8.1.5 Device Naming Facts

A Linux administrator should understand how a Linux system implements different types of storage devices.

This lesson covers the following topics:

- Storage device types
- Linux storage device files

Storage Device Types

Linux systems accommodate many types of storage.

Storage Device Type	Description
Hard disk drive (HDD)	For decades, hard disk drives have been the primary type of long-term storage used in desktop and server systems. Hard disk drives magnetically store information using spinning aluminum disks called platters. Each platter is coated with a magnetic surface material that allows the hard disk's read/write heads to store and retrieve information to and from the drive. The faster the disk's platters spin, the faster data can be accessed. A hard disk drive identifies where data can be stored on its platters using several parameters that are collectively called the drive's geometry. The following parameters are used by the storage device interface to determine how the drive is accessed and where data can be stored: ▪ Heads specifies to the number of read/write heads in the drive. ▪ Cylinders specifies the number of concentric parallel tracks on all sides of all platters in the hard disk drive. ▪ Sectors Per Track specifies the number of wedge-shaped areas the platters have been divided into. Hard disk drives are connected to the system motherboard using a storage interface. The interface is commonly integrated within the motherboard itself. However, it may also be implemented using an expansion card installed in an expansion slot. In a modern desktop computer system, the following storage interfaces may be used: ▪ Serial ATA (SATA) ▪ Small Computer System Interface (SCSI) ▪ Parallel ATA (PATA) (This interface is obsolete) Hard disks provide several advantages, including the following: ▪ They can store a large amount of data. ▪ They provide reasonably fast access speeds. ▪ The store data at a relatively low cost per megabyte. Hard disks also have several disadvantages, including the following: ▪ Hard disks wear out over time because they are mechanical devices that contain moving parts. ▪ Hard disks are vulnerable to physical damage. For example, dropping a hard drive while it is spinning can cause the read/write heads to dig into the platter, destroying any data stored there.
Solid state drive (SSD)	A solid-state drive is a storage device that functions much like a hard disk drive, using the same block-based I/O operations. However, instead of aluminum platters, SSDs use flash memory to store data. SSDs typically provide storage capacity comparable to that of a small hard drive. SSDs are beginning to replace standard hard disk drives in computer systems. Some of the advantages of SSDs include that they: ▪ Are much faster than hard drives. ▪ Have no moving parts, so they last longer. ▪ Have lower power consumption than hard drives. ▪ Are less susceptible to physical damage. ▪ Are smaller and lighter than hard drives. ▪ Use the same SATA interface used by standard hard disk drives. The main disadvantage currently for solid state drives is cost; they are several times more expensive than comparable hard drives.
External flash storage device	Like an SSD, external flash storage devices store information using programmable, non-volatile flash memory. External flash storage devices most commonly connect to the computer using a USB interface. Advantages of flash devices include: ▪ Portability ▪ Larger storage capacity than optical discs ▪ Relatively fast read access

	Some of the disadvantages of flash devices are: ▪ Less storage capacity than hard disks ▪ Relatively slow write speeds Common external flash storage devices include: ▪ CompactFlash cards ▪ eMMC cards ▪ SD cards ▪ SSD cards ▪ MiniSD cards ▪ MicroSD cards ▪ xD cards ▪ Hybrid cards (combines SSD and HDD technology) ▪ Memory sticks
Optical disc	Optical discs, such as CDs, DVDs, and Blu-ray discs, store information using pits and lands in the surface of their reflective coating. As the disc spins, the optical drive uses a laser to read data stored on the surface of the disc in the form of deflected and reflected light. Some advantages of optical discs include the following: ▪ They are highly portable. ▪ They are inexpensive. ▪ Recordable optical discs allow you to both read and write data. ▪ They have a long shelf life and are relatively sturdy. ▪ They use the same storage interfaces used by standard hard disk drives (SATA, SCSI, and PATA). ▪ Blu-ray discs can store a large amount of data (25 GB or more, depending upon the format). Some disadvantages of optical discs include: ▪ They are slower than hard disks, SSDs, and external flash devices. ▪ Older optical disc standards have limited storage capacities (650 MB for CDs, 4.7 GB for DVDs). ▪ There are occasionally compatibility issues between disc formats and readers.

Linux Storage Device Files

Storage devices in Linux are represented by device files.

- Device files are located in the **/dev** directory.
- The **/dev** directory contains files for all types of devices, even those that don't exist on the system.
- Not only do device files represent devices, they also indicate how data is transferred to that device:
  - Devices, such as hard drives, that receive data in block transfers by using memory to buffer the transfers are called block devices.
    - The **lsblk** command lists information about block devices including name, type (disk or partition), size, and mount point.
    - The **blkid** command also lists the attributes of block devices including its universally unique identifier (UUID), file system type and volume label.
    - The **/etc/crypttab** file describes encrypted block devices that are set up during system boot. Each line describes one encrypted block device. Each line is in the form ***name encrypted-device password options***. The first two fields are mandatory, the remaining two are optional.
  - Devices that send data transfers character-by-character (like a keyboard) are called character devices.
    - A raw device is a special type of logical device that is associated with a character device file.

The table below lists and describes the most common device files:

Device File	Description
/dev/sd*x**n***	sd files identify hard drives. A letter (beginning with a) follows the sd designation and identifies the ID of the hard drive. At the end is appended a number (beginning with 1) that identifies the partition on the drive. Examples include: ▪ sda2 is the second partition (2) on the hard drive with the lowest ID number (a). ▪ sdc1 is the first partition (1) on the hard drive with the third lowest ID number (c). ▪ sda1 is the first partition (1) on the hard drive with the lowest ID number (a). ▪ sdb3 is the third partition (3) on the hard drive with the second lowest ID number (b). ▪ sdc2 is the second partition (2) on the hard drive with the third lowest ID number (c). ▪ sdd1 is the first partition (1) on the drive with the forth lowest ID number (d).
/dev/sr*n*	This is a special designation used to identify optical drives in the system. The optical drive with the lowest ID number is addressed as **sr0**, the optical drive with the next lowest ID number is addressed as **sr1**, and so on. Many distributions include symbolic links named /dev/cdrom or /dev/dvd that point to the actual device file (sr0).

/dev/fd*n*	fd files identify floppy drives. Device numbering begins at 0. For example, /dev/fd0 is the first floppy drive.
/dev/tty*n*	tty files identify local terminals on the system. Device numbering begins at 0. Subsequent terminals are represented with files that increment by one (for example, the file for terminal two is /dev/tty1, and so on).
/dev/ttyS*n*	ttyS files identify serial ports. Device numbering begins at 0. Files for subsequent serial ports are represented by files that increment by one (for example, the file for serial port two is /dev/ttyS1, and so on).
/dev/lp*n*	lp files identify parallel ports. Device numbering begins at 0. Files for subsequent parallel ports are represented by files that increment by one (for example, the file for parallel port two is /dev/lp1, and so on).
/dev/st*n*	st files identify SCSI tape devices. Device numbering begins at 0.

TestOut Corporation All rights reserved.