

Internet Architecture

Research Project

Introduction-

The internet is structured off of many things, but the most required aspects of it are the protocols of the IP/TCP, the browsers that are used, and how secure the users information is. IP/TCP is important because it allows for data to travel to its desired location. The browser is very important because it tells the device what kind of server it will be connecting to. And without security over the information put onto the internet, the internet would lose its integrity.

IP's-

Computers are each assigned an individuality called an "IP Address", and each device that is connected to the internet has a unique IP address. The IP stands for "Internet Protocol", which is the official procedure that the internet follows to connect everyone to the web. It uses a logical addressing system and performs *routing*, which is the breaking up of data into packets, and then sending those packets on different routes until they arrive at the intended destination (another router). The IPs works on a "Best Effort Delivery Model", but this model does not guarantee delivery or ensure proper sequencing of the packets; those requirements are fulfilled by the TCP (Transmission Control Protocol). TCP is how two devices can communicate. By creating two hosts, and establishing a connection between them, information may travel between the hosts securely. TCP also does what the IP cannot, and guarantees the delivery of data and ensures proper sequencing of that data. In today's times, we have two different protocols that have been released for production, and these two protocols are the IPv4 or IPv6.

IPv4 is the fourth version of the Internet Protocol, and was the first version to be deployed on the ARPANET in 1983. It offered about 4.3 billion IP addresses to the world, and contains 32 bits; when the internet started gaining users at a rapid pace, and more and more people began using it, we realized we needed more space, so

that's when the IPv6 came out.

IPv6 is the most up to date internet protocol, and is the one that most people use today. This has a capacity of approximately 340 undecillion IP addresses, enough to last us for quite some time. The IPv6 IP has 128 bits, 4 times the previous IPv4.

I mention IP address because without them, our devices wouldn't be able to communicate with each other. The TCP/IP is what allows devices to access the IP addresses, and TCP/IP makes something similar to a private connection that only goes two ways. It works that "instead of having a physical connection, the TCP/IP protocol creates a "virtual IP port" and the network hardware and software is responsible for routing data in and out of each virtual IP port" -wordpress. Now devices don't just connect; one device needs to initiate the connection by making a request for the other devices IP address, and that device needs to respond to that to establish a connection. For a connection to be made, a device needs to know the IP address of where it wants to connect. After that, the data that is sent is broken into packets, and each take a separate route to the IP place, and and all reconnect and reorganize at the intended hub or switch. TCP/IP is very important to how the internet works and how we can all connect to each other.

ICANN (Internet Corporation for Assigned Names and Numbers) is a non-profit organization that coordinates and maintains the procedures of multiple databases that are related to the name spaces and number spaces that the internet has to offer. It was founded in 1988 with entrepreneur and philanthropist Esther Dyson as founding chairwoman. "This was a step in advancement of the internet. ICANN performs the actual technical maintenance work of the Central Internet Address pools and DNS root zone registries pursuant to the Internet Assigned Numbers Authority (IANA) functions contract." -Wikipedia

HTTP, HTTPS, SSL, and TLS

When a user attempts to access a website by searching up a url, the scheme that pops up is http or https. This is how the device connects to that website, and how the

data is sent and received. Http was designed by Tim Berners-Lee, and he had simplicity in mind when designing http, so it could be adopted by his other idea, the world wide web. Http stands for "Hypertext Transfer Protocol", and it is what your browser uses to know what server it is connected to.

There are however, issues with connecting to sites with "http", because the information that is sent over the internet, is sent in clear text, meaning that someone could easily read your personal search, and possibly steal your credit card number or your phone number. That is why browsers now have "https", which encrypts the information being sent over the internet, and makes it harder to understand what is being sent over the internet.

There are two protocols that are used to encrypt and secure your browser. These are SSL and TLS. SSL (Secure Socket layer) uses public key encryption to secure the data. The SSL request an SSL certificate from a web browser, and the web browser will send its certificate to verify it is secure, then it is considered "trustworthy" to be active on. The TLS (transport layer security), the successor to SSL. It verifies the authenticity of the server, encrypts the data, and authenticates the client. This is the same as SSL, but it is just better.

Conclusion-

In whole, IP addresses, http, and secure browsers are what make up the bulk of how the internet functions. IP addresses are what allow computers to locate and connect with one another, http is what tells the device you are using what kind of server it is connecting to. Secure browsers are what keep the internet mostly safe and trustworthy to use; if people didn't trust the internet, they wouldn't use it as frequently.

In the future, newer and better aspects of the internet will come about; and with that in mind we need to be ready to evolve with it as well. This will be a stepping stone for more careers that will help the internet evolve, and that is what I will hopefully go into with my career.

Sites used-

<https://hpbn.co/brief-history-of-http/>

<https://www.us-cert.gov/publications/securing-your-web-browser>

<https://hpbn.co/brief-history-of-http/>

<https://bcasino.wordpress.com/2015/01/21/basics-to-tcpip-protocol/>

<https://www.icann.org/en/system/files/files/ip-addresses-beginners-guide-04mar11-en.pdf>