Class 10: Internet History

Internet History Terms

- **Analog vs. Digital signal:**
  - Analog and digital signals are used to transmit information, usually through electric signals. In both these technologies, the information, such as any audio or video, is transformed into electric signals.
  - The difference between analog and digital technologies is that in analog technology, information is translated into electric pulses of varying amplitude.
  - In digital technology, translation of information is into binary format (zero or one) where each bit is representative of two distinct amplitudes.
- **Fault tolerance:** if we dropped a bomb in our system, would it still be able to work? The ability of the system to continue working even if a component fails. Assigning several computers to a host name offers load balancing and fault tolerance.
- **Local area network (LAN):**
  - A computer network that links devices within a building or group of adjacent buildings.
  - A computer network that interconnects computers within a limited area such as a home, school, computer laboratory, or office building using network media. The defining characteristics of LANs, in contrast to wide area networks (WANs), include their smaller geographic area, and non-inclusion of leased telecommunication lines.
- **Modem:** translates between digital device and analog line for data transmission over a phone system
- **Multiplexing:**
  - Packets from many transmissions mixed (multiplexed) over one transmission line. Using multiplexing, you only have to pay for the line capacity you use which results in dramatic cost savings.
  - Multiple signals or data streams are combined into one signal over a shared medium
- **Circuit/Packet switching:**
  - POTS (plain old telephone systems) use circuit switching. A "circuit" is a dedicated connection between two entities. When you have a POTS phone call, a circuit is open, dedicating a specific amount of capacity between you and the party on the other end. You're using that "circuit" regardless of whether you're talking.
  - Internet networks are packet-switched networks, which can be more efficient. Since we can slice conversations up into packets, we can squeeze them into smaller spaces. If there are pauses in a conversation or someone's on hold, applications don't hold up the network. And that creates an opportunity to use the network's available capacity for other users. The trade-off is one that swaps circuit-switching quality of service (QoS) with packet-switching efficiency and cost savings.
- **Protocol:**
  - set of rules for communicating
  - system of digital rules for data exchange
- **Wide Area Network (WAN):**
  - a network that covers a broad area (i.e., any telecommunications network that links across metropolitan, regional, or national boundaries) using private or public network transports. Business and government entities utilize WANs to relay data among employees, clients, buyers, and suppliers from various geographical locations. In essence, this mode of telecommunication allows a business to effectively carry out its daily function regardless of location. The Internet can be considered a WAN as well, and is used by businesses, governments, organizations, and individuals for almost any purpose imaginable.

Internet History Learning Objectives:

- **What was the military's reason for fueling innovation in NASA and ARPA? What sort of institutions housed the initial 4 mainframe computers connected to the ARPAnet and what were their incentives to contribute to the ARPAnet?**
  - Fear fueled innovation (fear of Soviet space mastery).
  - Which institutions housed the 4 mainframe computers? - UC Santa Barbara, Univ. of Utah, Stanford, and UCLA.
  - Incentives: to put together a network of computers to talk back and forth and share information
- **What is the benefit of signal transfer that is fault tolerant and how do analog and digital differ on this?**
  - If a line is overloaded and fails, it's not unreachable because there are many different pathways from one location to another.

- ○ Digital (packet switching) is fault tolerant.
- ○ Analog (circuit switching) is <u>not</u> fault tolerant.
- **What is the internet? What were major contributions to its creation in the 1960's, 70's, 80's, and 90's?**
  - ○ The internet is a network of networks. Protocols are the set of rules for the networks communicating with each other.
  - ○ Internet in:
    - ■ 1960's: Mainframe Computers; Owned by governments and universities. Eisenhower and Bob Taylor help contribute to research for internet. IMPs- break messages into packets to send over phone lines.
    - ■ 1970's: Bob taylor moves to run xerox palo alto research center where the first personal computer was developed. ·   Steve Jobs sees the first computer and sees that it is an amazing idea and combines it with a GUI that will be disruptive
    - ■ 1980's:
      - ● When cold world ended it promoted everyone to want to communicate
      - ● First commercial PC & MAC. Aging ARPANET shut down in 1989.
    - ■ 1990's:
    - ■ 1991: Tim Berners-Lee designed www which used HTML to display documents on different machines. HTTP enables publishing and receiving of HTML pages
    - ■ 1993: Mark Andreessen built the first public browser (Mosaic which is now Netscape)

- **How did a GUI help encourage more use of personal computers? What does this have to do with "barriers" for new users?**
  - ○ Before GUIs were invented, you needed to use computer language in a COMMAND LINE. GUIs enabled non-programmers to use computers.
  - ○ less barriers for entry because you don't have to know how to program in order to use a computer
  - ○ Internet switched from nerds to suits (more people can use for profit/business)

Data Communications Terms:
- **Domain name service (DNS):** the internet's phone book; database that looks up the host and domain names and returns IP address
- **Encryption & HTTPS:** secure protocol; packets are encrypted before sent out and then decrypted when they arrive at chosen location
- **Hypertext Transfer Protocol (HTTP):** rules allowing web browsers and web servers to communicate
- **Hypertext markup language (HTML):** language used to compose web pages
- **Internet Corporation for Assigning Names and Numbers (ICANN):** nonprofit responsible for Internet domain and numbering systems
- **Internet Protocol (IP) address**: identifying address that every device connected to the internet has
- **Uniform resource locator (URL):** the web address; identifying resources on the Internet along with appropriate protocol to receive it
- **Net Neutrality:** principle that all Internet traffic should be treated equally

Data Communications Learning Objectives:
- **How are IP addresses related to URLs? What parts make up a URL?**
  - ○ IP addresses and URLs are interchangeable, much like contacts and phone numbers
  - ○ URLs reference a specific IP address
  - ○ Parts of URL
    - ■ 1. *Scheme:* http or https
    - ■ 2. *Host:* www.google.com
    - ■ 3. *Path:* /index.html
- **How does your computer resolve an IP address from a web address?**
  - ○ When your computer needs to find the IP address for a host or domain name, it sends a message to a DNS resolver, which looks up the IP address starting at the root nameserver. Once the lookup has taken place, that IP address can be saved in a holding space called a cache, to speed future lookups.
- **How do the technologies of the Internet combine to answer the questions: What are you looking for? Where is it? How do we get there?**
  - ○ Google and other search engines have things called "spiders" to help them create their giant indexes

of websites. These spiders crawl through every web page and to the sites linked to them until they have a pretty large and complete collection of all these webpages and links. If you type in a search on google, they provide you with links to pages from their index that best match your search. The link sends you to the IP address on the server the website you are trying to reach is on.
  - ○ URL, DNS, lots of routers
- **What does a web browser really do?**
  - ○ Looks for files on the internet and matches the IP address you are looking for
- **Can you understand both sides of the net neutrality argument and be able to argue both sides?**
  - ○ One Side: no internet provider should be able to restrict which websites are available to you
  - ○ The other side: your internet provider has the right to give you access and restrict which ever websites they want because you are paying for a service they are providing

Class 11 Prep: Cloud and Software/Hardware as a Service
SaaS/Cloud Terms:
- **Cloud computing:** computer services provided over a network
- **Hardware clouds:** on the internet; make resources available to on a customer need basis. Utility computing, platform as a service, and infrastructure as a service.
- **Server farm (aka Data Center):** giant building that contains multiple computers with many files stored on them
- **Service level agreement (SLA):** vendors sign this with customers to guarantee uptime and define ability to meet demand spikes
- **Software as a Service (SaaS):** vendors sign this with customers to guarantee uptime and define ability to meet demand spikes

SaaS/Cloud Exercises and Practice Questions
- **The internet has brought about cloud which changed the way we access parts of the ecosystem…explain how. Also explain how the business model and pricing is different for cloud when compared to the traditional model.**
  - ○ Creates another layer of communication. Mostly affects middleware
  - ○ Low startup costs, low maintenance costs, don't have to pay for hardware
  - ○ Traditional has a lot more physical components than cloud
- **What do cloud computer do to switching costs and access to high-powered computer?**
  - ○ Dependent on internet connections, cloud computing doesn't have switching costs in terms of software (low start up costs, etc.), but it does in terms of data. If you have a lot of data, it can potentially be hard to transfer all of it.
- **How is On-Demand software (SaaS) different than traditional software? Why would a software vendor chose to offer a SaaS offering over traditional offering?**
  - ○ On-Demand refers to accessing information or cloud when needed through a website.
  - ○ Traditional was on-Premise; only your computer had the downloaded software on your personal hardware and couldn't be transferred.
  - ○ Choose SaaS because its highly accessible.
    - ■ Save money, more convenient for both buyer and seller, faster deployment time, higher quality and service levels, remote access and availability
- **How does packaged or custom ERP software that you install on your premise different from SaaS, which is accessed over the internet? Why would you decide to go with packaged ERP? What would be the argument to go with customized (i.e. more unique and expensive) ERP?**
  - ○ Don't have to go buy cd or buy software, just surf web and download. Rent vs. pay for house.
  - ○ Ability to customize onpremise. Low start up costs for SaaS. Upgrades, fixes, maintaining costs are high on packaged and custom.
  - ○ Accessibility: on demand can be accessed anywhere.
  - ○ Benefits to users: faster deployment times, not as costly, especially up front, provider- distribute.
  - ○ Argument for customized: risks of SaaS = control, off site, putting all of your eggs in one basket, safety concerns.

10.6 Cloud Computing: Hype or Hope?