Operating System Fundamentals

Module 7:

Device Support and Device Drivers

Agenda

- BIOS
- Connectors
- Device Driver
- Installation Process
- Development
- Maintenance
- Troubleshooting

BIOS

- Basic Input/Output System
- Lowest level software in a PC-class computer system
- Standardized way of providing interface between hardware and Operating System
- Resides in non-volatile memory (normally Flash memory for easy upgrades)
- Provides some hardware settings (BIOS Setup)
- Boots up the computer

BIOS Setup

- Entering the Setup utility is usually a keystroke after the POST (Power-in self test) and before the Operating System starts loading
  - Usually displayed on the screen for a short period
- Before making changes, it is good practice to make note of the original setting(s)
- Settings saved in battery-backed CMOS memory

BIOS – Standard Settings

- Date and Time
- Disk Settings
- Basic Video Settings

BIOS Advanced Features

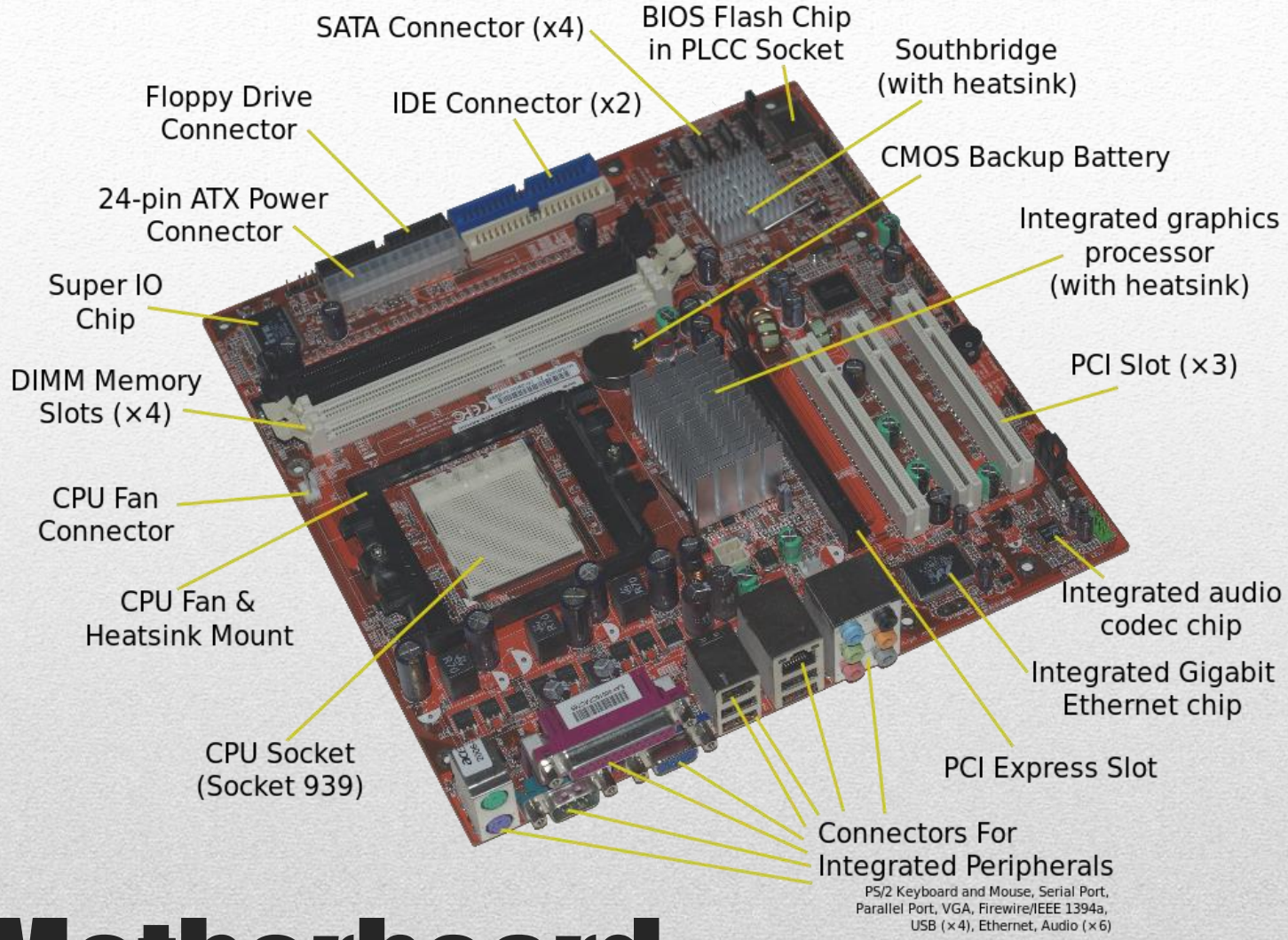
- Settings for L1 and L2 Processor Cache
- Various Boot options
- Advanced disk options
- Shadowing options for BIOS code
- Chipset features
- PnP configuration
- Peripheral configuration
- Power Management
- Security settings

BIOS Setup

- Although BIOS setup programs are generally similar, some manufacturers support special features on the motherboard
  - Best to see the documentation that came with your hardware for specific details on the setup items
- Demo

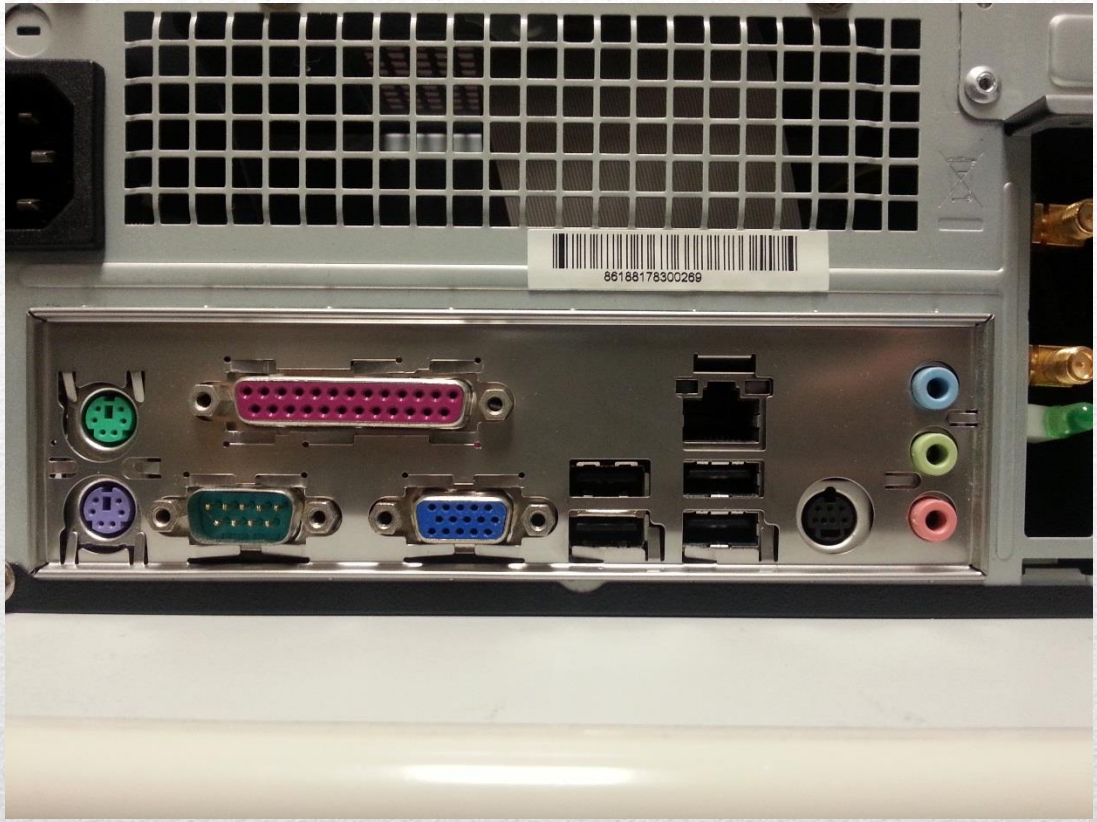
Devices

- Some support for devices is built into the BIOS
  - Generally the lowest common denominator to allow basic operation
  - Enhanced operation is usually available through support software loaded while Operating System loads



Motherboard

Source: Wikipedia (under GNU Free Documentation License)



Name the Sockets

Device Driver

- Program that acts as an interface between higher level programs and a "device"
- "Device" may be physical or virtual
- Examples of devices that use device drivers:
  - Printer, scanners, cameras
  - Video adapters, network adapters
  - Hard disk drive, USB memory sticks

Kernel-Mode and User-Mode

- Drivers can be written in two software layers
  - Kernel-Mode (Ring 0 of Intel)
    - Protected by allowing only system calls to access it
    - Better performance since "closer" to hardware
  - User-Mode (Ring 3 of Intel)
    - System potentially more stable; driver will not crash the OS

Windows Driver Installation

- Three Steps:
  - Device is identified
  - Driver is selected
  - Driver is installed
- Latest versions of Windows has an online database with all the files needed
- Some devices still need installer from manufacturer

Step 1: Device is ID'd

- Hardware Identifier is assigned
  - Used to get closes match to a "driver package"
  - Composed of Bus Prefix and Vendor specific information like vendor, model, revision
- Vendor may identify compatible ID's so Windows can use another device driver if the right one is not available
  - E.g. Video driver on initial startup

- Windows matches driver package specified in .inf file with evaluated ID's
- Best match selected:
  - If only one match, installs driver
  - If multiple matches, drivers are scored. If only one low score, then installs that driver
  - If multiple matches and tied low score, Signed Drivers have priority, and date and revision numbers could be used

Step 2: Driver is Selected

- Signature
- Features (Vista and later)
- Device ID

Ranking Drivers

- Copy files to locations specified in the .inf file
- Determine the “Device Setup Class” to help installation process
- Control transfers to the “Plug and Play Manager”
  - Loads the device driver
  - Starts the device

Step 3: Driver is Installed

Development

- Device Driver Kit (DDK)
- Windows Driver Development
  http://msdn.microsoft.com/en-us/library/ff557573(v=vs.85).aspx
- Development Tools
  http://msdn.microsoft.com/en-us/library/ff545440(v=vs.85).aspx
- Need special debugging facilities/tools

Maintenance

- Updates are usually sufficient
- Device Manager
  - Update, Disable, Install
  - Scan for hardware changes
  - Properties
    - General
    - Driver Details
    - Resources Used

- Use up to date drivers from manufacturer
- Disable or uninstall drivers for testing
- Start in Safe mode (or Advanced Startup)
  - Hold F8 on startup

Troubleshooting

References

- Windows Driver Installation Information: http://msdn.microsoft.com/en-us/library/ff549455(v=vs.85).aspx
- Windows Driver Development http://msdn.microsoft.com/en-us/library/ff557573(v=vs.85).aspx
- Development Tools http://msdn.microsoft.com/en-us/library/ff545440(v=vs.85).aspx