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

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
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

- Platters
- Read/Write Head
- Actuator Arm

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Speed

\[ r = \frac{3.5''}{2} \]
\[ \text{diameter} = 3.5'' \]
\[ \text{circumference} = 2\pi r \]
\[ \Rightarrow 3.5'' \times 3.1415 = \text{ca. 11''} \]
\[ \Rightarrow 7200 \text{ rpm} \]
\[ \Rightarrow 11'' \times 7.200 \text{ inch/minute (79,200 /min)} \]
\[ \Rightarrow 11'' \times 7.200 \times 60 \text{ inch/hour} \]
\[ \Rightarrow 4,752,000 \text{ inch/hour} \]
\[ \Rightarrow 4,752,000 / 63,360 \Rightarrow 75 \text{ mph} \]

Dust and Abrasion

Dust Particle

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

Dust Particle

Hard Disks

• Tracks
• Sectors

Hard Disks

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
+ Installation, Training
+ Supplies
+ Maintenance

TCO
determined by the chosen brand
determined by usage and brand
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

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!

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
  - 5,000 per year (50 weeks) $ 15,000 within 3 years
### Example

<table>
<thead>
<tr>
<th></th>
<th>Approach 1</th>
<th>Approach 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase Price</td>
<td>$300</td>
<td>$300</td>
</tr>
<tr>
<td>Supplies</td>
<td>$975</td>
<td>$300</td>
</tr>
<tr>
<td>15,000 * 0.065</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCO</td>
<td>$1275</td>
<td>$1400</td>
</tr>
<tr>
<td>8 Toner Kits</td>
<td></td>
<td>$400</td>
</tr>
<tr>
<td>8 * $50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Drum Kits</td>
<td></td>
<td>$400</td>
</tr>
<tr>
<td>TCO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Boxes of Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 * $10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Case Studies

#### 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

**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

**Question 3**
- Improvements:
  - Print paper ballots as backup
  - Support online voting (but: increases security issues etc.)

**Question 4**
- Electronic voting systems in the US
  - Search the Internet and read about the ongoing discussions
Case 2: Land Warrior

Question 1

- Power/Battery
- Cannot be repaired by the soldier

Question 2

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

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.

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

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)