REMINDERS

• Exercise 4
• Due Today, January 23

• Exercise 5
• Due Wednesday, January 25

• Exercise 6
• Due Wednesday, January 30
Today’s Topics

• BIOS

• Operating Systems
BIOS

Basic Input/Output System

– Lowest-level software on a computer system
– Functions as an interface between the hardware and the operating system
**BIOS**

**Primary BIOS Functions**
- Initiates system boot sequence
- Provides interface that allows you to change system hardware parameters

---

**BIOS Setup Utility**

<table>
<thead>
<tr>
<th>BIOS Information</th>
<th>Processor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build Date and Time</td>
<td>CPU O</td>
</tr>
<tr>
<td>BMC Information</td>
<td>Max CPU Speed</td>
</tr>
<tr>
<td>SDR Revision</td>
<td>CPU Signature</td>
</tr>
<tr>
<td>FRU Version</td>
<td>Processor Cores</td>
</tr>
<tr>
<td>Microcode Patch</td>
<td>6</td>
</tr>
</tbody>
</table>

**Set the Date. Use Tab to switch between Date elements.**

- **T4**: Select Item
- **Enter**: Select
- **+/−**: Change Opt.
- **F1**: General Help
- **F2**: Previous Values
- **F3**: Optimized Defaults
- **F10**: Save & Exit
- **ESC**: Exit

---

**Advanced Settings**

- **CPU Configuration**
- **Memory Configuration**
- **IDE Configuration**
- **SuperIO Configuration**
- **Trusted Computing**
- **USB Configuration**
- **PCI Configuration**
- **NPS Configuration**
- **Event Log Configuration**

---

**Configure CPU**

- **Select Screen**
- **T4**: Select Item
- **Enter**: Go to Sub Screen
- **F1**: General Help
- **F10**: Save and Exit
- **ESC**: Exit

---

[Image of BIOS setup utility]

---

[Oracle.com]

---

[AnandTech.com]
BIOS

Primary BIOS Functions

– Provides low-level communication and operation of the basic system hardware

– At a minimum, the BIOS drives the keyboard and provides primitive output to a display monitor
BIOS

What BIOS is

– BIOS is considered Firmware, because it is program code that is integral to a system’s hardware

– On older computers, the system BIOS was written on ROM chips and could not be changed

– New computers use Electrically-Erasable Programmable ROM (EEPROM), flash memory, or battery-backed static RAM chips to hold the BIOS program code
BIOS

Where to look for BIOS

– Besides a computer’s motherboard, BIOS chips can be found on adapters such as:
  – SCSI cards
  – Video cards
  – USB hard disk adapters
  – RAID controllers

(redundant array of independent disks)
BIOS
What BIOS Does

– The first “layer” of software that is read into RAM when a computer boots up is the BIOS code.

– To ensure that the BIOS code is always available to the system, particularly at boot-up, it is hardcoded (as ROM) into the BIOS chip on the system motherboard.

– Once the BIOS is in RAM, subsequent software layers can be read into RAM – most notably, the Operating System (always the second software layer).
An OS is usually (but not always) loaded onto a computer that you buy from a dealer.

Currently, there are several OS packages available for desktops/laptops. Microsoft Windows is by far the most common.
Good evening Mr. Gates, I'll be your server today!
Operating Systems

The OS manages and controls:

– System hardware and peripherals
– Basic system operations
– Application software; e.g.
  • Word processors
  • Spreadsheets
  • Web browsers
  • Etc.
Operating Systems

The OS is the second layer of software that is loaded into RAM at system startup.

– All subsequently-loaded software depends on the OS for **Common Core Services**, including:
  • Disk access
  • Memory management
  • Task scheduling (avoids conflict during multi-tasking)
  • User interface (interactions with menus, icons, keystrokes, mouse-clicks, etc.)
Operating Systems

- The OS ensures that software applications can:
  - Use memory (RAM)
  - Use input and output devices (keyboard, mouse, scanner, monitor, printer)
  - Have access to the file system

- The OS *kernel* provides these common core services to software applications.
Operating Systems

Current OS’s – there are two broad families:

- Microsoft Windows (about 90% of all desktop machines)
  - e.g., Windows 2000, XP, Vista, 7, 8, 10

- Unix-like OS’s
  - BSD (Berkeley Standard Distribution)
  - System 5 (Irix, Solaris)
  - AIX (IBM)
  - Mac OS X (10.14 = Mojave)
  - Linux ‘distros’ (Elementary, Mint, Arch, Ubuntu, Tails)
Operating Systems

• A condensed history of Windows:
  – DOS
  – Windows 3.x (DOS shell)
  – Windows 95 (DOS shell)
  – Windows 98 (DOS shell)
  – Windows ME (DOS shell)
  – Windows NT (New Technology! – revamped OS/2)
  – Windows 2000
  – Windows XP
  – Windows 7 (2010)
  – Windows 8 (2012)
  – Windows 10 (2014)

• Windows was originally designed to operate on Intel & AMD processors
By Kristiyan Bogdanov - Own work Made with CorelDraw 16. I tried saving in .SVG but it always showed bugs when rendering in Wikimedia., CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=20995196
Windows Vista
Windows 7
Windows 10
Operating Systems

• UNIX-like OS’s – a more diverse family
  – UNIX is a trademarked name that can be licensed to any programmer who creates an OS that follows and conforms to the specific set of UNIX standards
  – UNIX-like OS’s are used heavily in the server business, as well as in workstation environments that you find in academia and engineering companies

• UNIX OS’s can run on a wide variety of processor/computer types, including
  • Sun, SGI, Apple, Intel, AMD processors
Operating Systems

OS Components
– GUI or Command Line Interpreter (the “shell”)
– Low-level system utilities (e.g., My Computer, Windows Explorer)
– Kernel

The shell is the outer wrapper of the kernel. The kernel talks directly to the hardware.

Hardware ↔ Kernel ↔ Shell ↔ Application programs