



University of Diyala
College of Engineering



Department of Computer Engineering

Computer Science

1st stage

Lecture #4

- Course Number: U 102
- Course Name: Computer Science
- Credit Hours: (2-1-0-2)
- Prerequisites: None
- Course Contents: Computer Architecture, Computer Assembly and parts Characteristics, History of Computer, Generations of computer, Types of computer, Personal computer, major parts of the Computer (Hard Ware); Input Devices, Processor, Output Devices, Storage Devices, Internal Components, Software; Types of software, System software, Application software, Computer Languages and Scripting, Booting, Computer maintenance and troubleshooting, BIOS Setting, Open Source Software and Linux OS, Navigating Linux GUI, The Internet.

Booting

- Booting is basically the process of starting the computer. When the CPU is first switched on it has nothing inside the Memory. In order to start the Computer, load the Operating System into the Main Memory and then Computer is ready to take commands from the User.
- There are two types of booting:
 - **Cold Booting:** A cold boot is also called a **hard boot**. It is the process when we first start the computer. In other words, when the computer is started from its initial state by pressing the power button it is called cold boot. The instructions are read from the ROM and the operating system is loaded in the main memory.
 - **Warm Booting:** Warm Boot is also called **soft boot**. It refers to when we restart the computer. Here, the computer does not start from the initial state. When the system gets stuck sometimes it is required to restart it while it is ON. Therefore, in this condition the warm boot takes place. Restart button or CTRL+ALT+DELETE keys are used for warm boot.

Steps of Booting

- We can describe the boot process in six steps:
 1. The Startup: It is the first step that involves switching the power ON. It supplies electricity to the main components like BIOS and processor.
 2. BIOS: Power On Self Test, It is an initial test performed by the BIOS. Further, this test performs an initial check on the input/output devices, computer's main memory, disk drives, etc. Moreover, if any error occurs, the system produces a beep sound.
 3. Loading of OS In this step, the operating system is loaded into the main memory. The operating system starts working and executes all the initial files and instructions.
 4. System Configuration, In this step, the drivers are loaded into the main memory. Drivers are programs that help in the functioning of the peripheral devices.
 5. Loading System Utilities, System utilities are basic functioning programs, for example, volume control, antivirus, etc. In this step, system utilities are loaded into the memory.
 6. User Authentication , If any password has been set up in the computer system, the system checks for user authentication. Once the user enters the login Id and password correctly the system finally starts.

Computer maintenance and troubleshooting

- Relationship Between Hardware/ Software

- Hardware and software are mutually dependent on each other. Both of them must work together to make a computer produce a useful output.
- Software cannot be utilized without supporting hardware. Hardware without set of programs to operate upon cannot be utilized and is useless.
- To get a particular job done on the computer, relevant software should be loaded into the hardware . i.e. a device driver is needed.
- A device driver is a program that controls a particular type of device that is attached to your computer. There are device drivers for printers, displays, CD-ROM readers, diskette drives etc. When you buy an operating system, many device drivers are built into the product.

Computer maintenance and troubleshooting

- Hardware is a one-time expense.
- Software development is very expensive and is a continuing expense.
- Different software applications can be loaded on a hardware to run different jobs.
- A software acts as an interface between the user and the hardware.
- If Hardware is the 'heart' of a computer system, then Software is its 'soul'. Both are complimentary to each other.

Hardware or Software Problem ?

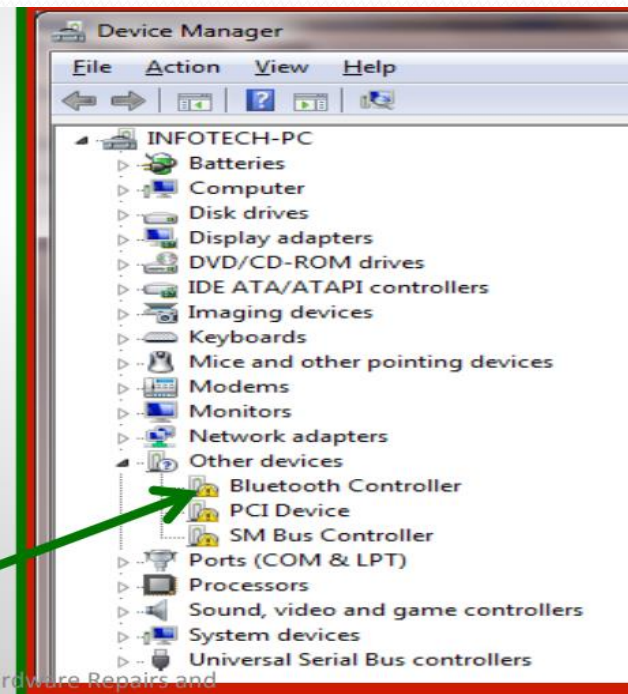
- Make sure you reduce possible “external” problems before proceeding. This means unplug any external devices (such as hard drives, scanners or printers), and remove any USB Flash disk, CD or DVD disks from their drives.
- Make sure you reduce possible “external” problems before proceeding. This means unplug any external devices (such as hard drives, scanners or printers), and remove any USB Flash disk, CD or DVD disks from their drives.
- Is the computer entirely dead? Or the screen blank? Or the screen showing a poor/incomplete picture? These faults are probably also due to hardware problems.
- Does the computer produce a series of beeps? This is a code that can be used to distinguish some hardware problems.
- Does the system give any error codes or descriptions while booting? These can be due to hardware or software problems. Take careful note of all information given in the error code.

- Does the computer produce error information after it has booted or only when you open specific programs? These error codes are probably due to software problems.
- Have any recent changes been made to hardware or software (including BIOS settings)? If so, these are likely culprits.
- Has the computer been exposed to viruses or other malware? This could be a cause of software problems.

☐ Use the Device Manager.

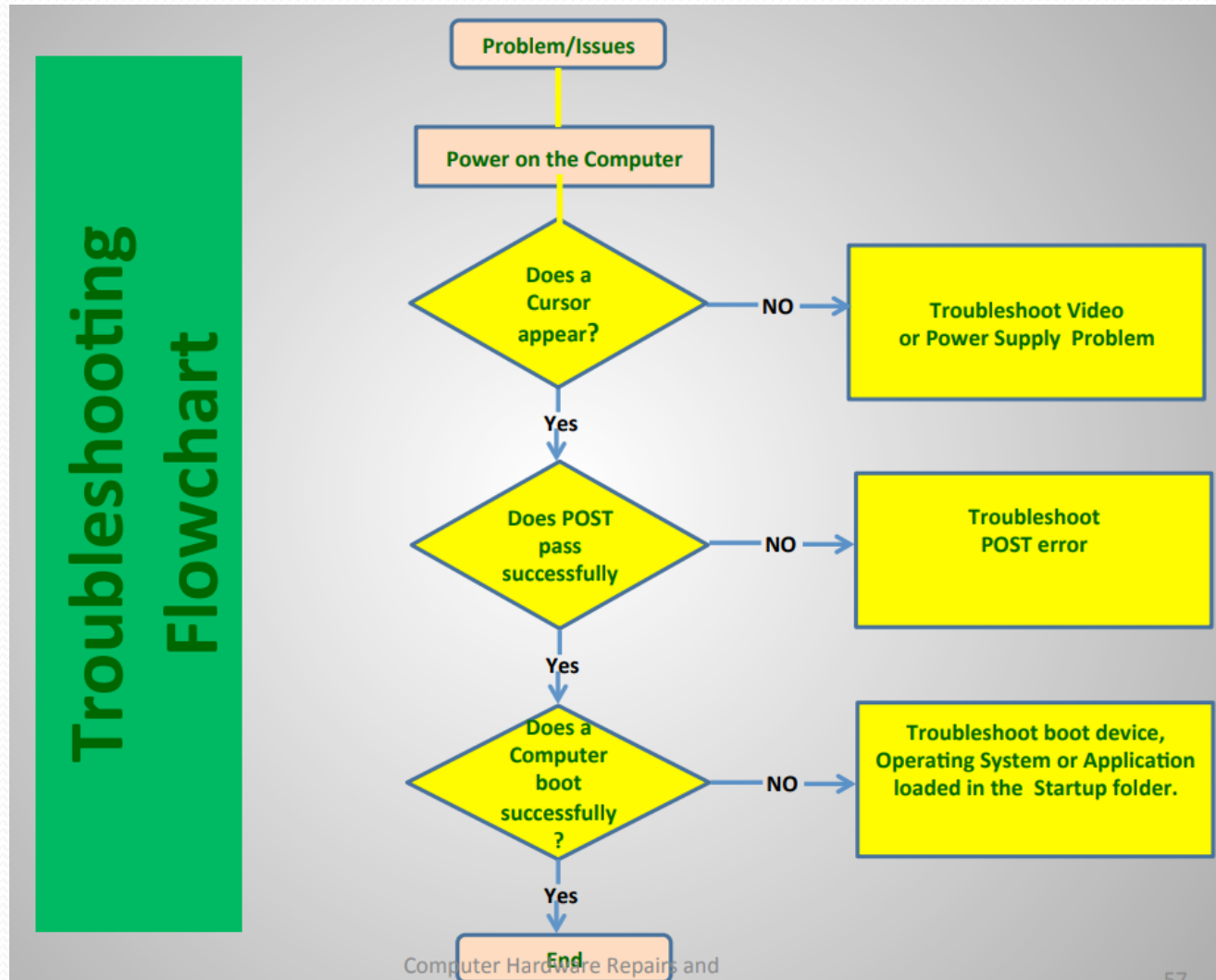
The Device Manager will list all of the **hardware** devices installed on a PC. Any device with a problem will have a **warning symbol** next to it, and double clicking on that device would give details and suggested remedies for the problem.

Warning symbol



Computer Hardware Repairs and

Computer Maintenance



BIOS



- **BIOS** (basic input output system) and **CMOS** (complementary metal-oxide-semiconductor) both are essential parts of every computer's motherboard. Let us have a look at BIOS and CMOS for their different tasks.
- **BIOS** This is an important piece of software which is stored in a ROM (read-only memory) chip inside the computer motherboard. It is the first program that runs every time when we turn on our computer. It stores all instructions related to controlling the keyboard, serial/parallel ports, hard disk drive, and other various storage drives. The BIOS is also responsible for storing all the specifications of the system in the battery backed RAM (which is also known as CMOS RAM) and provides a special setup program to change this information.
- The BIOS performs the **POST** (power-on self-test), which initialises and tests the computer's hardware. After that, it searches the boot loader and executes it. After that, the operating system gets loaded on the computer memory. BIOS creates an environment for configuring our computer hardware. You can see a message like 'Press F2 for setup' as you start your computer. It enables to see the BIOS interface or change its setting accordingly

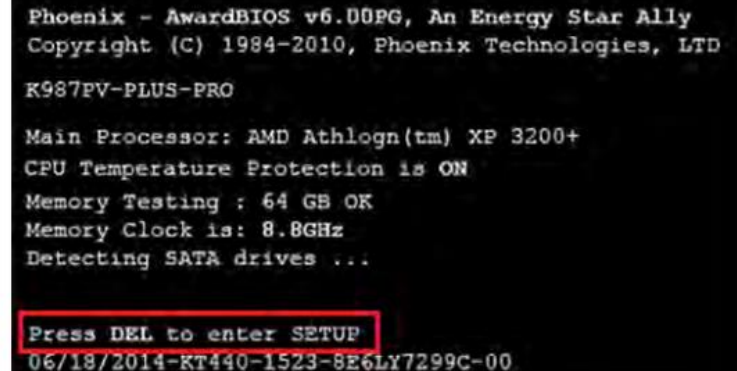
CMOS (complementary metal-oxide-semiconductor)



- CMOS As you modify the setting in BIOS configuration, the changes you have made are not stored in the chip of the BIOS. Basically these changes are stored in another special chip memory known as CMOS. Almost all chips like RAM and others (whichever store the BIOS setting) are manufactured in the same way as CMOS chips are manufactured. They can store data of a small size like 256 bytes. They store the information like disk drives installed, date and time of system, and booting sequence of our system. They may be present in a few motherboards. There is a separate chip for CMOS. The BIOS chip memory is non-volatile. It is capable of storing data even if powered off from computer. This is due to a separate power source of CMOS known as CMOS battery. CMOS Battery: This is a dedicated power source via a Lithium-ion whose size is equal to a coin. The life of a CMOS battery is approximately 10 years before it requires replacement. As soon as the battery gets expired, your CMOS setting will reset. If your CMOS battery dies, your computer BIOS settings will also reset to their default as soon as you shut down your PC.

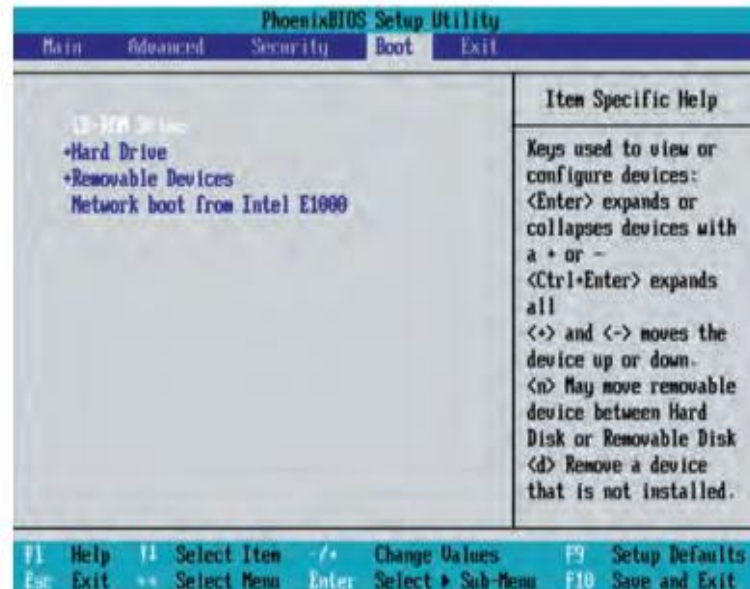
BIOS/CMOS setting

- You can open BIOS Setup in many ways. Every motherboard make and model has a different way to open it.
 1. Press [Enter any key] to enter setup. (See Figure)
 2. Setup: [Delete]
 3. Enter BIOS by pressing [F2 or Delete].
 4. Press [F10] to enter BIOS setup.
 5. Press [F10 and holding F10 key] to access BIOS
 6. Press [Window] to access system configuration

A screenshot of a BIOS/CMOS setup screen. The text is white on a black background. At the bottom, the text "Press DEL to enter SETUP" is highlighted with a red rectangular box. The screen displays system information including the BIOS version (Phoenix - AwardBIOS v6.00PG), copyright (1984-2010), motherboard model (K987PV-PLUS-PRO), main processor (AMD Athlon(tm) XP 3200+), CPU temperature protection status (ON), memory testing status (64 GB OK), memory clock (8.8GHz), and SATA drive detection status (Detecting SATA drives ...). The date and time "06/18/2014-KT440-1523-8E6LY7299C-00" are shown at the bottom.

```
Phoenix - AwardBIOS v6.00PG, An Energy Star Ally
Copyright (C) 1984-2010, Phoenix Technologies, LTD
K987PV-PLUS-PRO
Main Processor: AMD Athlon(tm) XP 3200+
CPU Temperature Protection is ON
Memory Testing : 64 GB OK
Memory Clock is: 8.8GHz
Detecting SATA drives ...
Press DEL to enter SETUP
06/18/2014-KT440-1523-8E6LY7299C-00
```

- Depending on the motherboard manufacturers, BIOS setup utility may have different types of options to set in different ways.
- This BIOS screen will be different as per new settings and technology which get updated regularly (see Fig). Exit save configuration changes and exit confirmation as shown in Figure.



2. To set the boot sequence of any bootable media on first priority like CD or DVD or HDD or USB over any drive, move it to the first position.
3. There could be different keys in different motherboards for changing the values of boot sequence. You can see these keys on the screen on the downside or right hand side.
4. After making necessary changes, save the setting by pressing F10 Key (or any other key as shown in your BIOS setup) and exit the BIOS setup utility.
5. Your computer will then restart with the new settings.

Exercises

- Which chip contains the system BIOS and can hold data permanently, even without electricity?
 - (a) Flash ROM
 - (b) NVRAM
 - (c) RAM
 - (d) ROM
- CMOS is power driven by a _____ battery.
- BIOS chip memory is _____.
- In modern PCs, CMOS settings are stored in _____.
- The data stored in BIOS remains the same even if power is off. (T/F)
- BIOS settings will reset to their defaults when the computer is restarted. (T/F)
- For loading operating system, BIOS is necessary. (T/F)
- Explain the difference between CMOS and BIOS.