Bandwidth and Latency

Bandwidth – How much information is being received (per second)

Latency – The lag when waiting for something to load (buffer)

If bandwidth is the amount of information sent per second, latency is the amount of time it takes to get that information from its source to you.

The higher the bandwidth, the more data the transmission media can handle at once. A lower bandwidth transmission media would not be able to carry as much data, meaning that the data would take longer to be sent.

A network with low latency experiences few delays in transmission, while a high latency network experiences many delays. The more delays there are, the longer it takes to send data across a network. Latency is affected by the number of devices on the network and the type of connection device.

These can affect the network performance because if multiple devices that are connected to the network are gaming and using more bandwidth, the bandwidth gets slower, and the latency increases.

Bandwidth is how much information you receive every second, while speed is how fast that information is received or downloaded. Let’s compare it to filling a bathtub. If the bathtub faucet has a wide opening, more water can flow at a faster rate than if the pipe was narrower. Think of the water as the bandwidth and the rate at which the water flows as the speed.

Latency is sometimes referred to as delay or ping rate. It is the lag you experience while waiting for something to load. If bandwidth is the amount of information sent per second, latency is the amount of time it takes to get that information from its source to you.

Throughput is how much information gets delivered in a certain amount of time. So, if bandwidth is the max amount of data, throughput is how much of that data makes it to its destination – taking latency, network speed, packet loss and other factors into account.

The 3 main types of network models:

* Client
* Server
* Peer-to-peer

**What is a client-server?**

A client-server network is the medium through which clients access resources and services from a central computer, via either a local area network (LAN) or a wide-area network (WAN), such as the Internet.

Example – Mail servers, Web servers, home network.

Benefits:

* All files are stored in a central location
* Backups and network security are controlled centrally
* Users can access shared data which is centrally controlled

Drawbacks:

* A specialist network operating system is needed
* The server is expensive to buy
* If any part of the network fails, a lot of disruption can occur

**What is a thin client?**

A thin client is a computer that runs from resources stored on a central server instead of a localized hard drive. Thin clients work by connecting remotely to a server-based computing environment where most applications, sensitive data, and memory, are stored.

Example – Microsoft Windows, Web browsers

Benefits:

* Less expensive as they don’t use a hard drive and use less powerful processors than PCs
* Require less power to function because they simulate a computer but with less moving parts
* More secure as users can’t install programs or store files on their terminals

Drawbacks:

* The lack of power can be a disadvantage because some applications require more processing power
* If you plan on having a lot of clients on the network, you will require a powerful server with high bandwidth otherwise a server may slow down
* Poor server maintenance or a bad network switch can stop productivity in the network altogether

**What is peer-to-peer?**

Peer-to-peer computing or networking is a distributed application architecture that partitions tasks or workloads between peers. Peers are equally privileged, equipotent participants in the application. They are said to form a peer-to-peer network of nodes. Each device acts as both a client and a server.

Benefits:

* Does not need an expensive server because each individual device is used to access the files and communicate with each other
* Specialist staff aren’t needed as each user sets their own permissions as to which files, they are willing to share
* If one computer fails it will not have any effect on the rest of the network. All it does is that the files from that computer aren’t available for others anymore

Drawbacks:

* Files and folders cannot be centrally backed-up, so in case of a server shutdown, they could lose all the files
* Due to the chance that each computer is being accessed by others, it can slow down the performance of the user
* Files and folders are not organized into a specific shared area for everyone, but on each individual device, making it difficult to locate some files without proper knowledge or communication

Example – Gaming platforms, discord

The purpose of:

Server – The main device that receives requests from clients and sends data back. Has control over the network.

Internet connection: To connect to the other devices and the network and access the internet, you need to have a connection to the internet.

Router – To route all the data to the right places and devices.

Network switch – Connecting multiple devices to one network with ethernet cables.

Client – The end user device that has to request data and access from the server to access certain things.

Networking Hardware:

Ethernet – connection between router and end device for an internet connection

Copper cross-over -

DTE is the router – the center device that connects everything and provides a clock speed

DCE is the external device – so anything that you connect to the router

Ethernet:

Connect 2 different devices (switch to pc)

Uses the ethernet port

Copper cross-over:

Connect 2 of the same devices (switch to switch)

Uses the ethernet port