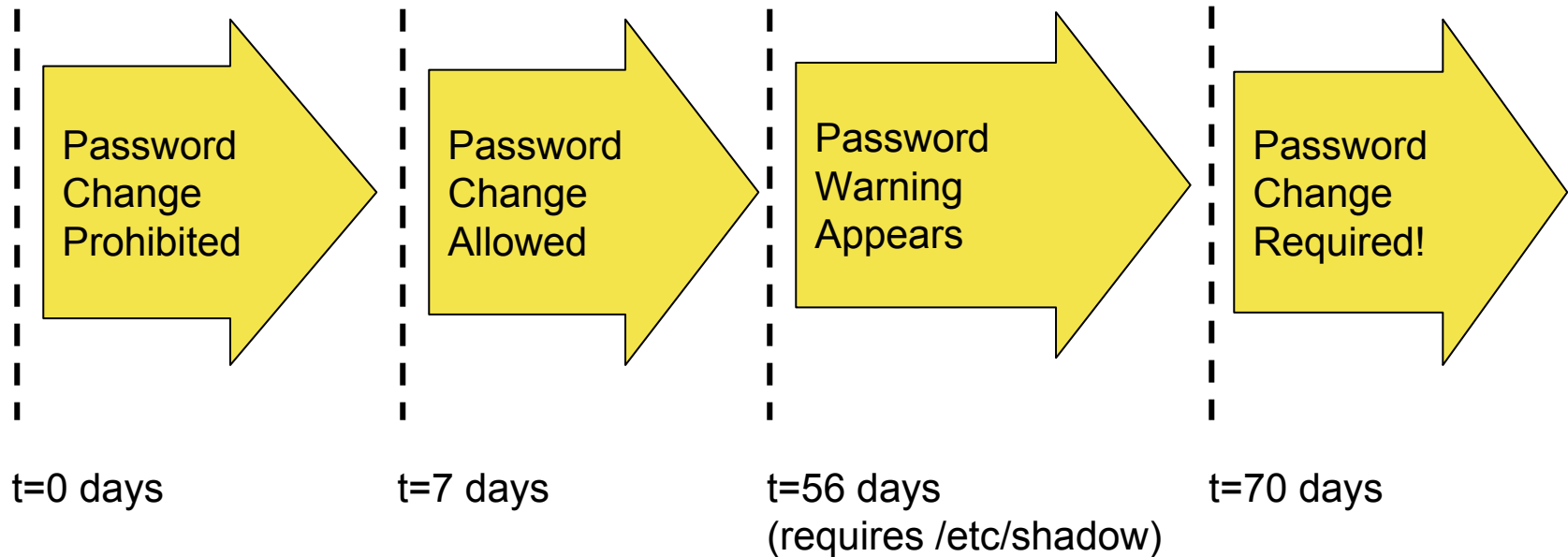
```
# find / -nogroup -exec ll -d +
```

Enabling Password Aging

Password aging forces users to change their passwords on a regular basis

```
# passwd -n 7 -x 70 -w 14 user1
# passwd -s user1
# passwd -sa
```

enable password aging for a user
check a user's password status
check the status of all users



Managing Groups

- Each user can belong to one or more groups
- Groups can be managed via groupadd/groupmod/groupdel
- Group memberships can be managed via usermod and groups

Create a new group

```
# groupadd -g 200 accts
```

Change a group name

```
# groupmod -n accounts accts
```

Delete a group

```
# groupdel accounts
```

Change a user's primary and secondary group membership

```
# usermod -g users user1
```

```
# usermod -G class,training user1
```

View a user's group memberships

```
# groups user1
```

Lab activity







Customizing User Accounts

Module 3

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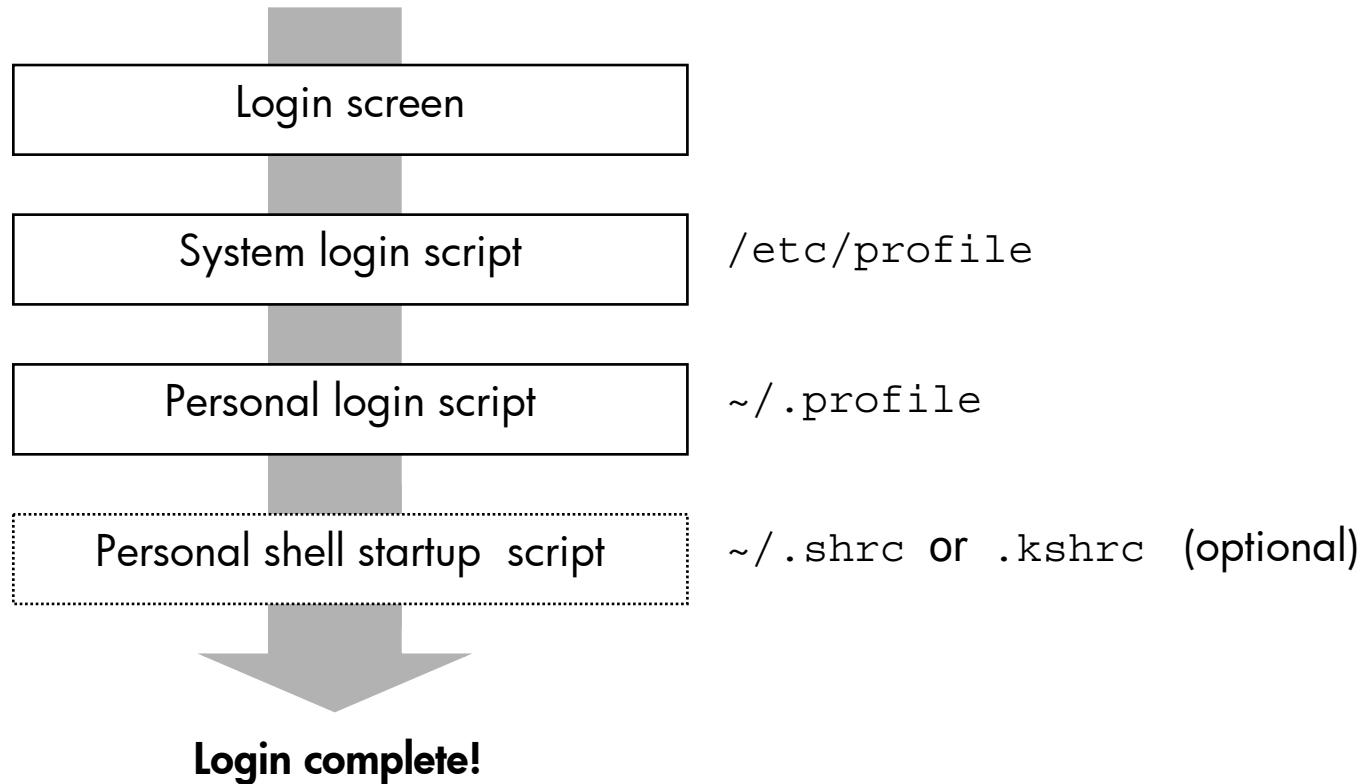
Why Customize a User Account?

- Set the user's terminal type.
- Customize the user's prompt.
- Set the user's default printer.
- Customize the user's PATH variable.
- Define a command line editor.

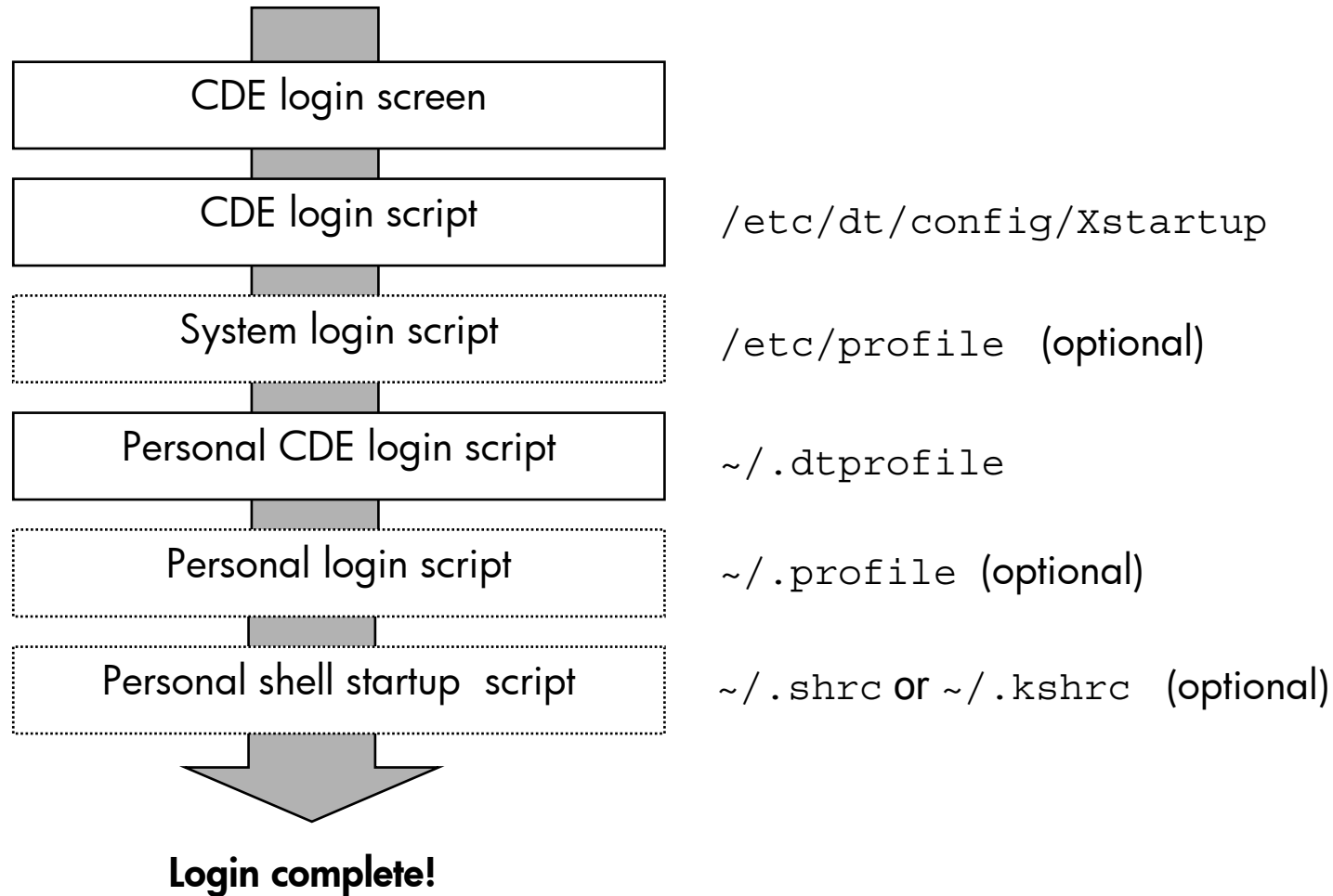
Some Sample Customizations

```
export TERM='vt100'  
export PS1='$PWD $'  
export LPDEST='laser'  
export PATH=$PATH:/usr/local/bin  
export EDITOR=vi  
export HISTSIZE=50  
export HISTFILE=~/.sh_history
```

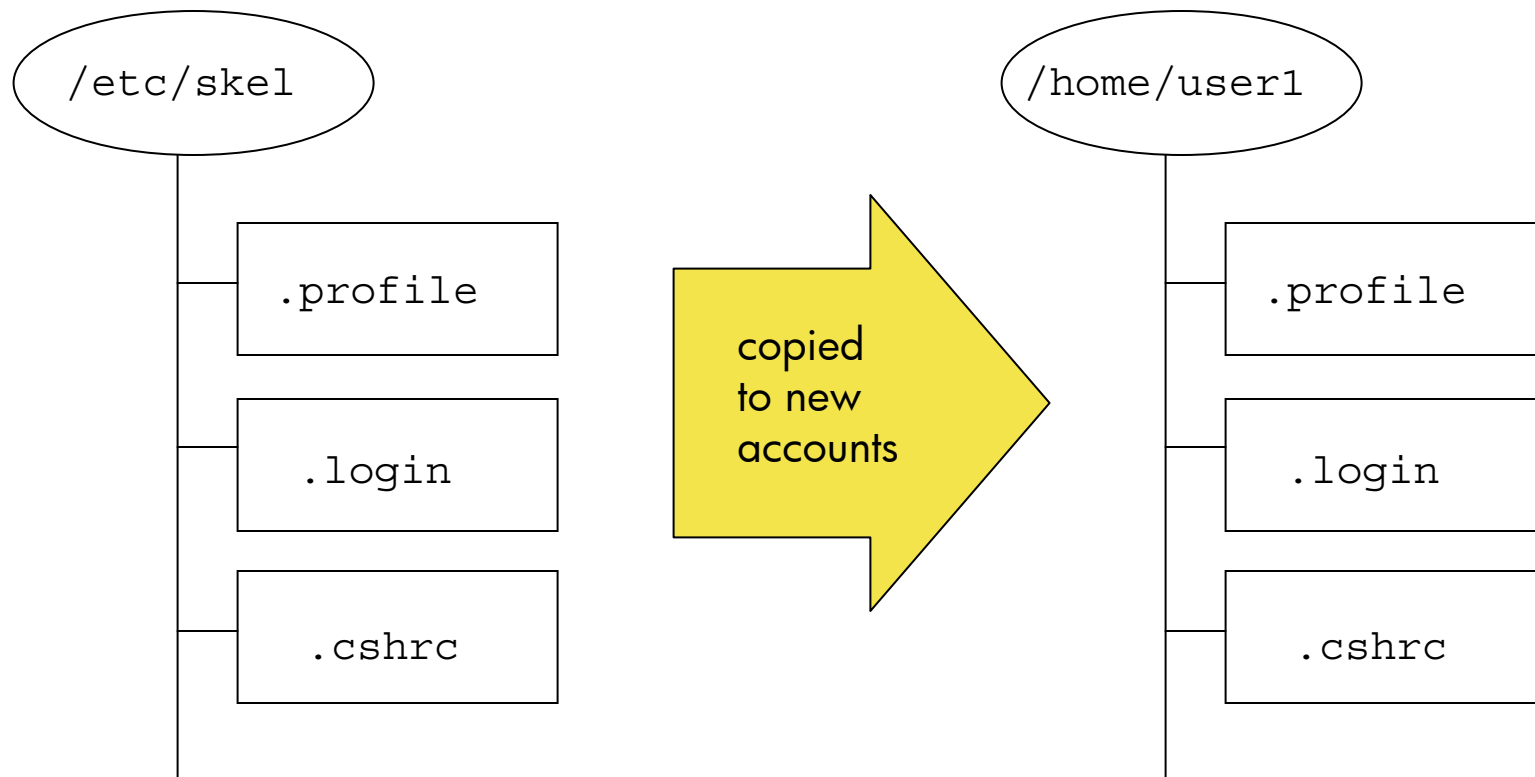
Customizing ASCII Logins



Customizing CDE Logins



The /etc/skel Directory



Lab activity







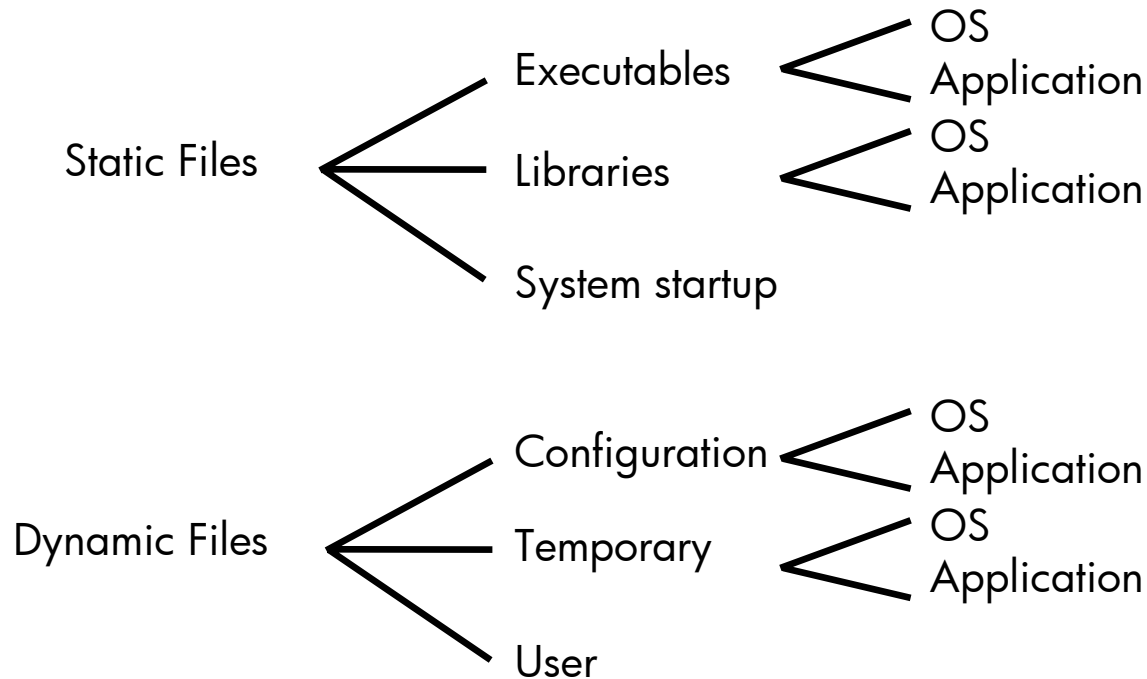
Navigating the HP-UX File System

Module 4

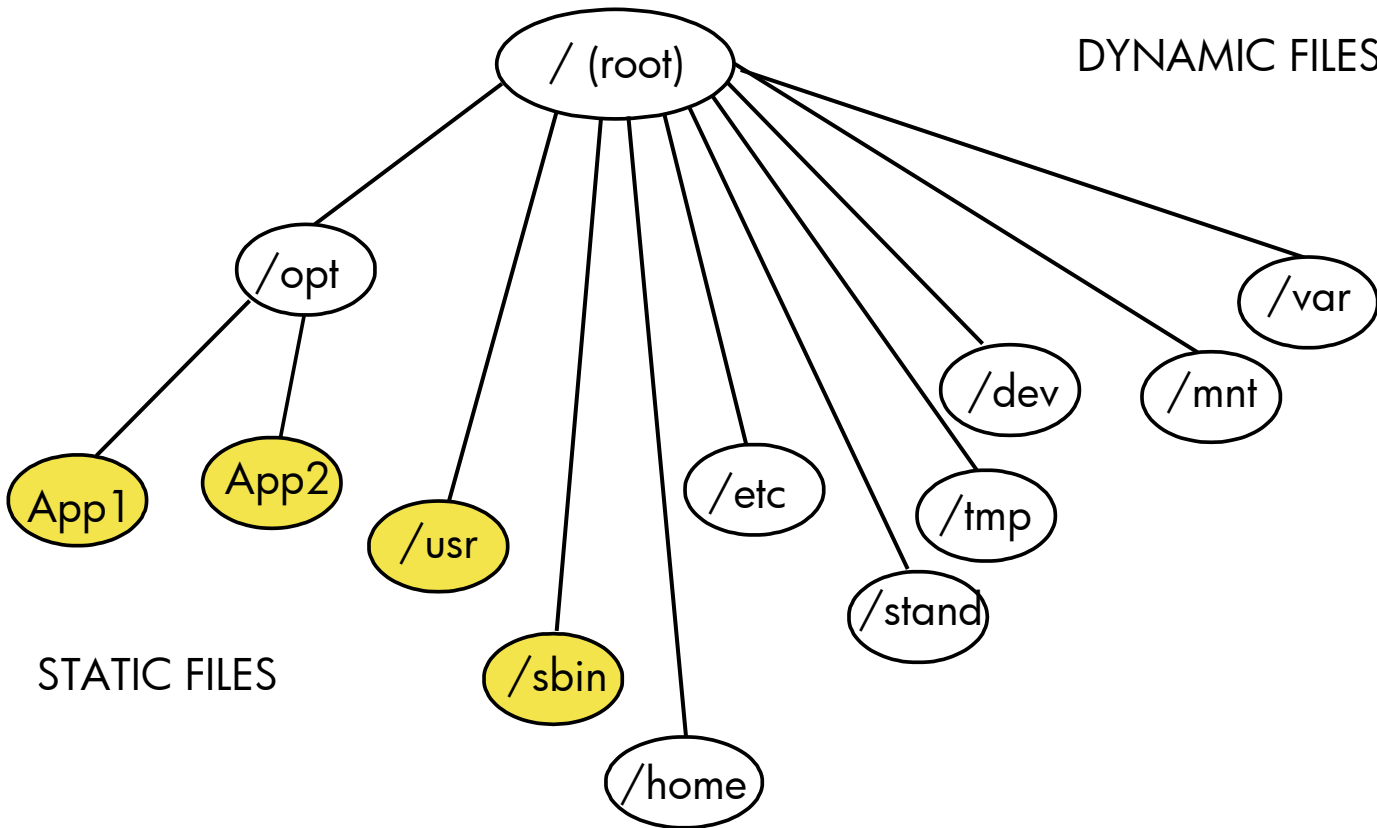
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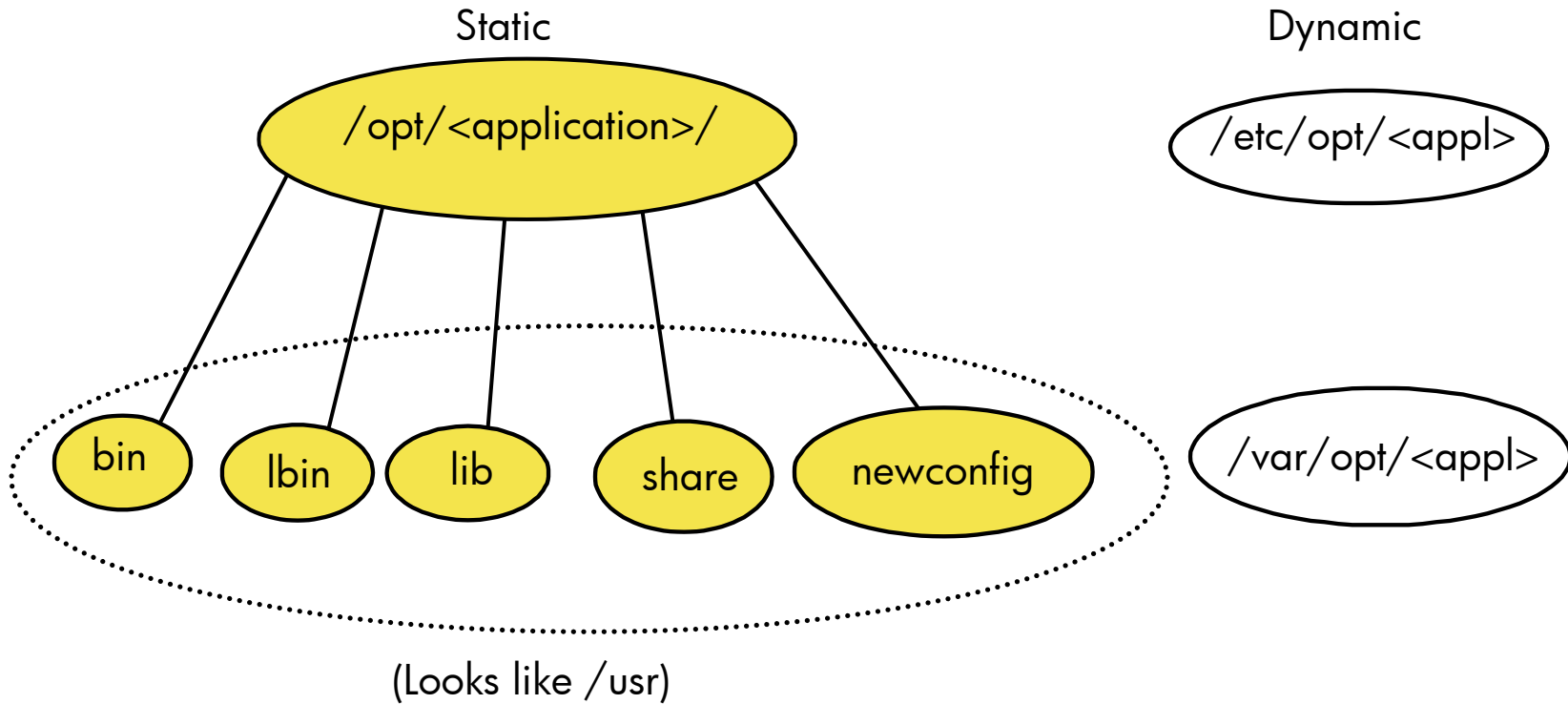
Introducing the File System Paradigm



System Directories



Application Directories



Commands to Help You Navigate

<code>find</code>	Searches the file hierarchy
<code>whereis</code>	Locates source, binaries, and man pages
<code>which</code>	Locates an executable in your PATH
<code>file</code>	Determines file type
<code>strings</code>	Displays ASCII characters in binary files

Lab activity







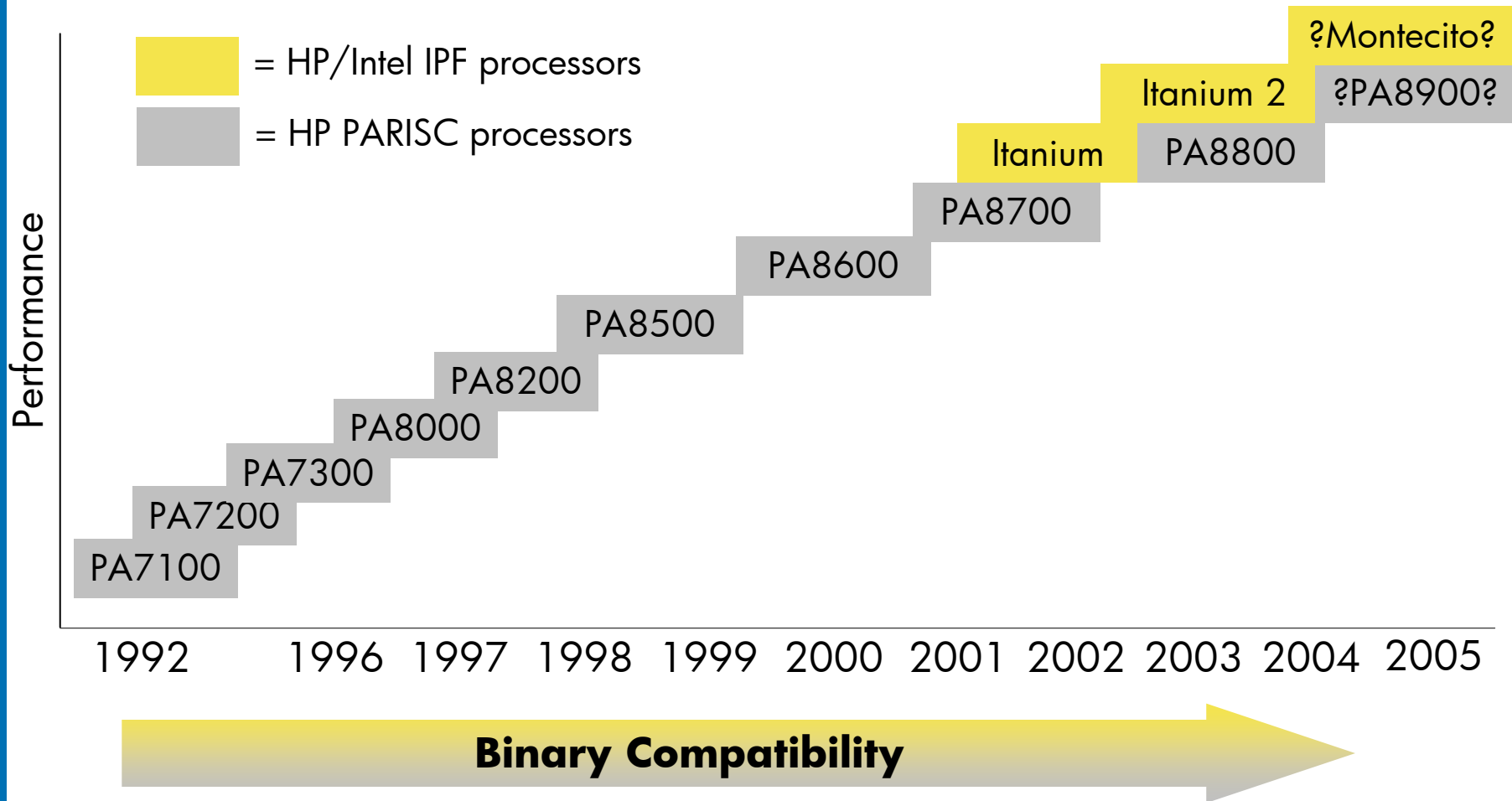
Configuring Hardware

Module 5

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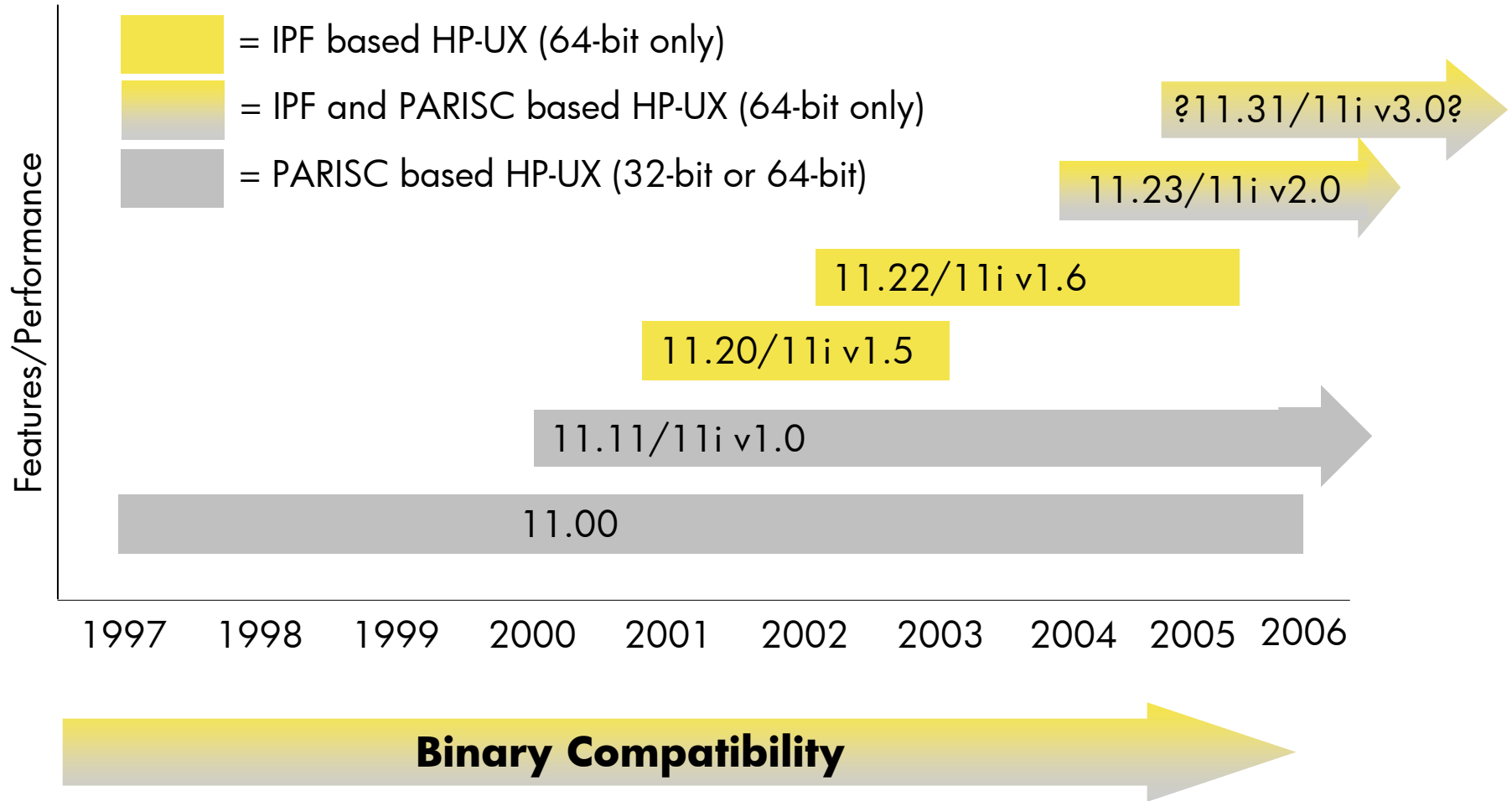
HP-UX Processor Roadmap



http://bcsmarketing.corp.hp.com/marketing/docs/Roadmaps/Roadmap-slides_031604.ppt

Information on this slide was current as of 2/2/2004. All future release dates are subject to change without notice.

HP-UX Operating System Roadmap



Source: <http://www.hp.com/software/releases/releases-media2/history/slide2.html>
 Information current as of March 2005. All future release dates are subject to change without notice.

HP-UX Hardware Product Overview

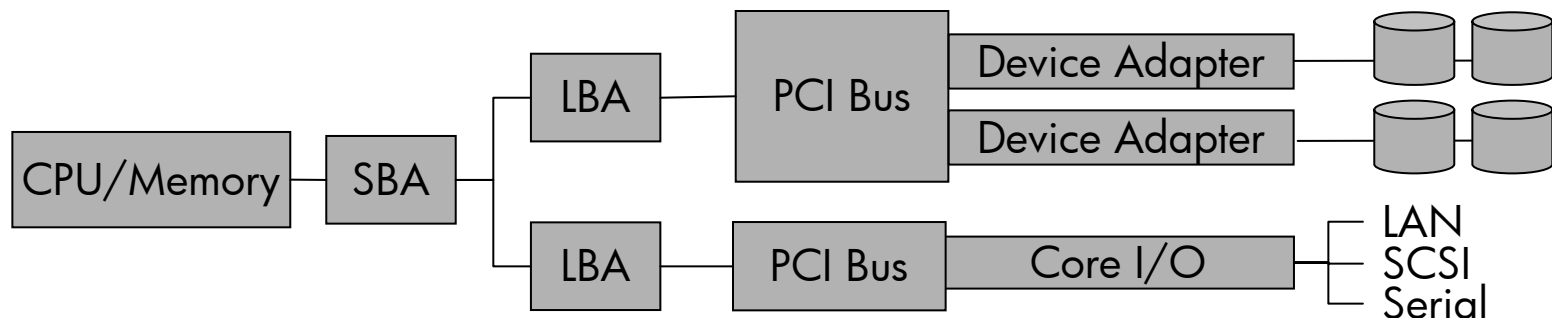
	PA-RISC	IPF
Servers (800s)	rp Series Servers and Superdome Servers	rx Integrity Series Servers and Integrity Superdome Servers
Workstations (700s)	B/C/J Series Workstations	zx Series Workstations



Hardware Component Overview

Every recent HP-UX system has several hardware components:

- One or more PA-RISC or Itanium CPU chips for processing data
- One or more memory modules for storing data
- One or more System / Local Bus Adapters that provide connectivity to I/O expansion buses
- One or more PCI I/O expansion buses with slots for add-on Device Adapter cards
- One or more Device Adapter cards with ports for cabling peripheral devices
- One or more Core I/O cards with built-in LAN, console, and boot disk connectivity



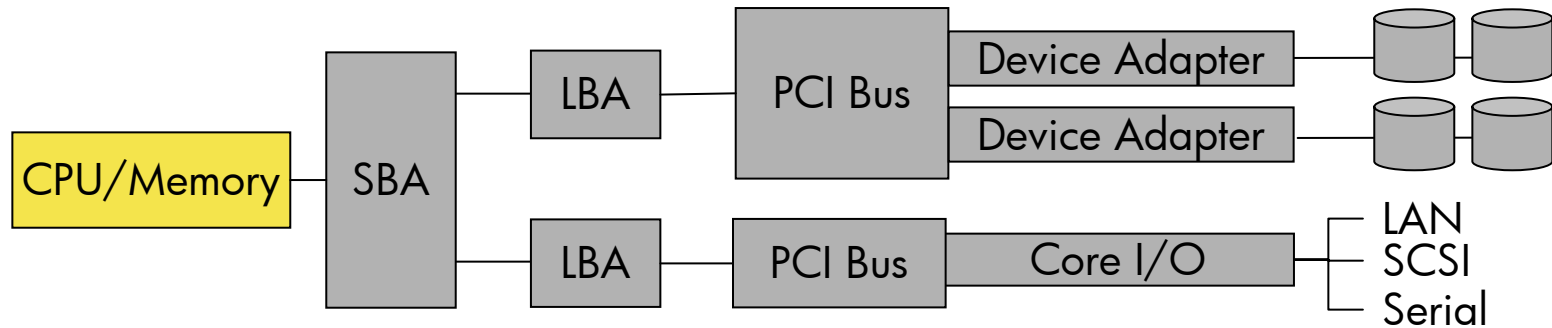
CPU, Memory, and Cell Boards

Processor-based systems

- HP-UX workstations and low-end servers use a processor-based architecture
- CPU and memory are physically hosted on a single system board

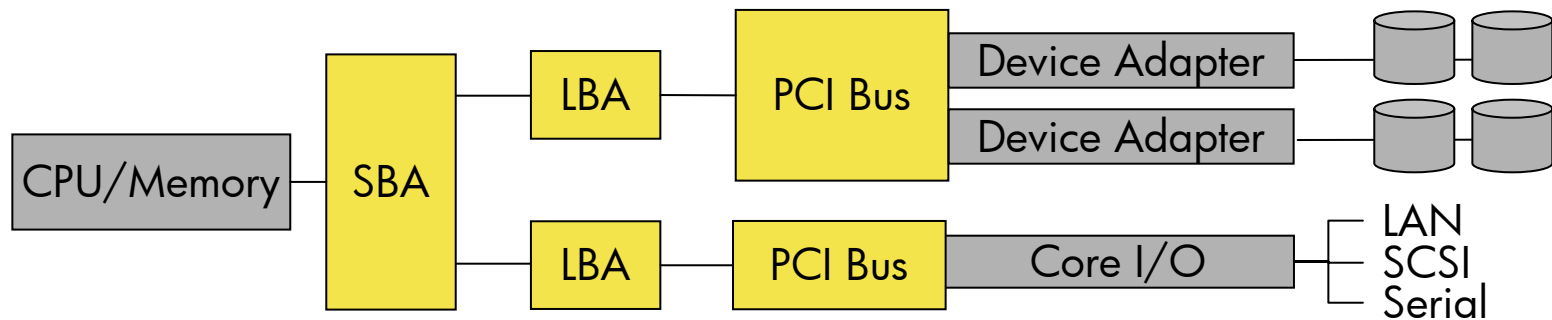
Cell-based systems

- High-end HP-UX servers use a cell based architecture
- Each system is comprised of one or more cell boards
- Each cell board contains one or more CPUs, and a portion of the system's memory
- All cell boards are interconnected via low latency system crossbars



SBAs, LBAs, and PCI Expansion Buses

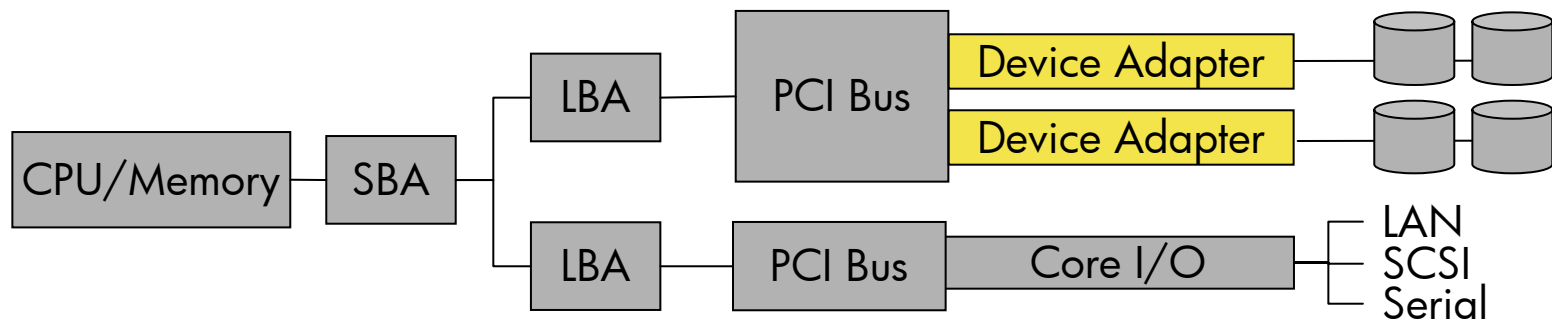
- System and Local Bus Adapters provide connectivity to I/O expansion buses
- PCI buses provide one or more slots for device adapter cards
- HP supports a variety of PCI bus types and bandwidths up to ~1GB/sec
- All current HP PCI slots support “adaptive signaling technology” for maximum flexibility
- Most HP PCI slots have dedicated buses to minimize downtime and maximize performance
- PCI buses on high-end servers support HP’s “Online Addition & Replacement” functionality



Device Adapter Cards

- Device adapters / interface cards provide connectivity to additional devices
- HP offers a variety of interface card types to support a variety of devices:

Interface Type	Typical Usage
SCSI	Disks, Tapes, CDROMs
Fibre Channel	Tape Libraries, Disk Arrays
10/100BaseT	LAN Connectivity
10/100/1000BaseT	High Speed LAN Connectivity
1000BaseSX, FDDI	High Speed Fiber Optic LAN Connectivity
ATM, X.25	WAN Connectivity

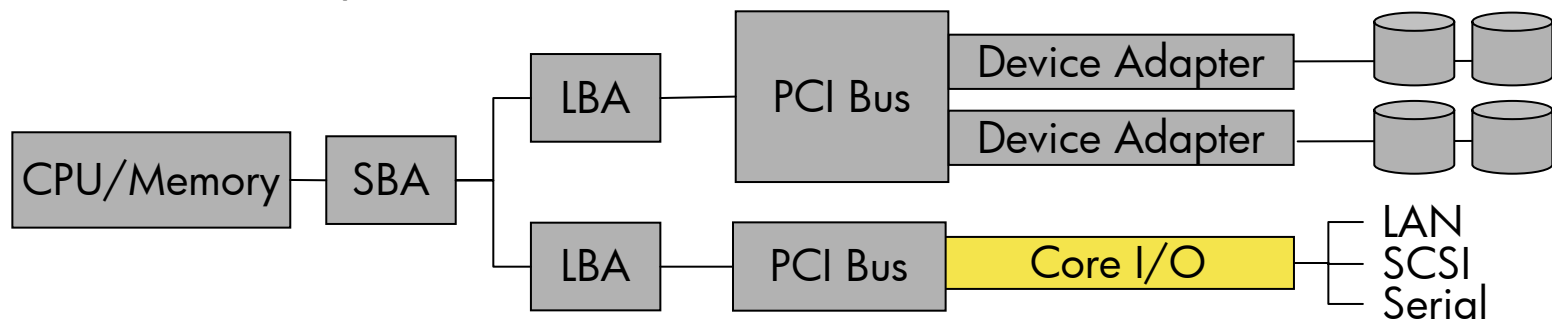


Core I/O Cards

- All HP servers and workstations include at least one Core I/O card
- Core I/O cards provide multiple core Device Adapter “functions” on a single card
- Sample Device Adapters found on many current core I/O cards include:

Interface Type	Typical Usage
SCSI	Boot disk, tape, and DVD connectivity
10/100BaseT	LAN connectivity
Serial	Serial terminal/modem connectivity
Parallel*	Printers & Scanners
USB/PS2*	Keyboards & Mice
Audio*	Speakers & Headphones

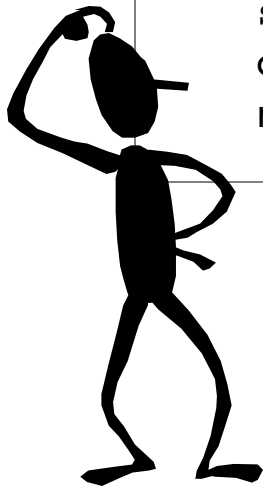
* Workstations only



Hardware Addressing

In order to successfully configure and manage devices on your HP-UX system, you need to understand the addressing mechanisms used to identify devices.

- The HP-UX kernel identifies devices via HP-UX hardware addresses
- HP-UX slot addresses identify an interface card's physical location on your system
- When interacting with the Integrity firmware, devices are identified via ACPI addresses



`syslog.log` tells me that one of my interface cards has failed – but how can I tell which one I need to replace?

HP-UX Hardware Addresses

The HP-UX kernel identifies cards and devices via HP-UX hardware paths, which describe a device's logical location in the kernel's I/O tree structure in memory.

Processor-based hw path format: SBA/LBA/device/function.target.LUN

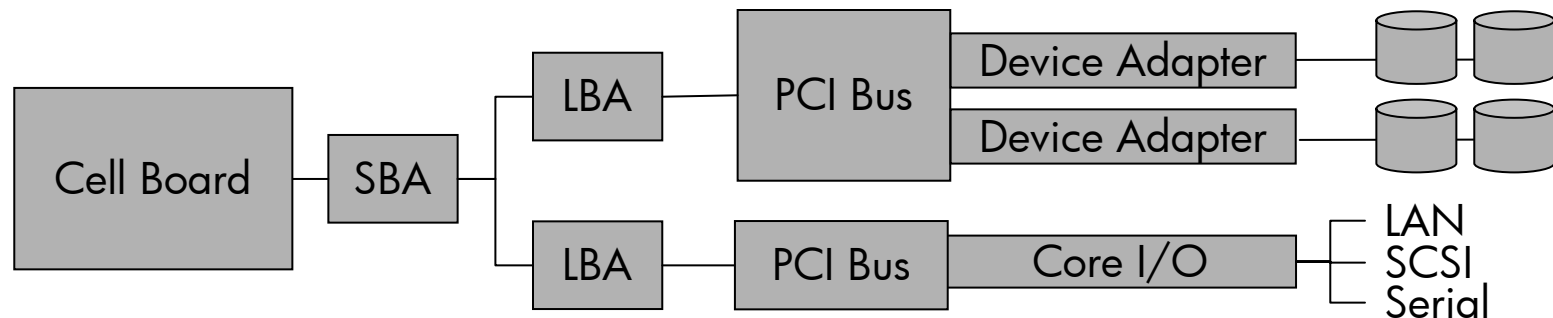
Processor-based hw path example: 0/0/2/0.6.0

Processor-based hw path explanation: SBA=0, LBA=0, dev=2, function=0, target=6, LUN=0

Cell-based hw path format: Cell/SBA/LBA/device/function.target.LUN

Cell-based hw path example : 1/0/0/2/0.6.0

Cell-based hw path explanation: Cell=1, SBA=0, LBA=0, dev=2, function=0, target=6, LUN=0



Viewing HP-UX Hardware Addresses (ioscan)



You can view devices' HP-UX hardware addresses, properties, and states via the `ioscan` command.

# <code>ioscan</code>	short listing of all devices
# <code>ioscan -f</code>	full listing of all devices
# <code>ioscan -fk</code>	full listing, using cached information
# <code>ioscan -fH 0/0/0/1/0</code>	full listing of device at 0/0/0/1/0
# <code>ioscan -fC disk</code>	full listing of "disk" class devices

```
# ioscan -f
```

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
root	0		root	CLAIMED	BUS_NEXUS	
cell	0	0	cell	CLAIMED	BUS_NEXUS	
ioa	0	0/0	sba	CLAIMED	BUS_NEXUS	SBA
ba	0	0/0/0	lba	CLAIMED	BUS_NEXUS	LBA
ext_bus	0	0/0/0/2/0	c720	CLAIMED	INTERFACE	SCSI Fast Wide
disk	0	0/0/0/2/0.6.0	sdisk	CLAIMED	DEVICE	HP Disk
ctl	0	0/0/0/2/0.7.0	sctl	CLAIMED	DEVICE	Initiator

Slot Addresses

On cell-based systems, administrators can identify a card slot's physical location by its slot address, which is based on:

- The slot's cabinet (each Superdome complex may have 1-4 cabinets)
- The slot's I/O bay (each Superdome cabinet may have 1-2 I/O bays)
- The slot's I/O chassis (each Superdome I/O bay may have 1-2 I/O chassis)
- The slot's slot number (each Superdome I/O chassis has twelve card slots)

Slot Address Format:	Cabinet-Bay-Chassis-Slot
Slot Address Example:	0-1-3-4
Slot Address Explanation:	Cabinet 0, Bay 1, Chassis 3, Slot 4

Viewing Slot Addresses (olrad and rad)

You can view slot addresses, properties, capabilities, and usage via the `rad` command (11i v1) or `olrad` command (11i v2). These commands are only available on midrange and higher systems.

```
# olrad -q
```

Slot	Path	Bus Num	Max Spd	Spd	Pwr	Occu	Susp	OLAR	OLD	Max Mode	Mode
0-1-3-1	2/0/1/1	21	133	133	Off	No	N/A	N/A	N/A	PCI-X	N/A
0-1-3-2	2/0/2/1	42	133	N/A	On	Yes	No	Yes	N/A	PCI-X	N/A
0-1-3-3	2/0/3/1	63	133	N/A	On	Yes	No	Yes	N/A	PCI-X	N/A

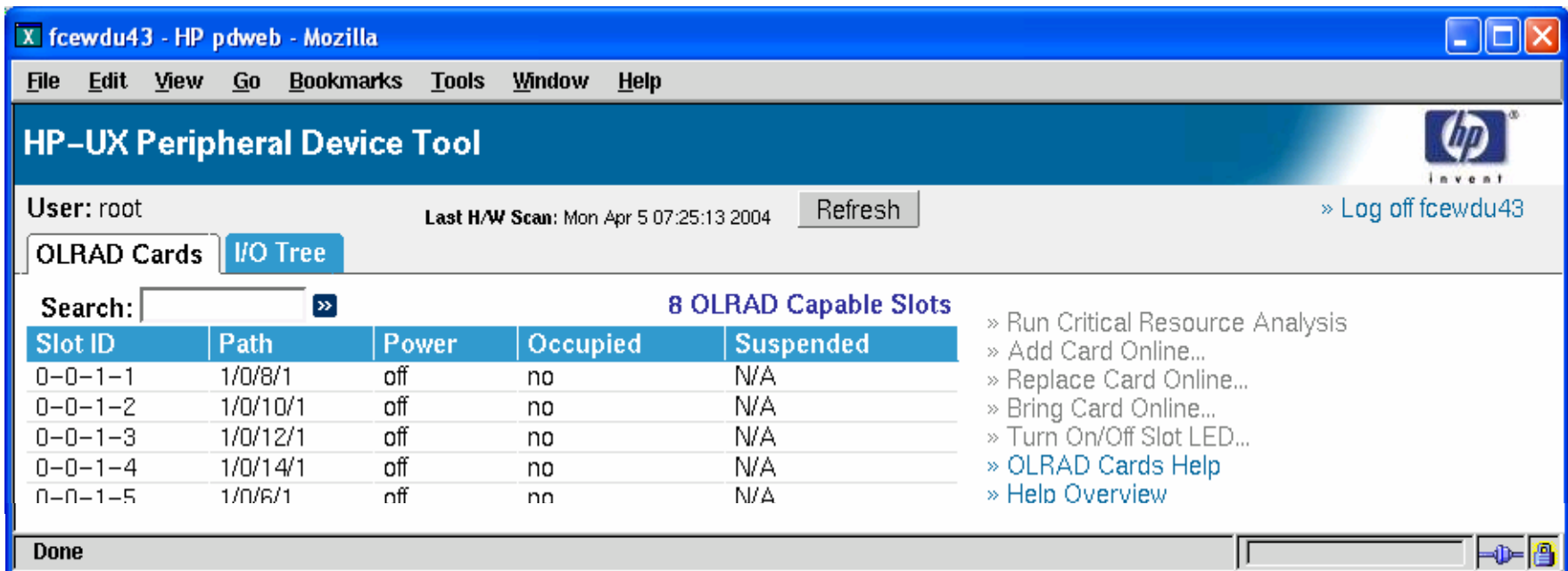
```
# rad -q
```

Slot	Path	Bus	Speed	Power	Occupied	Suspended	Capable
0-0-0-1	0/0/8/0	64	66	On	Yes	No	Yes
0-0-0-2	0/0/10/0	80	66	On	Yes	No	Yes
0-0-0-3	0/0/12/0	96	66	On	Yes	No	Yes

Viewing Slot Addresses (pdweb and sam)

- On 11i v1, you can view slot addresses via the SAM Interface Cards GUI
- On 11i v2, you can view slot addresses via the pdweb GUI/TUI/web interface

```
# pdweb -t (TUI) or
# pdweb [-F] (Local web interface) or
# mozilla http://server:1110/pd/pd.cgi (Remote web interface)
```



HP-UX Peripheral Device Tool

User: root Last H/W Scan: Mon Apr 5 07:25:13 2004 Refresh » Log off fcewdu43

OLRAD Cards I/O Tree

Search: »

8 OLRAD Capable Slots

Slot ID	Path	Power	Occupied	Suspended
0-0-1-1	1/0/8/1	off	no	N/A
0-0-1-2	1/0/10/1	off	no	N/A
0-0-1-3	1/0/12/1	off	no	N/A
0-0-1-4	1/0/14/1	off	no	N/A
0-0-1-5	1/0/16/1	off	no	N/A

» Run Critical Resource Analysis
 » Add Card Online...
 » Replace Card Online...
 » Bring Card Online...
 » Turn On/Off Slot LED...
 » OLRAD Cards Help
 » Help Overview

Done

EFI Hardware Addresses

On Integrity systems, the firmware responsible for early stages of the boot process uses EFI hardware addresses, which are easily mapped to HP-UX hardware paths

Processor-based EFI address format:

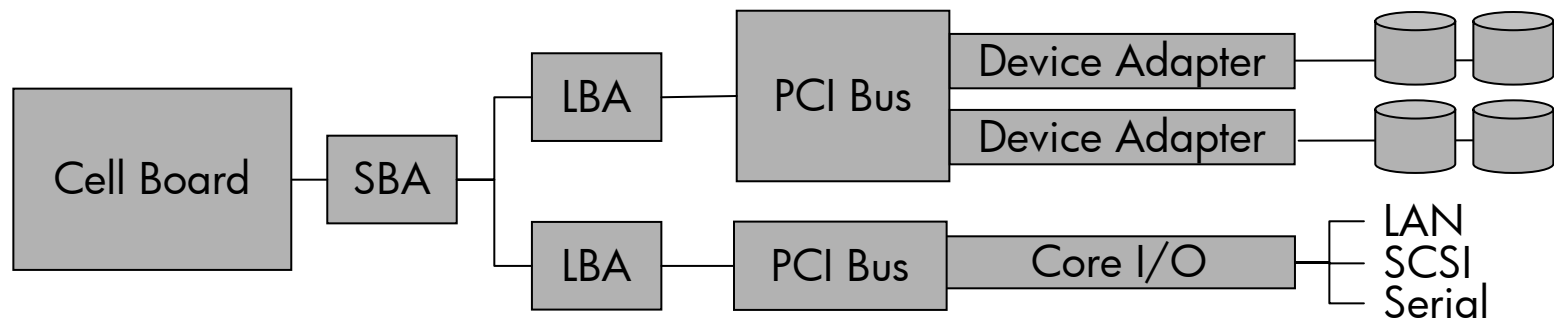
HP-UX Hardware Address: SBA/LBA/device/function.target.LUN (EFI part.#)

EFI Hardware Path: ACPI(*vendor,xxx*) / PCI(*d|f*) / SCSI (PUN*t*,LUN*l*) / HD(Part*p*,*hex*)

Cell-based EFI address format:

HP-UX Hardware Address: Cell/SBA/LBA/device/function.target.LUN (EFI part.#)

EFI Hardware Address: ACPI(*vendor,cxx*) / PCI(*d|f*) / SCSI (PUN*t*,LUN*l*) / HD(Part*p*,*hex*)



Viewing EFI Hardware Addresses (ioscan)



From HP-UX, use `ioscan -e` to view HP-UX *and* ACPI hardware paths

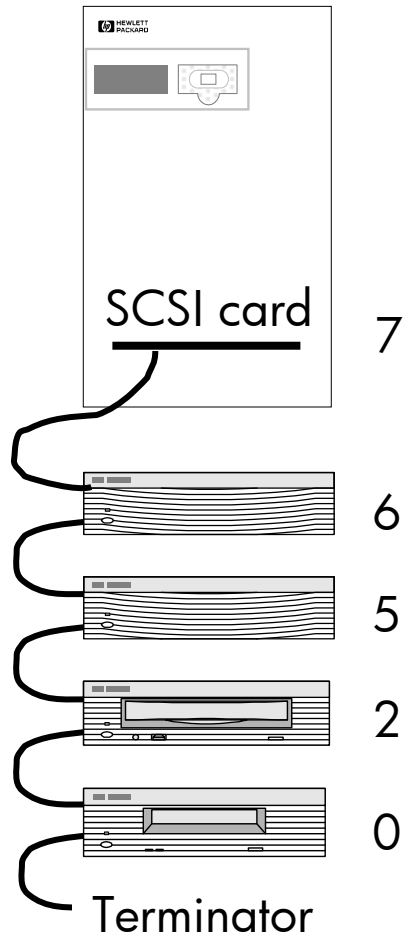
```
# ioscan -eC disk
H/W Path          Class    Description
=====
0/1/1/0.0.0      disk     HP 73.4GST373405LC
Acpi(000222F0,100)/Pci(1|0)/Scsi(Pun0,Lun0)/HD(Part1,SigF9)

0/1/1/0.1.0      disk     HP 73.4GST373405LC
Acpi(000222F0,100)/Pci(1|0)/Scsi(Pun1,Lun0)/HD(Part1,SigB8)
```

From the EFI Shell, use the `map` command to view ACPI hardware paths

```
Shell> map -r -fs -b
Device mapping table
fs0: Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun0,Lun0)/HD(Part1,SigB8D)
fs1: Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun1,Lun0)/HD(Part1,SigB8D)
```

SCSI Device Concepts and Addresses



```
# ioscanscan
H/W Path      Class      Description
=====
0/0/0/2       ext_bus    FW-SCSI Interface
0/0/0/2/0.0.0 tape       HP DDS Tape
0/0/0/2/0.2.0 disk       HP DVD ROM
0/0/0/2/0.5.0 disk       HP Disk
0/0/0/2/0.6.0 disk       HP Disk
0/0/0/2/0.7.0 sctl       Initiator
```

0/0/0/2/0.5.0

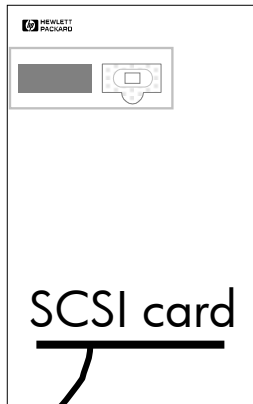


Logical Unit Number

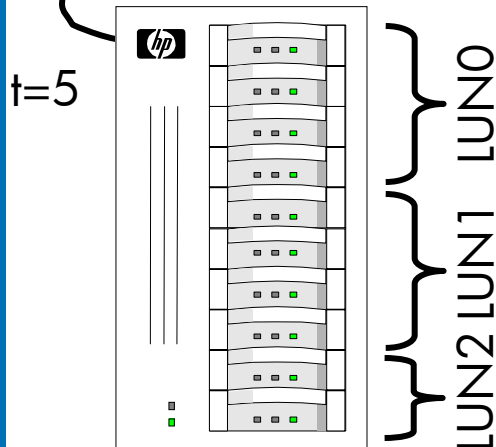
SCSI Target Address

Interface Card Address

SCSI LUN Addressing



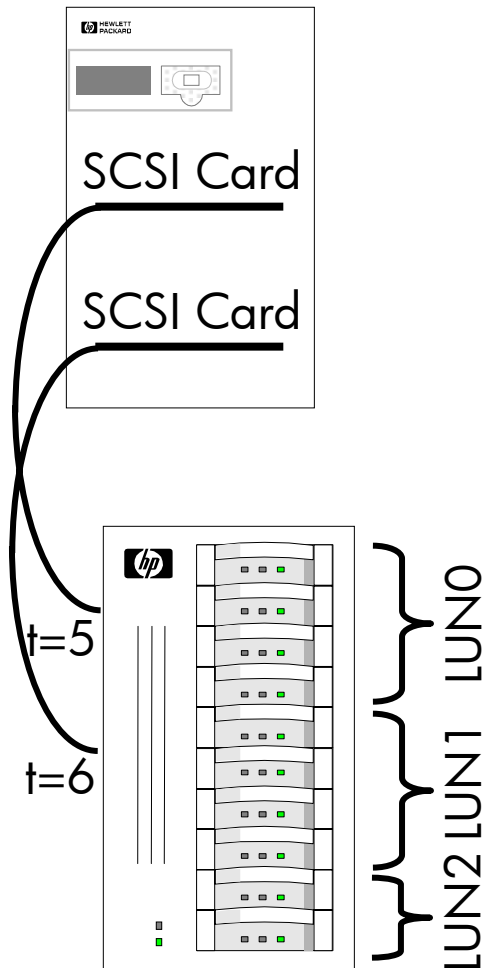
```
# ioscans -u
H/W Path  Class      Description
=====
0/0/0/2/0      ext_bus    FW-SCSI Interface
0/0/0/2/0.5.0  disk      HP Disk
0/0/0/2/0.5.1  disk      HP Disk
0/0/0/2/0.5.2  disk      HP Disk
0/0/0/2/0.7.0  sctl      Initiator
```



0/0/0/2/0.5.0



SCSI LUN Addressing with Alternate Paths

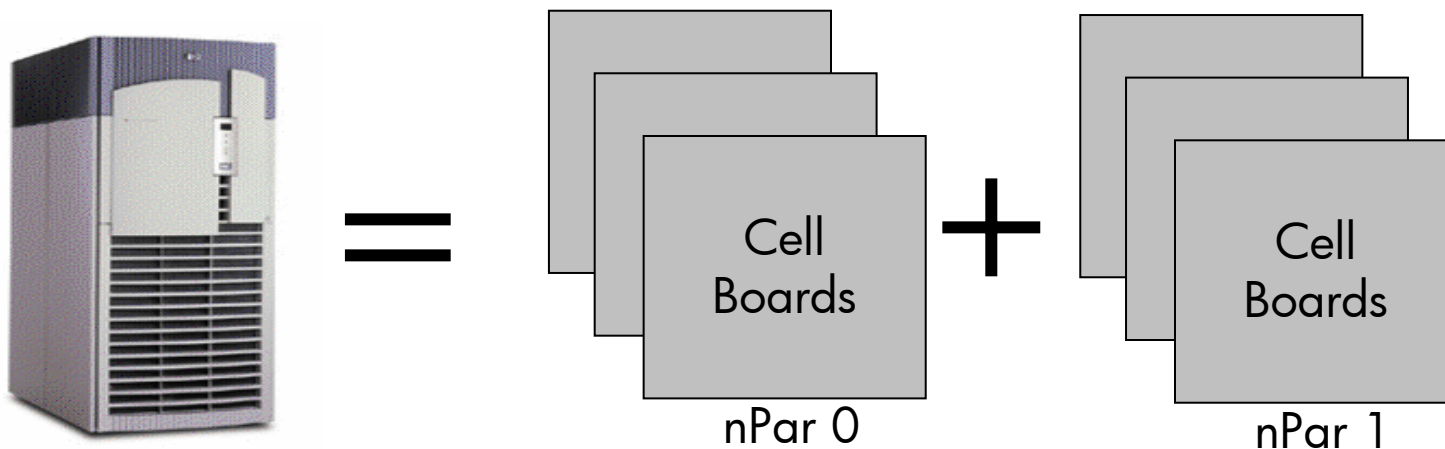


```
# ioscans -u
H/W Path  Class      Description
=====
0/0/0/2/0      ext_bus    FW-SCSI Interface
0/0/0/2/0.5.0  disk      HP Disk
0/0/0/2/0.5.1  disk      HP Disk
0/0/0/2/0.5.2  disk      HP Disk
0/0/0/3/0      ext_bus    FW-SCSI Interface
0/0/0/3/0.6.0  disk      HP Disk
0/0/0/3/0.6.1  disk      HP Disk
0/0/0/3/0.6.2  disk      HP Disk
```

Node Partition (nPars) Concepts

HP's mid- and high-end servers now support node partitions (npars)

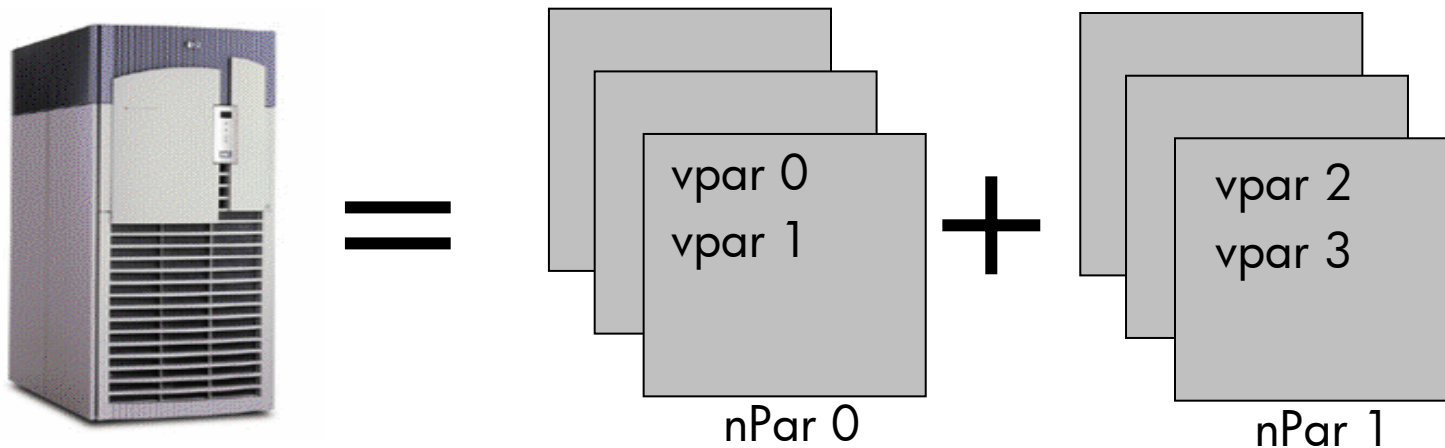
- Each nPar is assigned one or more cell boards
- Each nPar is assigned one or more I/O chassis containing up to twelve PCI slots
- Each nPar runs a separate instance of HP-UX
- Each nPar may booted/rebooted independent of other partitions
- Cell boards may be reassigned from nPar to nPar as needs change (reboot required)
- nPar partitions provide hardware, software, and OS fault isolation



Virtual Partition (vPars) Concepts

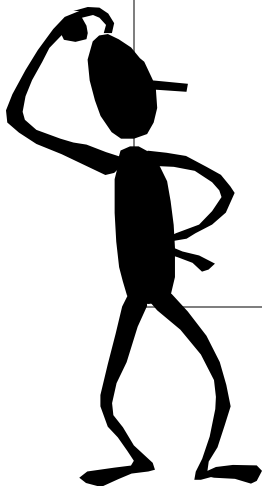
HP's high end servers now support virtual partitions (vPars), too

- Each vPar is allocated a portion of hardware resources from an nPar partition
- Each vPar runs a separate instance of HP-UX
- Each vPar may booted/rebooted independent of other partitions
- CPUs may be reassigned from vPar to vPar as needs change (no reboot required)
- vPar partitions provide software and OS fault isolation, but NOT hardware isolation



nPar and vPar Hardware Addresses

- Hardware resources allocated to one partition aren't visible to other partitions
- `ioscan`, `rad`, `olrad`, and `map` only display devices in the current partition
- The `parstatus` command reports which components are assigned to each nPar



Q: Why do I only see half of my interface cards and cell boards in my `ioscan` output?

A: `ioscan` only reports the devices available in my current partition!

Installing Interface Cards w/out OLAR

In order to add or replace an interface card on a low-end system, you must shutdown and power-off the system.

Installing a new interface card without OLAR:

- ✓ Verify card compatibility
- ✓ Verify that the required driver is configured in the kernel
- ✓ Properly shutdown and power off the system
- ✓ Install the interface card
- ✓ Power up
- ✓ Run `ioscan` to verify that the card is recognized

Installing Interface Cards w/OLAR (11i v1)

HP's mid- and high-end servers' OLAR technology make it possible to add and replace interface cards without rebooting.

Installing a new interface card with OLA/R:

- ✓ Verify card compatibility
- ✓ Verify that the required driver is configured in the kernel
- ✓ Go to the "SAM -> Peripheral Devices -> Cards" screen
- ✓ Select an empty slot from the object list
- ✓ Select "Actions -> Light Slot LED" to identify the card slot
- ✓ Select "Actions -> Add" to analyze the slot
- ✓ Insert the card as directed
- ✓ Wait for SAM to power on, bind, and configure the card
- ✓ Check `ioscan` to verify that the card is recognized

Installing Interface Cards w/ OLAR (11i v2)



HP's mid- and high-end servers' OLAR technology make it possible to add and replace interface cards without rebooting.

Installing a new interface card with OLAR:

- ✓ Verify card compatibility
- ✓ Verify that the required driver is configured in the kernel
- ✓ Run pdweb
- ✓ Select an empty slot
- ✓ Click "Turn On/Off Slot LED"
- ✓ Click "Add Card Online"
- ✓ Click "Run Critical Resource Analysis"
- ✓ Click "Power Off" to power-off the slot
- ✓ Insert the new card
- ✓ Click "Bring Card Online"
- ✓ Check `ioscan` to verify that the card is recognized

Installing New Devices

- LUNs and “Hot-pluggable” devices can be added to a system without rebooting
- “Non-hot-pluggable” devices require a system reboot

Configuring a new LUN or hot-pluggable device

- ✓ Verify device compatibility
- ✓ Verify that the required driver is configured in the kernel
- ✓ Connect or configure the device
- ✓ Run `ioscan` to add the device to the kernel iotree
- ✓ Run `insf` to create device files

Configuring a new non-hot-pluggable device

- ✓ Verify device compatibility
- ✓ Verify that the required driver is configured in the kernel
- ✓ Shutdown and power off the system
- ✓ Connect the device
- ✓ Power-on and boot the system
- ✓ Run `ioscan` to verify autoconfiguration

Lab activity







Configuring Device Files

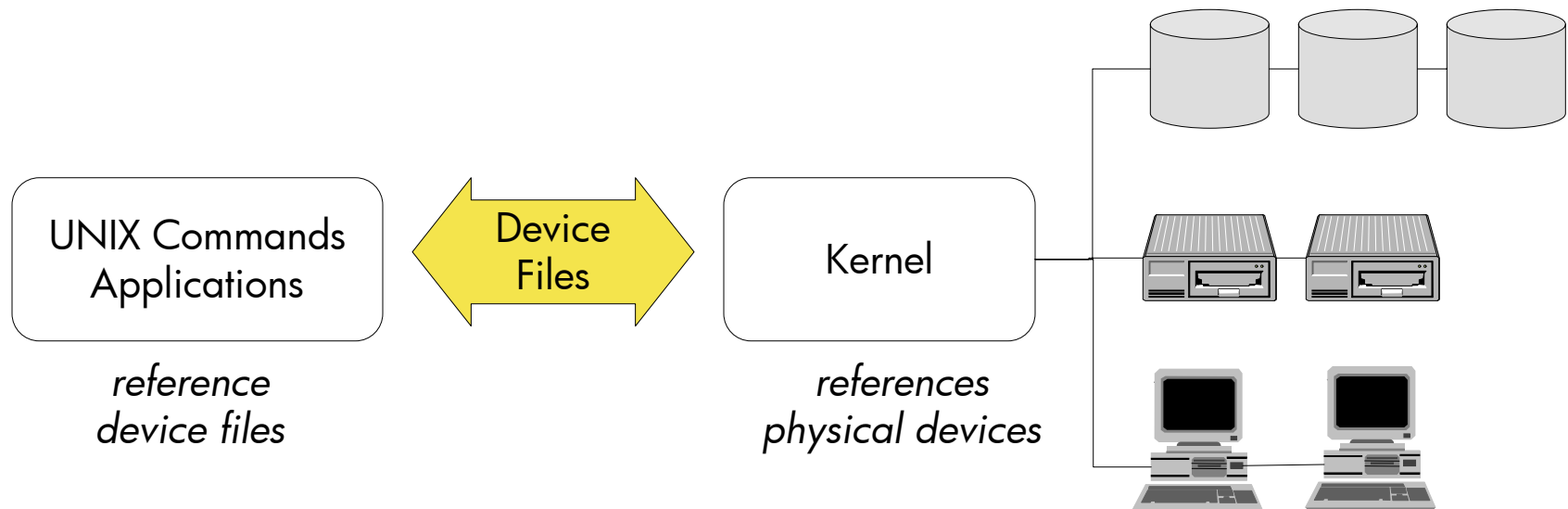
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HP-UX Device File Overview

- The HP-UX kernel accesses physical devices
- Each device is represented to applications, however, via one or more “device files”
- Applications access device files using standard file access system calls
- Result: underlying hardware complexity is hidden from applications



Listing Device Files with ll

Use the ll command to list device file major and minor numbers.

```
# ll /dev/*
brw-r----- 1 root sys 31 0x003000 Feb 10 2004 /dev/dsk/c0t3d0
brw-r----- 1 root sys 31 0x004000 Feb 10 2004 /dev/dsk/c0t4d0
crw-r----- 1 root sys 188 0x003000 Feb 10 2004 /dev/rdisk/c0t3d0
crw-r----- 1 root sys 188 0x004000 Feb 10 2004 /dev/rdisk/c0t4d0
```

Device File Type

Major#

Minor#

Device File Name

Translate major#s to device
driver names with lsdev

```
# lsdev
```

Character	Block	Driver	Class
188	31	sdisk	disk
205	-1	stape	tape

Listing Device Files with `ioscan`

Use the `ioscan` command to determine which device files are associated with which devices on your system.

```
# ioscan -fun          list all devices and device files
# ioscan -funC disk    list all disk devices and device files
# ioscan -funC tape     list all tape drives and device files
# ioscan -funH 0/0/1/0/0.0.0 list all device files for the device at 0/0/1/0/0.0.0
```

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
tape	1	0/0/1/0/0.0.0	stape	CLAIMED	DEVICE	HP C1553A
					/dev/rmt/1m	/dev/rmt/c0tld0BESTb
					/dev/rmt/1mb	/dev/rmt/c0tld0BESTn
					/dev/rmt/1mn	/dev/rmt/c0tld0BESTnb
					/dev/rmt/1mnb	/dev/rmt/c0tld0BEST

Listing Device Files with `lsdf`

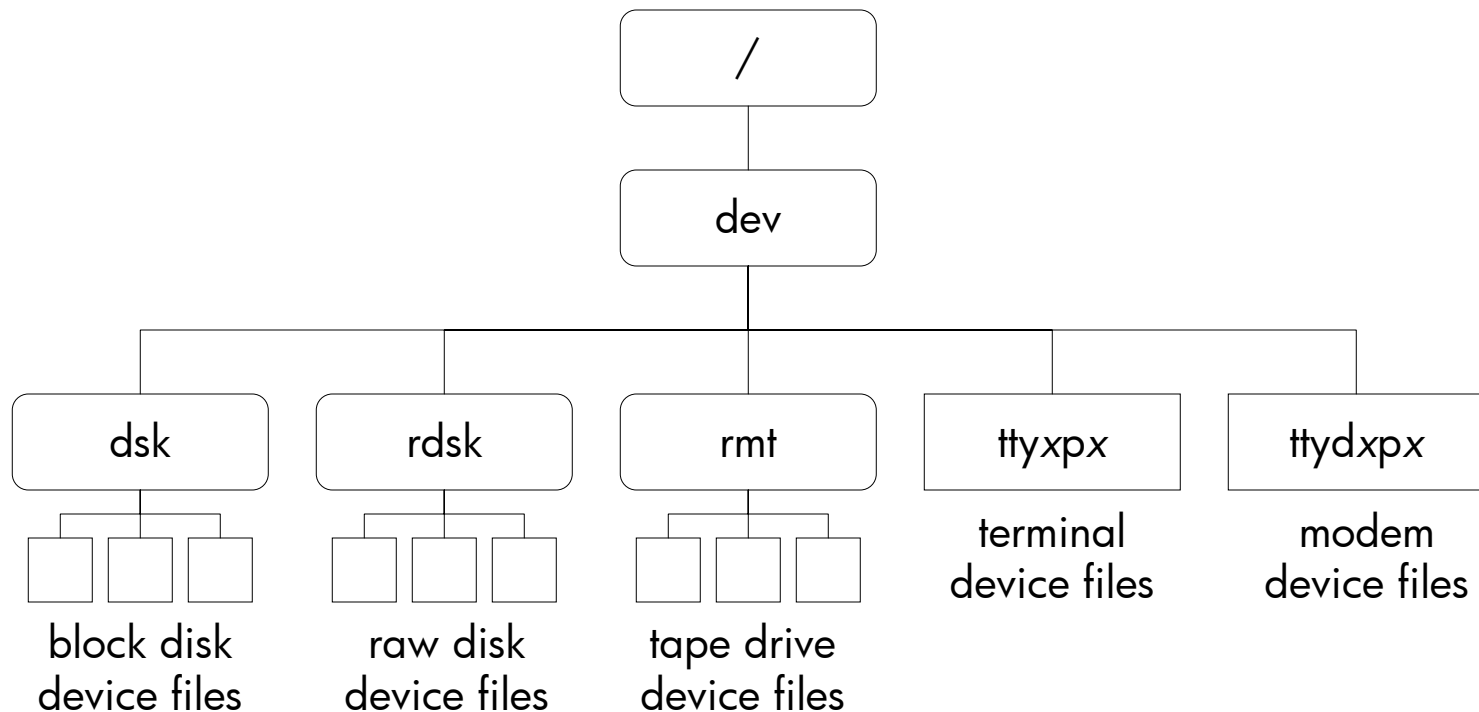
Use the `lsdf` command to display detailed information about a device file using the device file's major and minor numbers

```
# lsdf /dev/rdisk/c0t3d0
sdisk card instance 0 SCSI target 3 SCSI LUN 0
section 0 at address 0/0/1/0/0.3.0 /dev/rdisk/c0t3d0

# lsdf /dev/rmt/0mn
stape card instance 1 SCSI target 0 SCSI LUN 0
at&t no rewind best density available
at address 0/0/1/0/0.0.0 /dev/rmt/0mn
```


Device File Directories

- Device files are stored in a directory structure under `/dev`
- Disk, CDROM, and tape device files are kept in subdirectories under `/dev`
- Most other device files are kept directly under `/dev`



Device File Naming Convention

Disks, CDRoms, and tapes share a common naming convention

```
# ioscscan -f
```

Class	I	H/W Path	Description
ext_bus	0	0/0/1/0/0	Fast/Wide SCSI
disk	0	0/0/1/0/0.3.0	SEAGATE ST32171W
disk	1	0/0/1/0/0.4.0	SEAGATE ST32171W
ext_bus	1	0/0/2/0/0	Fast/Wide SCSI
disk	2	0/0/2/0/0.5.0	SEAGATE ST32171W

Card instance

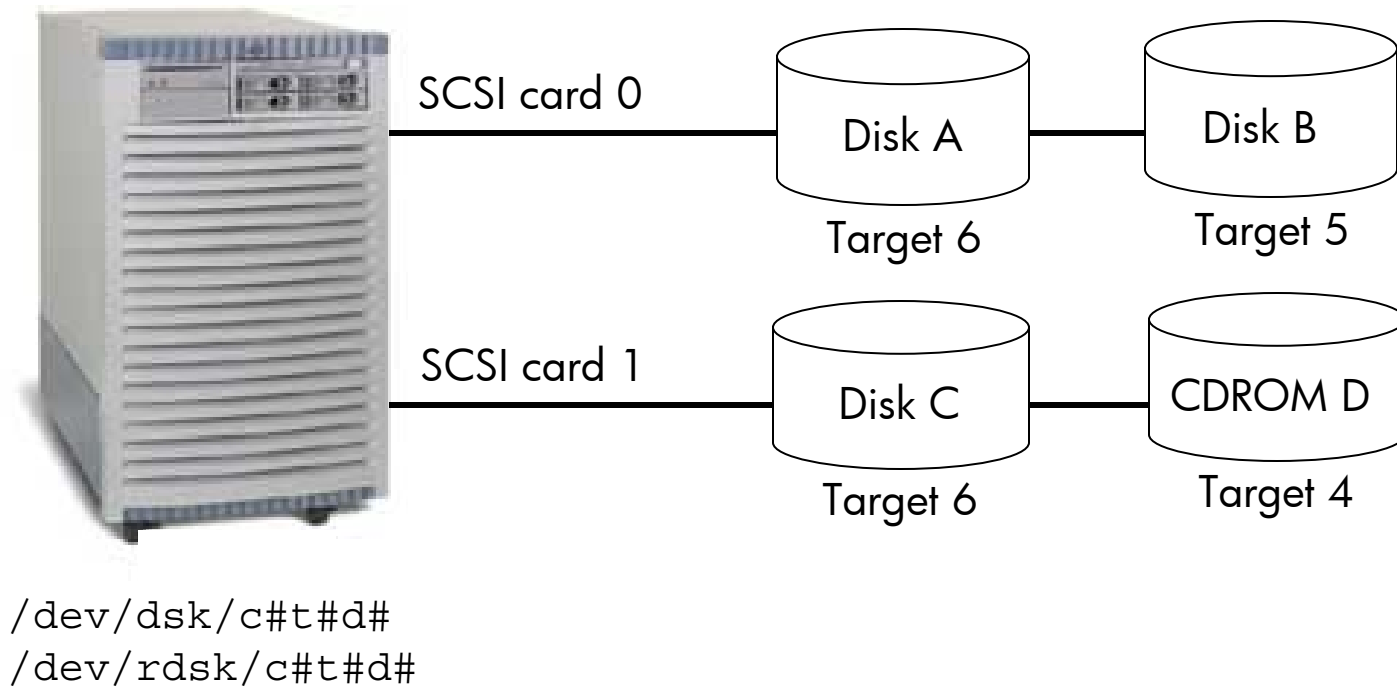
Target

LUN

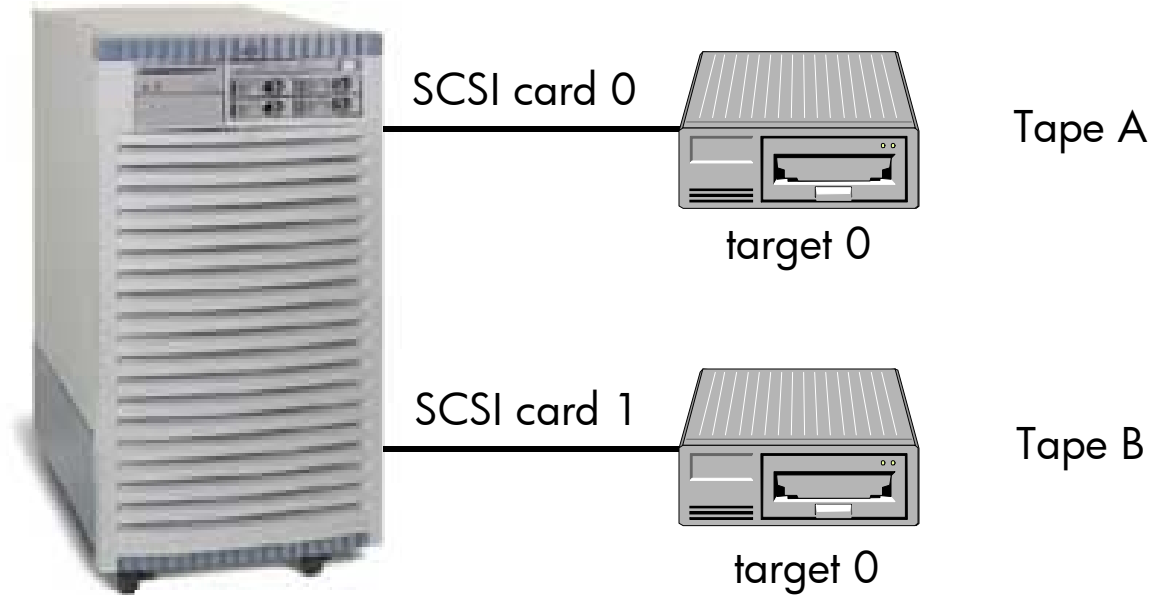
Device dependent options

/dev/dsk/c1t5d0 *options*

Disk Device File Names

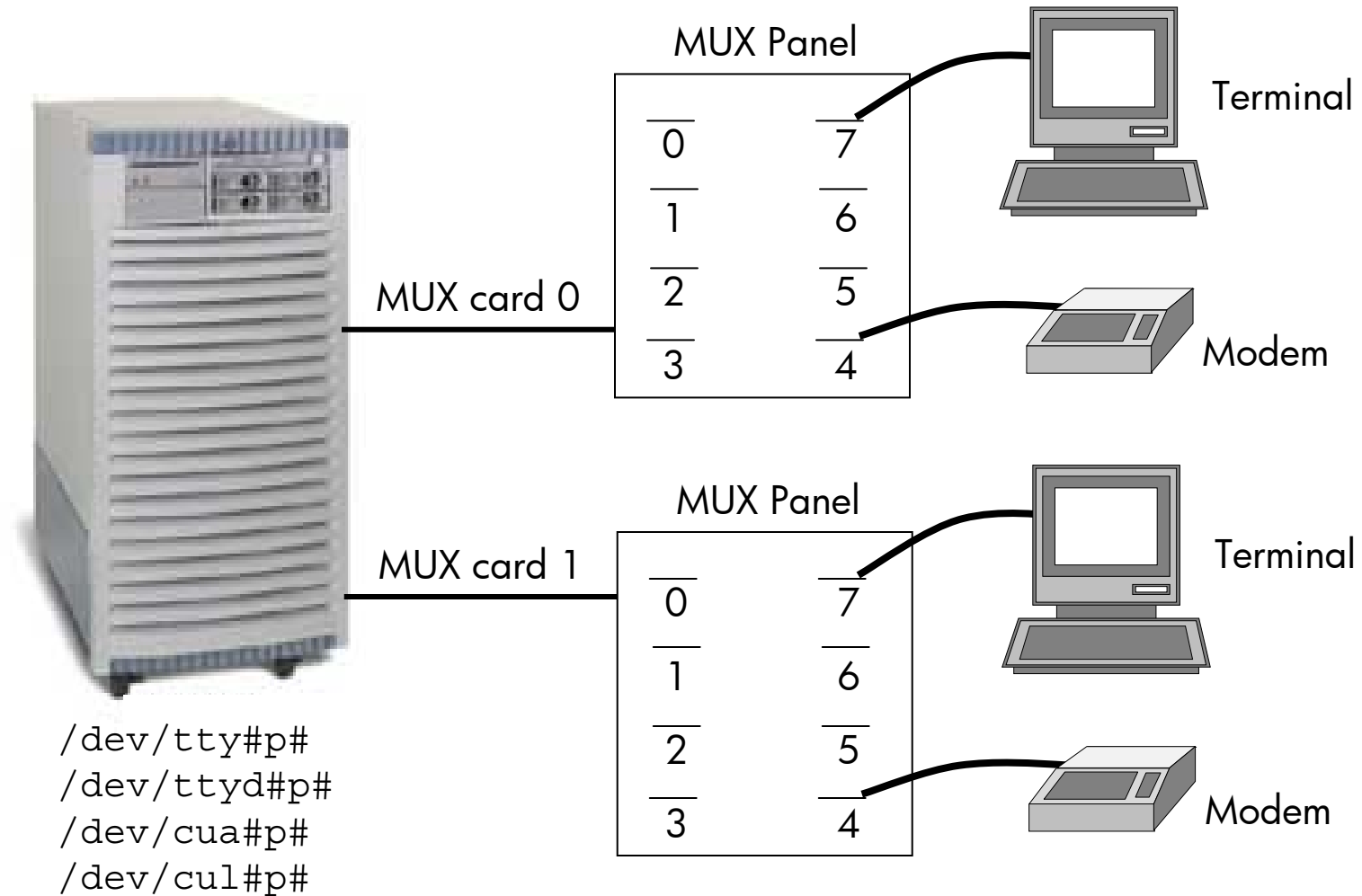


Tape Device File Names



`/dev/rmt/c#t#d# [AccessOptions]`

Terminal and Modem Device File Names



Creating Device Files

HP-UX provides several tools for creating and managing device files

- Autoconfiguration
- `insf`
- `sam`
- `mksf`
- `mknod`
- `rmsf`

Creating Device Files via Autoconfiguration

Most device files today are “autoconfigured” by the `insf` command, which uses information from the `/etc/ioconfig` file and the kernel I/O tree to create necessary device files in `/dev`.

`/etc/ioconfig`

Disk-based structure used to record instance number and driver assignments for all configured devices.

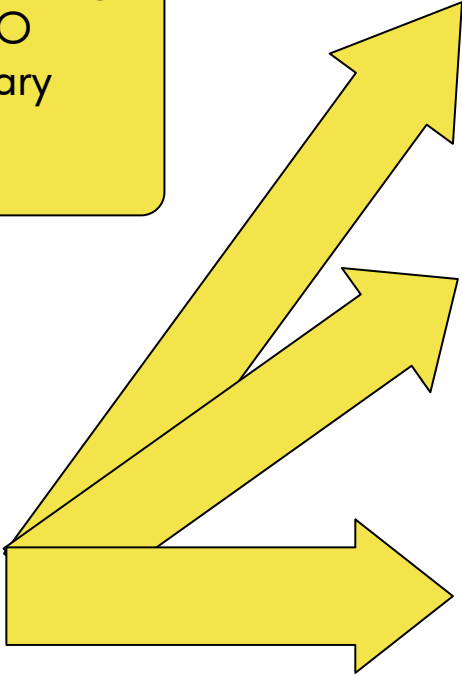
Kernel I/O Tree

Memory-based structure used to record HW paths and other information regarding all hardware on the system

`/dev/*`

Directory containing all device files

`insf`



Creating Device Files with `insf`

Although `insf` runs automatically during the boot process, it may be executed manually as well to re-create accidentally removed device files, or to create device files for newly added devices.

Create device files for any newly added auto-configurable devices:

```
# insf
```

Re-create missing device files for all existing auto-configurable devices:

```
# insf -e
```

Create or recreate device files for a specific auto-configurable device:

```
# insf -eH 0/0/1/0/0.3.0
```

See the `insf` man page for many more options and examples!

Creating Device Files with `mksf`

For tape drives and other devices that support many device dependent options, `insf` only creates device files for the most common combinations of options.

Use `mksf` to configure device files for other unusual combinations of options.

Configure a DDS2, no-rewind device file for the tape drive at `0/0/1/0/0.0.0`:

```
# mksf -H 0/0/1/0/0.0.0 -b DDS2 -n
```

Or ... specify the tape drive to configure by class/instance:

```
# mksf -C tape -I 1 -b DDS2 -n
```

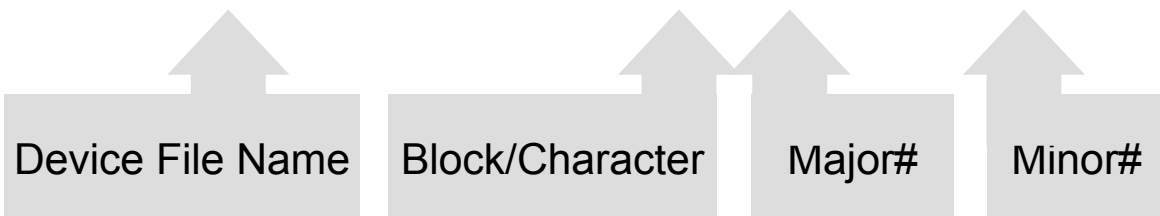
See the `mksf` and `mt` man pages for many more options and examples!

Creating Device Files with mknod

If a device isn't configurable via `insf` or `mksf`, you can manually create a device with custom major/minor numbers using `mknod`.

`mknod` must be used to create LVM volume group device files, and may be necessary to create device files for other vendors' devices.

```
# mknod /dev/vg01/group c 64 0x010000
```



Device File Name

Block/Character

Major#

Minor#

Removing Device Files with `rmsf`

When a device is no longer needed, its device files should be removed via `rmsf`.

Remove a specific device file:

```
# rmsf /dev/dsk/c0t3d0
```

Remove all the device files associated with a device:

```
# rmsf -a /dev/dsk/c0t3d0
```

Or ... specify the device's hardware path:

```
# rmsf -H 0/0/1/0/0.3.0
```

Lab activity







Configuring Disk Devices

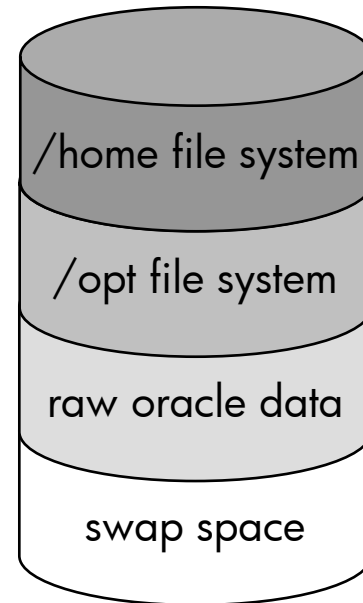
Module 7

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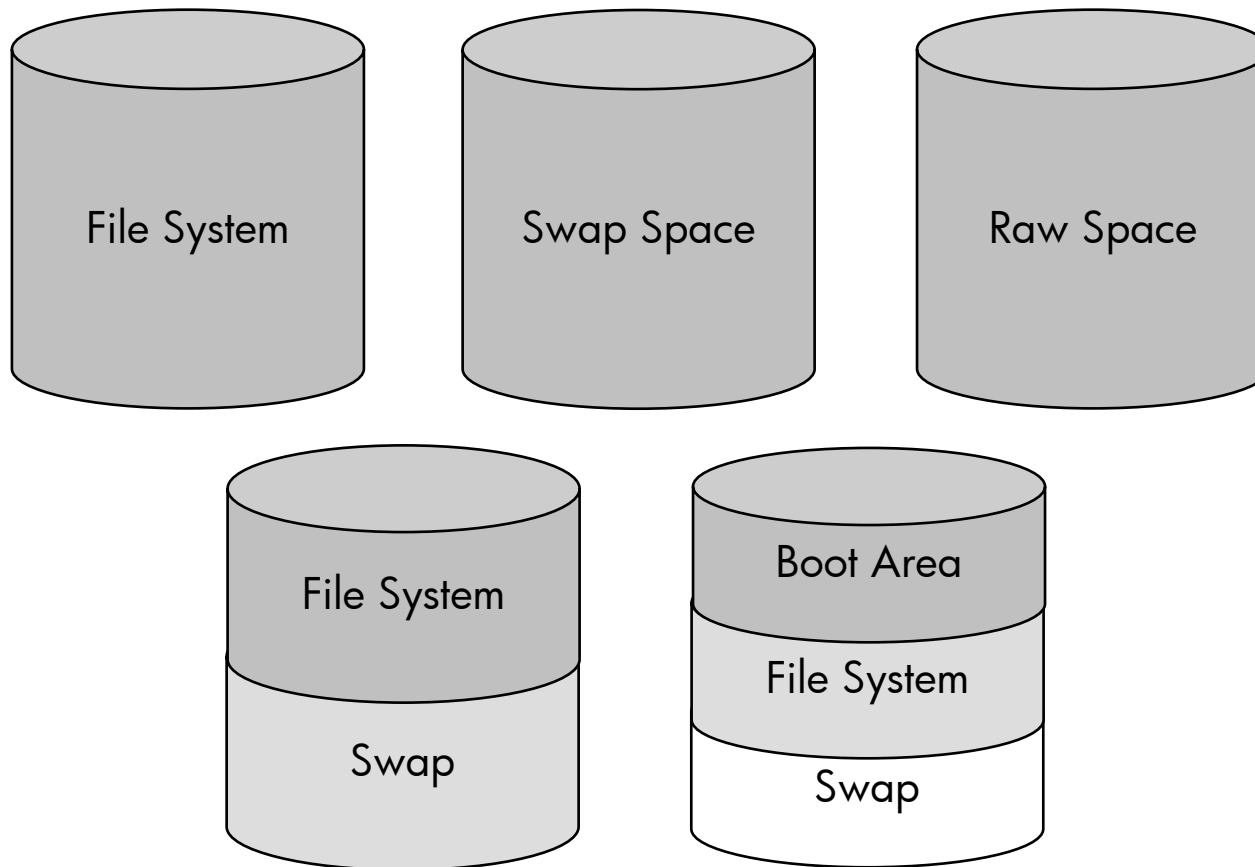
Disk Partitioning

- Each HP-UX disk can have one or more partitions.
- Each partition can be used for:
 - A file system
 - Swap space
 - Raw application data
 - A Boot area
- Partitions can be configured using:
 - The Whole Disk Approach
 - Logical Volume Manager
 - Veritas Volume Manager

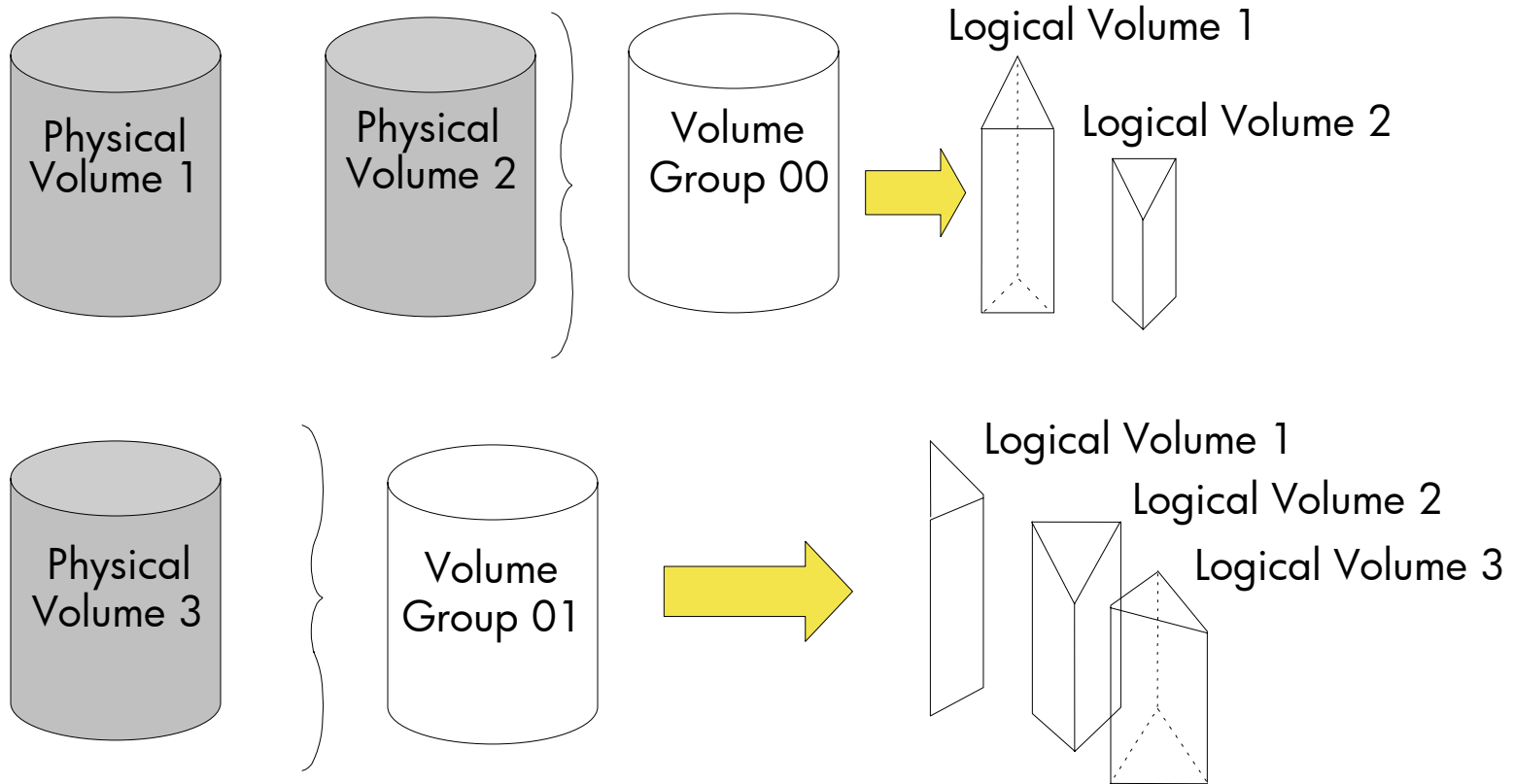


Whole Disk Partitioning

There are five ways to partition a disk using the whole disk approach.

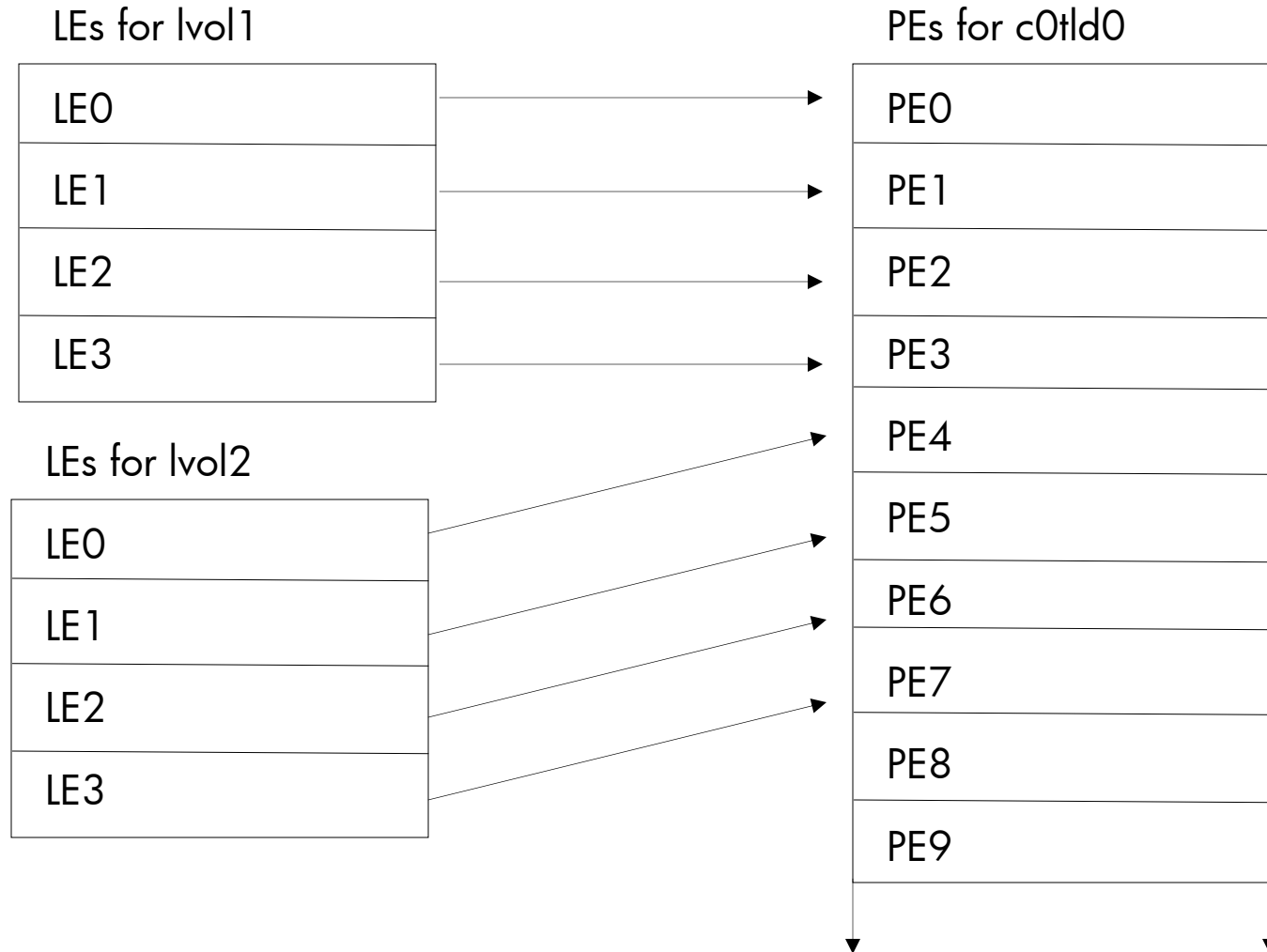


LVM Disk Partitioning

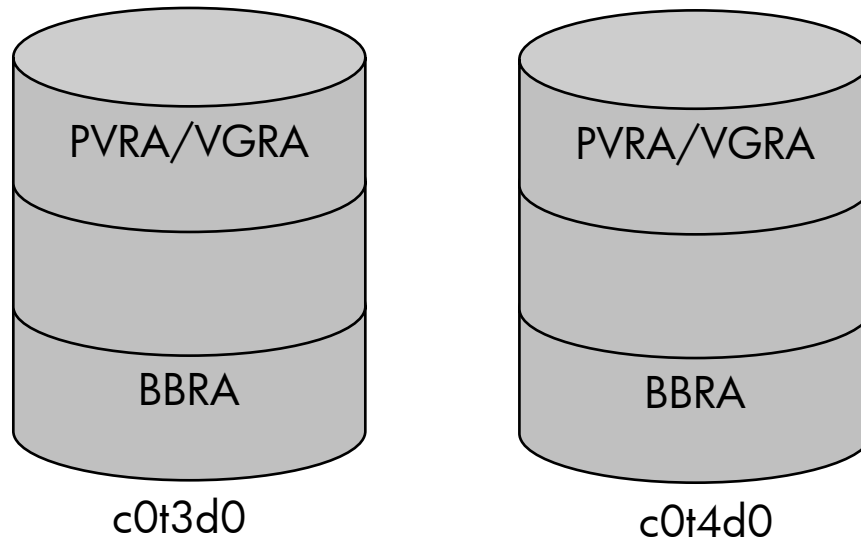




LVM Extents

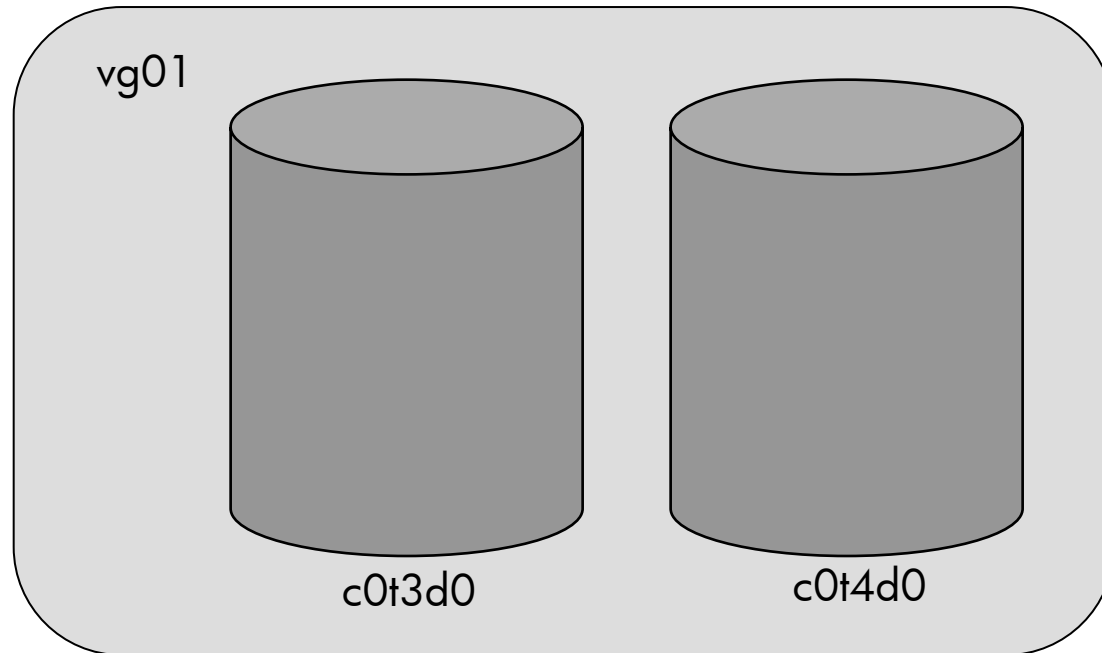


Creating Physical Volumes



```
# pvcreate /dev/rdisk/c0t3d0  
# pvcreate /dev/rdisk/c0t4d0
```

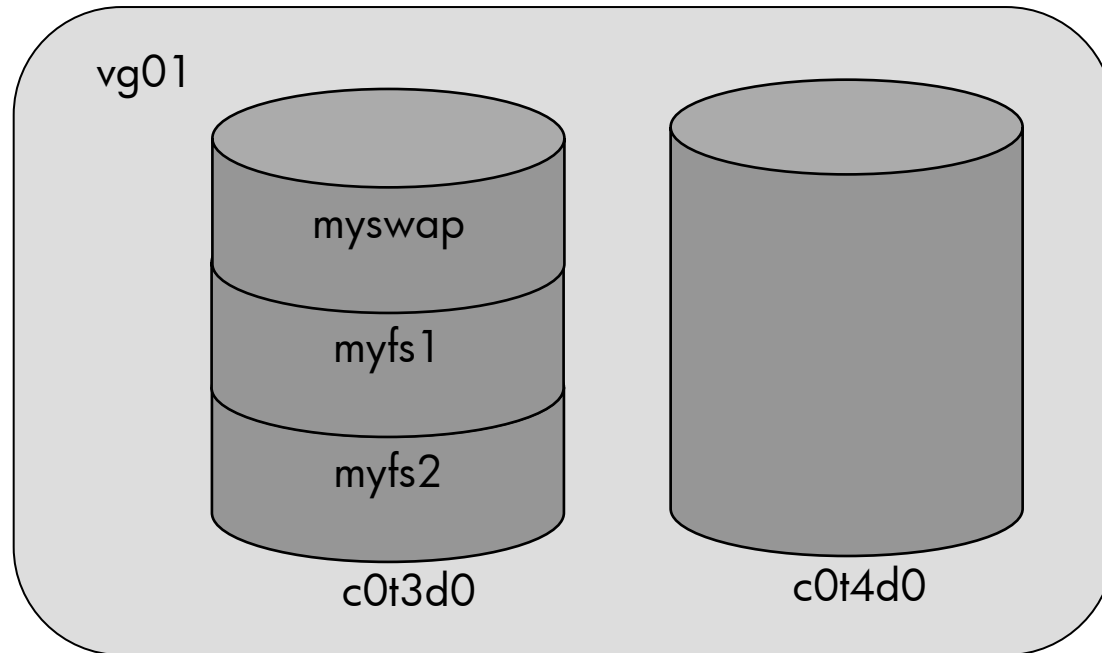
Creating Volume Groups



Create: # mkdir /dev/vg01
 # mknod /dev/vg01/group c 64 0x010000
 # vgcreate vg01 /dev/dsk/c0t3d0 /dev/dsk/c0t4d0

Check: # vdisplay -v vg01
 # pvdisplay -v /dev/dsk/c0t3d0
 # pvdisplay -v /dev/dsk/c0t4d0

Creating Logical Volumes



```
Create:  # lvcreate -L 16 -n myswap vg01
          # lvcreate -L 16 -n myfs1  vg01
          # lvcreate -L 16 -n myfs2  vg01
Check:   # vgdisplay -v vg01
          # lvdisplay -v /dev/vg01/myswap
```

Disk Space Management Tool Comparison

	Whole Disk	LVM	VxVM
HP-UX versions supported	10.x, 11.x, 11i	10.x, 11.x, 11i	11i
Boot disk support?	Yes	Yes	Yes
GUI configuration tool available?	SAM-based	SAM-based	Java-based
Available on other platforms?	Similar	Similar	Yes
Can partitions span disks?	No	Yes	Yes
Online resizing supported?	No	Yes	Yes
Online backups supported?	No	Yes*	Yes*
Striping (RAID 0) supported?	No	Yes	Yes
Mirroring (RAID 1) supported?	No	Yes*	Yes*
Mirrored stripes (RAID 0/1) supported?	No	Yes*	Yes*
RAID 5 supported?	No	No	Yes*
Dynamic relay layout support?	No	No	Yes*
Dynamic multipathing support?	No	Partial	Full*

* Features indicated by an asterisk require an extra license

Lab activity







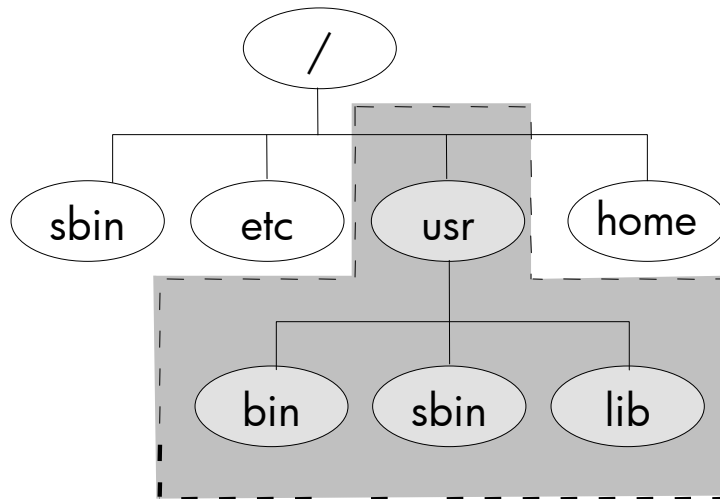
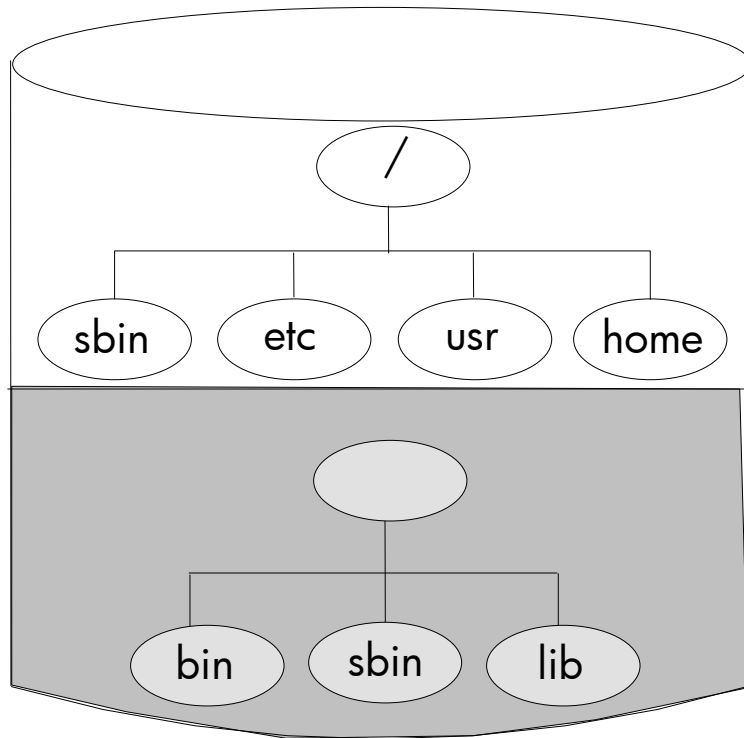
File System Concepts

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What Is a File System?



File System Types

- HP-UX supports several file system types:
 - HFS High Performance File System
 - JFS Journaled File System
 - NFS Network File System
 - CDFS CD-ROM File System
- HP-UX file commands work on all HP-UX file system types.

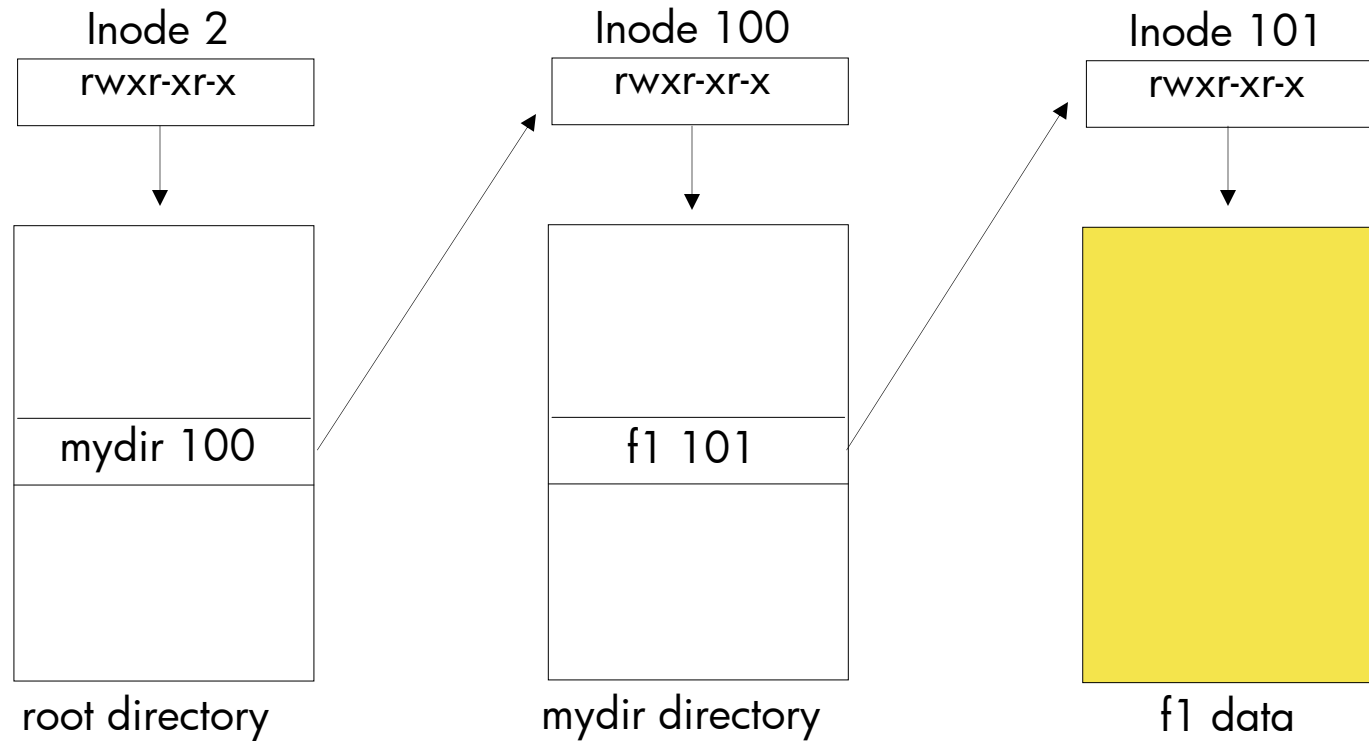
What's in a File System?

User data = actual data contained in files

Metadata = file system structural information

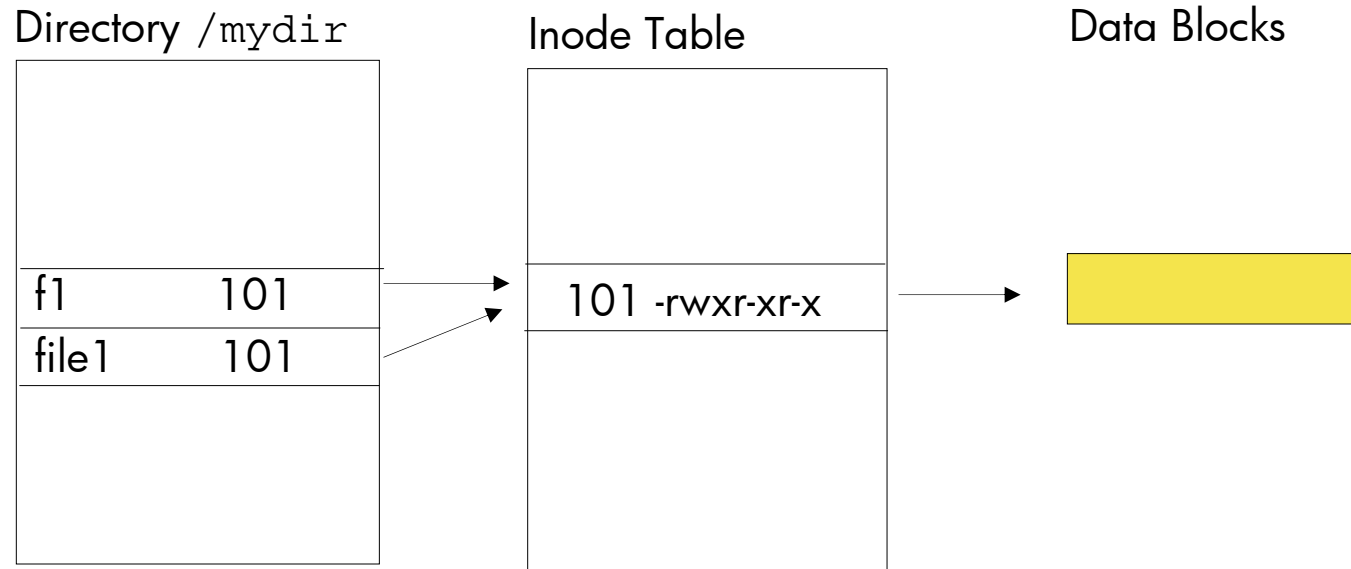
- Superblock
- Inodes
- Directories

Accessing a File System



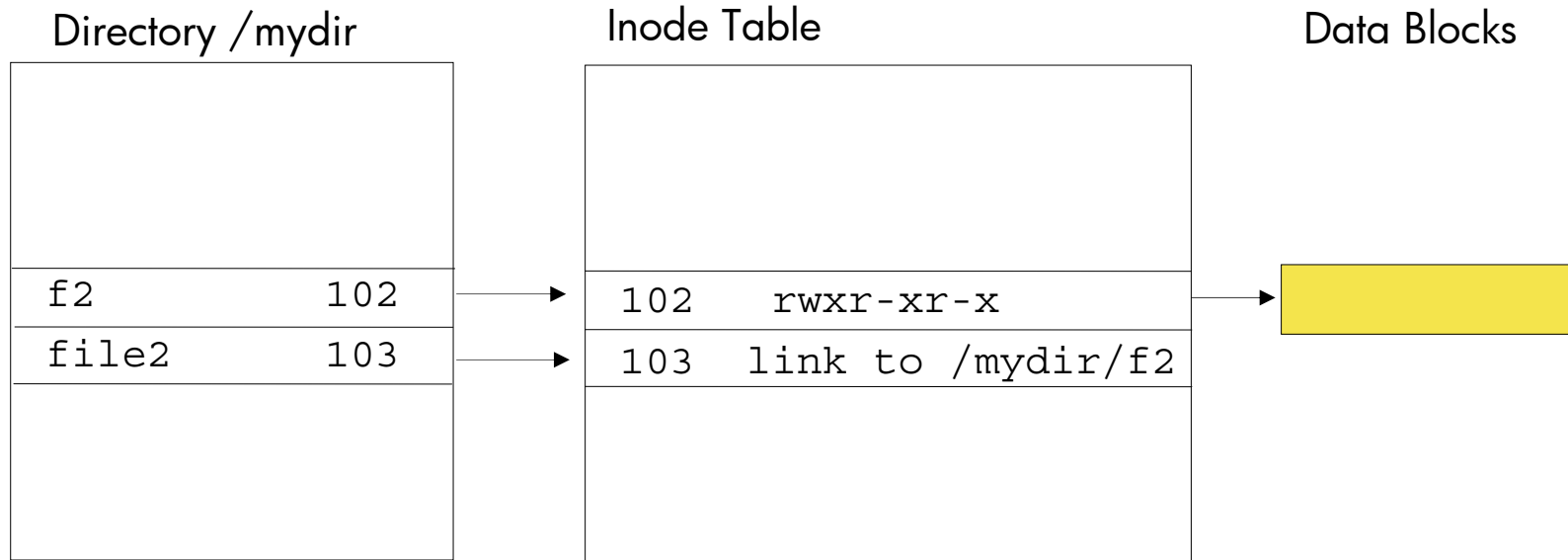
```
# cat /mydir/f1
```

HP-UX Hard Links



```
# ln /mydir/f1 /mydir/file1
```

HP-UX Symbolic Links



```
# ln -s /mydir/f2 /mydir/file2
```


HFS Structural Overview

Primary superblock

- File system type and size
- Free resource summary
- Pointers to everything else!

Cylinder group 0

- Superblock backup
- Free resource summary and maps
- Inode table
 - 101 `rw-r--r--` user1 pointers
 - 102 `r--r--r--` user2 pointers
 - 103 `r-xr-xr-x` user3 pointers
- Data blocks for files in cylinder group 0

Additional cylinder groups!

JFS Structural Overview

Primary superblock

- File system type and size
- Free resource summary
- Pointers to everything else!

Intent log

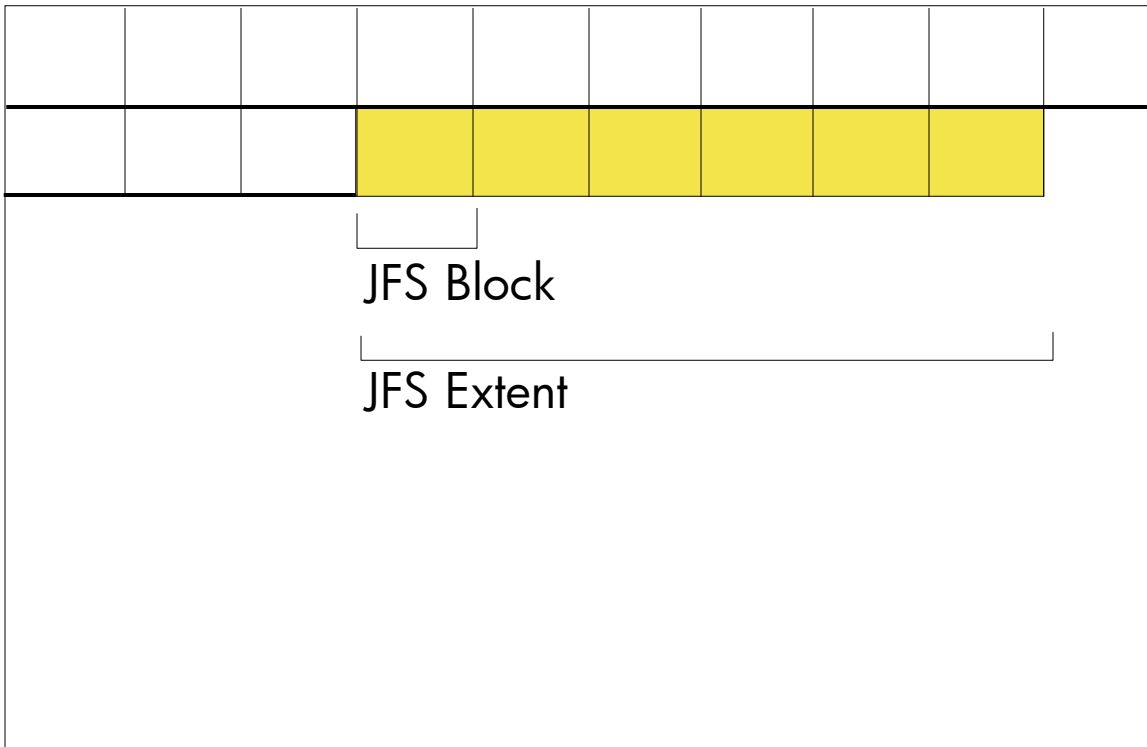
- Log of "intent" to change file system metadata structures

Allocation unit 0

- Superblock backup
- Free resource summary and maps
- Inode table
 - 101 `rw-r--r--` user1 pointers
 - 102 `r--r--r--` user2 pointers
 - 103 `r-xr-xr-x` user3 pointers
- Data blocks for files in allocation unit 0

Additional allocation units!

JFS Blocks and Extents



File System Comparison

	HFS**	JFS 3.0	JFS 3.3	JFS 3.5
Max File / File System Size?	128GB	1 TB	1 TB	16 TB
May be used for /stand?	Yes	No	No	Yes
Access Control Lists Available?	Yes	No	Yes	Yes
File System Tuning Available?	Yes	No	Yes	Yes
Fast File System Recovery?	No	Yes	Yes	Yes
Online Resizing Available?	No	Yes*	Yes*	Yes*
Defrag Utility Available?	No	Yes*	Yes*	Yes*
Online Backup Available?	No	Yes*	Yes*	Yes*

* Requires the JFS Online product

** HFS has been deprecated and may not be supported in future releases



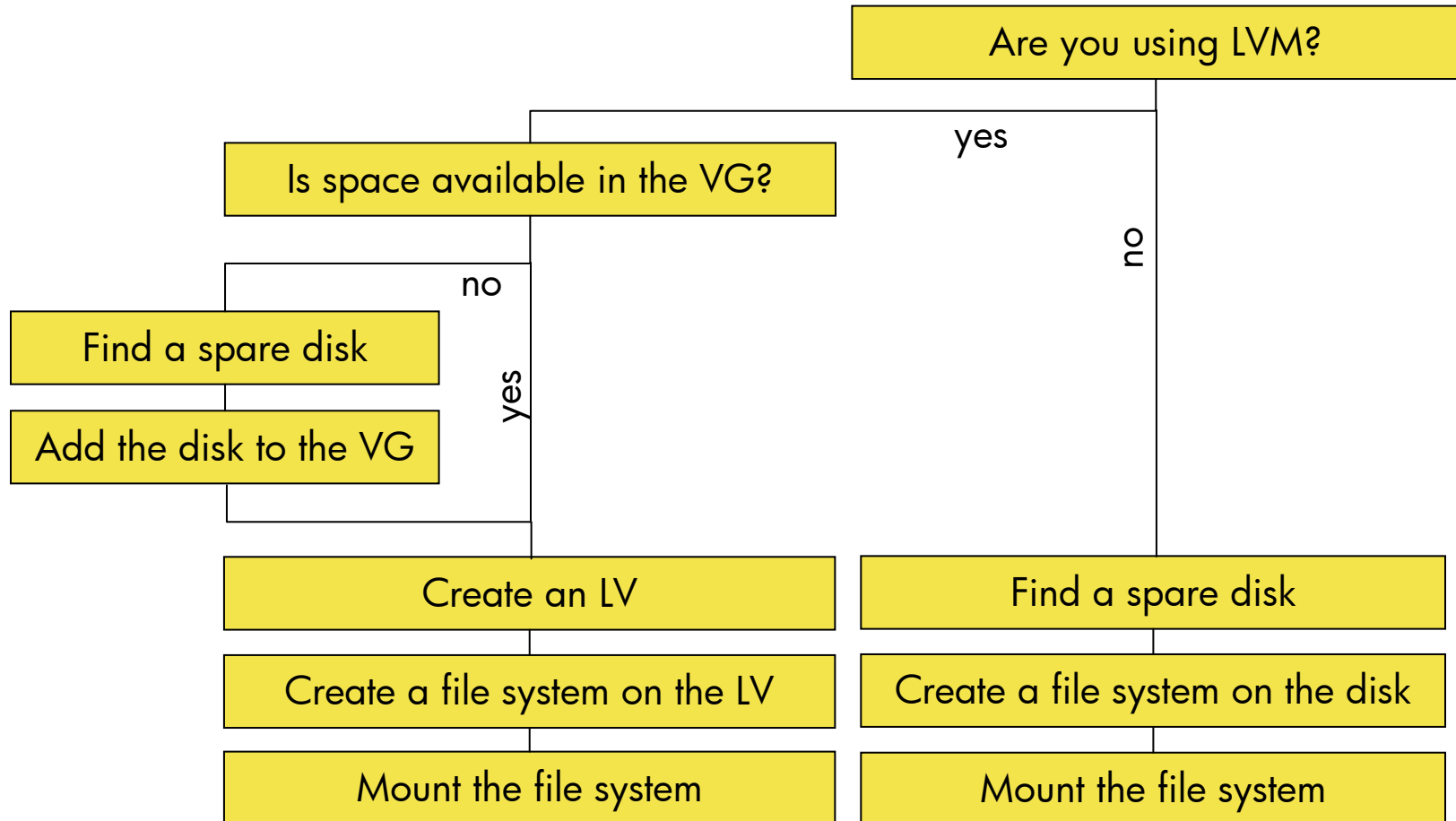


Creating and Mounting File Systems

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File System Creation Overview

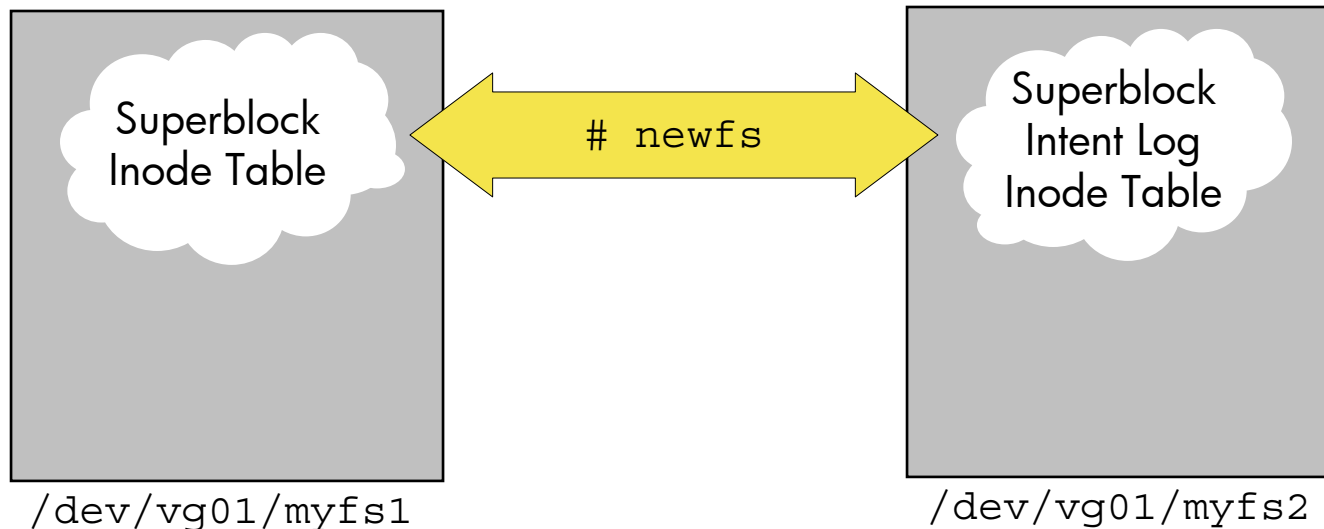


File System Creation Commands

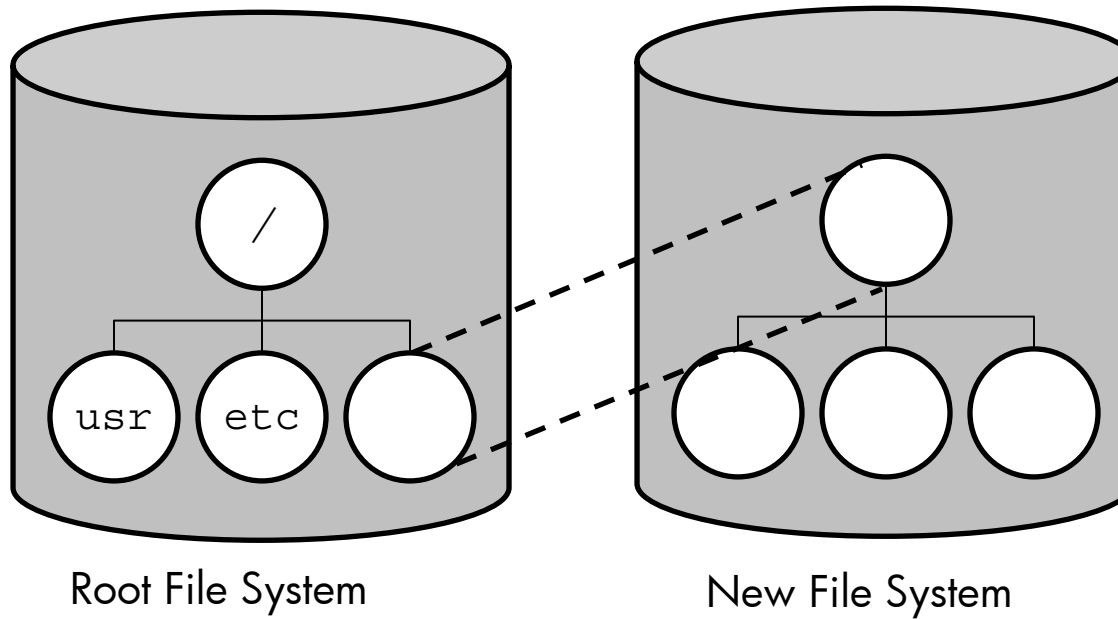
1. Create the new file system
`# newfs -F hfs /dev/vg01/rmyfs1`
2. Create a mount point directory for the file system
`# mkdir /myfs1`
3. Mount the new file system
`# mount /dev/vg01/myfs1 /myfs1`
4. Add the file system to the `/etc/fstab` file
`# vi /etc/fstab`

Creating the File System

```
# newfs -F hfs /dev/vg01/rmyfs1
# newfs -F hfs -o largefiles /dev/vg01/rmyfs1
# newfs -F vxfs /dev/vg01/rmyfs2
# newfs -F vxfs -o largefiles /dev/vg01/rmyfs2
```

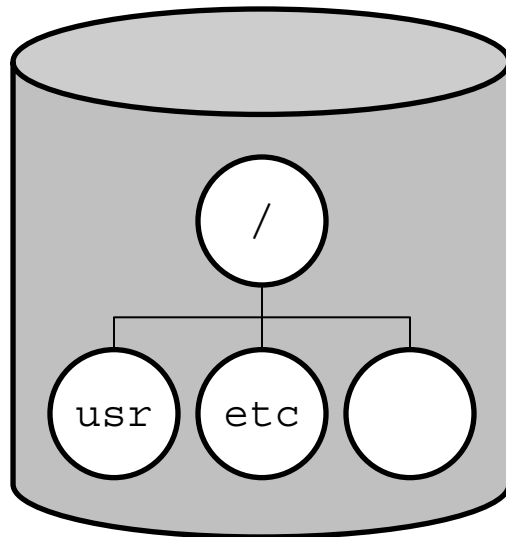


Mounting the File System

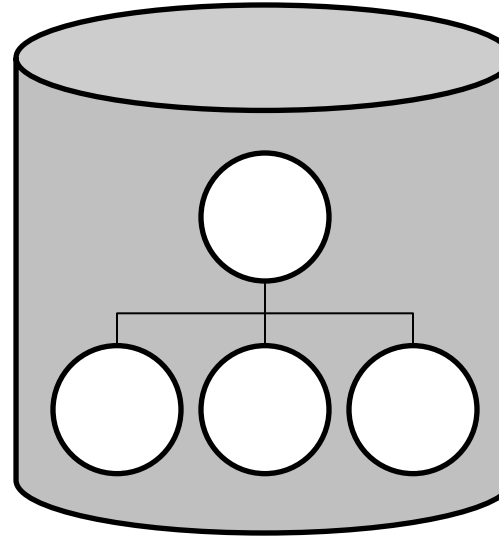


```
# mkdir /myfs1
# mount /dev/vg01/myfs1 /myfs1
# mount -v
```

Unmounting the File System



Root File System



New File System

```
# umount /myfs1
# mount -v
or
# /sbin/fs/vxfs/vxumount -o force /myfs1
# mount -v
```

Automatically Mounting File Systems

```
# vi /etc/fstab
```

/dev/vg00/lvol1	/stand	hfs	defaults	0	1
/dev/vg00/lvol3	/	vxfs	defaults	0	1
/dev/vg01/myfs1	/myfs1	hfs	defaults	0	2
/dev/vg01/myfs2	/myfs2	vxfs	defaults	0	2

Device File Name

Mount Point

FS Type

Mount
Options

Backup
Frequency

fsck
Order

```
# mount /myfs1
```

```
# mount -a
```

```
# mountall
```

mount /myfs1

mount all file systems

check, then mount all file systems

Mounting CDFS File Systems

CDFS may be used to mount High Sierra, ISO 9600, and ISO 9660/Rock Ridge CDROMs

1. Determine the device file name of your CDROM drive.
`ioscan -funC disk`
2. Create a mount point.
`mkdir /cdrom`
3. Mount the file system.
`mount -o ro,cdcase,rr /dev/dsk/c0t1d0 /cdrom`
4. Add the file system to `/etc/fstab`

```
/dev/vg01/myfs1 /myfs1 hfs defaults 0 2
/dev/vg01/myfs2 /myfs2 vxfs defaults 0 2
/dev/dsk/c1t3d0 /cdrom cdfs ro,cdcase,rr,noauto 0 0
```

Mounting LOFS File Systems

HP's Loopback File System (LOFS) allows the same file hierarchy to appear in multiple places, without creating symbolic links.

1. Create amount point
mkdir /opt/data
2. Mount the file system
mount -F lofs /data /opt/data
3. Add the file system to /etc/fstab

/dev/vg01/myfs1	/myfs1	hfs	defaults	0	2
/dev/vg01/myfs2	/myfs2	vxfs	defaults	0	2
/data	/opt/data	lofs	defaults	0	0

Lab activity







Maintaining File Systems

Module 10

H3064S F.00



Monitoring File System Free Space

Monitor available file system space with `bdf`:

```
# bdf
Filesystem      kbytes    used   avail   %used  Mounted on
/dev/vg00/lvol5 294912    261523 31352    89%    /opt
/dev/vg00/lvol4 24576     19333   4978    80%    /home
/dev/vg01/myfs1 16384      1174   14331     8%    /myfs1
/dev/vg01/myfs2 15893     14006    297    98%    /myfs2
```

Determine space used by directory subtrees with `du`:

```
# du -sk /myfs2/*
844      /myfs2/data1
1327     /myfs2/data2
4        /myfs2/lost+found
```

Reclaiming Wasted File System Space

Trim log files that grow without bound:

```
# > /var/adm/wtmp          Or on 11i v2:      # > /var/adm/wtmps  
# > /var/adm/btmp          # > /var/adm/btmps
```

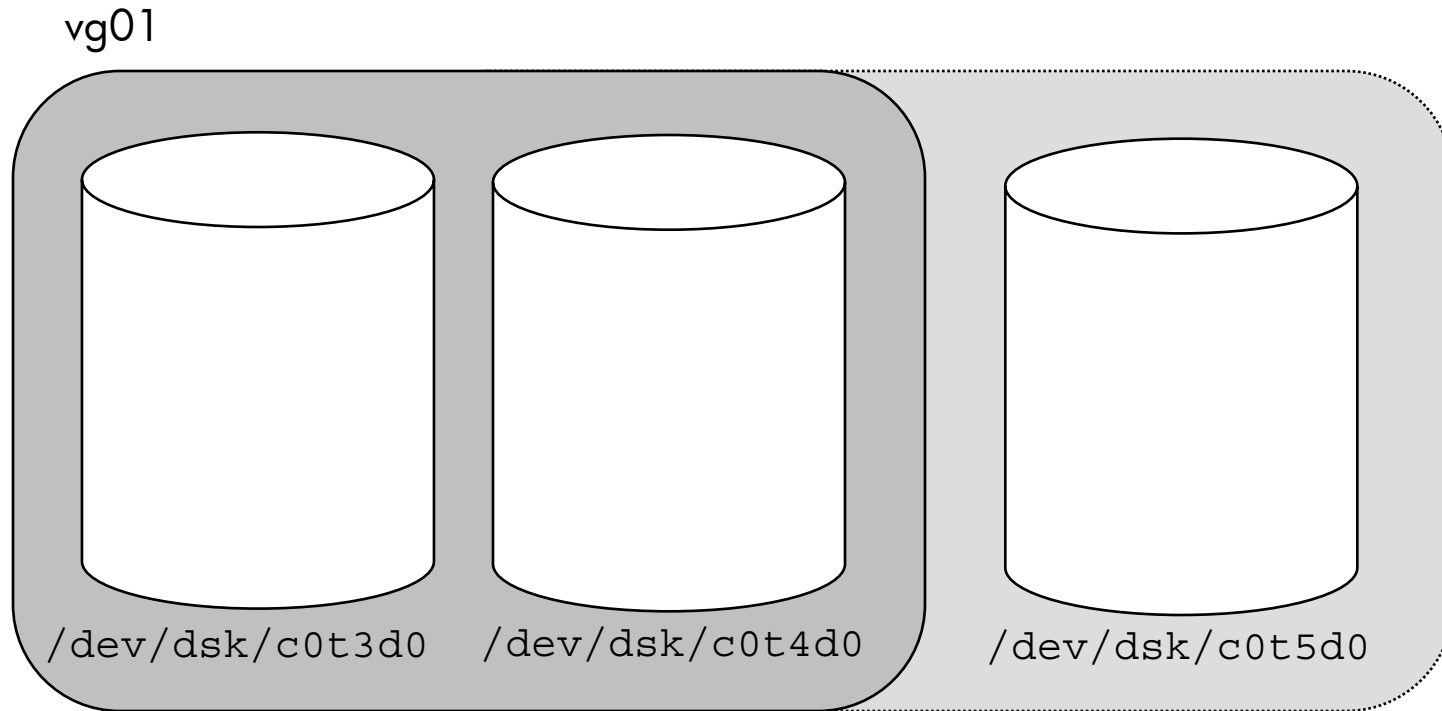
Purge core files:

```
# find / -name core -exec rm -i {} \;
```

Purge large, old files:

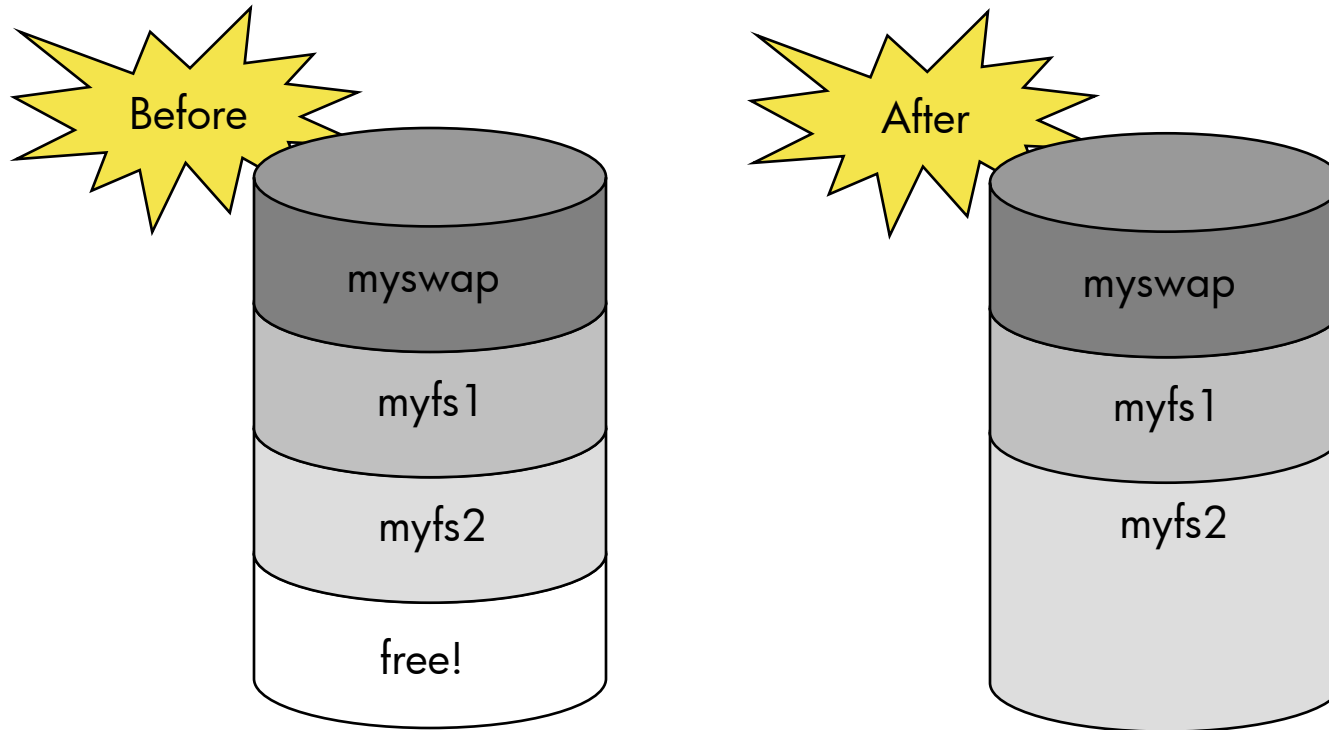
```
# find / -atime +30 -size +1000c -exec ll -ud {} \;
```

Extending a Volume Group



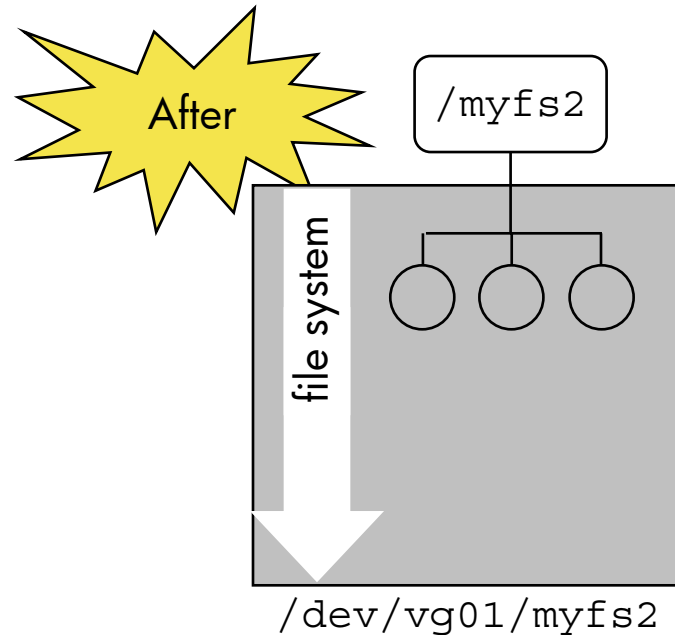
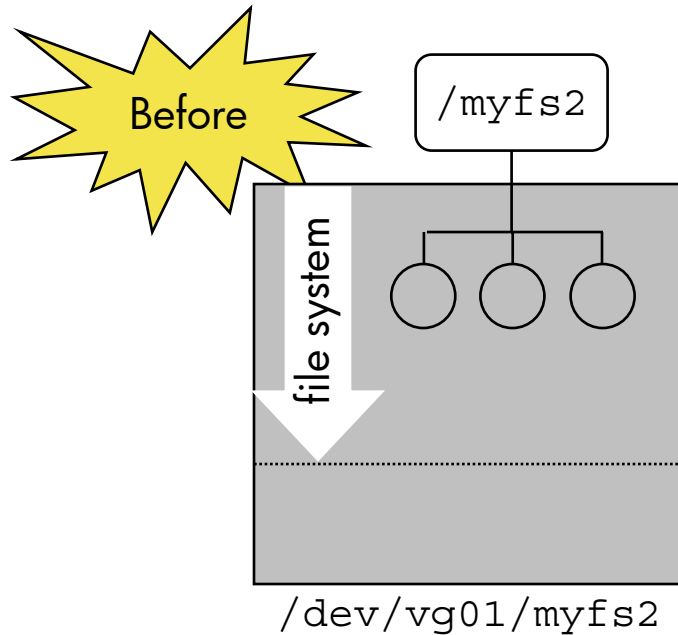
```
# pvcreate -f /dev/rdisk/c0t5d0  
# vgextend vg01 /dev/dsk/c0t5d0  
# vdisplay -v vg01
```

Extending a Logical Volume



```
# lvextend -L 32 /dev/vg01/myfs2 /dev/dsk/c0t3d0  
# lvdisplay -v /dev/vg01/myfs2
```

Extending a File System

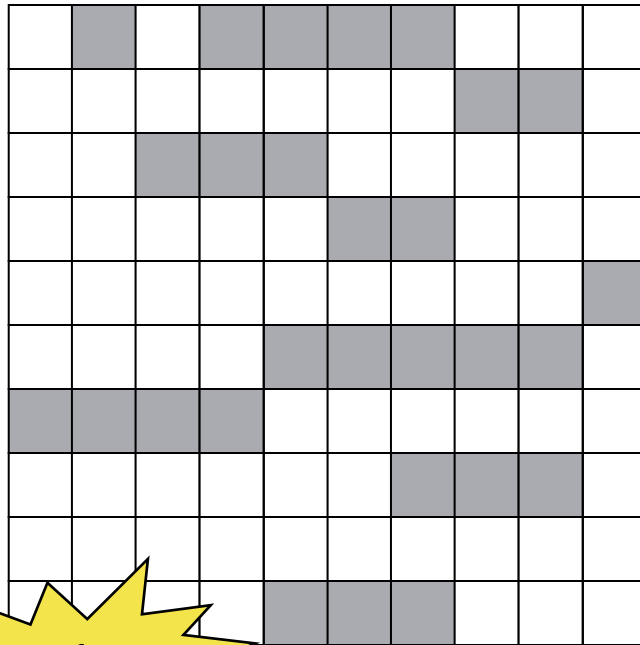


```
# umount /myfs2
# extendfs -F vxfs /dev/vg01/rmyfs2
# mount /myfs2
# bdf /myfs2
```

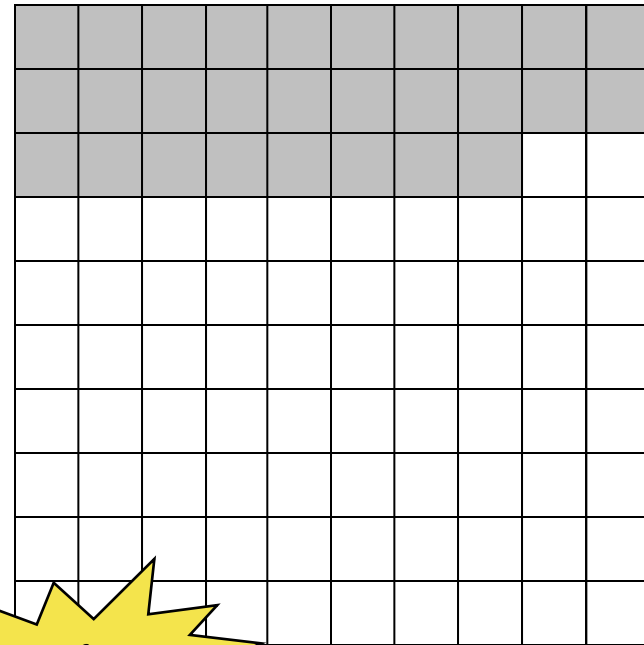
or

```
# fsadm -F vxfs -b 32M /myfs2
# bdf /myfs2
```

Defragmenting a File System



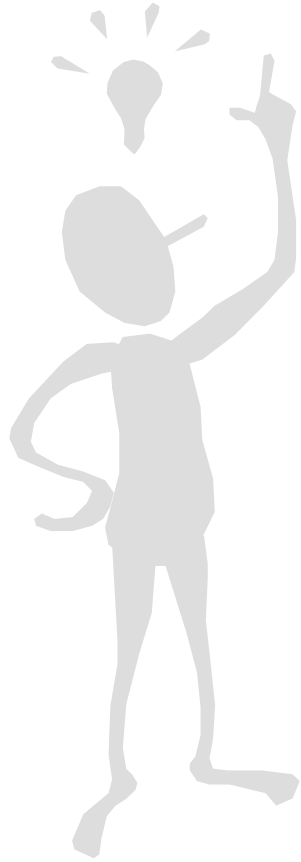
Before



After

```
# fsadm -F vxfs -deDE -t 600 /myfs2
```

Repairing a Damaged File System



`fsck` automatically corrects file system corruption after a system crash!

Example: Manually running `fsck` on an HFS file system:

```
# mount -v
# umount /myfs1
# fsck -F hfs /dev/vg01/rmyfs1
# mount /myfs1
```

Example: Manually running an intent log “replay” on a VxFS file system:

```
# mount -v
# umount /myfs2
# fsck -F vxfs /dev/vg01/rmyfs2
# mount /myfs2
```


Lab activity







File System Backup

Module 11

H3064S F.00



Why Back Up?

How Much Data Can You Afford To Lose?

Data is sometimes lost by:

- File system corruption
- Accidental removal of files
- Hardware failures
- System crash

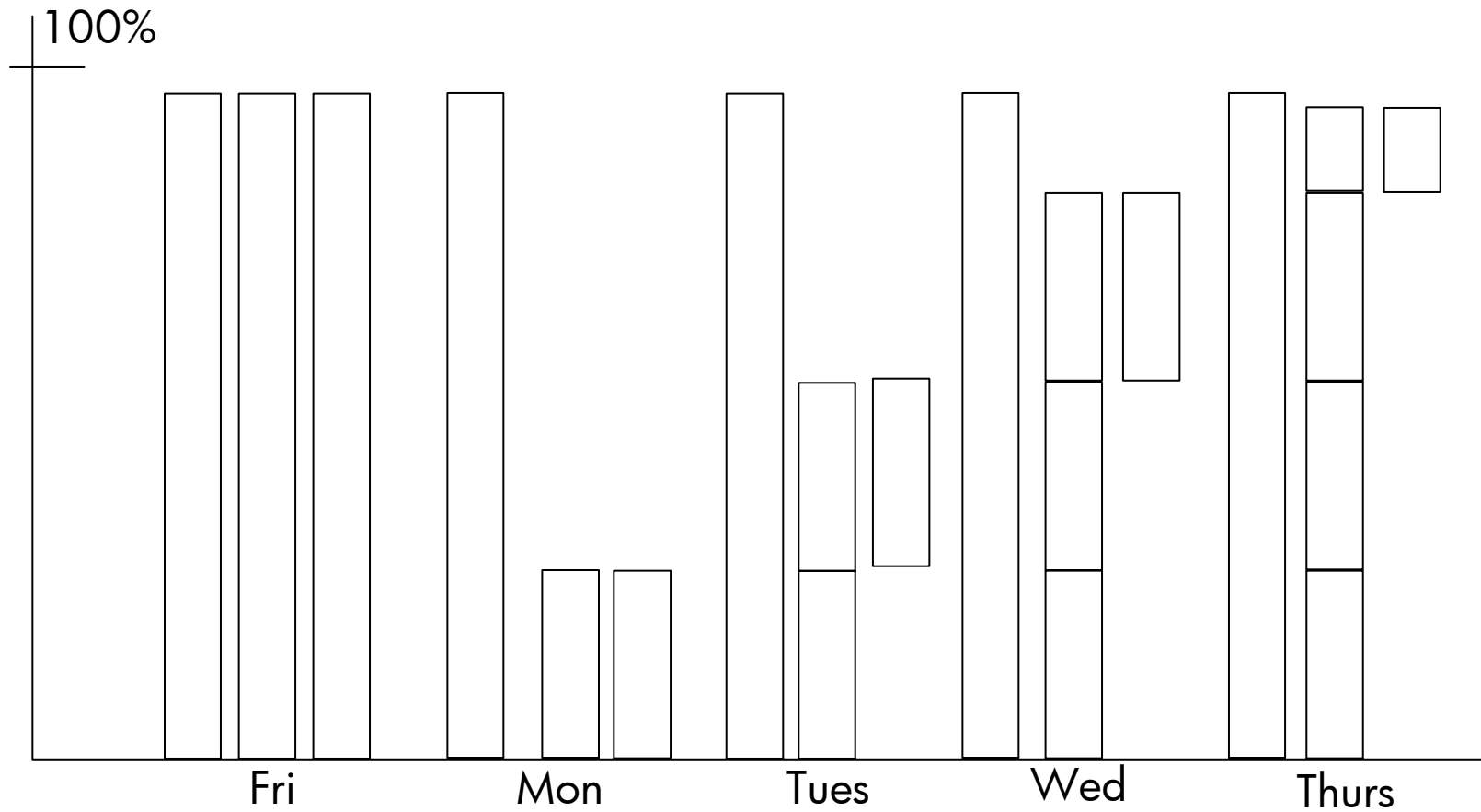
Regular backups:

- Minimize data loss
- Keep users happy
- Provide stability and order

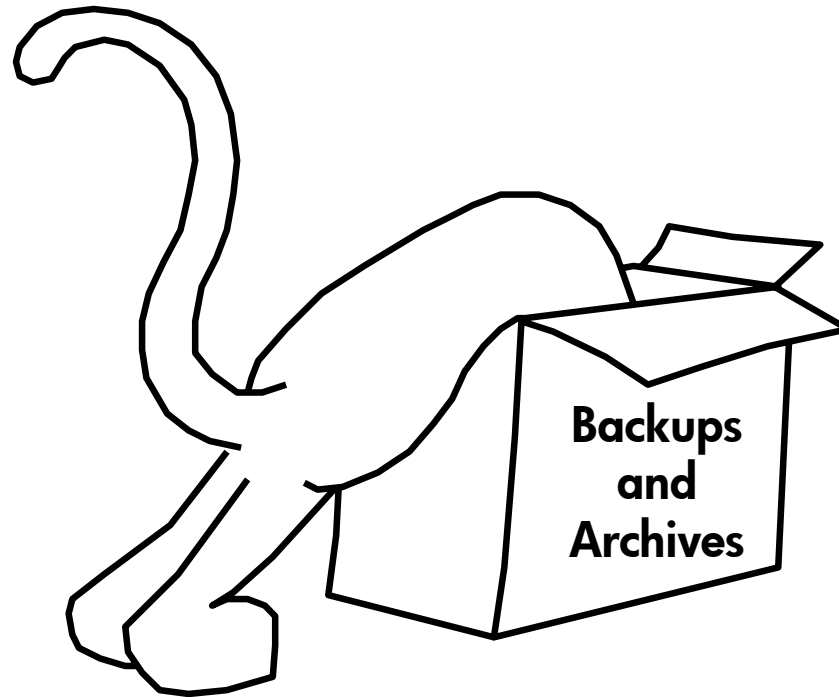
What Do You Back Up?

- Backup the entire file system (full backup)
- Backup part of the file system
 - Files that have changed since the last backup (incremental or delta backups)
 - A subtree of the file system
 - Application data
 - Users' files
- Backup the database configuration
- Backup the LVM configuration

How Often Do You Back Up?



How Do You Perform the Backup?



- `fbackup/frecover` are the most flexible standard HP-UX backup utilities.
- Other utilities are available as well.

Data Backup with fbackup

Back up a single directory or file:

```
# fbackup -f /dev/rmt/0m -i /home -I index.home  
# fbackup -f /dev/rmt/0m -i . -I index.pwd
```

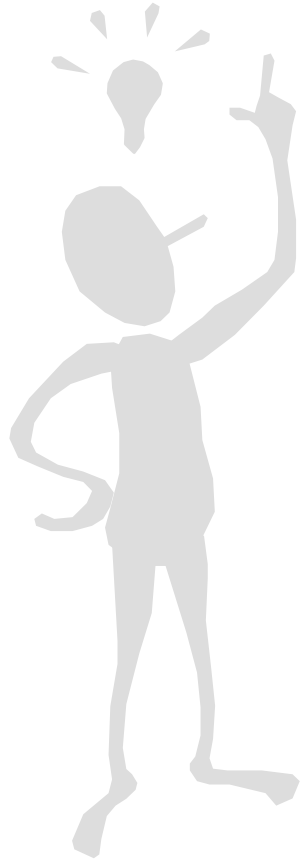
Perform full and incremental backups:

```
# cd /var/adm/fbackupfiles  
# vi graph
```

```
i /  
e /tmp  
e /cdrom
```

```
# fbackup -f /dev/rmt/0m -u0g graph -I index.full  
# fbackup -f /dev/rmt/0m -u1g graph -I index.incremental
```


Data Recovery with `frecover`



When users accidentally delete files,
restore the lost files with `frecover`!

View the contents of an fbackup tape:

```
# frecover -f /dev/rmt/0m -xNv
```

Restore all files and directories from tape:

```
# frecover -f /dev/rmt/0m -rv
```

Restore selected files and directories from tape:

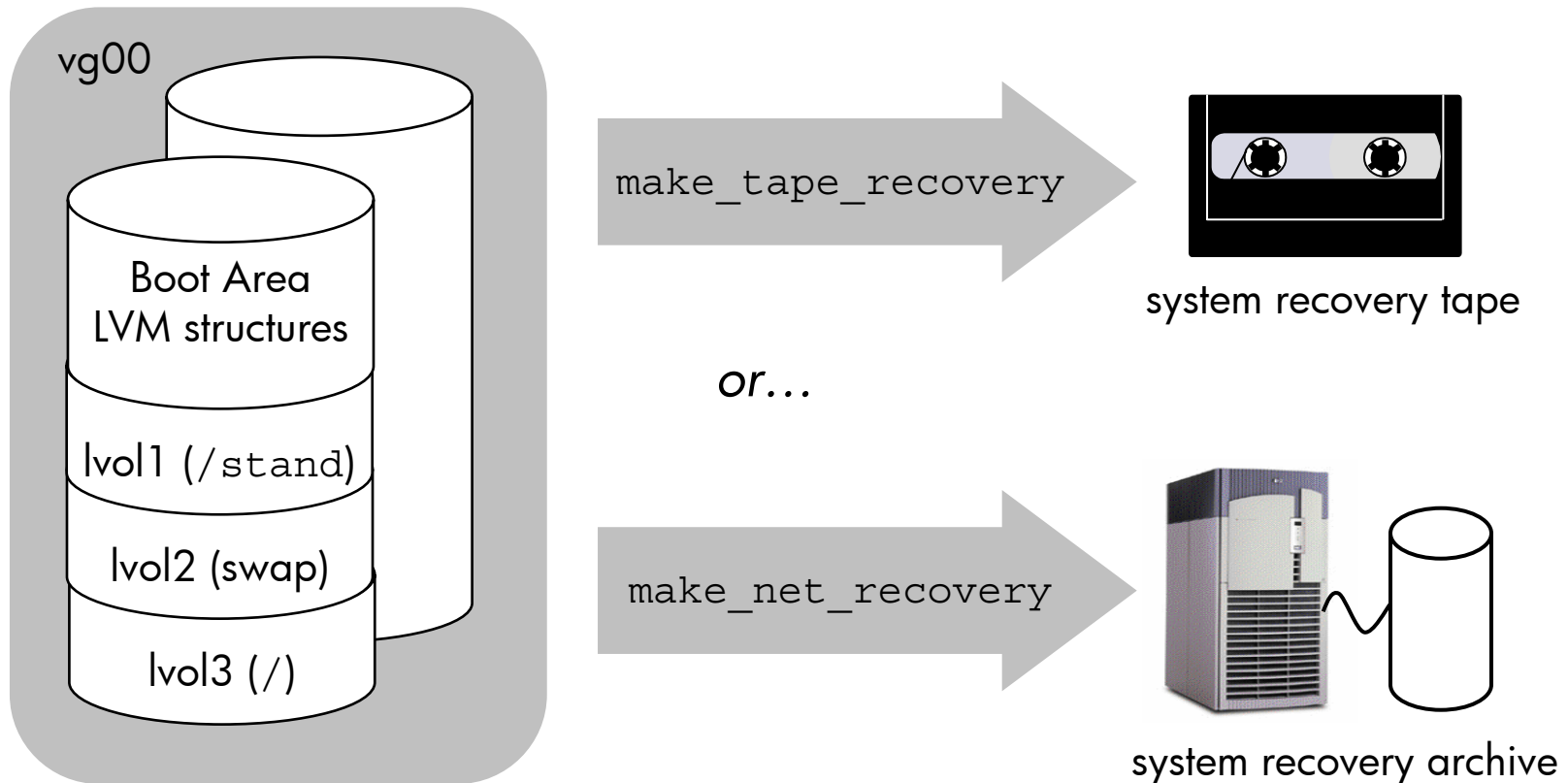
```
# frecover -f /dev/rmt/0m -i /home/user1 -xv
```

```
# frecover -f /dev/rmt/0m -i /home/user2 -xv
```

Boot Disk Backups with `make_*_recovery`

To ensure successful recovery if your boot disk fails:

- Create a system recovery tape with `make_tape_recovery` or
- Store a system recovery archive on an Ignite-UX server on the network



Creating a make_tape_recovery Archive

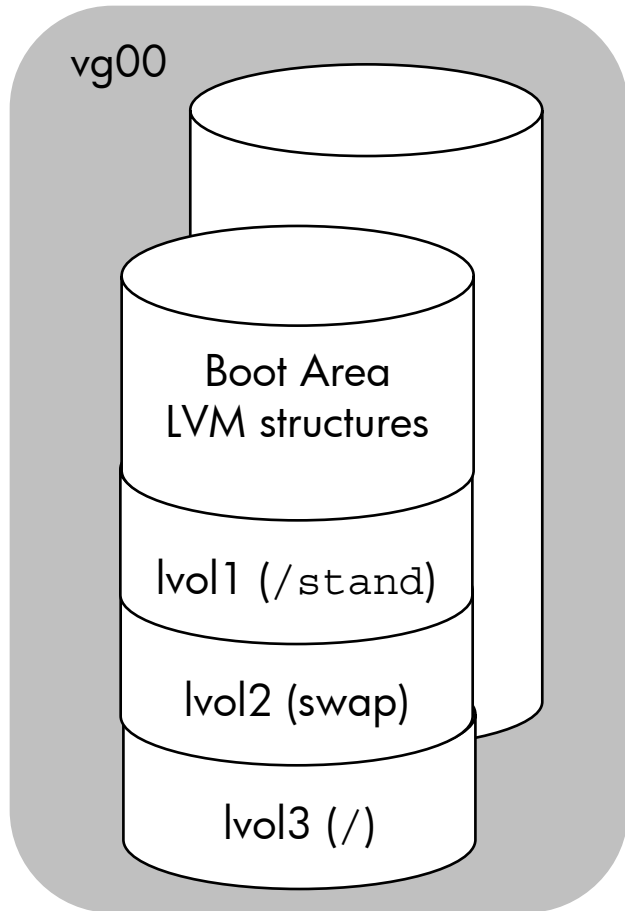
- ✓ Install the Ignite-UX product
- ✓ Check disk space availability in `/var`
- ✓ Put a tape in the tape drive
- ✓ Run `make_tape_recovery -a /dev/rmt/0mn`
- ✓ Check the log files in `/var/opt/ignite/recovery/`
- ✓ Recreate the system recovery tape when necessary

Creating a make_net_recovery Archive



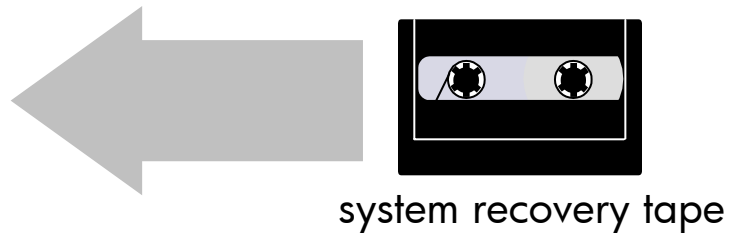
- ✓ Verify that the Ignite-UX server has enabled access for the client
- ✓ Install Ignite-UX on the client
- ✓ Check disk space availability in `/var` on the server
- ✓ Run `make_net_recovery -s servername` on the client
- ✓ Check the server's log files in `/var/opt/ignite/clients/client/recovery/`
- ✓ Recreate the system recovery archive when necessary

Using a make_*_recovery Archive



Booting from the system recovery archive will:

- Recreate the boot disk boot area.
- Restore LVM structures in `vg00`.
- Recreate file systems in `vg00`.
- Restore select, critical files in `vg00`.



Lab activity







Scheduling `cron` Jobs

Module 12

H3064S F.00



The cron Daemon

Use the `cron` daemon to automate routine system tasks!

cron Daemon To-Do List

- ✓ 01:00am Do system backup
- ✓ 05:00am Trim log files
- ✓ 08:00am Generate file system free space summary
- ✓ 11:00am Generate system performance report

Understanding the cron File

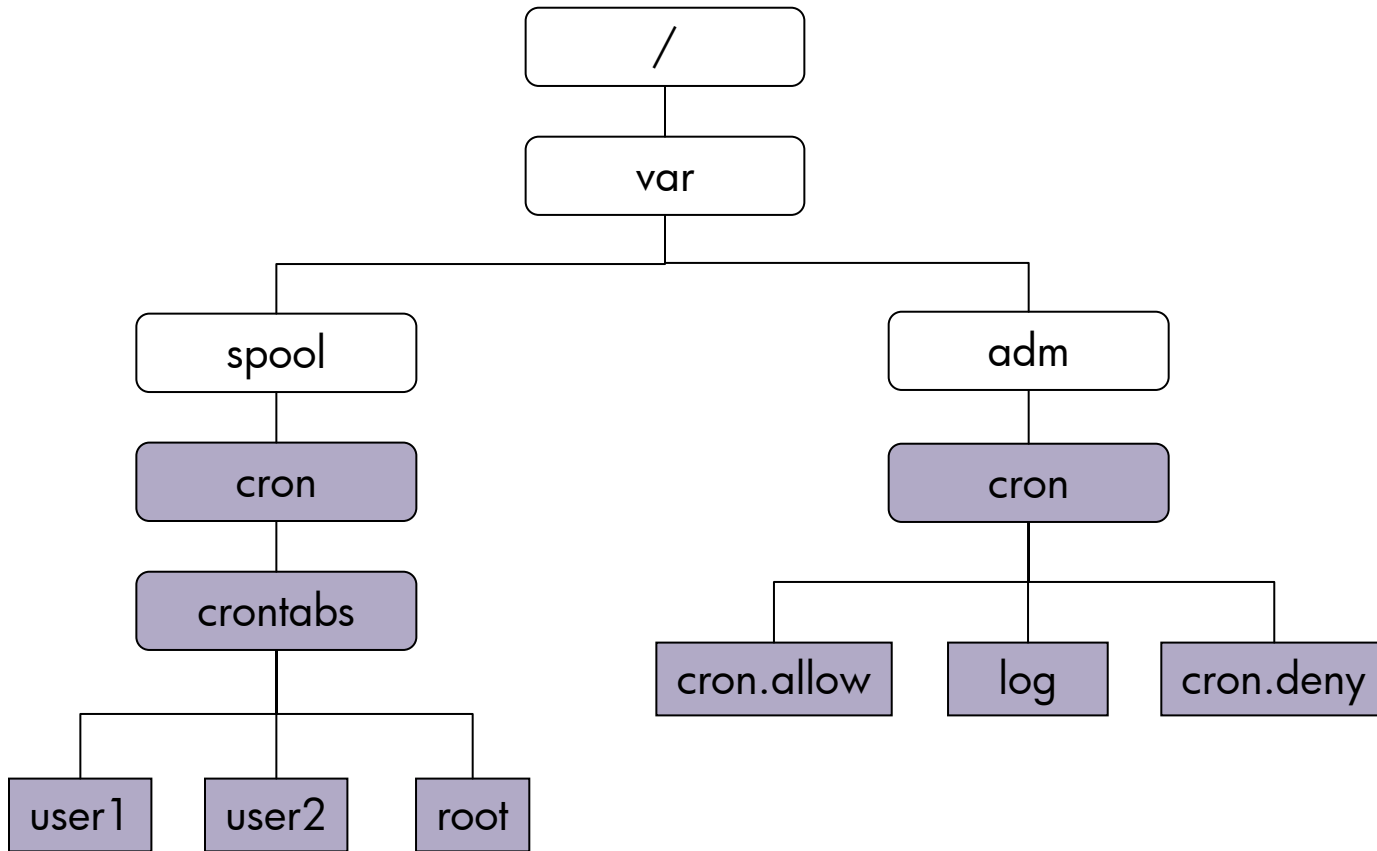
- ✓ The cron daemon is configured via one or more cron files.
- ✓ Each cron file contains one line for each scheduled job.

```
# min    hour    date    month    day    command
# 0-59    0-23    1-31    1-12     0-6    be sure to redirect output!
0        *        *        *        *        /usr/bin/date >/dev/console
0        6        1,15    *        *        >/var/adm/btmp
0        5        *        *        1-5     /usr/bin/who | /usr/bin/lp
```

Managing cron Files with crontab

- Edit and submit a cron file:
 - # crontab -e
- View your cron file:
 - # crontab -l
- Remove all your scheduled cron jobs:
 - # crontab -r

What Happens When a Job Is Scheduled?



Lab activity







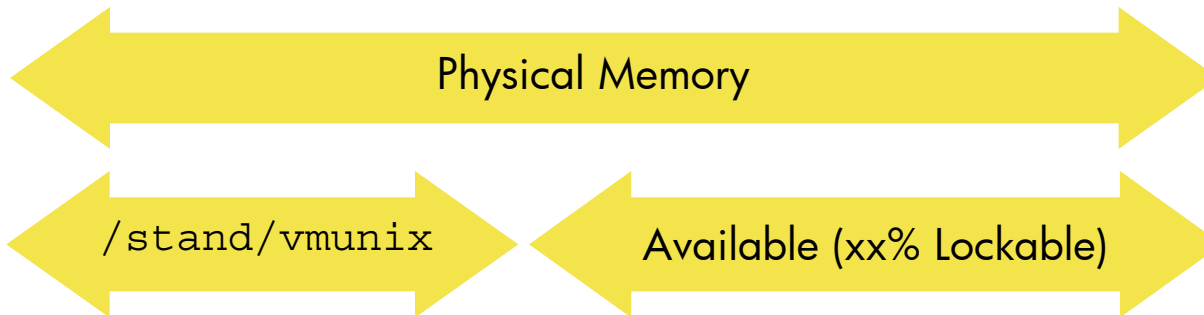
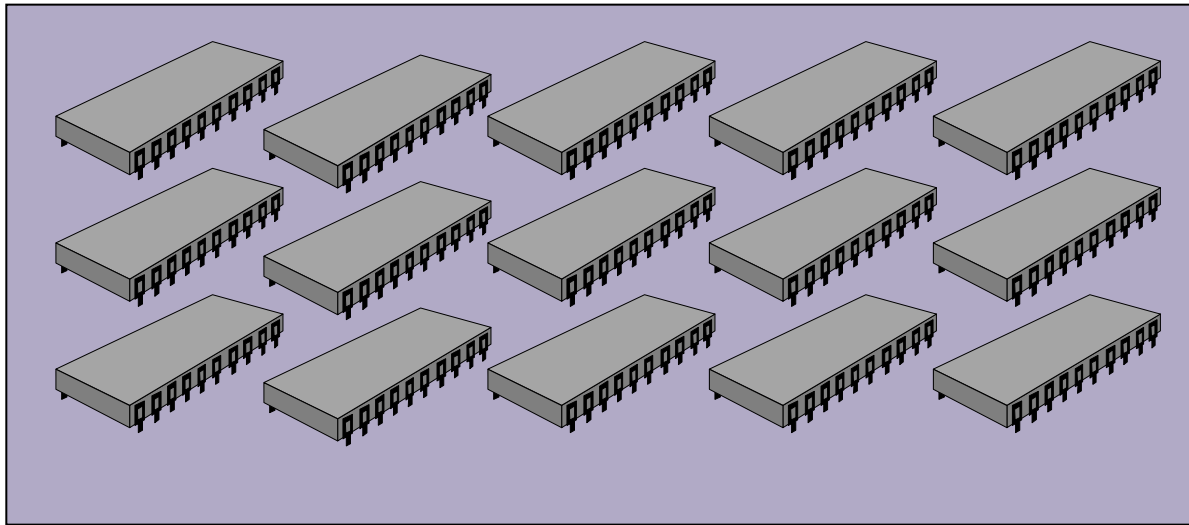
Managing Swap Space

Module 13

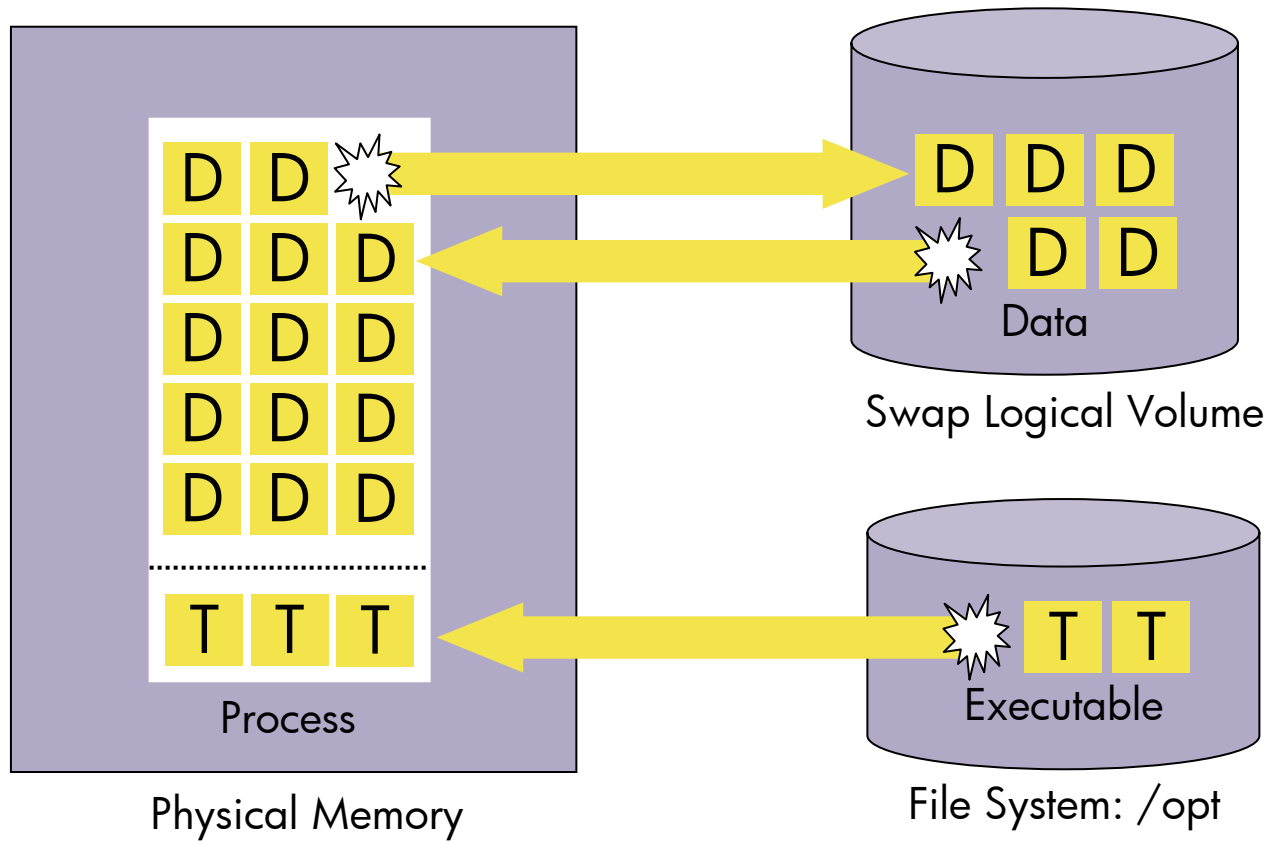
H3064S F.00



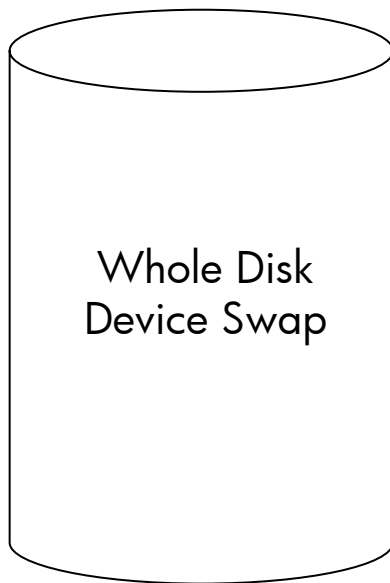
HP-UX Memory Concepts



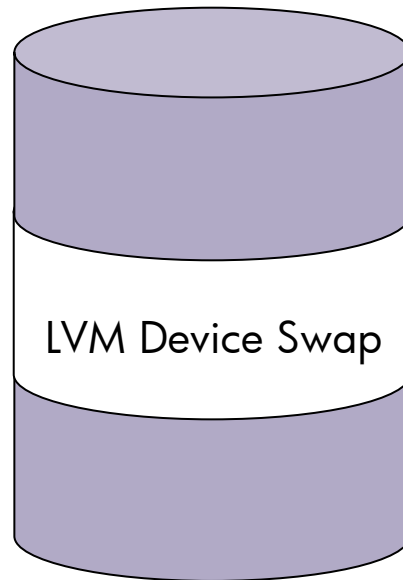
HP-UX Swap Concepts



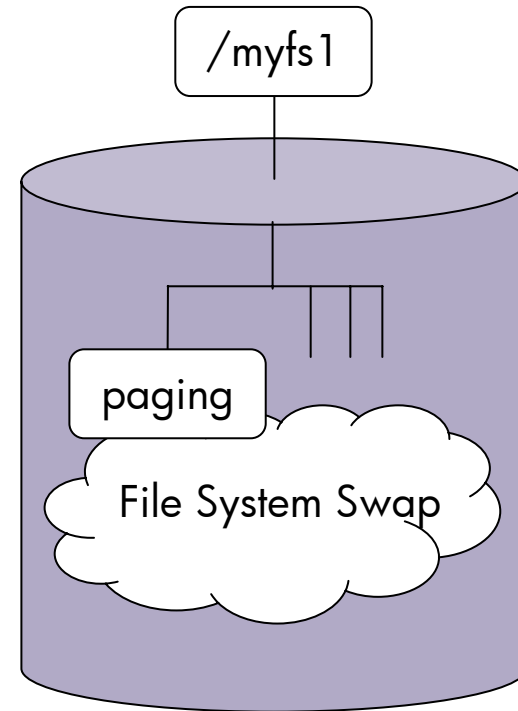
HP-UX Swap Types



Use an entire disk...

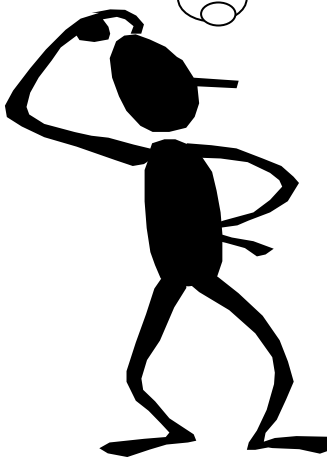


Use a logical volume...



Use extra file system space...

HP-UX Pseudoswap



I've got 1GB of swap and
4GB of available memory.
Can I start a
2GB process?

With Pseudoswap Enabled

Yes!

1GB Device Swap
+ 3GB Pseudo Swap (75% of 4GB)
4GB <i>Reservable</i> Swap

With Pseudoswap Disabled

No!

1GB Device Swap
+ 0GB Pseudo Swap
1GB <i>Reservable</i> Swap

Enabling Swap from the Command Line



Examples:

- ① # swapon /dev/vg01/myswap
- ② # swapon -e /dev/dsk/c0t1d0
- ③ # swapon /dev/dsk/c0t2d0
- ④ # swapon -p 4 -l 4M /myfs1

Explanation:

- ① Swap on a logical volume
- ② Swap on the end of a whole disk device
- ③ Swap on a whole disk
- ④ Swap on a file system

Enabling Swap via /etc/fstab

```
# vi /etc/fstab
```

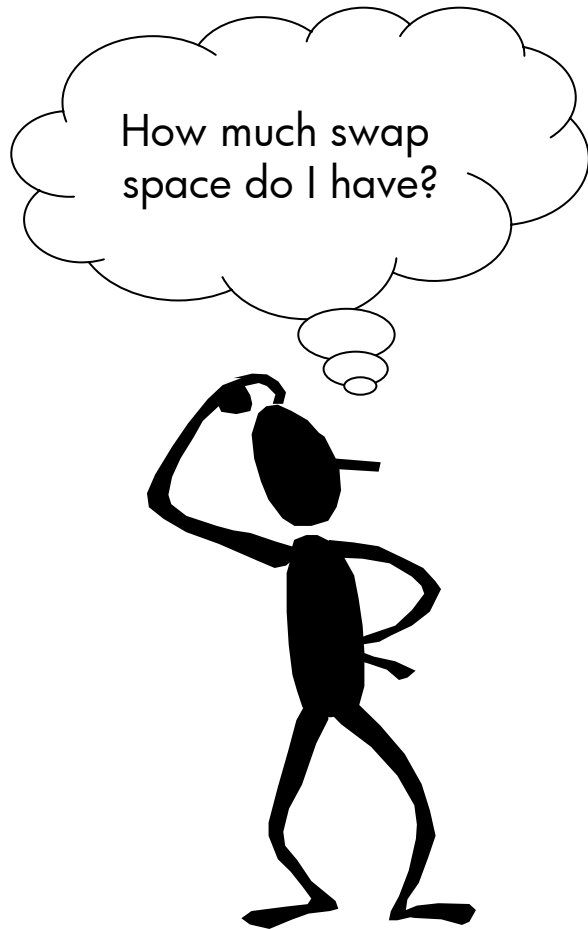
```
    /dev/vg01/myfs1    /myfs1    hfs        defaults    0 2
    /dev/vg01/myfs2    /myfs2    vxfs       delaylog    0 2
①  /dev/vg01/myswap    .          swap       defaults    0 0
②  /dev/dsk/c0t1d0     .          swap       end         0 0
③  /dev/dsk/c0t2d0     .          swap       defaults    0 0
④  /dev/vg01/myfs1    /myfs1    swapfs     pri=4,lim=4M 0 0
```

```
# swapon -a
```

Explanation:

- ① Swap on a logical volume
- ② Swap on the end of a whole disk device
- ③ Swap on a whole disk
- ④ Swap on a file system

Monitoring Swap Space



Examples:

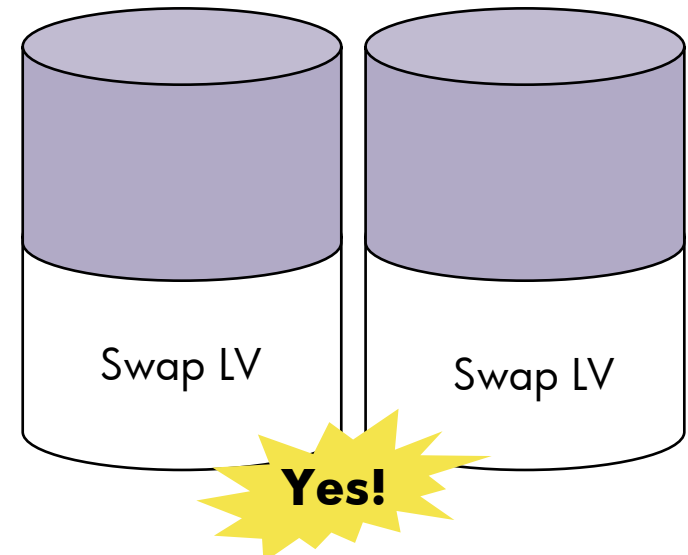
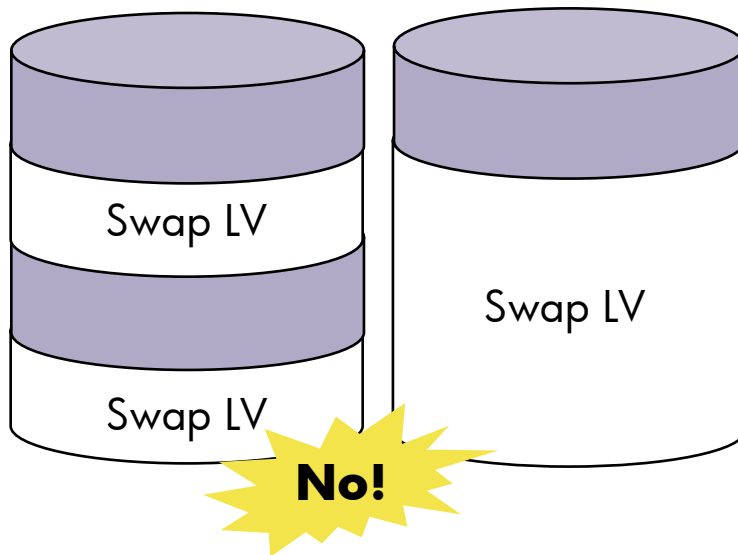
- ① # swapinfo
- ② # swapinfo -f
- ③ # swapinfo -d
- ④ # swapinfo -tm

Explanation:

- ① Report usage of all swap areas
- ② Report only on file system swap
- ③ Report only on device swap
- ④ Report values in MB, with a total line

Guidelines for Selecting Device Swap Areas

- ✓ Two swap areas on different disks are better than one single swap area.
- ✓ Only configure one swap area per disk.
- ✓ Device swap areas should be of similar size.
- ✓ Consider the speed of the disks.



Guidelines for Selecting File System Swap Areas



- ☑ Avoid file system swap altogether if possible.
- ☑ Avoid using busy file systems such as the root file system.
- ☑ Avoid using file systems already near capacity.
- ☑ Avoid using file systems on disks that already have swap configured.
- ☑ Set priorities appropriately.
 - Choose faster devices over slower devices.
 - Choose infrequently-used file systems over busier file systems.

Lab activity







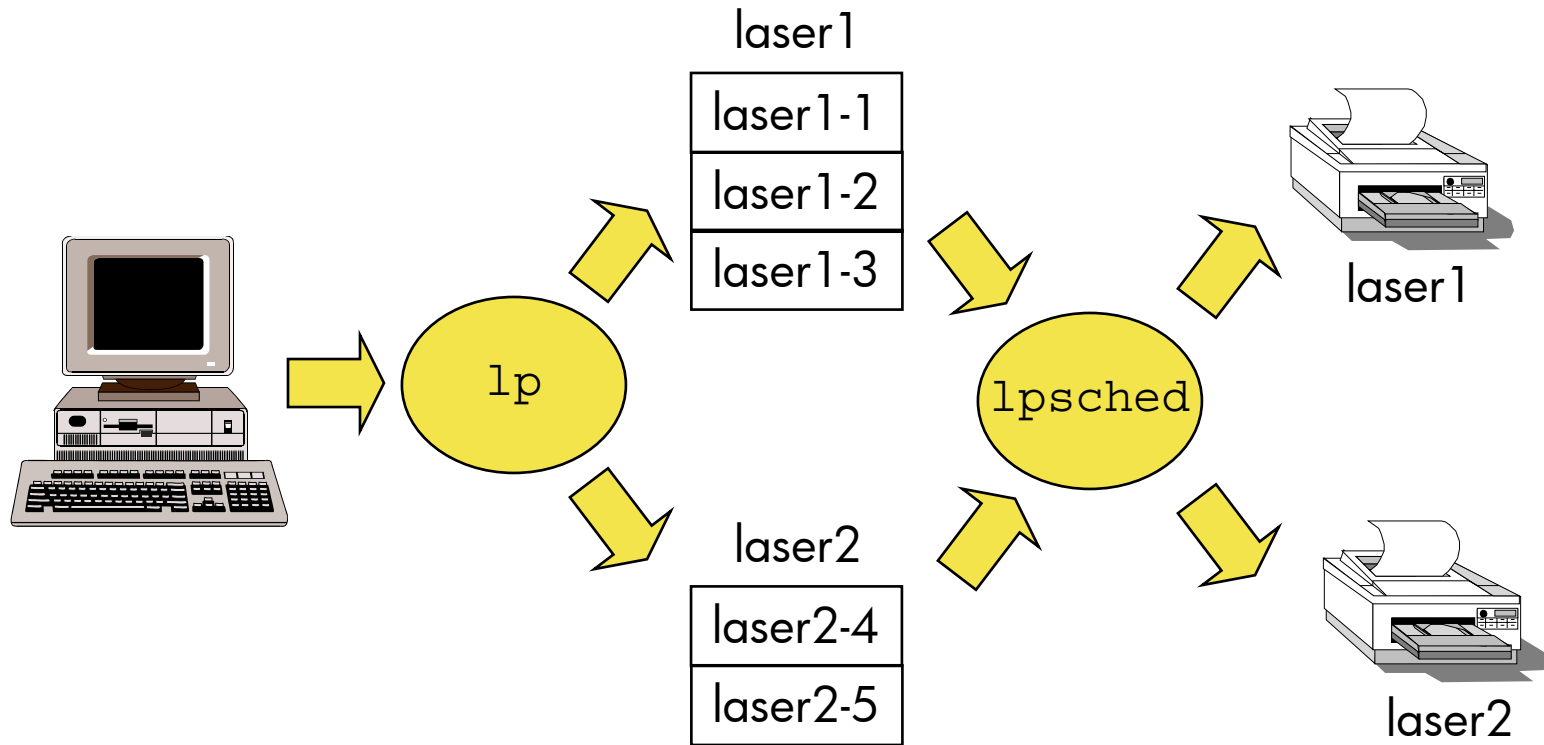
Managing Printers

Module 14

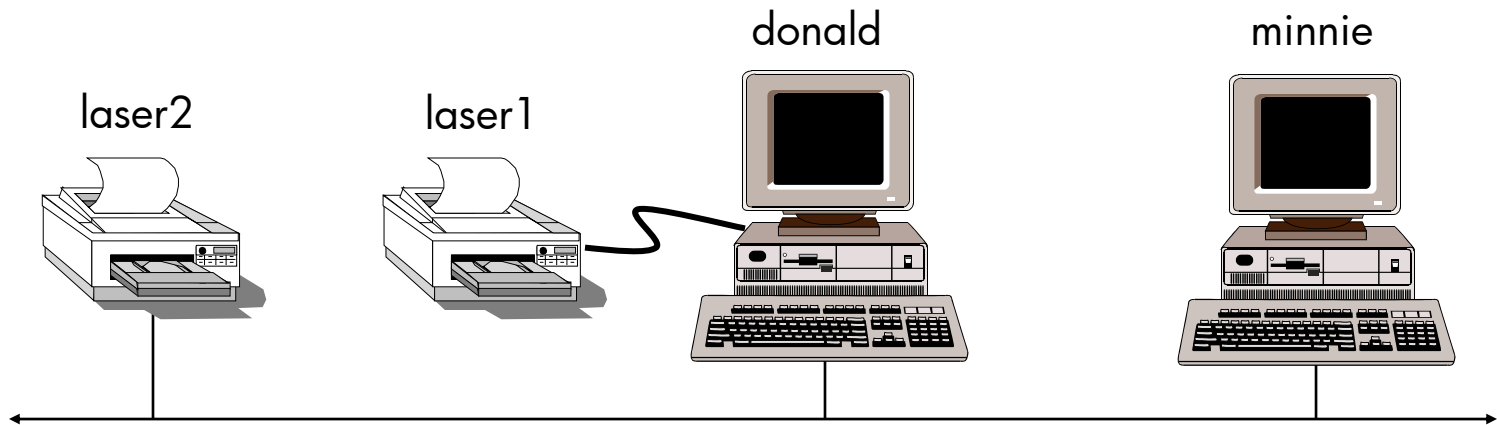
H3064S F.00



LP Spooler Concepts



LP Printer Types



- laser1 is a local printer for donald
- laser1 is a remote printer for minnie
- laser2 may be a network printer for minnie and/or donald

Adding a Local Printer via SAM

Printer Name:

(optional)

Default Request Priority:

☒ Make This Printer the Default Destination

Adding a Remote Printer via SAM

Printer Name:

Remote System Name:

Remote Printer Name:

Remote Printer is on a BSD System

Remote Cancel Model...

Remote Status Model...

Default Request Priority: 0

Allow Anyone to Cancel a Request

☒ Make This Printer the Default Destination

OK Cancel Help

Adding a Network Printer with hppi

```
*****
*****]          ****
**** ]          ****      JetDirect Printer Installer for UNIX
**** ]]]]] ]]]]] ****      Version E.10.18
**** ]   ] ]   ] ****
**** ]   ] ]]]]] ****      Spooler Administration
****      ]          ****
****      ]          ****      User: (root)      OS: (HP-UX B.11.11)
*****
```

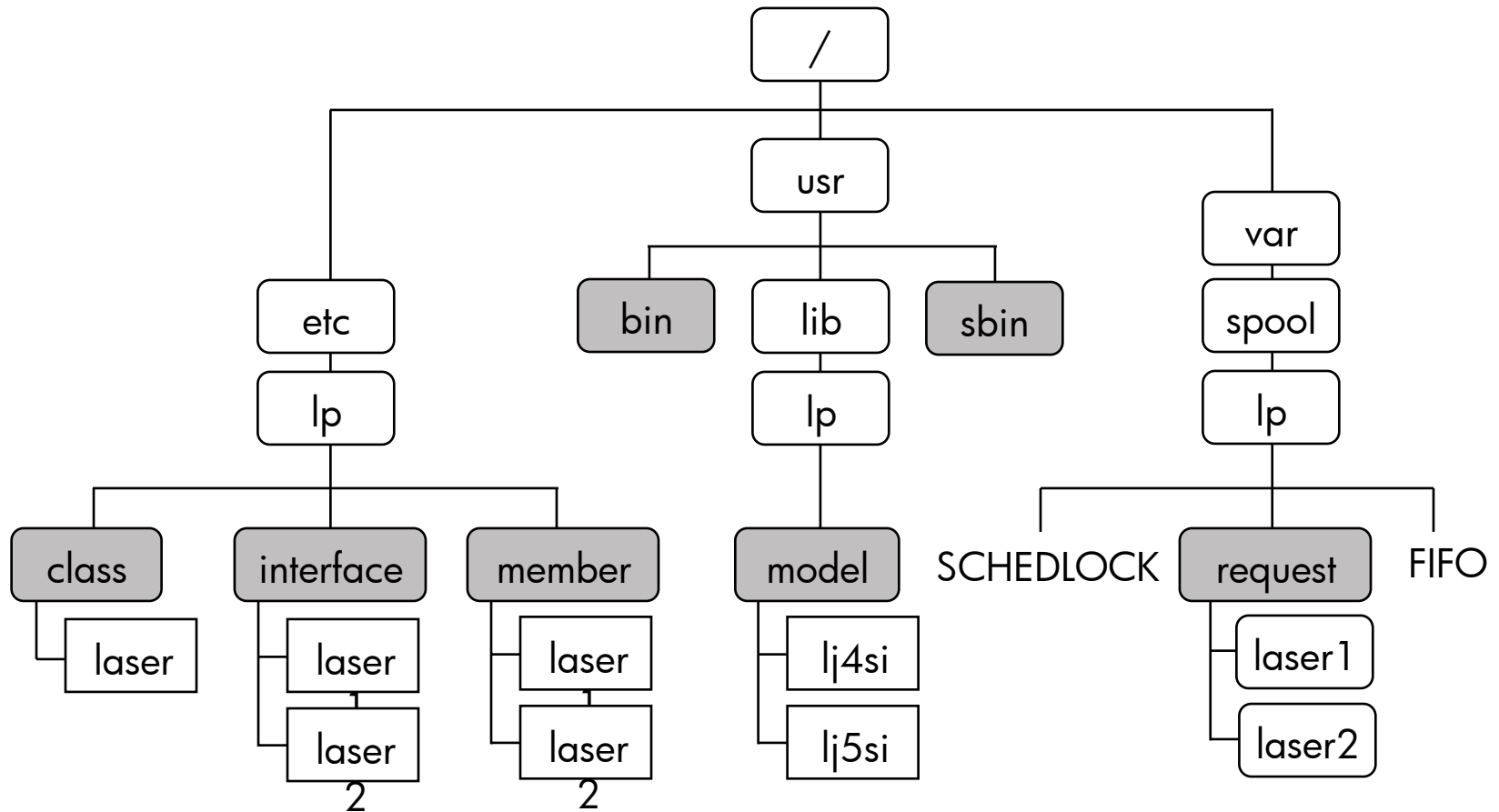
Spooler:

- 1) Add printer to local spooler
- 2) Delete printer from local spooler
- 3) Modify existing spooler queue(s)
- 4) Install New Model Script
- 5) Remove Model Script

?) Help q) Quit

Please enter selection: 1

LP Spooler Configuration Files



What Happens when a File Is Submitted with lp?



```
$lp -dLJ filename
```

```
request id is LJ-####
```

Print request submitted

Spooler assigns unique request

ID and queues request

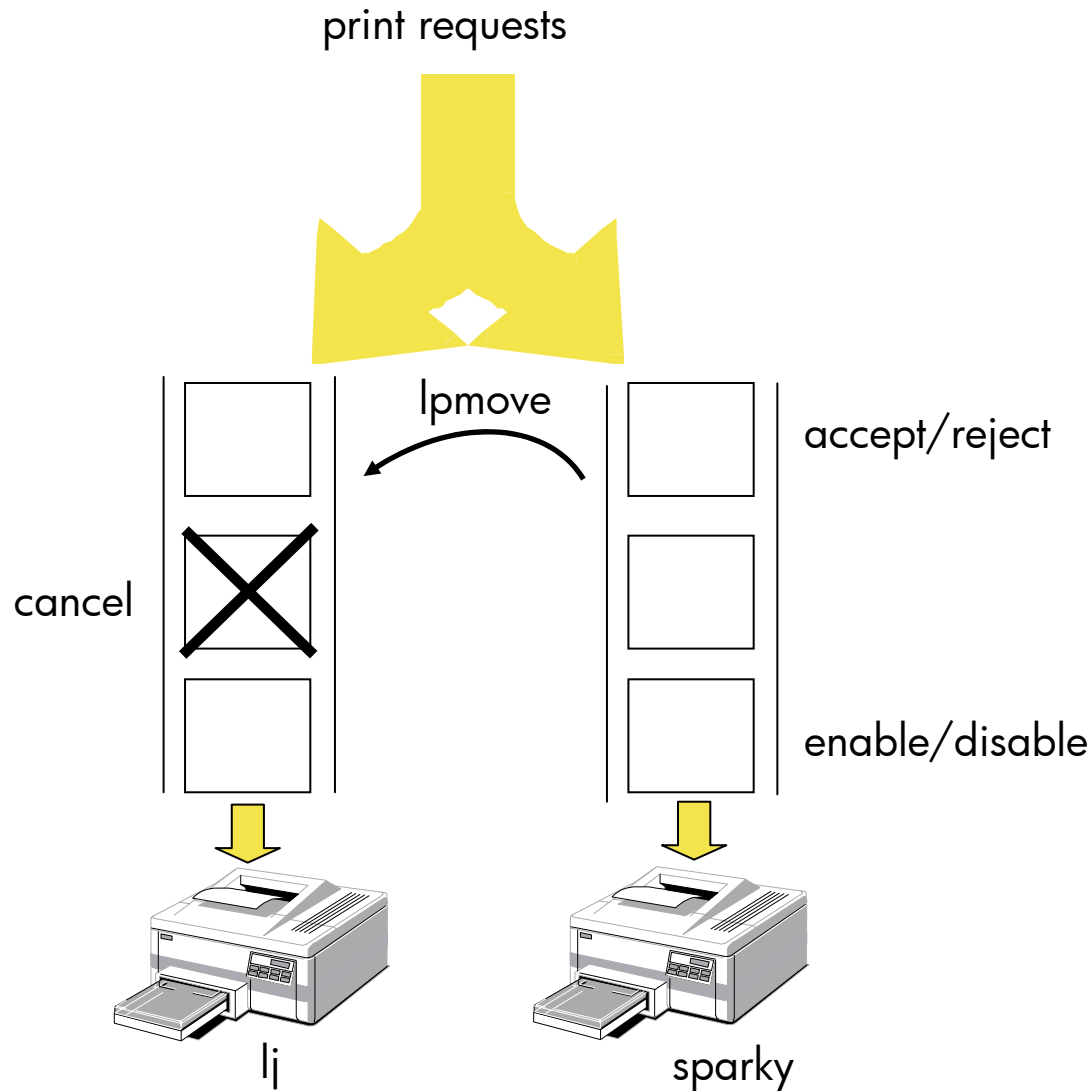
filename is linked or copied to spool
directory /var/spool/lp/request/LJ

Printer becomes available

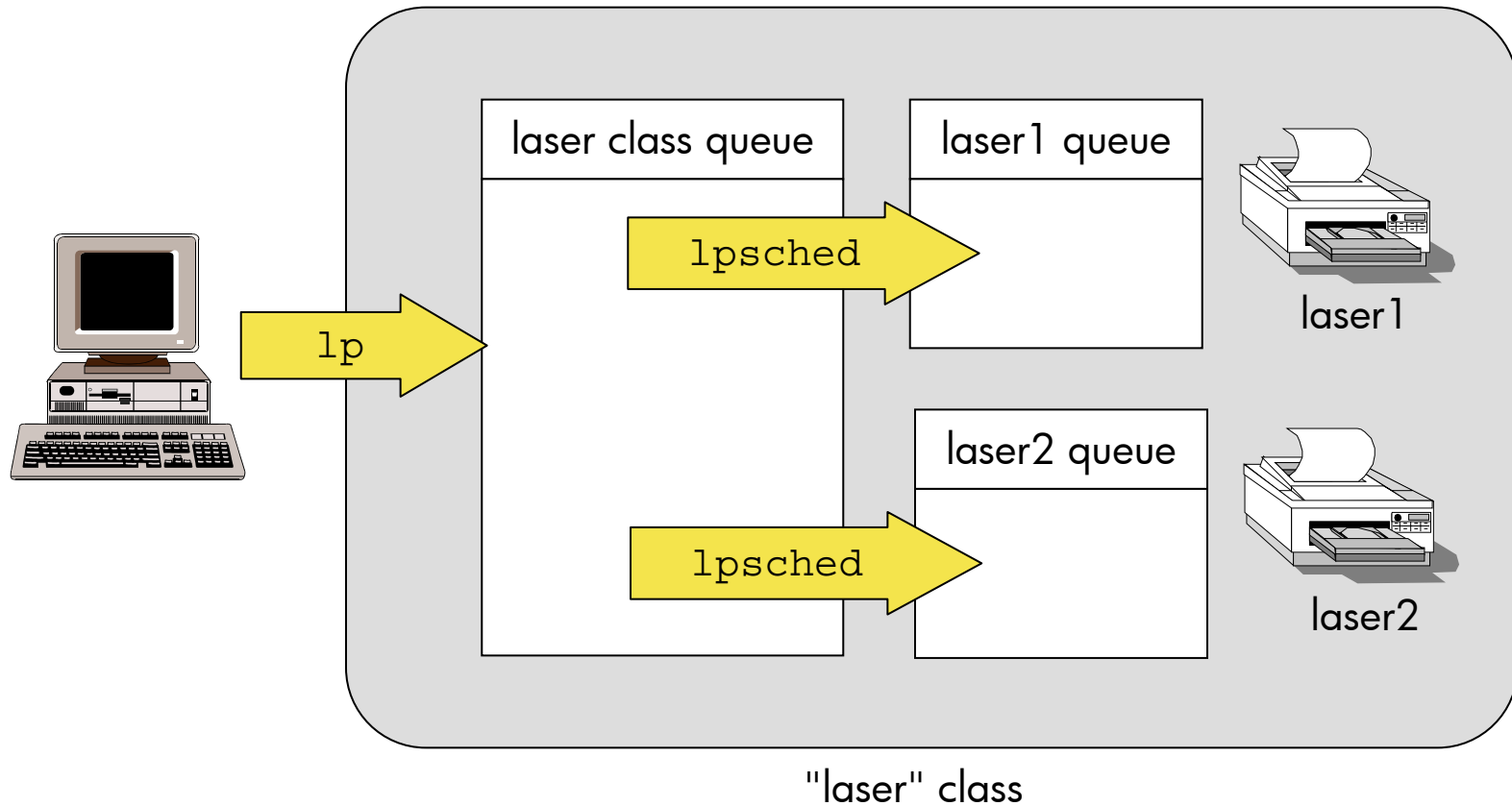
lpsched invokes the interface program
/etc/lp/interface/LJ

File is printed

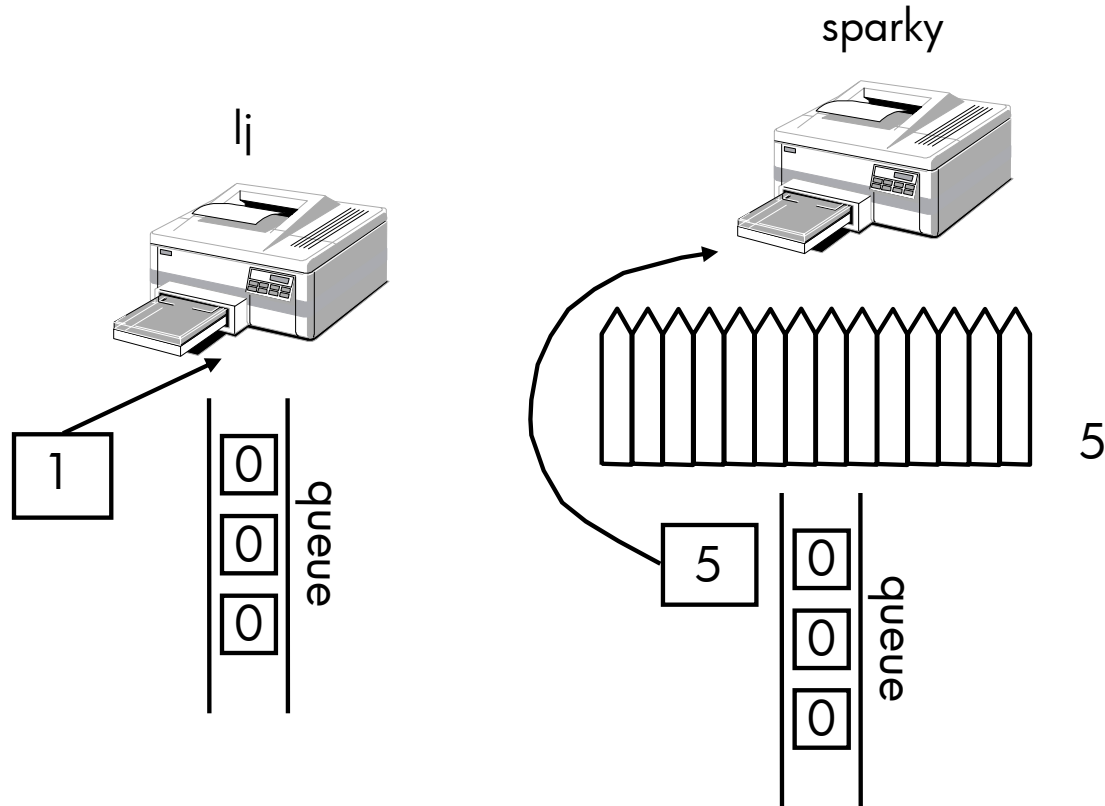
Managing Print Queues



Managing Printer Classes



Managing Priorities and Fences



Troubleshooting the Spooler

Potential Spooler Problems:

- Spooler won't start
- Scheduler won't stop
- Paper jam/printer out of paper
- Runaway printout
- Printer won't print

Lab activity







Accessing the System Console

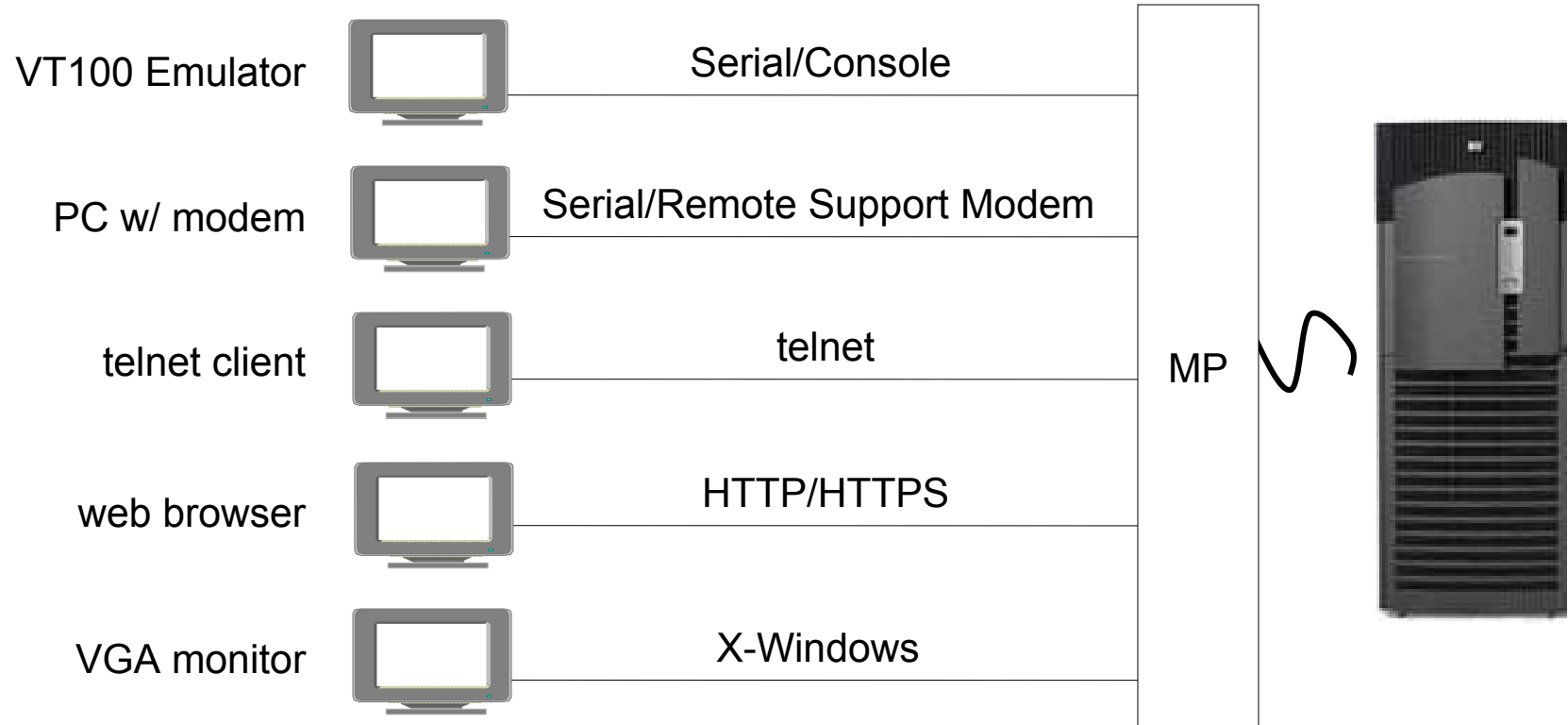
Module 15

H3064S F.00



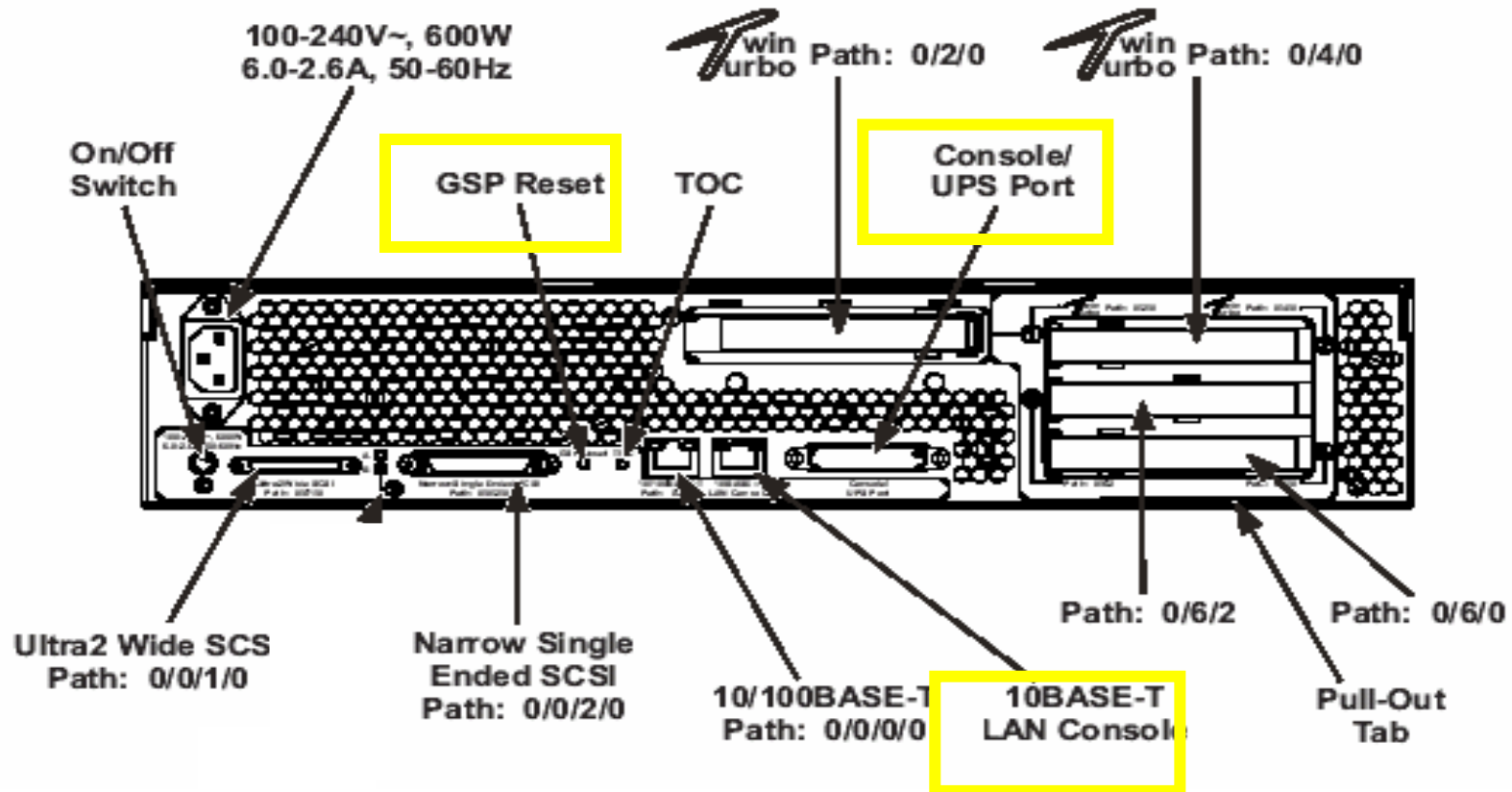
Introducing the MP

- All of HP's current PARISC and Integrity servers include a MP card
- The MP provides full console functionality via a variety of interfaces



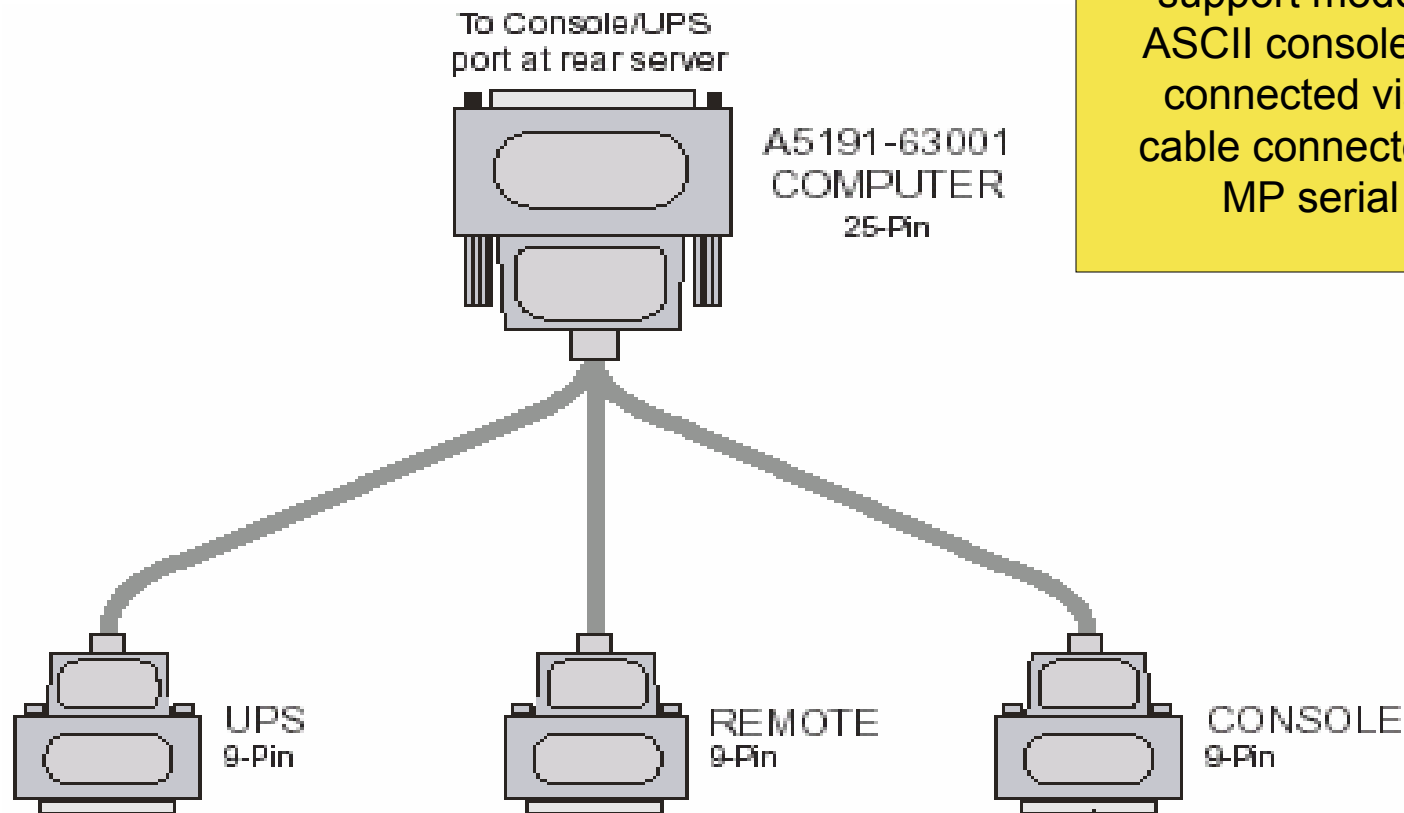
Viewing the MP Backplane

- The MP is accessible via several ports on the system backplane
- The MP offers a LAN console port, and a 25-pin serial port
- The MP reset button returns the MP to its factory default configuration



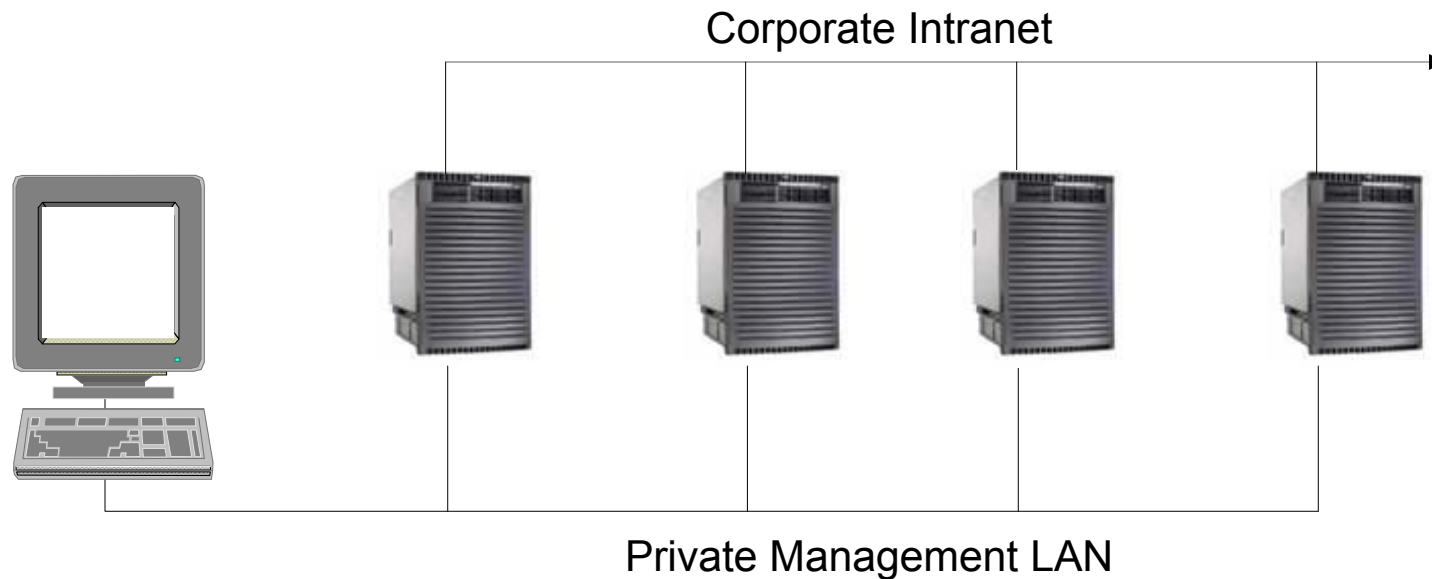
Connecting the MP Serial Port

A UPS unit, remote support modem, and ASCII console may be connected via a “W” cable connected to the MP serial port



Connecting the MP LAN Port

- LAN console port traffic is not encrypted
- LAN console ports should be connected to a private management LAN
- Some shops configure an SSH gateway between the corporate/management LANs



MP User Accounts

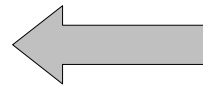
- Users must provide a username and password to access the MP
- The “Admin” user (password “Admin”) is predefined
- Up to nineteen MP users may be defined by the MP administrator
- A user’s access level determines which MP features and partitions s/he can access
- Factory default MP password: Admin/Admin

Access Level	Commands Available	Partitions Available
Administrator	All	All
Operator	Some	All
Single-partition user	Some	Some

Accessing the MP LAN Interface

- The MP LAN interface may be accessed via any `telnet` client
- A valid MP username/password is required
- Several MP users may login simultaneously to view a shared console interface

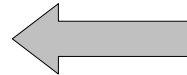
```
# telnet 192.168.1.1
```



Use any telnet client to access the MP IP.

```
MP login: Admin
```

```
MP password: Admin
```



A username/password is required to access the MP

```
(c)Copyright 2000 Hewlett-Packard Co.
```

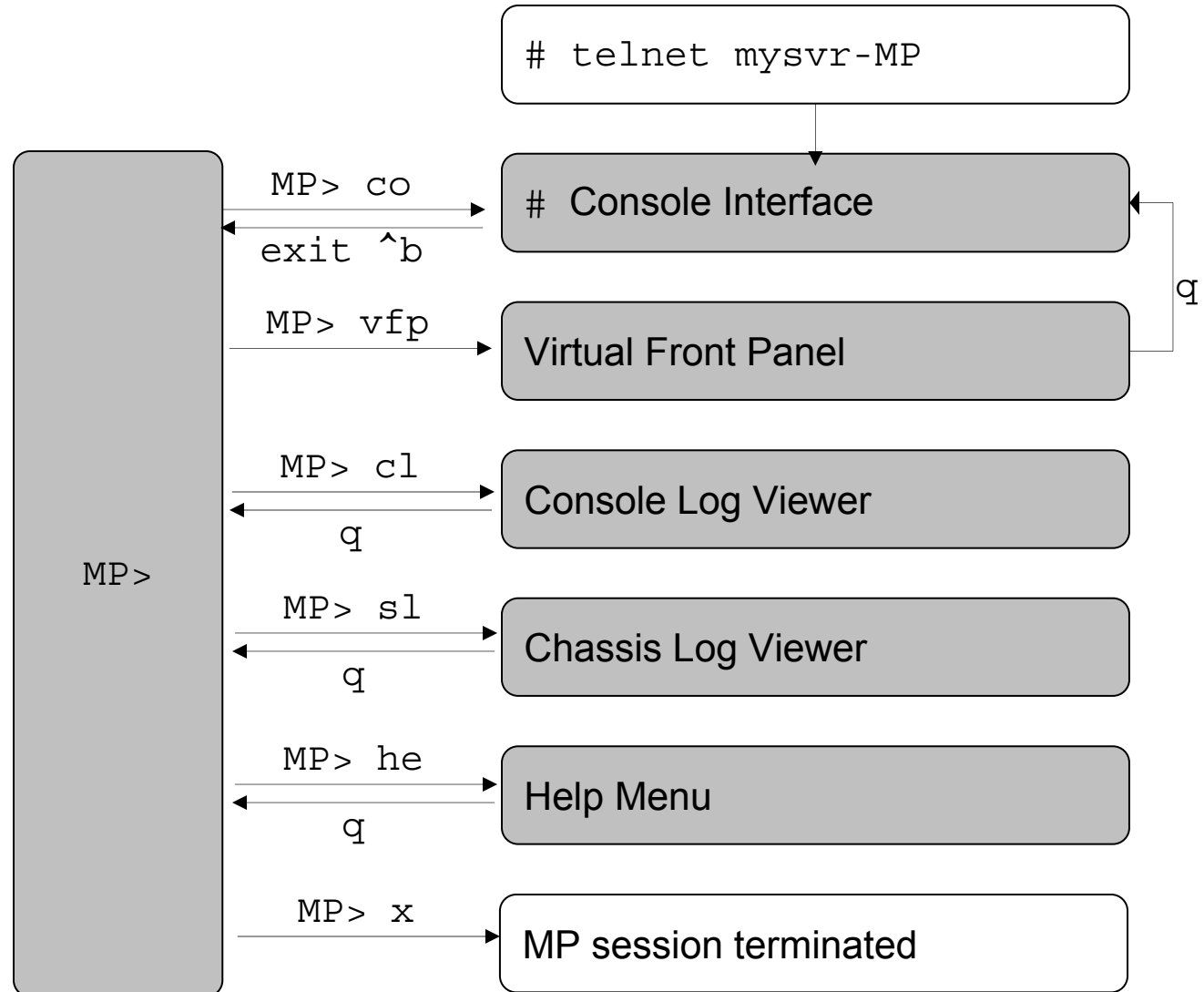
```
Welcome to
```

```
System Name: mysvr-MP
```

Navigating the MP Core Menus (Older)

MP core functionality is provided via a simple menu interface.

On low-end systems, all commands are available from the main menu.



Navigating the MP Core Menus (Newer)

Several commands and submenus are available from the initial MP main menu.

```
# telnet mysvr-MP
```

MP>

MP> co

#exit ^b

Console Interface

MP> vfp

^b

Virtual Front Panel

MP> cm

^b or ma

Command Menu

MP> cl

^b or q

Console Log Viewer

MP> sl

^b or q

Event Log Viewer

MP> fw

^b or q

Firmware Update (HP only)

MP> he

q

Help Menu

MP> x

MP session terminated

MP MAIN MENU:

CO: Consoles

VFP: Virtual Front Panel

CM: Command Menu

CL: Console Logs

SL: Show Event Logs

FW: Firmware Update

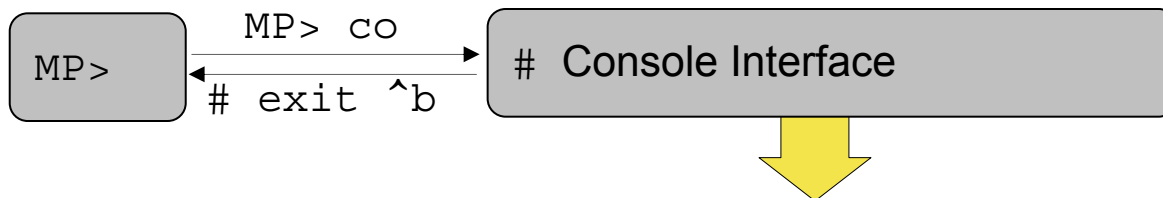
HE: Help

X: Exit Connection

MP>

Accessing the MP nPar Console Interface

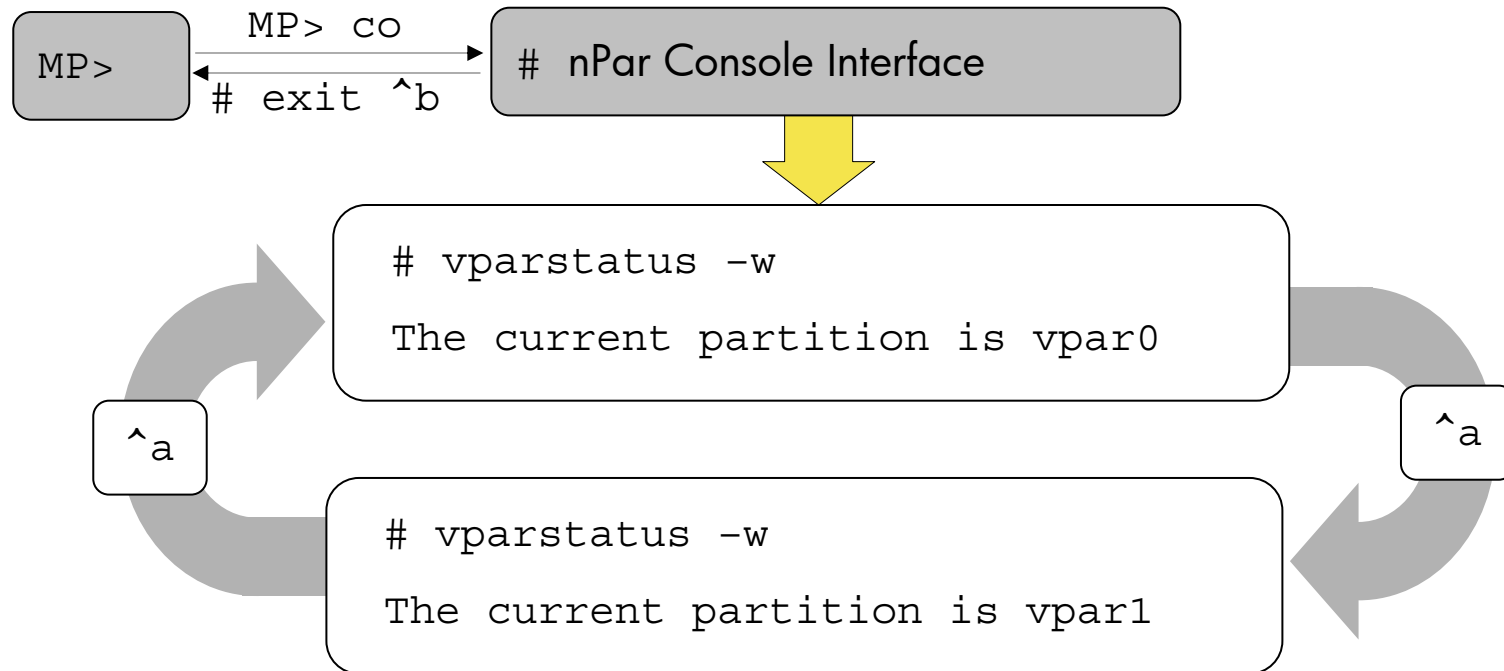
- The MP console interface provides access to all normal HP-UX console features
- Multiple MP users can “shadow” the console simultaneously
- To grab control of the console interface, press ^e cf
- To return to the MP menu, exit out of HP-UX, and press ^b



(Use ^B to return to main menu.)
[A few lines of context from the console log:]
- - - - -
GenericSysName [HP Release B.11.23] (see /etc/issue)
Console Login:

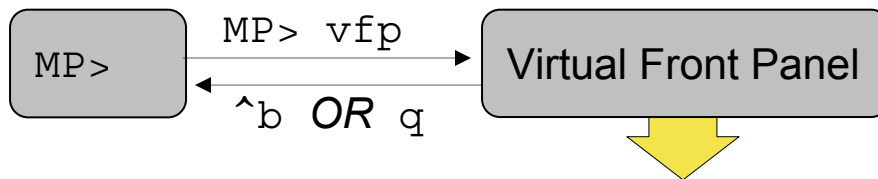
Accessing the MP vPar Console Interface

- A single nPar may contain multiple vPars
- To access a vPar console interface, access the nPar console first, ...
- Then press ^a to cycle through console interfaces for each vPar within the nPar
- On cell-based systems, you can access a console for any nPar



Accessing the MP Virtual Front Panel

- The VFP displays hardware status messages similar to LED displays on older servers
- Use the VFP to monitor system activity, especially during the boot process
- On cell-based systems, you can view a VFP for any nPar



```

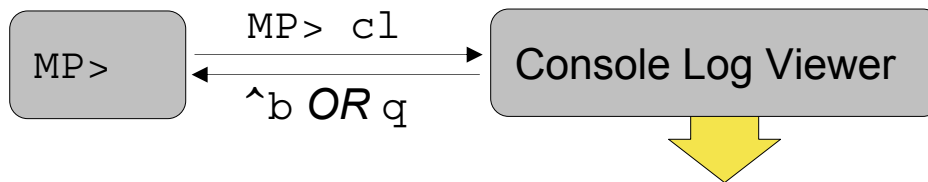
# Partition state      Activity
- -----
0 Cell(s) Booting      365 Logs

# Cell state          Activity
- -----
1 Memory discovery    MEM_TEST_READ_WRITE 187 Logs
2 Memory discovery    MEM_TEST_READ_WRITE 178 Logs
  
```

E indicates error since last boot
 MP:VFP (Use '?' to display help or ^B to Quit) >

Accessing the MP Console Logs

- Use the MP console logs to view recent activity on the console interface
- On cell-based systems, you can view a VFP for any nPar
- WARNING: The console logs don't deal well with screen-oriented output



```

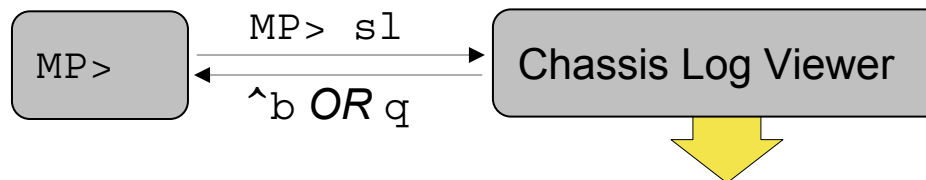
Start Highly Available cluster ..... N/A
Starting the Apache subsystem ..... OK
Start CDE login server ..... OK
  
```

```

Transition to run-level 3 is complete.
GenericSysName [HP Release B.11.23] (see /etc/issue)
Console Login:
  
```

Accessing the MP Event Logs

- Use the MP event logs to view low level hardware error messages
- Messages can be viewed in a variety of formats; “text” is easiest to read
- Particularly watch for messages level 3 (Warning) or higher

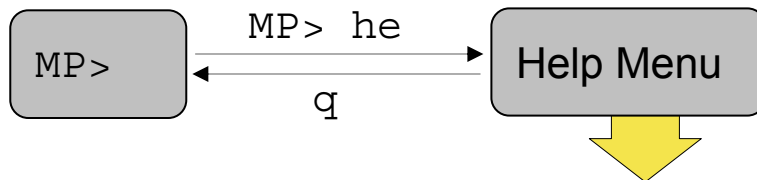


Select Chassis Code Buffer to be displayed:
 Incoming, Activity, Error, Current boot or Last boot? (I/A/E/C/L)i
 Set up filter options on this buffer? (Y/[N])

The first entry is the most recent Event Code
 Type + CR and CR to go up (back in time),
 Type - CR and CR to go down (forward in time),
 Type Q/q CR to quit.

Accessing the MP Help Menu

- Use the MP help menu to learn more about other MP commands



```
==== MP Help =====(Administrator)====  
      Hardware Revision A0  Firmware Revision C.02.12 Nov 10
```

```
MP Help System
```

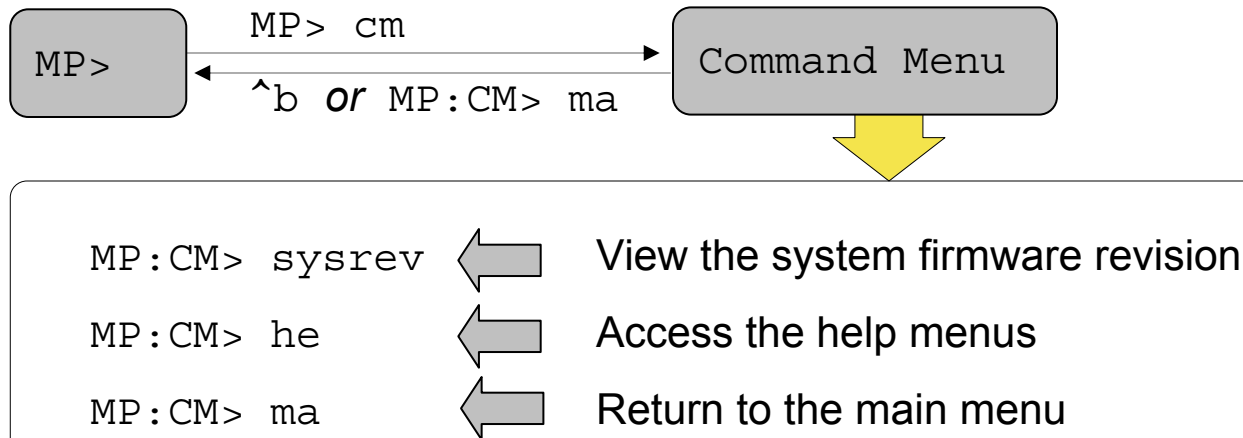
```
Enter a command at the help prompt:
```

```
OVERview   : Launch the help overview  
LIst       : Show the list of MP commands  
<COMMAND> : Enter the command name  
TOPics     : Show all MP Help topics and commands  
HElp       : Display this screen  
Q          : Quit help
```

```
MP HELP: li
```

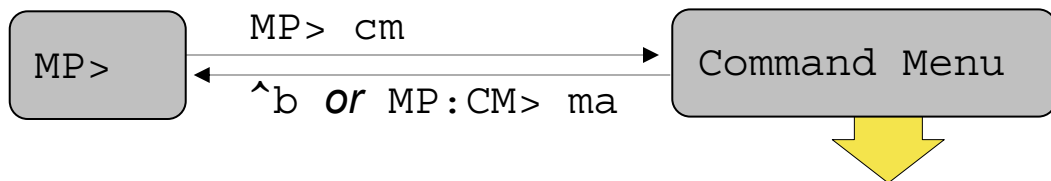
Accessing the MP Command Menu

- The MP command menu provides many additional commands
- Commands vary from model to model and firmware revision to firmware revision
- Most commands are interactive, menu-based utilities
- Newer MP firmware revisions also support an option/argument interface
- For a complete list of commands on your model, type `he` (help), then `li` (list)
- Press `^b` or type the `ma` command to return to the main MP menu



Managing the MP LAN Interface

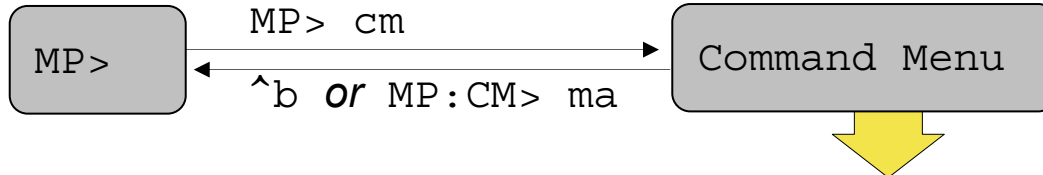
- The MP LAN console port ships with a pre-configured non-routable IP address
- The MP LAN IP can be customized for your network environment
- The command menu provides several commands to accomplish this



MP:CM> ls	←	Display current LAN console port status
MP:CM> lc	←	Change the LAN console configuration
MP:CM> el or sa	←	Enable/Disable the LAN console port
MP:CM> di	←	Terminate current remote logins, but don't disable interface
MP:CM> xd	←	Restarting the MP after changing the LAN configuration
MP:CM> dc	←	Reset the MP configuration to the factory defaults

Managing the MP Secure Web Interface

- For improved security, use the secure web interface to the MP rather than telnet
- The secure web interface secures traffic to/from the MP via SSL

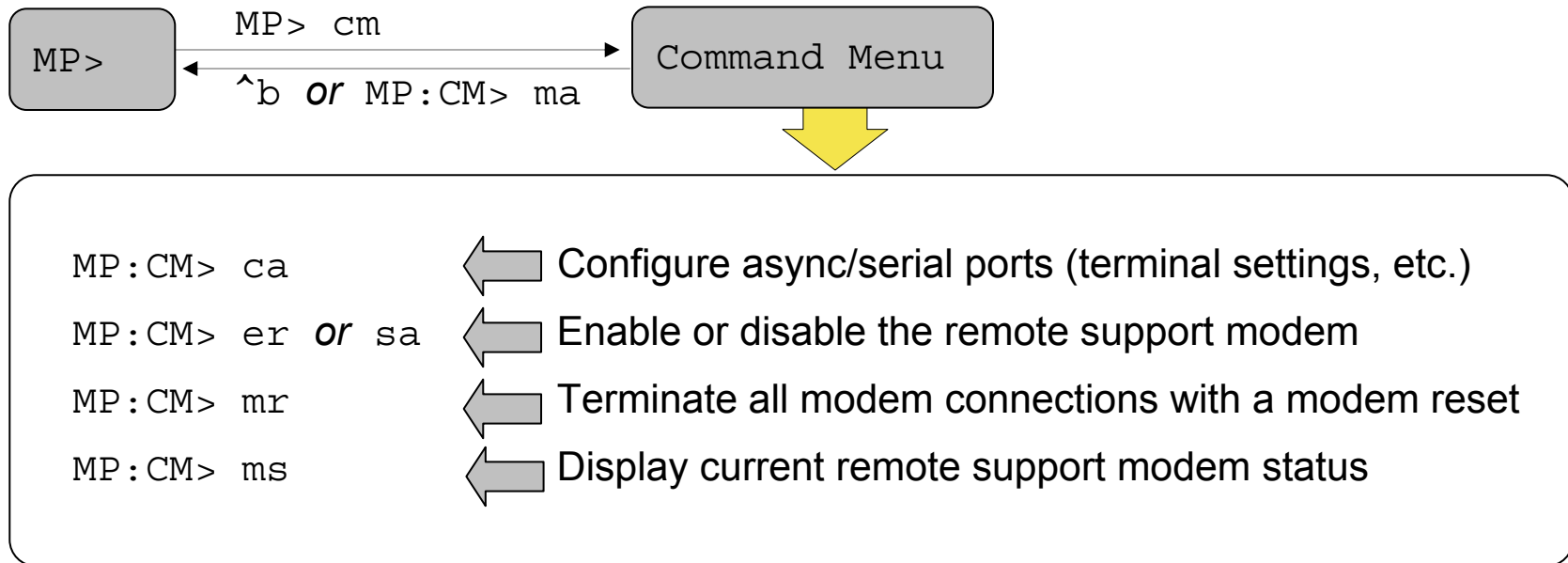


MP:CM> ls	←	Display current LAN console port settings
MP:CM> lc	←	Change the LAN console, including the Web console Port#
MP:CM> sa or ew	←	Enable/disable the Secure Web Console access method
MP:CM> so or es	←	Enable/disable Secure Web Console SSL functionality
MP:CM> cg	←	Generate SSL certificates
MP:CM> xd	←	Reset the MP to make changes take effect

Now point your browser to <https://server-MP.hp.com>!

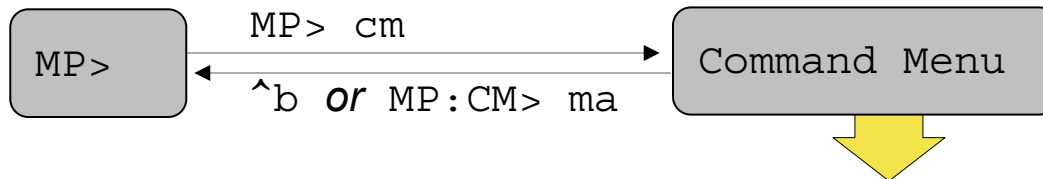
Managing the MP Serial Port

- Several other commands are available for configuring the serial and modem ports



Managing MP Logins

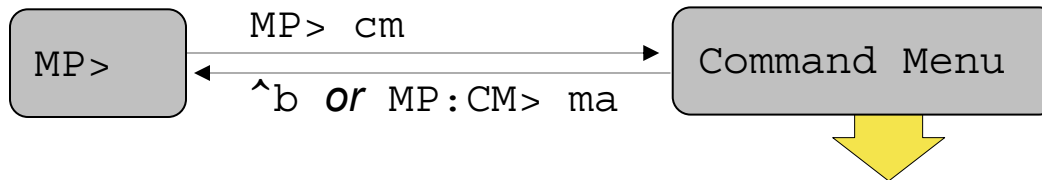
- Several other commands are available for managing MP logins and accounts



MP:CM> so	←	Modify login timeout values and settings
MP:CM> so <i>or</i> uc	←	Create/modify/remove MP user accounts
MP:CM> who	←	Determine which users are currently logged into the MP
MP:CM> te	←	Send (tell) a message to other logged in MP users
MP:CM> di	←	Terminate all current remote logins
MP:CM> dc	←	Reset the MP configuration to the factory defaults

Configuring MP User Accounts

- Two MP user accounts are predefined: Admin/Admin and Oper/Oper
- Predefined account passwords should be changed as soon as possible
- Additional MP user accounts may be created via the `so` or `uc` commands
- If any account is no longer needed, disable it

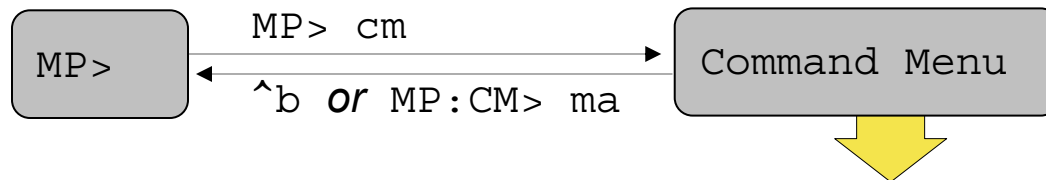


```

MP:CM> uc
Current users:
      LOGIN  USER NAME      ACCESS  PART.  STATUS
1   Admin   Administrator  Admin
2   Oper    Operator       Operator
1 to 2 to edit, A to add, D to delete, Q to quit :
  
```

Rebooting via the MP

- To do a proper shutdown, access the console interface and type shutdown/reboot
- A hung partition may be reset or power-cycled via special commands at the MP
- The MP remains accessible throughout all of these procedures



MP:CM> rs	←	Reset
MP:CM> tc	←	Crash dump, then reset
MP:CM> pc or pe	←	Power system up or down (MP access is retained)
MP:CM> ps	←	View power status of system components

Lab activity





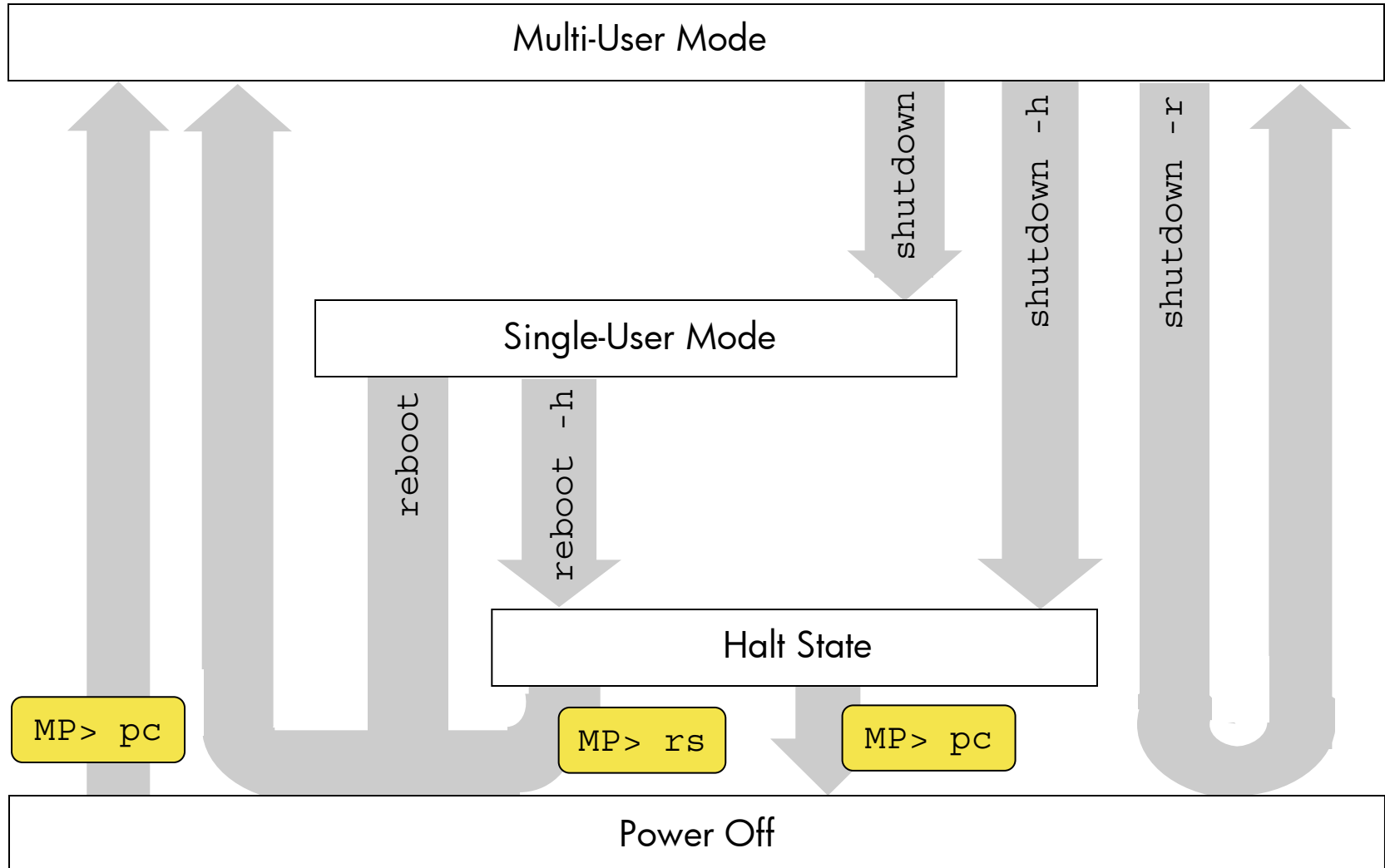


Booting PA-RISC Systems

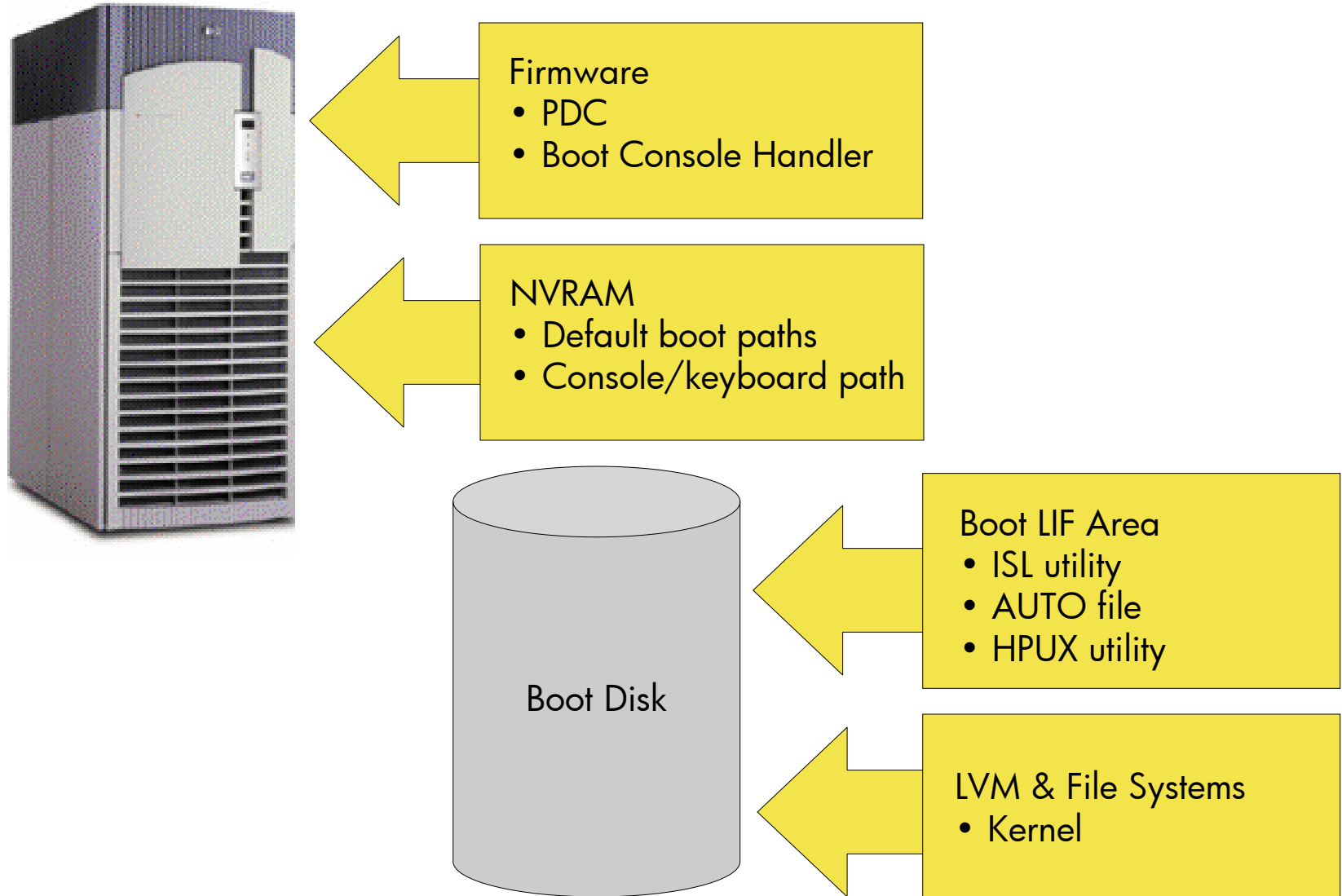
Module 16
H3064S F.00



HP-UX Shutdown and Reboot

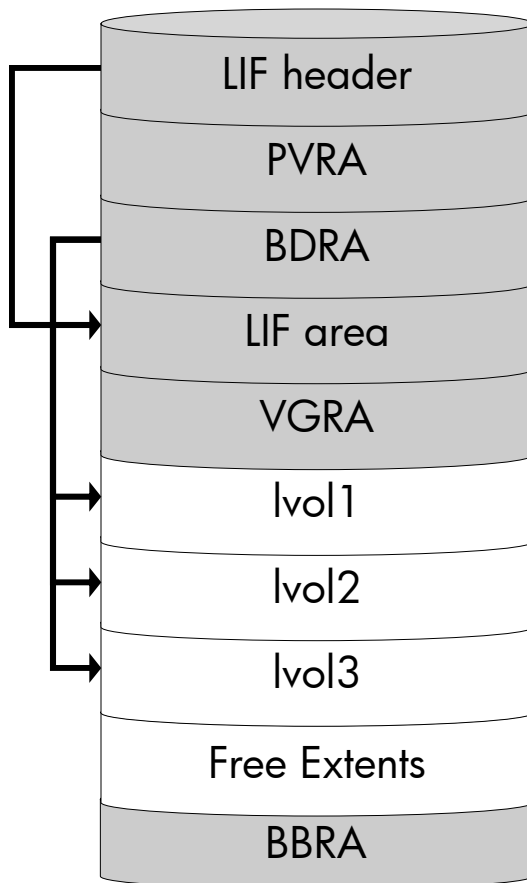


PA-RISC Boot Process Major Players



PA-RISC Boot Disk Structures

In order to serve as an HP-UX boot disk, a disk must have several structures in addition to the PVRA/VGRA structures normally found on non-boot physical volumes



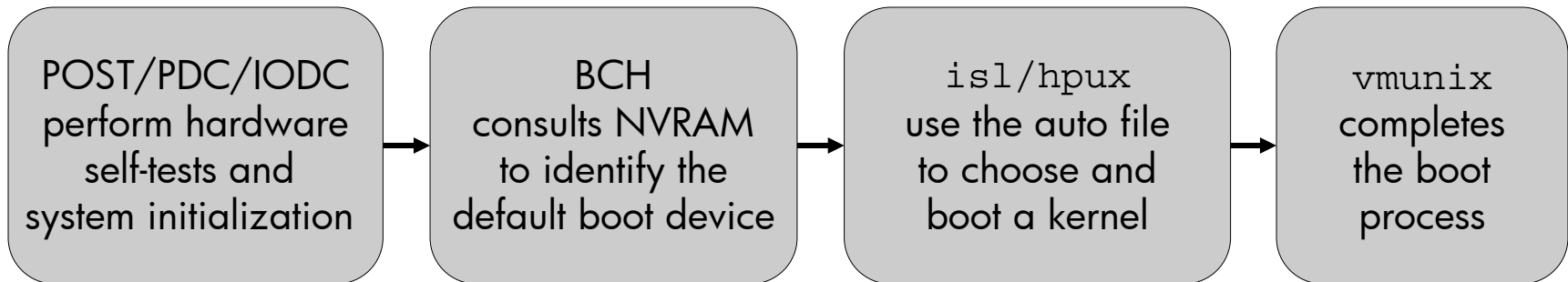
- LIF Hdr: Contains pointers to the LIF area
- PVRA: Records structural information about this PV
- BDRA: Contains pointers to /stand, swap, and /
- LIF: Contains ISL, AUTO, and HP-UX boot utilities & files
- VGRA: Records structural information about this VG
- /stand: HFS file system containing /stand/vmunix
- Swap: Primary swap, used during the boot process
- /: VxFS file system containing /, /sbin, /etc, /dev
- Extents: Free PEs available for allocation to other LVs
- BBRA: Space reserved for bad block relocation

PA-RISC Boot Process Overview

There are several steps in the PARISC boot process.

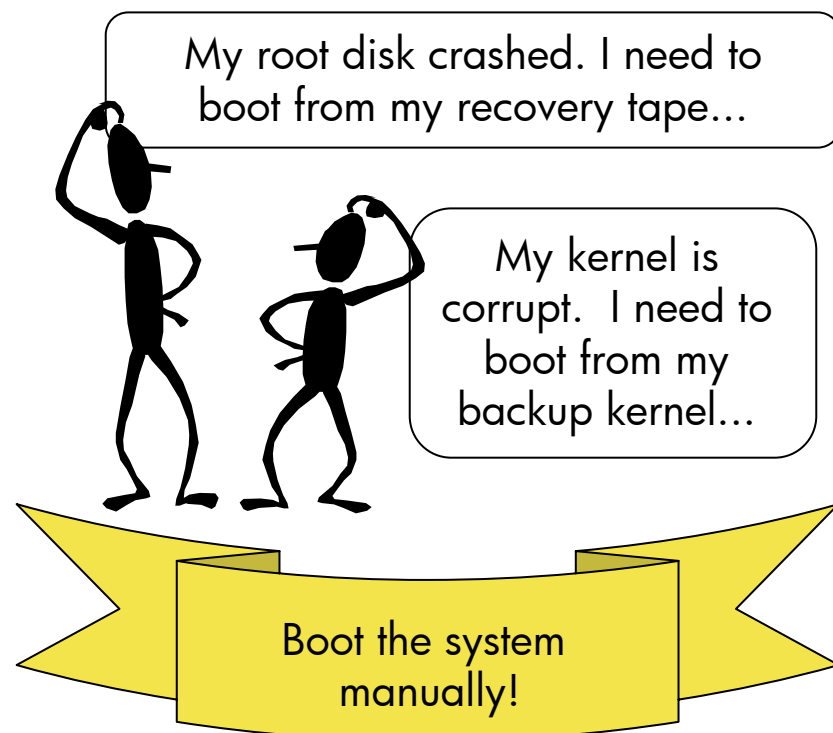
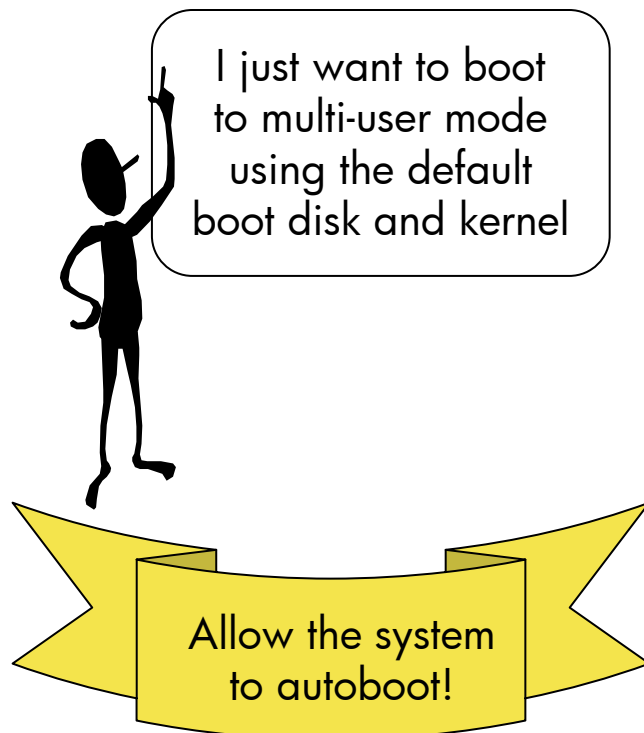
At each step, the administrator has an opportunity to interact with the boot process.

PARISC boot process



Autoboot versus Manual Boot

- Normally, we allow HPUX to “autoboot” without administrator interaction
- In some situations, though, it may be preferable to “manually” boot the system



Interacting with the BCH

By default, the BCH boots the primary boot disk recorded in NVRAM.
To interrupt the autoboot so you can interact with the BCH, press the Escape key

POST/PDC/IODC

BCH

```
> help                # view help menu
> in all              # view system information
> search              # list all possible boot devices
> search ipl          # list all devices containing an IPL
> path                # display contents of stable storage
> path pri x/x.x.x    # make x/x.x.x the primary boot path
> path haa x/x.x.x    # make x/x.x.x the HA alternate path
> path alt x/x.x.x    # make x/x.x.x the alternate path
> boot pri            # boot from the primary boot path
> boot haa            # boot from the HA alt boot path
> boot alt            # boot from the alt boot path
> boot x/x.x.x        # boot from an arbitrary device
> boot lan.x.x.x.x install # boot from Ignite server at IP x.x.x.x
> reset              # reset the system
```

Interacting with the ISL/IPL

If you want to boot from a non-default kernel, or to a non-default mode, use the BCH `bo` command to choose a boot device, then enter “yes” when asked if you wish to interact with the ISL/IPL.

POST/PDC/IODC

BCH

interact w/ IPL? yes

```
ISL> hpux show autofile      # display the AUTO file
ISL> hpux ls                  # list contents of /stand
ISL> hpux                     # boot from default kernel
ISL> hpux -is                 # boot to single-user mode
ISL> hpux -lq                  # boot without LVM quorum
ISL> hpux -lm                  # boot to LVM maintenance mode
ISL> hpux /stand/vmunix.prev  # boot an alternate kernel
ISL> exit
```


Lab activity





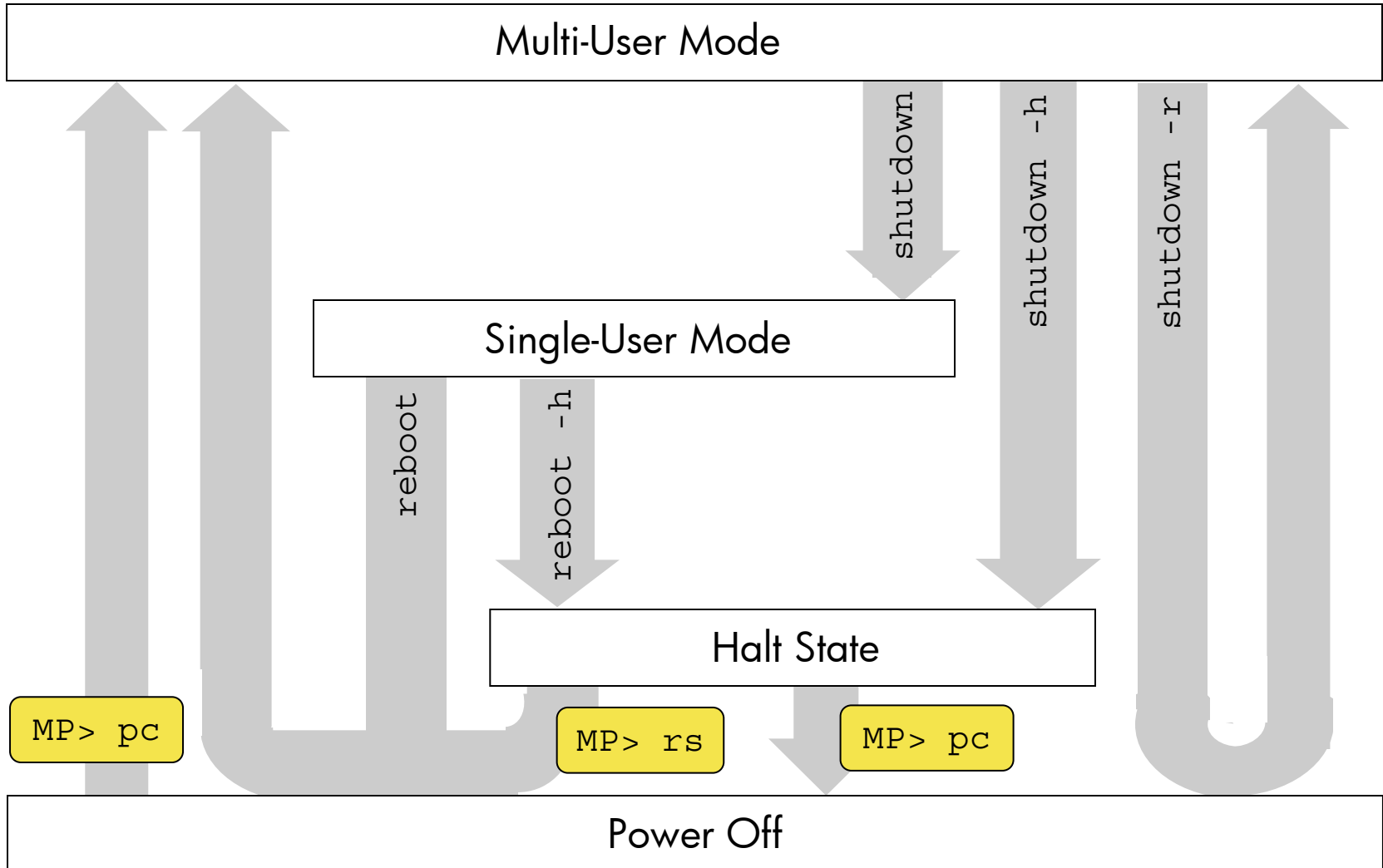


Booting Integrity Systems

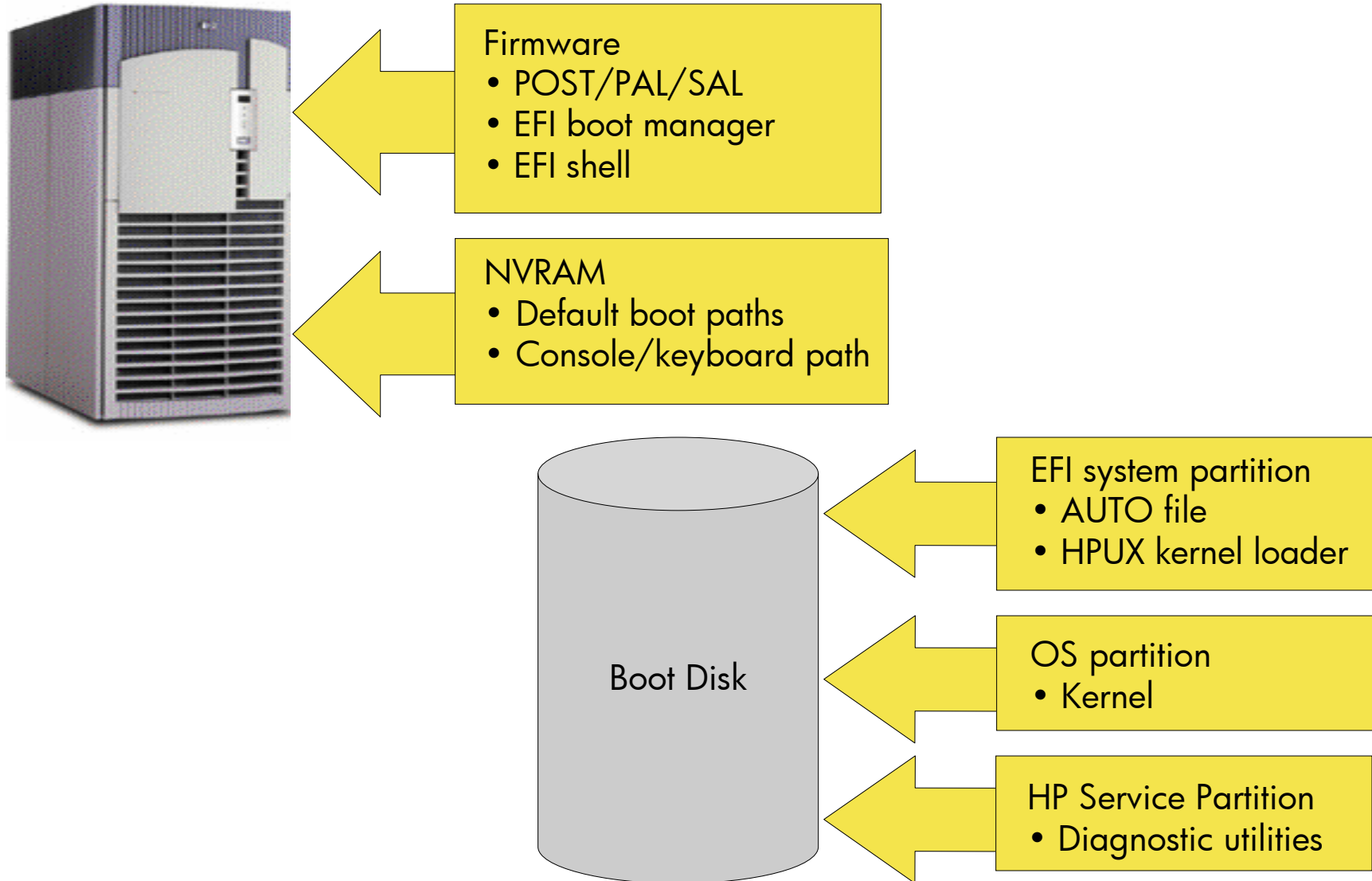
Module 17
H3064S F.00



HP-UX Shutdown and Reboot

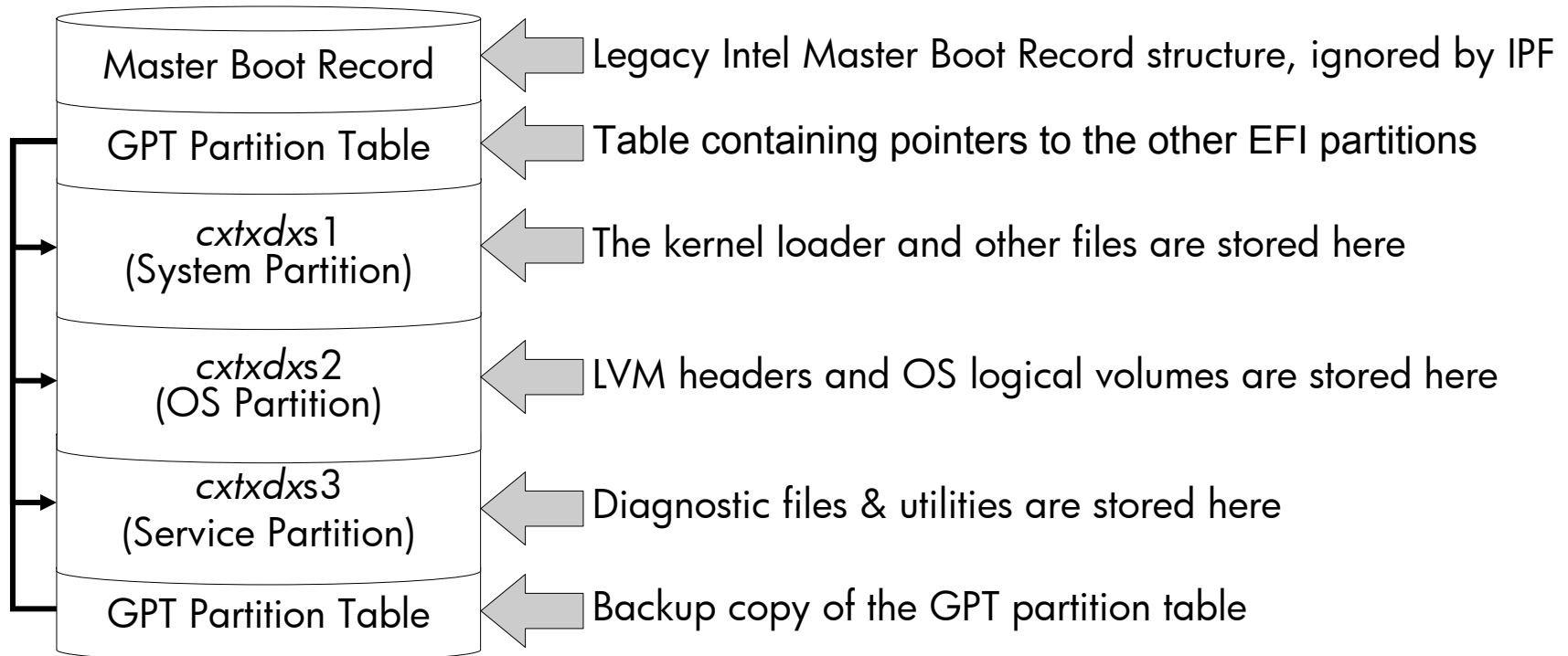


Integrity Boot Process Major Players



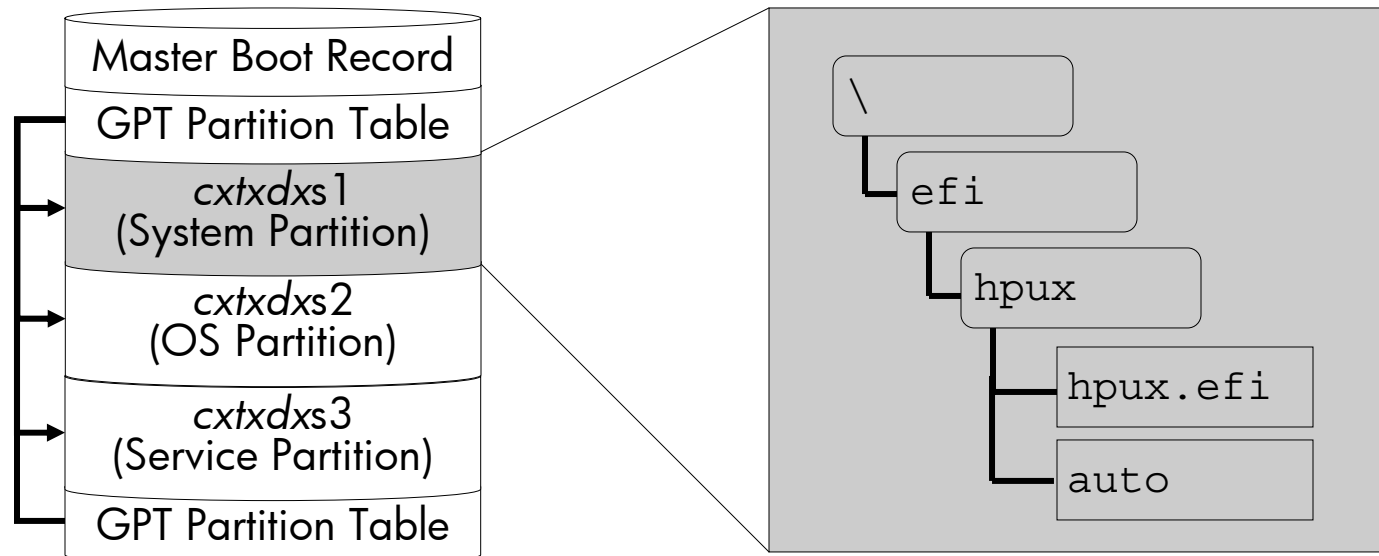
Integrity Boot Disk Structures

- Integrity boot disks may be subdivided into one or more EFI disk partitions
- These partitions may be configured via Ignite-UX or the HP-UX idisk utility
- HP-UX boot disks typically have three EFI partitions, and several supporting structures



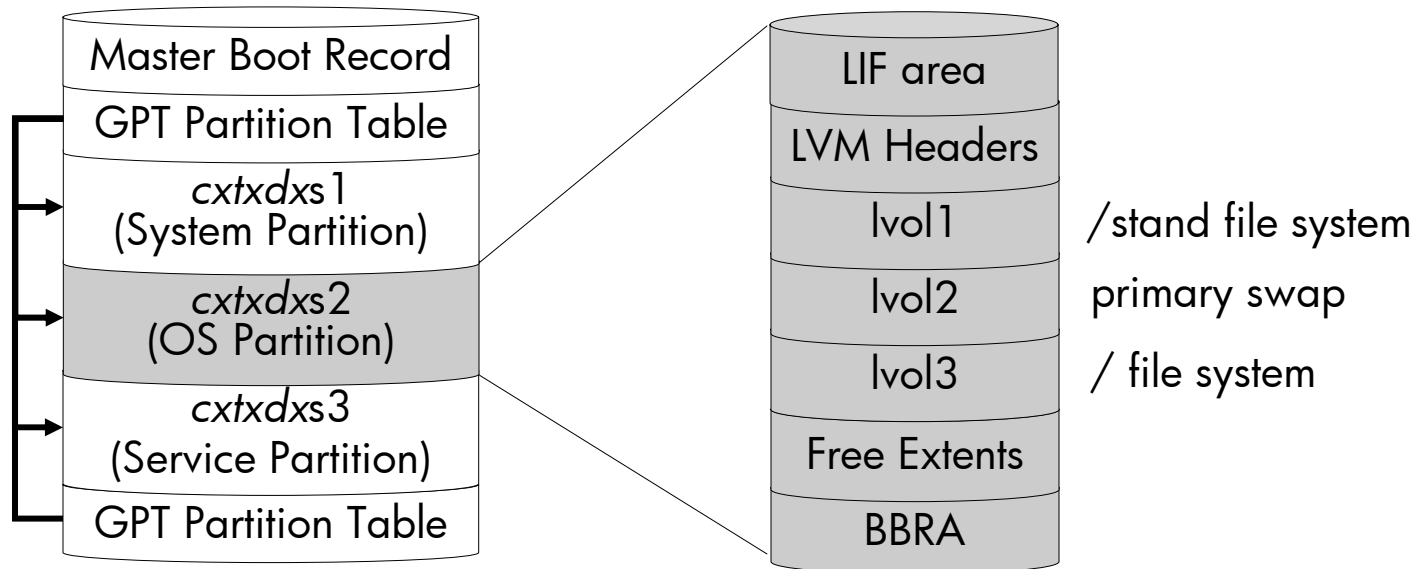
Integrity Boot Disk System Partition Structure

- Every IPF boot disk has an EFI system partition
- The system partition typically contains a FAT32 file system
- This file system contains two key files (and several other supporting files):
 - `\efi\hpx\auto`, a text file which determines the kernel boot string
 - `\efi\hpx\hpx.efi`, an executable which loads the kernel in memory



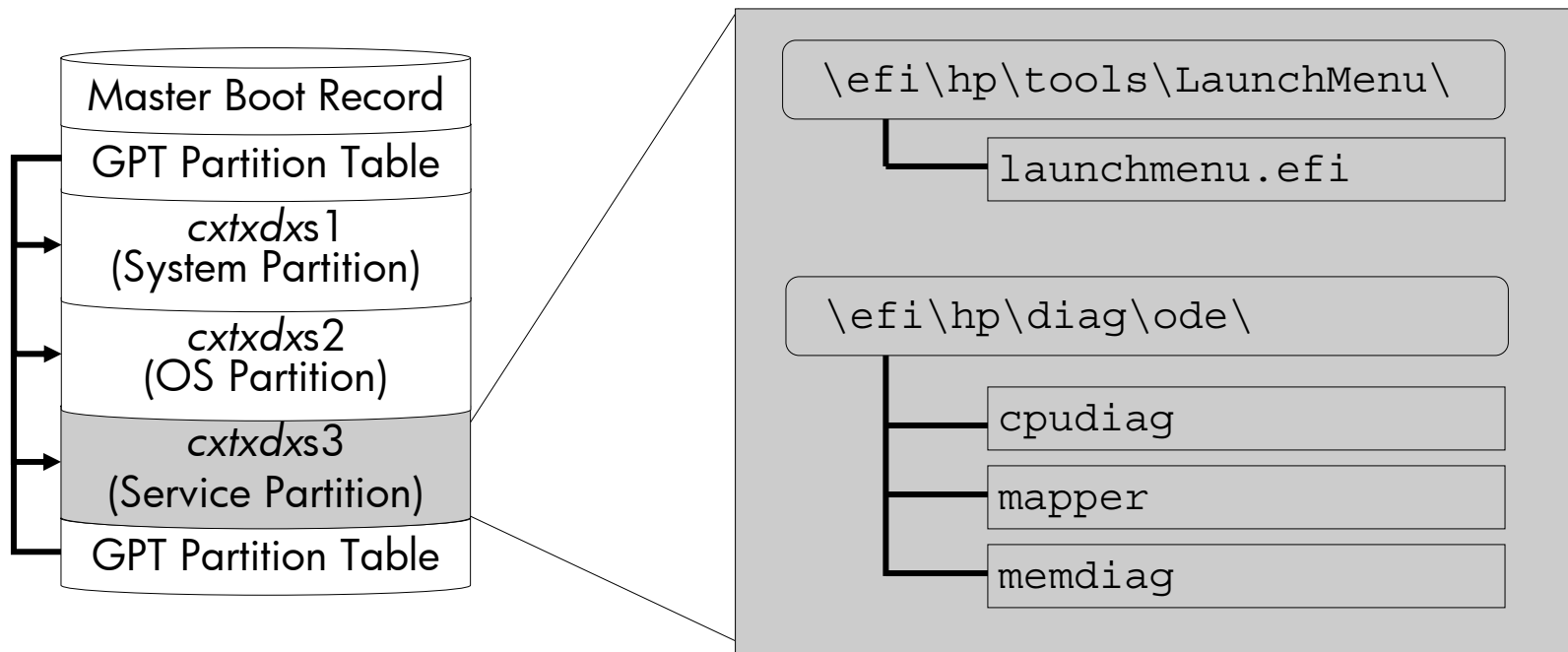
Integrity Boot Disk OS Partition Structure

- Every IPF boot disk has an operating system partition
- The HP-UX OS partition contains the LVM headers and OS logical volumes



Integrity Boot Disk HPSP Structure

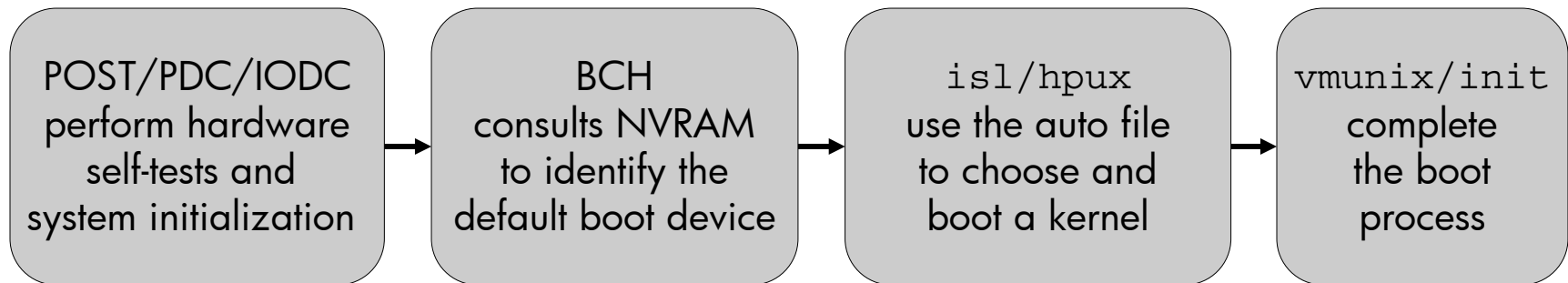
- An HP-UX boot disk may optionally contain a HP Service Partition (HPSP)
- The HPSP typically contains a 400MB FAT32 file system
- Diagnostic utilities may be stored in this partition



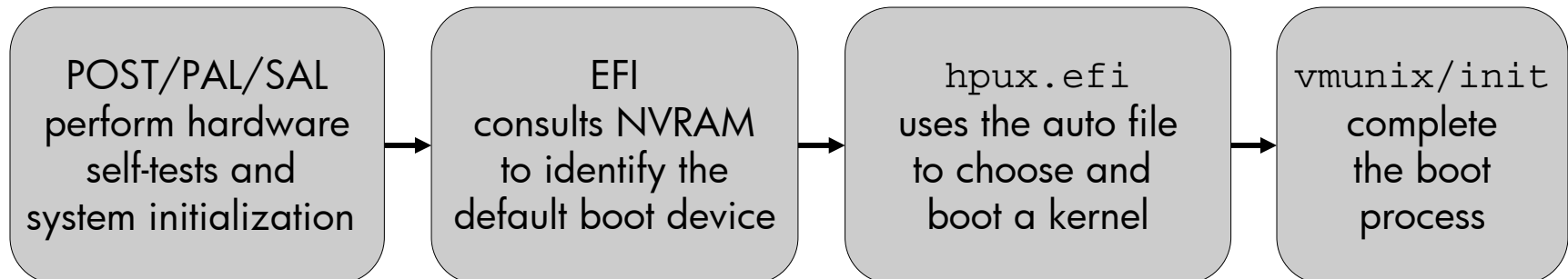
PARISC/Integrity Boot Process Comparison

At a high level, the Integrity boot process is similar to the PARISC boot process

PARISC boot process

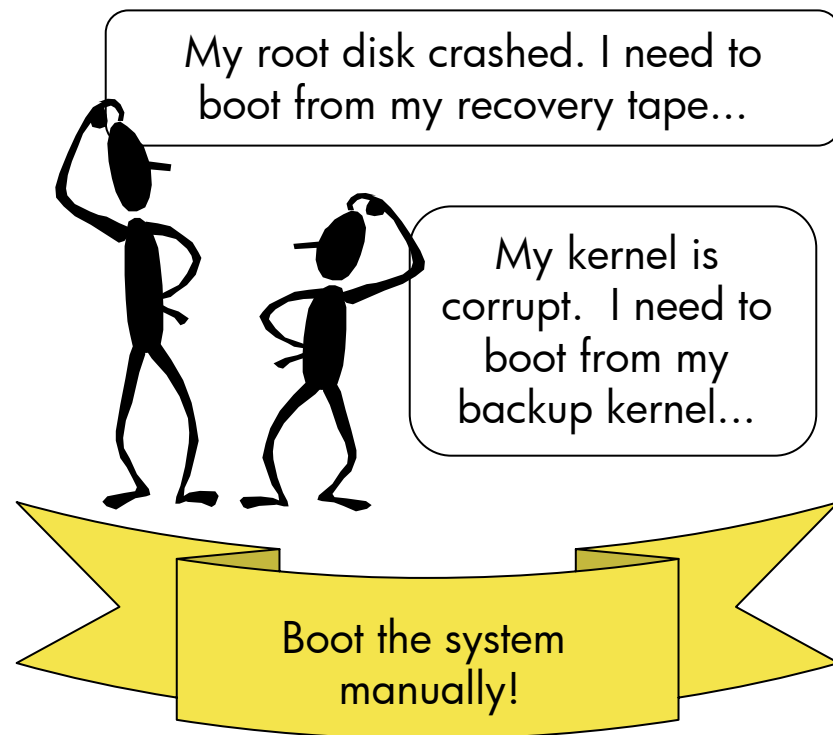
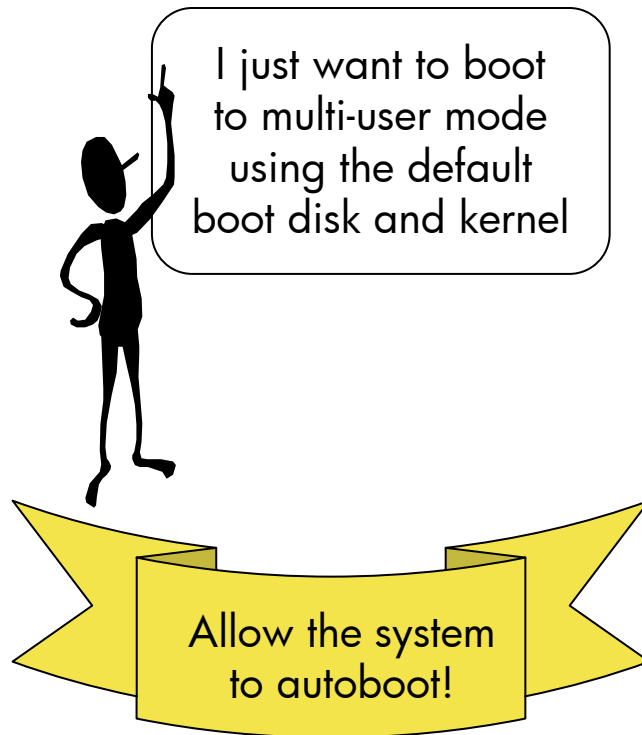


Integrity boot process



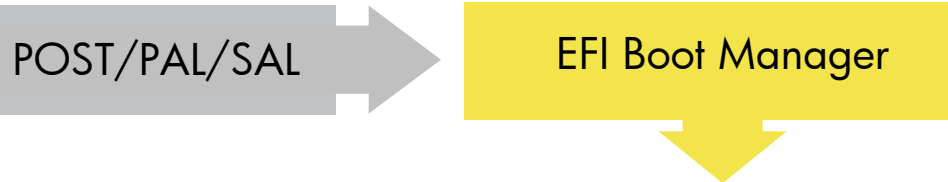
Autoboot versus Manual Boot

- Normally, we allow HPUX to “autoboot” without administrator interaction
- In some situations, though, it may be preferable to “manually” boot the system



Interacting with the EFI Boot Manager

- By default, the EFI boot manager boots the first device in the NVRAM-based boot menu
- If you wish, you can use the arrow keys to select an alternate boot device



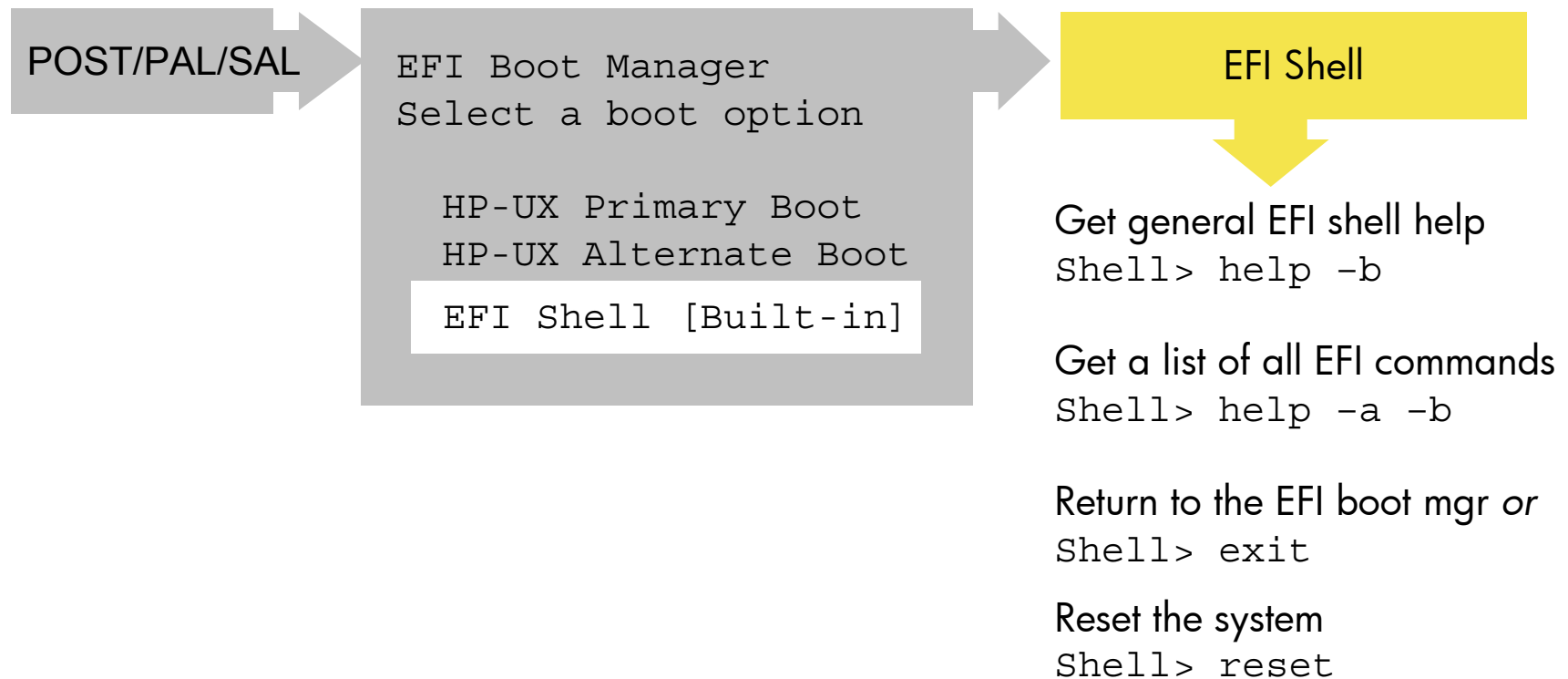
```
EFI Boot Manager ver 1.10 [14.60]  Firmware ver 1.61 [4241]
Please select a boot option
```

```
HP-UX Primary Boot
HP-UX Alternate Boot
EFI Shell [Built-in]
Boot option maintenance menu
```

```
Use ^ and v to change option(s). Use Enter to select an option
Default boot selection will be booted in 10 seconds
```

Interacting with the EFI Shell

- The EFI shell provides an opportunity to interact with and customize the boot process
- You can access the EFI shell via the boot manager EFI Shell menu option
- You can return to the boot manager or reboot by typing exit or reset



Viewing System Information via the EFI Shell



From the EFI shell, you can view your system configuration

Shell> info sys	model string, product number, serial number, etc.
Shell> info boot	boot and self-test settings, MAC addresses
Shell> info fw	firmware revisions
Shell> info spu	CPU quantity and type
Shell> info mem	DIMM quantity and type
Shell> info cache	cache quantity and type
Shell> info -b all	all available information
Shell> lanaddress	MAC address information
Shell> time	system time
Shell> date	system date
Shell> map -b -r -fs	view potential boot devices

Managing EFI File Systems via the EFI

The EFI provides a rich set of commands for managing files on the EFI system partition.

You can use these commands to edit the auto file, or to find an OS loader on the EFI partition.

EFI file system commands are based on traditional UNIX and DOS file commands.

Note that EFI file systems use DOS backslashes rather than UNIX forward slashes!

Select an EFI device containing a FAT32 file system

```
Shell> map -r
```

```
Shell> fsn:
```

Use `cd` change to a different directory

```
fsn:\> cd \efi\hpx
```

Use `cd` without arguments to determine the current directory

```
fsn:\> cd
```

Use `ls` or `dir` to list the contents of a directory

```
fsn:\> ls -b
```

Use `type` or `cat` to view the contents of a file

```
fsn:\> cat -b \efi\hpx\auto
```

Use `mkdir` or `md` to create directories

```
fsn:\> mkdir \efi\hpx\backup
```

Use `cp` or `copy` to copy a file

```
fsn:\> cp \efi\hpx\auto \efi\hpx\backup\
```

Use `edit` to edit a file

```
fsn:\> edit \efi\hpx\auto
```

To execute an EFI program, just type its full pathname

```
fsn:\> fsn:\efi\hpx\hpx.efi
```

Managing the EFI Boot Menu via the EFI Shell



From the EFI shell, you can customize the EFI boot menu via the `bcfg` command

View available devices

```
Shell> map -b -r -fs
```

Define the primary, high availability alternate, and alternate boot devices

```
Shell> bcfg boot add 1 fsn:\efi\hpux\hpux.efi "HP-UX Pri Boot"
```

```
Shell> bcfg boot add 2 fsn:\efi\hpux\hpux.efi "HP-UX HA Alt Boot"
```

```
Shell> bcfg boot add 3 fsn:\install.efi "HP-UX Alternate"
```

Remove the third item from the boot menu

```
Shell> bcfg boot rm 3
```

View the resulting boot menu

```
Shell> bcfg boot dump
```

Enable or disable the EFI autoboot feature

```
Shell> autoboot on|off|10
```


Booting an Arbitrary Device via the EFI Shell



From the EFI shell, you can boot from a variety of boot sources

View available devices, and identify your desired boot device

```
Shell> map -b -r -fs
```

Run the hpux.efi kernel loader from an alternate boot disk

```
Shell> fsn:\efi\hpux\hpux.efi
```

Run the diagnostics utility from the disk-based HPSP partition, or from the diagnostics CD

```
Shell> fsn:\efi\hp\tools\launchmenu\launchmenu.efi
```

Run the Ignite-UX install utility from the install DVD

```
Shell> fsn:\install.efi
```

Run the Ignite-UX install utility from an Ignite-UX server:

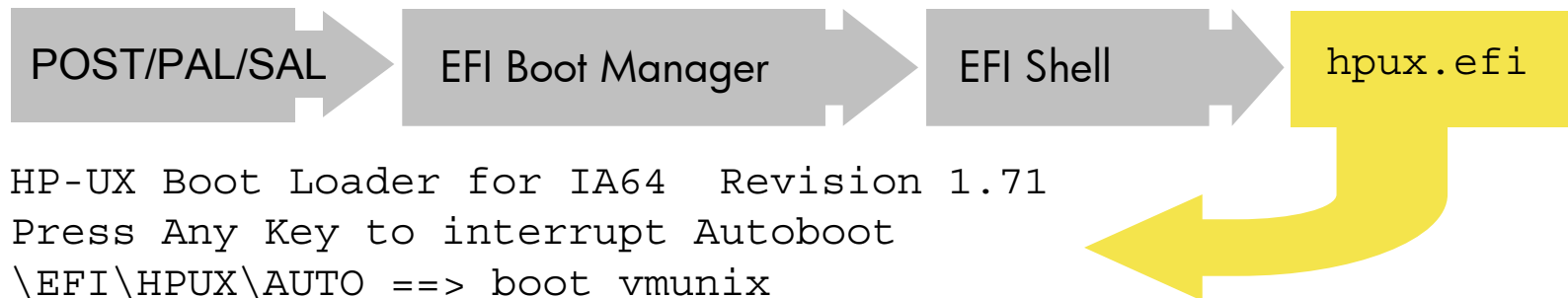
```
Shell> lanboot select
01  Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E1E7EE0)
02  Acpi(HWP0002,100)/Pci(2|0)/Mac(00306E1E9EA9)
Select Desired LAN: 1
```

Run the Ignite-UX recovery interface from a recovery tape (must boot from DVD first!)

```
Shell> fsn:\install.efi
```

Interacting with the hpux.efi OS Loader

From the hpux OS loader, you can select an alternate kernel or mode



```

HP-UX Boot Loader for IA64  Revision 1.71
Press Any Key to interrupt Autoboot
\EFI\HPUX\AUTO ==> boot vmunix
Seconds left till autoboot - 10
  
```

```

HPUX> help -d
HPUX> ll
HPUX> showauto
HPUX> setauto "boot vmunix"
HPUX> boot vmunix -v
HPUX> boot vmunix -is
HPUX> boot vmunix -lq
HPUX> boot vmunix -lm
HPUX> exit or reset
  
```

Get help

List the contents of the /stand directory

Show the contents of the \efi\hpux\auto file

Change the contents of the \efi\hpux\auto file

Boot vmunix to multi-user mode

Boot to single-user mode

Boot without checking quorum

Boot to LVM maintenance mode

Exit boot loader or reset

For Further Study

- Intel offers a number of free and for-fee EFI related courses. Look for the Extensible Firmware Interface course section on <https://shale.intel.com/SoftwareCollege/CourseCatalog.asp>
- Read the EFI shell documentation at http://www.intel.com/software/products/college/efishell/images/efi_shell_cmnd_1_1.pdf
- HP's *HP System Partitions Guide* on <http://docs.hp.com> includes a chapter on booting and resetting partitions on both HP-UX 11iv1 and HP-UX 11iv2
- For HP-UX command syntax descriptions and options, see the HP-UX online man pages.
- For EFI command syntax descriptions and options, access the EFI help screens by typing `help` at the `Shell>` prompt
- To learn more about the HP Service Partition visit: http://docs.hp.com/hpux/onlinedocs/diag/ode/ode_eddiag.htm

Lab activity







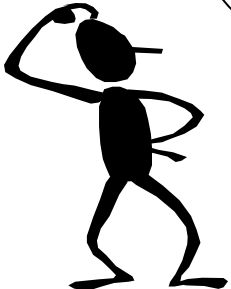
Configuring the HP-UX 11i v2 Kernel

Module 18
H3064S F.00



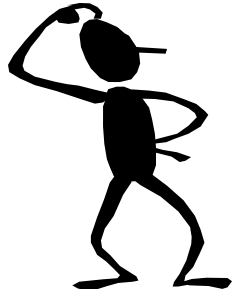
Why Reconfigure the Kernel?

Tuning the HP-UX kernel allows you to customize your kernel configuration to meet the needs of the devices, applications, and users on your system.



Q: `ioscan` says that my new Fibre Channel interface card is UNCLAIMED. What should I do?

A: Add a fibre channel driver module!



Q: My database needs access to more shared memory segments. What should I do?

A: Tune a kernel parameter!

Choosing a Kernel Configuration Interface

HP-UX offers several different interfaces for configuring 11i v2 kernels

Interface	Advantages	Disadvantages
kc* CLI	• Accessible via any terminal login • Scriptable • Use to manage <i>any</i> config	• Less intuitive than a GUI/TUI
kcweb TUI	• Accessible via any terminal login • Fairly intuitive	• Not scriptable • Only manages the “current” config
kcweb GUI	• Accessible remotely via the web • Very intuitive	• Possible firewall/security issues • Not scriptable • Only manages the “current” config

Using the `kc*` CLI Interface

HP-UX provides several commands for configuring & managing the kernel.
This course will focus on the web-based configuration utility, `kcweb`.

Command	Purpose
<code>kcweb</code>	web-based configuration tool
<code>kconfig</code>	command-line tool for managing kernel configurations
<code>kcpath</code>	command-line tool for determining the current kernel path
<code>kcmodule</code>	command-line tool for managing kernel modules
<code>kctune</code>	command-line tool for managing tunable parameters
<code>kcusage</code>	command-line tool for monitoring resource usage
<code>kcalarm</code>	command-line tool for setting kernel tunable parameter alarms
<code>kclog</code>	command-line tool for viewing the kernel configuration log

Using the **kcweb** TUI Interface

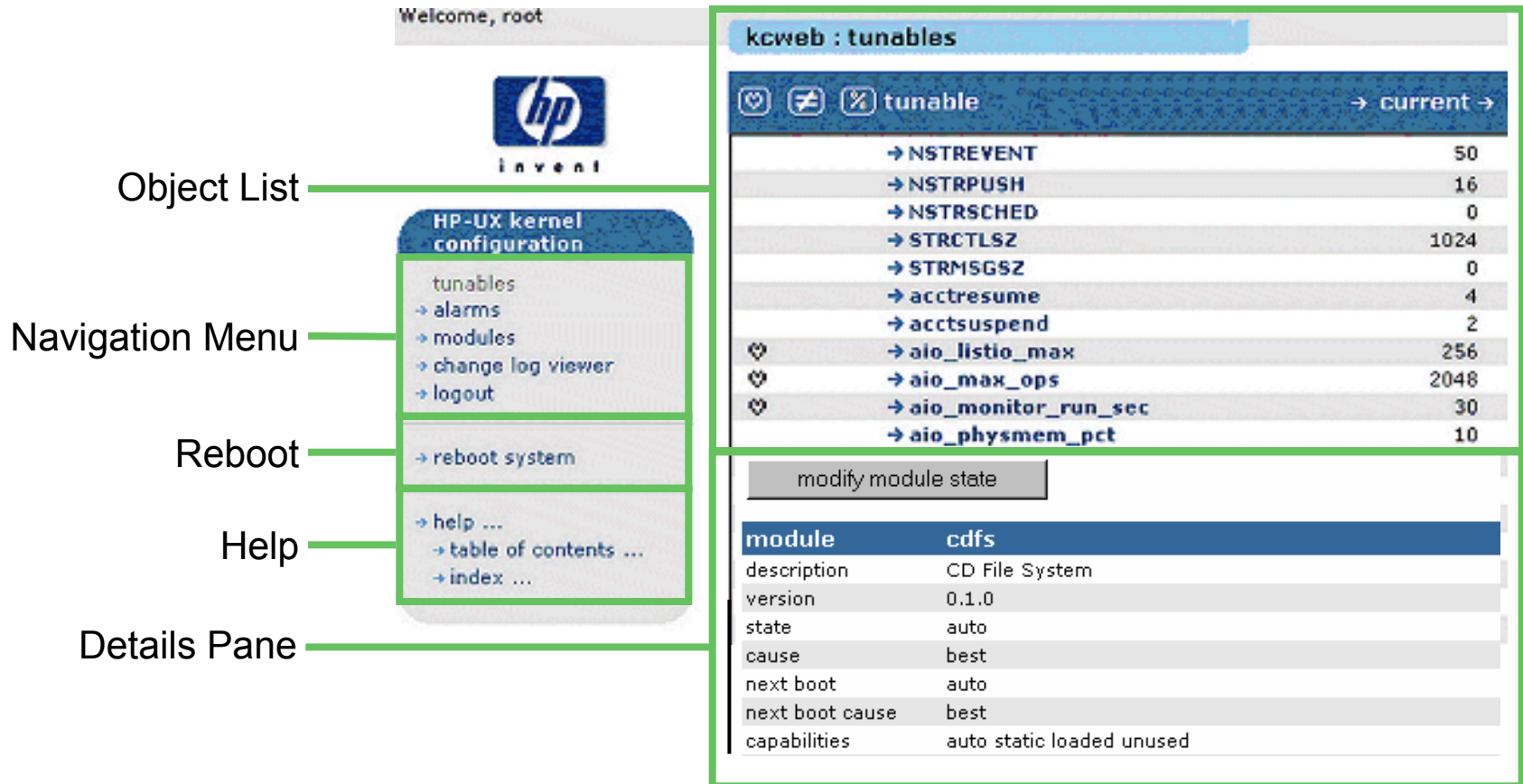
kcweb is a new menu-based TUI interface that may be used to configure modules and tunables in the currently running kernel

```
# kcweb -t or sam->Kernel Configuration
```

```
SAM -> Kernel Configuration -> Tunables ( All )
-----
Tunable          Current      Planned      Dynamic      Auto Tuning
                  Value        Value
=====
nfile             65536        16384        yes           Supported
nflocks           4096         1200         yes           Supported
nproc             4200         4200         yes
-----
ENTER-Detail    m-Modify     p-Pending    F2-kctune Manpage
ESC-Go Up       d-Dynamic    F1-Help      F3-Tunable ManPage
/-Search
```

Using the **kcweb** GUI Interface

If you have HTTPS or X-Window connectivity to your HP-UX 11i v2 server, kcweb may be accessed via an intuitive web GUI, too.



The screenshot shows the **kcweb : tunables** interface. On the left, a navigation menu is visible with the following items:

- HP-UX kernel configuration
 - tunables
 - alarms
 - modules
 - change log viewer
 - logout
- reboot system
- help ...
 - table of contents ...
 - index ...

Labels on the left side of the image point to specific parts of the interface:

- Object List** points to the HP logo and 'invent' text.
- Navigation Menu** points to the 'HP-UX kernel configuration' section.
- Reboot** points to the '→ reboot system' link.
- Help** points to the '→ help ...' link.
- Details Pane** points to the 'kcweb : tunables' section.

The main content area, titled **kcweb : tunables**, displays a table of tunable parameters:

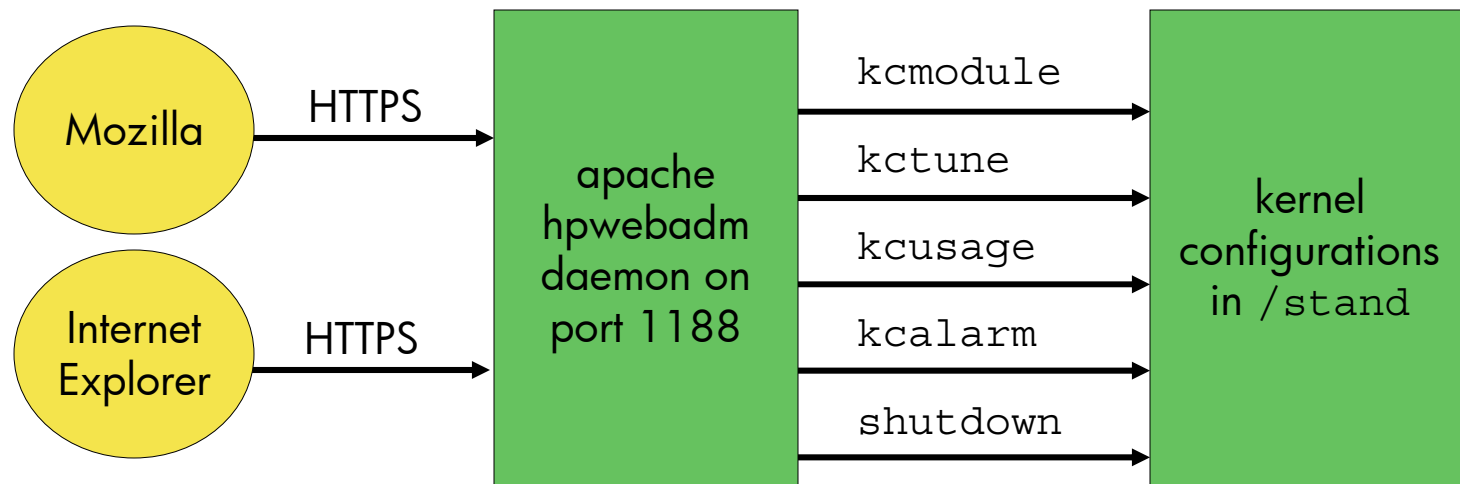
tunable	current
→ NSTREVENT	50
→ NSTRPUSH	16
→ NSTRSCHED	0
→ STRCTL5Z	1024
→ STRMSGSZ	0
→ acctresume	4
→ acctsuspend	2
→ aio_listio_max	256
→ aio_max_ops	2048
→ aio_monitor_run_sec	30
→ aio_physmem_pct	10

Below the table, there is a section titled **modify module state** with a table of module details:

module	cdfs
description	CD File System
version	0.1.0
state	auto
cause	best
next boot	auto
next boot cause	best
capabilities	auto static loaded unused

Understanding the **kcweb** Architecture

- kcweb provides an Apache-based, SSL protected, web interface for managing kernel configurations from any supported web browser
- The web interface calls command-line utilities to make the requested changes to the current kernel configuration



Using **kcweb** via a Local Browser

To manage kernel configurations on your localhost, simply set your `DISPLAY` and `BROWSER` variables, and run `kcweb`. `kcweb` will:

- Create SSL server certificates if needed
- Launch the Apache/administration server if it isn't already running
- Launch a web browser

Verify that your `DISPLAY` variable is set

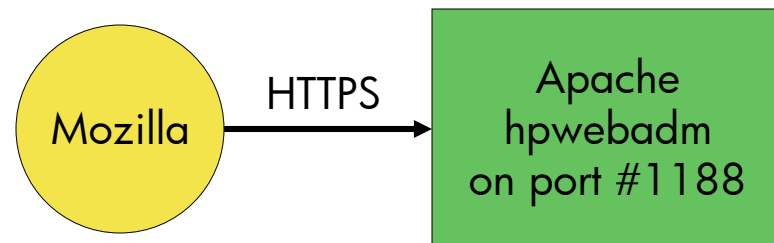
```
# echo $DISPLAY
```

Verify that your `BROWSER` variable is set

```
# export BROWSER=/opt/mozilla/mozilla
```

Run `kcweb` and enter the root username and password when prompted

```
# kcweb [-F] &
```



Using **kcweb** via a Remote Browser

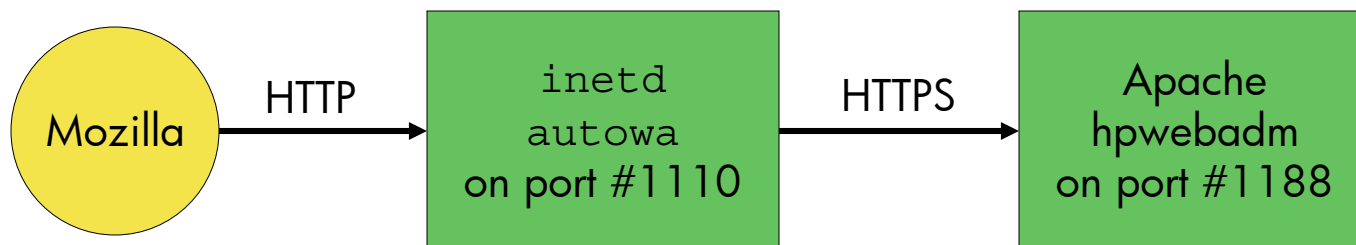
If you typically access the kcweb functionality from a remote browser, save yourself the hassle of manually starting the server daemons by enabling kcweb autostart functionality in `/etc/inetd.conf`.

Enable/disable autostart functionality for Apache/hpwebadm daemon

```
server# waconf -a on|off  
server# netstat -an | grep 1110  
tcp 0 0 *.1110 *.* LISTEN
```

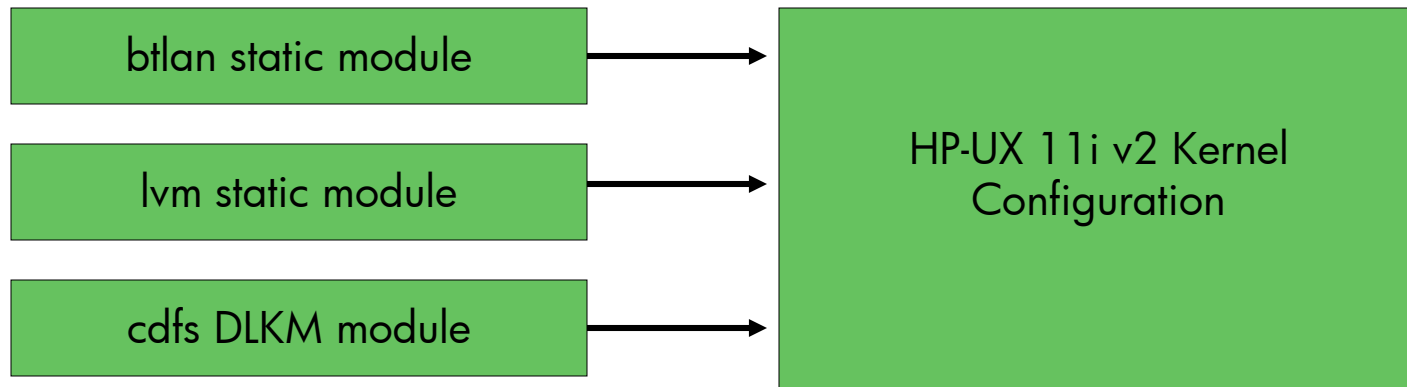
Launch a web browser and enter the root username/password when prompted

```
client$ mozilla http://server:1110/casey/top.cgi
```



Kernel Modules

- Every kernel includes multiple kernel modules
- A kernel module is a device driver, kernel subsystem, or some other body of kernel code
- Kernel modules must be linked or loaded into the HP-UX kernel
 - An increasing number of kernel modules are “dynamically loadable” DLKMs
 - Some kernel modules still must be “statically” linked into the kernel



Kernel Module States

- A module's state determines if/when the module will be accessible on the system
- HP-UX 11i v2 recognizes five different module states

State	Description
unused	The module isn't included in the kernel configuration
static	The module is statically bound into the <code>vmunix</code> kernel executable
auto	The module will be dynamically loaded into the kernel when needed
loaded	The module has been dynamically loaded into the kernel
best	The module is in the "best" state, as defined by the module developer

Kernel Module State Changes

- The system administrator can force a module state change via `kcmodule` or `kcweb`
- Sometimes, HP-UX may change a module's state automatically

Cause	Description
explicit	The system administrator explicitly chose the current state
best	The system administrator chose to use the module, but didn't choose a specific state, so the module is placed in its "best" state, as determined by the module developer
auto	The module was in the auto state, and was automatically loaded when something tried to use it (DLKMs only)
required	The module is required by the kernel
depend	The module is in use because some other module in the configuration depends on it

Viewing Module States via **kcweb**

The **kcweb** modules screen provides an easy way to view kernel module status.

Selecting a specific module displays more detailed information including:

- Module name
- Module description
- Current status & cause
- Nextboot status & cause
- Available states
- DLKM yes/no flag
- Required yes/no flag
- Dependencies

To change a module's state, click [modify module state] or 

module	→ state	→ next boot	→ version	
→ cachejsc	static	static	[3EAF7470]	
→ cb	static	static	[3EB75D70]	
→ ccio	unused	unused	[3EB75D70]	
☛ → cdfs	auto	auto	0.1.0	
→ cec_gen	static	static	[3EB75D70]	
→ cec_hp	static	static	[3EB75D70]	
→ cec_psm	static	static	[3EB75D70]	
→ cell	static	static	[3EB75D70]	
→ cifs	static	static	[3EAD8374]	
→ clone	static	static	[3EB75D70]	
→ cn	static	static	[3EB75D70]	
→ consp1	unused	unused	[3EB75D70]	
→ dev_acpi	static	static	[3EB75D70]	
→ dev_config	static	static	[3EB75D70]	
→ dev_olar	static	static	[3EB75D70]	
→ devkrs	static	static	[3EB75D70]	

modify module state

module	cdfs
description	CD File System
version	0.1.0
state	auto
cause	best
next boot	auto
next boot cause	best
capabilities	auto static loaded unused
dynamic	Yes ☛
required	No
dependencies	interface HPUX_11_23:1.0

Managing Module States via kcweb

kcweb also makes it possible to change a module's state.

Specify the desired state here

Make the change now, or after the next boot?

Backup the current configuration first?

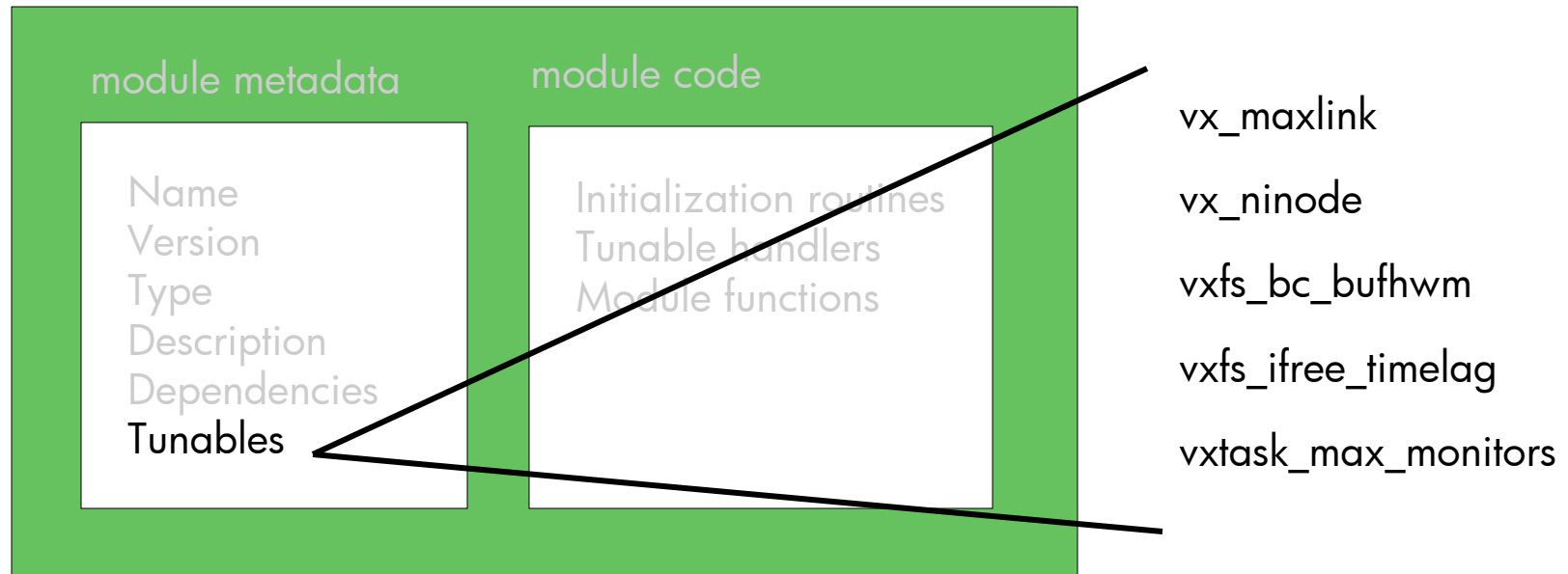
Record a comment in the kernel log?

module	cdfs
description	CD File System
version	0.1.0
state	auto
cause	best
next boot	☐ unused ☐ static ☐ auto ☐ loaded
capabilities	auto static loaded unused
dynamic	Yes
dependencies	interface HPUX_11_23:1.0
mode of change	☐ change immediately ☒ change at next boot
	☒ back up the current configuration before applying change
reason for change	
ok ?	cancel help...

Kernel Tunables

- Each kernel module may contain one or more tunable parameters
- Many parameters can be modified dynamically
- Some parameters can only be modified by rebooting

vxfs kernel module



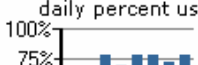
Types of Tunables

HP-UX 11i v2 supports five different types of tunable parameters

Type	Description
Static	Changes require re-linking, and rebooting
Dynamic	Changes may be applied immediately
Private	Tunables are hidden from listings, but may be tuned
Automatic	Default values are set automatically at boot time, but can be overridden by the administrator
User-Defined	May be used as variables in other tunables' formulas

Selecting a specific parameter also reports a history of the parameter's past usage at bottom right.

tunable	max_thread_proc
description	Maximum number of threads in each process
module	pm
current	256
next boot (expression)	256
next boot (integer)	Default
last boot value	256
default	256
legal range	> 64
present usage	159 (62.1%)
dynamic	Yes 
auto tune status	Not supported



daily percent usage

04/01/03 - 04/08/03

top consumers of max_thread_proc		
usage	id	name
159	43	vxfsd
21	1701	dced
19	14526	dbsnmp
19	18939	mxagent
14	1908	swagentd

Managing Tunables via **kcweb**

kcweb also makes it easy to change a tunable parameter

Specify the desired value here, or click recalculate

if it's a dynamic tunable, specify when the change should be applied

backup the current config before making changes?

optionally record a comment in the kernel log

tunable	dbc_max_pct
description	Maximum percentage of memory to be used for caching file I/O data and metadata
module	fs
current	50
next boot (expression)	65 default
next boot (integer)	Default recalculate
last boot value	50
default	50
legal range	1...90
dynamic	Yes
auto tune status	Not supported
mode of change	☒ change immediately ☐ change at next boot
	☒ back up the current configuration before applying change
reason for change	Running more data crunching apps this week.
ok cancel man page... help...	

command preview

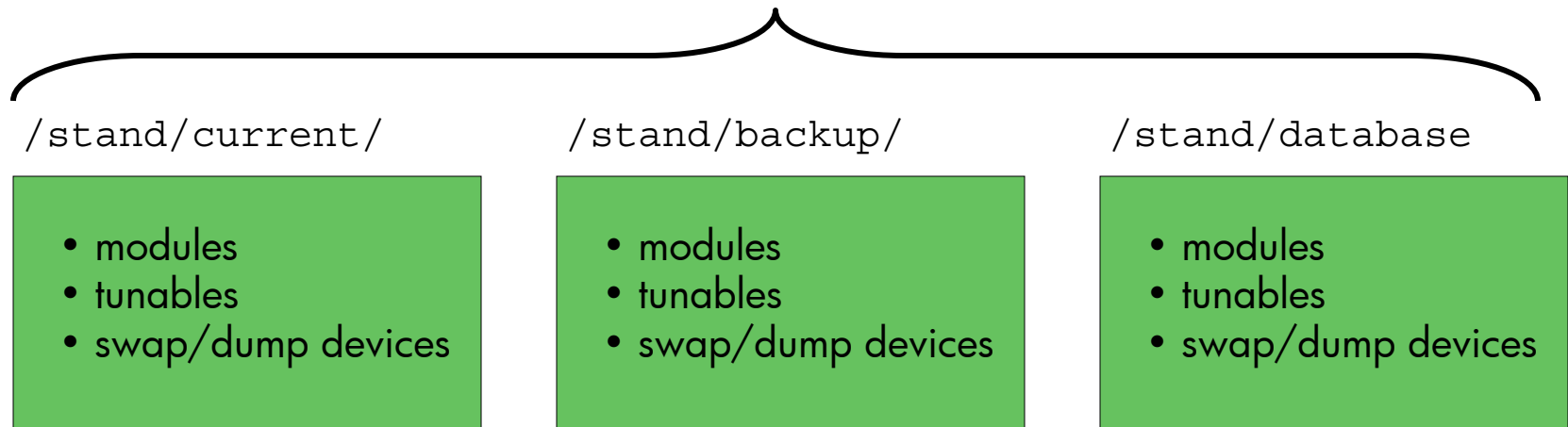
```
/opt/hpwebadmin/htdocs/casey/kctune -s -C "Running more data crunching apps this week." -B "dbc_max_pct=65"
```

Kernel Configurations

An HP-UX system may have one or more kernel configurations

- Each configuration contains a collection of modules, tunables, and other settings
- Each configuration is assigned a name and is stored in a subdirectory under `/stand`
- Configurations can be applied, tuned, exported, and imported as a unit

Sample Kernel Configurations



Special Kernel Configurations

HP-UX automatically maintains several special kernel configurations

Configuration	Description
<code>/stand/current/</code>	The configuration for the currently running kernel
<code>/stand/backup/</code>	Copy of the current configuration prior to changes
<code>/stand/nextboot/</code>	Link to the configuration to be used at the next boot
<code>/stand/last_install/</code>	Kernel configuration originally installed with OS
<code>/stand/crashconfig/</code>	Automatically created after any crash dump

There are also two special files in `/stand`:

- `/stand/vmunix` is a link to `/stand/current/vmunix`
- `/stand/system` is a link to `/stand/nextboot/system`

Kernel Configuration Command Overview

Kernel configurations may be managed via the kconfig command

Command/Option	Description
<code>kconfig -v</code>	List available configurations and their contents
<code>kconfig -a <i>conf</i></code>	Display the contents of a configuration
<code>kconfig -r <i>conf newconf</i></code>	Rename a configuration
<code>kconfig -c <i>conf newconf</i></code>	Copy a configuration
<code>kconfig -d <i>conf</i></code>	Delete a configuration
<code>kconfig -s <i>conf</i></code>	Save a copy of the running configuration
<code>kconfig -l <i>conf</i></code>	Load a configuration into the running kernel
<code>kconfig -n <i>conf</i></code>	Select a configuration for use after next boot
<code>kconfig -e <i>conf /tmp/system</i></code>	Create a system file from a configuration
<code>kconfig -i <i>conf /tmp/system</i></code>	Create a configuration from a system file
<code>kconfig -t <i>conf "for new myapp"</i></code>	Assign a title to a configuration
<code>kconfig -D</code>	View a list of pending changes
<code>kcpath -d</code>	Determine the currently booted config name

Example: Modifying the Current Config

- By default, `kc*` commands immediately attempt to modify the running kernel
- Changes to static modules and tunables will be saved until the next reboot
- Changes to non-static modules and tunables may be “held” until next boot, too, via `-h`

Save a copy of the current configuration before making changes (Optional)

```
# kconfig -s BeforeChanges
```

Modify modules and tunables immediately, or include `-h` to “hold” all changes until next boot

```
# kcmodule [-h] ...
```

```
# kctune [-h] ...
```

Review the new configuration

```
# kconfig -a
```

Check for pending changes

```
# kconfig -D
```

Example: Creating a New Named Config

- Rather than modify the current kernel, you may wish to create a named configuration
- Multiple named configurations may be stored in `/stand`

Create a new named configuration based on the currently running configuration

```
# kconfig -s MyConfiguration
```

Modify modules and tunables in the new configuration

```
# kcmodule -c MyConfiguration ...
```

```
# kctune -c MyConfiguration ...
```

Review the new named configuration

```
# kconfig -v
```

```
# kconfig -av MyConfiguration
```

Load the new named configuration

```
# kconfig -l MyConfiguration
```

Check for pending changes

```
# kconfig -D
```

Example: Copying a Config to Another Host



If you have identical systems running the same application under similar loads, you can create a named configuration on one system, then copy and load the configuration on the other systems, too

On the source system, export the named configuration to a system file

```
# kconfig -e MyConfiguration /tmp/MyConfiguration.system
```

FTP the .system file to the target system

```
# ftp target
```

```
ftp> put /tmp/MyConfiguration.system
```

On the target system, import the system file to create the named configuration

```
# kconfig -i MyConfiguration /tmp/MyConfiguration.system
```

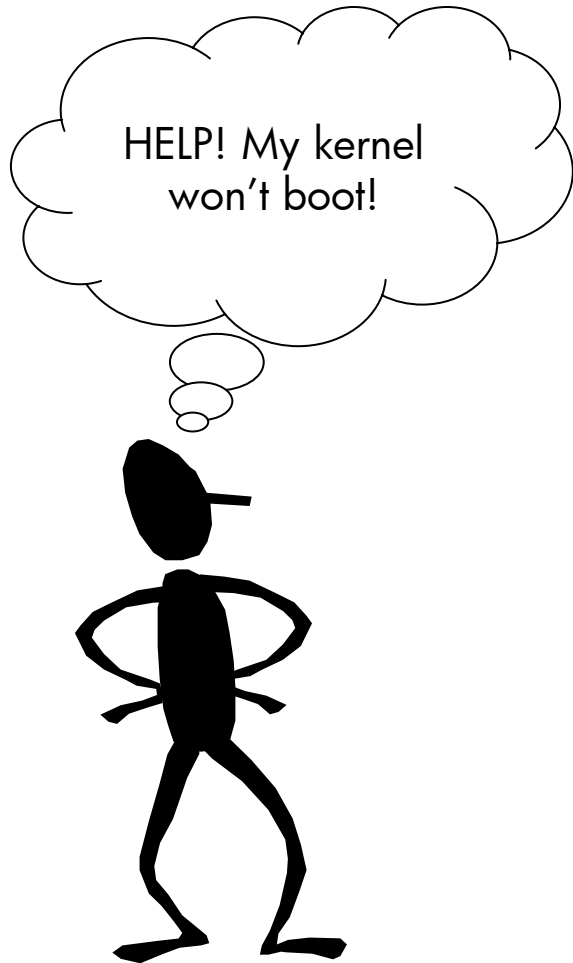
Load the new named configuration and reboot if necessary

```
# kconfig -l MyConfiguration
```

Check for pending changes

```
# kconfig -D
```

Kernel Troubleshooting Overview



HP-UX 11iv2 includes several solutions for solving kernel configuration problems:

- Review the kernel change log
- Review other log files
- Boot/load an alternate kernel
- Boot to failsafe mode

Viewing the Kernel Change Log

All changes made to the kernel configuration via `kcweb` and the `kc*` commands are recorded in `/var/adm/kc.log` and are viewable via the `kcweb` kernel log viewer

```
=====
Change to configuration 'current'
at 15:37:37 IST on 11 April 2003 by daemon:
Tunable 'aio_listio_max' set to 256.
=====
```

“daemon” indicates
changes made using `kcweb`

```
=====
Change to configuration 'current'
at 15:32:25 IST on 11 April 2003 by root:
Tunable 'aio_listio_max' set to 258.
=====
```

```
=====
Change to configuration 'current'
at 15:31:06 IST on 11 April 2003 by daemon:
Tunable 'aio_listio_max' set to 258.
=====
```

```
=====
Change to configuration 'current'
at 00:40:46 IST on 09 April 2003 by root:
Tunable 'bw_test' set to 1024.
=====
```

“root” indicates
changes made using
the command-line

```
=====
Change to configuration 'current'
at 19:48:14 IST on 01 April 2003 by daemon:
Tunable 'aio_max_ops' set to 2049.
=====
```

Viewing the **kcweb** Logs

kcweb log messages are recorded in a number log files

Log File	Purpose
<code>/var/sam/log/samlog</code>	hpwebadm log messages
<code>/var/opt/hpwebadmin/logs/error_log</code>	Apache error messages
<code>/var/opt/hpwebadmin/logs/access_log</code>	Apache access log
<code>/var/adm/kc.log</code>	kc* command log messages
<code>/var/adm/syslog/syslog.log</code>	System log messages

Booting from an Alternate Kernel

If the default `vmunix` kernel configuration won't boot,
boot from the `backup` kernel configuration, or any other named kernel configuration.

Booting the backup configuration on PA-RISC:

Processor is booting from first available device.

To discontinue, press any key within 10 seconds. Escape

Main Menu: `boot pri`

Interact with IPL? `y`

ISL> `hpux ls`

ISL> `hpux /stand/backup/vmunix`

Booting the backup configuration on Integrity:

HP-UX Boot Loader for IA64 Revision 1.71

Press Any Key to interrupt Autoboot

`\EFI\HPUX\AUTO ==> boot vmunix`

Escape

HPUX> `ll`

HPUX> `boot backup`

Booting to Tunable Maintenance Mode

Booting to tunable maintenance mode boots to single-user mode using failsafe tunable parameters hard-coded in the kernel modules. After booting to tunable maintenance mode, review the kernel log, modify the kernel as necessary, and reboot.

Booting to tunable maintenance mode on PA-RISC:

Processor is booting from first available device.

To discontinue, press any key within 10 seconds. Escape

Main Menu: boot pri

Interact with IPL? y

ISL> hpux -tm

Booting to tunable maintenance mode on Integrity:

HP-UX Boot Loader for IA64 Revision 1.71

Press Any Key to interrupt Autoboot

\EFI\HPUX\AUTO ==> boot vmunix

Escape

HPUX> boot vmunix -tm

For Further Study

- See the following manuals on <http://docs.hp.com>:
HP-UX 11i Version 2 Release Notes
Managing Systems and Workgroups: A Guide for HP-UX System Administrators
Tunable Kernel Parameters
Dynamically Tunable Parameters in HP-UX 11i
- Also read the man pages for the kernel configuration commands:
`kconfig(5)`, `kclog(1m)`, `kcmodule(1m)`, `kcpath(1m)`, `kctune(1m)`
- All tunable parameters now have man pages, too.
For a complete list of kernel tunables, type `kctune`.

Lab activity







Managing Software with SD-UX

Module 19
H3064S F.00



Introducing SD-UX

SD-UX is a comprehensive suite of utilities designed to simplify OS software, application, and patch management in HP-UX.

SD-UX includes utilities for:

- ✓ Installing Software
- ✓ Copying Software
- ✓ Removing Unwanted Software
- ✓ Listing Software
- ✓ Verifying Installations
- ✓ Packaging Software

SD-UX Software Structure

SD-UX manages software in units known as bundles, products, and filesets

bundle: HPUXBaseOS

product: LVM

subproduct: LVM.Runtime

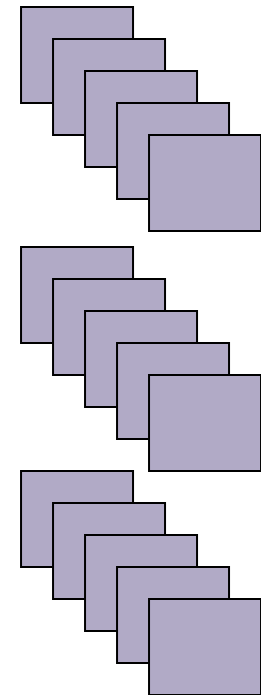
fileset: LVM-KRN

fileset: LVM-RUN

subproduct: LVM.Manuals

fileset: LVM-ENG-A-MAN

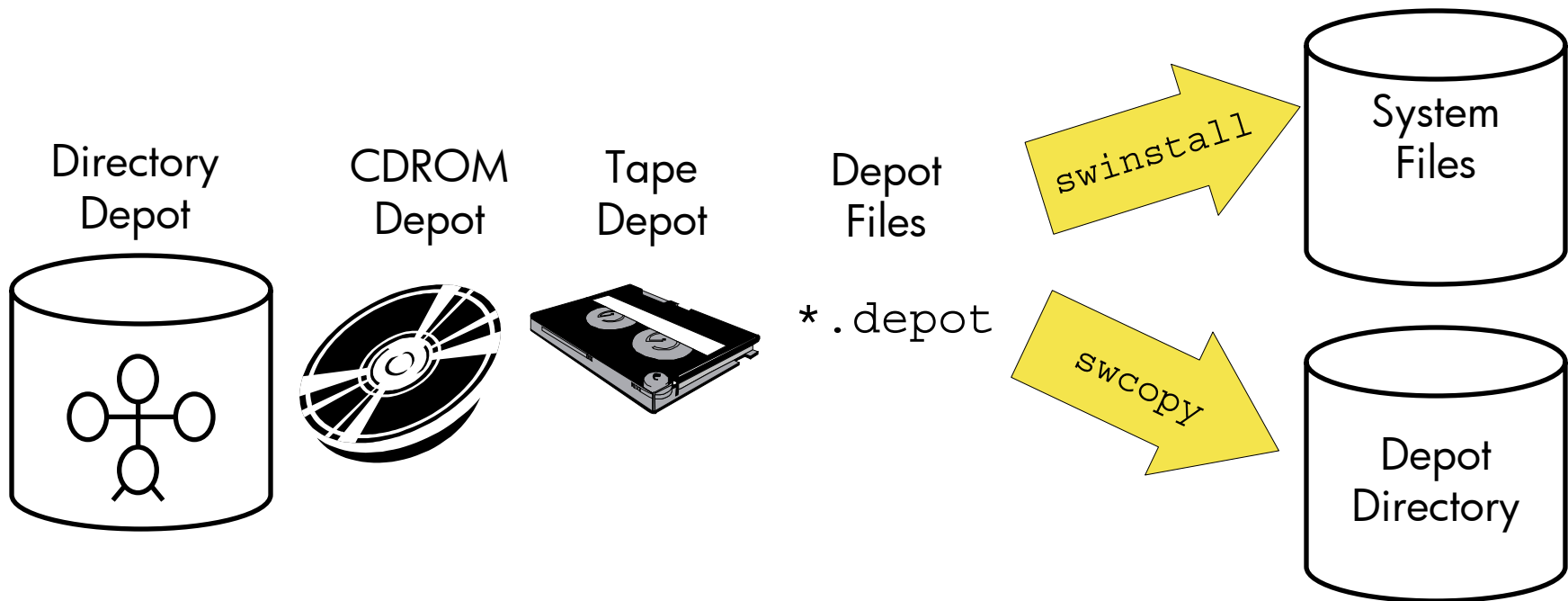
other filesets:



SD-UX Software Depots

An SD-UX “Depot” is a repository for SD-UX packaged software

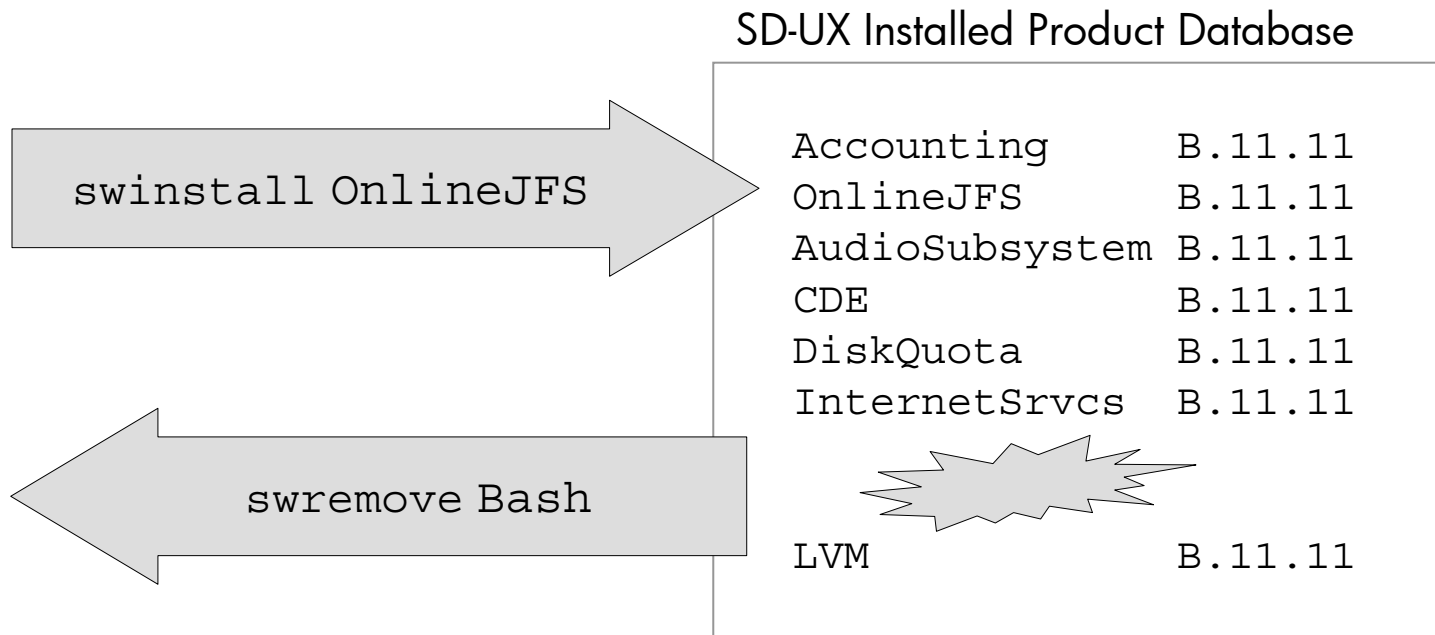
- Depots may be stored in a directory, on CD or tape, or in a .depot format file
- Software from a depot may be `swinstall`'ed to the OS or...
- `swcopy`'ed to another depot



SD-UX IPD

The Installed Product Database records all software installed on a system via SD-UX

- Installing a product via `swinstall` adds a record to the IPD
- Removing a product via `swremove` removes a record from the IPD
- The `swlist` command displays the contents of the IPD



SD-UX Daemons and Agents

The SD-UX `swagentd` daemon starts automatically at run level 2, and must be running in order to install or remove SD-UX software

`swagentd`

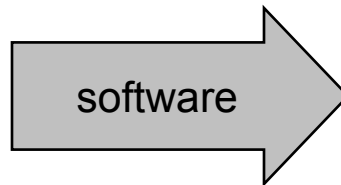
- Starts at run level 2, and runs continuously thereafter.
- Listens for SD-UX requests.
- Schedules `swagent` agents for each SD-UX request.

`swagent`

- Performs software management tasks.
- Started as needed by `swagentd`.



depot
server
`swagent`



target
host
`swagent`



Listing Software

Use the `swlist` command to view SD-UX software bundles, products, and filesets.

Determine if a specific installed bundle, product, or fileset has been installed:

```
# swlist bundle
```

List all bundles, products, or filesets on the localhost:

```
# swlist -l bundle|product|fileset
```

List all bundles, products, or filesets on another host:

```
# swlist -l bundle|product|fileset @ otherhost
```

List depots available on a depot server:

```
# swlist -l depot @ server
```

List bundles, products, or filesets available in a depot:

```
# swlist -l bundle|product|fileset -d @ server:/depot
```

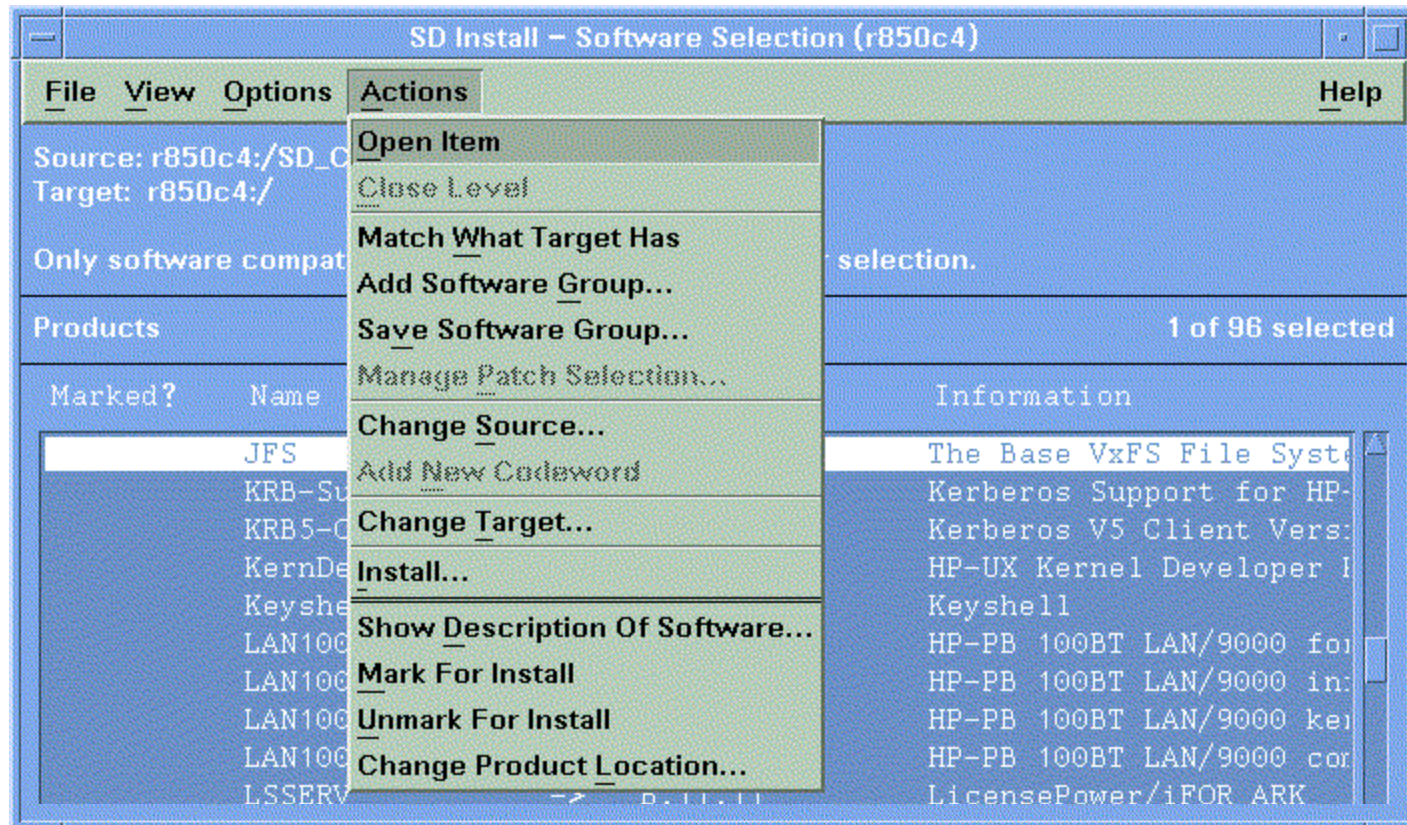
Interactively list installed software:

```
# swlist -i
```

Installing and Updating Software

Use any of the following three commands to install/update software:

```
# swinstall -s svr:/depot -x autoreboot=true bundle
# swinstall -s svr:/depot -x autoreboot=true -x match_target=true
# swinstall
```

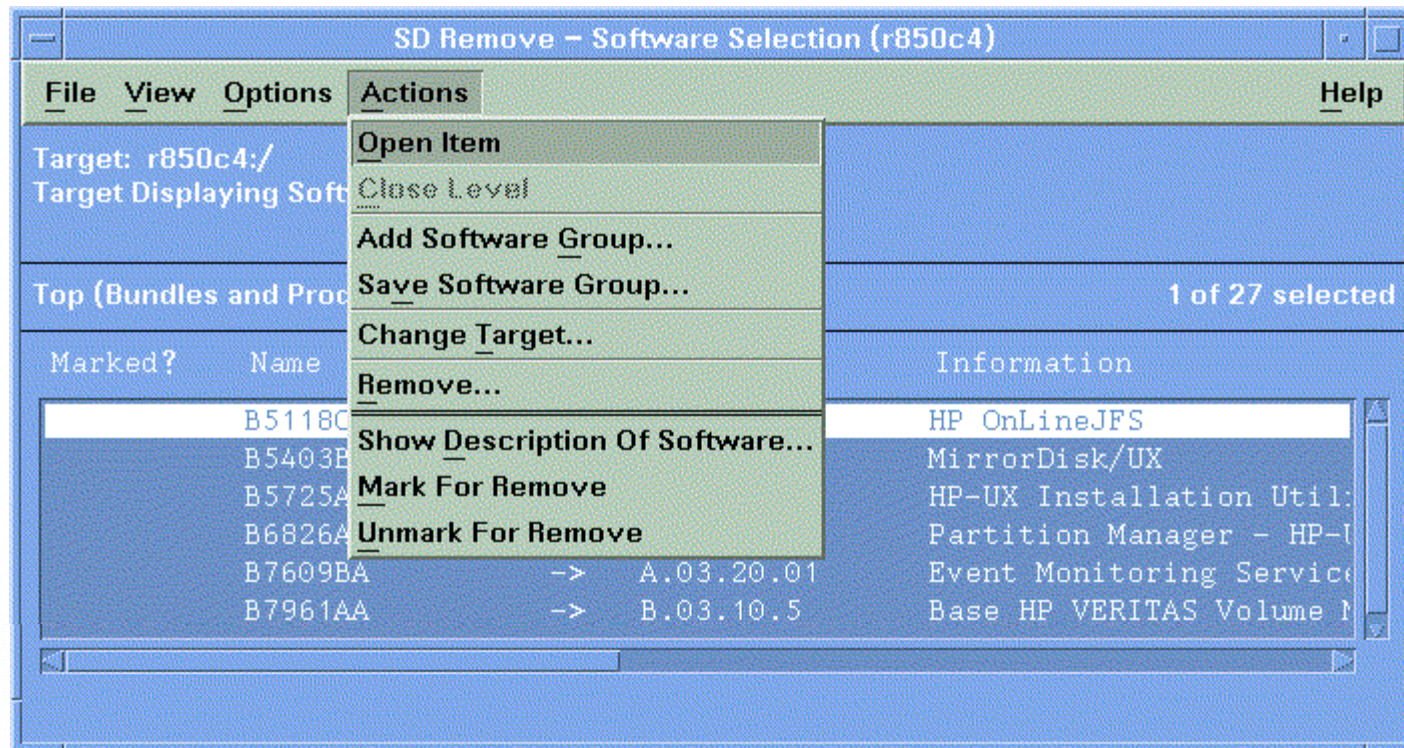


Removing Software

Use either of these commands to remove software:

```
# swremove -x autoreboot=true mybundle
```

```
# swremove
```



Lab activity







Managing Patches with SD-UX

Module 20
H3064S F.00



Why Install Patches?

HP releases patches for a variety of reasons

- New functionality
- New hardware support
- Bug fixes

Patch Naming Convention

HP patches follow a naming convention.
Note that PHKL kernel patches usually require a system reboot.

The Patch Name Format is: PHxx_yyyyyy where:

PH = Patch HP-UX.

xx = Area patched:

CO - general HP-UX commands.

KL - kernel patches.

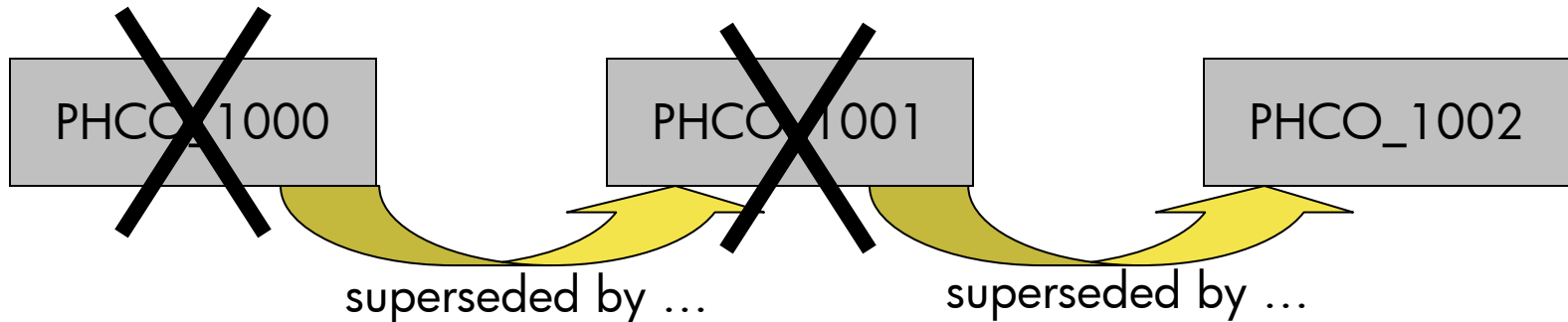
NE - network specific patches.

SS - all other subsystems and applications: X11, CDE, Openview, etc.

yyyyyy = A unique number

Patch Supersession

- Patches from HP are usually cumulative
- Later patches may “supersede” older patches
- The final patch in a supersession chain provides a superset of the features/fixes provided by its predecessors



Patch Ratings

Every patch is assigned a star rating that indicates how thoroughly the patch has been tested.
Many customers only install 2- and 3-star patches.

Rating	Explanation
	HP has done functional testing to verify that the patch fixes the problem that it purports to fix. Unwanted side effects were not discovered.
	Patch has been installed in a reasonable number of customer environments with no problems reported.
	Patch has been stress- and performance-tested by HP in simulated customer mission-critical environments using common application stacks.

Patch Sources

Patches may be obtained from a variety of sources, in a variety of formats

- HP IT Resource Center Patch Database
(Online database containing all available patches, accessible via FTP and HTTP)
- HP-UX Support Plus CD-ROM / download bundles
(CDROM containing bundles of critical, tested Operating Environment patches)
- HP-UX Software Pack CD-ROM
(CDROM containing OS enhancement patches)
- HP Enterprise Response Center Patch Tapes
(Custom patch tapes available to some customers with support contracts)
- Local SDUX depot server
(Locally managed depot containing patches approved for your environment)

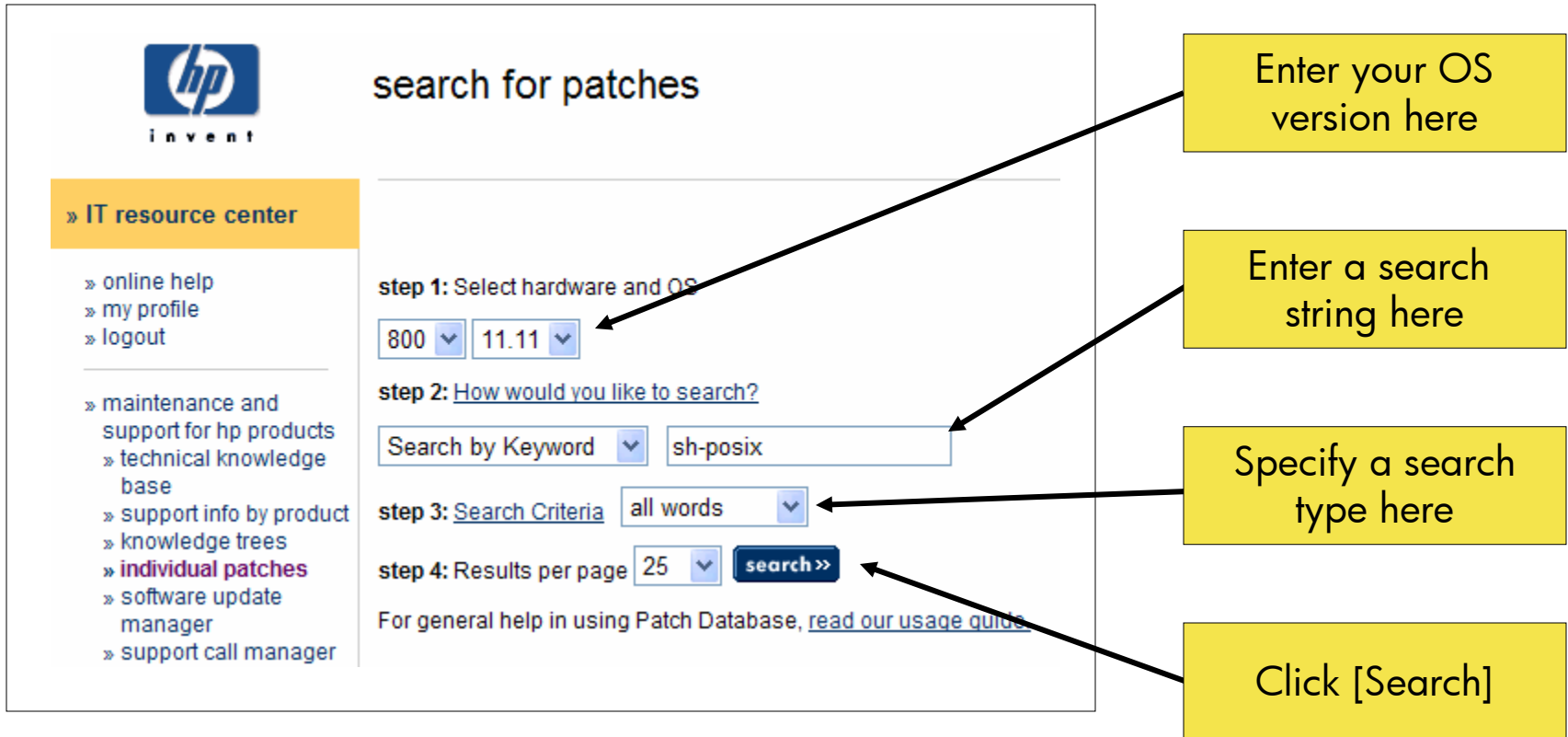
Patch Tools

HP-UX provides a variety of patch management tools

- SD-UX utilities: `swinstall`, `swlist`, `swremove`, `swcopy`
(Standard SD-UX utilities for installing, listing, and removing patches)
- ITRC patch database search engine
(Web-based utility for searching the patch database and downloading patches)
- Custom Patch Manager
(Web-based utility for doing custom patch analysis for support customers)
- Custom Patch Notification
(Email notification service that notifies customers when new patches are released)
- `security_patch_check`
(CLI utility that automatically identifies missing security patches)

Downloading Patches from the ITRC (1 of 4)

http://itrc.hp.com -> individual patches -> hp-ux



The screenshot shows the HP ITRC search interface. On the left is a navigation menu with the HP logo and 'invent' text. The main area is titled 'search for patches'. It contains four steps: Step 1: Select hardware and OS (with dropdowns for '800' and '11.11'); Step 2: How would you like to search? (with a 'Search by Keyword' dropdown and a text input containing 'sh-posix'); Step 3: Search Criteria (with a dropdown set to 'all words'); Step 4: Results per page (with a dropdown set to '25' and a 'search>>' button). Below the steps is a link to 'read our usage guide'. Four yellow callout boxes with arrows point to specific elements: 'Enter your OS version here' points to the '11.11' dropdown; 'Enter a search string here' points to the 'sh-posix' text input; 'Specify a search type here' points to the 'all words' dropdown; and 'Click [Search]' points to the 'search>>' button.

HP
invent

» IT resource center

- » online help
- » my profile
- » logout

» maintenance and support for hp products

- » technical knowledge base
- » support info by product
- » knowledge trees
- » **individual patches**
- » software update manager
- » support call manager

search for patches

step 1: Select hardware and OS

800 11.11

step 2: How would you like to search?

Search by Keyword sh-posix

step 3: Search Criteria all words

step 4: Results per page 25 **search>>**

For general help in using Patch Database, [read our usage guide](#).

Enter your OS version here

Enter a search string here

Specify a search type here

Click [Search]

Downloading Patches from the ITRC (2 of 4)

Your search resulted in 3 matches:
 Note: Use the recommended patch if it is listed below and it meets your needs. If the recommended patch does not meet your needs, use the most recent patch.

 -critical fix
  -reboot required
  -not available
  special instructions

description	recommended (hp rating)	most recent (hp rating)
s700_800 11.11 at(1)/cron(1M)/crontab(1) patch	☒ PHCO_26562 ★★★	☐ PHCO_26562 ★★★
s700_800 11.11 cumulative sh-posix(1) patch	☒ PHCO_25597 ★★★ notes  	☐ PHCO_27345 ★★ notes 
s700_800 11.11 rc scripts patch	☒ PHCO_28317 ★★ notes 	☐ PHCO_28317 ★★ notes 

[add to selected patch list >>](#)

Note the patch ratings

Click a patch name to read the .text file

Select desired patches

Click add to selected patch list

Downloading Patches from the ITRC (3 of 4)

 -critical fix
  -reboot required
  -not available
  -special instructions

these items are for hpux - 800 11.11

patch / bundle id	size (kb)	date posted	description
☒ PHCO_25597 ★★★ notes   remove >>	738	2002/04/17	s700_800 11.11 cumulative sh-posix(1) patch
☒ PHCO_26562 ★★★ remove >>	126	2002/07/22	s700_800 11.11 at(1)/cron(1M)/crontab(1) patch
☒ PHCO_28317 ★★ notes  remove >>	28	2003/04/08	s700_800 11.11 rc scripts patch
☒ PHKL_26743 ★★★ notes   remove >>	739	2002/06/21	s700_800 11.11 LVM Cumulative Patch

[download selected >>](#)

Click download selected

Downloading Patches from the ITRC (4 of 4)

Note: One or more of the patches that you have selected for download contain special installation instructions. [View these special instructions.](#)

The total space required for these 4 items is 1632 kb
[More information about this download page is available](#)

download items in one operation

1. You may select a server in your region. Most users should use the default setting. **i**

default ▾

For Asia Pacific users, you may select "Singapore" for a faster download time

2. Select the desired format **i**

gzip package ▾

3. Click on the download button

download >>

- OR -

As an authorized user, you may have patches delivered on media by selecting a WebPatches server.

atlanta ▾

download >>

download items individually

You may retrieve items via anonymous ftp(1) or http. Use your browser's "Save Link As"(Netscape) or "Save Target As"(MSIE) operation. This operation can be accessed by a right mouse click on the http/ftp button.

selected patches	size(kb)	download via
PHCO_25597	s700_800 11.11 cumulative sh-posix(1) patch	738
		HTTP >> FTP >>

Review special instructions

Choose a download source

Choose a download format

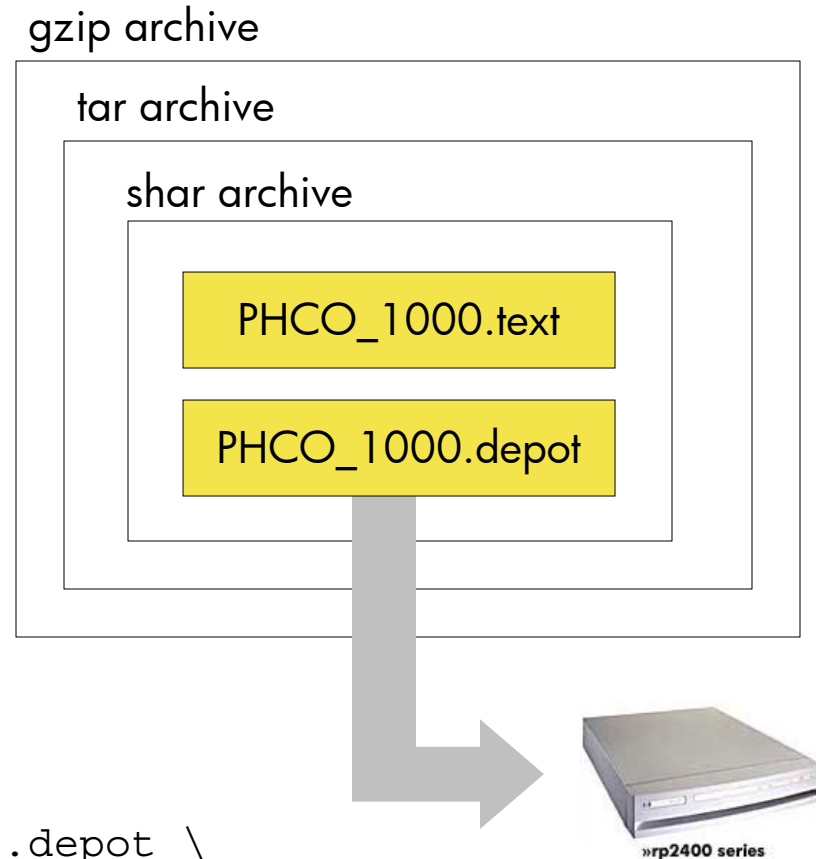
Click download

Alternatively, request a patch tape/CD

Or, download individual patches

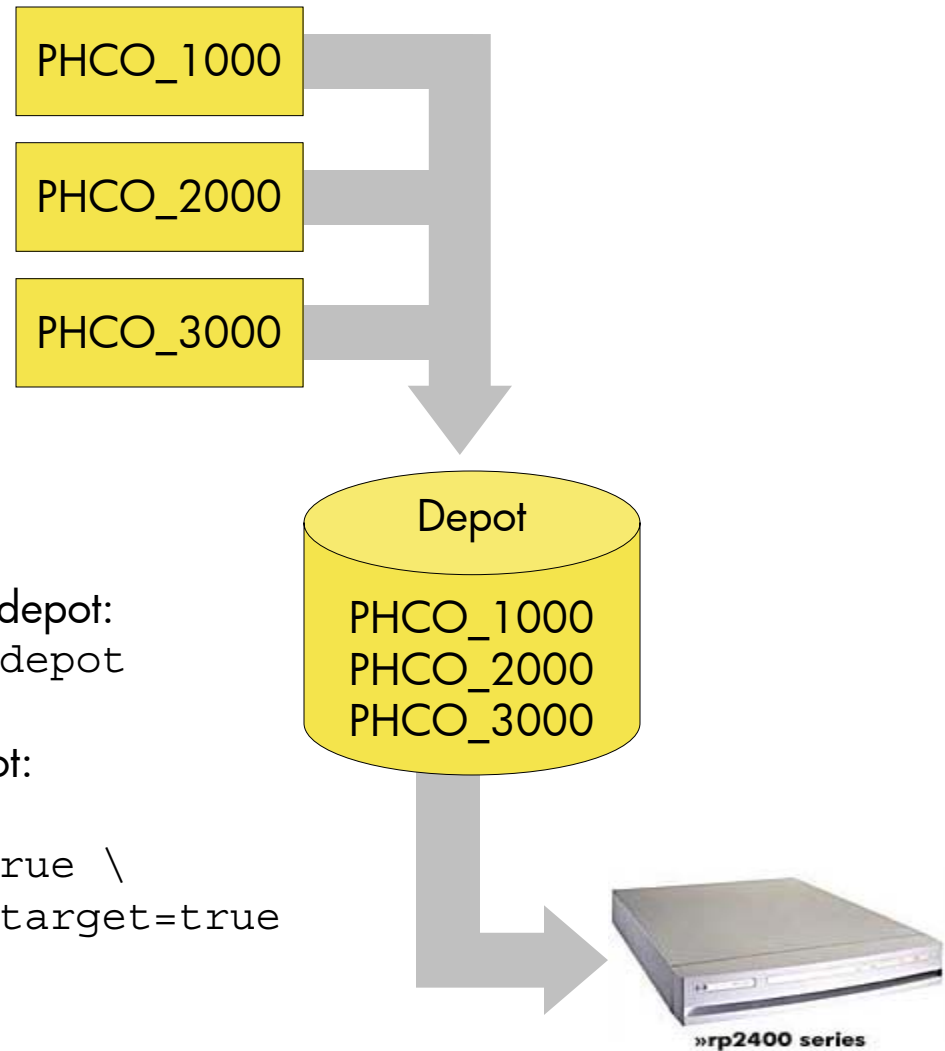
Installing a Single Patch from the ITRC

1. Do a full backup
2. Unzip the archive:
`# gzip -d /tmp/patches.tgz`
3. Untar the archive:
`# tar -xvf /tmp/patches.tar`
4. Unshar each patch:
`# sh /tmp/PHCO_1000`
5. Read the resulting .text file carefully:
`# more /tmp/PHCO_1000.text`
6. Install each patch:
`# swinstall -s /tmp/PHCO_1000.depot \
-x autoreboot=true \
-x patch_match_target=true`



Installing Multiple Patches from the ITRC

1. Do a full backup
2. Unzip the archive:
`# gzip -d /tmp/patches.tgz`
3. Untar the archive:
`# tar -xvf /tmp/patches.tar`
4. Copy the patches to a depot:
`# cd /tmp`
`# ./create_depot_hp-ux_11`
5. View the patch readme files from the depot:
`# swlist -a readme -s /tmp/depot`
6. Install all of the patches from the depot:
`# swinstall -s /tmp/depot \`
`-x autoreboot=true \`
`-x patch_match_target=true`



Installing Patches from CD

1. Do a full backup.
2. `# mkdir /patchCD`
3. `# mount /dev/dsk/cxtxdx /patchCD`
4. `# ls /patchCD`
5. `# more /patchCD/GOLDBASE11i.readme`
6. `# swinstall -s /patchCD/GOLDQPK11i \`
`-x autoreboot=true \`
`-x patch_match_target=true`

Support Plus
CDROM



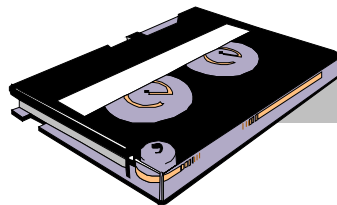
Installing Patches from Tape

1. Do a full backup.
2. View the patch readme files from the depot:

```
# swlist -a readme -s /dev/rmt/0m
```
3. Install the patches

```
# swinstall -s /dev/rmt/0m \  
-x autoreboot=true \  
-x patch_match_target=true
```

Depot Format
Patch Tape



Installing Patches from a Depot Server

1. Do a full backup.
2. View the patch readme files from the depot:

```
# swlist -a readme -s svrname:/depotpath
```
3. Install the patches

```
# swinstall -s svrname:/depotpath \  
-x autoreboot=true \  
-x patch_match_target=true
```

SD-UX Depot
Server



Listing Patches with `swlist`

```
# swlist -l patch LVM (view patches and their associated filesets)
```

```
# LVM                      B.11.00      LVM
# LVM.LVM-KRN              LVM.LVM-KRN
  PHKL_15956.LVM-KRN,l=/,r=1.0  LVM.LVM-KRN  applied
  PHKL_16433.LVM-KRN,l=/,r=1.0  LVM.LVM-KRN  applied
  PHKL_20186.LVM-KRN,l=/,r=1.0  LVM.LVM-KRN  applied
```

```
# swlist -l product 'PH*' (view patches only)
```

```
PHCO_19479      1.0      LVM commands cumulative patch
PHKL_15956      1.0      LVM Cumulative PVLinks patch
PHKL_16433      1.0      LVM commands hang
PHKL_19287      1.0      LVM failover to alternate path
PHKL_20186      1.0      LVM Cumulative patch
```

Removing Patches with **swremove**

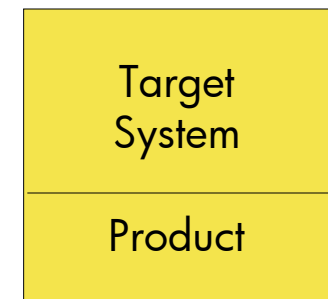
Before:



```
# swremove -x autoreboot=true PHCO_1000
```

```
/var/adm/sw/save  
/var/adm/sw/save/PHCO_1000/FOO-PROD  
/var/adm/sw/save/PHCO_1000/FOO-PROD/usr  
/var/adm/sw/save/PHCO_1000/FOO-PROD/usr  
/var/adm/sw/save/PHCO_1000/FOO-PROD/usr/bin  
/var/adm/sw/save/PHCO_1000/FOO-PROD/usr/bin/foo
```

After:



Lab activity







Installing the OS with Ignite-UX

Module 21
H3064S F.00



Why Install?

A number of different situations may require an HP-UX OS install.
In all of these situations, HP's Ignite-UX product facilitates the install process.

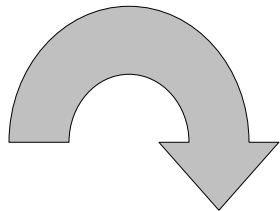
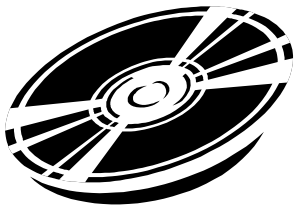


IS THE ANSWER!

Install Sources

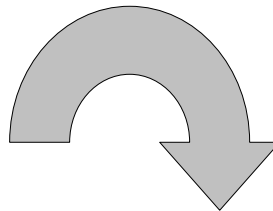
Ignite-UX supports several different install approaches.

CoreOS CD



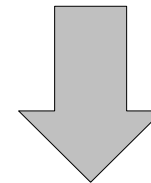
Installing from local
media

Ignite-UX Server



"Pull Install" from an Ignite
Server

Ignite-UX Server



"Push Install" from an Ignite
Server

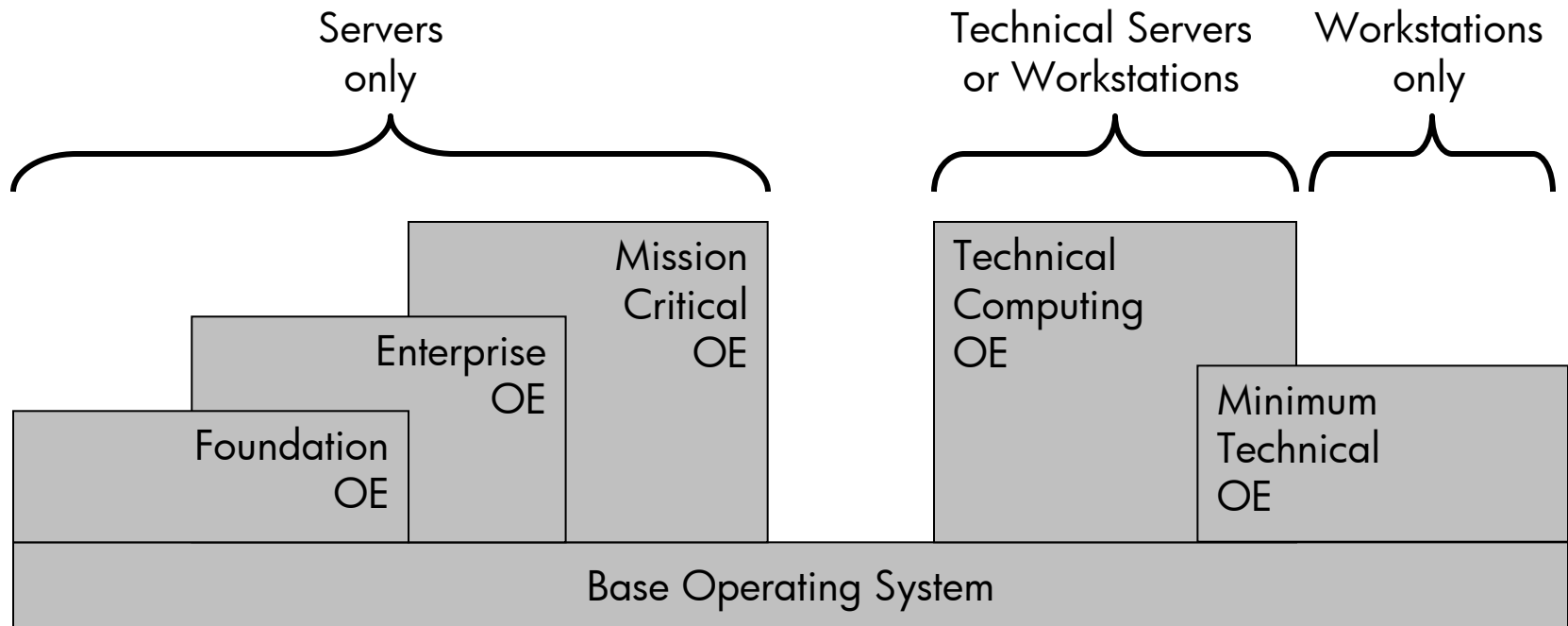
Planning the Install

Careful planning is the key to a successful installation.

- ✓ Read the documentation!
- ✓ What is the hardware path of the boot disk?
- ✓ What is the hardware path of the CDROM/DVD?
- ✓ What IP address and hostname will be assigned to the host?
- ✓ Will you use LVM, VxVM, or the whole disk approach?
- ✓ Will you use JFS or HFS?
- ✓ How much space is required in each file system?
- ✓ How much swap space is required?
- ✓ Which “operating environment” is required?
- ✓ Which “install-time security bundle” is required?

Choosing an Operating Environment

- HP-UX 11i v1/2 support five different "Operating Environments" (OEs)
- Each Operating Environment contains a bundle of commonly-used software
- All five OEs are built on top of the common Base OS
- Only one OE can be installed on any given machine



Choosing an Install-Time Security Bundle

During the HP-UX 11iv2 install process, it is now possible to select an install-time security bundle, which uses HP Bastille to automatically lock down a variety of vulnerable network services

Bundle Name	Config File	Effect on System Behavior
Sec00Tools	N/A	Install security infrastructure without applying security
Sec10Host	HOST.config	Host-based lockdown: no firewall; telnet and FTP remain enabled, but less common network services are disabled in <code>/etc/inetd.conf</code> .
Sec20MngDMZ	MANDMZ.config	Lockdown: IPFilter firewall blocks all incoming connections except common, secured, management protocols
Sec30DMZ	DMZ.config	Full lockdown: IPFilter blocks all incoming connections except HP-UX Secure Shell

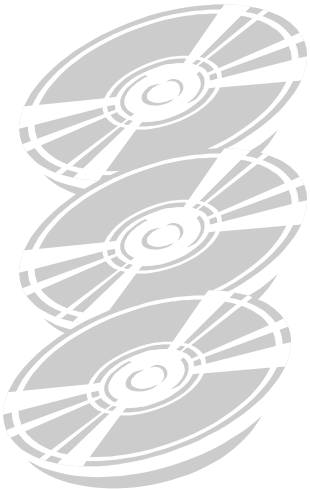
Locating the Source Media

- The 11i media kit includes four DVDs
- Only the first DVD is required to complete the initial OS install/update



Core/Operating Environment DVD:

- Base OS
- Operating Environments
- Diagnostics
- Required networking software
- Several customer-selectable applications



Instant Information DVD:

- 11i manuals and release notes

Applications DVD:

- Customer-selectable applications

Internet Express DVD:

- Open source applications and utilities

Initiating a PARISC Install

To initiate a PARISC system install,
simply use the BCH `boot` command to boot from DVD or an Ignite install server.

- If installing from DVD, CDROM, or tape, load the appropriate media
- Access the console interface
- Initiate the boot sequence with the `MP:CM> rs` command
- Press `Escape` to interrupt the autoboot sequence and access the BCH main menu
- From the BCH main menu, use the search and boot commands to boot from DVD

```
Main Menu: search ipl
```

```
Main Menu: boot p1
```

- Or, boot from the Ignite-UX install server

```
Main Menu: boot lan.10.1.1.1 install
```
- Don't interact with the ISL/IPL
- Wait for the Ignite-UX menu interface to appear

Initiating an Integrity Install

To initiate an Integrity system install,
simply use the EFI shell to boot from DVD or an Ignite install server.

- If installing from DVD or tape, load the appropriate media
- Access the console interface
- Initiate the boot sequence with the `MP:CM> rs` command
- Press `Escape` to interrupt the EFI autoboot sequence and access the EFI shell
- From the EFI shell, identify the DVD device and load the `install.efi` program

```
SHELL> map -r -fs -b  
SHELL> fsn:\install.efi
```

- Or, run the EFI `lanboot` command to install from an Ignite server

```
SHELL> lanboot select  
01  Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E1E7EE0)  
02  Acpi(HWP0002,100)/Pci(2|0)/Mac(00306E1E9EA9)  
Select Desired LAN: 1
```

- Wait for the Ignite-UX menu interface to appear

Navigating the Ignite-UX Menus

After selecting a keyboard language and providing some initial networking information, you will be presented with a tabbed Ignite-UX interface that may be used to make additional selections and complete the install.

```

+-----++-----++-----++-----++-----+
| Basic || Software || System || File System || Advanced |
|      \-----+
|
| Configurations:      [ HP-UX B.11iv2 Default ->]
| Environments:       [ Mission Critical OE-64bit  ->]
| [ Root Disk...  ]   HP_73.4GST373405LC, 0/1/1/0.1.0, 70007 MB
| File System:       [ Logical Volume Manager with VxFS  ->]
| [ Root Swap (MB)... ] 4096 Physical Memory (RAM) = 4088 MB
| [ Languages...   ]   English [ Keyboards ] [ Additional ]
|
+-----+

```

Verifying the Install

Always check for errors after installing.

- Check for SD-UX errors, especially ERRORS and WARNINGS:

```
# more /var/adm/sw/swinstall.log
```

```
# more /var/adm/sw/swagent.log
```

- Check for boot errors:

```
# more /etc/rc.log
```

- Verify software:

```
# swverify \*
```

Completing Post-Install Configuration Tasks

A few other cleanup steps may be required, too...

- Install patches from the Support+ CDROM
- Move root's home directory to `/root`
- Update configuration files, if necessary
- Install additional applications, if necessary
- Import volume groups, if necessary
- Populate the HPSP, if desired
- Backup the newly installed system

For Further Study

To learn more about installing and updating HP-UX, read the following manuals on <http://docs.hp.com>:

- *HP-UX 11i Version 2 Release Notes*
- *HP-UX 11i Version 2 Installation and Update Guide*
- *Read Before Installing or Updating to HP-UX 11i Version 2*
- *Software Distributor Administration Guide for HP-UX 11i v2*
- *Ignite-UX Administration Guide, Edition 14*
- *Managing Systems and Workgroups: A Guide for HP-UX System Administrators*

Lab activity







Course Review

Module 22

H3064S F.00



Review: What you Learned this Week

During this week, you've learned how to perform the most common HP-UX system administration tasks. We hope that you will return for HP Education's System and Network Administration 2 course to learn more about HP-UX administration.

Day 1:
Creating and Managing User Accounts
Customizing User Accounts
Navigating the HP-UX File System

Day 2:
Configuring Hardware
Configuring Device Files
Configuring Disk Devices
File System Concepts

Day 3:
Creating and Mounting File Systems
Maintaining File Systems
Backing up File Systems
Scheduling cron Jobs
Managing Swap Space

Day 4:
Managing Printers
Accessing the System Console
Booting PA-RISC Systems
Booting Integrity Systems

Day 5:
Configuring the 11i v2 Kernel
Managing Software with SD-UX
Managing Patches with SD-UX
Installing the OS with Ignite-UX





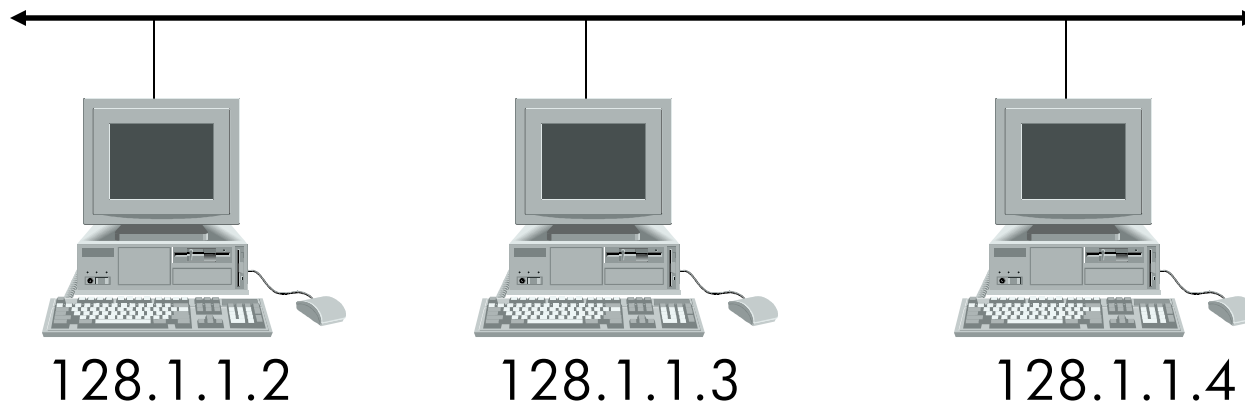
Connecting to a Network

Appendix A

H3064S F.00



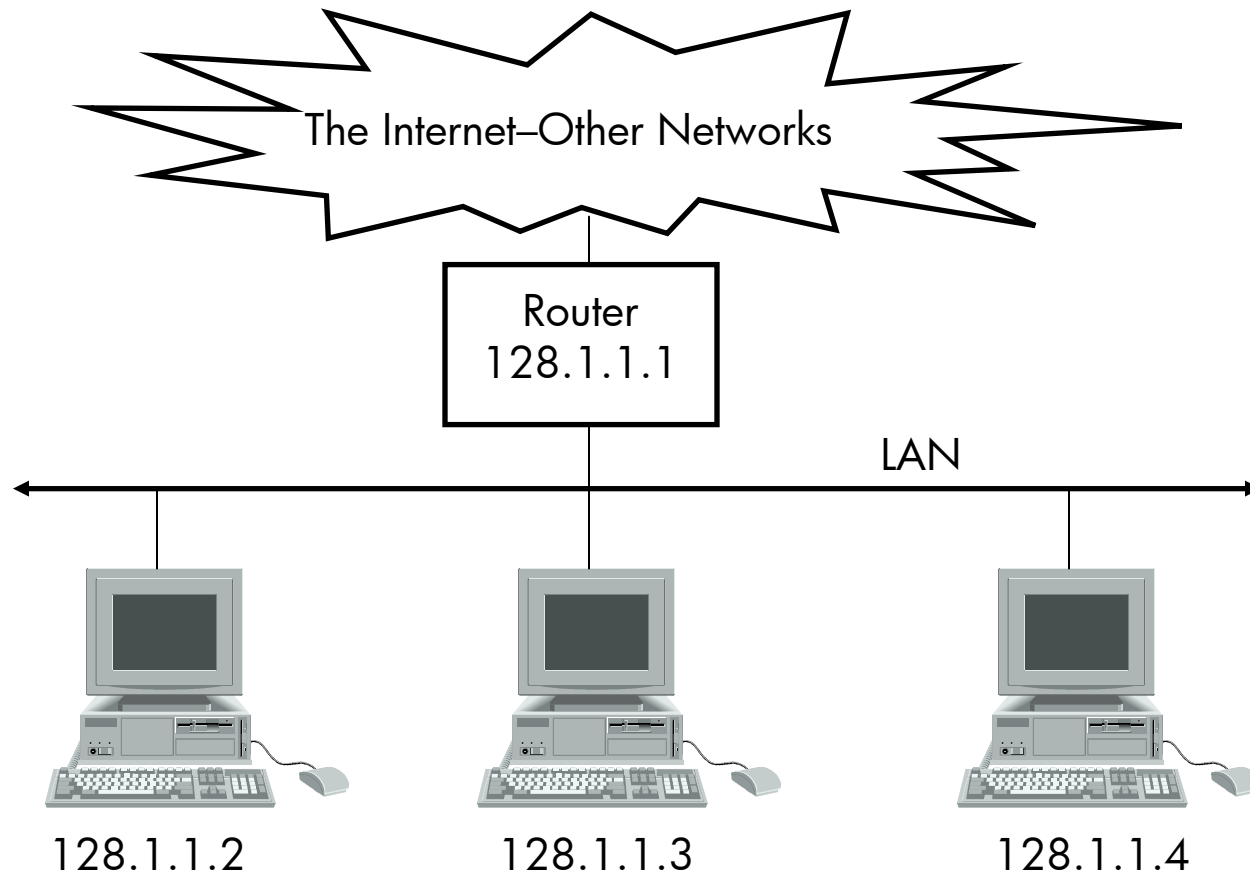
Setting an IP Address and Subnet Mask



IP addresses

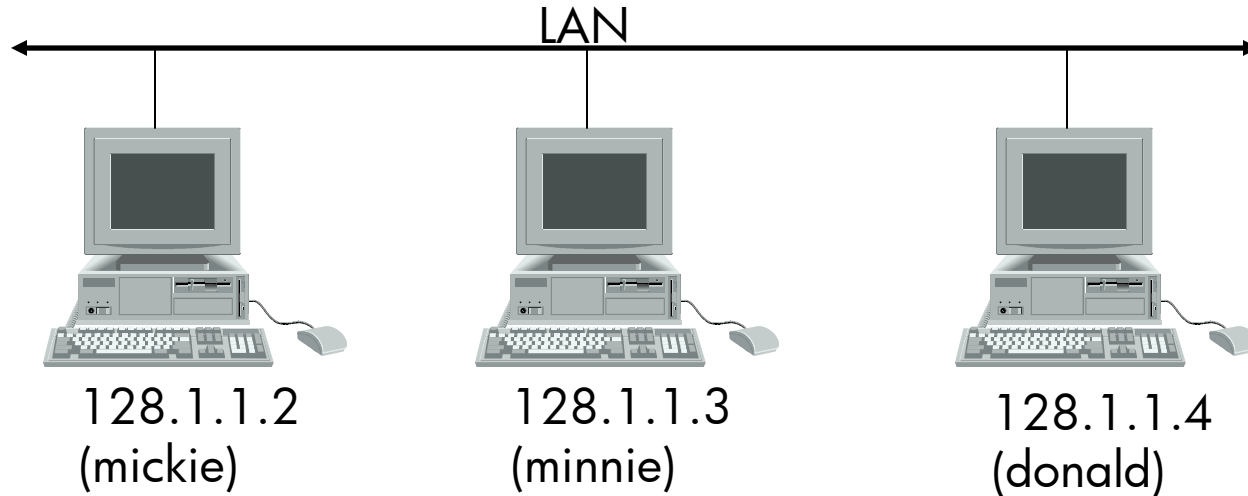
- Assigned to each network node
 - Must be unique
 - Define via SAM or `set_parms`

Setting a Default Route



- Hosts can locally deliver data to nodes on own LAN
- Route is required to route data to other LANs
- Defined via SAM or `set_parms`

Setting a System Hostname



Hostnames

- Mnemonic name assigned to each node
- Can be based on
 - Purpose of node
 - Primary users of node
 - Any other naming convention
- Defined via `set_parms`

Resolving Hostnames to IP Addresses

```
telnet mickie  
      └─┬─> 128.1.1.2
```

```
ftp minnie  
   └─┬─> 128.1.1.3
```

- Every outgoing packet requires an IP address
- Three ways to resolve hostnames to IP addresses
 - `/etc/hosts` file
 - Domain Name Service (DNS)
 - Network Information Service (NIS)

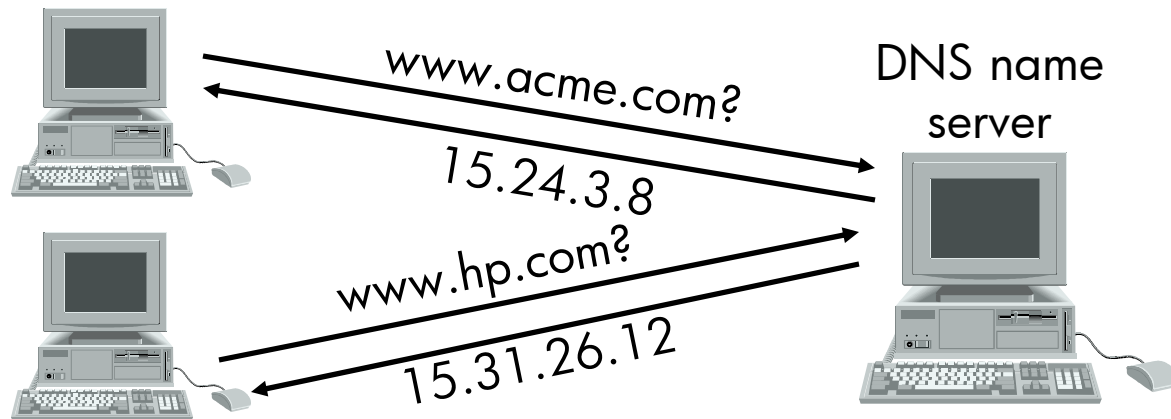
Configuring `/etc/hosts`

Sample `/etc/hosts`:

128.1.1.1	mickie mailsvr
128.1.1.2	minnie
128.1.1.3	donald

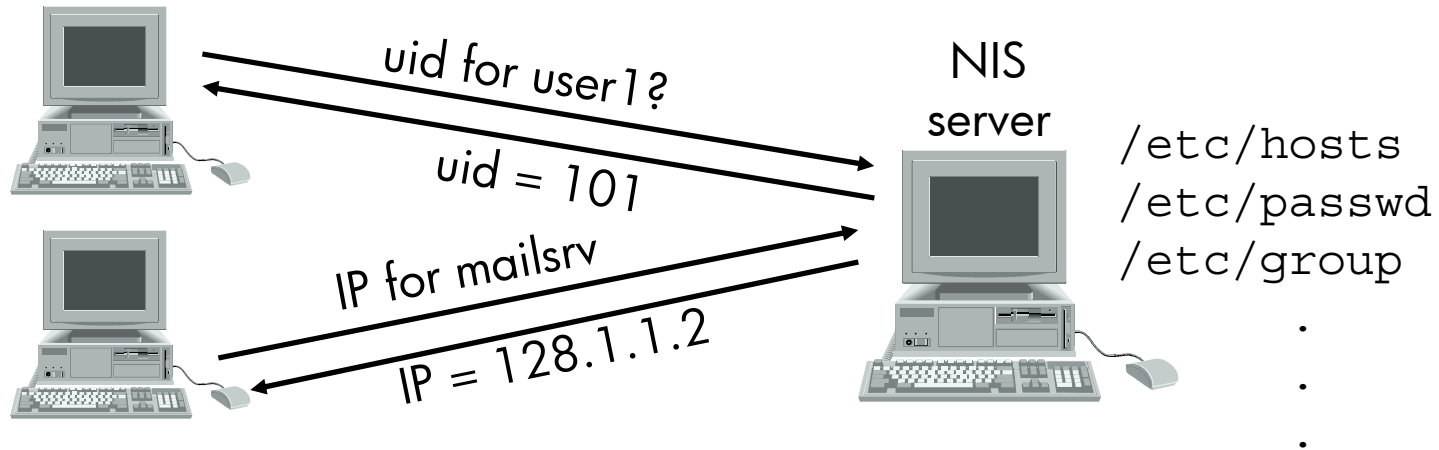
- Maps: IP addresses $\longleftrightarrow$ hostnames
- Maintained on each individual host
- Usually used to resolve hostnames on small LANs
- Define via SAM or copy from another host

Configuring a DNS Client



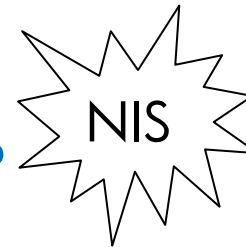
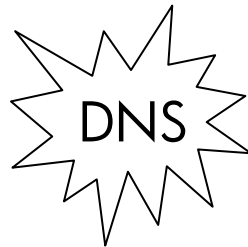
- Used to resolve hostnames on larger networks
- Clients request lookups from DNS servers
- To prevent duplicate names, each host assigned to a “domain”
- Must define the following via SAM or `set_parms`
 - Your DNS server address
 - Your DNS “domain” name

Configuring an NIS Client



- Centralized maintenance of configuration files
- Clients send host, user, group lookups to NIS server
- Must define the following via SAM or `set_parms`
 - NIS domain
 - NIS server address

Choosing a Look-Up Service



Q: Where do I look up hostnames?

A: Consult `/etc/nsswitch.conf`

Troubleshooting Tools

Check connectivity

```
# ping 128.1.1.3
```

```
# ping 128.1.1.4
```

Check hostname resolution

```
# nslookup minnie
```

```
# nslookup donald
```






Configuring the HP-UX 11i v1 Kernel

Appendix B

H3064S F.00



Why Reconfigure the Kernel?

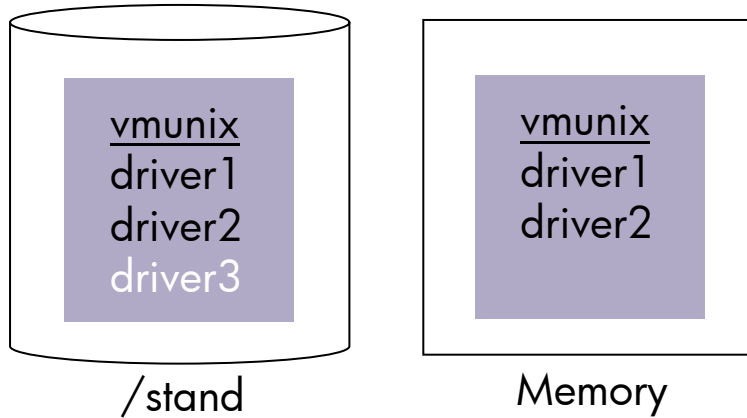
Reasons for reconfiguring the kernel:

- ✓ To add or remove device drivers
- ✓ To add or remove subsystems
- ✓ To modify system parameters

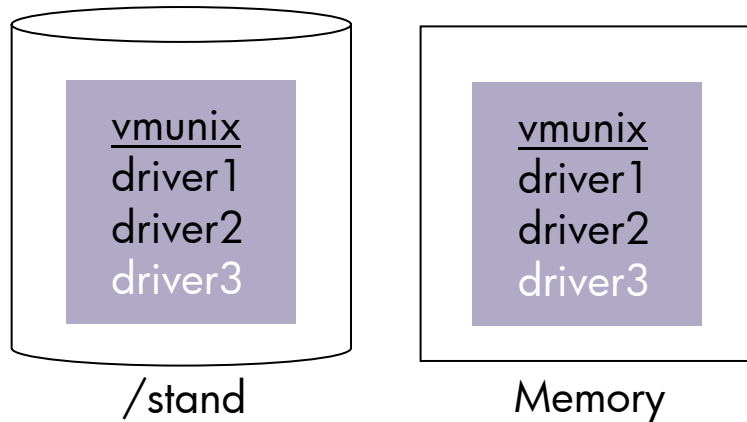
Methods for reconfiguring kernel:

- ✓ SAM
- ✓ HP-UX commands

Static Kernel Modules

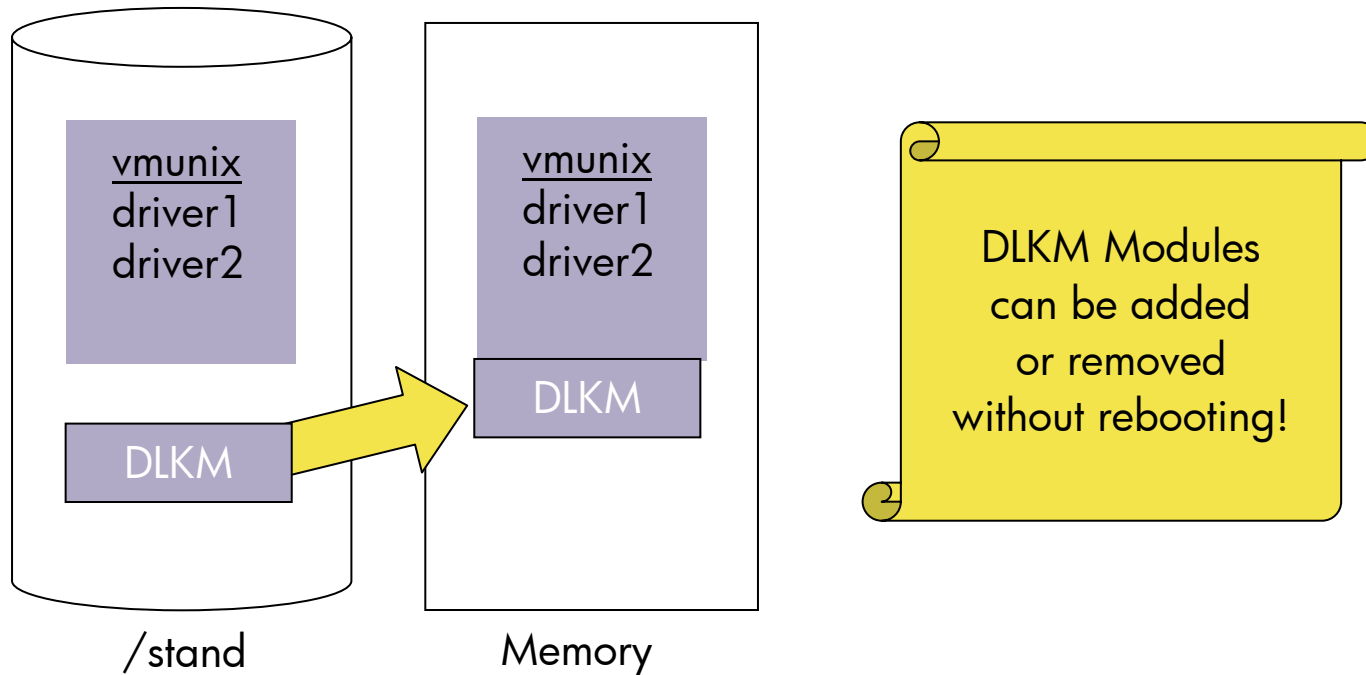


Reboot Required!



Adding or removing a static kernel module always requires a reboot!

Dynamically Loadable Kernel Modules



No Reboot Required!

Configuring Kernel Drivers and Subsystems

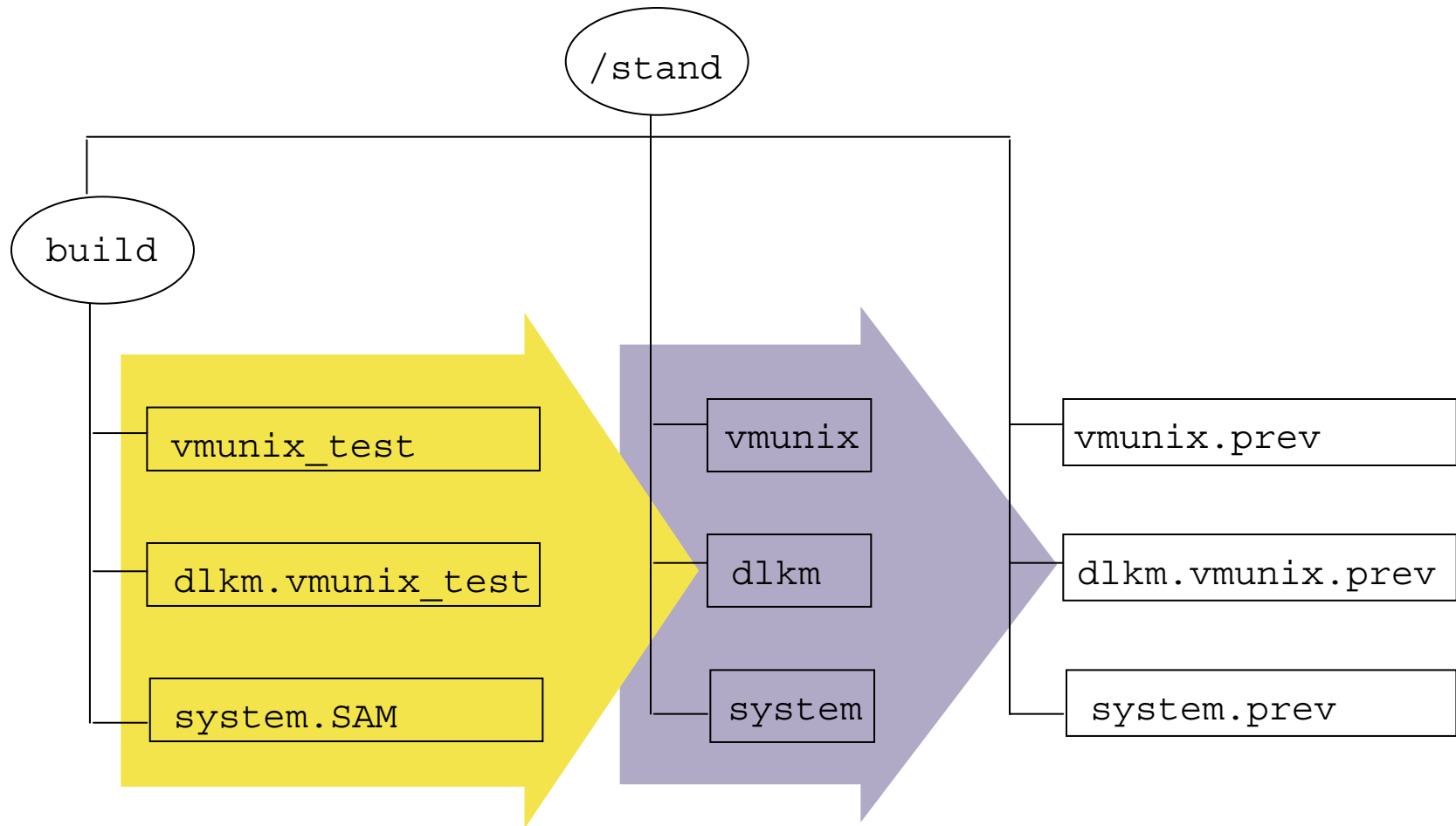


Kernel Configuration					
File	List	View	Options	Actions	Help
Press CTRL-K for keyboard help.					
Pending Kernel Based Upon: Current Kernel					
Drivers 0 of 91 selected					
Name	Current State	Pending State	Class	Type	Load Module At Boot?
krm	In	In	Module	Loadable	No
lrs	In	In	Driver	Static	N/A
lan2	In	In	Driver	Static	N/A
lan3	Out	Out	Driver	Static	N/A
lanmux0	Out	Out	Driver	Static	N/A
ldterm	In	In	Driver	Static	N/A
lpr2	Out	Out	Driver	Static	N/A
lpr3	Out	Out	Driver	Static	N/A
mux2	Out	Out	Driver	Static	N/A
mux4	Out	Out	Driver	Static	N/A

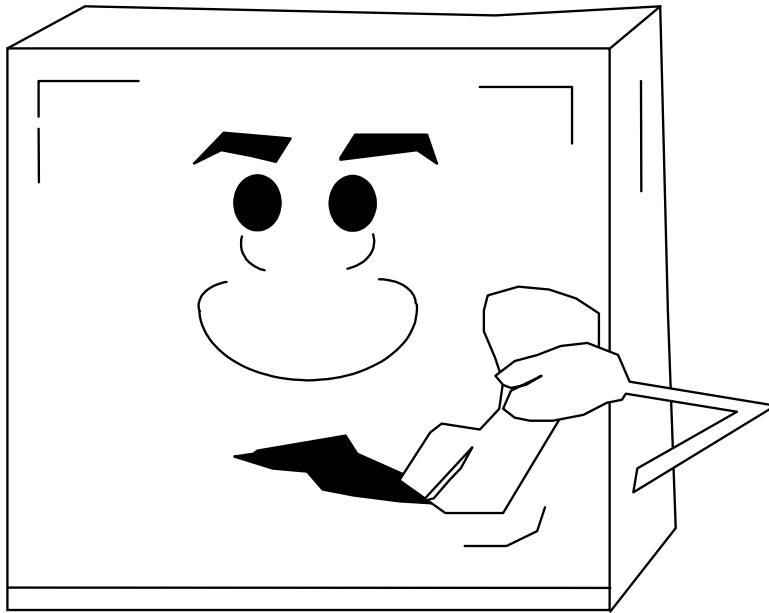
Configuring Kernel Tunable Parameters

Kernel Configuration				
File List View Options Actions				Help
Press CTRL-K for keyboard help.				
Pending Kernel Based Upon: Current Kernel				
Configurable Parameters				0 of 167 selected
Name	Current Value	Pending Value	Type	Associated Module
☒ maxfiles	60	60	Static	N/A
maxfiles_lim	1024	1024	Dynamic	N/A
maxssiz	8388608	8388608	Static	N/A
maxswapchunks	256	256	Static	N/A
maxtsiz	67108864	67108864	Dynamic	N/A
maxuprc	75	75	Dynamic	N/A
maxusers	32	32	Static	N/A
maxvgs	10	10	Static	N/A
mesg	1	1	Static	N/A
modstrmax	500	500	Static	N/A

Moving the New Kernel into Place



What If the New Kernel Won't Boot?



If the new kernel
fails to boot,
boot from the
backup kernel!

```
[POWER]  
[ESC]  
Main Menu> boot pri  
Interact with the IPL? y  
ISL> hpux -is /stand/vmunix.prev
```

Lab activity



