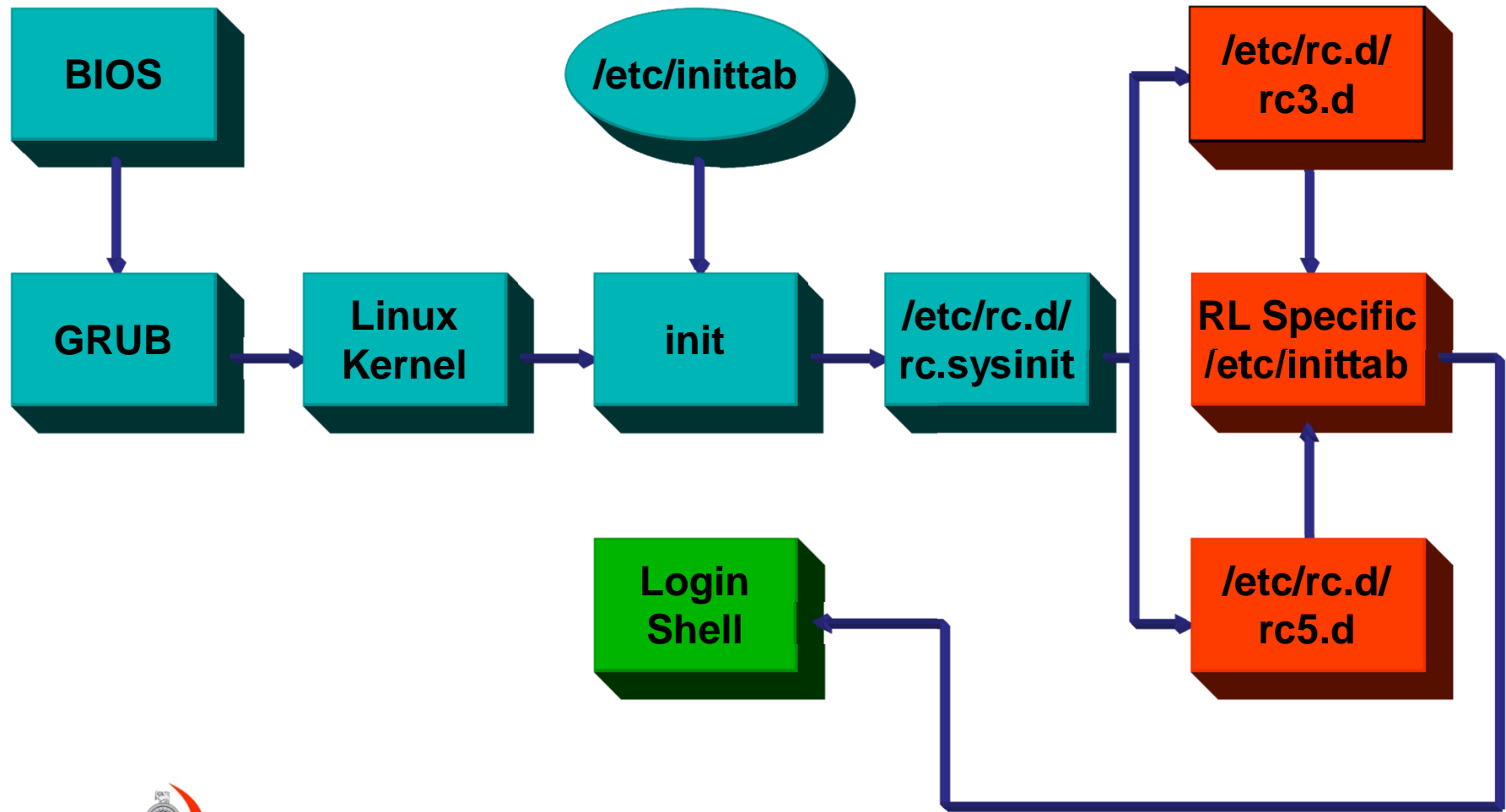# IT 6204
# Section 2.0

# Installing an Operating System

# 2.1 Boot Process

# Boot Process

# Welcome to Linux …..

```
CentOS release 5.4 (Final)
Kernel 2.6.18-164.el5 on an i686

centosvm login: _
```
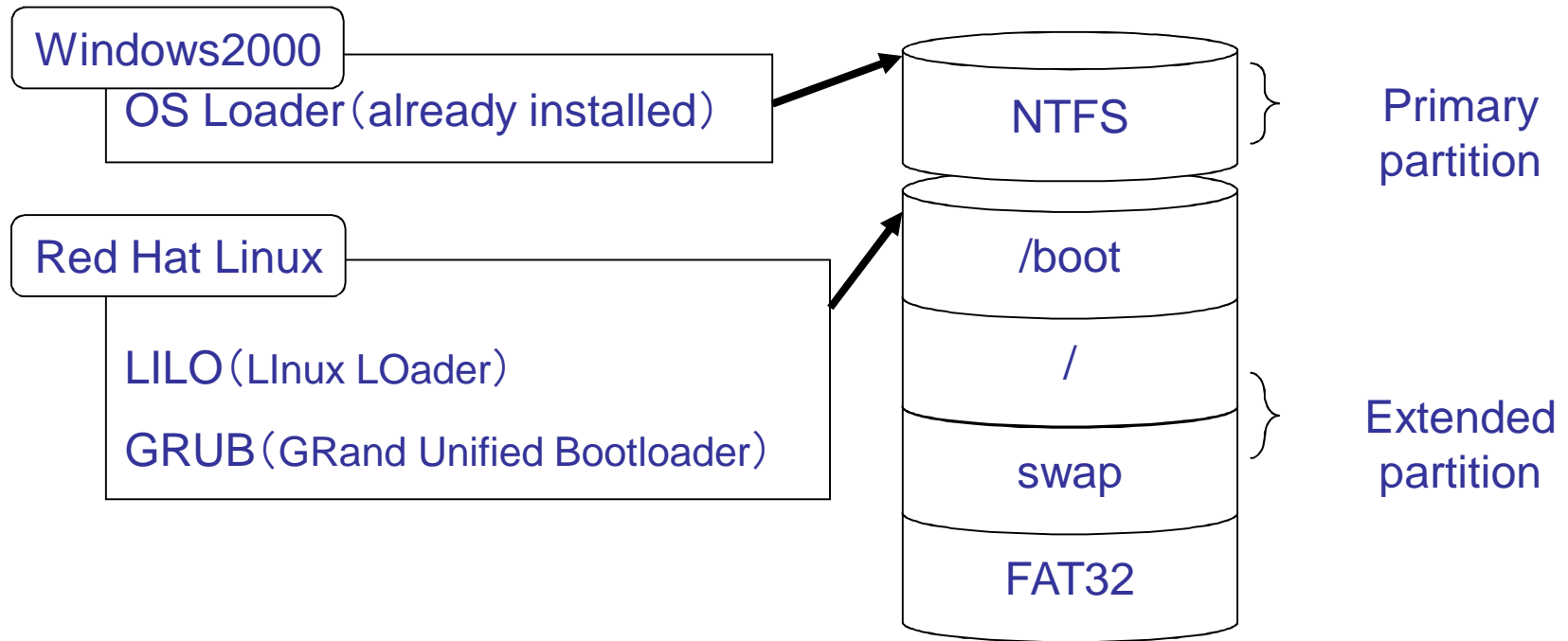
# 2.2 Dual Booting

# Single versus Dual Booting

➢ Dual booting allows multiple operating systems to be installed on the same machine

- Operating system loader allows the user to choose which operating system to load at boot time
- Useful for home and desktop computers
- Requires hard drive space to be partitioned before installation to
- create separate disk space

➢ Single booting applies when only one operating system is installed

- Standard choice for server installations

# OS Boot Loader

Windows2000

OS Loader（already installed）

Red Hat Linux

LILO（LInux LOader）

GRUB（GRand Unified Bootloader）

NTFS

/boot

/

swap

FAT32

Primary partition

Extended partition

# OS Boot Loader Cont....

➢ The Win NT/2000 loader can be used to boot Linux.

➢ The boot loader for Linux should be installed in the first sector of the "/boot" partition.

➢ Although LILO and GRUB boot loaders can be selected for Linux, the OS loader of Windows 2000 is always used for the initial boot after switching on.

# GRUB

**GNU GRUB** is a bootloader capable of loading a variety of free and proprietary operating systems. GRUB stands for GRand Unified Bootloader.

➢ GRUB is dynamically configurable. This means that the user can make changes during the boot time, which include altering existing boot entries, adding new, custom entries, selecting different kernels, or modifying initrd.

➢ GRUB also supports **Logical Block Address mode**. This means that if your computer has a fairly modern BIOS that can access more than **8GB** (first 1024 cylinders) of hard disk space, GRUB will automatically be able to access all of it.

# GRUB Cont.…

➤ GRUB can be run from or be installed to any device (floppy disk, hard disk, CD-ROM, USB drive, network drive) and can load operating systems from just as many locations, including network drives.

➤ It can also decompress operating system images before booting them.

*LILO supports only up to 16 different boot selections; GRUB supports an unlimited number of boot entries. LILO cannot boot from network; GRUB can.*

*LILO must be written again every time you change the configuration file; GRUB does not. LILO does not have an interactive command interface.*

# GRUB Cont.…

➢ By default, MBR code looks for the partition marked as active and once such a partition is found, it loads its boot sector into memory and passes control to it.

➢ GRUB replaces the default MBR (512 bytes: primary boot loader and partition table) with its own code. Furthermore, GRUB works in stages (Stage 1, Stage 1.5, Stage 2).

➢ GRUB has its own notation, which is very similar yet somewhat different from the general notation a typical Linux user might be used to.

**(hd0,1)**

# GRUB Cont.…

➢ The **brackets** are a must; all devices listed in GRUB menu must be enclosed in brackets. **hd** stands for hard disk; alternatively, fd stands for floppy disk, cd stands for CD-ROM etc. The first number refers to the **physical hard drive** number; in this case, the first drive, as they are counted from zero up. The second number refers to the **partition number** of the selected hard drive; again, partitions are counted from zero up.

➢ It is evident that GRUB (menu) does not discriminate between IDE or SCSI drives or primary or logical partitions. The task of deciding which hard drive or partition may boot is left to BIOS and Stage 1.

# GRUB Cont.…

```
default=0
timeout=30
splashimage=(hd0,0)/grub/splash.xpm.gz

# Linux
title Linux
root (hd0,3)
kernel /boot/vmlinuz26 root=/dev/hda4 ro

# (1) Windows
title Windows XP
rootnoverify (hd0,0)
makeactive
chainloader +1
```

# 2.3 Single User Mode

# Runlevel

➢ A system can be booted into any of several runlevels, each of which is represented by a single digit integer. Each runlevel designates a different system configuration and allows access to a different combination of processes.

➢ The are differences in the runlevels according to the operating system. Seven runlevels are supported in the standard Linux kernel. They are:

- 0 - System halt; no activity, the system can be safely powered down.

- 1 - Single user; rarely used.

- 2 - Multiple users, no NFS (network filesystem); also used rarely.

# Runlevel Cont.….

- 3 - Multiple users, command line (i.e., all-text mode) interface; the standard runlevel for most Linux-based server hardware.

- 4 - User-definable

- 5 - Multiple users, GUI (graphical user interface); the standard runlevel for most Linux-based desktop systems.

- 6 - Reboot; used when restarting the system.

➢ By default Linux boots either to runlevel 3 or to runlevel 5. The former permits the system to run all services except for a GUI. The latter allows all services including a GUI.

# Single user mode

- **Single user mode** is a mode in which a multiuser computer operating system boots into a single superuser.

- It is mainly used for maintenance of multi-user environments such as network servers. Some tasks may require exclusive access to shared resources, for example running fsck on a network share.

- This mode can also be used for security purposes - network services are not run, eliminating the possibility of outside interference.

- On some systems a lost superuser password can be changed by switching to single user mode, but not asking for the password in such circumstances is viewed as a security vulnerability.

# Single user mode in Grub

- ➢ Using GRUB, you can manually edit the proposed menu entry at boot time.
- ➢ To do so, when GRUB is presenting the menu list (you might need to press ESC first), follow those instructions:
- ➢ use the arrows to select the boot entry you want to modify.
- ➢ press *e* to edit the entry
- ➢ use the arrows to go to *kernel* line
- ➢ press *e* to edit this entry
- ➢ at the end of the line add the word *single*

# Single user mode in Grub Cont.…

➢ press ESC to go back to the parent menu

➢ press *b* to boot this kernel

➢ The kernel should be booting as usual (except for the graphical splash screen you might be used to), and you will finally get a root prompt (#).

# 2.4 Rebooting & Shutting down

# Rebooting & Shutting down

➢ Linux systems consists of various utilities that allow a system administrator to reboot or shutdown the system.

➢ If you use a proper method for reboot or shutdown a Linux system, it confirms data protection by terminating processes and synchronizing the file systems.

➢ "shutdown –r" or "reboot" command allows you to reboot a Linux system if you log as a root in a command prompt.

➢ The init command also can use to reboot the system by entering runlevel 6 ("init 6").

# Rebooting & Shutting down cont.…

➢ Init command allows you to change the current runlevel, and for a shutdown, this value is 0 ("init 0" ).

➢ "shutdown", "halt" or "poweroff" command allows you to shutdown a Linux system.

➢ According to the GUI you have installed, it contains options to reboot or shutdown the system.

# End of Section 2.0