

Graphics, Digital Media and Multimedia

Chapter 6 Multimedia Part [1](#)

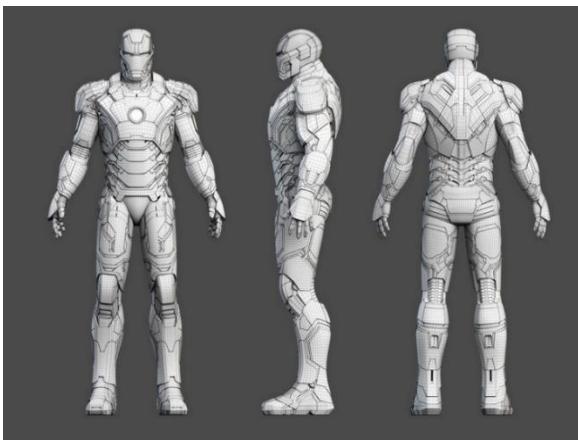


Topics

- Computer Graphics
- Image Processing
- Computer vision
- 3D modeling
- Computer Aided Design\Manufacturing
- Presentation Graphics

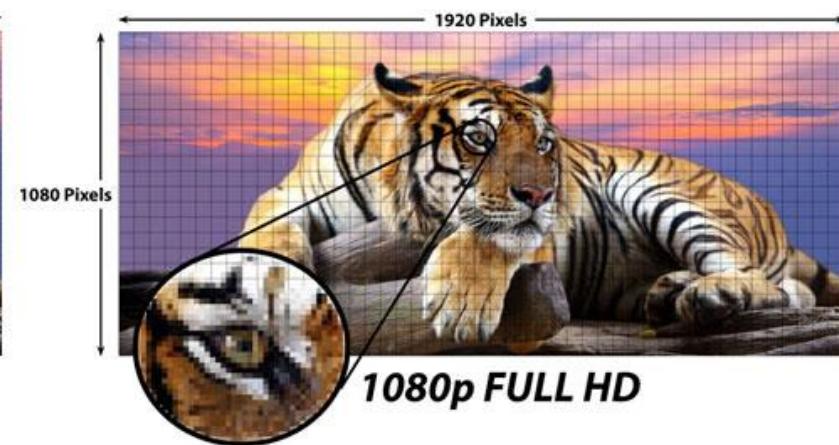
Computer Graphics

- Graphics created using computers and the representation of image data by a computer specifically with help from specialized :
 - Hardware: Graphics Cards, Cameras, Motion sensors, etc...
 - Software: Adobe Photoshop, Unity, Blender, etc...



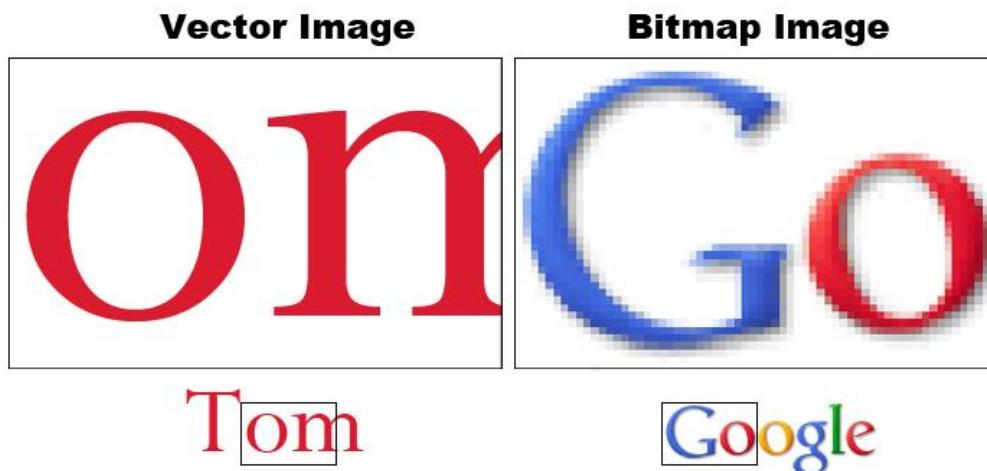
Graphics Terminology

- Pixels:
 - Smallest element in an image.
 - Square shape.
- Image Dimensions:
 - Is measured by the Width x Height of a digital image
 - E.g. 1920 x 1080 (Full High Definition)



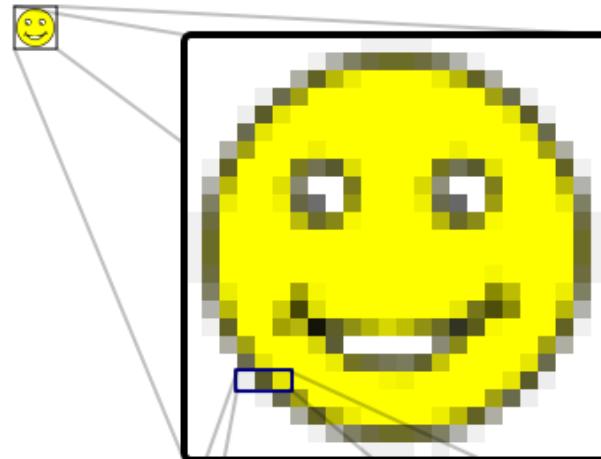
Graphic Types

- Bitmap Graphics (Raster graphics)
 - Painting pixels on the screen with a pointing device like mouse, stylus(for artist),etc.
 - Capturing an image with a digital camera.
- Vector Graphics (Object Oriented Graphics)
 - Pointer movements translated into lines and patterns on screen using mathematical formulas

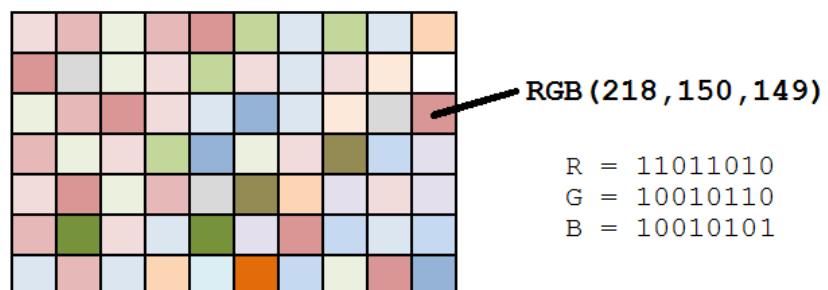


Bitmap/Raster Graphics

- Is a rectangular grid of pixels, with each pixel's color being specified by a number of bits
 - File Formats: JPG, BMP, PNG, GIF
- Painting Software's:
 - MS Paint, Adobe Photoshop, GIMP, etc...
- Factors determining image quality:
 - Color Depth
 - Resolution



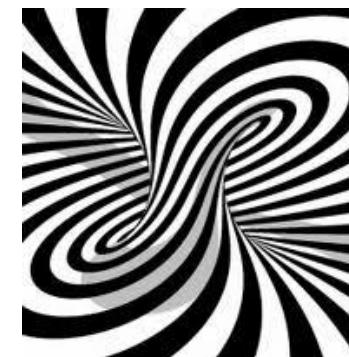
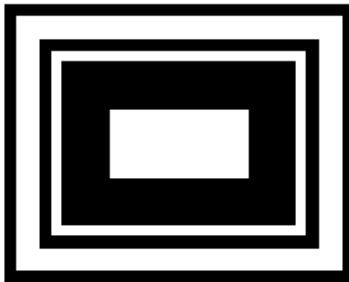
R 93%	R 35%	R 90%
G 93%	G 35%	G 90%
B 93%	B 16%	B 0%



Color Depth

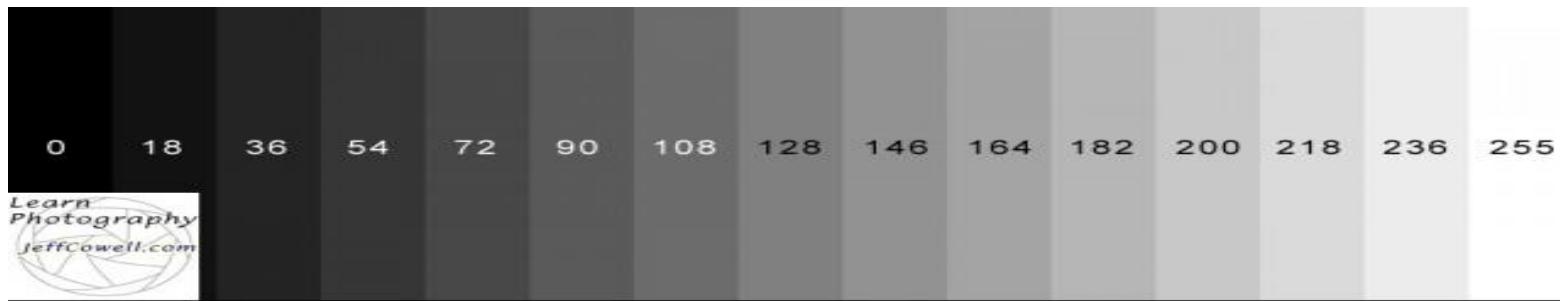


- Color depth: or bit depth:
 - Is the number of bits devoted to each pixel
- Simple bit mapped (monochrome)
 - Each pixel represented by 1 bit.
 - Can be 0 or 1 → e.g. Black and White
- Calculate the file size of a simple bitmap image with dimensions 250 x 200
 - Total Number of pixels in the image = $250 * 200 = 50,000$ pixels
 - File size = $50,000$ pixels * 1 bit/pixel = 50,000 bits



Color Depth

- Gray-scale graphics
 - Uses 8 bits per pixel
 - E.g. Allows up to 256 different shades of gray
- Calculate the file size of a gray-scale image with dimensions 250 x 200
 - Total Number of pixels in the image = $250 * 200 = 50,000$ pixels
 - File size = $50,000$ pixels * 8 bit/pixel = 400,000 bits $\sim 50,000$ bytes



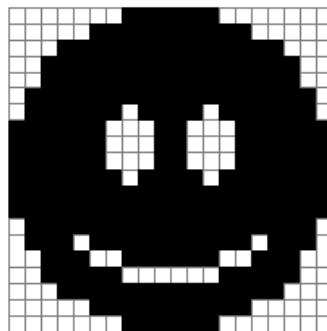
Color Depth

- Colored Graphics
 - Modern PCs uses 24-bit (True Color) or 30 to 48 bits (Deep Color) to display millions of colors at a time; photorealistic color.
 - E.g. RGB: (Red, Green, Blue)
- Calculate the file size of a 24-bit colored image with dimensions 250 x 200

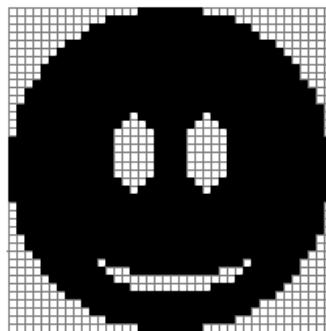


Resolution

- Is a measurement of the pixel density of an image.
 - Usually measured in pixels per inch **ppi** or dots per inch **dpi**.
- For Excellent print quality 300 dpi or more
- For Excellent web quality 72 dpi



Canvas Size: 20 x 20 px
Resolution: 9 DPI



40 x 40 px
18 DPI



200 x 200 px
90 DPI

Resolution



1600 pixels



800 pixels



400 pixels



200 pixels



100 pixels



50 pixels



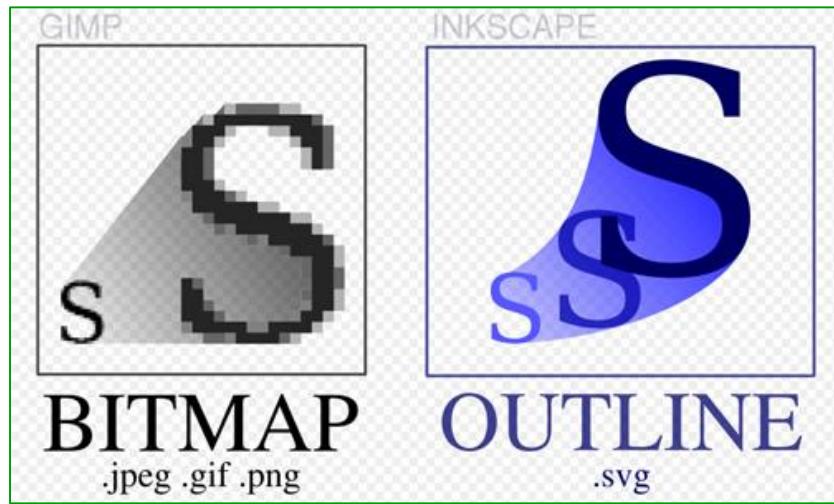
25 pixels



12 pixels

Object Oriented Graphics (Vector graphics)

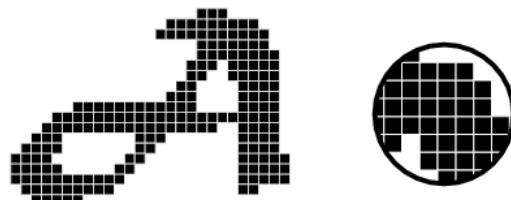
- Vector-based graphics are scalable graphics that are built using mathematical formulas.
- The advantage of vector-based graphics is that they can be resized without losing image quality.
- Drawing Software's: Adobe Illustrator or Inkscape
 - File Format: SVG



Bitmap Vs Vector

Bitmap

- Stores as dots
- More memory
- Texture, shading and finer details
- Good for Paintings/ Photographs



Vector (Obj Oriented)

- Stores as objects
- Less memory
- Lines cleaner, Shapes smoother
- Good for graphs/ charts, Logos, Drawings , 3-D graphics

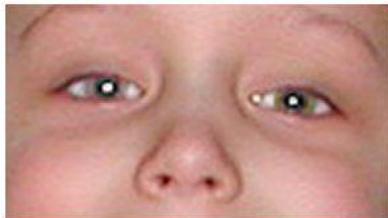


Image Processing

- A field in computer science that studies the use of computer algorithms to perform image processing on digital images.
- Filtering and cleaning
 - Eliminate red eye and facial blemishes
- Far more powerful than photo retouching
 - Can distort and combine photos as in tabloids
 - Can create fabricated images (which look like real)



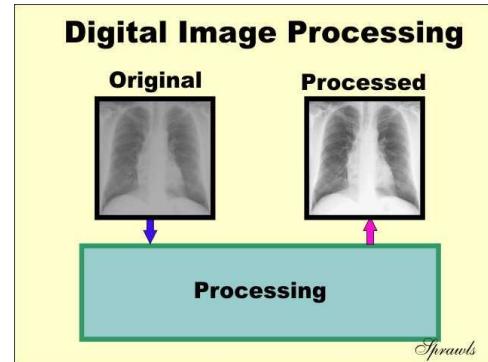
BEFORE



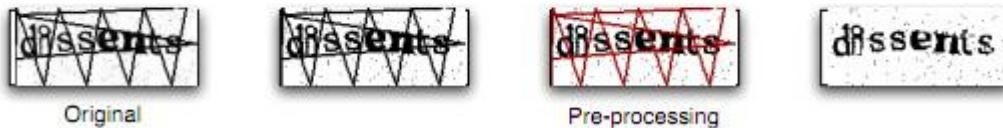
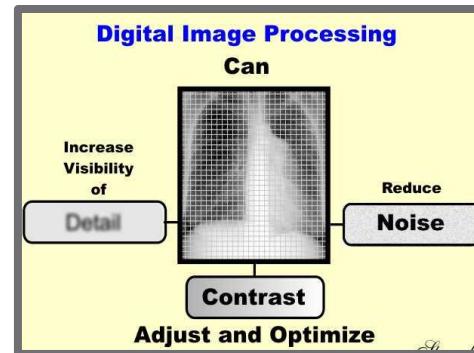
AFTER



Image Processing



- Medical field help doctors clean x-ray images
- Images from Moon and Mars missions are analyzed for detecting presence of any life-sustaining resources, and other natural resources.
- Natural Language Processing
 - Cleaning Captcha Phrases

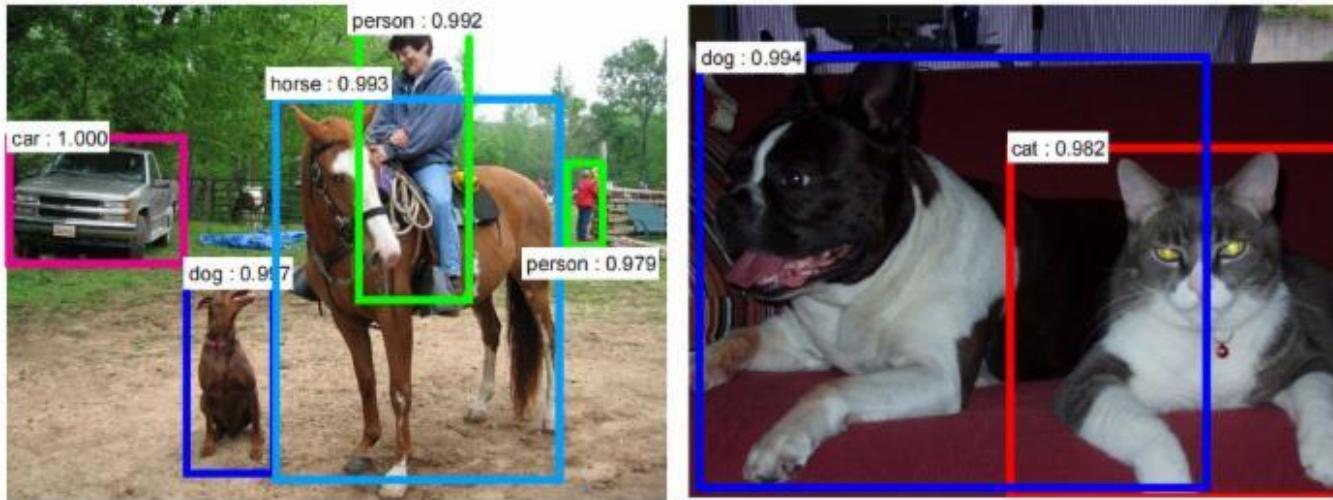


Computer vision

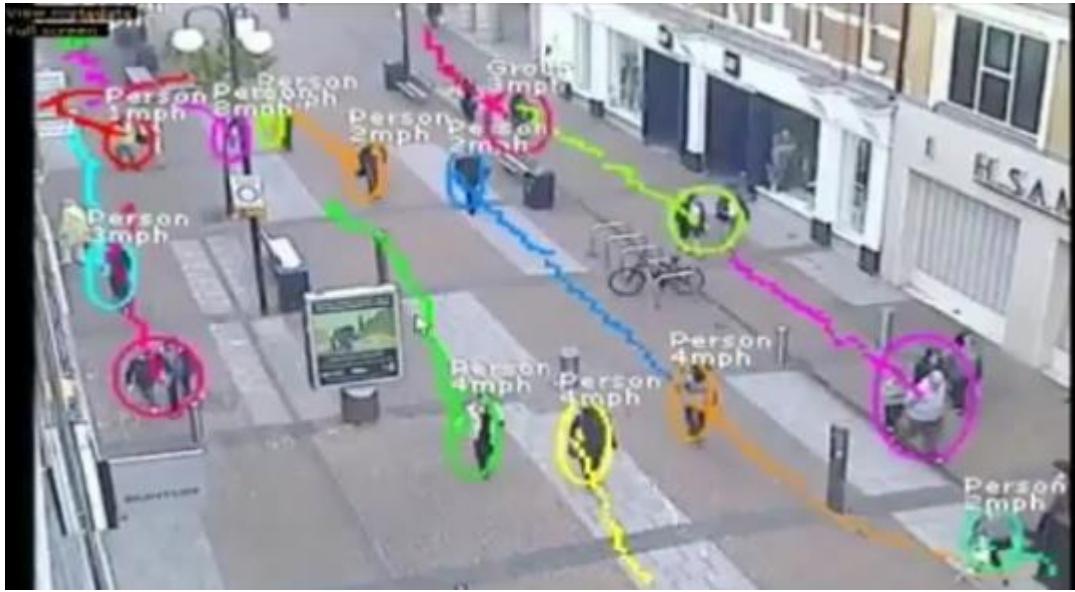
- A field that includes methods for acquiring, processing, analyzing, and understanding images
- Some of the research areas in computer vision :
 - Object detection
 - Tracking
 - Action recognition
 - Facial Recognition



Object Detection



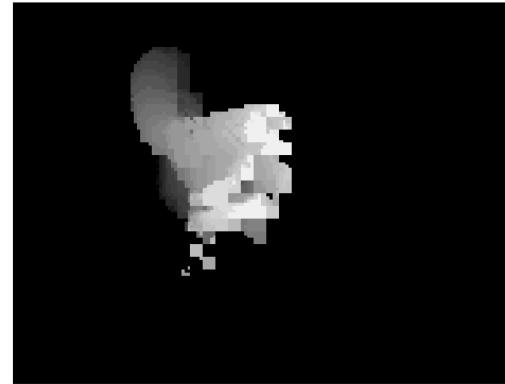
Tracking



Action Recognition [YouTube Link](#)



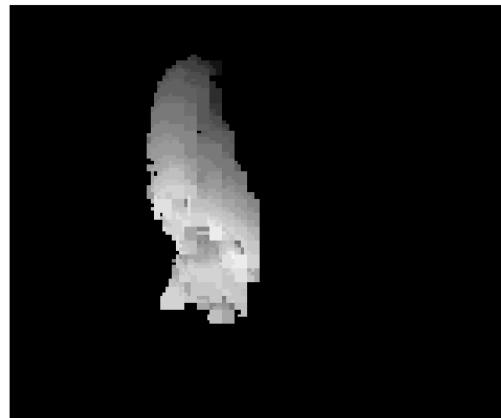
sit-down



sit-down MHI



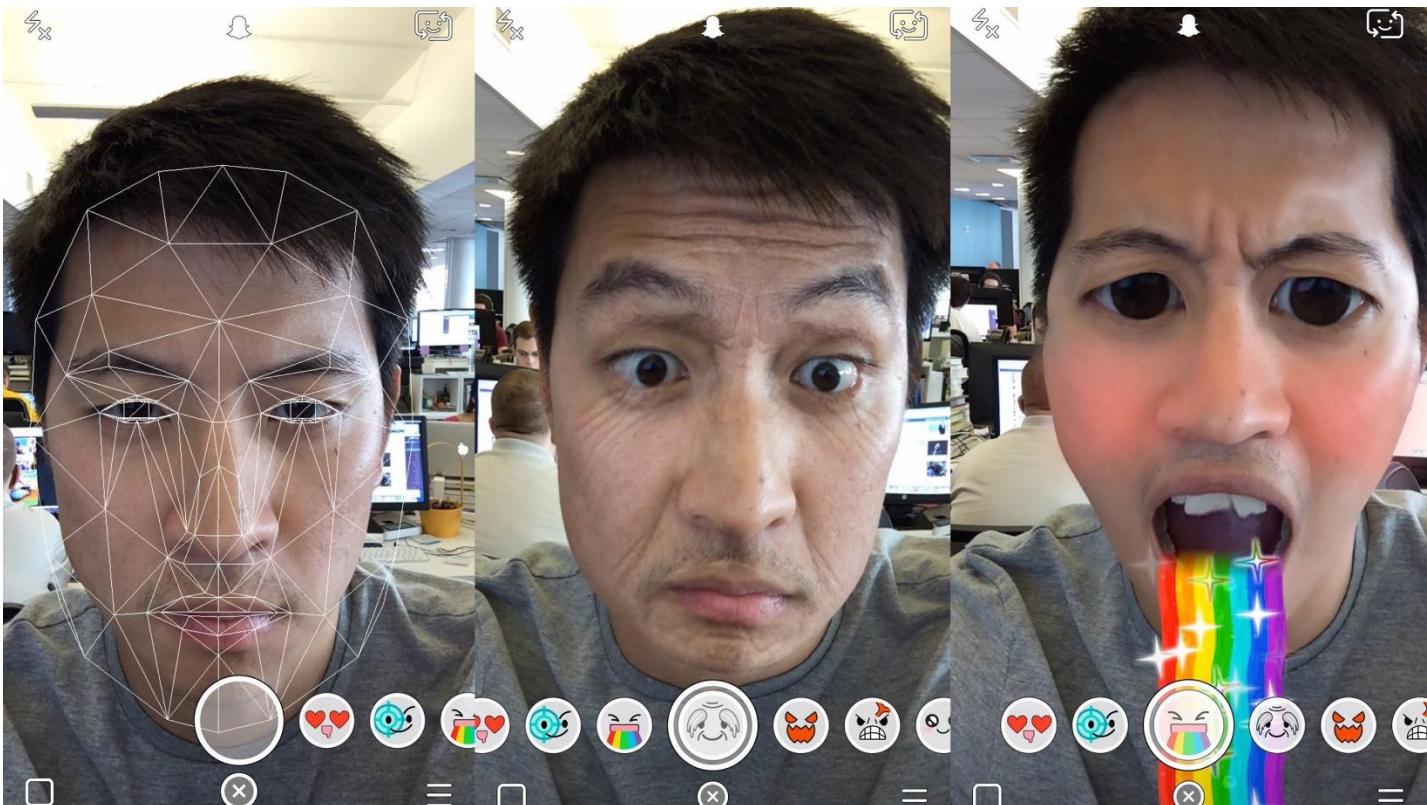
crouch-down



crouch-down MHI

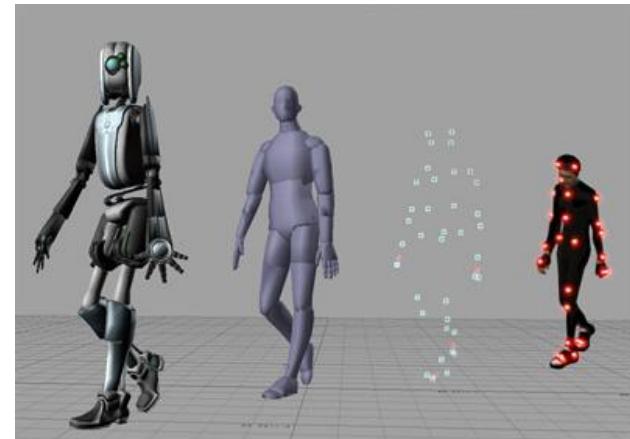
Facial Recognition

- Snapchat Filters



3D modeling Software

- Is the process of developing a mathematical representation of any surface of an object in three dimensions via specialized software.
- Ability to rotate it and view from different angles
- Can create walk through 3D environment that exists only in memory
- Software Tools:
 - Blender, 3D Max, AutoCad, Sweet Home 3D



3D modeling

- Animation Movies



3D modeling

- The Hobbit movie motion capture ([YouTube](#))



3D modeling

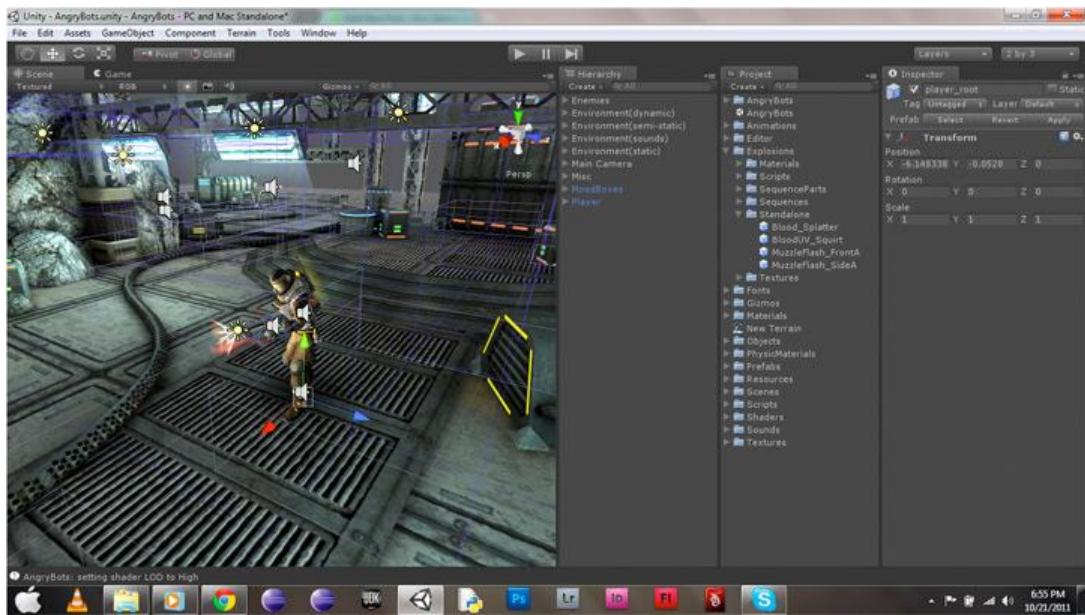
- 3D home design





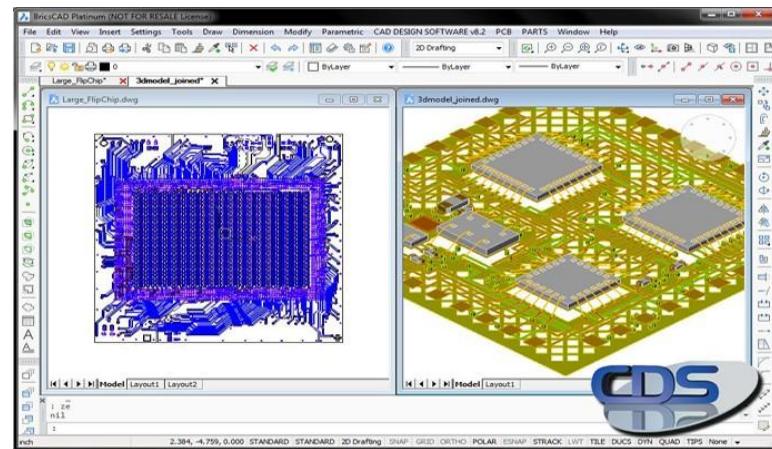
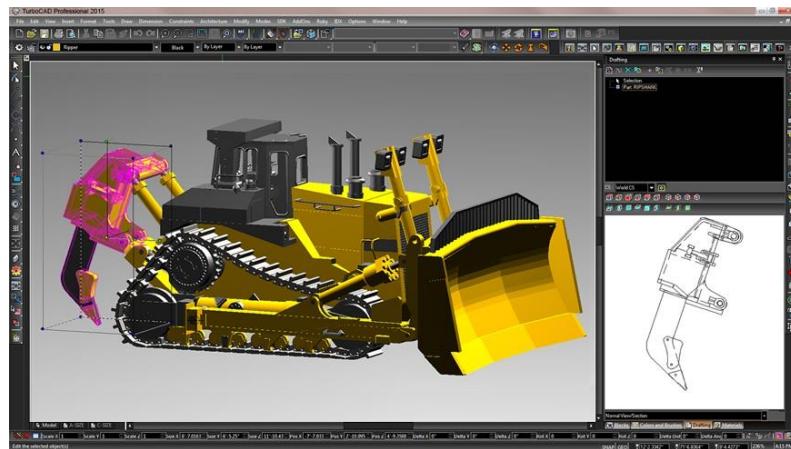
3D modeling

- [Dorms Nightmare GamePlay](#); Game Created By Walid Abu Ali& Hamad Mubarak
- [3D Animation Showreel](#), By Walid Abu Ali - BS IT Multimedia
- Game Engines: Unity 3D or Unreal 4



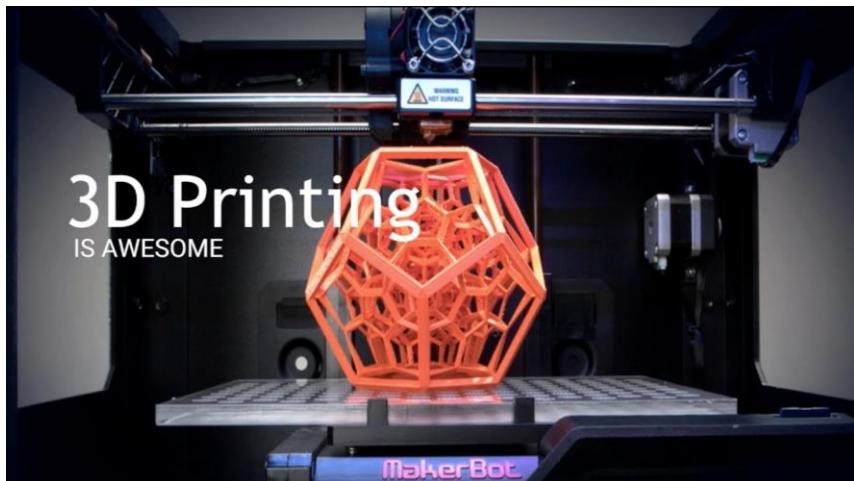
CAD- Computer Aided Design

- CAD is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design.
 - Creates designs on screen
 - Design computer chips PCB (Printed Circuit Boards) or building electric schematics
 - Can test product prototypes
 - Cheaper and faster than design-by-hand



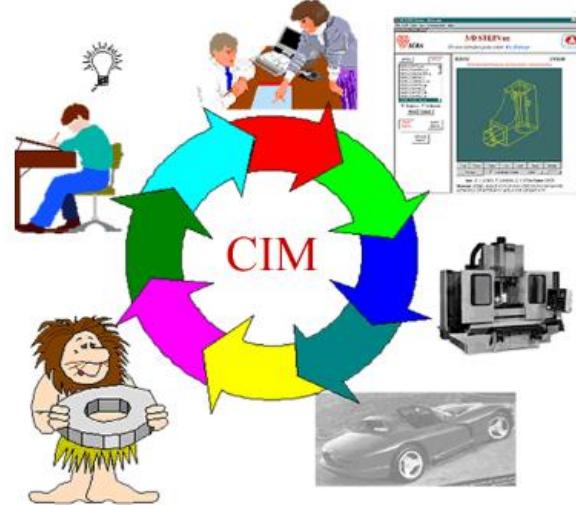
CAM- Computer Aided Manufacturing

- CAM is the use of software to control machine tools to help manufacture products.
- Translates the design of a product created on computer with CAD tools, into manufacturing instructions for numerical controlled machine tools.



CIM- Computer Integrated Manufacturing

- Combination of CAD/ CAM
 - Is the manufacturing approach of using computers to control the entire production process.
- Major step towards fully automated factory
 - Increased productivity
 - Enhanced flexibility
 - Improved quality



Presentation Graphics

- Used for Lectures, Sales demos, seminars etc.
- Slide shows on comp screen + LCD projectors
- Includes images, animation and video clips
- Example:
 - MS PowerPoint
 - [Prezi](#)
 - Emaze



Presentation Tips

- Eye Contact
- Don't read from the slides
- Don't condenses your slide with too much text
- Slow down
- Clear voice
- Understand your audience
- Have fun and be entertaining
- Choose correct design theme colors

Graphics, Digital Media and Multimedia

Chapter 6 Multimedia Part 2



Topics

- Multimedia Definition
- Animation
- Video
- Audio
- Hypertext and Hypermedia
- Interactive Multimedia

Multimedia

- Multimedia means that computer information can be represented through audio, video, and animation in addition to traditional media (i.e., text, graphics/drawings, images).



Animation



- Is a method in which pictures are manipulated to appear as moving images. The effect of animation is achieved by a rapid succession of sequential images that minimally differ from each other.
- A **frame** is one of the many still images which compose the complete *moving picture*, Each frame has a drawn picture.
- Frame Rate:
 - Is the frequency (rate) at which consecutive images called frames appear on a display.
 - Usually (> 24 frames/sec → standard 30)
- A 20 second 30fps animation, how many frames?

Computer Animation

- Computer Animation used in television and movies to create effects that would be difficult or impossible to achieve without computers
- Most animations are made with computer-generated imagery (CGI)
- https://en.wikipedia.org/wiki/Computer-generated_imagery
- [Tweening](#):
 - It is the process of generating intermediate frames between two images, called key frames, to give the appearance that the first image evolves smoothly into the second image



Video



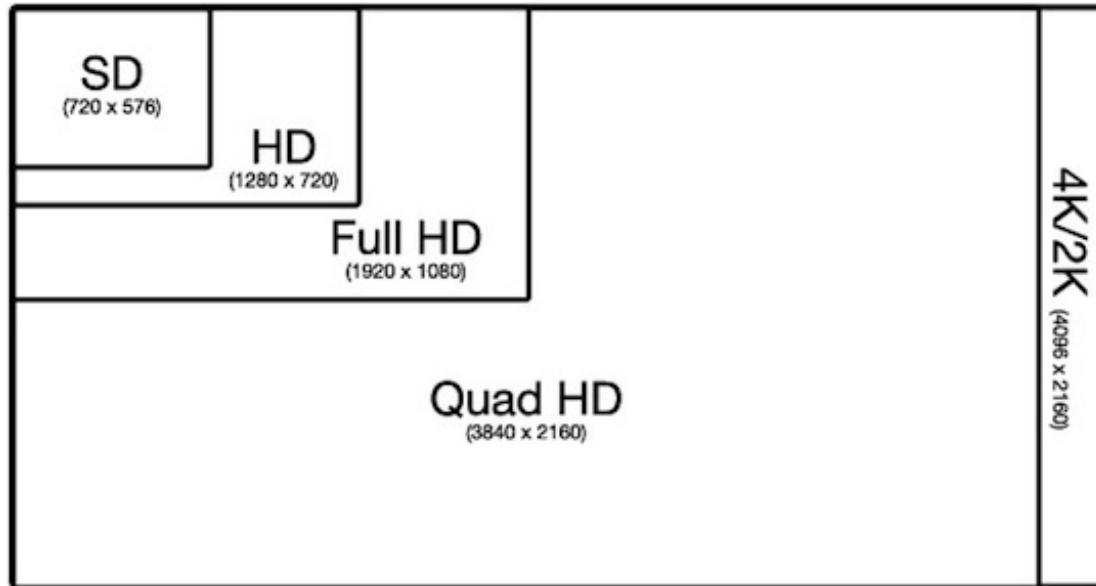
- Is an electronic medium for the recording, copying, playback, broadcasting, and display of moving visual media.
- Digital video is a series of bitmap images that, when played back, create the illusion of movement.





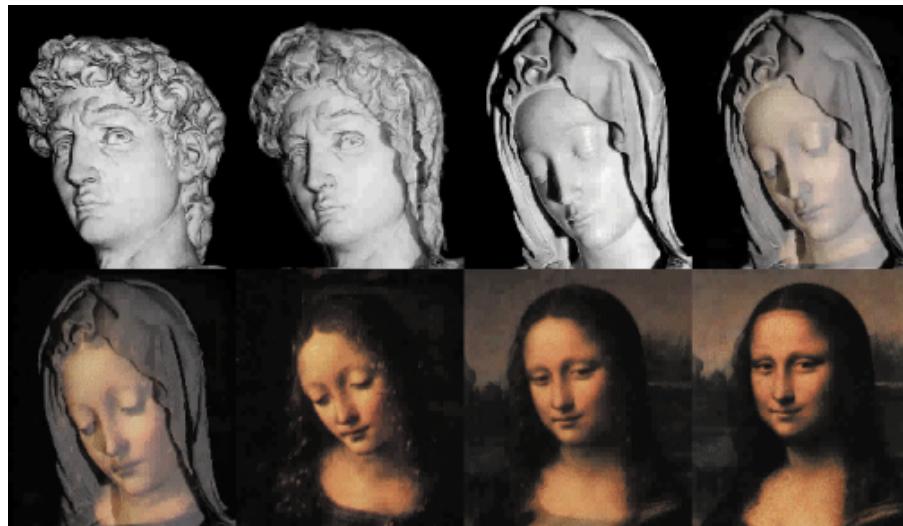
Video

- The quality and overall file size of digital video is determined by its frame size, bit depth & frames per second (fps).
- Frame size: Width x Height
 - E.g. High-definition video: 1280x720



Special Effects

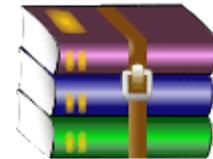
- Morphing
 - is a special effect in motion pictures and animations that changes (or morphs) one image or shape into another through a seamless transition
 - Uses a series of frames to create a smooth movement (YouTube Link [Chapter 6 part 2.2](#))



Data Compression

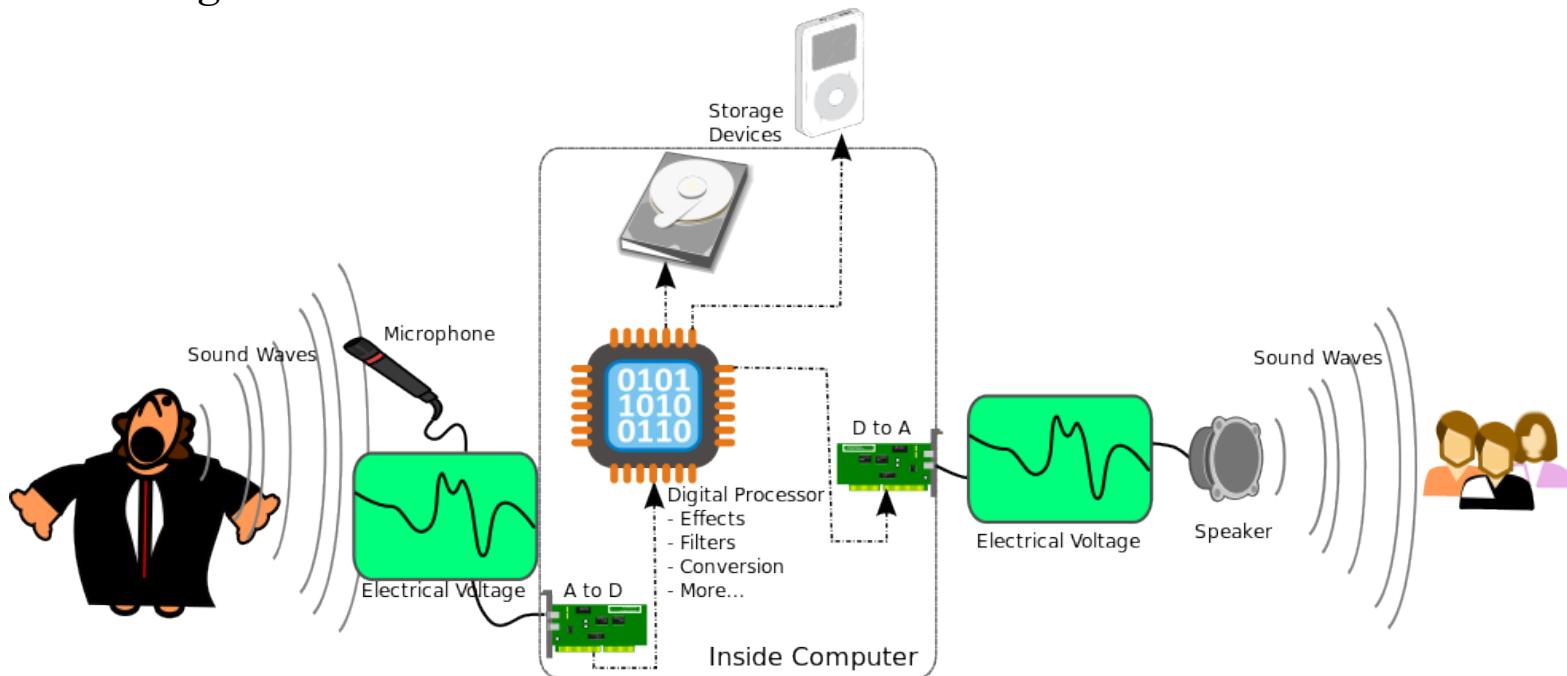


- Encoding information using fewer bits than the original representation. Compression can be either lossy or lossless.
- Lossless : recover the original representation
 - E.g. WinZip, WinRar,
 - Not good enough for Multimedia Data!
- Lossy: recover a representation similar to the original one
 - Throw away nonessential (perceptually less relevant) parts of the data stream
 - Examples: MP3, JPEG, MPEG Video
 - high compression ratios
 - More practical use



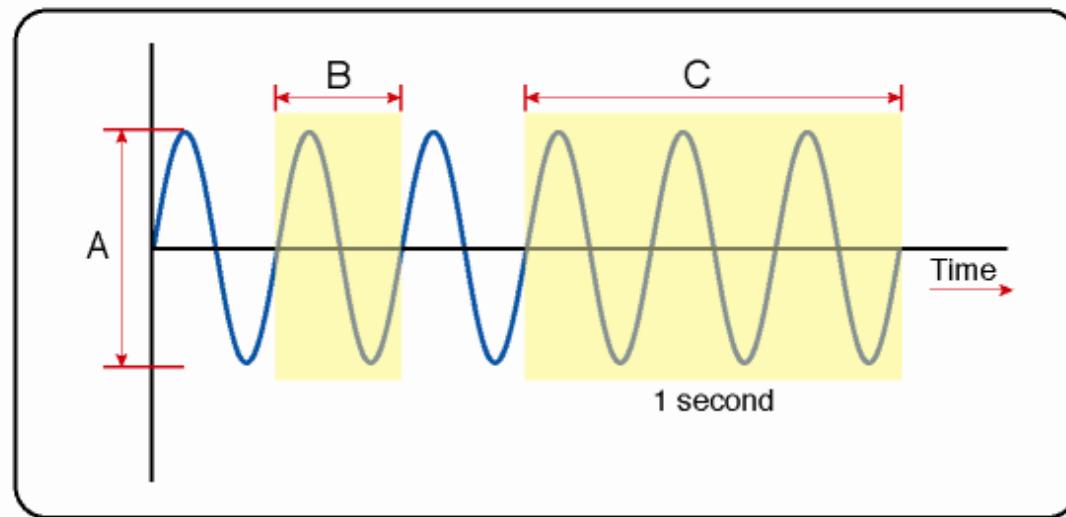
Digital Audio

- Using a microphone to capture sound and convert it into an analog form (Electric Wave)
- Electric wave is converted into digital data by Audio digitizer



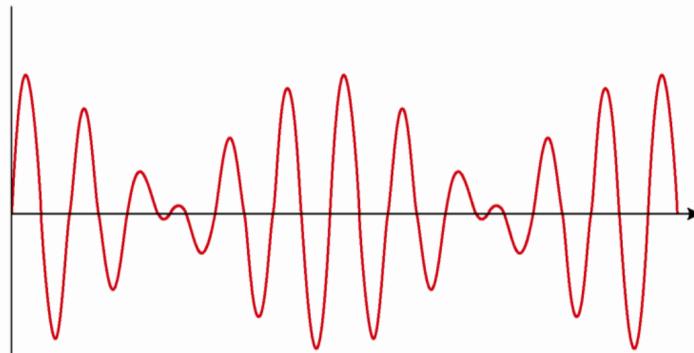
Visualizing a Sound Wave

- Sine waves visualize the repetitive oscillations of sound vibrations.
 - A. Amplitude
 - B. Wavelength
 - C. Frequency

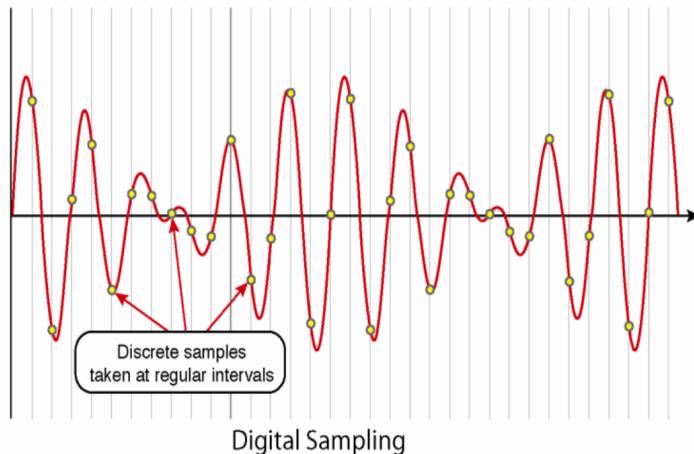


Digital Sampling

- An analog audio signal is continuous without interruption (top)

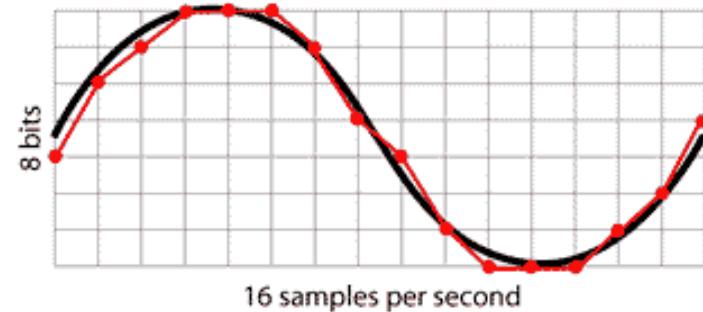
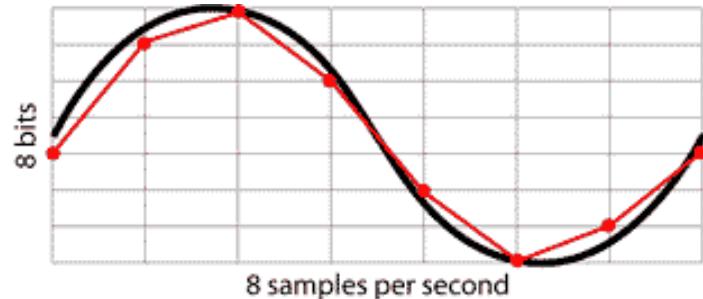


- A digital audio signal is sampled at regular intervals (bottom)



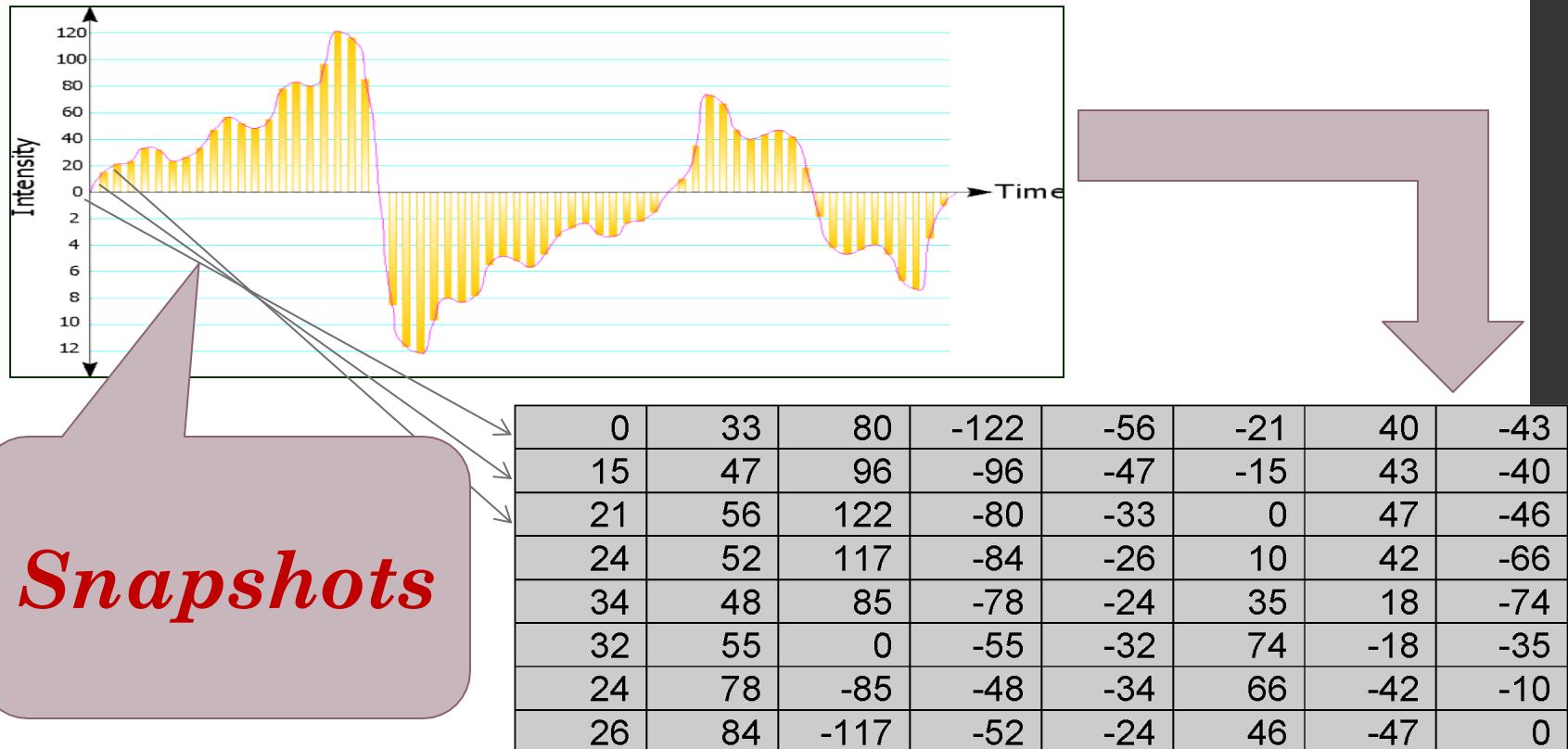
Audio Quality

- What determines the quality of digital audio?
 - The sampling Rate:
 - How often the samples are taken per second
 - Frequency measured in Hertz (Hz)
 - The sample size (Bit Depth)
 - How many bits are used to represent a sample
 - Bit depth measured in bits
 - The number of channels
 - Mono or Stereo



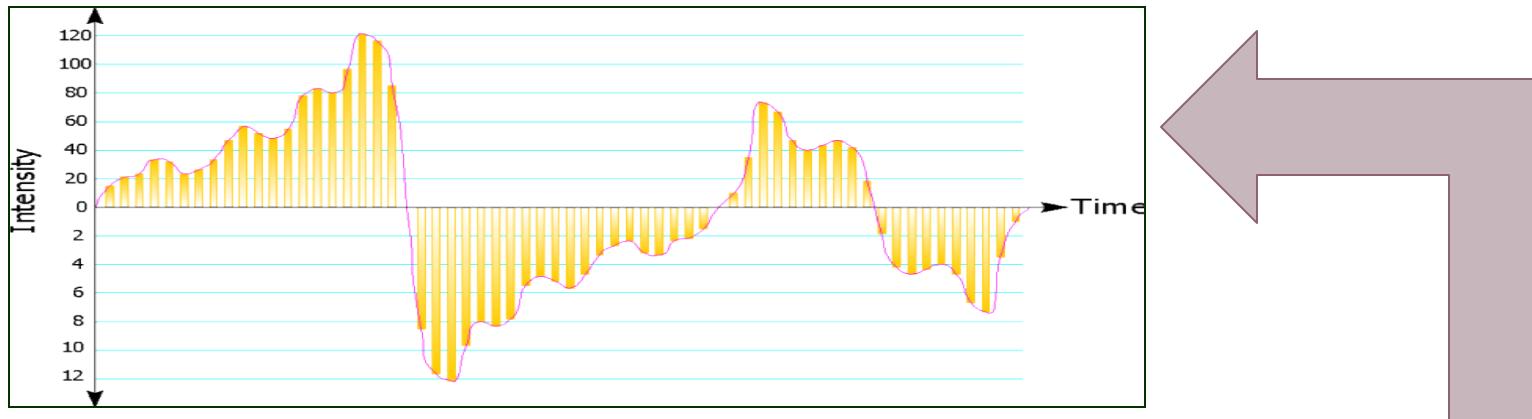
Audio Digitizer

- Captures sound(Analog) and stores it as a data file



Playing back digital audio

- Digital data converted to analog wave and played



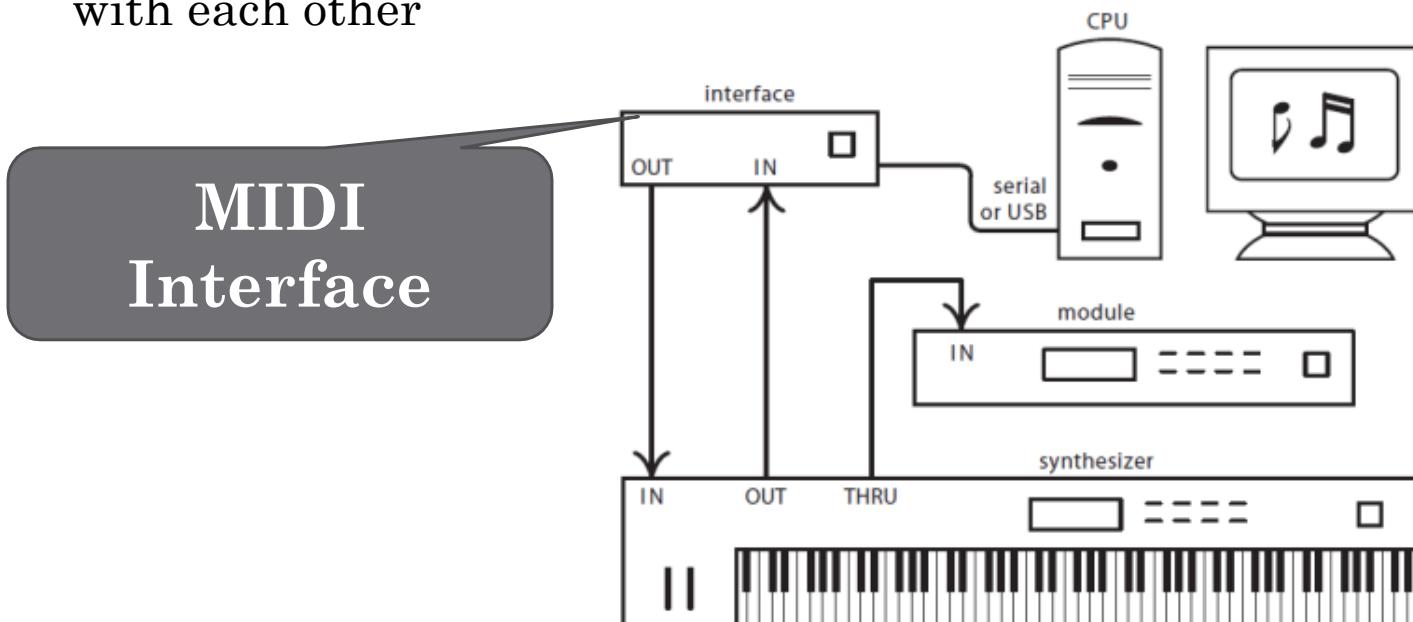
0	33	80	-122	-56	-21	40	-43
15	47	96	-96	-47	-15	43	-40
21	56	122	-80	-33	0	47	-46
24	52	117	-84	-26	10	42	-66
34	48	85	-78	-24	35	18	-74
32	55	0	-55	-32	74	-18	-35
24	78	-85	-48	-34	66	-42	-10
26	84	-117	-52	-24	46	-47	0

Audio Formats

Format	Description
WAV, AIFF	Uncompressed audio for Windows and the Mac OS
MP3	1/10 the size of the original
WMA	An alternative to MP3 for Windows.
AAC	Apple's alternative to MP3
OGG	Similar to MP3 → open source and freely available

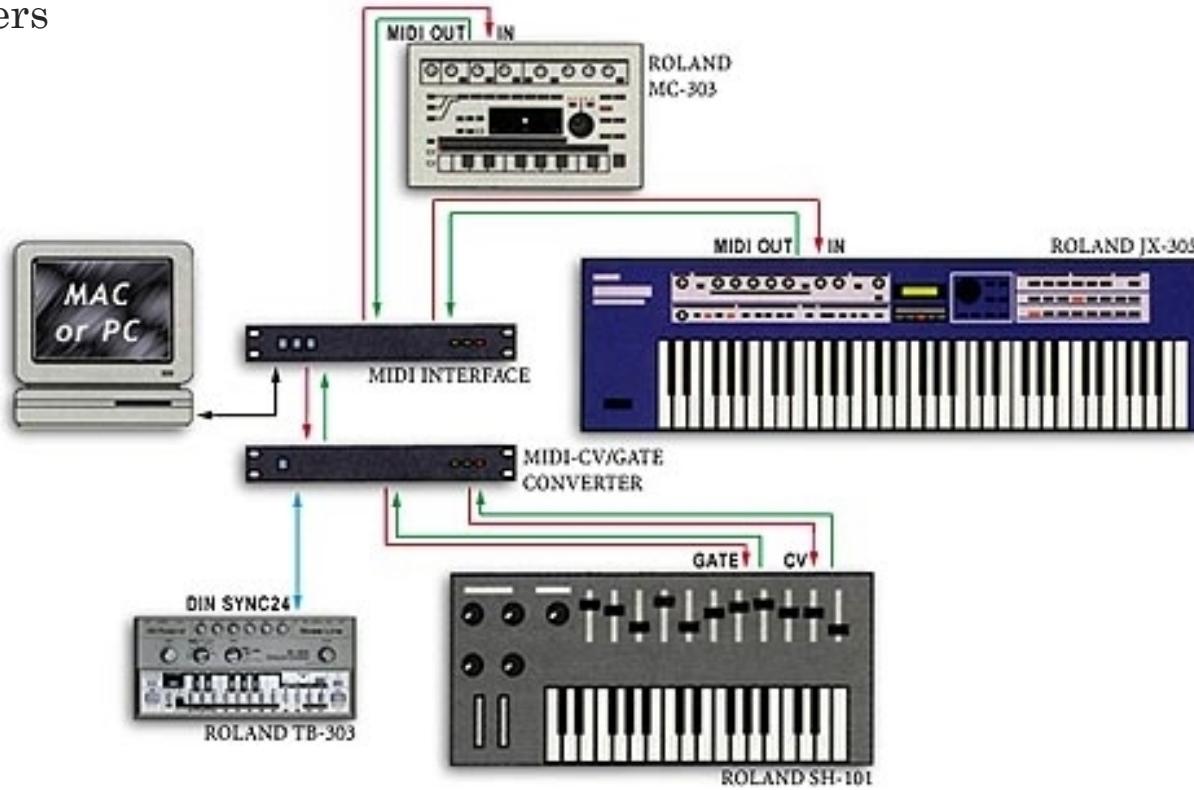
MIDI- Musical Instrument Digital Interface

- A standard for digitally representing and transmitting sounds that was first developed in the 1980s.
- Enables electronic musical instruments such as keyboard controllers, computers, synthesizers, sound cards, samplers, drum machines, and other electronic equipment to communicate, control, and synchronize with each other



Computers and Music

- MIDI commands can be interpreted by
 - Music Synthesizers
 - Samplers

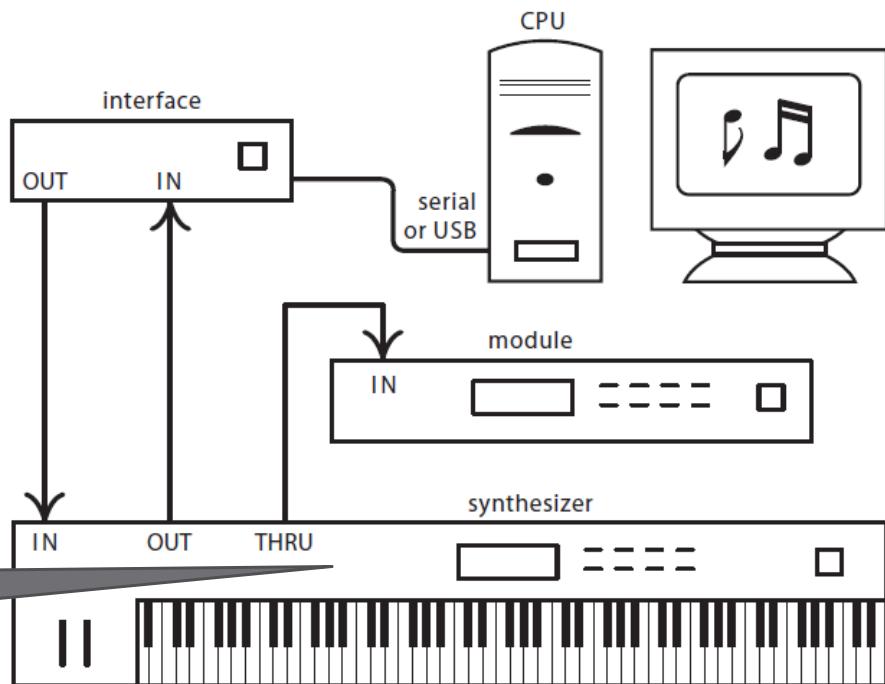


Synthesizer

- An electronic instrument that synthesize, create, produce, etc. sounds using mathematical formulas

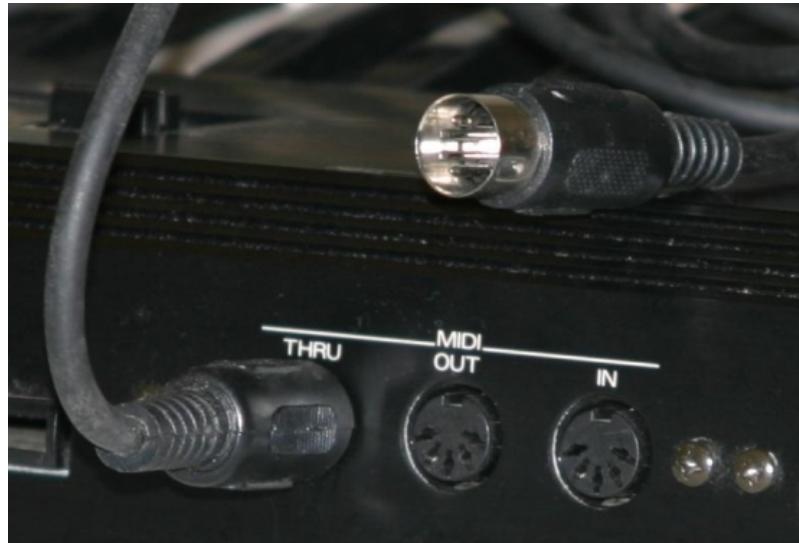


Synthesizer



Samplers

- An electronic instrument similar in some respects to a synthesizer but, instead of generating sounds, it uses recordings (or "samples") of sounds that are loaded or recorded into it by the user



Computers and Music

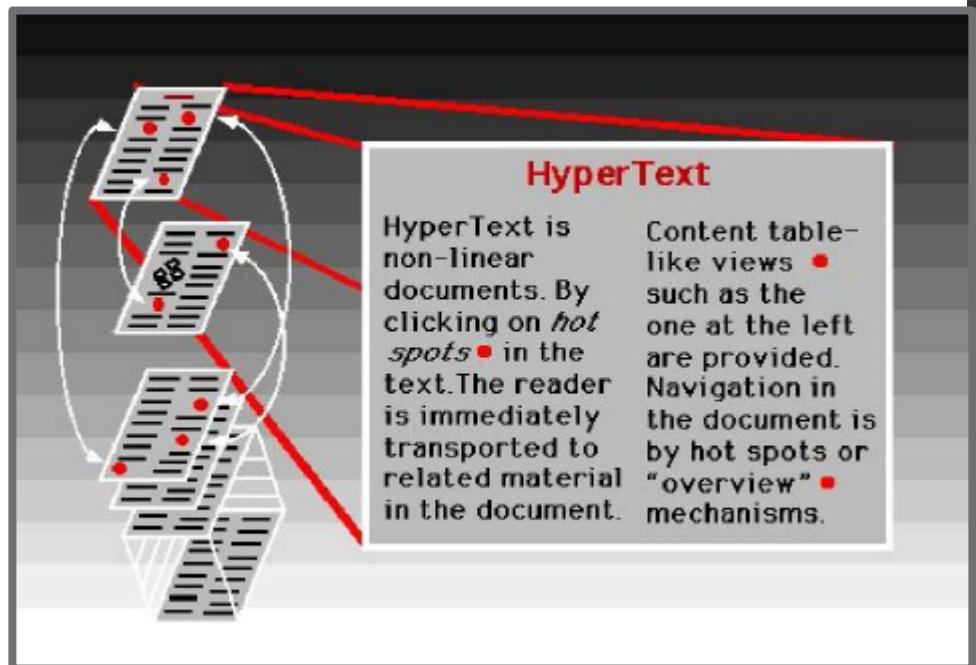
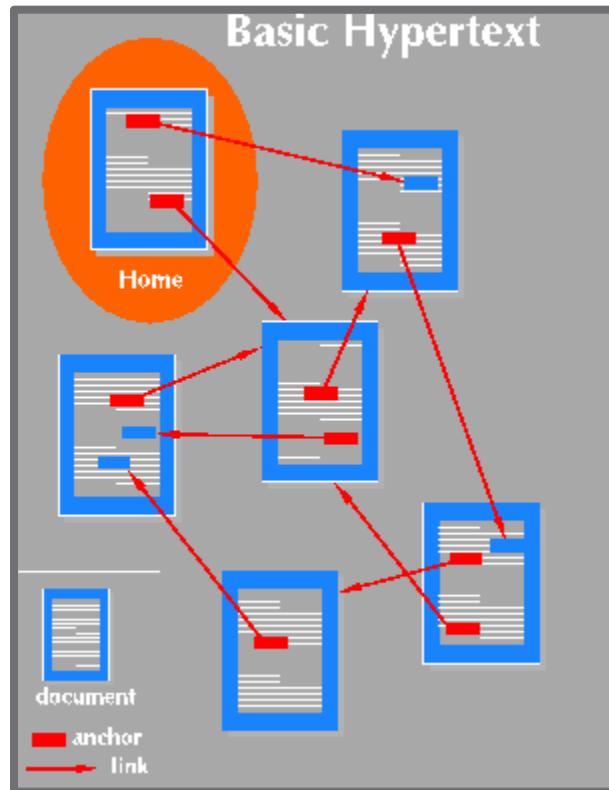
- Computer interprets the MIDI commands using sequencing software
- **Sequencing Software** is an application software that can record, edit, or play back music, by handling note and performance information in several forms, typically MIDI.



A growing number of musicians depend on sequencers to play along with live musicians in performance

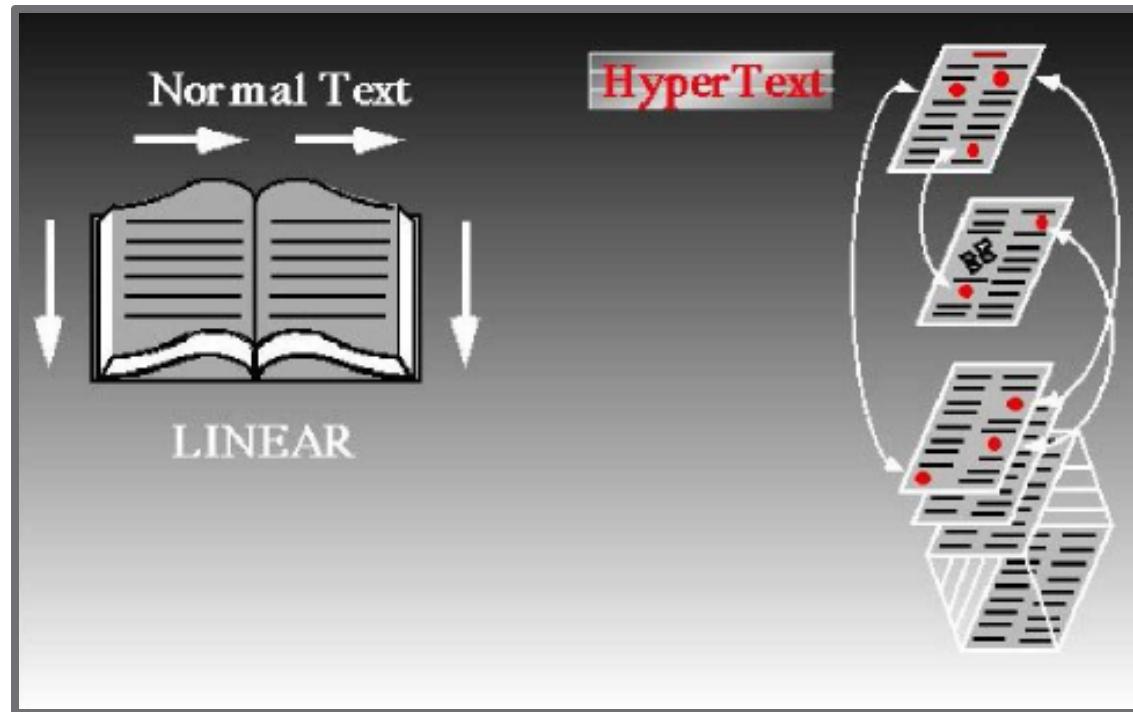
HyperText

- Text which contains links to other texts
- Information linked in non-sequential ways.



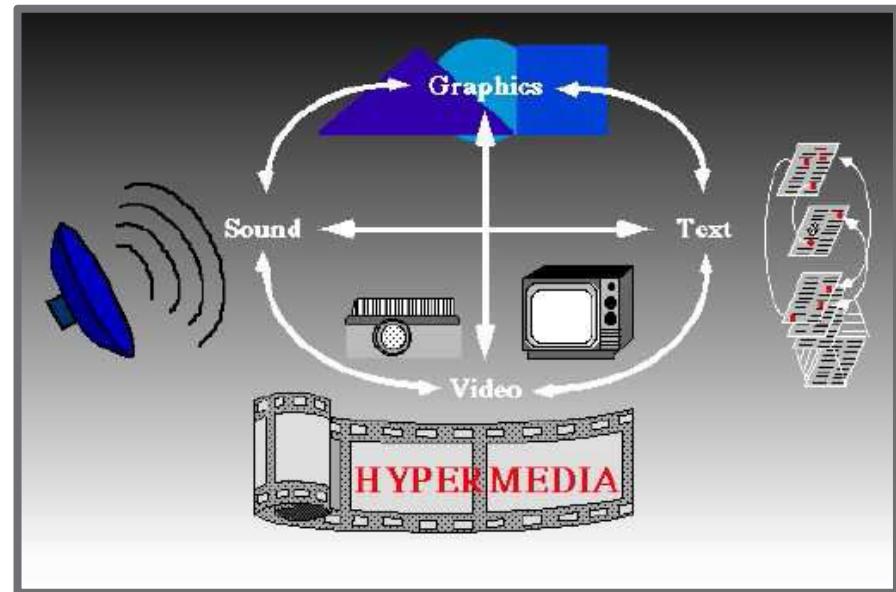
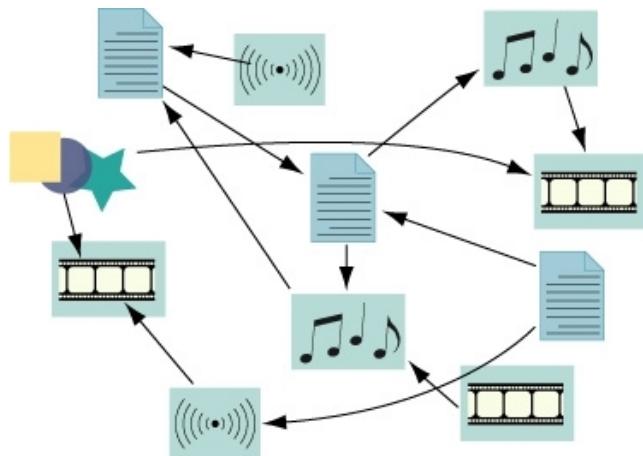
HyperText

- Traversal through pages of hypertext is therefore usually non-linear.



HyperMedia

- Hypermedia is not constrained to be text-based, it can include other media
- Hypermedia: combines
 - text, numbers
 - graphics, animation
 - sound, music



Interactive Multimedia

- Is the integration of digital media including combinations of electronic text, graphics, moving images, and sound, into a structured digital computerized environment that allows people to interact with the data for appropriate purposes.



Interactive Multimedia

- Siftable: YouTube
 - Developed as a platform for hands-on interactions with digital information and media.
- The Funky Forest
 - Children manage resources to influence the environment around them using their bodies



Interactive Multimedia

- Interactive Ear
 - Provides visual guide to Hearing
- We Choose The Moon
 - www.wechoosethemoon.org/
- The Great Animal Orchestra
 - <http://www.legrandorchestredesanimaux.com/en>



Chapter 8

Networking and Digital Communication

Part 1

Topics

- Networking Fundamentals
- Network Types
- Network Components
- Networking Software Protocols
- Connection Types
- Wireless communication

Network Fundamentals

- A computer network is any system of two or more computers that are linked together.
 - Each computer or networked peripherals on the network is called a Node
- Three essential components of every computer network system:
 - Hardware
 - Software
 - People



Network Types



Network Types

- **PAN (Personal Area Network)**
 - A network used for communication between devices close to one person.
 - E.g. Connecting a headphone to Smartphones and tablets using wireless technologies such as Bluetooth and Wi-Fi



- **LAN (Local Area Network)**
 - Is a network where computers are physically close to each other.
 - E.g. Computer lab or Home Network.
 - Every single node in a network has a unique address called IP Address
 - IPv4 32-bit
 - IPv6 128-bit



Network Types

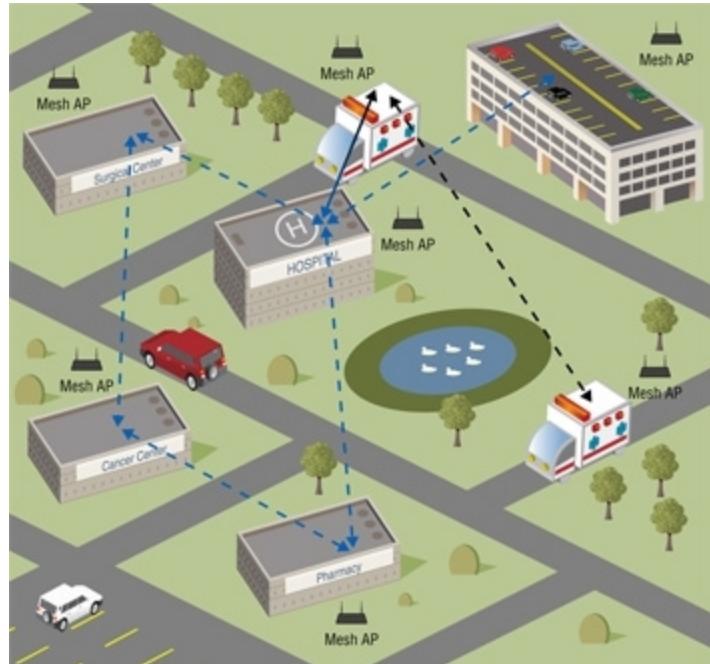
- **MAN (Metropolitan Area Network)**
 - Is a large network designed to provide a specific geographical area such as an entire city.
- **WAN (Wide Area Network)**
 - Extends over a large physical distance
 - The internet is the largest WAN
 - Each LAN site is a node on WAN



Network Types

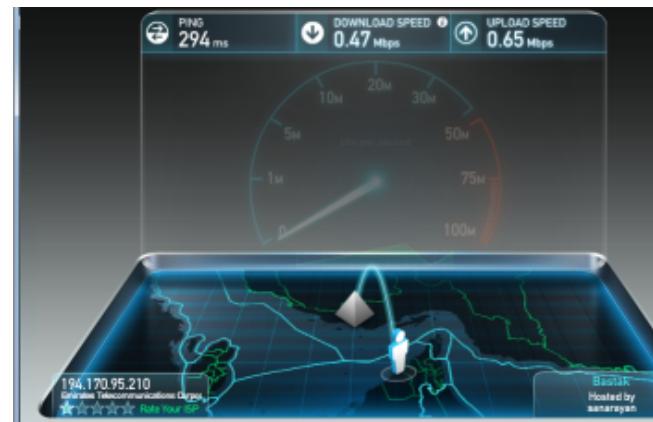
- **Mesh Networks**

- Each node captures and disseminates its own data
- Serves as a relay for other nodes
 - E.g. Emergency personnel set up and use it at fire scenes.
- Advantages:
 - Most suitable in areas where networking infrastructure is limited.
 - Help during times of disaster when traditional communications are halted.



Bandwidth (Network Speed)

- Quantity of data transmitted per sec
 - Measured in Kilo**bits**/sec, **Mbps** or **Gbps**
- Bandwidth depends on:
 - Transmission media: copper wire or fiber optic
 - 1 fiber optic cable can replace 10,000 copper telephone cables
 - Amount of traffic on the network
- **Measure your internet speed at home**
 - E.g. <http://www.speedtest.net/>



Networking Components

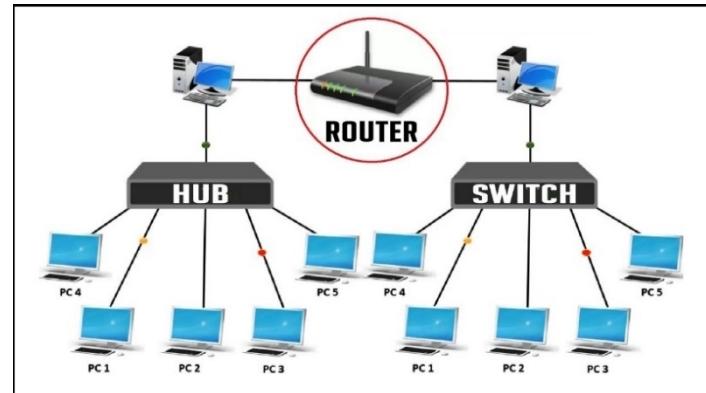
- **Switches/Hubs:**

- Allow any node on the network to communicate with any other node



- **Routers**

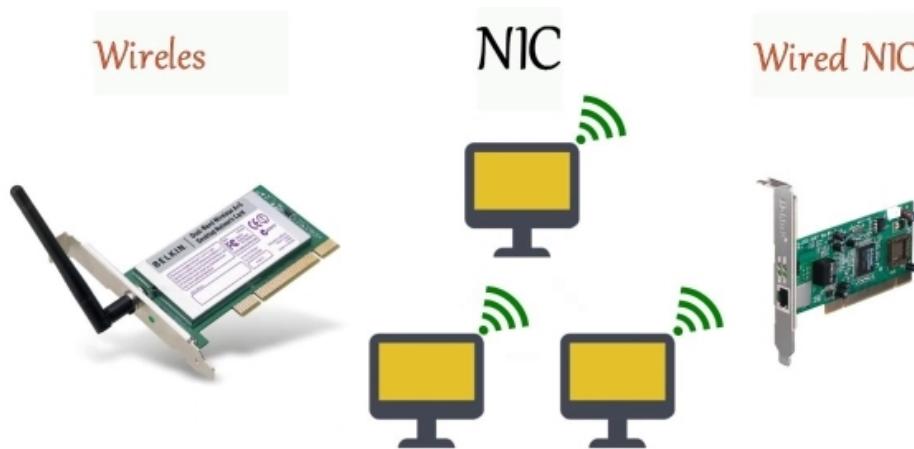
- Hardware devices or Software programs that route messages as they travel between networks
- They are used to connect two or more networks together



Networking Components

- **Network Interface Card:**

- For each node on a network to communicate with other nodes. It designed to use different types of transmission media



Networking Models

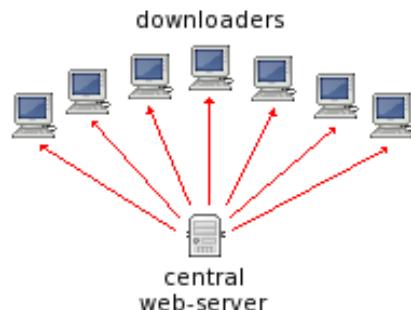
Client/server model:

- One or more computers act as dedicated servers and all the remaining computers act as clients.

Peer-to-peer model:

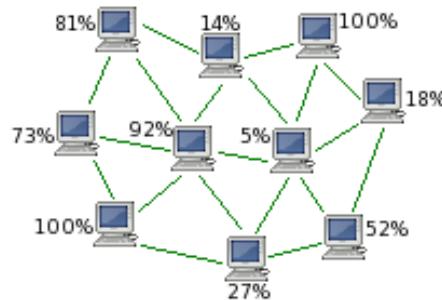
- Every computer on the network is both client and server

Traditional Centralized Downloading



- Slow
- Single point of failure
- High bandwidth usage for server

Decentralized Peer-to-Peer Downloading

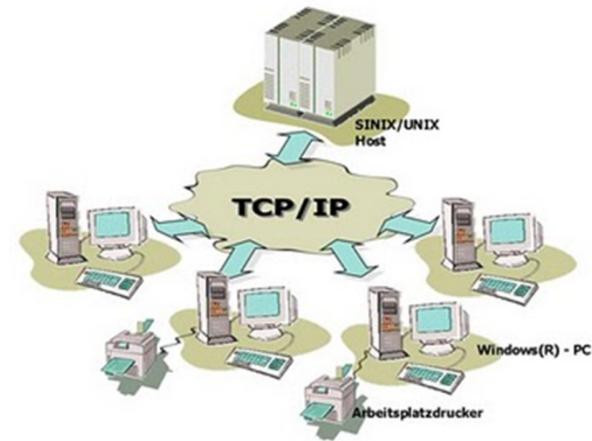


- Fast
- No single point of failure
- All downloaders are also uploaders

Networking Software

NOS (Network Operating System):

- It is a system that is available on servers and handles communication and requests from multiple clients.

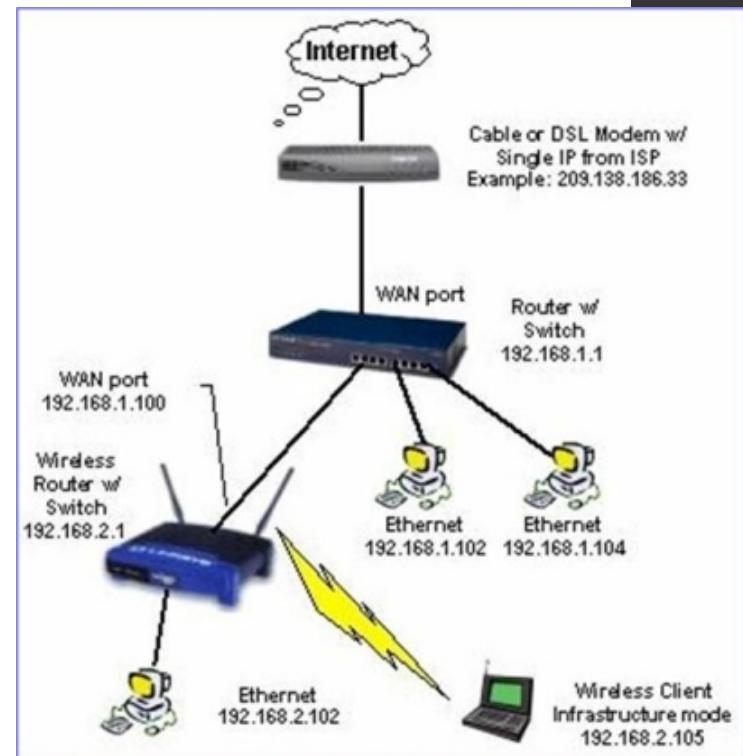


Communication Protocols:

- Is a system of rules that allow two or more entities of a communications system to transmit information via any kind of variation of a physical quantity.
- Same protocol is required for data exchange
- E.g. If one machine is “talking” at 200Kbps and the other is “listening” at 100Kbps , the message doesn’t get through

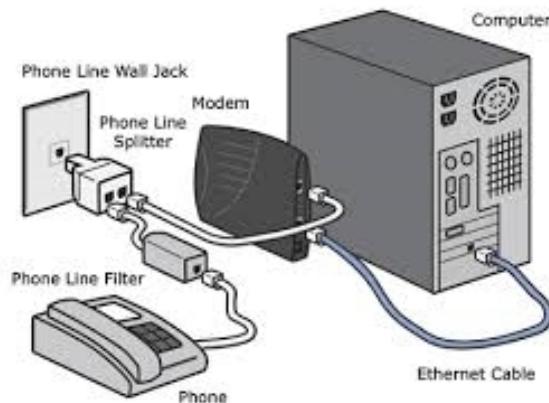
How does the internet work

- TCP/IP
 - The most famous protocol for computer networking
 - It controls the exchange of data between computers in the Internet
 - Example Protocols:
 - HTTP, FTP, DHCP, DNS, etc...
- Information transmitted over the internet is broken into smaller pieces called packets.
 - E.g. An e-mail message or an image is broken into parts of a certain size



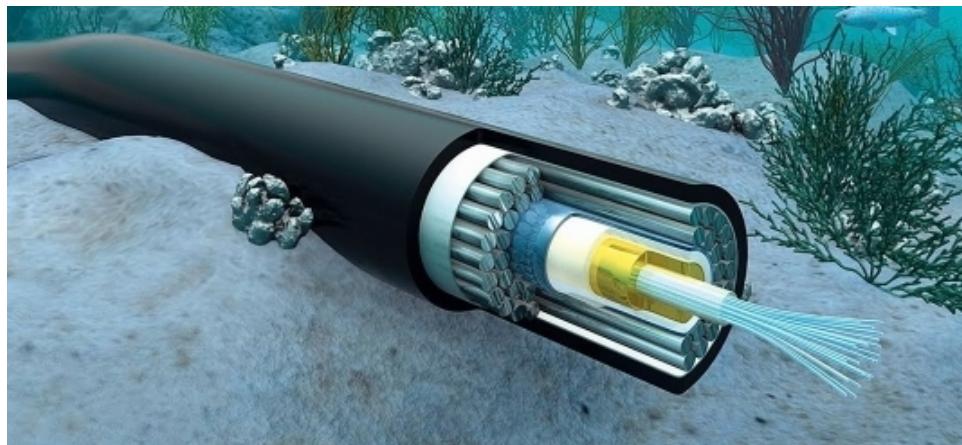
Making Connections

- Modem Connection ([Dialup sound](#))
 - Modem: modulator/ demodulator
 - Transmission thro' Telephone lines
 - Conversion at both ends
 - Speed: up to 56.6 Kbps



Making Connections

- **Broadband Connection**
 - Greater bandwidth than modems
- **Types**
 - **DSL:** (digital subscriber line) Uses standard Tel. Lines
 - **Cable modems:** Uses fast TV cables
 - **Wireless :** Uses radio waves
 - **Satellite connection:** Uses TV dishes
 - **Optical Fiber:** Sea cables



Wireless Networks

- Is a computer network that uses wireless data connections between network nodes.
- **Examples include:**
 - Wireless Local Area Networks
 - Cell Phone/Mobile Networks
 - Wireless Sensor Networks
- **Wireless Technology Standards:**
 - Wi-Fi
 - Wi-Max
 - Infrared
 - Bluetooth
 - 3G, 4G, 5G





Wireless Connections

- **Wi-Fi**
 - Fastest growing Wireless technology IEEE 802.11 standard
 - Uses radio waves to link computers to Wireless Access Point (WAP)
 - Allows Peer to peer communication
- **Is affected generally by:**
 - Objects blocking the signals
 - Antenna placement
 - Other wireless devices in the same air space
- **List of Standards & Bandwidths**



Generation	IEEE Standard	Maximum Bandwidth
Wi-Fi 6	802.11ax	600–9608 Mbit/s
Wi-Fi 5	802.11ac	433–6933 Mbit/s
Wi-Fi 4	802.11n	72–600 Mbit/s





Wireless Connections

- **Wi-Max**

- Is a family of wireless broadband communication standards based on the IEEE 802.16 set of standards
- New radio based technology
- A single tower can provide access to 25 square mile area





Wireless Connections

- **Bluetooth:**

- is a wireless technology standard for exchanging data between fixed and mobile devices over short distances
- Designed to quickly and automatically connect devices like printers, PDAs, Cameras, etc... to computers and to each other and communicates regardless of OS.
- Bluetooth uses low power, low cost transmitters and receivers with a range of 10-100 meters.

- **Wearable computing**

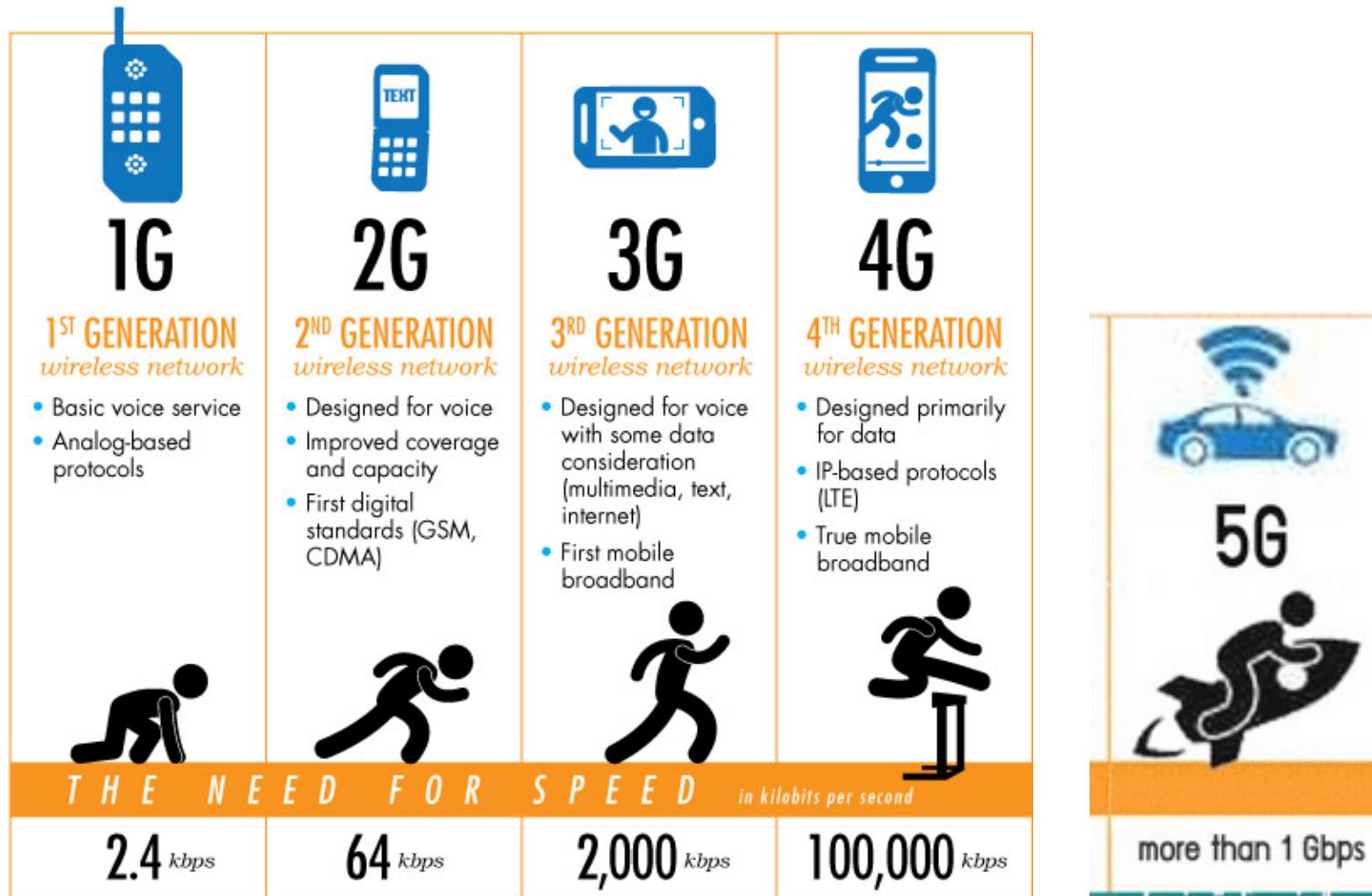




Mobile Phone Networks

- 1G**
 - Introduced in 1981, Analog voice only network
- 2G**
 - 1992, Based on many different Digital Standards; GSM, GPRS
- 3G**
 - 2001, faster networks that handle multimedia data and voice communications simultaneously
- 4G**
 - 2012, 100MB broadband speeds, LTE
- 5G**
 - 2020, much greater bandwidth than previous more than 1GB

Mobile Phone Networks



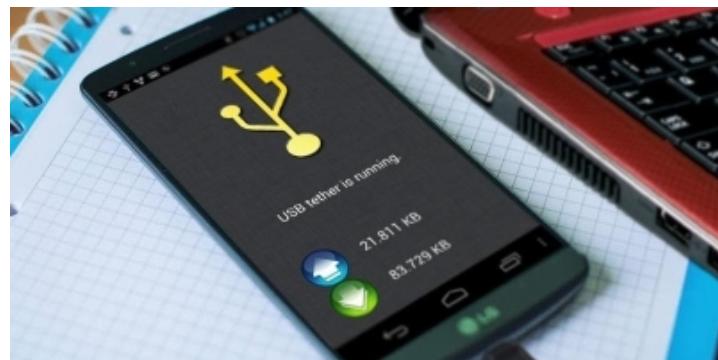
Mobile Phone Networks

- **Tethering:**

- Cabling a laptop to a mobile phone to get internet connection.

- **Mobile Hotspot:**

- Tethering done over Wi-Fi, where the internet-connected mobile device is acting as a portable Wireless Access Point (WAP)



Share Mobile Internet Connection to Other Devices

Securing Wireless Networks

- Packets of information on a wireless network are broadcast through airwaves. Anyone with sufficient technical expertise can intercept these signals and decode your messages.
- **Measures to help secure your communication:**
 - Setup a password for your wireless network
 - Use encryption and wireless security protocols
- **WEP:** Wired Equivalent Privacy (Lowest protection)
- **WPA:** Wi-Fi Protected Access (Compatible with more devices)
- **WPA2:** Wi-Fi Protected Access Version 2 (Most Secure)



Chapter 8

Networking and Digital Communication

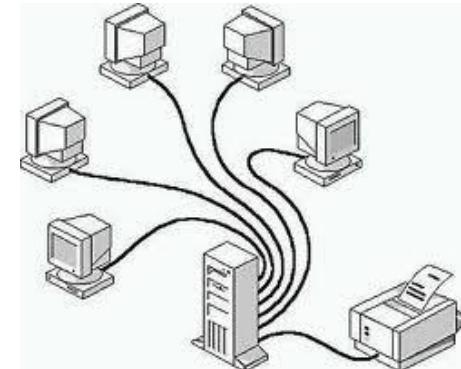
Part 2

Topics

- Network Advantages
- Specialized Networks
- Interpersonal Computing
 - Emails
 - Blogs
 - Social Networking
 - Community collaboration
 - Online Gaming
- Online Survival Tips

Network Advantages

- Networks enable people to:
 - Share computer **hardware** resources
 - Print servers accept, prioritize, and process print jobs
 - Share data and **software** programs
 - Site licenses reduce costs for multiple copies of software
 - **Work, play, and communicate together**
 - Groupware enables several users to work on the same document at the same time.



THE INTERNET OF THINGS

Sensors on factory floors to control equipment



Sensors that call emergency services if an elderly person falls at home



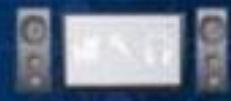
Printers alert your computer that ink needs replacing



Elevators notifying facilities of a fault in the system wirelessly



Air Con/Heating controlled centrally to ensure building runs efficiently

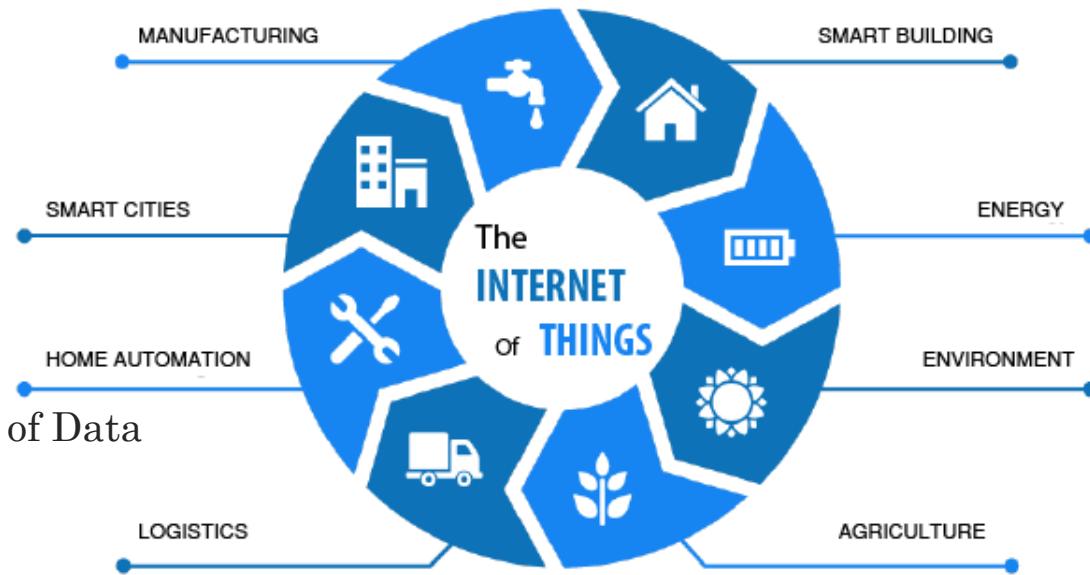


Centralised monitoring of Street lighting/water mains



Internet of Things IoT [Video Link](#)

- The Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation, and others all contribute to enabling the Internet of things.
- The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.
- Applications:
 - Smart Home
 - Smart Cities
- Challenges:
 - Security
 - Privacy
 - Massive amounts of Data



Specialized Networks

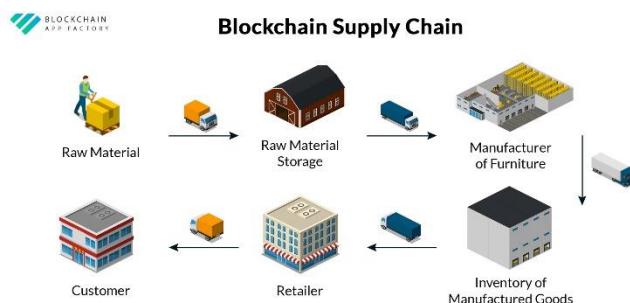


- **Blockchain**

- A system in which a record of transactions are maintained across several computers that are linked in a peer-to-peer network. Transactions are verified by network nodes and recorded in a public ledger.

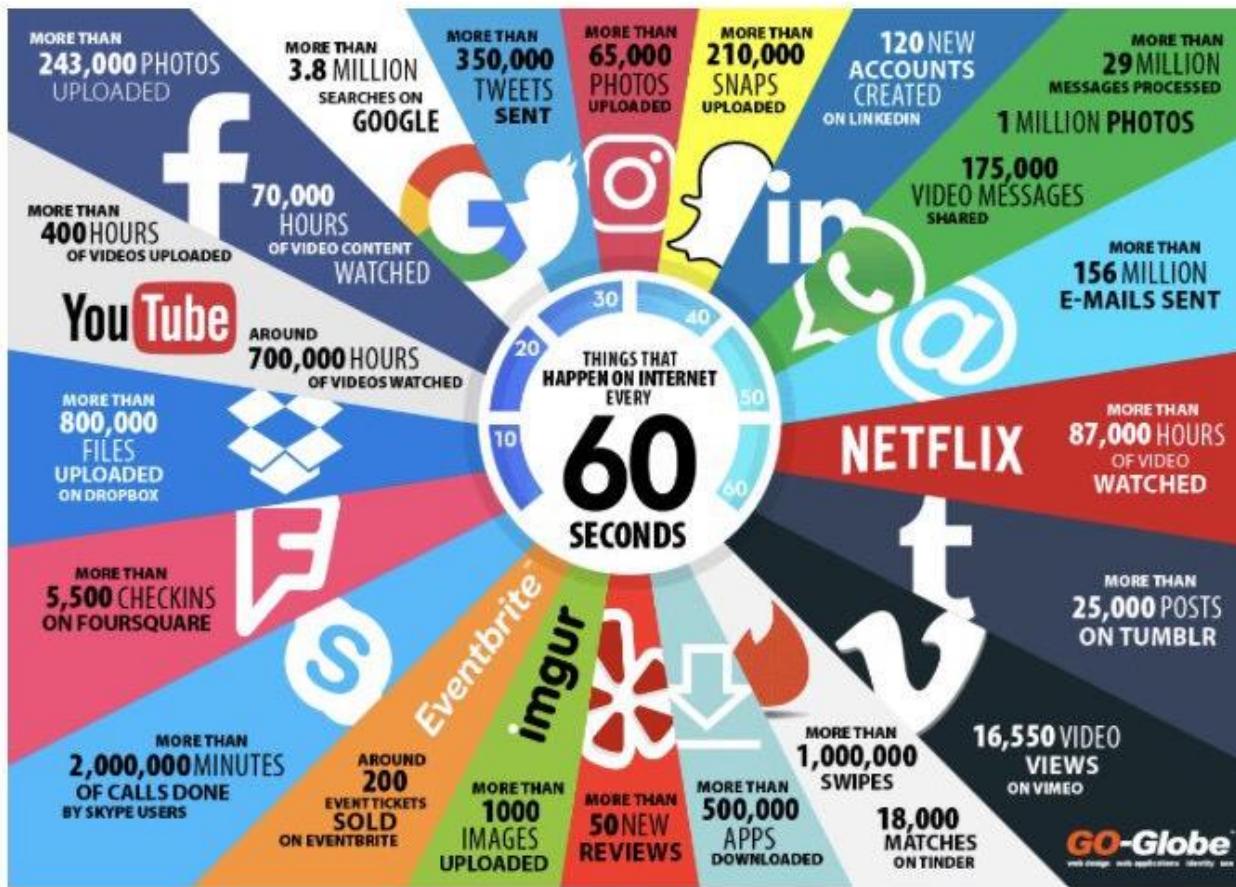
- Applications:

- **Cryptocurrencies** ([Bitcoin](#), Ethereum, etc...)
 - Is a digital asset designed to work as a medium of exchange that uses strong cryptography to secure financial transactions.
- **Supply chains and logistics** (IBM Blockchain)
 - Knowing the status and condition of every product on your supply chain from raw materials to distribution is critical.



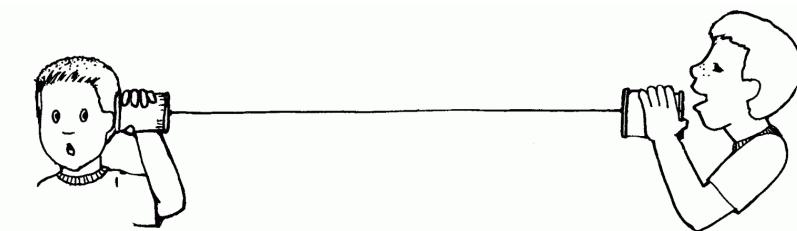
Network Advantages

- What do you think happens in the internet in 60 seconds?



Interpersonal Computing

- **Human-to-human** digital communication
 - Users spend around **70% of connected time** on the internet **to communicate** with other users.
 - **Applications:**
 - Emails
 - Chatting
 - Blogging
 - Video teleconferencing
 - Computer Telephony
 - Social Networking
 - Information Sharing



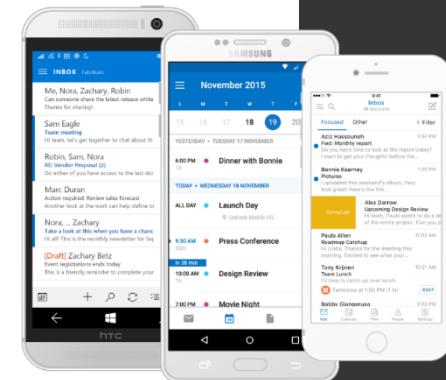


Online Communication

- Allows people to interact while being physically located at different places in the world
- **Synchronous communication**
 - Real time communication between all parties
 - Instant Messaging (IM), Audio Conferencing, and Video Conferencing
- **Asynchronous communication**
 - Poster and reader don't have to be logged in simultaneously.
 - Examples : Emails, Newsgroup, Forums, etc...
 - Text messaging: Uses SMS technology



ProtonMail AOL Mail ZOHO



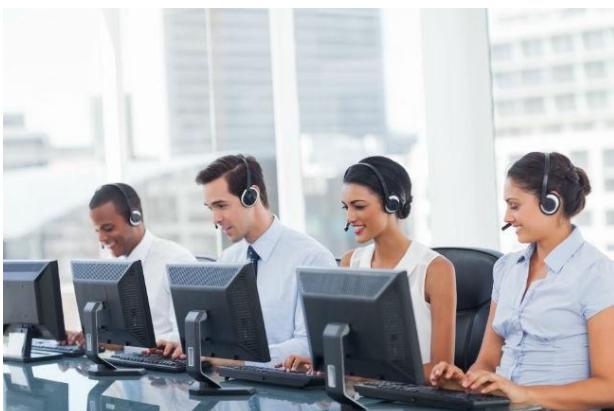
Email

- Messages distributed by electronic means from one computer user to one or more recipients via a network.
- **Email Server**
 - Is a server that handles and delivers e-mail over a network, usually over the Internet. A mail server can receive e-mails from client computers and deliver them to other mail servers. A mail server can also deliver e-mails to client computers.
- **Common Issues:**
 - Spam unwanted junk mail
 - Attachment sizes
 - Email size limitations



Audio Communication

- It enables two or more people to use the computer as a telephone conferencing system
- **IP Telephony or Voice over IP (VoIP)**
 - Is a general term for the technologies that use the Internet Protocol's to exchange voice, fax, and other forms of information that have traditionally been carried over dedicated phone lines.
- **Voice Mail:**
 - Is a computer-based system that allows users and subscribers to exchange personal voice messages



Video Communication

- **Video Teleconferencing:**
 - Capability of simultaneous video and audio for communication between people in real-time.
- **Benefits:**
 - No need to travel
 - Saves time
 - Share resources and collaborate



Blogging

- **Blogs (Web Log)**

- An ongoing online diary or commentary written by an individual. Examples: Blogger, WordPress, etc...

- **Micro blogs**

- Is the practice of posting small pieces of digital content—which could be text, pictures, links, short videos, or other media. Example: Twitter, Facebook, etc...

- **Video Blog (Vlog)**

- Is a form of blog for which the medium is video, entries often combine embedded video (or a video link) with supporting text and images.



Social Network Revolution

- Is an online platform which people use to build social networks or social relationship with other people who share similar personal or career interests, activities, backgrounds or real-life connections



Social Networking Issues

Pros

- Easily accessible
- Inexpensive
- Informed & connected

Cons

- Privacy
- Information overload
(Oversharing)
- Addicted at the expense of personal relationships

How social Media is rewiring our brains?

Social Media Influencers

- Users on social media who has established credibility in a specific industry.
- A social media influencer has access to a large audience.
- They contribute content
 - YouTube Videos
 - Snapchat
 - Instagram

3 Types of Social Media Influencers



Micro-influencers



Macro-influencers



Celebrities

> 1,000
FOLLOWERS

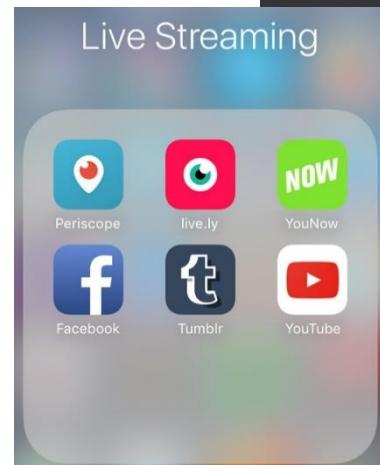
> 100,000
FOLLOWERS

> 1,000,000
FOLLOWERS



Media Sharing

- **Video sharing platforms:**
 - YouTube, Vimeo, Keek, etc..
- **Viral video:**
 - Video that spreads through the process of internet sharing, in a short time period.
- **Streaming:**
 - Transmit or receive (data, especially video and audio material) over the Internet as a steady, continuous flow.
- **Live Streaming**
 - Refers to online streaming media simultaneously recorded and broadcast in real time
- **Podcasting:**
 - the practice of using the Internet to make digital recordings of broadcasts available for downloading to a computer or mobile device.





Community Collaboration

- Crowdsourcing: using the internet and the intelligence of the crowd to accomplish a task or solve a problem for the benefit of all.
- Different forms
 - **Crowdsolving**: a collaborative, yet holistic way of solving a problem using many people
 - **Crowdfunding**: the collection of funds from the crowd to sponsor a project, e.g. Kickstarter, gofundme, indiegogo
 - Non commercial work, e.g. Anyone can contribute to it, Wikipedia



Online Gaming

- Is either partially or primarily played through the Internet or another computer network
- Includes:
 - First Person shooter
 - Strategy Games
 - Massively Multiplayer Online Role-playing Games (MMORPGs)



Online Gaming



NINTENDO
NETWORK

- Gaming Networks
 - PlayStation Network
 - Xbox Live
 - Nintendo Network
- Characteristics
 - Thousands of simultaneous players
 - Players take roles in the virtual worlds
 - Passionate addiction of the Players
 - Cooperation among group of players required



Sharing Resources

- Peer-to-Peer:
 - File sharing without posting on central server (music), e.g. torrents
- Grid Computing
 - Sharing processing power rather than data
- Cloud Computing
 - Resources come from the internet



Online Survival Tips

- Maximize work by system
- Store Names in Address book
- Don't share emails/ passwords
- Don't display privacy matters
- Don't open suspicious mails
- Don't open suspicious links (phishing)
- Keep your system up to date
- Cross check online information
- Beware of fake stories circulating
- Avoid information overload



Computer Security & Risks

Chapter 11 Part 1

Outline

- Overview
- Computer Forensics
- Computer Theft
- Malwares
- Hacking



Overview

- Computer Security
 - The protection of computing systems and data that they store or access from unintended or unauthorized access, change or destruction.
- Computers could be used for either:
 - Upholding laws
 - E.g Computer forensics, etc ...
 - Breaking the laws
 - E.g Viruses, Identity theft, etc ...



Computer Forensics ([YouTube](#))



- Investigation of a wide variety of computer crimes.
 - Use special software to store and reference clues in complex cases
 - Trace digital fingerprints “deleted files”
 - Automated Fingerprint Detection



Computer Crime

- Cybercrime
 - Any crime using Computer Technology
 - Billion of dollars are lost
 - Majority are conducted by company insiders
 - Insider crimes are covered up to avoid embarrassment



Computer Crime

- Cyberstalking
 - A form of harassment repeatedly harm or harass other people in a deliberate manner on the internet
 - To help yourself, limit how much you share your personal info
- Cyber bullying
 - Targeting children and young adults online, involves humiliation, rumors, lies, taunts or threats.
 - [Stop cyberbullying! \(Video Link\)](#)



Computer Crime Types

- Computer Theft
- Software Piracy
- Identity Theft
- Viruses
- Worms
- DDoS
- Hacking



Computer Theft

- Theft of computer itself
 - Laptops, PDAs and Smartphone's are often stolen
 - The SW and data on the computer are more valuable than the hardware



Computer Theft

- Intellectual Property Theft
 - Software Piracy
 - File sharing of copy righted songs
 - Illegal duplication and distribution of movies
 - Plagiarism of copy righted text



THE COPYRIGHT INFRINGEMENT SHIP



The Pirate Ship is powered by the winds of acts of infringement. These acts are depicted on the sails.

Acts that are permissible and free for public use are found on the open seas.

Single copy for back up
(CD, DVD) (not Books)

Computer Theft

- What is stolen?
 - Money
 - Goods
 - Information
 - Software Resources
- Getting sensitive data through:
 - Spoofing
 - Identity Theft
 - Phishing

Copyright 2006 by Randy Glasbergen.
www.glasbergen.com



"If you were concerned about identity theft, you shouldn't have left your private information lying around where I could find it!"

Computer Theft

- Spoofing/Social Engineering
 - Trick that target to extract secret information
 - E.g. Making a phone call and posing as an internet technician, to extract sensitive data especially passwords.
- Shoulder surfing
 - Is a type of social engineering technique used to obtain information by looking over the victim's shoulder.
 - E.g. Passwords and other confidential data



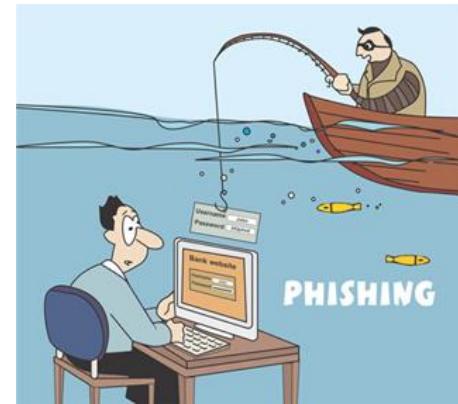
Computer Theft

- Identity Theft
 - Extract personal information to commit a crime in another person identity
 - National ID
 - Driving License
 - Credit card number
 - “Catch Me if you Can”
 - Movie about **Frank Abagnale**
 - Between the ages of 15 and 21. He became one of the most famous impostors ever



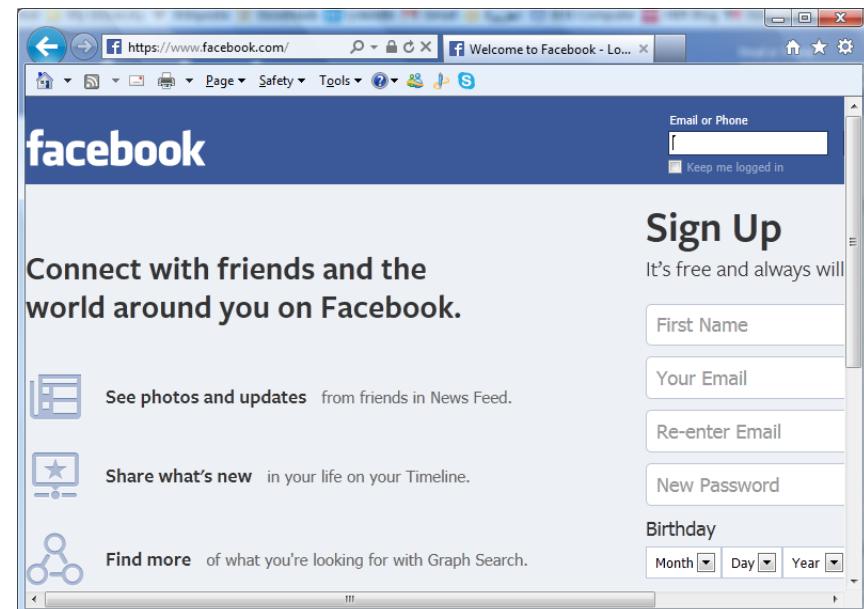
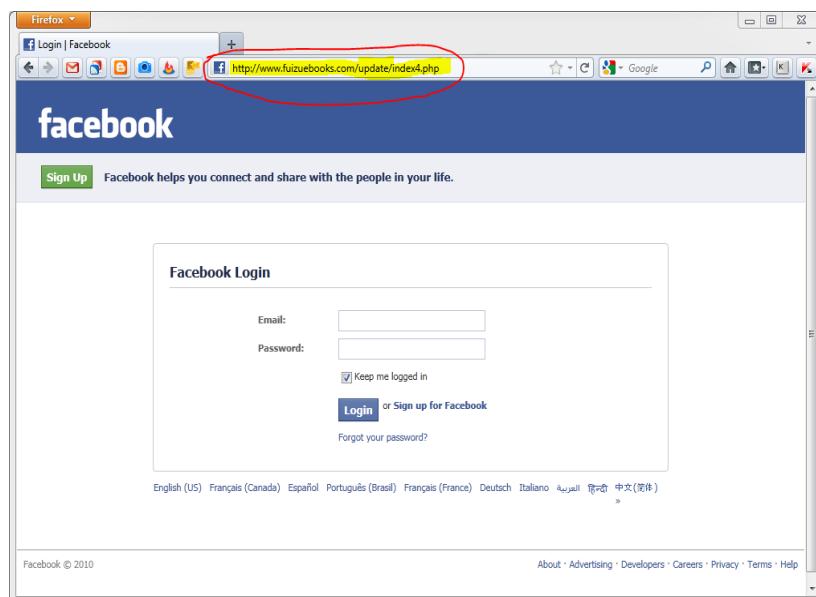
Computer Theft

- Phishing ([Video Link](#))
 - Is the act of attempting to acquire sensitive information by masquerading as a trustworthy entity in an electronic communication
 - Sending an email posing as a bank representative and asking to fill a fake bank web form.
 - Pornographic sites asking users to reveal credit card numbers to prove age



Computer Theft

- Facebook Phishing Example:
 - URL: [fuizuebooks/update/index4.php](http://www.fuizuebooks/update/index4.php)



Computer Theft

From: Microsoft office365 Team [mailto:cjh11241@lausd.net]
Sent: Monday, September 25, 2017 1:39 PM
To:
Subject: Your Mailbox Will Shutdown Verify Your Account



Detected spam messages from your <EMAIL APPEARED HERE> account will be blocked.

If you do not verify your mailbox, we will force to block your account. If you want to continue using your email account please verify.

[Verify Now](#)

Microsoft Security Assistant

Microsoft office365 Team! ©2017 All Rights Reserved

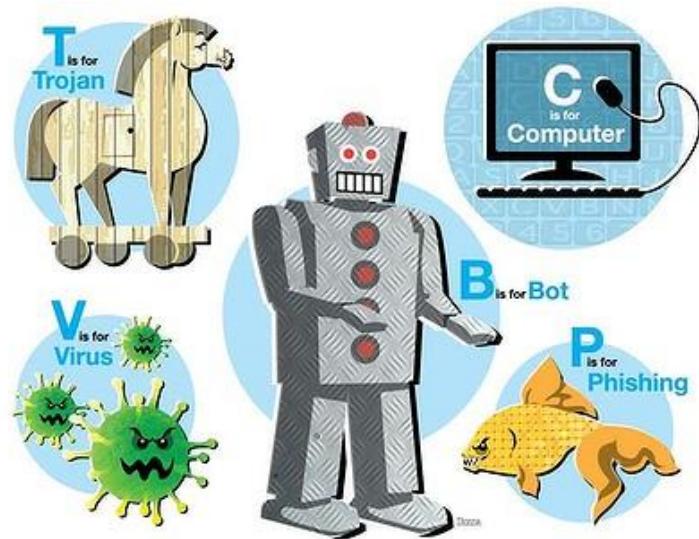


Computer Theft

- Identity theft protection
 - Use separate credit card for online use
 - Use secure websites (<https://>)
 - Don't disclose personal info on phone
 - Handle email with care
 - Don't put your national ID on checks
 - Copy your cards to get replacement in case stolen
 - Report Identity theft promptly

Software Sabotage

- Malicious software [Video Link](#)
 - Used to disrupt computer operation, gather sensitive information, or gain access to private computer systems
 - Viruses
 - Worms
 - Trojan horses
 - Spyware

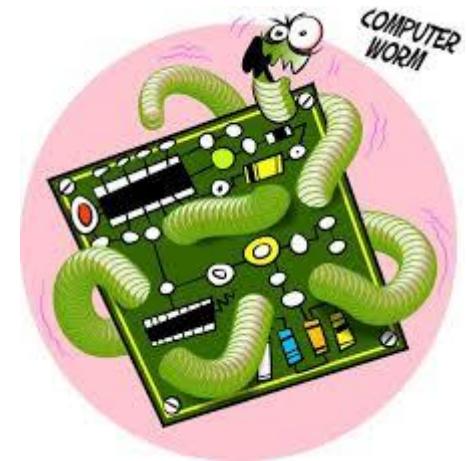


Software Sabotage

- Viruses
 - Normally it is embedded in a file and travels as an email attachment, or infected flash memory disks.
 - When the virus program is executed it cause
 - Damages to the Operating systems
 - Display messages
 - Viruses are OS specific but **New types** are cross-platform.
 - Macro viruses: attach themselves to documents that contain macros
 - E.g MS Office applications

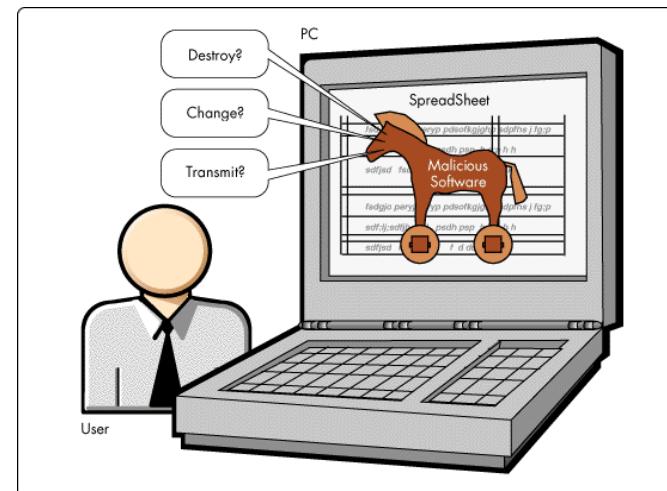
Software Sabotage

- Worms
 - They are independent programs
 - Capable of reproducing themselves
 - Causes memory freezes
 - Spreads through the internet
- Famous worm:
 - Code Red (2001)
 - Didn't attack PCs, it attacked internet servers running Microsoft Servers



Software Sabotage

- Trojan Horse
 - Disguise themselves as useful programs or apps, but has hidden destructive program
 - Often posted in shareware
 - Names look like games, utilities or pictures
 - Track and monitor your keystrokes
 - Act as a backdoor allowing the attacker to control your PC



Software Sabotage



- Spyware:
 - Gets installed and collects information without user's knowledge
 - Called Spybot or Tracking software
 - Tracks
 - Keystrokes (Key Logger)
 - Web sites visited
 - Screen displays



Software Sabotage

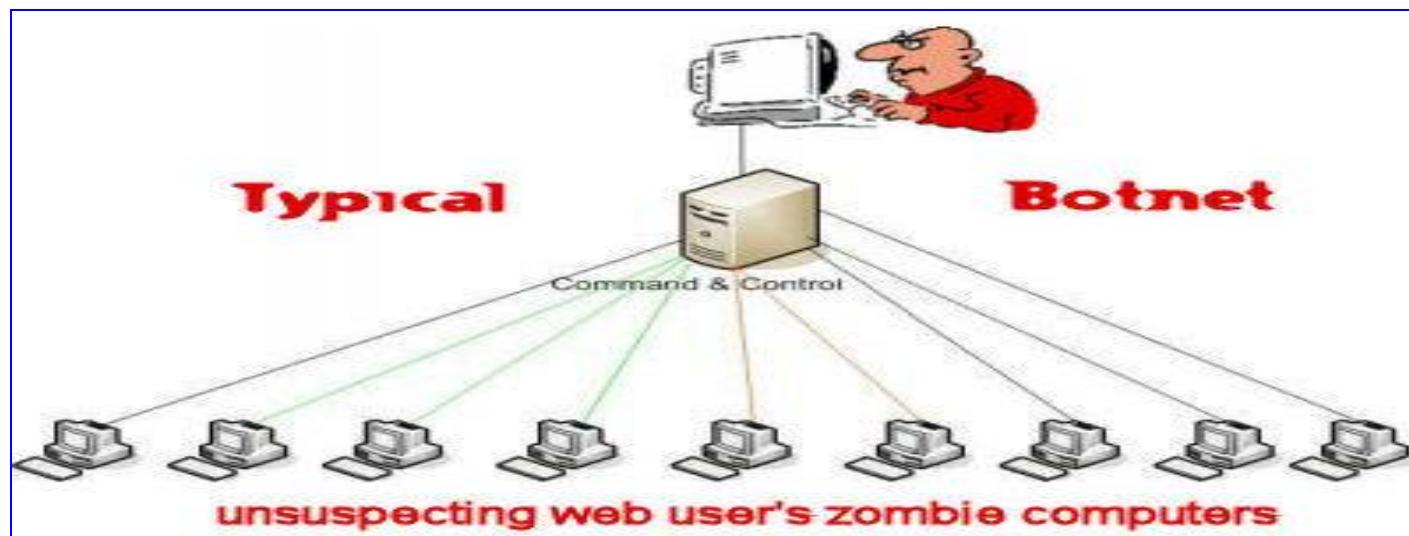
- Ransomware
 - It is a malware type that locks your computer and encrypts data in your hard drive and then demands that you pay a ransom to unblock the files again.
- How do you get infected?
 - Open an infected email attachment or malicious link
- Attackers usually ask you to pay the ransom using digital currencies, such as Bitcoin because it is untraceable
- Ransomware Examples:
 - TeslaCrypt: uses super strong uncrackable encryption



Hacking and Electronic Trespassing

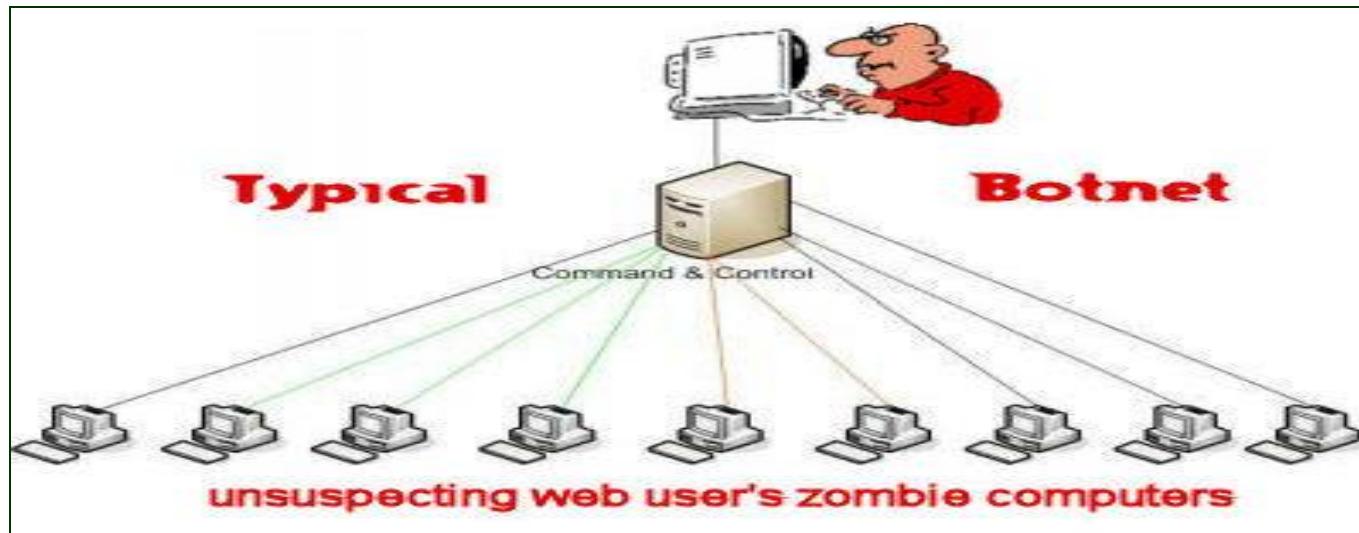
- **Zombie Computers**

- Internet connected computers that have been hijacked using viruses to perform malicious acts without the knowledge of the owners



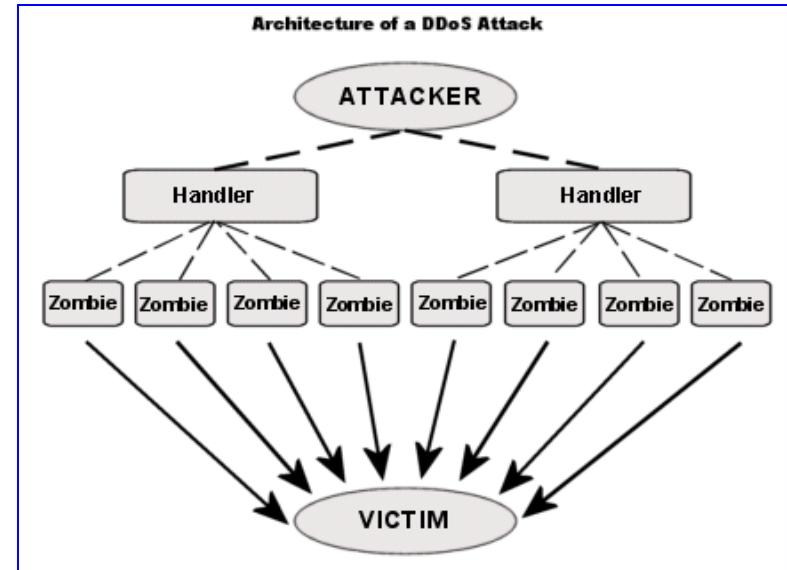
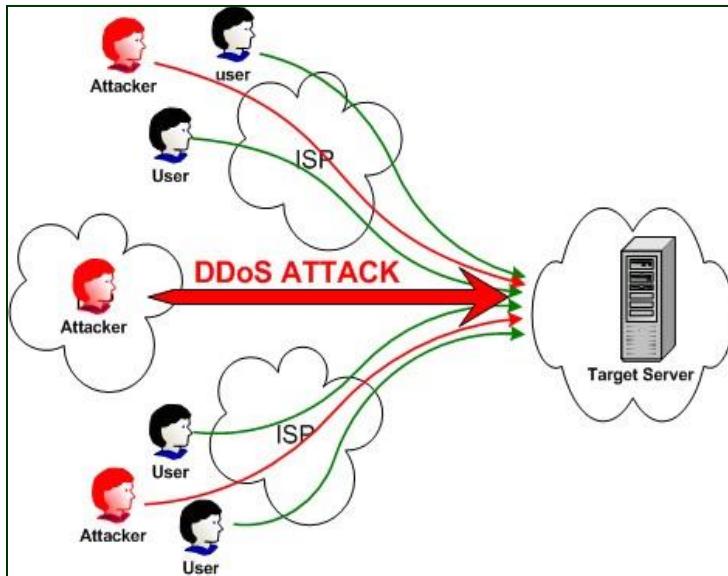
Hacking and Electronic Trespassing

- Botnets
 - Network of computers
 - That have been hijacked using viruses
 - To perform malicious acts without knowledge of the owners



Hacking and Electronic Trespassing

- DDOS (YouTube Link)
 - Distributed Denial of Service
 - attacks bombard servers and web sites with traffic that shuts down Web sites → uses botnets



Hacking and Electronic Trespassing

- Hackers
 - People who break into computer systems (In 70s it was considered intelligent and harmless). But now it is synonymous with Cracking.
- Cracking
 - Breaking into computer systems with criminal intention.



Hackers

- Black Hat Hacker
 - Criminals develop new techniques to penetrate security systems with harm intentions
- White Hat Hacker
 - Security experts developing new techniques to protect us.
 - Called Ethical Hacker



Inspiring white hackers videos

- James Lyne: Everyday cybercrime -- and what you can do about it
- Mikko Hypponen: Fighting viruses, defending the net
- <https://www.youtube.com/watch?v=mwj2NkTYWuw>



Computer Security & Risks

Chapter 11 Part 2

Outline

- Protection
 - Passwords
 - Firewalls
 - Encryption
 - Audit Control
 - Backup
- Security vs Privacy
- Security vs Civil Rights
- Cyberwar

Physical Access Restriction

Something You Have

- Key
- Access Card



Something You Know

- Password
- Lock Combination



Something You Do

- Signature
- Typing speed
- Error Pattern

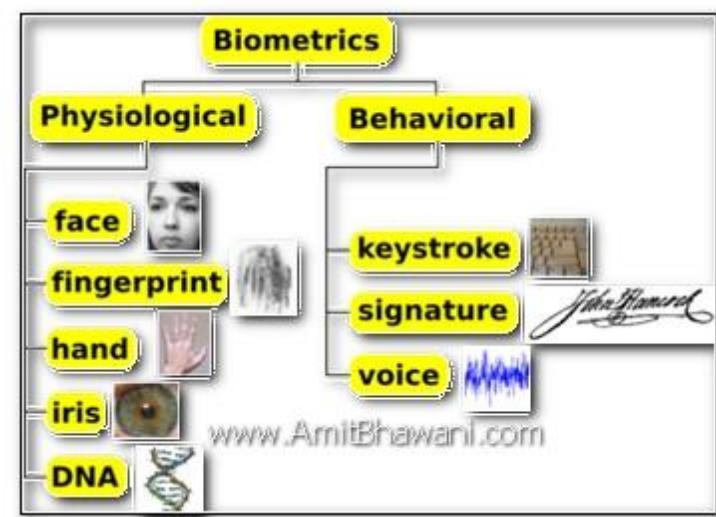
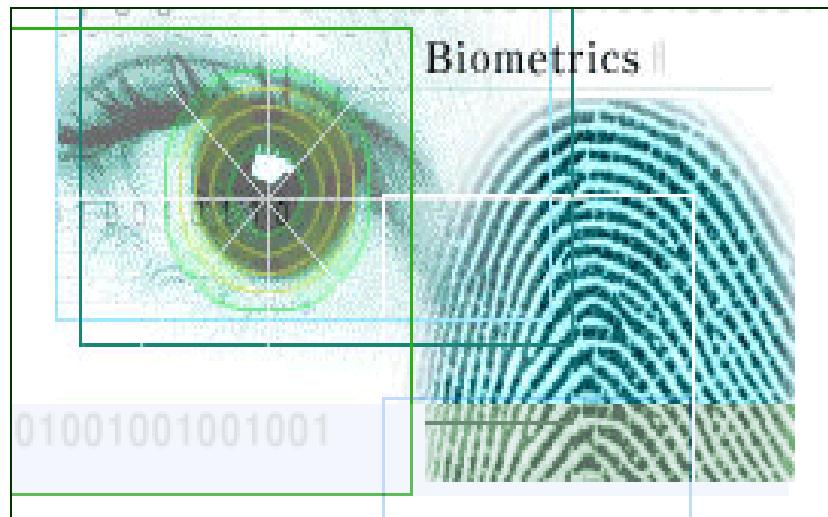


Something About You

- Voice Print
- Fingerprint
- Retinal Scan

Security Biometrics

- Identification of humans by their traits to get Access Control
 - Examples: Fingerprints, Retina Scan, etc...



Passwords and Access Privileges

- Password:
 - Most common tool used to restrict access to computers
- Effective Passwords:
 - Not real words
 - Changed frequently
 - Not names
 - Combination of letters and numbers

Strong Password Rules	Bad Example	Better Example
Passwords should have more than 8 characters; mix letters, numbers and symbols as well as mix between upper and lower case letters	password 12345678	Mtwf!382 GatsbJ11*)
Don't use a password someone can guess, such as your name, birthday.	Saeed1994 1stMarJohn	S@ed#1\$9 13j*nUiM

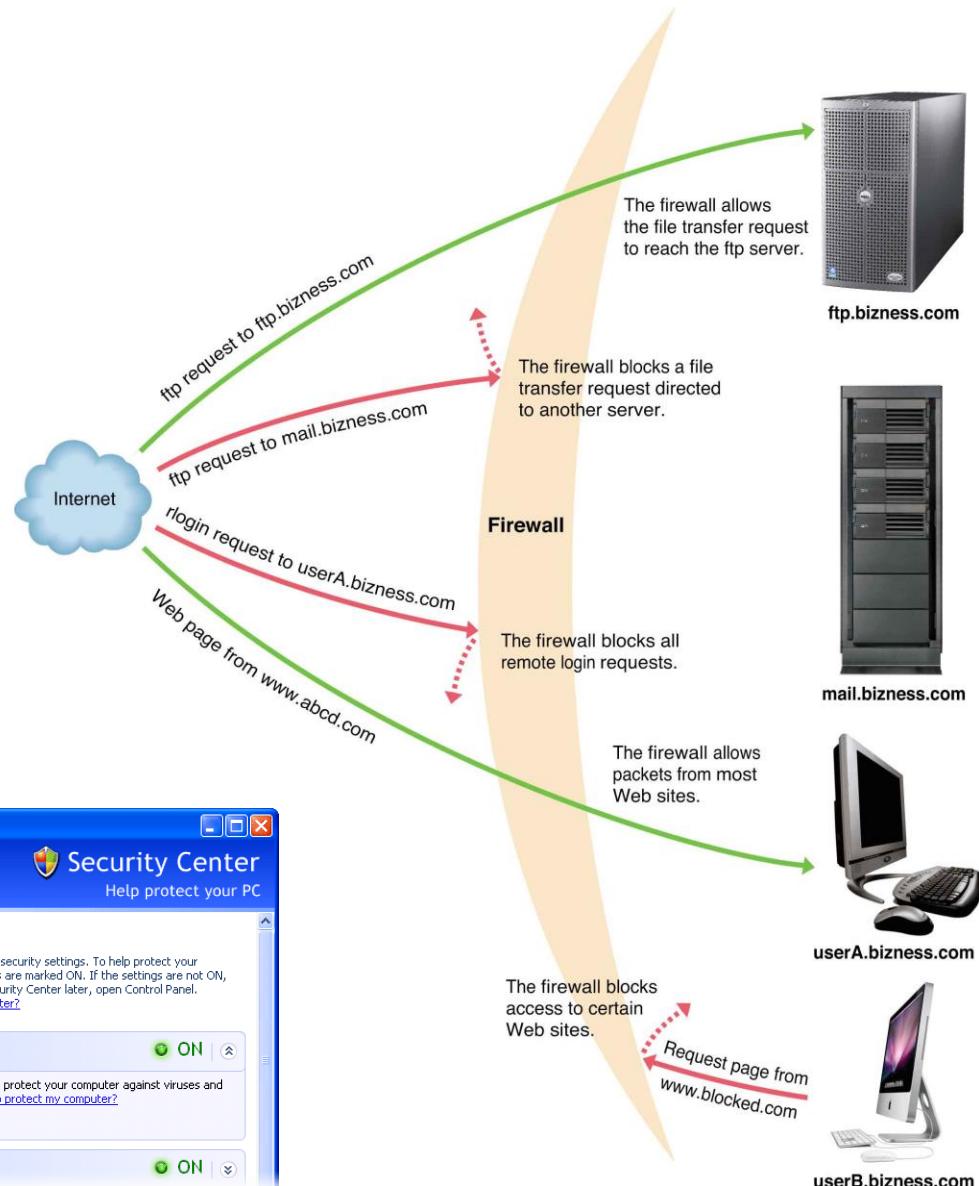
Passwords and Access Privileges

- Access Control Software
 - Doesn't need to treat all users identically
- System Administrator
 - At least one of the accounts on a PC must be Admin
 - Has additional privileges
 - Permission to install additional software
 - Change system settings



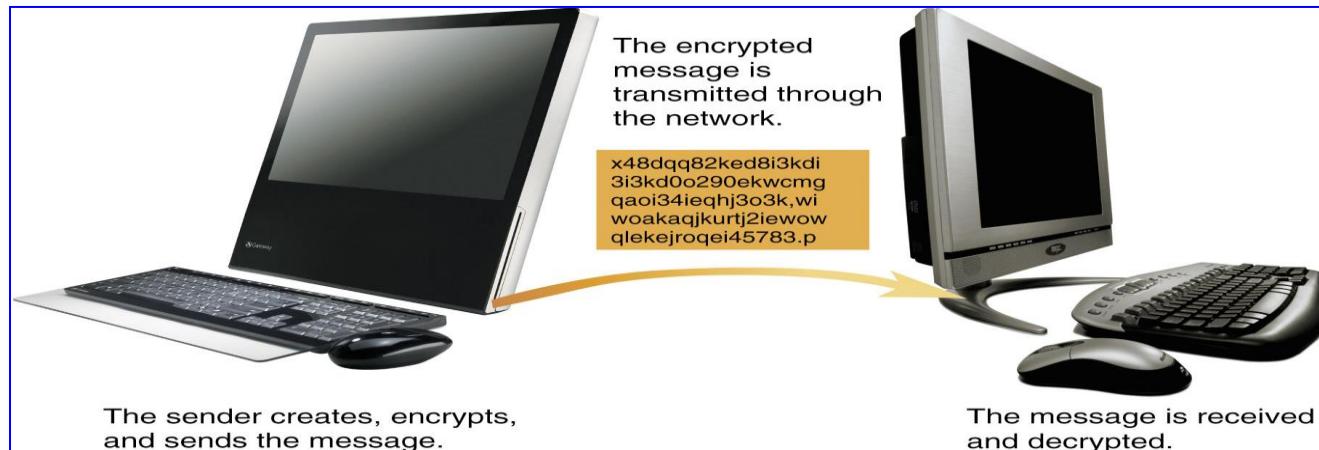
Firewalls

- It filters information between a private network and the rest of the internet.
- It could be either
 - Software
 - Hardware



Encryption Software

- Scrambling transmitted messages to secure them using a secret numerical code called
 - **Encryption Key**
- Reverse process to retrieve original message called **decryption**



Software sabotage Protection

- Anti-virus

- Search for viruses and delete them
- Continually monitor the system for viruses
- Need to be frequently revised for new viruses
- Several days required to develop patches for new viruses



Audit Control Software

- Monitoring and Recording user computer transactions
 - Tracing and identifying suspicious computer activity



Audit Log

Selected Date: Last 24 Hours
Event: No Filter — No Filter Applied
Login: No Filter
Database Revision: No Filter

Type: No Filter
Name: No Filter
Show/Hide Audit Log Events: Show

Audit Log

Date	Login	Event	Type	Name
May 3, 2011 11:57:40	admin	View	Admin Settings	Audit Log
May 3, 2011 11:52:43	admin	View	Group	Group Manager
May 3, 2011 11:52:42	admin	System	Admin Settings	Restart XLi engine
May 3, 2011 11:52:42	admin	Update	Group	Group Member List
May 3, 2011 11:52:42	admin	Update	Group	Monitor Group Only (ID:7)
May 3, 2011 11:52:25	admin	View	Group	Group Member List
May 3, 2011 11:52:21	admin	View	Group	Monitor Group Only (ID:7)
May 3, 2011 11:52:14	admin	View	Group	Group Manager
May 3, 2011 11:44:11	admin	View	Admin Settings	Audit Log
May 3, 2011 11:43:56	admin	View	Admin Settings	Audit Log
May 3, 2011 11:43:50	admin	Rename	Group	Monitor Only Group (ID:7)
May 3, 2011 11:39:24	admin	View	Group	Group Manager
May 3, 2011 11:39:10	admin	View	Internet Usage Rule	Internet Usage Rules Manager
May 3, 2011 11:38:46	admin	View	Group	Group Manager
May 3, 2011 11:38:37	admin	View	Admin Settings	Conductor Settings
May 3, 2011 11:35:06	admin	View	Admin Settings	Conductor Settings
May 3, 2011 11:35:05	admin	Update	Admin Settings	Conductor Settings

Notice the difference in the Group name, and Event status.

Backups & Other Precautions



- The best and most widely used data recovery insurance is **Regular Backups**
- Types of backups
 - Incremental
 - Happens more or less continuously; e.g. Hourly, Daily
 - Bootable
 - Makes a complete duplicate of a disk; e.g. backup drive in laptops
 - Off-site
 - Transport DVDs of data to remote sites or by uploading data into the internet cloud

Backups & Other Precautions

- UPS: Uninterrupted Power Supply
 - Protects data loss due to Power failure
- Surge Protector
 - Shields electronic equipment from dangerous power spikes



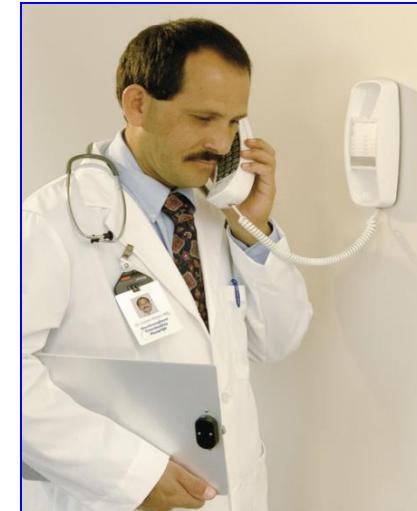
Safe Computing



- If it's important, back it up.
- If it's sensitive, lock it up.
- Treat your removable discs and drives as if they contained something important.
- If you're sending sensitive information, consider encryption.
- Share with care.
- Beware of email bearing gifts.
- Handle shareware and freeware with care.
- Don't pirate software.
- Disinfect regularly.
- Take your passwords seriously.

Security vs Privacy ([YouTube](#))

- Security measures prevent crime but they can also threaten privacy
- Smart badges
 - broadcast identification codes
 - A badge-location database stores data about the location of the badge (or person wearing the badge)
 - Instead of paging the entire hospital, an operator could route the call based on your location from your badge.
- Smart phones have similar technology called proximity recognition technology



Security vs Civil Rights

- New laws are being created and questions about civil rights are being raised.
 - Many hackers arrested and punished
- Laws introduced new problems by threatening rights of citizens
 - Professor Edward Felton was threatened with a lawsuit if he presents a paper analyzing the system that encodes digital music



UAE Cybercrime Law

- UAE Cybercrime Law No 5 of 2012
 - Any form of misuse of a computer/smart device or an electronic network/system .
 - Includes stern punishments that could go up to a life sentence and/or a fine varying between Dh50,000 and Dh3 million depending the severity and seriousness of the cybercrime.
 - E.g. breaching someone's privacy by copying, saving or publishing their photo or personal data using an electronic device is an offence punishable by at least six months in prison and/or a fine of up to Dh500,000, even if the photo was taken in a public place.

Security & Reliability

- Software Bugs
 - It cause more damage than viruses
- It is impossible to eliminate all bugs
 - The bigger the system the bigger the problem



Security & Reliability

- Y2K Bug
 - For decades only two digits were used for year; e.g. (89 → 1989)
 - But in 2000 it would become 00 causing calculation errors.
- More than 100 billion dollars spent to avert the disaster
 - Many programs had to be changed



Computers at War

- Smart weapons
 - Missiles that use computerized guidance systems to locate their targets
- Autonomous system
 - Complex system that can assume almost complete responsibility for a task without human input



Computers at War: Cyber Warfare

- By attacking computer networks the enemy can cripple: ([YouTube](#))
 - Telecommunications
 - Power grids
 - Water and gas supplies

