# OS Programming

## */ - the root hierarchy*

Some content for these slides comes from:
A Guide to Unix Using Linux, Fourth Edition

# Objectives

- Understand the elements of the root hierarchy

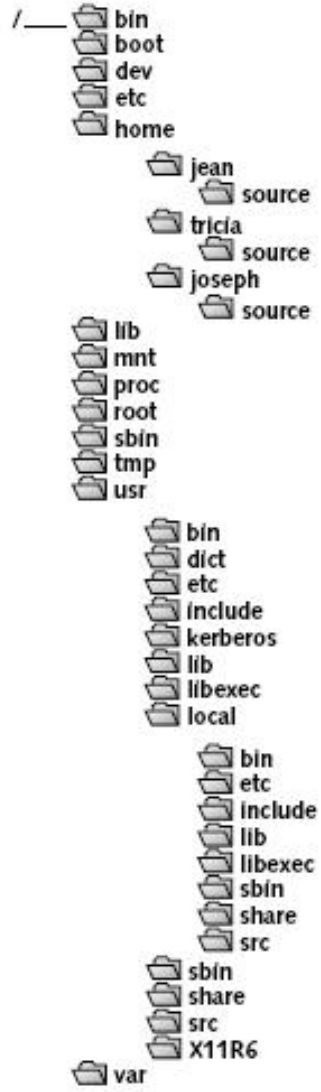


Figure 2-1 Typical UNIX/Linux hierarchical structure

# The /bin Directory

- Contains **binaries**, or **executables**
  - Programs needed to start the system and perform other essential system tasks
- Holds many programs that all users need to work with UNIX/Linux

# The /boot Directory

- Normally contains:
  - Files needed by the bootstrap loader
    - The **bootstrap loader** is the utility that starts the OS
  - Kernel (OS) images

# The /dev Directory

- Files in /dev reference system devices
- Devices are managed through **device special files**
  - Contain information about I/O devices that are used by OS kernel when a device is accessed
  - Two types:
    - **Block special files**
      - Example: for CD/DVD drives
    - **Character special files**
      - Example: for printers
  - To see the list of device files: *ls -l /dev*
  - *null* is a “black hole”.
  - *random* can be used to get random bytes.

**Table 2-3** UNIX/Linux device special files

| File | Description |
|---|---|
| /dev/console | For the console components, such as the monitor and keyboard attached to the computer (/dev/tty0 is also used at the same time on many systems) |
| /dev/fd*n* | For floppy disk drives, where *n* is the number of the drive, such as fd0 for the first floppy disk drive |
| /dev/hd*xn* | For IDE and EIDE hard drives, where *x* represents the disk and the *n* represents the partition number, such as hda1 for the first disk and partition |
| /dev/modem | For a modem, a symbolic link to the device special file (typically linked to /dev/ttys1), where a symbolic link enables one file or directory to point to another (in later versions of Fedora/Red Hat Enterprise Linux, the modem file may be in /usr/share/applications, and in SUSE this file may be under /usr/share/applications/YaST2 because it is managed using the YaST management tool) |
| /dev/mouse | For a mouse or other pointing device, a symbolic link to the device special file (typically linked to /dev/ttys0)—in Fedora/Red Hat Enterprise Linux, the mouse file may be under /usr/share/applications, and in SUSE it may be under /opt/gnome/share/applications |
| /dev/sd*xn* | For a hard drive connected to a SCSI interface, where *x* represents the disk and the *n* represents the partition, such as sda1 for the first SCSI drive and first partition on that drive |
| /dev/st*n* | For a SCSI tape drive, where *n* represents the number of the drive, such as st0 for the first tape drive |
| /dev/tty*n* | For serial terminals connected to the computer |
| /dev/ttys*n* | For a serial device connected to the computer, such as ttys0 for the mouse |

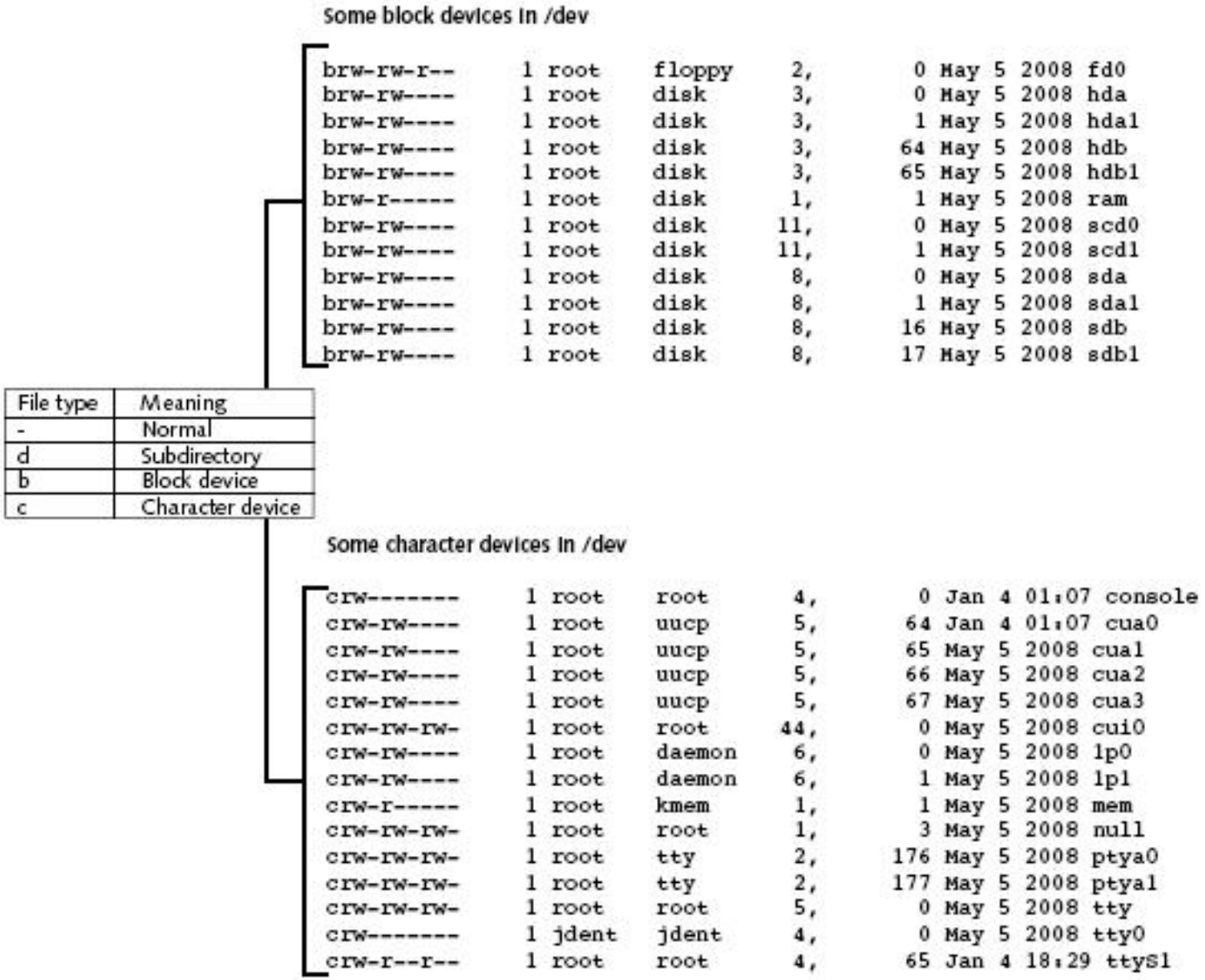


**Figure 2-3** Device files in /dev

# The /etc Directory

- Contains configuration files that the system uses when the computer starts
  - *Example: passwd*

# The /home Directory

- Often located on the /home partition
- Used to offer disk space for users, such as on a system that has multiple user accounts
  - Examples:
    - /home/jean
    - /home/tricia
    - /home/joseph

# The /lib Directory

- /lib houses:
  - Kernel modules
  - Security information
  - **Shared library images**
    - Used by programmers to share code rather than creating copies in their programs
- Many files in this directory are symbolic links to other library files
  - **Symbolic link:** name, file name, or directory name that contains a pointer to a file/directory in the same directory or in another directory on your system
    - created with the **ln** command

# The /mnt Directory

- Mount points for temporary mounts by the system administrator reside in /mnt
  - A temporary mount is used to mount a removable storage medium
    - Example: CD/DVD or USB/flash storage
- /mnt is often divided into subdirectories to clearly specify device types
  - Example: /mnt/cdrom

# The /media Directory

- In newer distributions of UNIX/Linux, mount points for removable storage are in /media
  - Relatively new recommendation of the Filesystem Hierarchy Standard (FHS)
- Modern Linux distributions include both /mnt and /media directories
  - Users and programmers are often encouraged to use /media

# The /proc Directory

- /proc occupies no space on the disk
  - **Virtual file system** allocated in memory only
- Files in /proc refer to various processes running on the system as well as details about the OS kernel

# The /root Directory

- Home directory for the root user
  - The system administrator

# The /sbin Directory

- Reserved for the system administrator
- Stores:
  - Programs that start the system
  - Programs needed for file system repair
  - Essential network programs

# The /tmp Directory

- Many programs need a temporary place to store data during processing cycles
  - The traditional location for these files is /tmp

# The /usr Directory

- Houses software offered to users
  - Software might be:
    - Example: Office software

# The /var Directory

- Located on the /var partition
- Holds subdirectories that often change in size
  - These subdirectories contain files such as error logs and other system performance logs
  - Common subdirectories are:
    - /var/spool/mail for incoming mail
    - /var/spool/lpd for temporarily holding print files