

BIOS and Bootloader

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BIOS=Basic Input Output System

- ▶ Firmware code lives on flash memory
- ▶ On the motherboard
- ▶ minimum software that system needs
- ▶ designed to run as the first code by PC
- ▶ identify, test, and initialize system devices
- ▶ Also known as device drivers, or just drivers.

Computer BIOS



<http://www.computerhope.com>

BIOS Instructions

- ▶ how to load basic computer hardware
- ▶ test referred to as a POST(verify)

Functions of Bios

- ▶ POST (power on self test)
- ▶ Bootstrap loader
- ▶ BIOS drivers
 - ▶ Low level drivers that give the computer basic operational control over your computer's hardware.
- ▶ BIOS or CMOS Setup

POST (power ON self test)

- ▶ test the computer hardware
- ▶ Contains diagnostic routines for
 - ▶ initializing the hardware and peripherals
 - ▶ the video card, the main memory, the processor, the keyboard, etc.
 - ▶ testing vital system components
- ▶ If the computer does not pass the POST, you will receive a combination of beeps indicating what is malfunctioning within the computer.
- ▶ Runs quickly, stop without booting up
- ▶ Happens early, speaker is used
- ▶ diagnose hardware problems with your PC.
- ▶ POST boot errors are fatal(halt the boot process immediately)

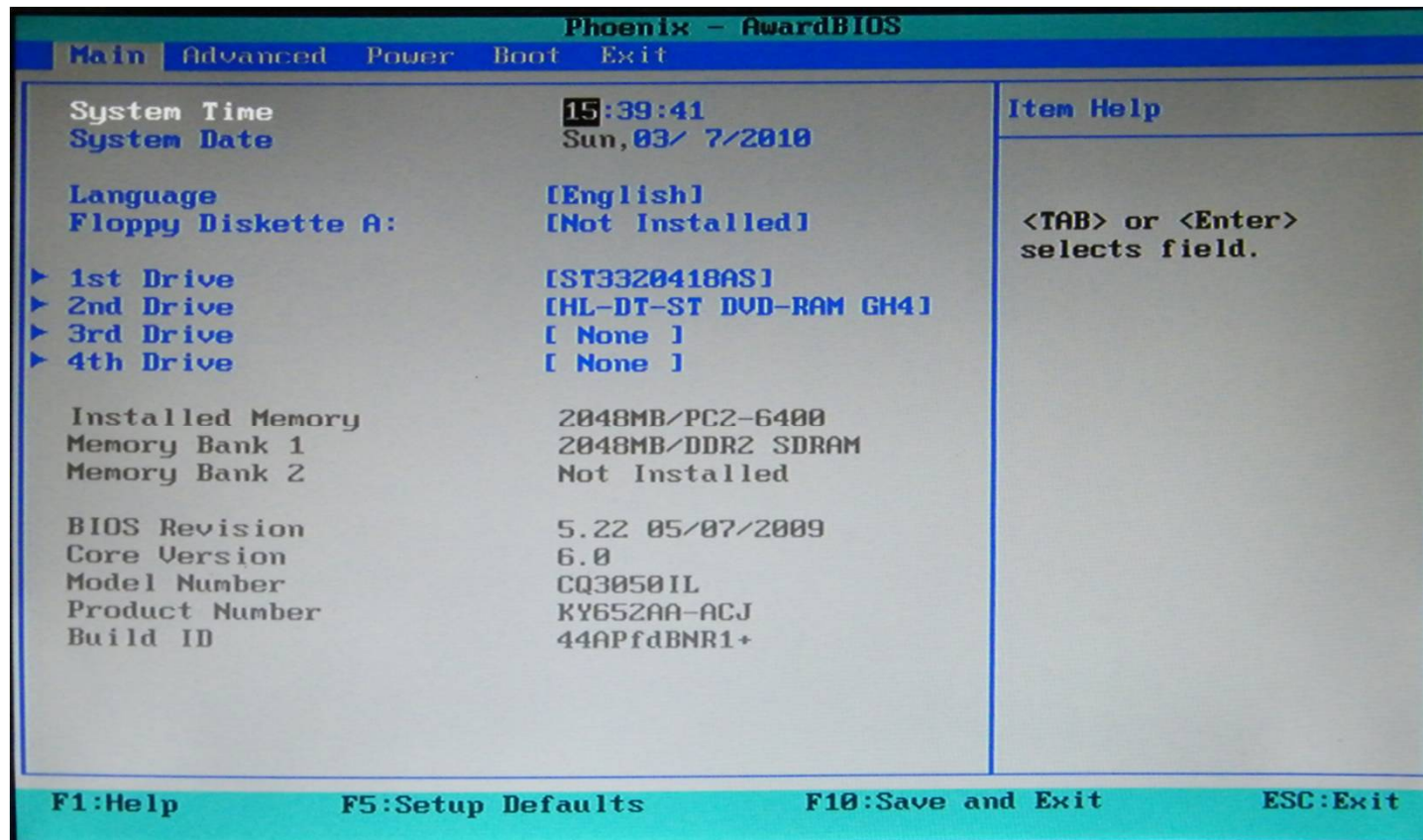
Bootstrap loader

- ▶ Locate the operating system, pass control to it.
- ▶ resides in the computer's EPROM, ROM, or other non-volatile memory.
- ▶ automatically executed by the processor when turning on the computer.

BIOS or CMOS Setup

- ▶ Usually a menu-driven program activated by pressing a special key during the POST, which enables you to configure hardware settings such as the date and time, passwords, disk drives, and other basic system settings.

Setup Screen



Question

The relationship between BIOS and CMOS?
Different or the same?

Question

The relationship between BIOS and CMOS?

- ▶ different components of a computer
- ▶ work together to make the computer function properly

CMOS

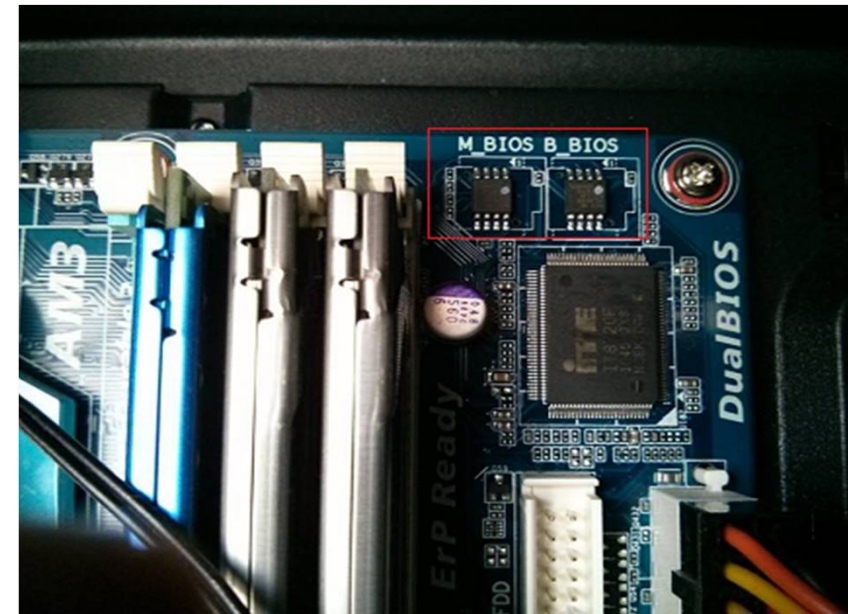
- ▶ RAM chip--store information about computer components
- ▶ Feature: lose the information when no power supplied
- ▶ CMOS battery is needed
 - ▶ If removed, lose all information
 - ▶ Any settings you made in the CMOS setup would be lost, and you would need to make those settings changes again after a new CMOS battery was put on the motherboard.
 - ▶ E.g. time and date will reset back to the manufactured date if it has been off for a long period of time.

BIOS and CMOS

- ▶ BIOS program reads information from the CMOS chip during boot up process
- ▶ CMOS setup, not the BIOS setup
- ▶ BIOS chip can only be updated by manufacturer(BIOS flash program)

Dual-BIOS

- ▶ Bios - a small Read-Only memory chip
- ▶ If fails, the BIOS cannot be loaded anymore
- ▶ Need Dual-BIOS system on modern motherboard
 - ▶ main BIOS chip fails
 - ▶ restart the computer and the backup BIOS chip is used to load the BIOS with the default settings



BIOS and Bootloader

- ▶ BIOS is the very **first step** when you press power button on your CPU. BIOS is a **small firmware** stored in ROM of mother board which is **manufacturer dependent code**.
- ▶ Boot loader is a program which is called by BIOS and once again **initializes boot related hardware** and finally boot loader is the one who exactly knows(memory location) where the **Kernel image is**.

Bootloader of Linux

- ▶ LILO
- ▶ GRUB

LILO cannot boot from network; GRUB can.

LILO supports only up to 16 different boot selections; GRUB supports an unlimited number of boot entries.

LILO does not have an interactive command interface.

How does GRUB work?

- ▶ Stage 1 is located in the MBR and mainly points to Stage 2, since the MBR is too small to contain all of the needed data.
- ▶ Stage 1.5 also exists and might be used if the boot information is small enough to fit in the area immediately after MBR.
- ▶ Stage 2 points to its configuration file, which contains all of the complex user interface and options we are normally familiar with when talking about GRUB. Stage 2 can be located anywhere on the disk. If Stage 2 cannot find its configuration table, GRUB will cease the boot sequence and present the user with a command line for manual configuration.

How does GRUB work?

```
default 0  
timeout 8
```

```
title openSUSE 10.2  
root (hd0,2)  
kernel /boot/vmlinuz-...  
initrd /boot/initrd.img-...
```

GRUB (GRand Unified Bootloader)

- ▶ dynamically configurable
- ▶ can load operating systems from many locations
- ▶ can be run from or be installed to any device

Booting

- ▶ GRUB has two distinct boot methods:
 - ▶ load an operating system directly.
 - ▶ chain-load another boot loader which then will load an operating system actually.

Installing GRUB

Source:

usr/share/grub/i386-redhat/

```
grub-install '(hd0)'
```

Summary

- ▶ Bios
- ▶ BIOS vs. CMOS RAM
- ▶ Dual-BIOS
- ▶ BIOS vs. Bootloader
- ▶ GRUB



Thank you!