Information Systems
ISM 3011

Spring 2004
Unit 3A/B

Assignment for Next Class

- Read chapter 4.
- Check that you understand the key terms on p. 171.
- Pass the self-assessment test on pp. 171-172.
- Prepare the review questions 1, 13, and 14.

Five Main Hardware Components

- Central processing unit (CPU)
- Primary storage (main memory; memory)
- Secondary storage
- Input devices
- Output devices

Hardware Components

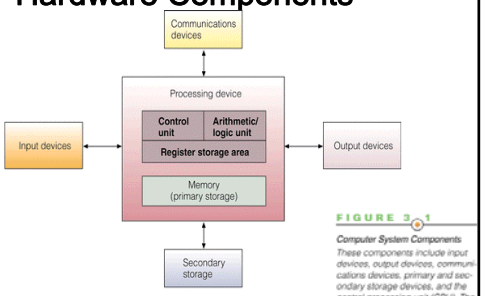


FIGURE 3-1
Computer System Components
These components include input devices, output devices, communications devices, primary and secondary storage devices, and the central processing unit (CPU). The control unit, the arithmetic/logic unit (ALU), and the register storage areas constitute the CPU.

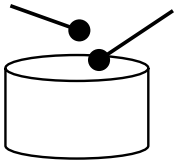
Machine Language

CLEAR A	0000: 100
LOAD A, 7	0001: 200 7
LOAD B, 5	0003: 201 5
SUB A, B	0005: 150
JUMP TO 0034 IF ZERO	0006: 170 0034
	…
Assembler	0034: …
(Mnemonics)	Machine Language

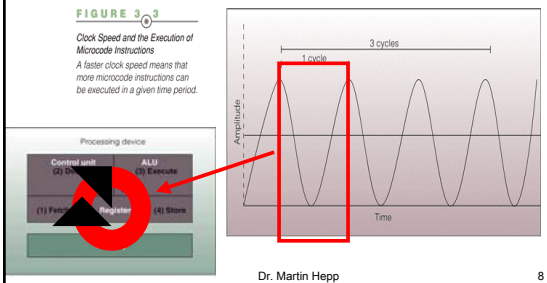
Hardware Components in Action

- *Step 1*: Fetch instruction
- *Step 2*: Decode instruction
- *Step 3*: Execute the instruction
- *Step 4*: Store results

Clock Speed – The Computer's Drum Beat



Clock Speed



Complex and Reduced Instruction Set Computing

- **Complex instruction set computing (CISC)** - places as many microcode instructions into the central processor as possible
  (French Restaurant ☺)
- **Reduced instruction set computing (RISC) -** involves reducing the number of microcode instructions built into a chip to an essential set of common microcode instructions
  (Fast food ☺)

Hard Disks

http://computer.howstuffworks.com/hard-disk.htm/printable

Hard Disks

•Platters
•Read/Write Head
•Actuator Arm

http://computer.howstuffworks.com/hard-disk.htm/printable

Hard Disks

http://computer.howstuffworks.com/hard-disk.htm/printable

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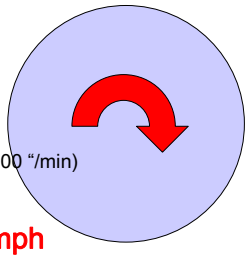
Speed

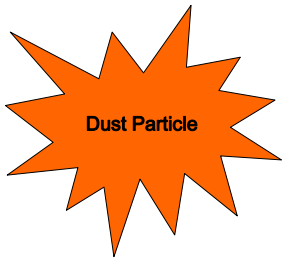
r = 3.5” / 2
diameter = 3.5 “
circumference = 2π r

⇒3.5” * 3.1415 = ca. 11”

⇒7200 rpm
⇒11” * 7,200 inch/minute (79,200 “/min)
⇒11” * 7,200 * 60 inch/hour
⇒4,752,000 inch/hour
⇒4,752,000 / 63,360 => **75 mph**



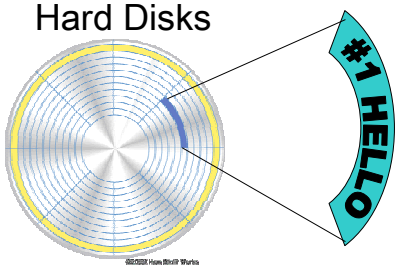
Dust and Abrasion



a few micrometers
(ca. 1/1,000,000 yard)

Hard Disks

- Tracks
- Sectors



http://computer.howstuffworks.com/hard-disk.htm/printable

How should you organize backup copies of your data?

Apply Your Knowledge: TCO

- Calculate and compare the TCO of one ink-jet and one laser printer model.
- Make necessary assumptions and name them!

Total Cost of Ownership (TCO)

Purchase Price } determined by
+ Installation, Training } the chosen brand
+ Supplies } determined by
+ Maintenance } usage and brand

TCO

TCO: Cost of Supplies and Maintenance

- In order to determine the cost of all supplies and maintenance, one must make assumptions about the product usage, e.g.
  - how many pages will be printed per week
  - how many hours will the machine run per day (->power consumption)

TCO: Examples of Printer Supplies

Paper: 10 $ per 500 sheets

Toner: 50 $ for a unit that will last for 2,000 pages

Drum unit: 200 $, needs to be replaced after 10,000 pages

Approach 1: Divide Price for Each Part by Amount of Pages

Paper: 10 $/500 sheets → $ 0.02/page

Toner: 50 $/2,000 pages → $ 0.025/page

Drum unit: 200 $/10,000 → $ 0.02/page

$ 0.065/page

When one prints 12,000 pages over the whole life span of the printer, you have to pay for 2 drum units, not 1.2!

Paper: [illegible] sheets → $ 0.02/page

Toner: [illegible] $/2,000 pages → $ 0.025/page

Drum unit: 200 $/10,000 → $ 0.02/page

Approach 2

- To solve this problem, you can determine the actual number of supply units needed to print the total number of pages.
- Example for 12,000 pages:
  - 24 boxes of paper, 6 toner kits, 2 drum kits

Example

- Assumptions:
  - Printer costs $ 300 including installation, but without first drum kit and toner
  - Costs of supplies as on the previous slides
  - Printer will be used for 3 years
- Usage:
  - 20 pages per day → 100 pages per week (Mo – Fr) → 5,000 per year (50 weeks) → 15,000 within 3 years

Example

Approach 1		Approach 2	
Purchase Price	$ 300	Purchase Price	$ 300
Supplies 15,000 * 0.065	$ 975	30 Boxes of Paper 30 * $ 10	$ 300
TCO	$ 1275	8 Toner Kits 8 * $ 50	$ 400
		2 Drum Kits	$ 400
		TCO	$ 1400

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Case Studies

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Case 1: Electronic Voting Question 1

- 215,000 / 313,000 = 2/3 = 66 %
  - 66 % of Canberrans voted
- 16,500/215,000 = 7,67 % of the voters tried the new electronic system
- Reasons for the low percentage:
  - Voting is a rare task, thus people are more reluctant to learn new procedures
  - Lack of transparency

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Case 1: Electronic Voting Question 2

- Concerns:
  - Canberra is atypical of the country
  - Rural areas would require a huge number of computer systems
  - Security issues
- Security, Privacy, and Transparency are the most serious issues.
  - Physical recount is impossible
  - Voting decisions can be traced

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Case 1: Electronic Voting Question 3

- Improvements:
  - Print paper ballots as backup
  - Support online voting (but: increases security issues etc.)

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Case 1: Electronic Voting Question 4

- Electronic voting systems in the US
  - Search the Internet and read about the ongoing discussions

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Case 2: Land Warrior Question 1

- Power/Battery
- Cannot be repaired by the soldier

Case 2: Land Warrior Question 2

- Access to satellite image data (e.g. to look behind the buildings etc.)

Case 2: Land Warrior Question 3

- Soldiers must receive special training to use the device
- On the other hand, one must make sure that traditional skills remain present, in case the Land Warrior fails.
- Availability of devices that do tasks for us tend to weaken our own skills, because we lack training.

Case 2: Land Warrior Question 4

- Special forces could be equipped with the Land Warrior first.
- In case of injuries or death, relatives of such soldiers without access to the Land Warrior might regard this as the reason for the incident.

Case 3: Smaller Servers Question 1

- Advantages:
  - require less space
- Disadvantages
  - higher server density per s/f requires changes in power supply, air-conditioning, and data lines

Case 3: Smaller Servers Question 2

- Advantages of Server Blades:
  - require even less space than ultra slim servers
  - improved flexibility and performance
  - heat and power issues less critical than with ultra slim servers
- Disadvantages
  - limits: power supply, air-conditioning, and data lines
  - management software required

Case 3: Smaller Servers Questions 3 & 4

- Question 3:
  - check whether heat and power issues need extra attention
- Question 4:
  - Provide effective management and maintenance software

Thank you!

The slides will be available on the internet at

http://ruby.fgcu.edu/courses/mhepp/

(-> CRN80097)