Information Technology

- Y2K (year 2000) problem
  - Result of expensive computer memory in the early days of computing
  - Two-digit to store year values
- Knowing something about where technology has been, can help us understand where technology is headed

Information Technology

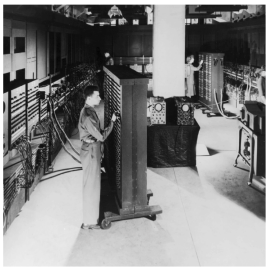
Early Computers:

- 1939 – 1952
- complex & expensive
- single user
- one program at a time
- housed at universities

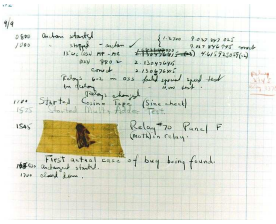
Information Technology

Early Computers:

- 1947, ENIAC
- → Mark I
- 1952, FERUT at U of T



1st Computer Bug



The First "Computer Bug"
Moth found trapped between points at **Relay # 70, Panel F**, of the Mark II Aiken Relay Calculator while it was being tested at Harvard University, 9 September 1947. The operators affixed the moth to the computer log, with the entry: **"First actual case of bug being found"**. They put out the word that they had "**debugged**" the machine, thus introducing the term "**debugging a computer program**".

Mainframes: 1952 - Present

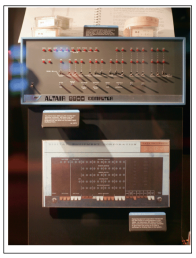
- 1st digital computers
  - used in business & government
- 1st generation, vacuum tubes
  - IBM 650 ($200,000 - $400,000)
  - Add or subtract 16,000 numbers/second
- 2nd generation, transistor
  - Smaller, easier to maintain, reliable

Mainframes: 1952 - Present

- 3rd generation (mid 1960's)
  - operating systems
  - Multiprocessing/Timesharing
  - Cost $millions
  - Mini-computers
- Still being used today
  - Fast processing, massive storage

Microcomputers: 1975 - Present

- integrated circuits
- small microprocessors
- monitors
- keyboards
- portable floppy disks
- software



Altair 8800

Microcomputers: 1975 - Present

- 1981, PCs
  - IBM
  - Apple
  - Compaq
  - Texas Instruments
  - integrated circuits

Networking PC: 1985 - Present

- Local Area Networks (LANs)
  - linking many PCs together
  - shared access to data, printers & peripheral devices
- Wide Area Networks (WANs)
  - The Internet
    - Email
    - Web browsing

Technology Lessons

- Technology advances
  - Moore's Law
  - Take advantage of the changes
- Small is powerful
  - Use it anywhere
- Networking is the thing
  - Communication & Collaboration

Computer Hardware

- Hardware
  - electronic components
    - input, process, output, and store data according to instructions encoded in computer software
- Basic hardware categories:
  - Input
  - Processing
  - Output
  - Storage

Central Processing Unit

- CPU
  - "Brains" of the computer
  - Speed (MHz)
  - Fast CPU needed for:
    - Complicated calculations & manipulations
    - Processing large graphics files

Special Function Cards

- Augment basic capabilities
- Sound Card
  - Provides better sound quality
- Video Card
  - Enhances clarity & speed of video display

Main Memory

- Main memory
  - Size (MB,GB)
  - Speed
  - Increased amount of memory allows for many applications to be run at the same time.

Computer Data

- Binary digits (bits)
  - Used to represent data
    - Represented as either zero or one
- Bytes
  - Bits grouped into 8-bits
  - Specifications for size of memory
    - K – kilobytes, 1024 bytes
    - MB – megabyte, 1024K bytes
    - GB – gigabyte, 1024 MB bytes
    - TB – terabyte, 1024 GB

Hard Drive (Magnetic Disks)

- Provides long-term storage
- Storage Capacity (size)
  - Affects performance
- Data recorded in concentric circles
- Disks spin & read/write heads move in/out
- Time required to read data depends on:
  - Rotational delay
  - Seek time

Optical Disks

- Types:
  - CDs
  - DVDs
- Data stored differently
- Different capacities & speed
- ROM = read-only memory
- R = record data once
- RW = rewritable

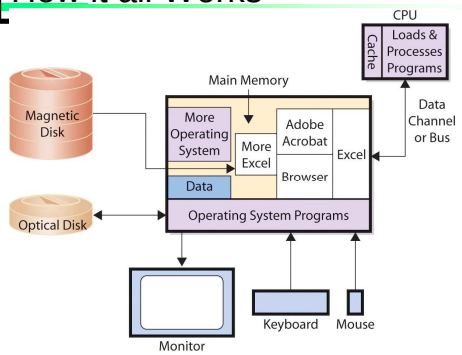
Video Displays

- Two types:
  - CRTs (Cathode ray tubes)
    - Big and bulky
  - LCDs (Liquid crystal display)
    - Slimmer
- Specifications
  - Screen size (in inches)
  - Resolution (in pixels)

Pixels

- Single point on screen
- Number of Pixels depends
  - Size of monitor & Creation of image
- Resolutions:
  - 640 x 480, 800 x 600, 1024 x 768, 1280 x 1024 ... 1680 x 1050, 1920 x 1080
  - Optimal grid for sharpness & clarity

How it all Works



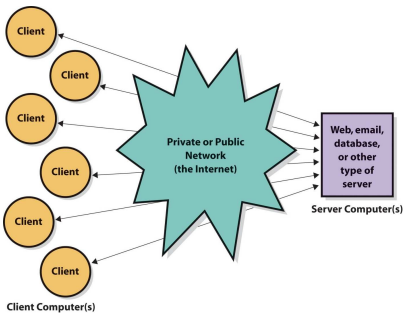
What do you need to know …

- Memory
  - One program or many
  - Small or large files
- CPU Speed
  - Specified in cycles – hertz (1 GHz, 3 GHz)
  - Small or large files
  - Simply or complicated tasks

What do you need to know …

- Volatile Memory
  - Contents lost when power is turned off
  - Cache and Main Memory
- Nonvolatile
  - Contents survive when power turned off
  - Magnetic Disk & Optical Disks

Client & Server Components



Thin/Thick Client?

- Amount of code required to run on the client computer
- Thin Client
  - Requires nothing more than a browser
- Thick Client
  - Requires other programs on the client's computer to run

Cloud Computing

- Similar having servers supply applications & data
- Customers do not typically own the computers
- Hardware, software, and applications are provided as a service, through a web browser
- The cloud (metaphor for the Internet) makes software and data services available from any location at any time

Cloud Computing

- Use provides reduction of cost per MB for storages and network bandwidth
- More efficient, user only pays for what they use
- Builds upon the concept of **grid computing**
- Grid Computing
  - several computers used to address a single problem at the same time

Software Components

- Two types:
  - Operating system
    - Program that controls computer's resources
    - Typically particular to a type of hardware
    - Examples: Windows, MAC OS
  - Application programs
    - Perform specific user tasks
    - May be written for a specific Operating System
    - Example: Word, Access

Four Major Operating Systems:

- Windows
  - Over the majority of world's desktops
  - Over the majority of business users
  - Developed by Microsoft
  - Different versions

Four Major Operating Systems:

- Mac OS
  - Developed for Mac's by Apple Computer Inc.
  - Easy to use interfaces
  - MACs with Intel processor can run Windows too
  - Roots in Graphic design

Four Major Operating Systems:

- Unix
  - Developed by Bell Labs
  - Scientific & Engineering community
  - Sun Microsystems major vendor for this OS
- Linux
  - Developed by open-source community
  - Version of Unix
  - IBM primary user

Own Versus License

- Users buy license to use program
- Ownership remains with development company
  - "I accept"
- Linux owned by the open-source community
  - No license fee
  - Companies make money offering support

Application Software

- Programs that perform a function
  - General purpose – Excel, Word
  - Specific – Quickbooks, Photoshop

Application Program Categories:

- Horizontal-market
  - Common uses across organizations
    - Examples: Word, Excel, PowerPoint
- Vertical-market
  - Serves need of specific community
    - Examples: dental appointment scheduling software

Application Program Categories:

- One-of-a-kind
  - Designed for specific need
    - Example: CRA (Canadian Revenue Agency) software
- Dual Category
  - Example: Customer Relationship Management (CRM)
- Custom developed
  - Developed in-house or outside by developer

Application Software Aquisition

- Off-the-shelf
  - Buying a shirt off the shelf
- Off-the-shelf with alterations
  - Buying a shirt off the shelf & altering the sleeve length
- Custom-developed
  - Buying a custom made shirt

Firmware

- Computer software embedded in a hardware device (printers, print servers, communication devices)
  - Installed into ROM (read-only memory)
  - Ability to change & upgrade
- Basic Input/Output System (BIOS)
  - Used when computer booted up
  - Instructions maintained in ROM, then loaded into volatile memory when booted

Purchasing Decisions in Business?

- Depends on organization's policies
  - Large organizations use IS departments
  - Medium to small organizations less formal
    - Managers/employees make take an active role
- Managers and employees may have role in specifying application software
  - Typically no role in server specifications

What Software Do We Need?

- OS
  - Include in purchase of hardware
- Application
  - Site license
    - Ability to install software on all equipment
    - Typically unit price < unit retail price
  - Upgrade
    - newer version purchased at reduced cost

What Hardware Do We Need?

- Laptop or desktop?
- CPU
- Main memory
- Storage (Magnetic disks)
- Monitors (Video displays)
- What to buy?

Keeping up to Speed!

- Technology continues to change
- Need to keep up-to-date!
  - Don't ignore technology
  - Professional events with technology
  - Get involved

Computer Security: Viruses, Worms & Zombies

- Virus
  - Computer program that replicates itself
  - Consumes computer resources
    - **Payload** causes unwanted activity
      - Delete/modify data – harmful activities
  - Macro viruses
    - Attaches to specific documents
    - Virus placed in startup of application
    - Virus infects every file created or processed by that application

Computer Security: Viruses, Worms & Zombies

- Worm
  - Virus that propagates using Internet or network
  - Spreads faster than other viruses
  - Programmed to spread
  - Ability to "Choke" networks making them unusable
  - Example: Slammer

Computer Security: Viruses, Worms & Zombies

- Zombies
  - Subsequent computers infected with worm or virus
  - Owners typically unaware of problem
  - Typically used by spammers to send email
  - **Botnet**
    - Compromised machine
    - Set of computers and applications
      - coordinated through a network
      - perform malicious tasks

Computer Security: Prevention

- Patch security holes
  - Check vendors regularly
- Never download from unknown sites
- Don't open attachments from strangers
- Don't open unexpected attachments
- Use Virus protection software (licensed)
  - Virus protection @ Western
- If you have a virus
  - Follow instructions to remove it