**Domain Names and ICANN**

The internet as we know it today, and oftentimes referred to as the world wide web, was invented by Tim Berners-Lee. While inter-computer and inter-network communication already existed thanks to the ARPANET, Berners-Lee dreamt up HTTP (Hypertext Transfer Protocol) communication across the internet. Berners-Lee also founded and is still the current director of the W3C (World Wide Web Consortium). Both of which will be discussed in greater detail in later sections.

The innovation that Berners-Lee brought to the forefront, was simplicity and ease of access. As we will go into detail later, HTTP is the language that is used for communication between web browsers and DNS (domain name servers). These domain name servers will also be described in greater detail later, but they are extremely important to making the internet as we know it accessible. They are so important that there is a regulatory group specifically in charge of managing domain namespaces as well as their databases. This regulatory group is known as ICANN (Internet Corporation for Assigned Names and Numbers)

ICANN “coordinates the allocation and assignment of names in the root zone of the Domain Name System (**DNS**) and coordinates the development and implementation of policies concerning the registration of second-level domain names” (ICANN.org). Put in similar terms, the ICANN is responsible for allocating and maintaining the name spaces for the internet. This is both the “website name” (i.e. Facebook, Amazon, Google, etc.) as it is referred to by many people as well as the “dot com” segment.

The “dot com” segments can more accurately be called top-level domains. The most generic of these is “com”, but several others exist. “Com” was initially used in order to be the commercial top-level domain, but it has since become the generic one to use. There is also .gov for government and it’s agencies, .mil for US military use, .edu for educational use (mainly colleges and universities), and then .org and .net for additional “generic” top level domains.

The domain names listed above are by no means exhaustive and several other have been added and maintained by ICANN. This can be international and country specific codes like .uk, .fr, .de, etc. as well as even some city specific domains like .tokyo, .london, .nyc, etc. ICANN has also expanded and allowed for the use of several other generic top level domains in the form of domains like .xyz, .online, and several others that can be seen below.





**IP Address, Packets, and Routing**

The internet has always been a network of networks (some smaller than others). Local networks (i.e. devices like laptops and cellphones connected to a home Wi-Fi enabled or wired router) are then connected to a greater network through an ISP (internet service provider) like Comcast or Verizon. The ISP then connects you to other ISPs and other networks that are all interconnected. While this may all seem simple and intuitive now, it was not always the case.

During the initial days of the internet, there was no standard in packet sending or receiving. Internetworking Protocol (IP) was developed by Vint Cerf and Bob Kahn. They thought that the internet would be better served with a design philosophy and architecture expressed in a set of uniform protocols. A protocol is well known set of rules and standards that all parties agree to use to communicate between machines. This has allowed the expansion of the internet and internet capable devices due to uniform standards (i.e. which protocols to use and work with).

All devices on the internet have a unique address (just a number) within a given network. These unique IP addresses work similar to, and can even be thought of as, mailing street addresses of the physical world. Visiting a website can be broken down / thought of as your computer sending mail with the IP address of the website as the recipient address and a return address of your computer. This allows the website to return information to you in the same manner.

Traditional IP addresses are 32 bits long and can be broken down into four 8-bit segments. While this is no longer always the case, IP addresses used to be segmented into country/region/subnetwork/device. This previous standard of segmenting IP addresses was known as IPv4. It was originally designed in 1973 and widely adopted in the 1980s.

While the original IPv4 address allocation allowed up to 4 billion unique addresses (devices) to be connected to the internet, the world and its engineers realized that this would quickly no longer be enough. Due to this, the world is currently in transition to a new standard of IP address allocation called IPv6. This new IP addressing schema uses 128 bits per address (8 segments of 4 hexadecimal characters).

Even with the implementation of these new, more complex, IP addresses, browsing the internet will not change. This is due to the fact that people no longer need to rely on IP addresses to browse the internet like the early days. In today’s world, most people never know or see actual IP addresses of websites due to DNS.

Data transfers on the internet are not point to point but very indirect. Paths can change extremely often, even during a transmission. Packets are data traveling along the internet and work more like cars than trains. Packets are allowed to take any available road (whether it is the most efficient route or not).

Packets can contain almost any type of data and depending on size, messages may be broken up into several packets. Groups of packets can take diverging paths and arrive at the destination at different times and potentially out of order. Packets simply carry the data as well as headers containing to and from addresses and are moved through the networks via Routers.

Keeping with the analogy of IP addresses being similar to mailing street addresses, routers can be thought of as mail sorting machines located within a post office. Routers act like traffic managers to keep packets moving smoothly through the network. Routers attempt to push packets through the "cheapest" available path at any given moment. Having multiple routes allows the network to be fault tolerant (i.e. multiple roads can be closed or blocked but packages can still get to their end destination).

TCP (transmission control protocol) manages the sending and receiving of all your data packets (i.e. guaranteed mail service where TCP validates all packets have been received) so that when all packets are received, they can be reassembled. TCP and Routing were built with scalability in mind. The hope and design philosophy was more routers = more redundancy.