

# **CST8207**

## **GNU/Linux O/S I**

### **Disks, Partitions,**

### **File Systems**

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# Topics

DOS disk Partition Table (Master Boot Record - MBR)  
Identifying DOS Partitions  
Linux Partition naming  
The fdisk utility  
Mounting file systems

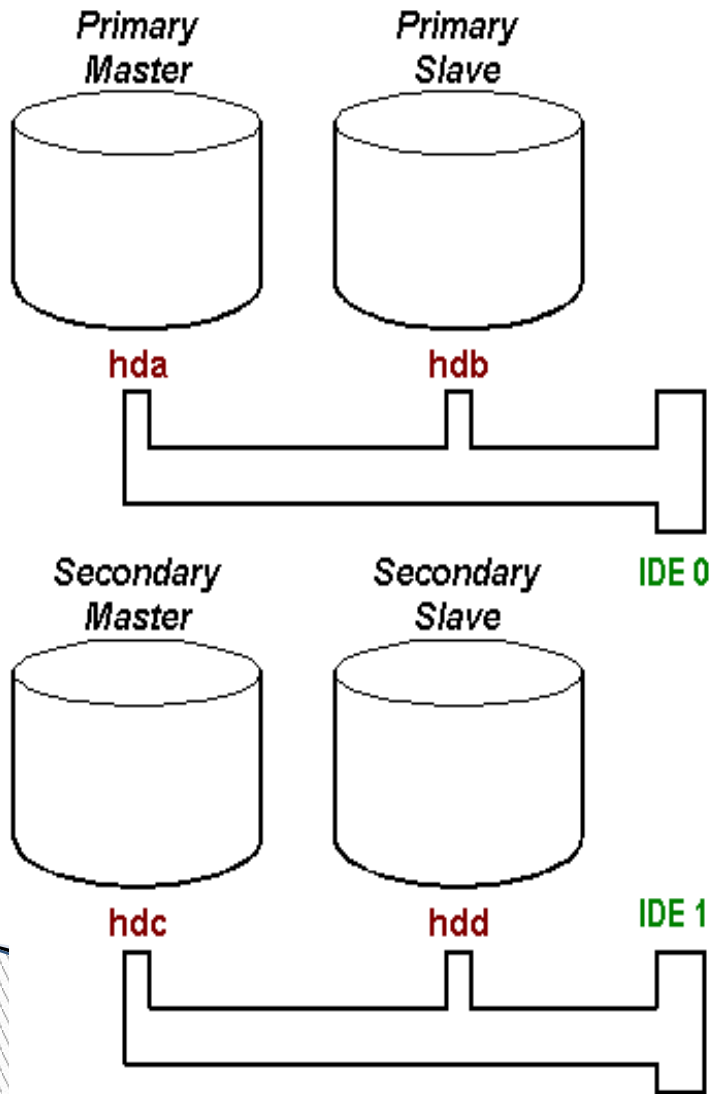
# What is a disk partition?

- ^^ A **partition** is a section of a physical disk. It can be all or part of the disk. It is usually formatted to contain a **file system**.
- ^^ The Master Boot Record of the disk (first sector) contains the **Partition Table**, which can hold exactly **four** partition entries
  - We only cover the **four-entry** MSDOS Partition Table type
  - Some programs can create more than four; rarely done
- ^^ Each **partition table entry** specifies its disk **start** location, **end** location, and whether it is **bootable**
- ^^ Partitions can be assigned **system identifiers** (or **types**), but the type may not match what is actually in the partition – you can put *anything* into any type of partition
- ^^ Some of the identifiers stand for multiple types - confusing

# Three Types of DOS Partitions

- ^^ Each of the **four** DOS partition entries on a disk can be either a **Primary partition** or an **Extended Partition**
- ^^ Up to **four** Primary Partitions are possible on a disk
- ^^ Only **one** of the four partition entries can be designated as an **Extended Partition** that may contain any number of additional **Logical Partitions** inside it (as many as you like)
- ^^ An **Extended Partition** takes one of the four slots and reduces the number of possible **Primary Partitions** to three
- ^^ You can create many **Logical Partitions** inside an **Extended Partition**, up to the size limit of the **Extended Partition**
- ^^ Some operating systems only *recognize* a limited number of **Logical Partitions** – check your O/S manual

# Linux Disk Names - sd?

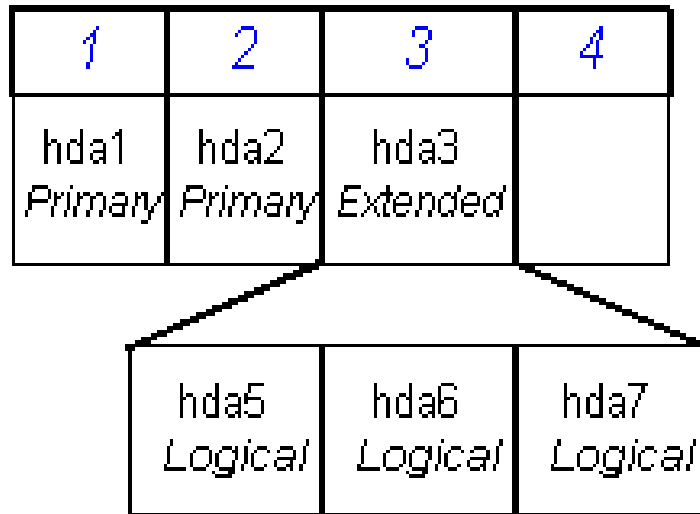


## Naming disk drives – sd?

- ^^ Primary master --- hda or **sd**a
- ^^ Primary slave ----- hdb or **sd**b
- ^^ Secondary master - hdc or **sd**c
- ^^ Secondary slave -- hdd or **sd**d
- ^^ Other disks: **sd**e, **sd**f, **sd**g, etc.

- ^^ “sd” used to mean only SCSI disks, but modern Linux systems treat all disks, even IDE, ATA, and SATA, as SCSI disks and name them starting with “sd”

# Linux Partition Names in /dev



## Naming partitions

∅ **sd?1 - sd?4**

- The four DOS partitions *always* use these **four** names

∅ **sd?5 - sd?63**

- Logical Partitions inside an Extended Partition *always* start at number **5**

- Maximum of 4 DOS primary/extended partition entries
- “*Any number*” of Logical Partitions inside Extended

# Linux Device Names in /dev

- Each disk and each partition is represented in the Linux file system as a separate “*device special file*”, usually in the **/dev** directory:
  - **/dev/sda** represents the entire first disk (**sdb** is the second)
  - **/dev/sda1** is the first of four DOS partitions (**Primary** or **Extended**) of the first disk (**sda2** is the second primary/extended DOS partition)
- **Logical Partitions** inside an **Extended Partition** *always* start at **5**
  - **/dev/sda5** is *always* the first Logical Partition (**sda6** is the second)
- Partitions using the four DOS **Primary Partition** entries never change numbers when you create or delete them. They always number **1** to **4**.
- Logical Partitions are *always* numbered sequentially starting at number **5**; removing a Logical Partition causes all the **following** logical partition numbers to go down by one, e.g. 6 becomes 5, 7 becomes 6, etc.!

# Required Linux Partitions

- ^ Linux can run inside only a single partition, the **ROOT** partition, but most Linux systems use at least two partitions:
  - ♦ A **ROOT** partition (with the O/S and all your files)
    - e.g. it might be **/dev/sda1**
  - ♦ A **swap** partition (to permit **virtual memory**)
    - e.g. **/dev/sda2** (if swap is a *primary* partition)
    - or **/dev/sda5** (if swap is a *logical* partition)
    - Or any other partition – swap can go anywhere



# Programs for Partitioning

- ^^ Linux **fdisk** program – easy to use for DOS partitions
  - similar to DOS fdisk, but more features available
  - console/terminal-based – does not need a GUI
- ^^ console-based **parted** can handle more modern partition tables (e.g. GPT) but is newer and a bit harder to use
- ^^ Other Linux graphical utilities may be used if you have a GUI (but many servers have no GUI!) e.g. *Disk Druid*, *gparted*
- ^^ Buy third-party stand-alone tools (e.g. *Partition Magic*, etc.)
  - Make sure the tool understands what's in the partitions!
  - Some tools only understand Microsoft/Apple partitions

# Linux `fdisk` command

- `fdisk` is the universal command-line partition table manipulator for Linux: `fdisk [options] device`
  - The device is a **disk name** (“`/dev/sda`”) *not* a partition name (not `/dev/sda1` )!
  - Useful “-1” option: `fdisk -l ; fdisk -l /dev/sda`
  - Useful options for non-legacy use (CentOS): `-cu`
- allows for viewing or modifying existing partition table and/or creating new partition(s) for a specified device
- can set the Partition Type (system ID) for most of the common file systems in use today
- Does not change anything until you **write** out the partition table – remember to **save** your changes!

# Linux/Unix mounting

/dev/sda2



/dev/sda3



# Linux/Unix mounting

/dev/sda2



/dev/sda3



# Linux/Unix mounting

/dev/sda2



/dev/sda3



# What is the maximum number of primary partitions allowed?

1. one
2. two
3. three
4. four
5. 63
6. as many as you like

# What is the maximum number of extended partitions allowed?

1. one
2. two
3. three
4. four
5. 63
6. as many as you like

# Which of these is the third partition of the second disk?

1. /dev/b3sd

2. /dev/a2sd

3. /dev/2asd

4. /dev/sd3b

5. /dev/sda2

6. /dev/sdb3

7. /dev/bs3d

8. /dev/as2d

9. /dev/3bsd

10. /dev/sd2a

