Module 3—Introduction to Broadband Technologies
w/ Eli the Computer Guy
URL: http://www.elithecomputerguy.com/2010/01/01/understanding-broadband/

+ Questions:

1. **In a broadband context, what is the difference between synchronous and asynchronous communications?**
    a. Synchronous communication indicates that the download and upload speeds are the same transfer rate, Asynchronous indicates that they are different.
2. **What is latency?**
    a. It is the time it takes for a command or request to be sent out, acknowledged and received back at the origin.
3. **From Eli's point of view, what is the difference between business and residential service?**
    a. Business Class service is regarded as better by the ISP over residential service because it means that there will likely be less service calls, and higher likelihood of being paid in full and on time. Business class service is where the money is.
4. **Explain the difference between a static and dynamic IP Address.**
    a. A static IP Address remains the same, a dynamic IP Address changes over time.
5. **Why might an organization want a static rather than a dynamic IP Address?**
    a. If an organization is running internal services, such as a website, that needs to be accessed outside of the network, a static IP will ensure that the website can always be accessed. Because dynamic IP addresses change, sometimes without even knowing, unless configuration is changed on the server and the domain name, the website will not be accessible to the outside.
6. **Why would an ISP block a particular port?**
    a. This is typically only done for residential services because ISP's want to avoid certain actions from occurring, like someone sending out spam on port 25 or avoiding a DDoS attack on 80.
7. **What is an SLA?**
    a. A Service Level Agreement is a contractual agreement that the services payed for will be the services received at a guaranteed percentage rate, typically 99.99%
8. **When would you use a T1 line?**
    a. When the business/organizations transfer rates are not very demanding but still desire reliability
9. **What are two advantages of a T1 line?**
    a. T1 Internet services has coverage in more places where other providers don't
    b. A SLA is provided for the services
10. **What is the primary disadvantage of a T1 line?**
    a. T1 is used for both Voice and Data transfer, so when voice is added to part of the service, it reduces the speeds of the Internet speed
        i. 24, 64-bit channels
11. **What is the primary advantage of carrier class Ethernet?**
    a. The ability to connect a building to the Internet directly through Ethernet cables at high speeds
12. **In wireless networking, what does 'unlimited Internet' mean?**
    a. The ability to connect to the internet all the time, however the service is throttled back when a certain amount has been used. So it is not truly unlimited.
13. **In an old building, what could be a problem source concerning DSL service?**
    a. Old phone lines in the building could reduce the quality of Internet service
14. **With a cable connection, what type of problem could be associated with a trunk line?**
    a. Trunk lines bring in several homes or communities to a single point to return to the central office, which creates a bottleneck if many users are on the Internet at the same time.
15. **From a business perspective, what is a potential weakness of Cable?**
    a. Cable does not provide a SLA
16. **What is FIOS?**
    a. Fiber Optic services, extremely fast internet speeds

17. What is the reason that you probably don’t want a satellite connection?

a. Satellite connections has high latency.

+ Notes

+The Basics:
++What's the difference between bits and bytes?
- 8 bits = 1 Byte
    - A **bit** is represented with a lower case b
    - A **Byte** is represented with an upper case B
- A Byte refers to data storage/size
    - The size of a file, hard disk, etc
- A bit refers to the speed at which data can travel
    - If you have a 1Mb connection and 1MB file, it would take 8 seconds to get to you…
        - Because there are 8 bits in 1 Byte

++ Transfer types—Whenever we talk about broadband speeds, we discuss the download and upload speeds.
- Asynchronous (Cable and DLS)—if the download speed is NOT the same as the upload speed
- Synchronous (TI Or Commercial Ethernet)—download and upload are the same speed

++Latency—it's not speed, it's the time between when you send a command to an external entity on the internet, and when that command gets acknowledged and returned to you
- Situation: If you want to see a video on a website, latency is the time from when you requested the video and when it actually started to download on your machine
- Latency is important for things like Real-Time communication, latency should be as low as possible
    - It's measured in milliseconds (20-30 milliseconds is good for RT communication)
        - You can find out what you speed or latency is through tests….
            - Whatismyip.com to test speed and latency

++ Different Types of Services
- Residential and Business Class Services
    - ISP's usually prefer Business Class services, they will likely get more money that way
        - Will pay their bills, which are higher, and usually have their own tech support, so ISP's don't have to do service calls… usually.
    - Residential Services are considered a pain in the butt

++ IP Addresses
- It designates who you are on the internet…
- There are two types:
    - Static or Dynamic
        - Static: Does not change…
        - Dynamic: May change every other day…
            - Two problems:
                - If users are trying to reach something on an IP addresses that you have given out, it may change and no one will be able to access it.
                - Services that are configured to that IP Address will stop working… AND many services like MAIL services will block email from servers with a dynamic IP Address… Damn spam filters

++ Ports & Services
- All programs and services on a computer system, tend to use ports.
- Websites usually run on port 80 (HTTP), email uses 25 (SMTP)
- THING TO REMEMBER:
    - Some ISP's will block certain ports
    - Some residential internet services, automatically block certain ports

        - Ex. Verizon Residential will block port 80 for incoming traffic

++ SLA's: Service Level Agreements
- The agreement between you and the service provider about what the service should be
    - Usually with T1 or Carrier Grade Ethernet, they provide a 99.99 guarantee that you will receive the speeds of Internet that you pay for

+ T1—allow for 1.5Mb down and up
- Were good for running websites and most business
    - It's not the same today, because it's limited… you can get much better with other services available
- Advantages:
    - You get a SLA when you buy a T1 line, 99.99% uptime guarantee
    - Go to places that DSL or Comcast can't go…
        - Meaning that it's available in more places
- Disadvantages:
    - The T1 line can be used for voice and data
        - T1 line consists of 24, 64bit channels
            - Each channel can be used for voice or data, and splitting it up, brings down the transfer speed
- Fractional T1
        - Instead of buying the entirety of a 1.5Mb, a company/entity can decide to only buy 12 channels worth of the 24 channels.

+ Carrier Grade Ethernet—the ability to connect a building to the Internet directly through an Ethernet connection
- You will receive an SLA with this connection, with a wider range of speeds (versus being restricted like T1)
- It's a synchronous connection
- Connection can range from 256Kb up and down, all the way to 20Mb up and down

+ Point to Point Wireless—Internet service based on antennas sending signals between each other.
- A tower with an antenna sends a wireless signal to the receiving antenna attached to your home/business to provide Internet
    - Service is good enough for real time communications
    - Can be good in situations with really old wiring and can get any other services to that sector
- It is point to point, the antennas are pointed directly at each other. It is directional.
- Disadvantages:
    - Many of the companies providing these services are not very reputable
        - Not corporate goliath
        - So it's a problem with unreliable service and number of employee's

+ Wireless—technologies like 3G, Edge, LTE… etc.
- Wherever you are, you can get internet connection anywhere (given that reception is possible)
- Speeds vary
- May be limited to how many nodes can be connected to each connection
- They push the idea of "Unlimited Data"
    - All of these services are limited…
        - Data Transfer is limited.

+DSL—Digital Subscriber Line (offered by phone companies)

- It is an Asynchronous connection, almost always maxes out at about 756Kb up, but 3-12Mb down.
    - Depends on what you need
- You cannot put different companies on different services:
    - Ex. Cannot put company A telephone line and company B DSL.
        - All needs to be from the same company (DSL and Telephone)
- DSL is restricted by the distance of the central office of the phone company
- DSL vs Cable: A solid central line to the main central office
    - Cable has a trunk line, a shared line for an area of neighborhood

- Disadvantages:
    - Telephone lines may be the original lines from the 30's
        - It can be so bad that DSL services are rendered horrible

+ Cable

- Rides on the same cable as television, and then splits off into a cable modem for internet services
- Cable internet has gotten better because of a new standard called DOCIS 3.0
- Allows for up to 152Mb DL speed and 108 UL speed
- Disadvantages:
    - Trunk Lines, a single point to connect several areas or houses back to the central office
        - This can slow speeds down, as bandwidths increase with many users on the same line
    - Does not have SLA

+FIOS—Fiber Optic

- Gigabit speeds
- Disadvantages:
    - Not as easy to deploy
        - Very costly and time consuming
        - Requires lots of approval

+Satellite Internet Connection

- Sends signals down and sends signals up
- You can get an internet connection anywhere…
- Disadvantage:
    - Very expensive for the internet connection
    - Expensive installation fee's
    - Speeds are not great… 1.5MB/s to 5MB/s
        - The main issue is the latency
    - NOT great for real-time communication

+Final Thoughts:

- Know what you're paying for and make sure it does what you need it to do…