

# CSC-203 Operating Systems[3]

Lecture: 3

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## Lecture 3

# Historical Background

### Buses

- as processors and memories got faster, the ability of a single bus to handle all the traffic was strained to the breaking point
- additional buses were added, both for faster I/O devices and for CPU-to-memory traffic

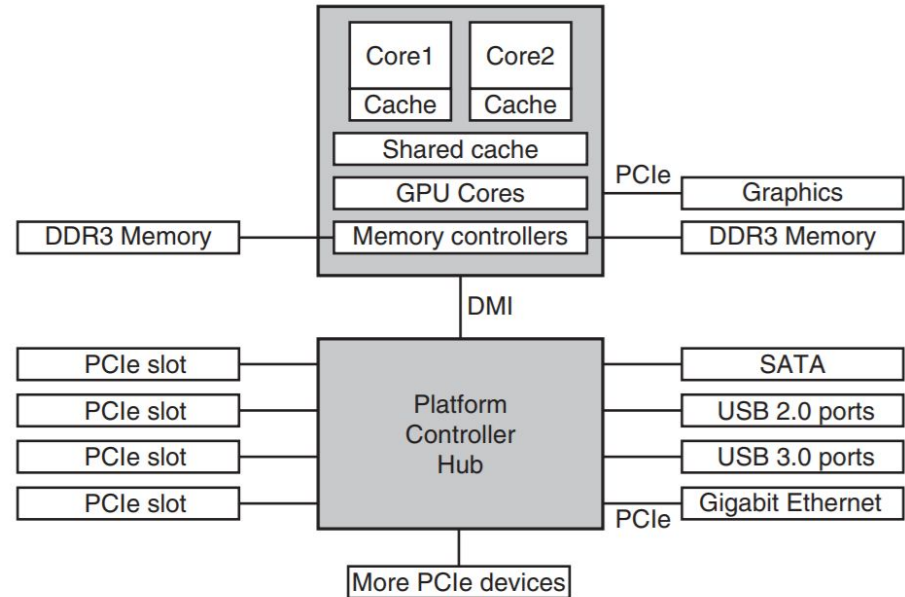


Figure 1-12. The structure of a large x86 system.

### Buses

- The main bus is the **PCIe (Peripheral Component Interconnect Express)** bus. Capable of transferring **tens of gigabits per second**,
- **shared bus architecture** means that multiple devices use the same wires to transfer data
- **parallel bus architecture** as used in traditional PCI means that you send each word of data over multiple wires
- **serial bus architecture** sends all bits in a message through a single connection known as a line
- **USB??**

### Buses

- **USB(Universal Serial Bus)** was invented to attach all the slow I/O devices, such as the keyboard and mouse, to the computer.
- USB is a centralized bus in which a root device polls all the I/O devices every 1 msec to see if they have any traffic
- USB 1.0 could handle an aggregate load of 12 Mbps, USB 2.0 increased the speed to 480 Mbps, and USB 3.0 tops at no less than 5 Gbps.
- **SCSI (Small Computer System Interface)** bus is a high-performance bus intended for fast disks, scanners, and other devices needing considerable bandwidth. They can run upto 640 MBps

### Booting the Computer

#### The boot Process:

- On motherboard a program called the system BIOS(Basic Input Output System) contains low-level I/O software including procedures to read the keyboard, write to the screen, and do disk I/O, among other things.
- On System boot, the BIOS starts.
- It first checks to see how much RAM is installed, whether the keyboard and other basic devices are installed and responding correctly.
- Next scans the ISA and PCI buses to detect all the devices attached to them
- If the devices present are different from when the system was last booted, the new devices are configured.

### Booting the Computer

#### The boot Process:

- BIOS then determines the boot device by trying list of devices stored in CMOS memory
- Attempt to boot from a CD-ROM or USB or Network
- First sector of the bootable device contains a program that normally examines the partition table at the end of the boot sector to determine active partition.
- OS then queries the BIOS to get the configuration information.
- OS then loads devices into the kernel, initialized its tables, creates background processes necessary and a login program GUI pops up finally.

### Operating System Variations

- Mainframe operating systems
- Server operating systems
- Multiprocessor operating systems
- Personal computer operating systems
- Handheld operating systems
- Embedded operating systems
- Sensor node operating systems
- Real-time operating systems
- Smart card operating systems

### Mainframe operating systems

- Mainframe OS are heavily oriented toward processing many jobs at once, most of which needs prodigious amount of I/O
- Services Provided:
  - Batch
  - Transaction processing, and
  - Timesharing
- **batch system** is one that processes routine jobs without any interactive user present.
- **transaction-processing** systems handle large numbers of small requests, for example, check processing at a bank or airline reservations
- Each unit of work is small, but the system must handle hundreds or thousands per second



### Mainframe operating systems

- **Timesharing** systems allow multiple remote users to run jobs on the computer at once, such as querying a big database.
- example mainframe OS: **OS/390**.
- However, mainframe operating systems are gradually being replaced by UNIX variants such as Linux.

### Server operating systems

- One level down are the server operating systems.
- Run on servers (either large personal computers, workstations or even mainframes)
- serve **multiple users at once** over a network and allow the users to **share hardware and software resources**
- **Services:** print service, file service or web service
- **Examples:** Solaris, FreeBSD, Linux and Windows Server 201x.

### Multiprocessor Operating Systems

- increasingly common way to get major computing power is to connect multiple CPUs into a single system
- increasingly common way to get major-league computing power is to connect multiple CPUs into a single system
- even conventional desktop and notebook operating systems are starting to deal with at least small-scale multiprocessors and the number of cores is likely to grow over time.
- Examples: **Windows and Linux**, run on multiprocessors

*Personal computer operating systems*

**Handheld operating systems**

- **Smaller and smaller systems, tablets, smartphones and other handheld computers**
- **PDA(Personal Digital Assistant)**
  - A small computer that can be held in a hand during operation
- Runs mostly on UNIX based systems

### Embedded Operating Systems

- Embedded systems run on the computers that control devices that are not generally thought of as computers and **which do not accept user-installed software.**
- microwave ovens, TV sets, cars, DVD recorders, traditional phones, and MP3 players
- main property which distinguishes embedded systems from handhelds is the certainty that no untrusted software will ever run on it.
- All software is in ROM

### Sensor-Node Operating Systems

- Sensor networks are used to protect the perimeters of buildings, guard national borders, detect fires in forests, measure temperature and precipitation for weather forecasting, glean information about enemy movements on battlefields, and much more
- sensors are small battery-powered computers with built-in radios
- runs a small, but real operating system, usually one that is event driven, responding to external events or making measurements periodically based on an internal clock
- nodes have little RAM and battery lifetime is a major issue
- Example: **TinyOS**
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### Smart Card Operating Systems

- smallest operating systems run on smart cards, which are credit-card-sized devices containing a CPU chip
- Some are powered by contacts in the reader into which they are inserted, but contactless smart cards are inductively powered, which greatly limits what they can do
- ROM on the smart card holds an interpreter to interpret programming language

### Next Lecture

- Operating SYstem Concepts
- System Calls
- Operating SYstem Structure



## Historical Background

- Operating system evolution
- Hardware review
- Operating system structure
- Overview of operating system: batch system, multiprogramming, time-sharing, real-time, mainframe operating systems, personal computer operating systems, system calls.

# Q&A

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# THANK YOU