

Lecture 21

Q15 Main components of a computer system:

① Internal memory
processor etc.

② Peripheral
disk
Display
Audio
mouse
key board etc.

Interface:

Interface is a intermediate software/hardware that allows exchange information between software, hardware, peripheral devices or humans.

Hardware interfaces: connect physical component of a computer to the operating system.

Example: USB, DMA, Timer, counter, peripheral controller etc.

Software Interfacing manage the relationships between software applications and the hardware.

Example: Device driver (Linux)
Assembly code

PCI (Peripheral Component Interconnect) is a local bus that connects hardware devices to a computer's processor bus.

Example: Audio card
VGA card
Ethernet card

Motivation

- ① Knowledge of hardware and software
- ② Skill in interfacing are valuable in numerous applications including computers and embedded system.

③ Career opportunities: Expertise in peripheral and interfaces opens up highly paid job opportunities in industries like Intel (BIOS and driver development), Sony, Motorola and others.

④ Advancements in peripheral technology: Knowledge of advanced peripherals and modern technologies like USB 3.0, Bluetooth 4 and high-performance graphics cards is essential as these technology widely used in the industry.

Dolby Digital

Dolby digital provides surround sound with multiple audio channels that enhancing audio quality for a more immersive experience.

→ Dolby digital commonly uses 5.1 channels:

5 main channels for high frequency

1) Left Front (L)

2) Right front (R)

3) center (C)

4) Left surround (LS)

5) Right ~~so~~ surround (RS)

* 1 Low-frequency effects (LFE)
channel for bass frequencies

→ Dolby digital uses perceptual audio coding to compress audio.

→ It uses AC-3 (Audio code 3) compression, which reduces data by encoding only essential audio frequencies.

→ Dolby digital adjust the bit rate dynamically.

→ when the encoded Dolby digital signal reaches a playback device, such a home theater system, Dolby digital decoders decode the signal and route each channel to its respective speaker which provide so surround sound experience.

HD cinema

→ properties of HD cinema :-

(i) Frame rate for HD cinema video is 30 frame/sec.

(ii) Standard resolution for HD video is 720p or 1080p

(iii) Uncompressed 1080p video would take up around 1.35 TB for an hour of footage.

(iv) Some video formats are MP2, MP4 and MKV

(v) The older ~~cinema~~ standard cinema resolutions is 2K, and the newer standard is 4K.

Bluetooth: properties:

(i) Bluetooth operates within a range of 10 to 100 meters

(ii) Bluetooth is designed to be energy-efficient.

(iii) Bluetooth data transfer rates vary across versions:

→ classic Bluetooth: up to 3 Mbps

→ Bluetooth 4.0: up to 1 Mbps

→ Bluetooth 5.0 and newer: up to 2 Mbps

(iv) Bluetooth uses frequency-hopping spread spectrum.

operating in the 2.4 GHz band.

⑤ Bluetooth maintain a low latency.

⑥ Newer Bluetooth devices can connect with older ones and it's also cross-platform

Bluetooth 3.0	Bluetooth 4.0	Bluetooth 5.0
24 Mbps max speed	24 3 Mbps max speed	50 Mbps max speed
max range 30 m	max range 60 m	max range 240 m

Peripheral Controller Migration refers to the shift in how peripheral controllers are integrated within computer systems.

① On-board Integrations

Many peripherals are now integrated directly onto the mother-board, like graphics, audio and network controller). This reduces the need for multiple external components and save space.

② Integration within the processor

In modern computing, certain peripheral controllers are now built directly into the CPU on architecture. For example: Intel Celeron and Atom processors integrate wireless, graphics, and memory controllers within the processor chip.

Advantages of peripheral Controller migration:

- ① Lower power consumption: Integrated peripherals can operate at lower power levels.
- ② Improved performance: on-chip controllers allow faster communication between the processor and peripherals, reducing bottlenecks.
- ③ Space Efficiency: Reduces the physical space required for peripheral components, allowing compact design.
- ④ Cost-effectiveness: Reduces manufacturing and maintenance costs by minimizing the number of components.

Macrastron platform

Macrastron platform was a mobile computing platform developed by Intel, aimed at improving the performance and power efficiency of mobile devices.

Components :

(i) Lineroft (45 nm) : This is the main processor unit, which includes the LPIA core, memory controller, video encoding and decoding, as well as controls for graphics and display.

(ii) Largwell : This acts as the system controller and handles tasks like solid-state disk control. ~~And~~ it connects to other devices through various I/O blocks.

③ (iii) Evans peak: This component manages WiFi/WiMAX, Bluetooth, GPS, 3G+, and mobile TV functionalities.

(iv) PMIC: A bulky integrated power management IC that ensures power management across different parts of the platform.

☐ Intel Centrino processor: was introduced as a mobile platform. It combined a processor, chipset and wireless network interface.

☐ Intel Atom processor: was designed for ultra-low power consumption, targeting mobile devices, notebooks, and embedded systems. It uses a simplified, low-power architecture.



(iii) From back: The Component manager

Intel Centrino | Intel Atom

Focus on mobile

Computing performance
and battery life.

Focus on ultra-low
power consumption

A platform with
CPU, chipset and

A standalone processor

WiFi

Moderate power
efficiency

Low-power efficiency

High performance

Low performance

Mid 19-20

① Keyboard interfacing refers to the connection and communication between the keyboard and a computer or microcontroller.

Scanning in keyboard is the process by which the microcontroller or computer checks each key on the keyboard to detect if it is pressed.

Scan time is the time taken for the system to check all the keys on the keyboard once.

② Key bouncing is the phenomenon when a single press of a key causes multiple signals due to the mechanical vibration of the switch.

Keyboard matrix formation:

A keyboard matrix formation is created by arranging keys in rows and columns. Each key is positioned at the intersection of a row and a column. When a key is pressed, it connects the corresponding row and column, allowing the microcontroller to detect which key is pressed by identifying the active row and column pair.

③ Accuracy of an optical mouse refers to its ability to precisely track movements on a surface. This is measured in DPI (dots per inch), which indicates the sensitivity of the mouse. Higher DPI means the mouse can detect finer movements.

Factor affecting quality:

DPI: Higher DPI provides greater accuracy and ~~sent~~ sensitivity.

Polling rates: The frequency at which the mouse sends data to the computer. Higher polling rates lead to more responsive and smoother tracking.

Sensor quality: Better sensor can track on a variety of surface and other more consistent performance.

Lighting conditions: Optical mice may work better under certain lighting conditions as the sensor relies on light to detect movement.

④

polling rate is the rate at

which the mouse sends its position to the computer,

which measured in Hz. A

Higher polling rate means the mouse updates its positions

more frequently. It also leads

to more responsive and

smoother tracking.

Refresh rate is the number

of times per second that the

display refreshes the image, measured in Hz. A Higher

refresh rate allows for smoother visuals, reducing

motion blur and flicker, which is beneficial for gaming and high motion tasks.

Final-18-19

3/ (c) A mouse's sensitivity (DPI) can be adjusted, and people change it for a variety of reasons:

(1) Precision tasks:

Lowering the DPI can help with tasks that require precision, like drawing or in-game targeting.

(II) Faster movement:

Increasing the DPI can be idle for games or other apps that require faster movement.

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(a) Hall effect keyboard

* Hall effect keyboards use magnets and hall effect sensors, when a key is depressed, it moves a magnet, which is detected by the solid

state sensor.

* These keyboards are extremely reliable.

* These keyboards can be easily made totally waterproof. (ii)

* They are used for ultra-high reliability applications, in locations like nuclear power plants or aircraft cockpits. They are also sometimes used in industrial environments.

* These keyboards are very expensive ~~also~~ since, they use a magnet and sensor for each key.