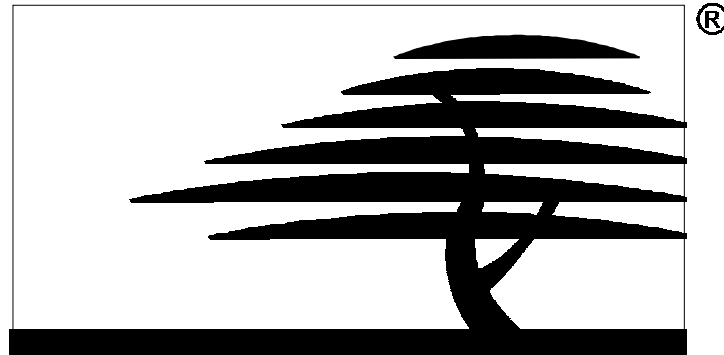




SCO

**SCO OpenServer™ Release 5
Administration II: System Installation,
Configuration, and Maintenance**

Transparency Masters

Course Release: 3.0

For Software: SCO OpenServer™ Release 5

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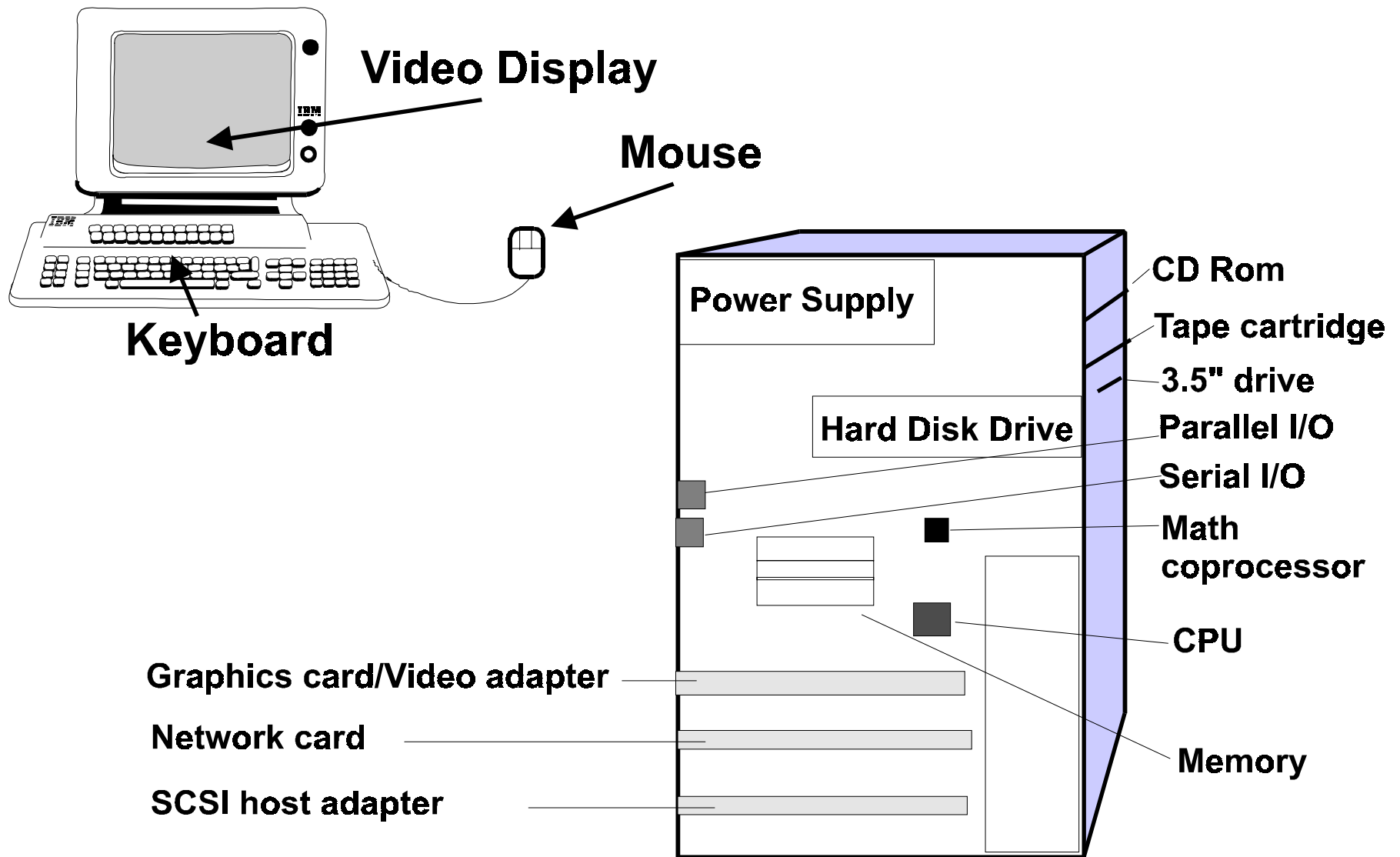
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Basic Hardware Configuration

- Identify the major components of a typical system
- Describe the functions of microprocessors and memory
- Describe the bus architectures supported by SCO
- Describe the functions of SCSI host adapters
- Describe supported hard disk configurations
- Identify general compatibility issues
- Maintain a sample administration log book

Major Hardware Components of a Typical System



The Motherboard with CPU

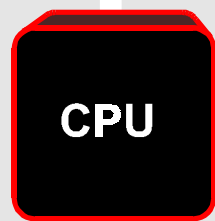
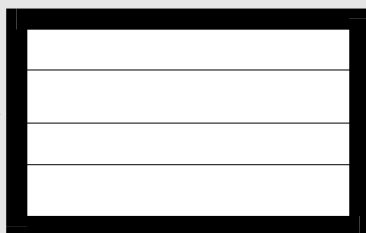
Motherboard



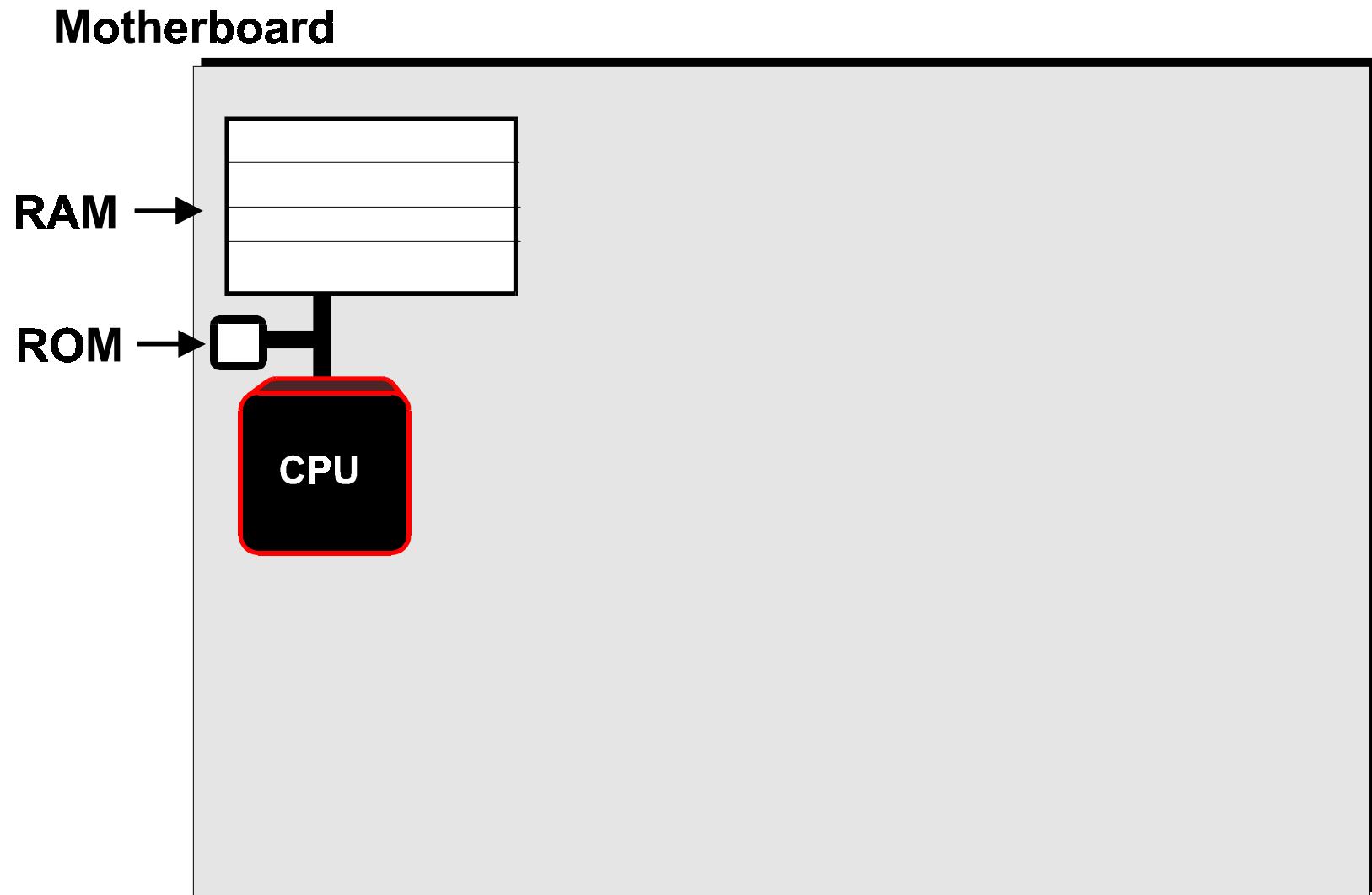
Random Access Memory (RAM)

Motherboard

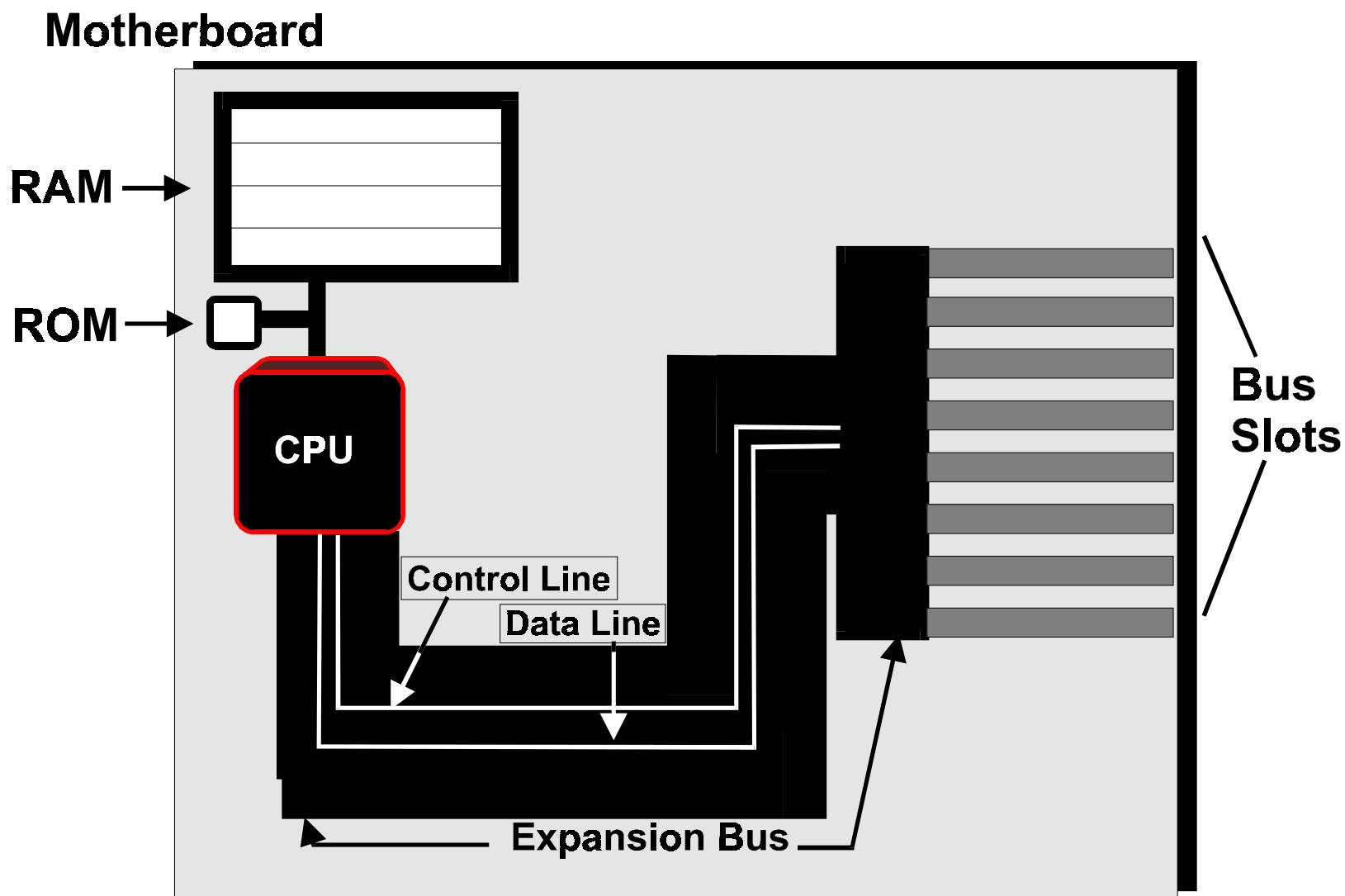
RAM →



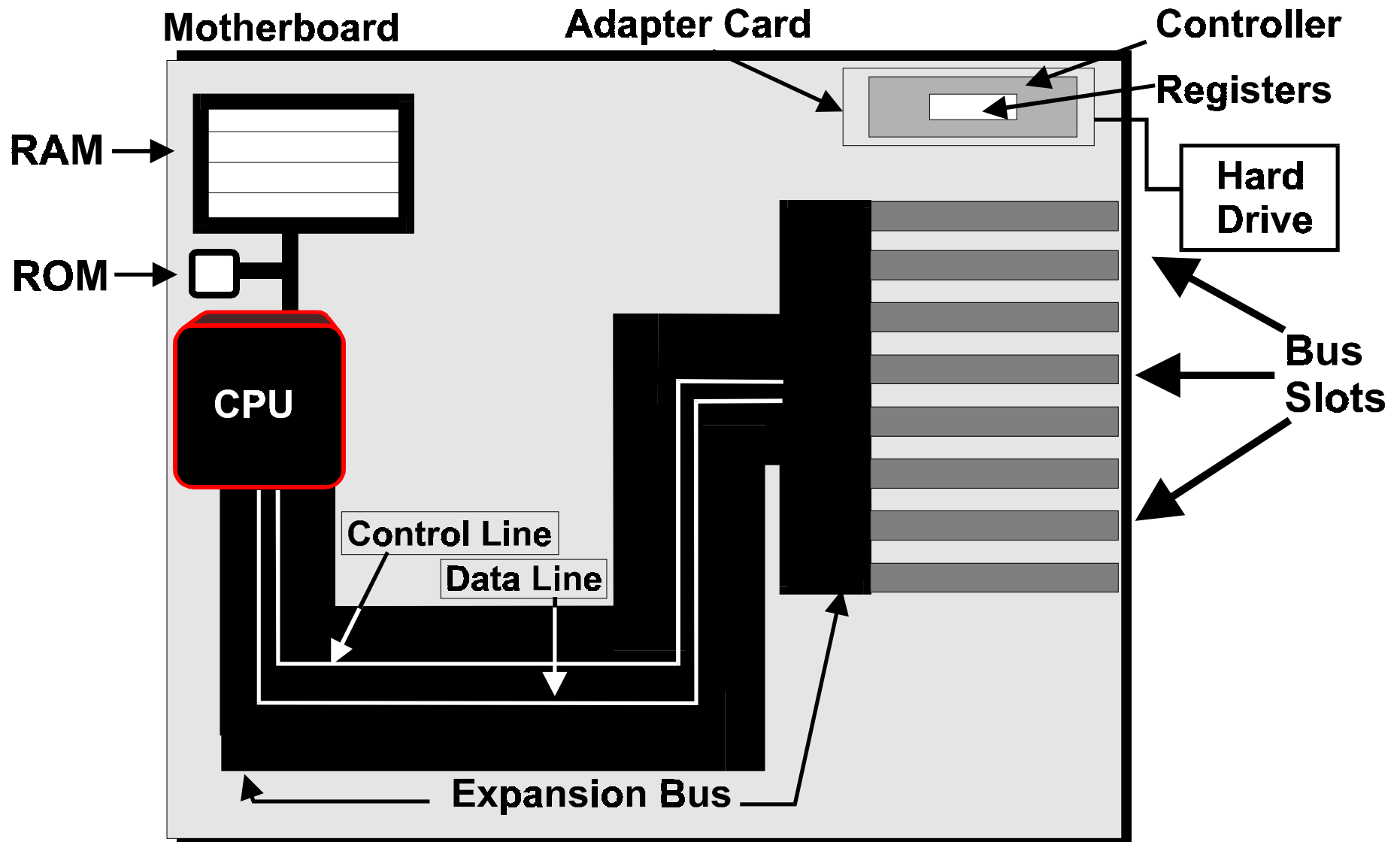
Read Only Memory (ROM)



Expansion Bus



Adapter Card and Controller

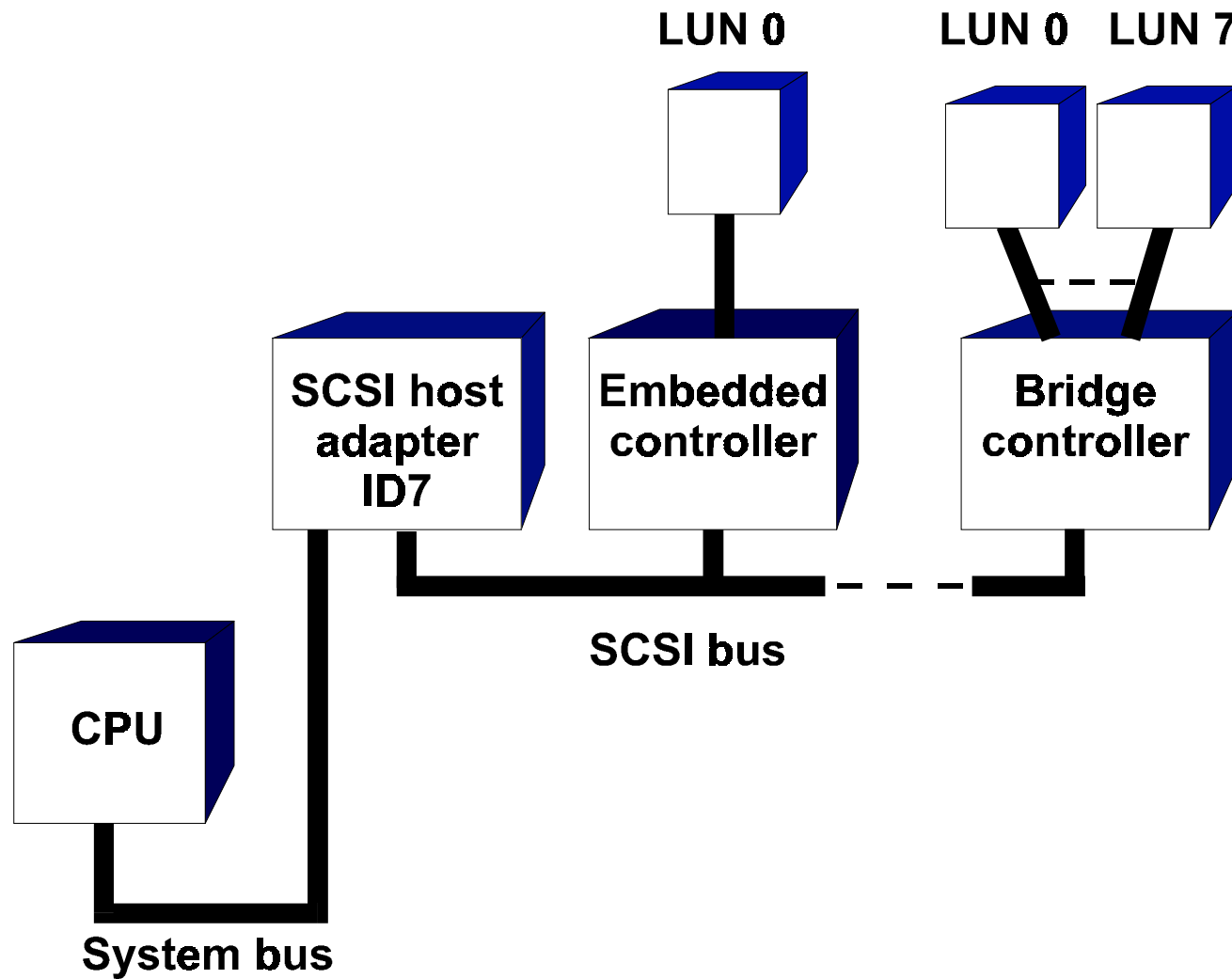


Typical Device Interrupts

Interrupt	Octal	Device
0*	0	Clock
1*	1	Console
2	2	Networks, tapes and others
3	3	Serial COM2
4	4	Serial COM1
5	5	Alternate parallel port (1p2)
6*	6	Floppy disk
7	7	Main parallel port (1p0 or 1p1)
9*	11	Chain from IRQ2
10	12	
11*	13	SCSI host adapter 1
12	14	SCSI host adapter 1
13*	15	FPU
14*	16	ST506/ESDI/IDE controller 0
15	17	ST506/ESDI/IDE controller 1

*Do not attempt to use these interrupts for any other purpose.

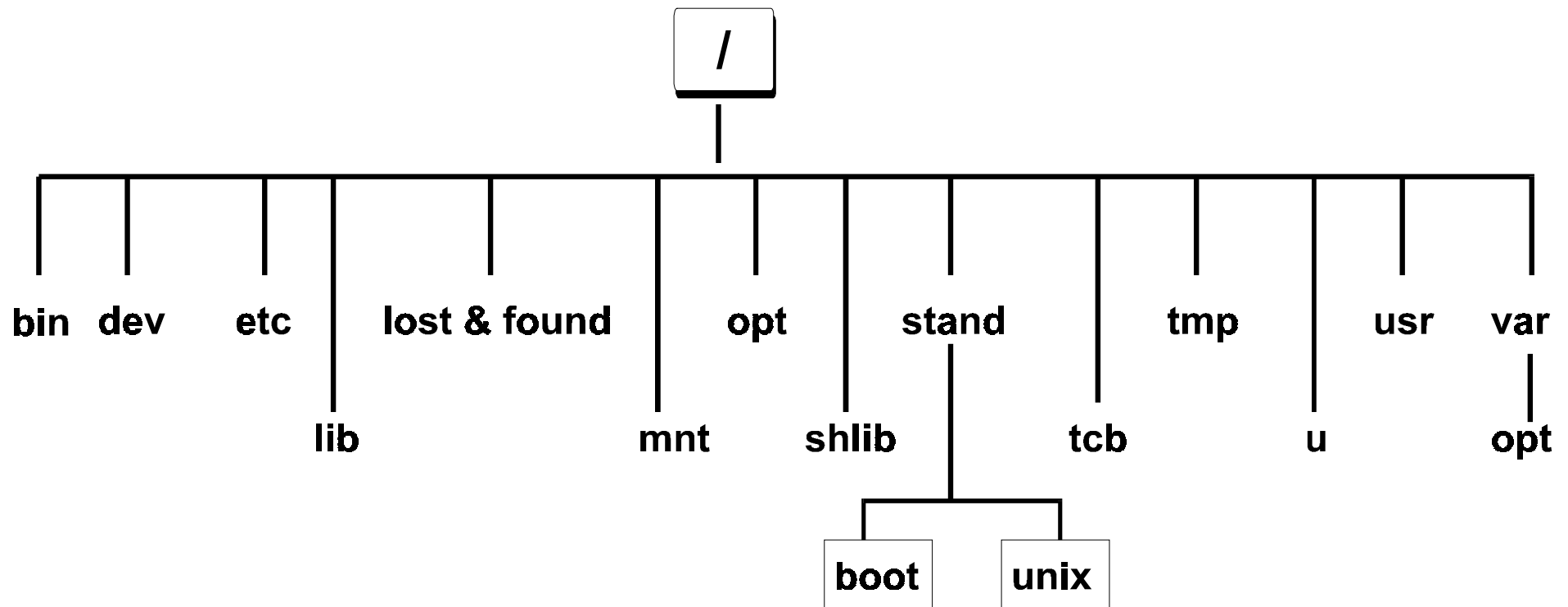
SCSI Bus Addressing



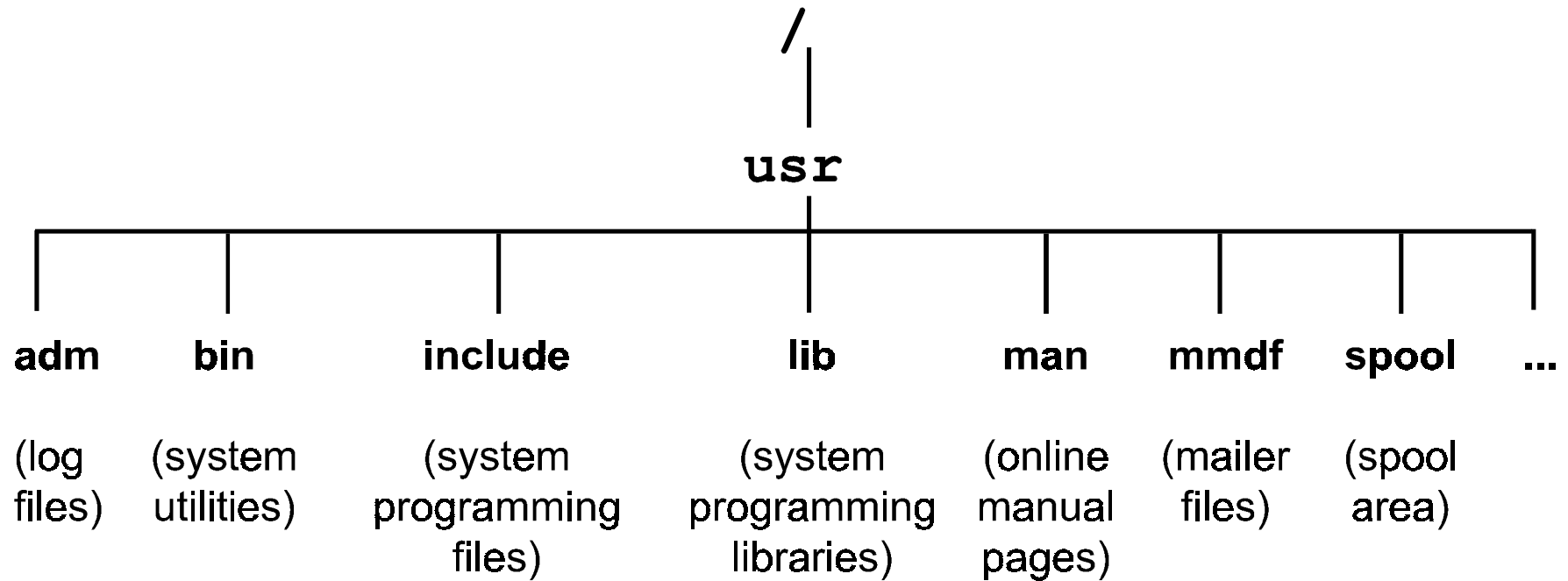
Files and Filesystems

- Describe the directory hierarchy
- Describe the role of Software Storage Objects (SSOs)
- Describe the UNIX filesystem types
- Describe the UNIX disk structure

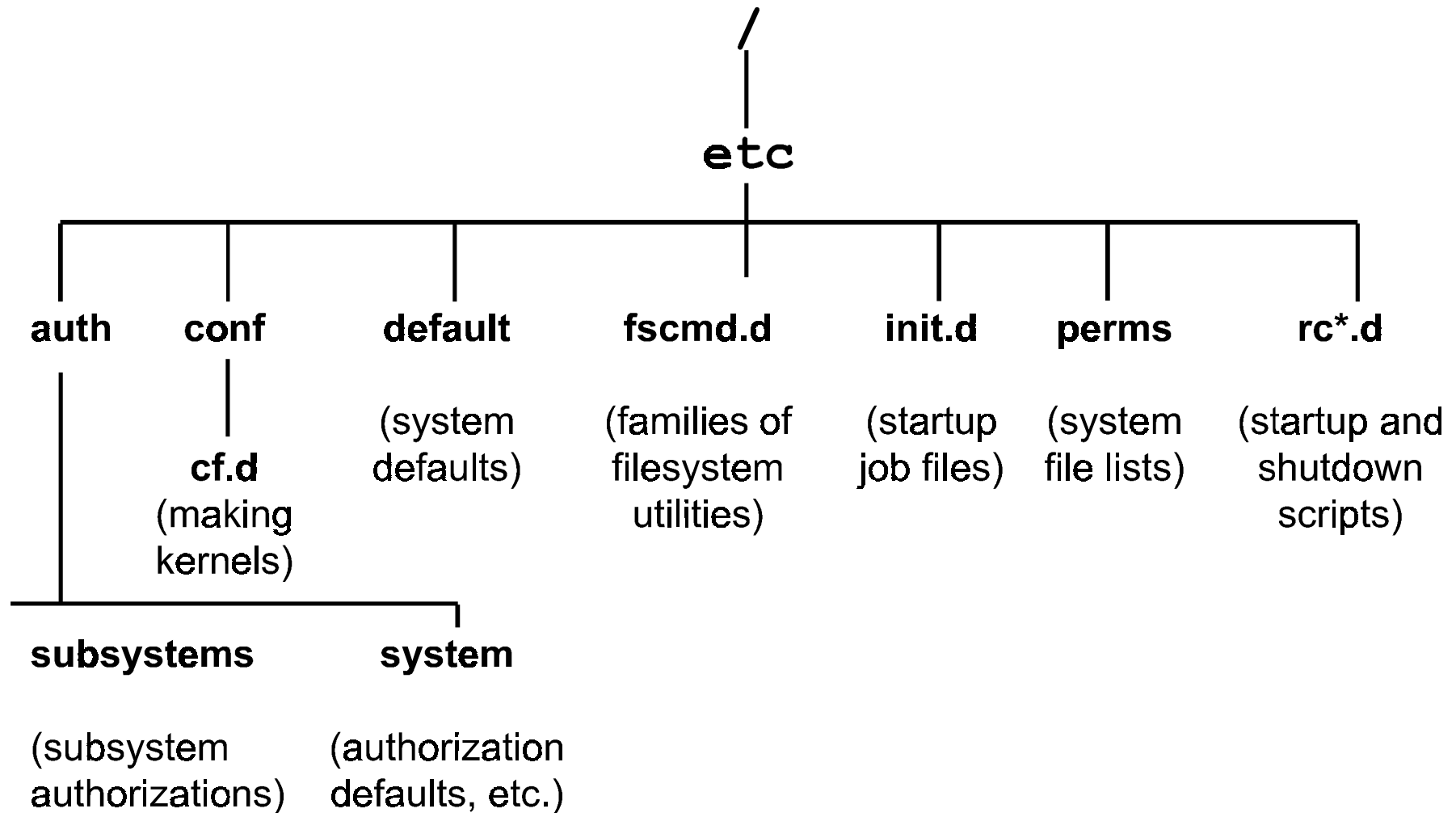
Root (/) Directory Structure



`/usr` Directory Structure



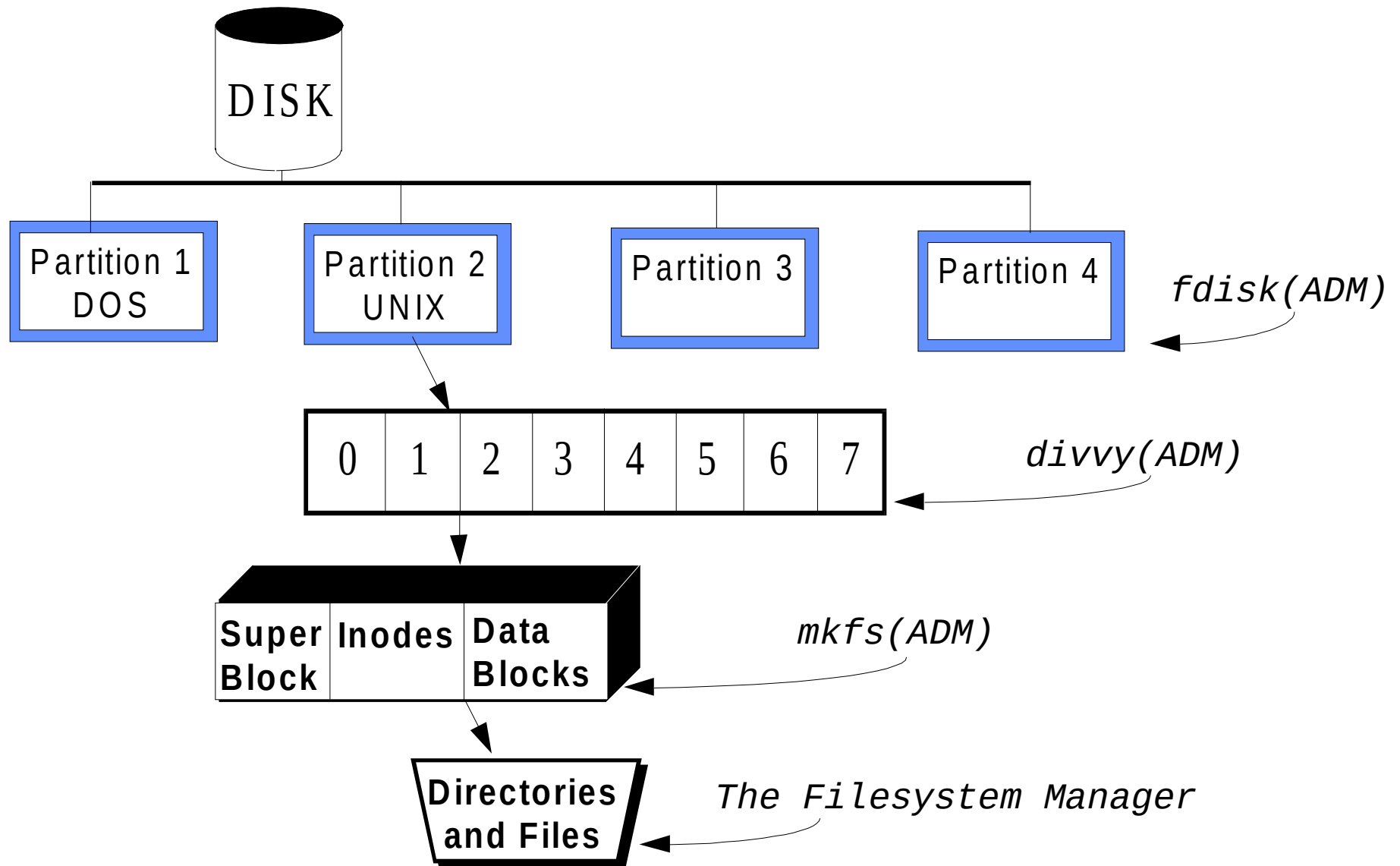
/etc Directory Structure



Supported Disk Filesystems

Filesystem	Bootable	Versioning	Check- pointing	Intent Logging	Advantages
AFS	X		X	X	Backwards compatability
EA FS	X		X	X	Used to create boot filesystem
DTFS		X	X	X	Uses data compression to save disk space
HTFS		X	X	X	Defaults use caching techniques for high performance
S51K	X		X		Backwards compatability
XENIX	X				Backwards compatability
DOS					Elminate need for DOS utilities

UNIX Disk Structure



The dkinit(ADM) Command

Disk Parameters	Values
1. Cylinders	1000
2. Heads	64
3. Write Reduce	0
4. Write Precomp	0
5. Ecc	0
6. Control	0
7. Landing Zone	0
8. Sectors/track	32

The fdisk(ADM) Command

1. Display Partition Table
2. Use Entire Disk for UNIX
3. Use Rest of Disk for UNIX
4. Create UNIX Partition
5. Activate Partition
6. Delete Partition
7. Create Partition

Enter your choice or 'q' to quit:

Displaying the Partition Table with **fdisk**(ADM)

Current Hard Disk Drive: /dev/rhd00

Partition	Status	Type	Start	End	Size
1	Active	UNIX	4	41063	64063

Total disk size: 64123 tracks (60 reserved for masterboot and diagnostics)

The **badtrk**(ADM) Command

1. Scan entire UNIX partition
2. Scan a specified range or blocks
3. Scan a specified filesystem
4. List current bad block table
5. Add entries to bad block table
6. Delete entries from bad block table
7. Clear bad block table
8. Re-allocate bad blocks
9. Modify target parameters

Enter your choice or 'q' to quit:

The **divvy**(ADM) Command

Name	Type	New FS	#	First Block	Last Block
boot	EAFS	no	0	0	15359
swap	NON FS	no	1	15360	80895
root	HTFS	no	2	80896	1023988
	NOT USED	no	3	-	-
	NOT USED	no	4	-	-
	NOT USED	no	5	-	-
recover	NONFS	no	6	1023989	1023998
hd0a	WHOLE DISK	no	7	0	1025007

1023999 1K blocks for divisions, 1008 1K blocks reserved for the system

Installation Planning

- Identify SCO OpenServer products
- Identify SCO OpenServer hardware requirements
- Complete an installation checklist

Operating System Installation

- Stop and restart the installation
- Install the operating system software
- Troubleshoot problems during the installation
- Troubleshoot problems after the installation

Selecting a Keyboard Type

Selecting a keyboard type

To change the keyboard type, press <Space> and select the keyboard you are using. The keyboard type specifies the language for which the keyboard is configured. For more information, press <F1>, or consult your system administrator, or your keyboard documentation .

You can return to this window to change your keyboard type at any time.

Keyboard:

Accept above choices

Press <Space> to select a different keyboard type.

Enter=Continue F1=Help F2=Abort Space=More choices

Licensing Your System

Licensing your system

Type in the license number and license code exactly as they appear on your Certificate of License and Authenticity.

License number: Type in

License code: Type in

Accept above choices

Esc=Previous F1=Help

Suitability for Automatic Upgrade

It will take a few minutes to check whether you can run an automatic Upgrade on your system (retaining all user and configuration files).

To verify whether your system is suitable for an automatic Upgrade, highlight Upgrade below and press <Enter>.

To begin a Fresh installation (which overwrites the current root filesystem with the new product), highlight Fresh below and press <Enter>.

Upgrade

Fresh

Press <Enter> to begin a Fresh installation.

Configuring the Basic System

If the information below does not match your requirements, follow the instructions at the bottom of the screen to change the values:

System name:	rosey1
Domain name:	sco.com
Security Profile:	Traditional
Time zone:	EasternStandard/ Summer Time
Language:	Standard C (English)

Accept above choices

Type in a unique system name for this machine.

Initial System Profile

The profile you choose pre-selects the software packages most useful for your system type. Press <F1> for details on each profile.

Standard Enterprise system configuration: Yes

Lightweight character terminal configuration: No

If you run large database products, choose the following:

Database services: No

Accept above choices

Press <Space> to toggle between Yes and No.

Preparing Your Disk and Choosing Software

If the information below does not match your requirements, follow the instructions at the bottom of the screen to change the values:

Hard disk setup: Preserve layout: Bad Blocking OFF

Optional Software: SCO OpenServer Enterprise System, 265 MB

Accept above choices

Press <Space> to change your hard disk configuration.

Setting up your Hard Disks

Disk 0, 4068 MB. Partitions and filesystems:

Disk 0 bad block type:

Preserve existing layout

Use whole disk for UNIX

Customize

Interactive fdisk/divvy

Accept above choices

Choose a disk configuration.

Selecting Optional Software

You can select more than one item for each list. Items marked with * are selected. Use <Space> to deselect or select an item.

****The basic system software always gets installed.****

Space remaining in root filesystem: Unknown

Operating System Services:	Some selected
Graphical Environment:	All selected
Connectivity:	Some selected
Internet FastStart:	All selected
Documentation:	Some selected
Language Support:	None selected

Accept above choices

Press 'a' for All items in the list, 'n' for None or <Space> for selections.

Configuring Optional Software

If the information below does not match your requirements, follow the instructions at the bottom of the screen to change the values.

Please refer to the Installation Checklist in the OpenServer Handbook for assistance when selecting the Email system.

Network Card:	Autodetect
Network Address:	No network card configured
Video and Graphics:	VESA SVGA
Mouse:	No mouse configured
Email system:	MMDF

Accept above choices

Press <Space> for network card selection options.

Configuring Your Network

Setting network addresses for `scosysv.sco.com`

TCP/IP networking parameters:

IP address:	132.147.103.197
Net mask:	255.255.255.0
Video and graphics	132.147.103.255

IPX/SPX networking parameters

IP internal network number:	Deferred
IPX network number:	Deferred
IPX framing type:	Deferred

Accept above choices

Type in your IPX internal network number. Press <F5> to defer configuration.

Setting Your Root Password

Setting your root password

Enter a root password that is at least 5 characters long and a combination of lowercase letters, uppercase letters, numbers, or symbols. To defer setting a root password until after the installation is complete, press <F5>

Root password:

Please type again to confirm:

Accept above choice

Esc=Previous Enter=Continue F1=Help F2=Abort F5=Defer

System V Hard Disk Initialization

Starting hard disk initialization

System V Hard Disk Initialization

The primary hard disk in the system will now be initialized.

The hard disk initialization requires you to set the disk parameters, specify the size of the UNIX partition, and control the layout of the filesystems and swap area. System default values are available at each selection.

Initialization Selection:

1. Continue with hard disk initialization.
2. Return to the Installation Query Manager (IQM).
This will return you to the serial/activation screen. All previous answers will be lost.
3. Exit and abort installation.

Enter your choice:

The hard disk installation program will now invoke /etc/fdisk. Entering 'q' at the following menu will exit /etc/fdisk, and the hard disk installation will continue.

If you wish to exit the entire installation at this menu, press the key.

1. Display Partition Table
2. Use Entire Disk for UNIX
3. Use Rest of Disk for UNIX
4. Create UNIX Partition
5. Activate Partition
6. Delete Partition
7. Create Partition

Enter your choice or 'q' to quit:

scsi version = 2
vendor = WDIGTL
product = WDE4360-1808A1

1. Scan entire UNIX partition
2. Scan a specified range of blocks
3. Scan a specified filesystem
4. List current bad block table
5. Add entries to bad block table
6. Delete entries from bad block table
7. Clear bad block table
8. Re-allocate bad blocks
9. Modify target parameters

Enter your choice or 'q' to quit.

Swap and Boot Space Allocation

There are 4176900 1K blocks in the UNIX area. Between 16000 and 512000 1K blocks should be reserved for the swap area.

Please enter the swap-space allocation, or press <Return> to get the default allocation of 98000 1K blocks:

**There are 4176900 1K blocks in the UNIX area.
Between 15000 and 64000 1K blocks should be reserved for the
boot filesystem.**

Please enter the boot-space allocation, or press <Return> to get the default allocation of 20000 1K blocks:

Filesystem Creation

Do you want a separate /u filesystem? (y/n)
Enter allocation of 1K blocks for the /u filesystem (80000
to 3745546) 80000

The layout of the filesystems and swap area is now
prepared.

Do you wish to make any manual adjustments to the sizes or
names of the filesystems or swap area before they are
created on the hard disk? (y/n) y

divvy Table (continued below)

Name	Type	New FS	#	First block	Last block
boot	EAFS	yes	0	0	14999
swap	NON FS	no	1	15000	29999
root	HTFS	yes	2	30000	1023988
	NOT USED		3	-	-
	NOT USED		4	-	-
	NOT USED		5	-	-
recover	NON FS	no	6	1023989	1023998
d1057a11	WHOLE DISK	no	7	0	1025006

divvy Table (continued)

1023999 1K blocks for divisions, 1008 1K blocks reserved for the system.

n[ame]	Name or rename a division
c[reate]	Create a new filesystem on this division
t[ype]	Select or change filesystem type on new filesystem
p[revent]	Prevent a new filesystem from being created on this division
s[tart]	Start a division on a different block
r[estore]	Restore the original division table

Enter your choice or q to quit

Post-installation Administration

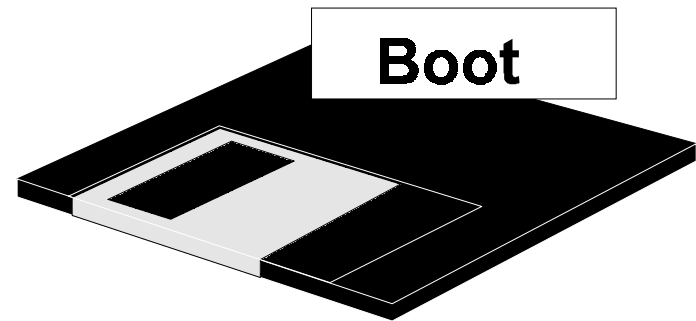
- Create an emergency boot floppy set
- Install applications
- License and register your SCO OpenServer products

Contents of a Boot Floppy

`/boot`

`/stand/unix`

`/stand/etc/default/boot`



Contents of a Root Floppy

`/bin`

`/dev`

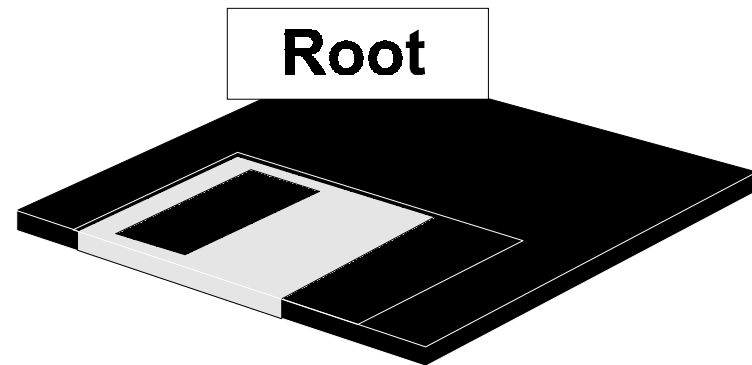
`/etc`

`/lib`

`/mnt`

`/tcb`

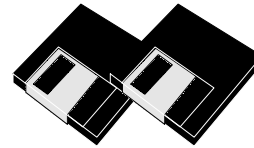
`/usr`



Not all files are copied from each directory

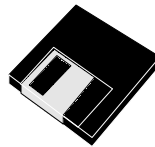
Emergency Boot Floppy Set

1.44 MB and 1.2 MB floppies -



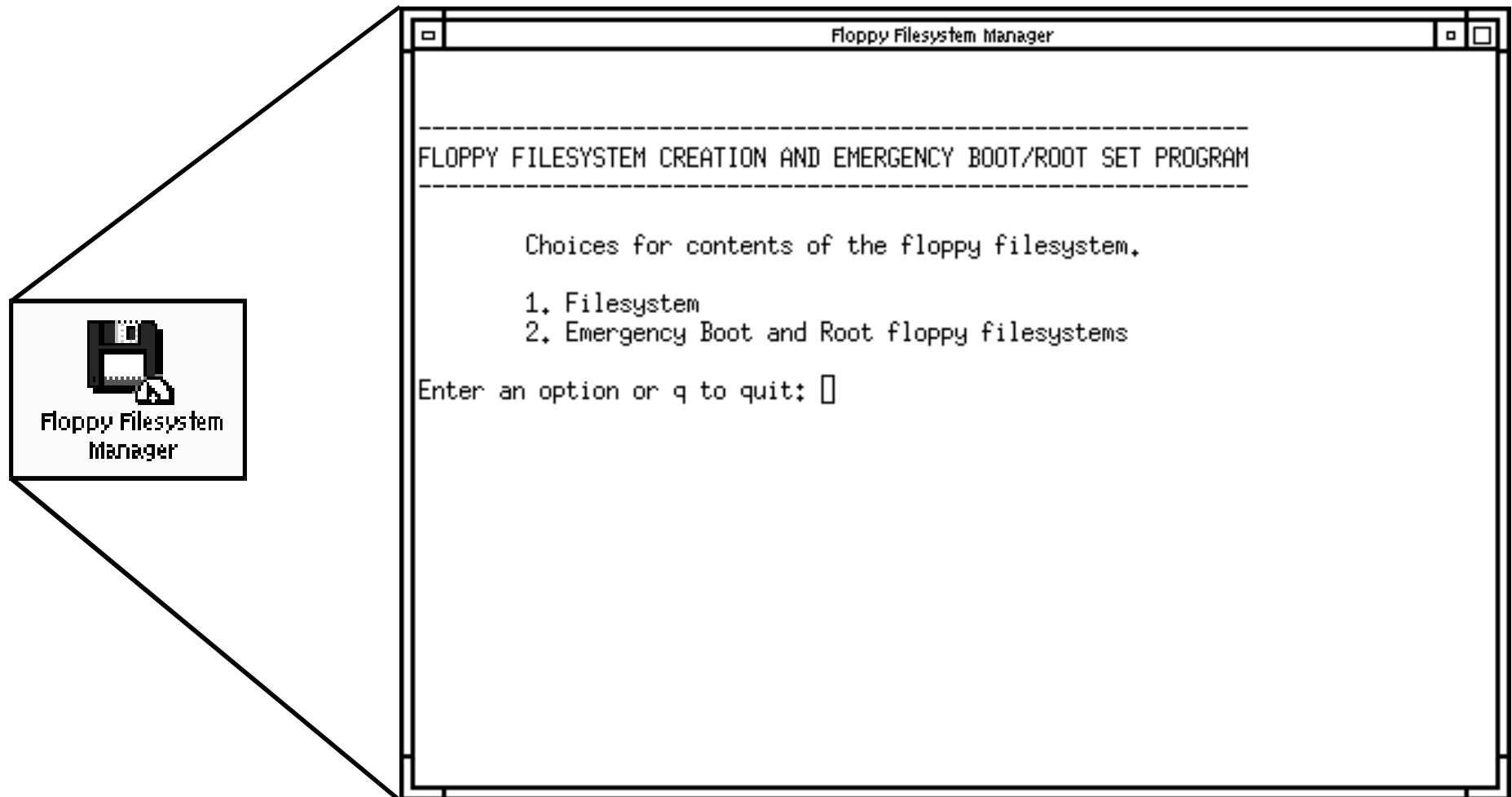
Creates both a boot and root floppy set

2.88 MB floppy -

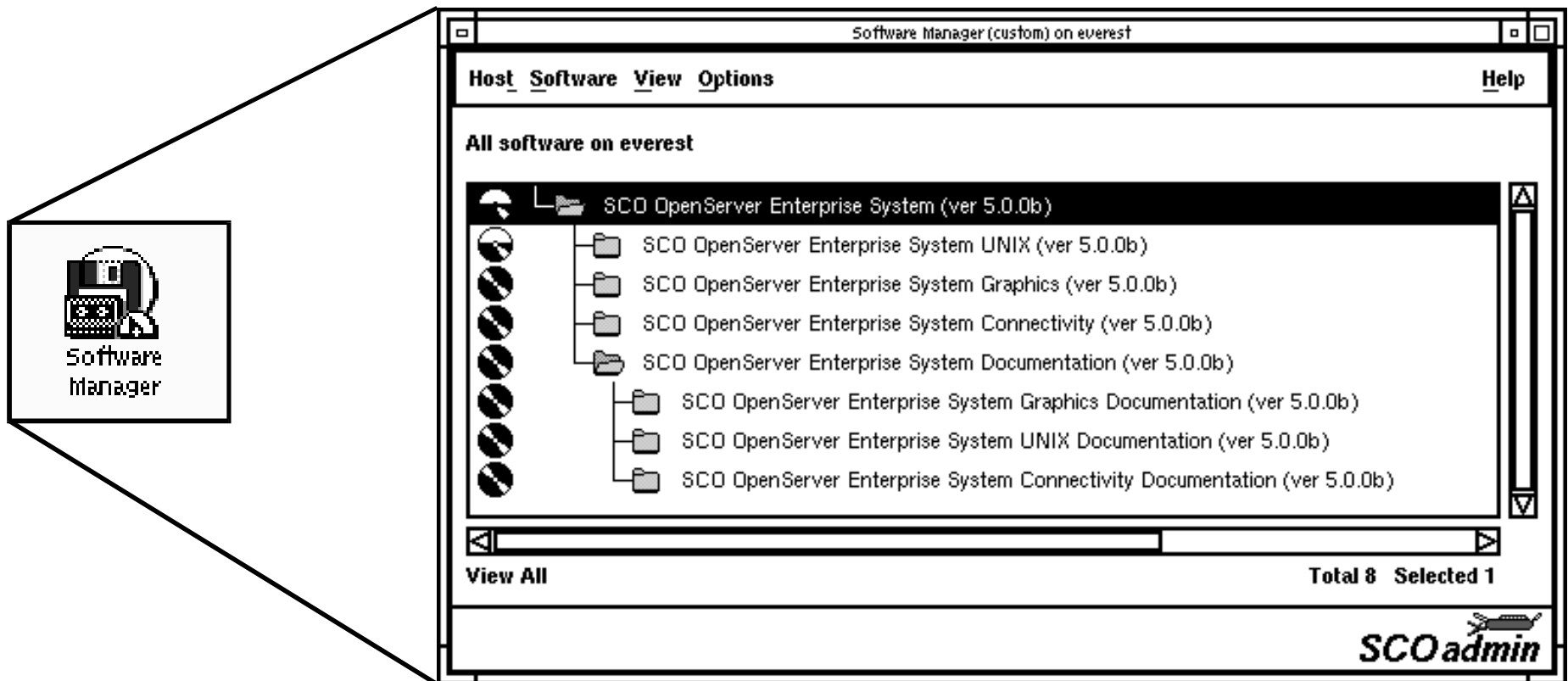


Creates a single boot and root floppy

Using the Floppy Filesystem Manager



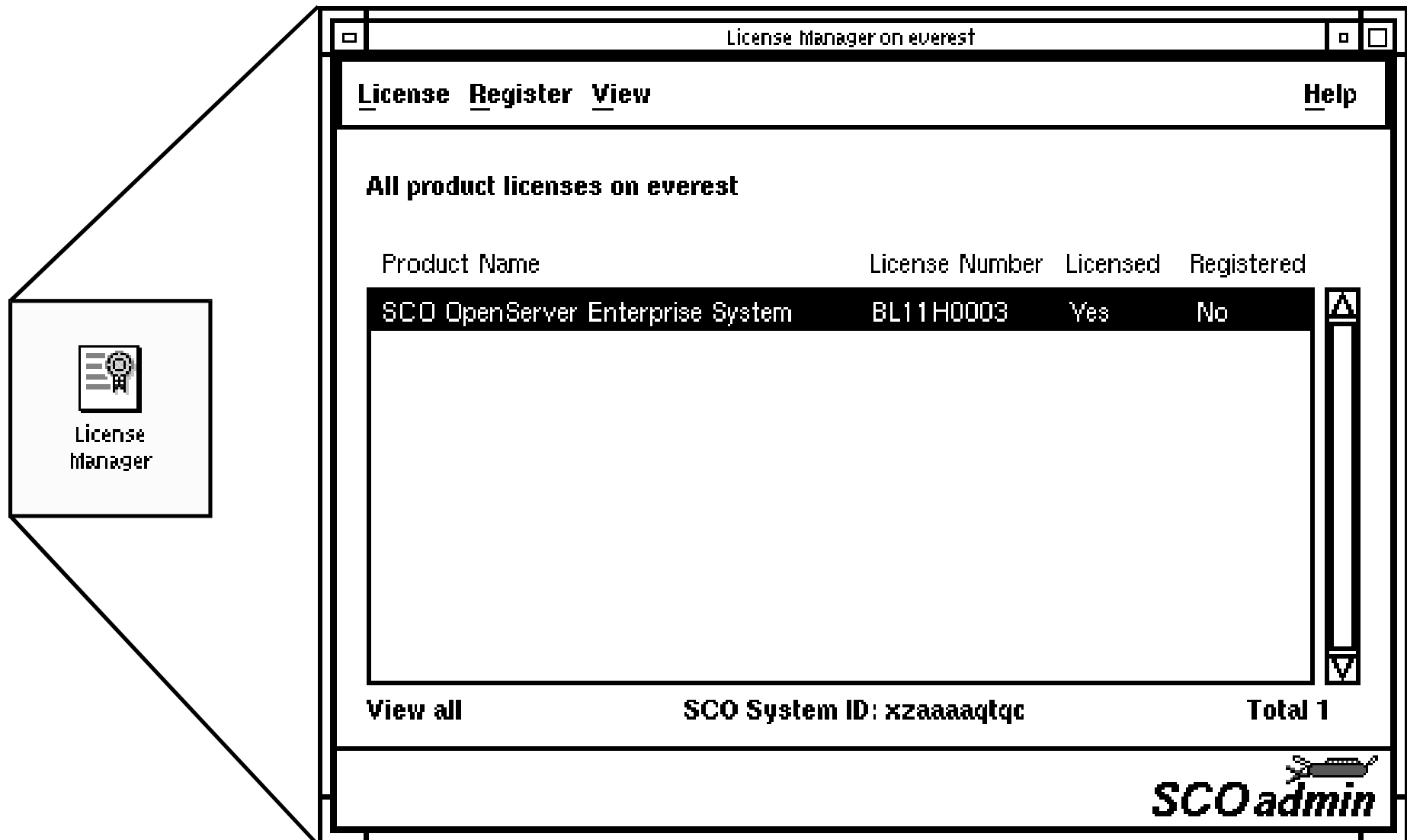
The Software Manager



Licensing and Registration Summary

Item	Where to find	When you need	Where you enter the item
License Number	Certificate of License and Authenticity (with software)	For licensing during installation	Installation setup phase
License Code	Certificate of License and Authenticity (with software)	For licensing during installation	Installation setup phase
License Data	Certificate of License and Authenticity (with software; optional)	For licensing during installation	Installation setup phase
System ID	License Manager (generates with install)	For registering	License Manager, "Register"
Registration Key	SCO Registration Center (given when you call in)	For registering	License Manager, "Register"

Registering Your Software



Managing System Startup and Shutdown

- Describe the default UNIX boot process
- Customize the UNIX boot process
- Use the hardware information displayed at boot time
- Choose the mode of operation
- Trace and customize multiuser initialization
- Troubleshoot system startup
- Analyze system shutdown

Bootable UNIX Filesystems - SCO OpenServer

	Yes	No
AFS	X	
EAFS	X	
S51K	X	
XENIX	X	
HTFS		X
DTFS		X

Role of Components at Boot-Time

1. PC's BIOS searches for active partition

Hard Disk

2.

Masterboot
Active partition:
2 (UNIX)

DOS

3.

UNIX

Partition 3

Partition 4

UNIX Partition

4.

boot0

5.

boot1

divvy table

badtrack table

alias tracks

6.

/stand/boot



/stand/etc/default/boot



/stand/unix

sched

init

bdflush

vhand

getty

getty

UNIX Kernels Residing in */stand*

unix	default kernel
unix.safe	kernel created after first kernel rebuild
unix.old	kernel created after any subsequent kernel rebuilds
unix.install	original kernel from installation diskette

Operating Systems Loaded with **bootos**(ADM)

ccpm	Concurrent CP/M
dos	Matches any DOS filesystem
dos_12	DOS 12-bit FAT
dos_16	DOS 16-bit FAT
dos_32	DOS 32-bit FAT
dos_ext	DOS extended partition
nt	NT(TM)
OS2	OS/2
OS2_hpfs	OS/2 HPFS
UNIX	SCO OpenServer System
XENIX	XENIX Operating System

/etc/default/boot

```
DEFBOOTSTR=hd(40)unix swap=hd(41) dump=hd(41) root=hd(42)
AUTOBOOT=YES
FSCKFIX=YES
MULTIUSER=YES
PANICBOOT=NO
MAPKEY=YES
SERIAL8=YES
SLEEPTIME=0
BOOTMNT=RO
```

/etc/default/boot

```
DEFBOOTSTR=hd(40)unix swap=hd(41) dump=hd(41) root=hd(42)
AUTOBOOT=YES
FSCKFIX=YES
MULTIUSER=YES
PANICBOOT=NO
MAPKEY=YES
SERIAL8=YES
SLEEPTIME=0
BOOTMNT=RO
```

/etc/default/boot

```
DEFBOOTSTR=hd(40)unix swap=hd(41) dump=hd(41) root=hd(42)
AUTOBOOT=YES
FSCKFIX=YES
MULTIUSER=YES
PANICBOOT=NO
MAPKEY=YES
SERIAL8=YES
SLEEPTIME=0
BOOTMNT=RO
```

Kernel Initialization Check Letters (Partial List)

- D - Checks direct memory access**
- E - Initializes numeric processor and multiprocessor memory**
- F - Initializes pseudo and I/O devices (F0-F34)**
 - F1 - audit driver**
 - F4 - serial driver**
 - F6 - floppy disk driver**
 - F34 - Compaq IDA disk driver**
- G - Initializes Programmable Interrupt Controller and multiprocessor**
- H - Initializes various system resources (H0-H13)**
 - H2 - inodes**
 - H4 - file table**
 - H13 - print error messages**
- I - Prints total kernel and user memory**
- J - Initializes floating point emulator**
- K - Opens swap device**
- M - Initializes vendor-specific memory ECC support**

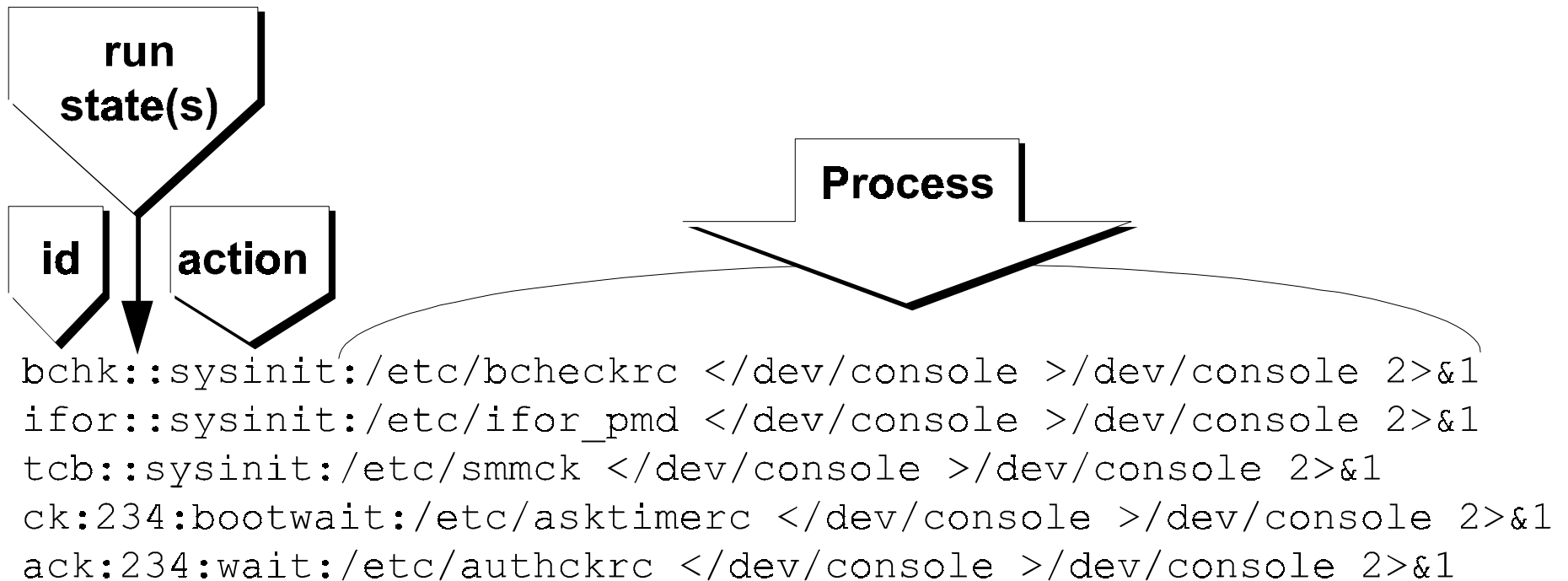
Kernel ID

device	address	vector	dma	comment
%fpu	-	13	-	type=80387
%serial	0x03F8-0x03FF	4	-	unit=0 type=Standard nports=1
%serial	0x02F8-0x02FF	3	-	unit=1 type=Standard nports=1
%floppy	0x03F2-0x03F7	6	2	unit=0 type=135ds18
%console	-	-	-	unit=vga type=0 12 screens=68k
%parallel	0x0378-0x037A	7	-	unit=0
%tape	0x0300-0x0304	5	1	type=wangtek
%adapter	0x0340-0x035F	11	-	type=spad ha=0 id=7
%smc/wdn	0x0240-0x025F	9	-	type=8003EP addr=00:00:c0:a0:92:26
%tape	-	-	-	type=S ha=0 id=2 lun=0 bus=0 ht=spad
%disk	-	-	-	type=S ha=0 id=0 lun=0 bus=0 ht=spad
%Sdsk	-	-	-	cyls=1002 hds=64 secs=32 fts=b

mem: total = 15996k, kernel = 5104k, user = 10892k
 swapdev = 1/41, swplo = 0, nswap = 30000, swapmem = 15000k
 rootdev = 1/42, pipedev = 1/42, dumpdev = 1/41
 kernel: Hz = 100, i/o bufs = 1420k

System Startup

An /etc/inittab File



Initialization of Run-Levels

Extract from `/etc/inittab`

```
r0:056:wait:/etc/rc0 1> /dev/console 2>&1 </dev/console
r1:1:wait:/etc/rc1 1> /dev/console 2>&1 </dev/console
r2:2:wait:/etc/rc2 1> /dev/console 2>&1 </dev/console
r3:3:wait:/etc/rc3 1> /dev/console 2>&1 </dev/console
sd:0:wait:/etc/uadmin 2 0 >/dev/console 2>&1 </dev/console
fw:5:wait:/etc/uadmin 2 2 >/dev/console 2>&1 </dev/console
rb:6:wait:/etc/uadmin 2 1 >/dev/console 2>&1 </dev/console
```

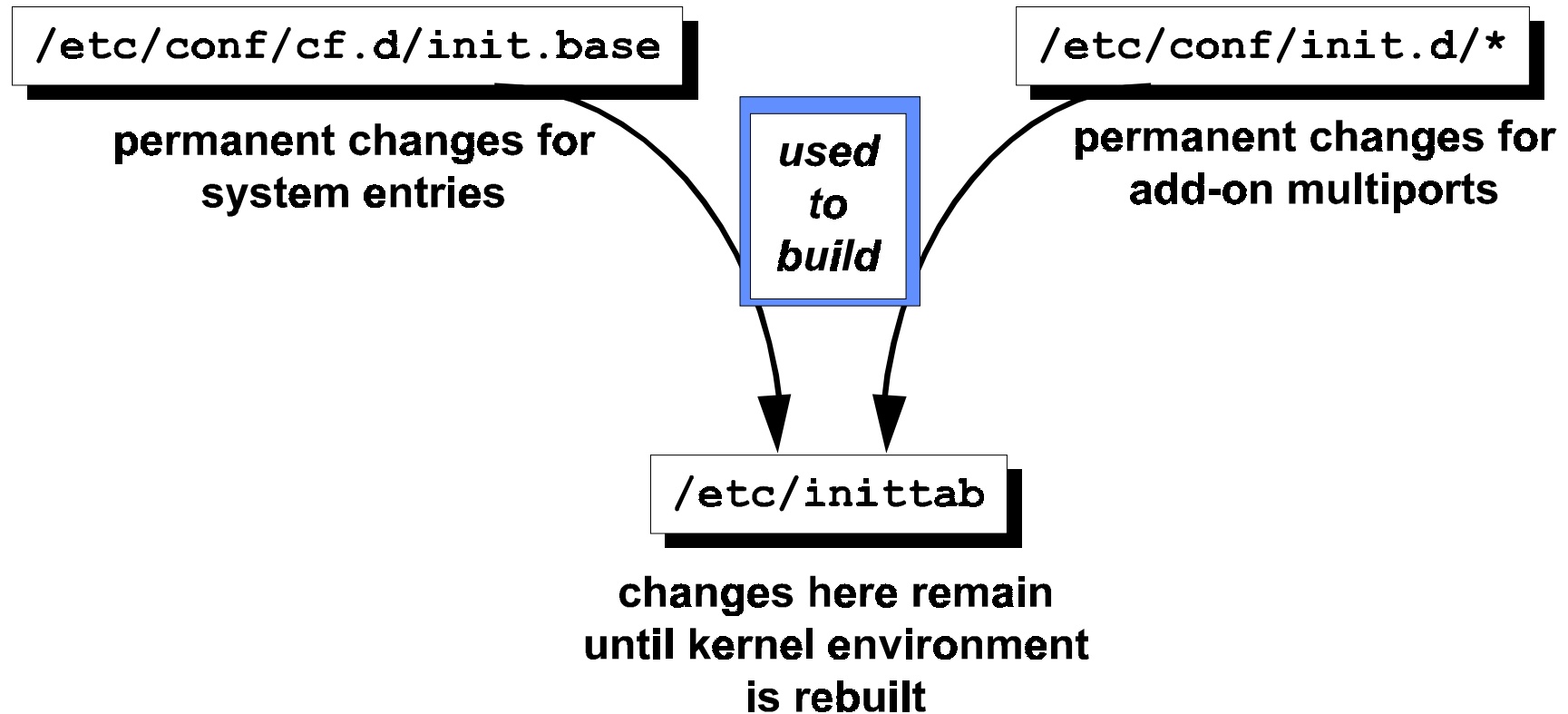
inittab(F) Action Definitions

respawn	If the process does not exist, start the process, and when it dies restart the process.
wait	Upon entering the matching run-level, start the process and wait for its termination.
once	Upon entering the matching run-level, start the process; do not wait for its termination. When it dies, do not restart the process.
boot	The entry is to be processed only at boot-time read of the file.
bootwait	The entry is to be processed the first time when the system goes from single-user to multiuser state after the system is booted.

More **inittab**(F) Action Definitions

powerfail	Execute the process associated with this entry only when it receives a power fail signal.
powerwait	Execute the process associated with this entry only when it receives a power fail signal and wait until it terminates before continuing.
off	Ignore this process.
ondemand	This is the same as respawn, used with run-levels a, b, c and e.
initdefault	This is used to determine the run-level.
sysinit	Entries are executed before init (M) accesses the console.

Changing */etc/inittab*



/etc/rc2.d

P00SYSINIT	P90RESERVED
P01MOUNTFSYS	P93scohttp
P03RECOVERY	P95calserver
P04CLEAN	S00MDAC
P05RMTMPFILES	S25pm
P15HWDNLOAD	S35dlpi
P16KERNINIT	S60sync
P20syssetup	S80lp
P21perf	S84rpcinit
P70uucp	S85tcp
P75cron	S89nfs
P86mmdf	s99apcssd
P86scologin	messages
P87USRDAEMON	
P88USRDEFINE	

/etc/rc0.d

```
K25PM  
K79nfs  
K80lp  
K81VDRESTORE  
K83sync  
K96tcp  
K97dlpi  
K98rpcinit  
P00ANNOUNCE  
P70uucp  
P75cron  
P86mmdf  
P91scologin  
P95calserver  
messages
```

Filesystem Configuration and Disk Management

- Describe the structure of a UNIX filesystem
- Manage the `/dev` directory
- Configure filesystems
- Describe important filesystem features
- Check and repair filesystems
- Configure additional hard disks
- Troubleshoot hard disks

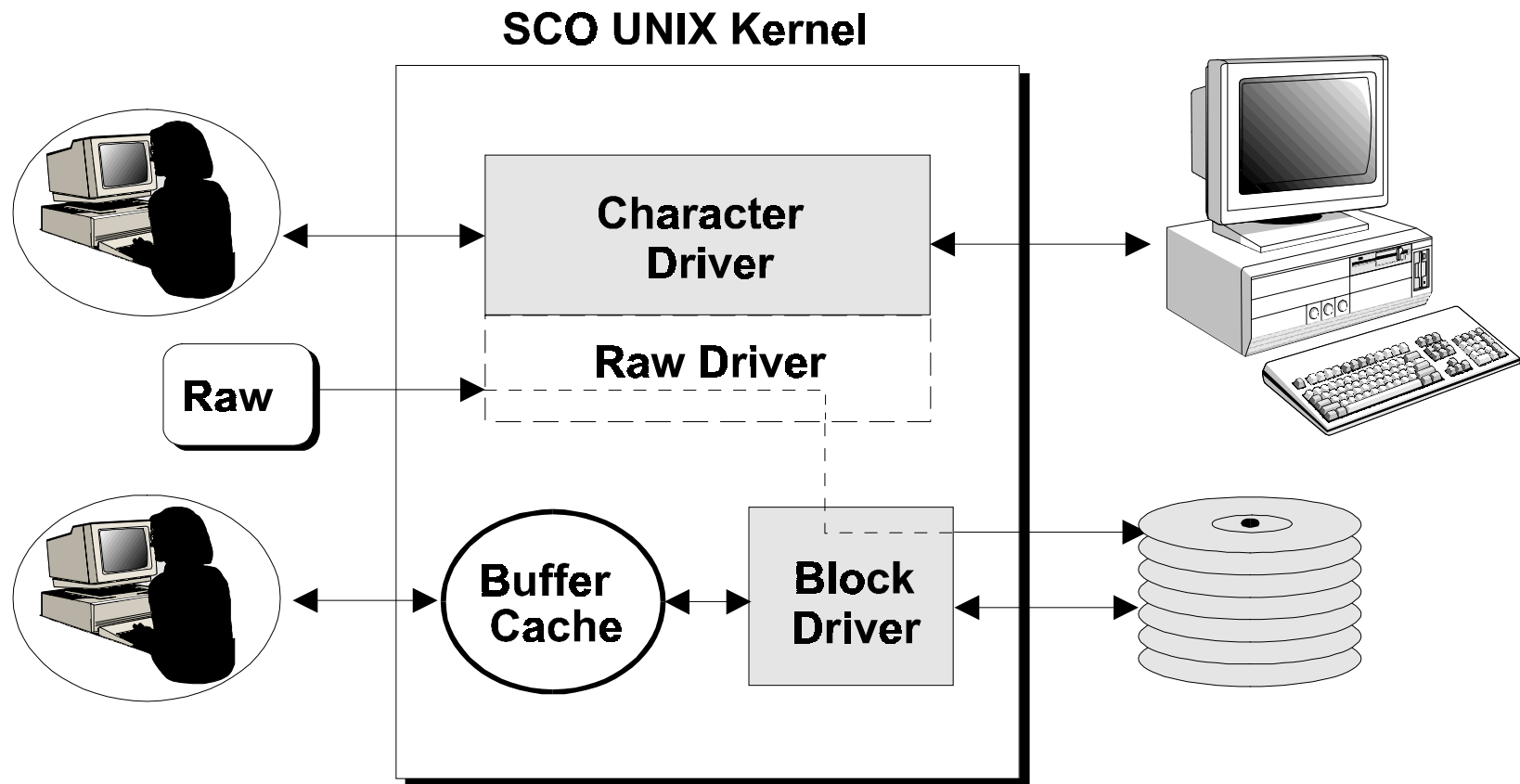
Structure of an Inode

File type and permissions
Link count
Owner UID
File GID
File Size
Data block addresses, major, minor #'s, or symbolic link pathnames
File last access time
File modification time
Inode modification time

Special Device Files

brw-----	2	sysinfo	sysinfo	1,	0	Apr 02	15:35	/dev/hd0
brw-----	2	sysinfo	sysinfo	1,	0	Apr 02	15:35	/dev/dsk/0S0
brw-rw-rw-	7	bin	bin	2, 64	Apr 02	15:35	/dev/fd0	
brw-rw-rw-	7	bin	bin	2, 60	Apr 02	15:35	/dev/fd0135ds18	
brw-rw-rw-	7	bin	bin	2, 60	Apr 02	15:35	/dev/dsk/f03ht	
brw-rw-rw-	7	bin	bin	2, 53	Apr 02	15:35	/dev/dsk/f1t	
brw-rw-rw-	7	bin	bin	2, 53	Apr 02	15:35	/dev/dsk/f15ht	
brw-rw-rw-	7	bin	bin	2, 53	Apr 02	15:35	/dev/dsk/f1q15dt	
crw-rw-rw-	1	bin	bin	5,128	Apr 02	15:35	/dev/tty1A	
crw-rw-rw-	1	bin	bin	5, 0	Apr 02	15:35	/dev/tty1a	
crw-----	1	sysinfo	sysinfo	1, 0	Apr 02	15:35	/dev/rhd00	
crw-----	1	sysinfo	sysinfo	1, 15	Apr 02	23:45	/dev/rhd01	

Block vs. Character Files



Major and Minor Device Numbers

`/dev/fd0135ds18`

Major = 2

Minor = 60

UNIX Kernel			1	Hard Disks	44
			2	Floppy	48
			6	Parallel	52
			10	Tape	60
# #	57	52	0	Console	64
Other Devices	Pseudo Devices	Video			

brw-rw-rw- 2 bin bin 2,60 Feb 27 19:46 fd0135ds18

divvy(ADM)

Name	Type	New FS	#	First Block	Last Block
boot	EAFS	no	0	0	15359
swap	NON FS	no	1	15360	80895
root	HTFS	no	2	80896	1023988
	NOT USED	no	3	-	-
	NOT USED	no	4	-	-
	NOT USED	no	5	-	-
recover	NONFS	no	6	1023989	1023998
hd0a	WHOLE DISK	no	7	0	1025007

1023999 1K blocks for divisions, 1008 1K blocks reserved for the system

divvy(ADM) Instructions

n[ame]	Name or rename a division.
c[reate]	Create a new file system on this division.
t[ype]	Select or change filesystem type on new filesystems.
p[revent]	Prevent a new file system from being created on this division.
s[tart]	Start a division on a different block.
e[nd]	End a division on a different block.
r[estore]	Restore the original division table.

Enter your choice or q to quit

i[nstall]	Install the division set-up shown
r[eturn]	Return to the previous menu
e[xit]	Exit without installing a division table

Please enter your choice:

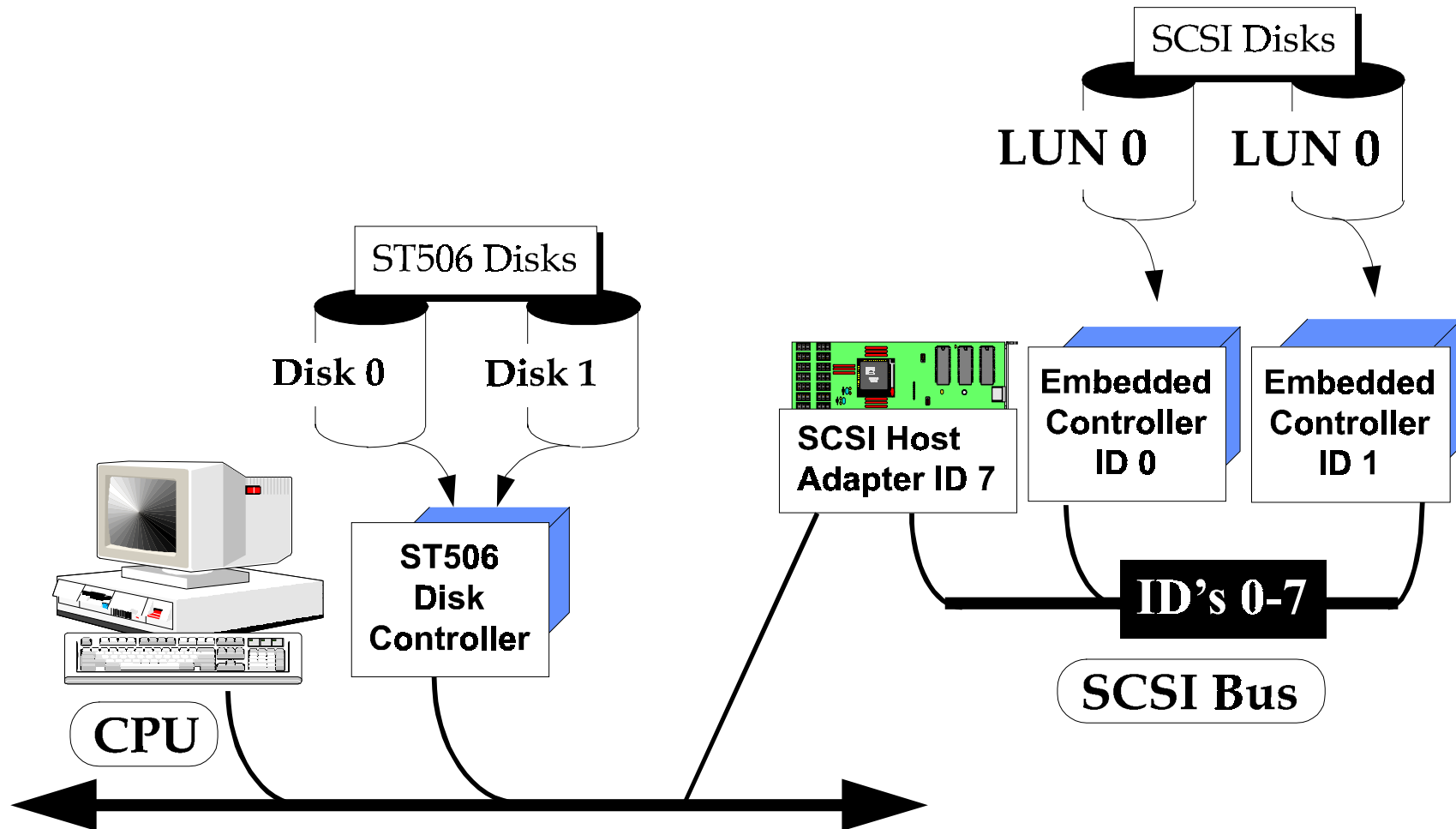
/etc/default/filesys

```
bdev=/dev/boot cdev=/dev/rboot \  
    mountdir=/stand mount=no fstyp=EAfs \  
    fsck=no fsckflags= rcmount=yes \  
    rcfsck=no mountflags=  
bdev=/dev/root cdev=/dev/rroot \  
    mountdir=/ mount=no fstyp=HTFS \  
    fsck=no fsckflags= rcmount=no \  
    rcfsck=no mountflags=  
bdev=/dev/u cdev= mount=no fstyp=HTFS \  
    fsck=no fsckflags= rcmount=yes \  
    rcfsck=no mountflags=
```

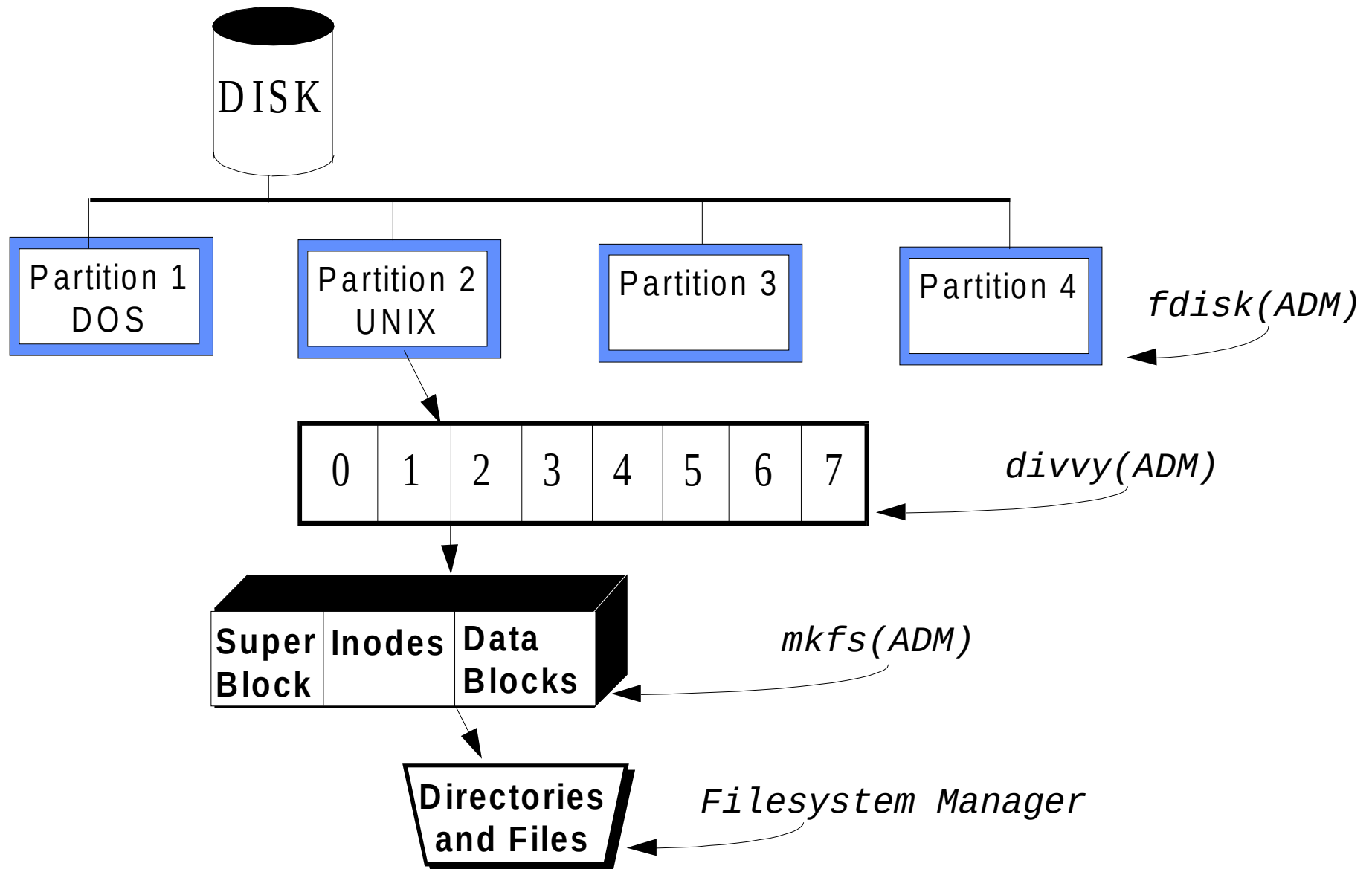
fsck(ADM) Check Phases

```
** Phase 0 - Replay Log
** Phase 1 - Check Blocks and Sizes
** Phase 1b - Rescan for more DUPS
** Phase 2 - Check Pathnames
** Phase 3 - Check Connectivity
** Phase 4 - Check Reference Counts
** Phase 5 - Check Free List Bitmap
** Phase 6 - Salvage Free List Bitmap
```

ST506 and SCSI Configuration Examples



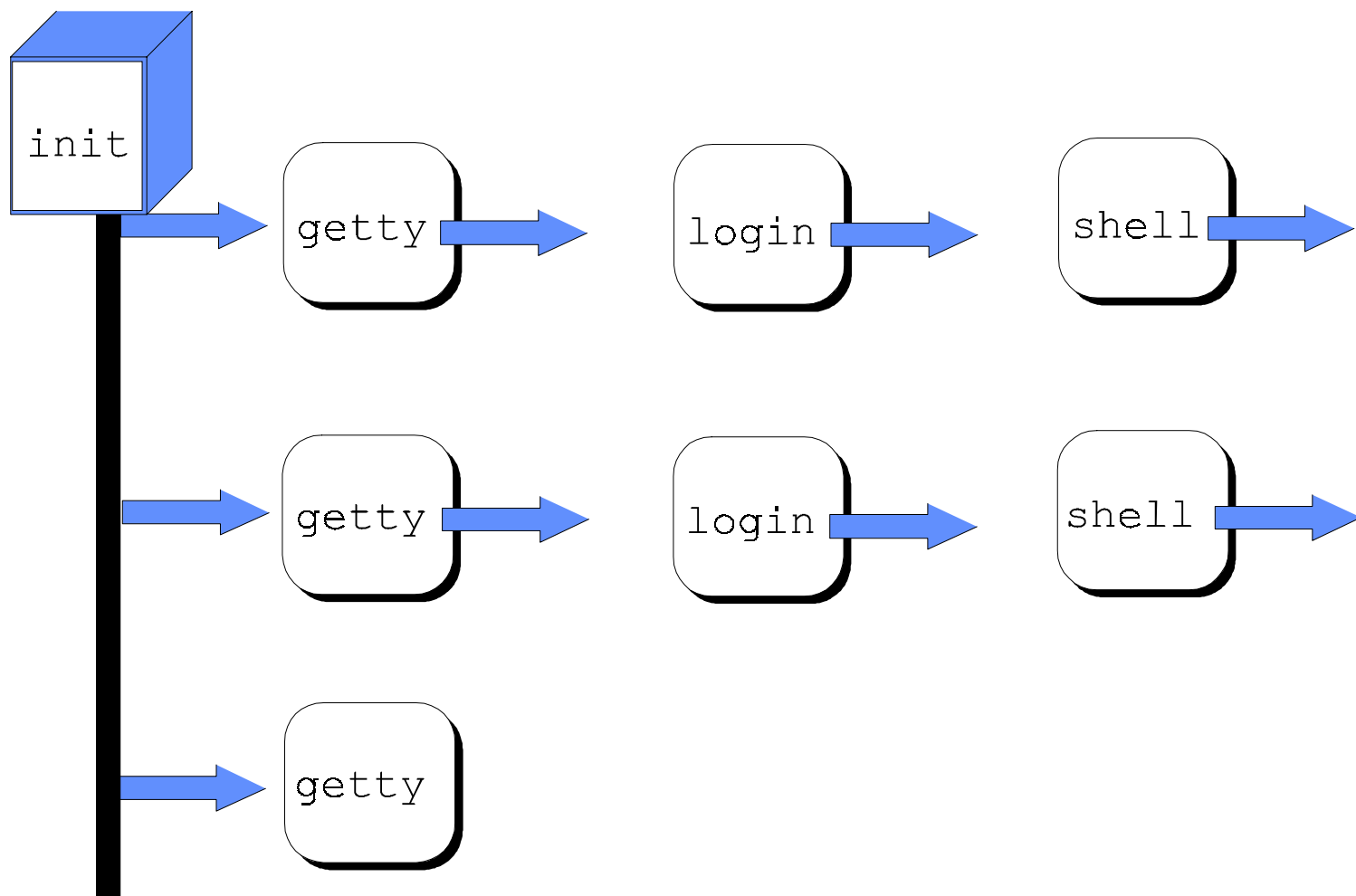
UNIX Disk Structure



Installing and Managing Serial Ports

- Identify standard serial ports
- Describe the levels of hardware communication
- Describe the login sequence
- Install a serial adapter card
- Install serial terminal hardware
- Manage terminal configuration files and utilities
- Troubleshoot common serial terminal problems

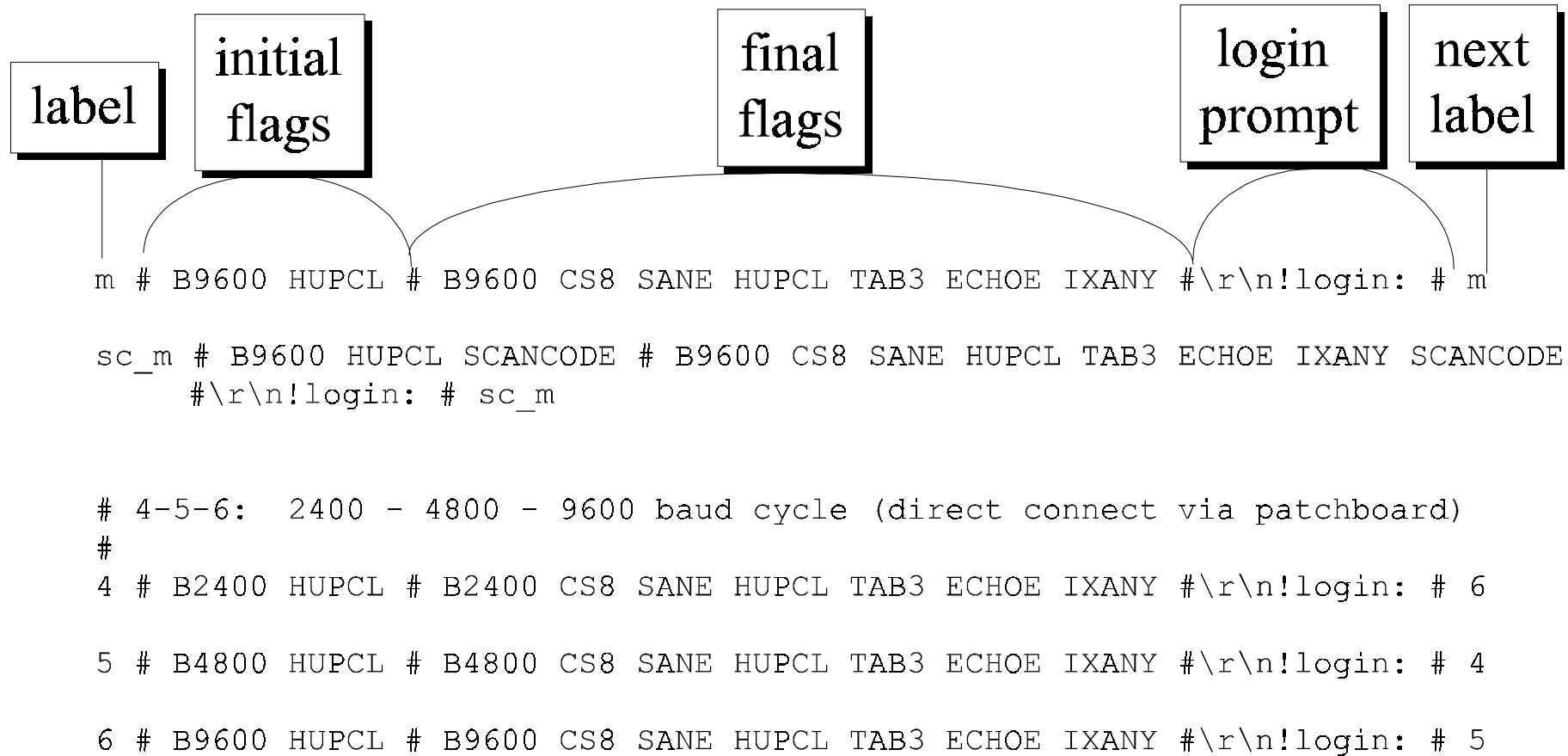
Terminal Software Configuration



/etc/inittab

```
c0:2345:respawn:/etc/getty tty01 sc_m
c01:1:respawn:/bin/sh -c "sleep 20; exec /etc/getty tty 01 sc_m
c02:2:respawn:/etc/getty tty02 sc_m
c03:2:respawn:/etc/getty tty03 sc_m
# ...
c10:2:respawn:/etc/getty tty10 sc_m
c11:2:respawn:/etc/getty tty11 sc_m
c12:2:respawn:/etc/getty tty12 sc_m
sdd:2:respawn:/tcb/files/no_luid/sdd
Sela:2:respawn:/etc/getty tty1a m
SelA:2:off:/etc/getty-t60 tty1A 3
```

Sample from /etc/gettydefs



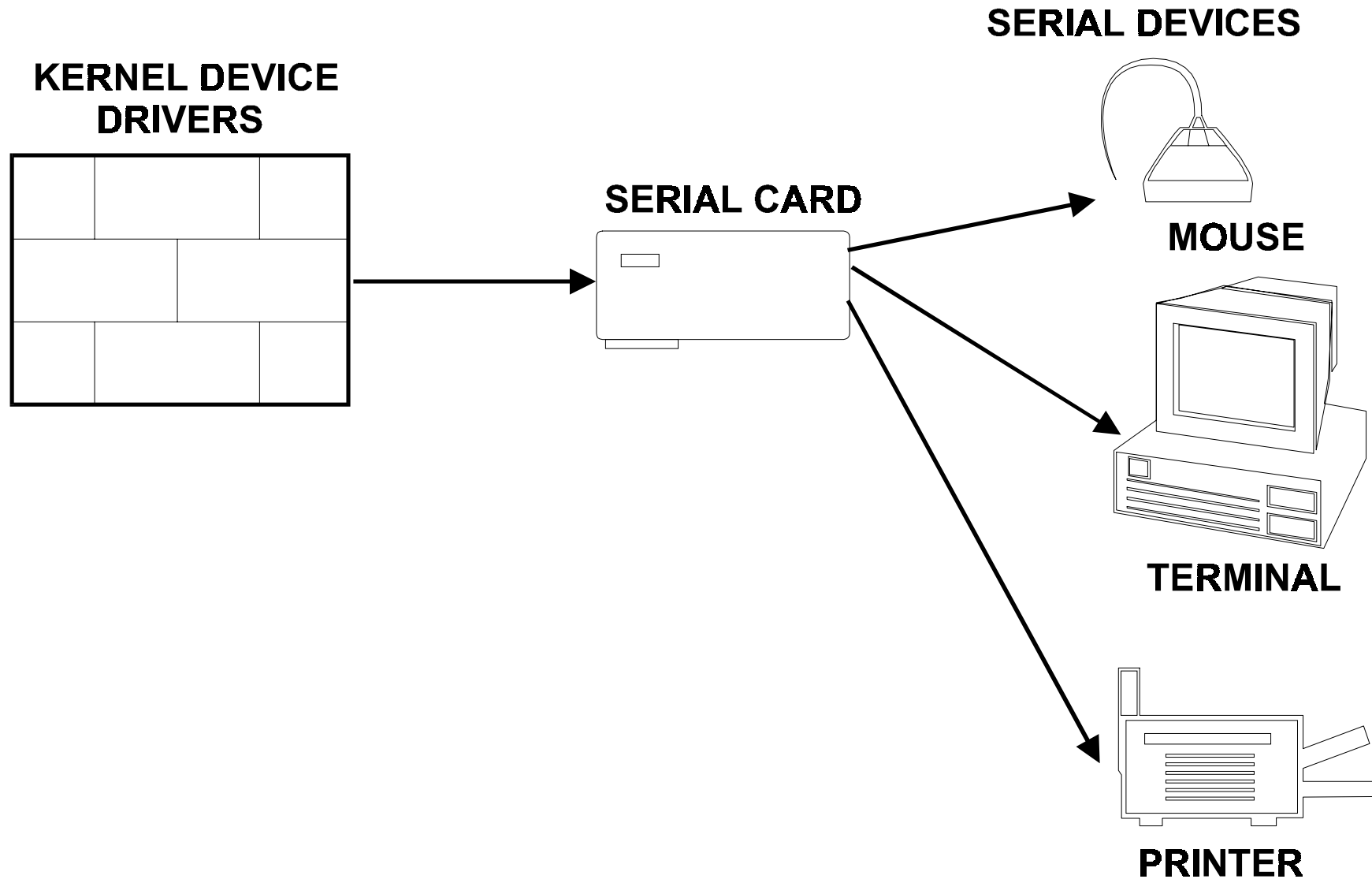
Baud Rate Settings in */etc/gettydefs*

```
.
.
.
0 # B9600 HUPCL # B9600 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # 0
#
1 # B300 HUPCL OPOST CR1 NR1 #
   B300 CS8 SANE HUPCL TAB3 IXANY #\r\n!login: # 2
2 # B1200 HUPCL OPOST CR1 ECHOE NL1 #
   B1200 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # 3
3 # B2400 HUPCL OPOST CR1 ECHOE NL1 #
   B2400 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # 1
.
.
.
m # B9600 HUCPL # B9600 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # m
n # B19200 HUCPL # B19200 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # n
o # B38400 HUCPL # B38400 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # o
```

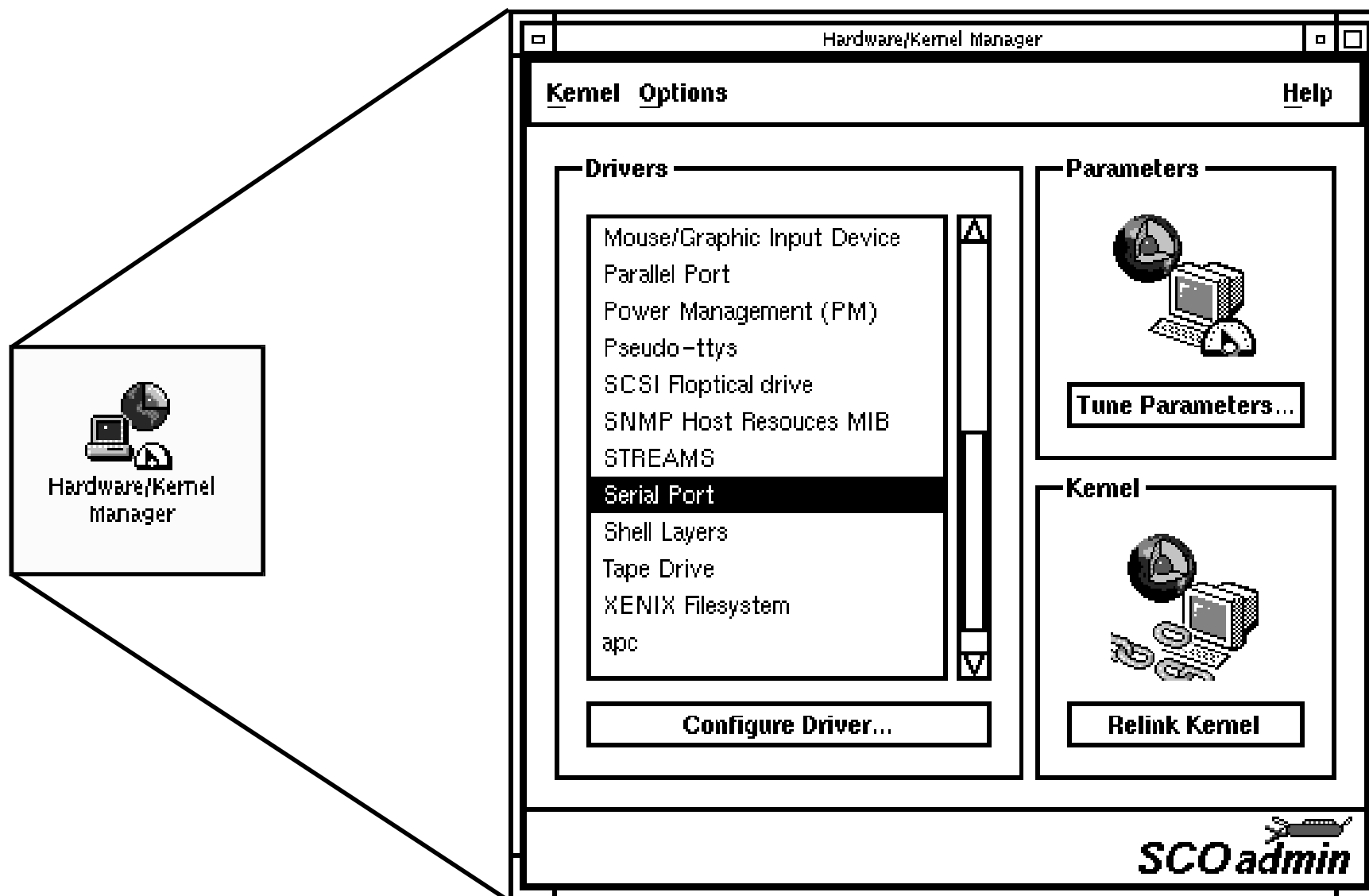
Terminal Administration

Program	Files	Display
init	<i>/etc/inittab</i>	
getty	<i>/etc/systemid</i> <i>/etc/default/issue</i> <i>/etc/gettydefs</i>	hostname Welcome to SCO OpenServer Release 5 login:
login	<i>/etc/passwd</i>	Password:
ksh	<i>/etc/profile</i> <i>\$HOME/.profile</i>	\$

Installing a Serial Adapter Card



Configuring a Dumb Card



Serial Manager

Serial Manager on spider1

Configured serial cards on spider1.curric.com:

Description	Ports	IRQ	I/O addr
IBM-COM1	1	4	3F8
IBM-COM2	1	3	2F8

Add...
Delete
Modify...

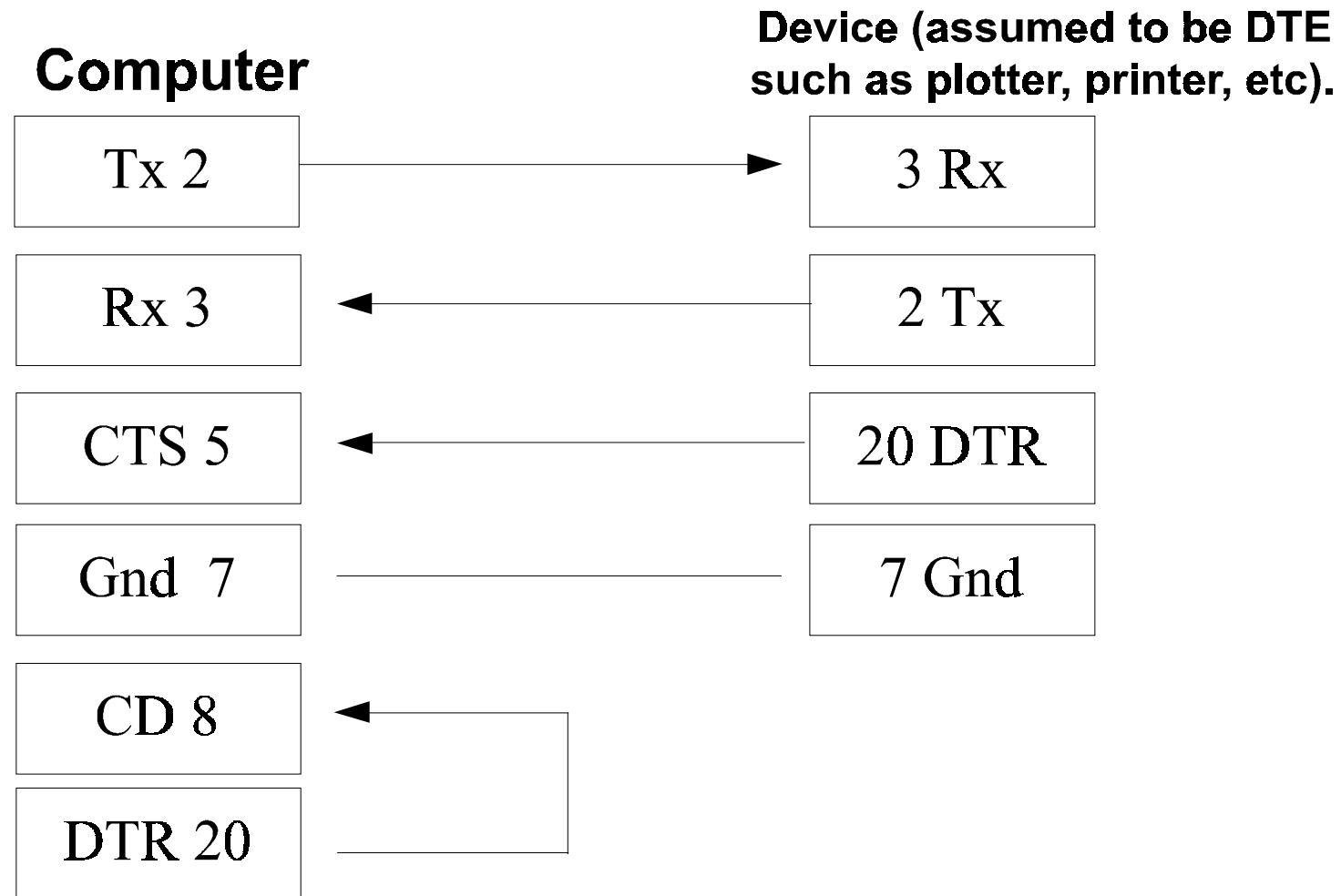
Ports controlled by: IBM-COM1

Modify...

SCOadmin

Close Help

DTR Handshaking for 25 Pin Connector



All other pins unused

Example Terminal Setup Screen

F10 - TOP LEVEL

ARROWS - NEW FIELDS

SPACE - NEXT CHOICE

BAUD RATE=9600

DATA/STOP BITS=8/1

PARITY=NONE

RCV HNDSHAKE=XON/XOFF

XMT HNDSHAKE=XON/XOFF

XPC HNDSHAKE=OFF

AUX BAUD RATE=9600

AUX DATA/STOP BITS=8/1

AUX PARITY=NONE

AUX RCV HNDSHAKE=DSR

AUX XMT HNDSHAKE=NONE

F1
DISP

F2
GENERL

F3
KEYBRD

F4
COMM

F5
MISC

F6
TABS

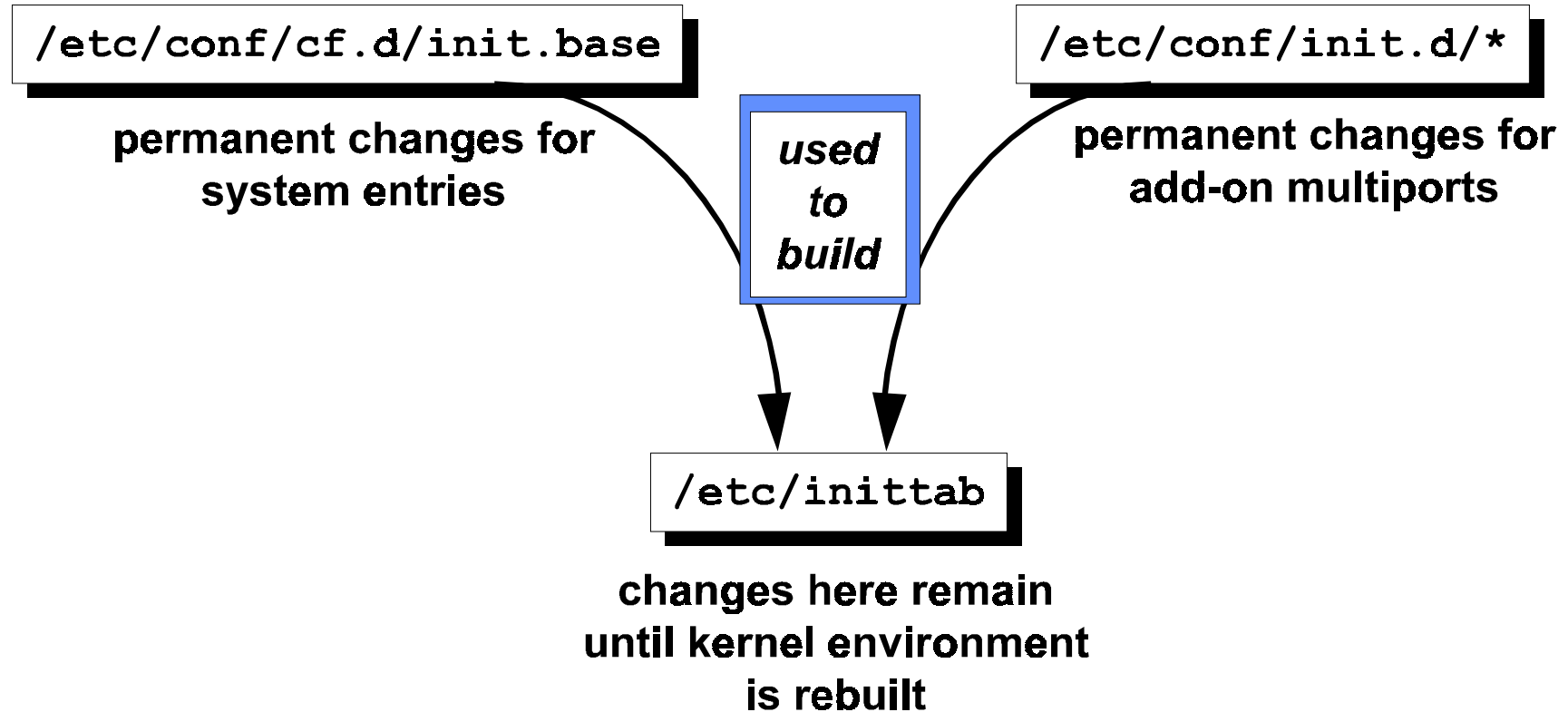
F7
A/BACK

F8
F/KEYS

F9
LABELS

F10
EXIT

Changing */etc/inittab*



Sample from /etc/gettydefs

The diagram illustrates the structure of a line in the `/etc/gettydefs` file. Five labels are positioned above the text: 'label', 'initial flags', 'final flags', 'login prompt', and 'next label'. Curved lines connect these labels to their corresponding parts in the text below. 'label' points to the first character 'm'. 'initial flags' points to the flags 'B9600 HUPCL'. 'final flags' points to the flags 'B9600 CS8 SANE HUPCL TAB3 ECHOE IXANY'. 'login prompt' points to the prompt string '#\r\n!login: #'. 'next label' points to the next character 'm'.

```
m # B9600 HUPCL # B9600 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # m  
  
sc_m # B9600 HUPCL SCANCODE # B9600 CS8 SANE HUPCL TAB3 ECHOE IXANY SCANCODE  
    #\r\n!login: # sc_m  
  
#  
# 4-5-6:  2400 - 4800 - 9600 baud cycle (direct connect via patchboard)  
#  
4 # B2400 HUPCL # B2400 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # 6  
  
5 # B4800 HUPCL # B4800 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # 4  
  
6 # B9600 HUPCL # B9600 CS8 SANE HUPCL TAB3 ECHOE IXANY #\r\n!login: # 5
```

Terminal Environment Set-up Files

Line (port) set-up

/etc/inittab

line enabled or disabled
pointer to line characteristics

/etc/gettydefs

line characteristics defined

Terminal set-up

/etc/ttytype

terminal type name
terminal line

/usr/lib/terminfo/[a-z]

terminal type name
terminal characteristics

Hung or Scrambled Terminal

Problem: hung terminal

1. Check physical connections.
2. Type  q
3. Press  or  \
4. Kill process.
5. Turn terminal off and on.
6. Check terminal configuration.
7. Type  jstty sane  j

Problem: scrambled terminal

1. Log out and log back in.
2. Check terminal type.
3. Check terminal setup (baud rate).
4. Type  jstty sane  j

Configuring a Modem

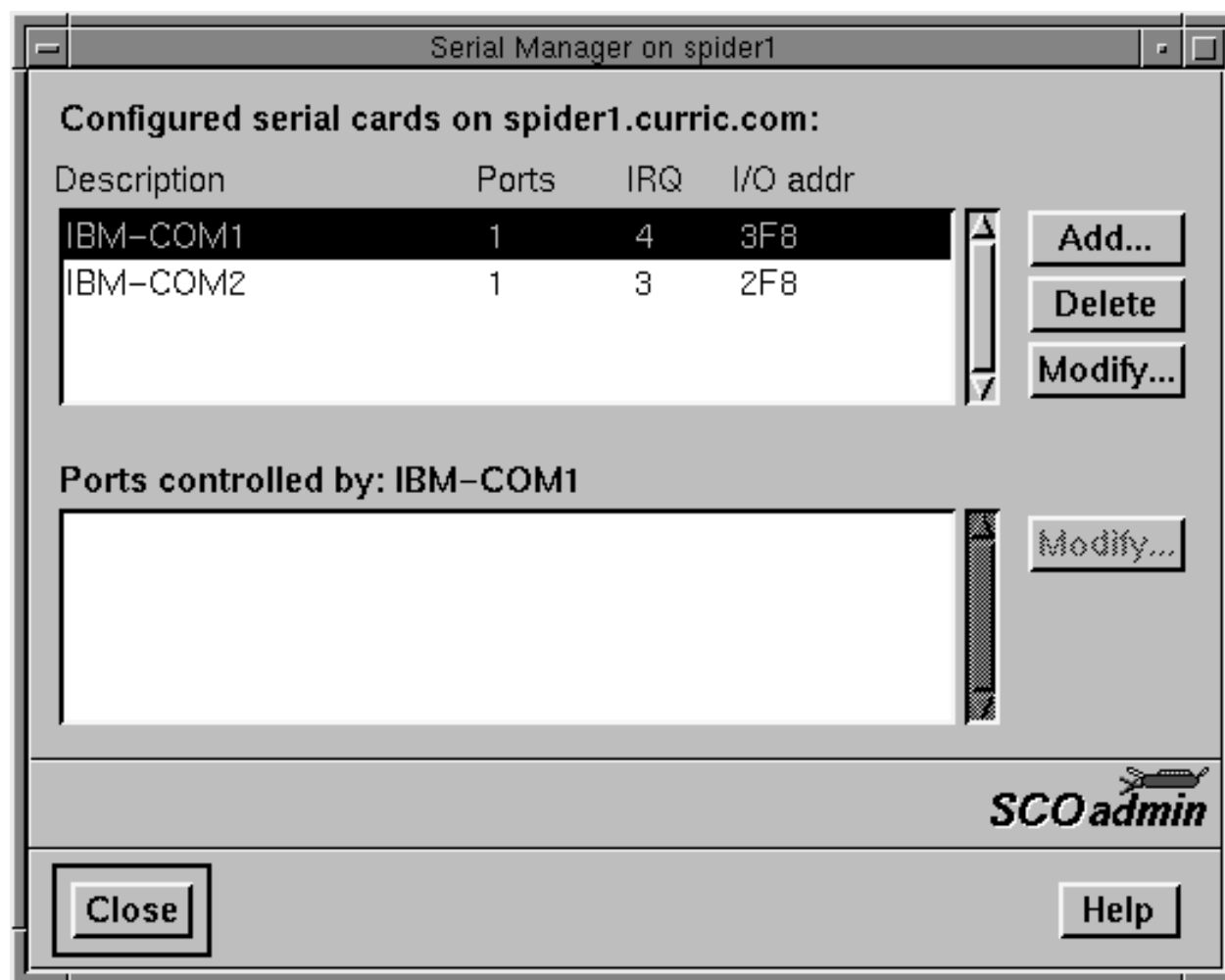
- Add a modem to your system
- Test and troubleshoot the connection

Modem Manager

Host Modem Ports Options					Help
Configured modems on spider1.curric.com:					
Type	Answers	Port	Speed	Dialer	
Standard 28800 bps Modem	Yes	tty2A	2400-3840	Standard_28800_bp	

SCOadmin

Serial Manager



Modem on COM1 configured to answer incoming calls:

```
Se1a:234:off:/etc/getty tty1a m  
Se1A:234:respawn:/etc/getty -t60 tty1A o
```

Modem on COM2 configured for outgoing calls only:

```
Se2a:234:off:/etc/getty tty1a m  
Se2A:234:off:/etc/getty -t60 tty1A o
```

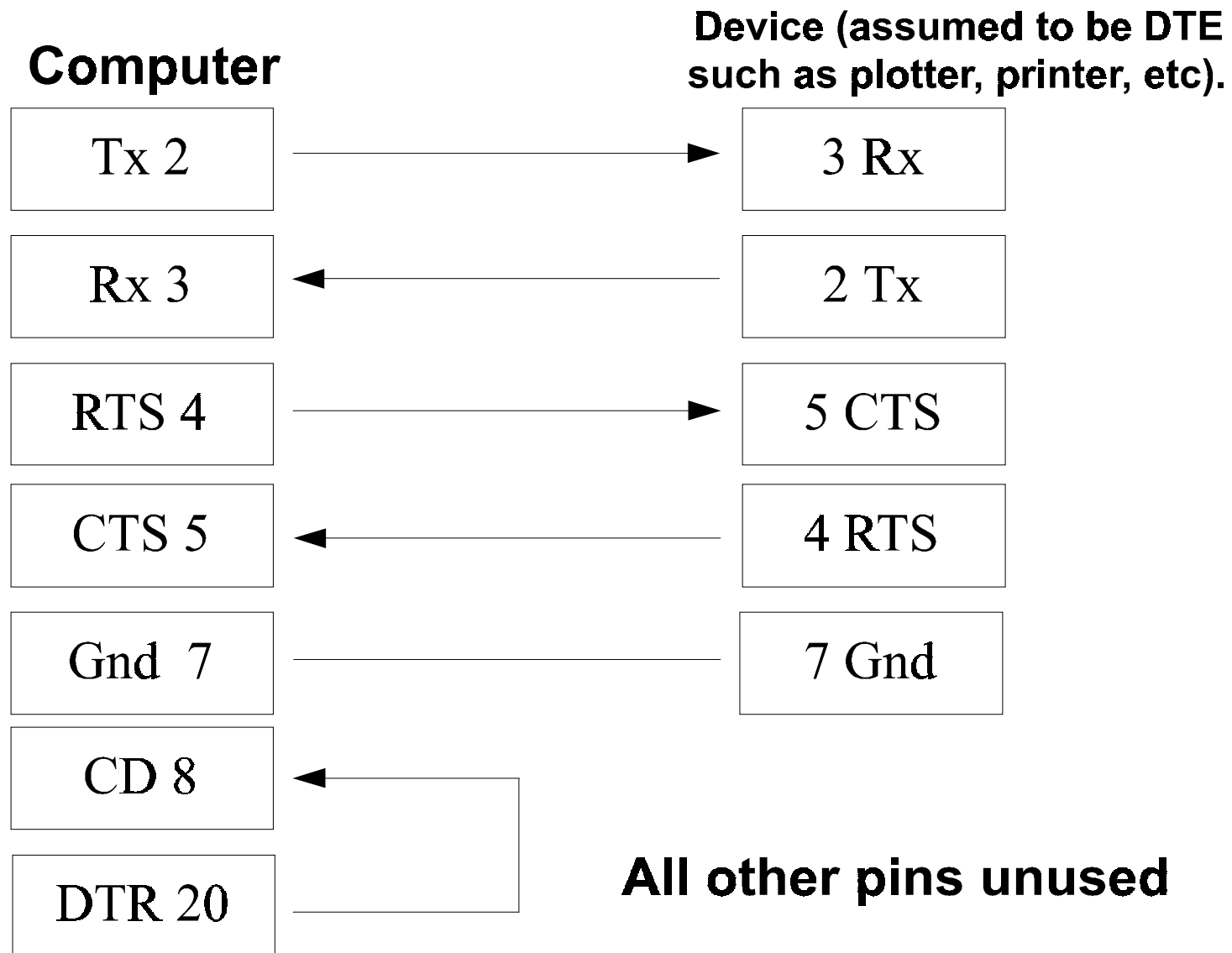
The */usr/lib/uucp/Devices* File

```
#  @(#) Devices 25.2 93/06/30
#
#...
ACU tty2A - 38400 Standard_28800_bps_Modem
```

Installing and Managing Printers

- Install a parallel adapter card
- Install parallel and serial printers
- Add local and remote printers to your system
- Troubleshoot common printer installation problems
- Describe the UNIX print service
- Manage the print request directories
- Set print request priorities
- Manage printer interface scripts
- Troubleshoot the UNIX print service

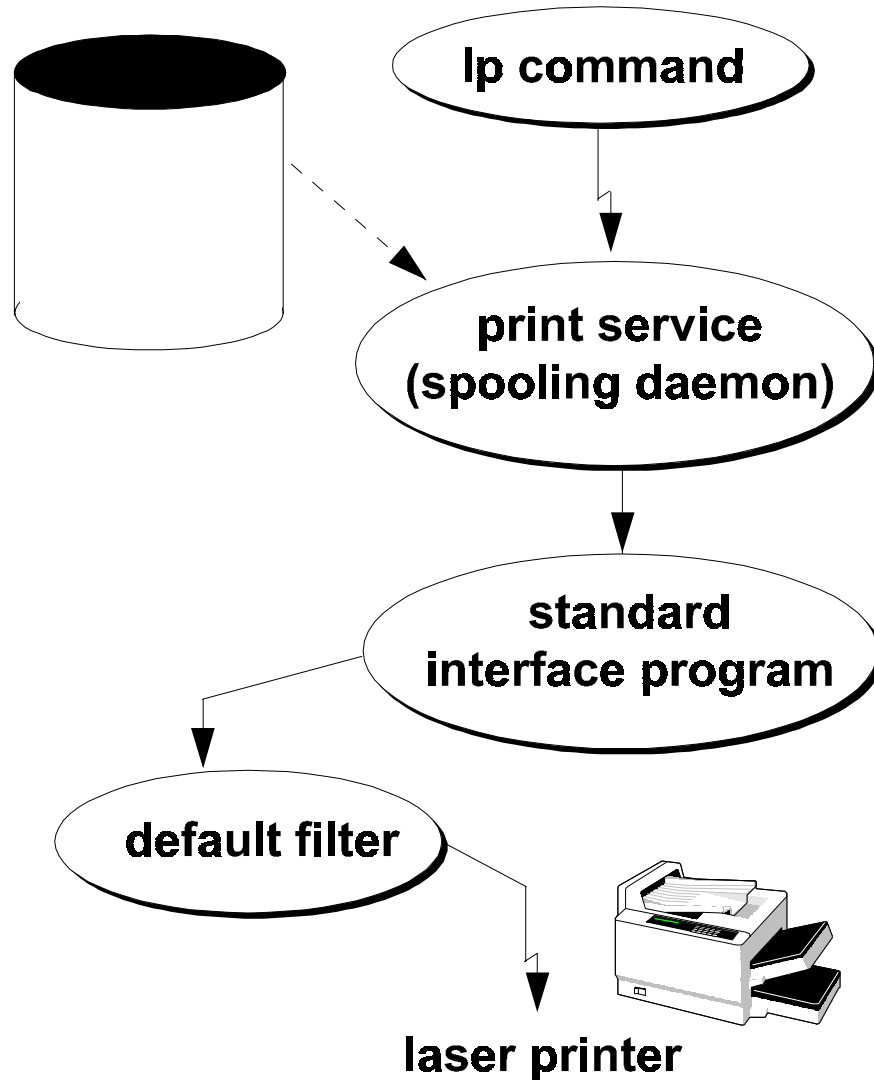
RTS/CTS Handshaking for 25 Pin Connector



RTS/CTS and DTR Printer stty Setting Changes

RTS/CTS handshaking printers	DTR handshaking printers
-ixon	-ixon
-ixoff	-ixoff
-clocal	-clocal
ortsfl	-ortsfl
rtsflow	-rtsflow
ctsflow	ctsflow

Print Request Processing



Key:

- Communication path
- UNIX system process control
- Data access
- UNIX system process
- Disk Files

Overview of print request processing

Viewing the Status of the Print Scheduler with lpstat -t

```
scheduler is running
system default destination: laser
device for laser: /dev/lp0
laser accepting requests since Fri Feb 3 13:12:22 1995
printer laser enabled since Wed Feb 8 08:16:29 1995. available.
laser-5      root      1246      Feb  8  08:16  on laser
laser-6      johnsp    1246      Feb  8  08:16
laser-7      aaronm    1246      Feb  8  08:17
```

Partial Request Log Entries

Letter	Content of line
C	Number of copies printed
D	Printer or class destination or the word "any"
F	Filename in <i>/user/spool/lp/temp</i> printed. This line repeated for each file printed, and files are printed in the order given.
N	How the print service notified the user after printing the file. • M by an electronic mail message • W by a message written to the user's terminal
O	Any -o options given to lp(C)
P	Priority of the print request
s	Outcome of the job, expressed as a combination of individual bits in hexadecimal form. The important bits used internally by the spooler are: 0x0004 Slow filtering finished successfully. 0x0010 Printing finished successfully. 0x0040 Request was cancelled. 0x0100 Request failed filtering or printing.
U	Name of the user who submitted the print request.

Listing of Scripts Stored in */usr/spool/lp/model* (Partial)

```
DECColormatePS  
DEClaser1150  
DEClaser2250  
DEClaser3250  
HPDeskJet500  
HPDeskJetPlus  
HPLaserJet  
crnlmap  
dumb  
emulator  
epson  
hp  
standard
```

Interface Scripts - Changing Baud Rates

```
#####  
##  
##  Initialize the printer port  
#####  
  
# First set the default parameters,  
# then the requested parameters  
#####  
  
stty \  
          9600 \  

```

Installing Tape Drives and CD-ROM Drives

- Install a tape drive on your server
- Install a SCSI CD-ROM drive on your server

Tape Device Files

Default special devices have been created with the following links:

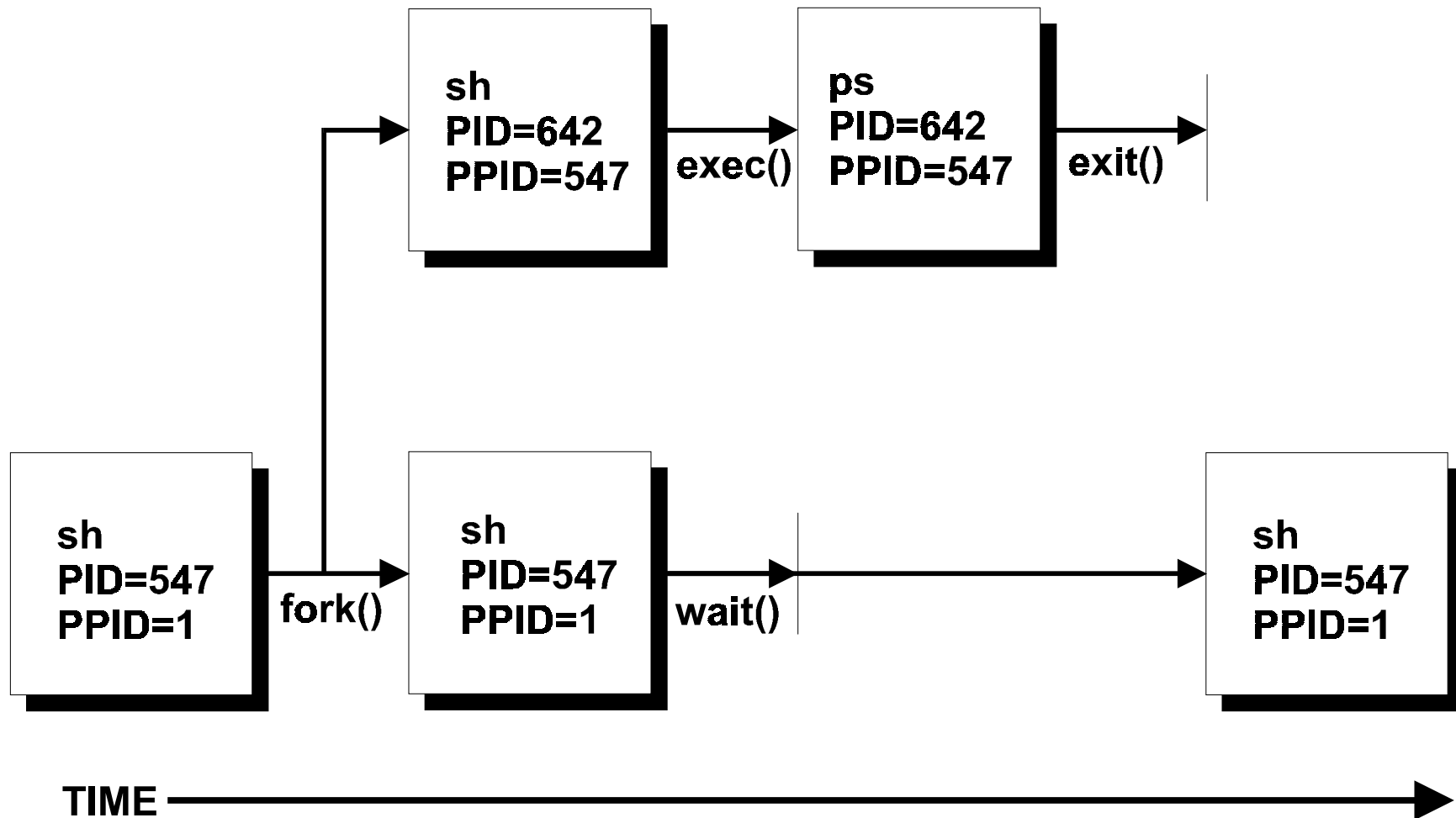
/dev/xct0	linked to /dev/xStp0	
/dev/rct0	linked to /dev/rStp0	and /dev/rmt/0b
/dev/nrct0	linked to /dev/nrStp0	and /dev/rmt/0bn

Controlling User and System Processes

- Describe how processes are created
- Distinguish between user- and system-generated processes
- Use system tools to gather information about processes
- Determine the priority of a process
- Use process accounting to monitor processes
- Use **crontab**(C) to automate system processes

Command Execution

\$ ps



System Processes

UID	PID	PPID	C	STIME	TTY	TIME	CMD
root	0	0	0	Mar-24	?	00:00:00	sched
root	1	0	0	Mar-24	?	00:00:28	/etc/init -a
root	2	0	0	Mar-24	?	00:00:31	vhand
root	3	0	0	Mar-24	?	00:01:42	bdf flush
root	4	0	0	Mar-24	?	00:00:00	km daemon
root	5	1	0	Mar-24	?	00:10:29	htepi_daemon
root	6	0	0	Mar-24	?	00:00:00	vd daemon
root	7	0	0	Mar-24	?	00:00:00	strd
root	35	1	0	Mar-24	?	00:00:54	/etc/ifor_pmd
root	36	35	0	Mar-24	?	00:00:02	/etc/sco_cpd
root	31	1	0	Mar-24	?	00:00:31	/etc/syslogd
root	28	1	0	Mar-24	?	00:00:02	htepi_daemon /stand
root	446	1	0	Mar-24	?	00:01:25	/usr/lib/scosh/cal daemon
root	278	1	0	Mar-24	?	00:01:01	/usr/lib/lpsched
root	267	1	0	Mar-24	?	00:00:14	/etc/cron
root	947	364	0	Mar-24	?	00:00:05	/usr/bin/X11/scolgin

System Processes

UID	PID	PPID	C	STIME	TTY	TIME	CMD
root	0	0	0	Mar-24	?	00:00:00	sched
root	1	0	0	Mar-24	?	00:00:28	/etc/init -a
root	2	0	0	Mar-24	?	00:00:31	vhand
root	3	0	0	Mar-24	?	00:01:42	bdf flush
root	4	0	0	Mar-24	?	00:00:00	km daemon
root	5	1	0	Mar-24	?	00:10:29	htepi_daemon
root	6	0	0	Mar-24	?	00:00:00	vd daemon
root	7	0	0	Mar-24	?	00:00:00	strd
root	35	1	0	Mar-24	?	00:00:54	/etc/ifor_pmd
root	36	35	0	Mar-24	?	00:00:02	/etc/sco_cpd
root	31	1	0	Mar-24	?	00:00:31	/etc/syslogd
root	28	1	0	Mar-24	?	00:00:02	htepi_daemon /stand
root	446	1	0	Mar-24	?	00:01:25	/usr/lib/scosh/cal daemon
root	278	1	0	Mar-24	?	00:01:01	/usr/lib/lpsched
root	267	1	0	Mar-24	?	00:00:14	/etc/cron
root	947	364	0	Mar-24	?	00:00:05	/usr/bin/X11/scolgin

Status of Processes

F	S	UID	PID	PPID	C	PRI	NI	TTY	TIME	CMD
71	S	root	0	0	0	95	20	?	00:00:00	sched
20	S	root	1	0	0	66	20	?	00:00:05	/etc/init -a
71	S	root	2	0	0	95	20	?	00:00:00	vhand
71	S	root	3	0	0	95	20	?	00:00:01	bdflush
61	O	root	4	0	0	36	39	?	00:00:00	CPU1 idle process
61	R	root	5	0	0	36	39	?	00:00:00	CPU2 idle process
61	O	root	6	0	0	36	39	?	00:00:00	CPU3 idle process
61	R	root	7	0	0	36	39	?	00:00:00	CPU4 idle process

CPU Activity **sar -u**(ADM)

```
SCO_SV  sosco 3.2v5.0.0 i80486 03/29/95
```

10:36:49	%usr	%sys	%wio	%idle
10:36:53	21	18	13	48
10:36:57	1	1	0	97
10:37:01	1	4	1	94
10:37:05	1	2	0	97
Average	6	7	4	84

Examining the Run Queue **sar -q**(ADM)

```
SCO_SV  sosco 3.2v5.0.0 i80486      03/28/95

06:56:55  runq-sz  %runocc  swpq-sz  %swpocc
06:57:00   1.7    98      1.5      36
06:57:05   1.0    63      1.0      31
06:57:10   1.0    58      1.0      49

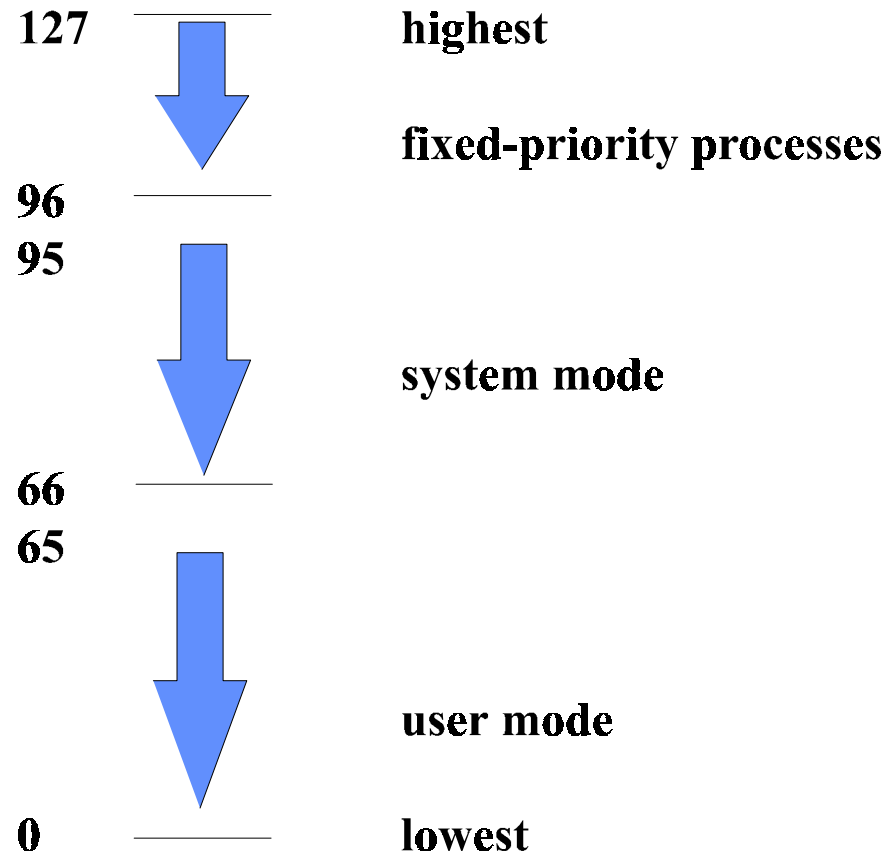
Average   1.3    74      1.2      39
```

Priority Values

Priority	Meaning
95	swapping/paging
88	waiting for an inode
81	waiting for i/o
80	waiting for buffer
76	waiting for pipe
75	waiting for tty input
74	waiting for tty output
73	waiting for exit
66	sleeping --- lowest system mode priority
65	highest user mode priority
51	default user mode priority
0	lowest user mode priority

System Process Priorities

Priorities



System Crontabs

System Crontabs `/usr/spool/cron/crontabs`

<code>-rw-rw----</code>	<code>1</code>	<code>adm</code>	<code>cron</code>	<code>2491</code>	<code>Jan</code>	<code>31</code>	<code>22:54</code>	<code>adm</code>
<code>-rw-rw----</code>	<code>1</code>	<code>root</code>	<code>cron</code>	<code>816</code>	<code>Mar</code>	<code>10</code>	<code>12:30</code>	<code>root</code>
<code>-rw-rw----</code>	<code>1</code>	<code>sys</code>	<code>cron</code>	<code>750</code>	<code>Mar</code>	<code>10</code>	<code>12:30</code>	<code>sys</code>
<code>-rw-rw----</code>	<code>1</code>	<code>bin</code>	<code>cron</code>	<code>811</code>	<code>Jan</code>	<code>31</code>	<code>22:55</code>	<code>uucp</code>
<code>-rw-rw----</code>	<code>1</code>	<code>root</code>	<code>cron</code>	<code>815</code>	<code>May</code>	<code>17</code>	<code>11:52</code>	<code>mmdf</code>

crontab(C) Parameters

Field	Allowable Values
Minute	0-59
Hour	0-23
Day of Month	1-31
Month of Year	1-12
Day of Week	0-6 (0=Sunday)
Command Name	Any non-interactive command or shell script

- A field value can be a single value, range of values, or list of values separated by commas
- An asterisk selects all allowable values

Managing System Security

- Describe trusted system concepts
- Describe and select a security profile
- Change your system's security profile
- Review the account database files
- Determine appropriate subsystem and user authorizations
- Configure a user account to execute root commands
- Use advanced protection bits
- Manage, maintain the integrity of, and repair the Trusted Computing Base (TCB)
- Configure additional security measures

System Security Profiles - Logins

Security Parameters	Low	Traditional	Improved	High
Logins				
Maximum unsuccessful attempts (account/terminal)	Infinite	99	5/9	3/5
Delay between login attempts (secs) - terminal only	0	1	2	2
Time to complete login (terminal only)	60	60	60	60

System Security Profiles - Passwords

Security Parameters	Low	Traditional	Improved	High
Passwords				
Minimum days between changes	0	0	0	14
Expiration time (days)	Infinite	Infinite	42	42
Lifetime (days)	Infinite	Infinite	365	90
User can choose own	Yes	Yes	Yes	No
User can run generator	Yes	Yes	Yes	Yes
Maximum generated length	8	8	10	10
Minimum Length	1	3	5	8
Password triviality checks	None	System V	Goodpw weak	Goodpw strong
Checked for obviousness	-	No	No	Yes
Password required to login	No	No	Yes	Yes
Single User Password required	Yes	Yes	Yes	Yes

System Security Profiles - Logins

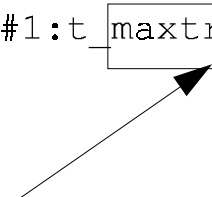
Security Parameters	Low	Traditional	Improved	High
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Default Security Profile

```
default:\
:d_name=default:\
:u_pwd=*\
:u_priority#0:u_cmdpriv=audittrail,su,queryspace, printqueue, mem, terminal:\
:u_syspriv=execsuid,nopromain,chmodsugid, chown:\
:u_minchg#0:u_maxlen#8:u_exp#0:u_life#0:\
:u_pickpw:u_genpwd:u_restrict@:u_nullpw:\
:u_suclog#0:u_unsuclog#0:u_maxtries#99:u_lock:\
:u_singleuserpswd:U_secclass=c2:u_integrity@:u_tcbpw@:\
:u_pwseg#1:\
:t_logdelay#1:t_maxtries#99:t_login_timeout#60:\
:chkent:
```



/etc/auth/system/default

Protected Password Database

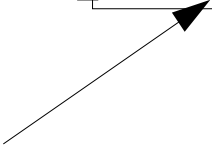
```
rossp:u_name=rossp:u_id#200:\
```

```
:u_pwd=rK2Q8egMA4hh2:\
```

```
:u_type=general:u_succhg#772992157:u_unsucchg#774629753:u_pswduser=rossp:\
```

```
:u_suclog#786025159:u_suctty=tty03:u_unsuclog#779568915:u_unsuctty=tty01:\
```

```
:u_maxtries#10:u_lock@:chkent:
```



```
/tcb/files/auth/[a-z]/logname
```

/etc/passwd and */etc/group* (Partial Contents)

/etc/passwd

```
root:x:0:3:Superuser:/:  
aaronm:x:200:100:Training Coodinator:/u/aaronm:/bin/sh  
chuckc:x:201:102:Graphic Artist:/u/chuckc:/bin/sh  
sheilage:x:202:101:Sales Department:/u/sheilage:/bin/sh  
barbme:x:203:101:Sales Department:/u/barbme:/bin/sh
```

/etc/group

```
root::0:root  
group::50:  
training::100:aaronm  
sales::101:sheliage,barbme  
graphics::102:chuckc
```

`/etc/default/login`

```
ALTSHELL=YES  
ULIMIT=2097151  
PATH=/bin:/usr/bin  
OVERRIDE=tty01  
PASSREQ=NO  
IDLEWEEKS=0  
ALLOWHUSH=YES  
REUSEUID=YES
```

`/etc/default/passwd`

```
PASSLENGTH=3  
MINWEEKS=0  
MAXWEEKS=0  
RETRIES=3  
ONETRY=YES  
DESCRIBE=/dev/null  
SUMMARY=/dev/null  
CHECKDIR=/usr/lib/goodpw/checks  
GOODPW=YES
```

Subsystem Authorizations

Authorization	SCO admin Manager	Powers
m e m	-	Access to system data tables, listing all processes on the system
t e r m i n a l	-	Unrestricted use of the w r i t e(C) command
l p	Printer Manager	Administer printers
b a c k u p	Backup Manager	Perform backups
a u t h	Account Manager	Administer accounts: adding users, changing passwords
a u d i t	Audit Manager	Audit administrator: run system audits and generate reports
c r o n	Job Manager	Control use of c r o n(C) , a t(C) , and b a t c h(C) commands
r o o t	-	Allows use of any command found in <i>/tcb/files/rootcmds</i>
s y s a d m i n	-	Not implemented

Secondary Authorizations

Secondary Authorization	Parent Authorization	Description
audittrail	audit	Ability to generate personal audit reports on one's own activity.
backup_create	backup	The ability to create (but not restore) backups.
restore	backup	The ability to restore (but not create) backups.
queryspace	backup	Use of df(C) command to query disk space.
printqueue	lp	View all jobs in queue using lpstat(C) .
printerstat	lp	Use of printer enable/disable commands.
su	auth	Access to the root (superuser) account and other accounts. Access still requires a password.
shutdown	root	Ability to use shutdown(ADM)
passwd	auth	Ability to change user passwords.

Installed Security ProfileDefault (Secondary Authorizations)

Authorizations	Low	Traditional	Improved	High
<i>Subsystem</i>	audittrail, backup, lp, mem, queryspace, shutdown,su terminal	audittrail, mem, printqueue, queryspace, terminal, su,	audittrail, queryspace, printqueue,su	queryspace

User System Privileges

Authorizations	Action
configaudit	configure audit subsystem parameters
writeaudit	write audit records to the audit trail
execsuid	ability to run set-UID programs
chmodsugid	ability to set the set-UID and set-GID bit on files
chown	ability to change the owner of an object
suspendaudit	suspend operating system auditing of the process

User System Privileges Assigned Based on Installed Security Profile

	Low	Traditional	Improved	High
Kernel	chmodsugid, chown, execsuid, suspendaudit	chmodsugid, chown execsuid	chmodsugid, chown, execsuid	chown, execsuid

Subsystems Privilege Requirements

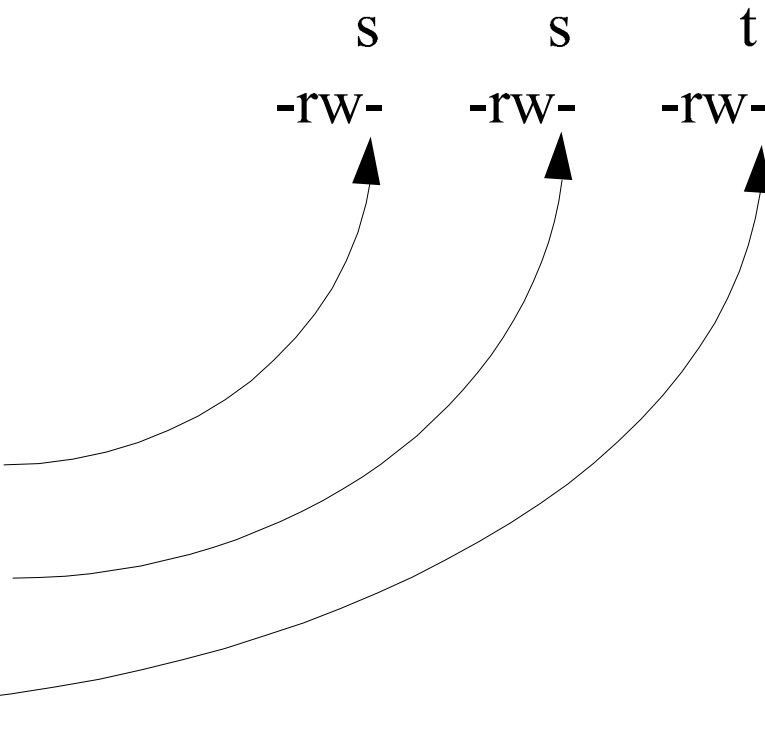
Subsystem Authorization	Privilege Required
audit	configaudit, execsuid, writeaudit
auth	execsuid, chown
backup	execsuid
lp	chown
cron	chmodsugid, chown, execsuid
sysadmin	chmodsugid, chown, execsuid

```
audit:audittrail  
auth:su,passwd  
backup:queryspace,create_backup,restore_backup  
cron:  
lp:printqueue,printerstat  
mem:  
sysadmin:  
terminal:  
uucp:  
root:shutdown
```

Extended Discretionary Access Control

File Permissions:

s s t
-rw- -rw- -rw-



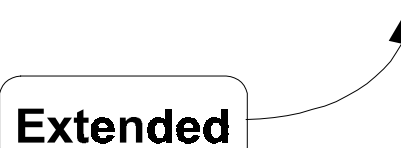
Set User ID (SUID)

Set Group ID (SGID)

Sticky Bit

`chmod 7666 filename`

Extended



Default Discretionary Access Control

Effect on Files:

Unrestricted permissions:

(6)(6)(6)
-rw-rw-rw-

umask 022

0 2 2

Permissions of new files:

-rw-r--r--
(6)(4)(4)

Effect on Directories:

Unrestricted permissions:

(7)(7)(7)
drwxrwxrwx

umask 022

0 2 2

Permissions of new directories:

drwxr-xr-x
(7)(5)(5)

Contents of */etc/default/su*

```
SULOG=/usr/adm/sulog  
PATH=  
SUPATH=/bin:/etc:/usr/bin:/tcb/bin  
ASROOTPW=NO  
CONSOLE=
```

Performance Tuning

- Describe factors that influence performance
- Define performance goals
- Collect performance goals
- Identify dynamically configured kernel tables
- Interpret kernel error messages
- Configure kernel parameters

CPU Activity **sar -u(ADM)**

```
SCO_SV  sosco 3.2v5.0.0 i80486 03/29/95
```

10:36:49	%usr	%sys	%wio	%idle
10:36:53	21	18	13	48
10:36:57	1	1	0	97
10:37:01	1	4	1	94
10:37:05	1	2	0	97
Average	6	7	4	84

Examining the Run Queue **sar -q**(ADM)

```
SCO_SV  sosco 3.2v5.0.0 i80486      03/28/95

06:56:55      runq-sz      %runocc      swpq-sz      %swpocc
06:57:00      1.7        98          1.5        36
06:57:05      1.0        63          1.0        31
06:57:10      1.0        58          1.0        49

Average      1.3        74          1.2        39
```

Buffer Managment - Tunable Parameters

NBUF	Size of the buffer cache
NHBUF	Number of hash queues
NMPBUF	Number of 4KB pages of memory
PLOWBUFS	Buffer cache located in first 16MB of memory
PUTBUFSZ	Size of the circular buffer
NHINODE	Size of the inode hash table
BDFLUSHR	Rate in which the buffer cache is written to disk
NAUTOUP	Age of data in the buffer cache
BFREEMIN	The number of buffers that must remain in the free list

Paging - Tunable Parameters

GPGSLO	Low value of free memory before vhand runs
GPGSHI	High value of free memory before vhand stops
MAXSLICE	Maximum time slice for user processes
MINARMEM	Minimum amount of physical memory needed for text and data segments of user processes
MINASMEM	Minimum size that virtual memory is allowed to reach
SPTMAP	Size of the map entry array

Number of Bytes per Unit Parameter (Partial Listing)

NBUF	1096 per buffer on most filesystems 4168 per buffer on the DTFS filesystem
MAX_INODE	76 per entry
MAX_PROC	344 per entry
MAX_FILE	12 per entry
MAX_REGION	76 per entry

Commands to Configure Kernel Parameters

configure (ADM)
Hardware/Kernel Manager (scoadmin (ADM))
idtune (ADM)
iddeftune (ADM)
setconf(ADM)

Buffer Management
Processes and Paging
TTY's
Name Cache
Asynchronous I/O
Virtual Disks

User and Group Configuration

Security

TTY and Console Configuration

Filesystem Configuration

Table Limits

STREAMS

Message Queues

Event Queues

Semaphores

Shared Memory

Miscellaneous System Parameters

Miscellaneous Device Drivers and Hardware Parameters

Disaster Recovery

- Prepare for recovery
- Recover system files
- Restore a non-root filesystem
- Restore the root and boot filesystems
- Replace the root hard disk

Recovery Components

- **Original Media**
- **Registration information**
- **Emergency Boot Floppy Set**
- **System and Backup Logs**
- **System and Data Backups**