**How the Internet Works**

* Internet:
  + Servers, routers, and switches make the internet work
  + HTPP- Hypertext Transfer Protocol
    - Set of rules for asking for and receiving web pages
  + TCP/IP- Transmission Control Protocol and Internet Protocol
    - Rules for sending and receiving data on the internet
* Clients vs servers
  + Server- both a piece of hardware and a piece of software
  + Client- a computer that makes request to a server
    - Desktops, laptops, tablets, phones
  + Relationship example:
    - Computer requesting a webpage (client), and computer sending back the webpage (server)
* TCP/ IP
  + TCP: Splits data up into packets and puts them back together again at their destination
    - If something gets lost along the way, it re-requests the information
  + IP: tells the packets where to go and where to return
    - IP address: unique number for each computer
      * Used to rout the TCP packets
    - IP Header: Information on how to send the packets
      * source IP address and destination IP address
* Routers and Switches
  + Routers: Intermediary devices that route data to their correct destination
    - Connect multiple networks in order to move information
    - Use protocol to talk to each other
    - Keeps information about other routers in routing table
      * Uses it to determine where to send info next
  + Switches: Physically connect local networks
    - Creates a local area network (LAN)
* Connecting personal devices to the internet
  + Coaxial cable or phone line or satellite
  + Modem: what connects the internet to your network at home
    - Translate the digital data from your computer into electrical signals to be transmitted over cable or telephone wires

**How the Web Works**

* HTTP: Hypertext transfer protocol
  + Language that all web browsers speak. You put in the request to access a website
  + How clients and servers talk to each other on the web
* The web: Software that makes up websites, apps, games, etc., that you can access on web browsers
* Servers contact each other through IP Addresses pointing to a particular server on the web
* DNS: Domain name server
  + Address book for the internet
  + Service in the middle between the domain name you put in and the IP Address
  + Rushes your request along to the server you requested
  + Not every DNS server knows your domain name
    - Based on proximity
* URLs: Uniform Resource Locaters
  + If URL starts with http:// then what follows is the domain name (facebook.com)
* Domain Names and IP Address:
  + Top level domains (.com) are the end or extension of a domain
  + Whatever is on the right of the dot is the subdomain (i.e. facebook is the subdomain of .com)
    - Can type in the IP address as well and will lead you to the same website (bypasses DNS but may not always work because IP address could change)
  + Internet Protocol version 4 (IPv4):
    - Format for IP addresses
    - Comprised of 4 numbers separated by dots
    - New format is IPv6 (allows for more IP addresses)
* HTTP and HTTPS
  + How clients and servers talk to each other on the web
  + Status code and resource information is passed
  + HTPP status code: help identify the cause of the problem when a webpage is not identified (3 numbers long and helps categorize the status) (i.e. 404)
  + HTTPS: S is for secure (information is private or encrypted)

**Computer Basics**

* Almost all data is represented in Binary form
  + Bit: is either off (0) or on (1)
* Binary Numbering System:
  + Bit: smallest unit of binary
  + 8 bits together is a byte
  + Position indicate the relative value
* Hardware: anything hard (desktop, tablet, smartphone)
  + Programs are all stored as data
  + Operating system: core software component of a computer
* Storing data into memory:
  + RAM (temporary): allows Central Processing Unit (CPU) to have immediate access to the operating system (opening an app also loads it to RAM)
    - If you don’t save the data, the information is lost
  + ROM (permanent)
* Hard drive: store memory using magnetism
  + Permanent storage
  + Each large disk is divided into millions of tiny areas that can be magnetized into a 1 or a 0
  + Relatively slow compared to RAM
* Software: collection of code or programs that run on your computer
  + You can change it all the time (update)
  + Application Software: firing up apps (Word, Spotify)
    - Behind it is programming software
  + System software: designed to operate and control computer’s hardware and provide platform for running app software
    - Directly accessing physical hardware of machine
    - Runs in background
  + Integrated Development Environment (IDE): combines several programming software into one product
* Machine language vs higher level languages
  + Machine language is the lowest level language because it works directly with the hardware without using a compiler (different computers use different machine languages)
  + Higher level languages use common language in the code to make it more programmer friendly
  + Getting from lower level language to higher level language requires a complier
* Client Server Model
  + Client makes a request to the server, and the server gives back the content to the client
* Programming Paradigms
  + Functional programming: you’re looking at the program like a math function
    - The function receives information and then uses it to create an output
  + OO Programing
    - Made up attributes or methods
    - Attributes: represent data associated with that object (i.e. name or size)
      * Nouns
    - Methods: actions you can perform with the object
      * Verbs

**HTTP: Do you GET it?**

* Hypertext Transfer Protocol
  + Protocol: a set of formal rules describing how to transmit or exchange data, especially across a network
  + Hypertext: concept of documents that are linked together
  + HTTP is stateless: you can send a request but it does not remember who you are
    - Cookies help track and know you are
      * Sent in every HTTP request to the domain that owns them
* HTTP status codes:
  + 100s: Informational
  + 200s: Success
  + 300s: Redirection (you were redirected to another page)
  + 400s: Client error (i.e. 404- page not found)
  + 500s: Server error
* Request methods:
  + GET: requests information (not expecting it to change anything)
  + POST: you can change the information
  + PUT: update (if it doesn’t exist then it’s created)
* Server side: responsible for creating the response

**HTML**

* HTML and CSS are the basic building blocks of any website
  + HTML builds it, CSS styles it
* Comments: <!-- *text here* -->
  + Allows other readers know what is going on in your code
* Doc Type <!DOCTYPE html>: tells you what kind of document it is (e.g. html)
* Opening HTML tag: <html> *text*  </html> sets up the HTML page
* The head of an HTML document: begins with <head> and ends with </head>
  + Meta tag: <meta charset=”utf-8”>
    - Meta information: information about our information
  + Title tag: <title>*TITLE HERE*</title>
    - The title for the browsers toolbar
    - There can only be one title element in an HTML document
  + Style tag: <style>*TEXT*</style>
    - Allows you to put CSS code to style the page
  + Begins right after the HTML tag and before the body tag
* The body of an HTML document: <body> </body>
  + <h1>: biggest and boldest thing on page
  + <h2>: smaller headline
  + <p>: adds a paragraph to a page