

# Networking Essentials

Cloud Infrastructure Engineering

**Nanyang Technological University  
& Skills Union - 2022/2023**

# Course Content

- Quick Check-In
- Outline the importance of Networking
- Explore concepts and dive into the basics of Networking
- Explore the components of Networking
- Explore the different types of Networking
- Explore the goals of Networking

# Recap

- 4 key components of IT Infrastructure:
  - Servers, Network, Storage & Virtualization
- Cloud Migration Pros & Cons
- Activities & Assignments to give you a glimpse into what you can expect in the future

Time	What	How or Why
7:10pm - 7:30pm	Part 1 - Presentation	Computer Network & Components
7:30pm - 7:50pm	Part 1 - Activity	Individual activity + quick sharing
7:50pm - 7:55pm	Break	Break
7:55pm - 8:35pm	Part 2 - Presentation	Unique Identifier of Networks with individual exercises
8:35pm - 8:45pm	Part 3 - Presentation	Goals of Computer Networks
8:45pm - 8:50pm	Assignment Briefing	Instructor share the assignment tasks
8:50pm - 9:00pm	Break	
9:00pm - 9:50pm	Learners self attempt on assignments	
9:50pm - 10:00pm	Recap	

# Self Study Check-In



# Q1) Make a guess - what are some networking hardwares that you know of?

Share what you think with the class

# Why is Networking Important?



# What are computer networks?

Computer networks **connect nodes** like computers, routers, and switches using cables, fiber optics, or wireless signals. These connections **allow devices in a network to communicate and share** information and resources.

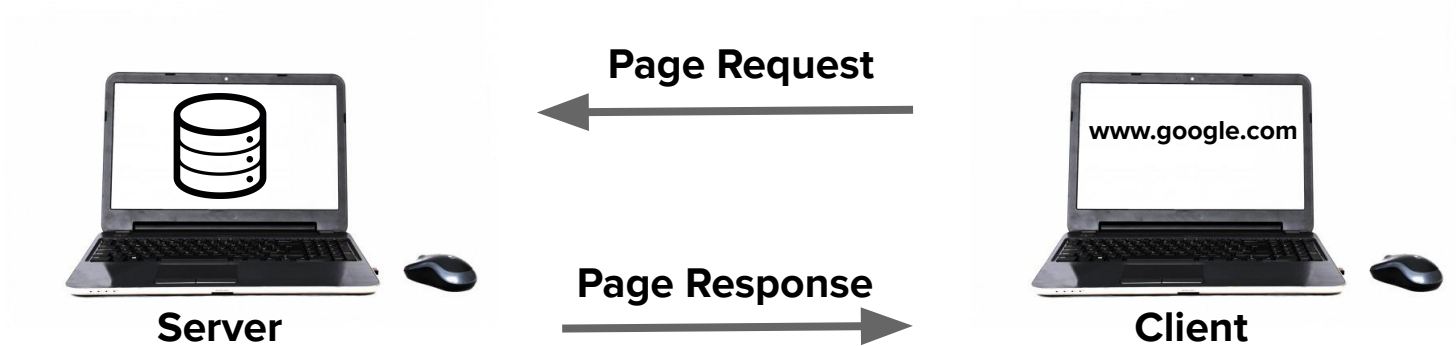


# Clients & Servers

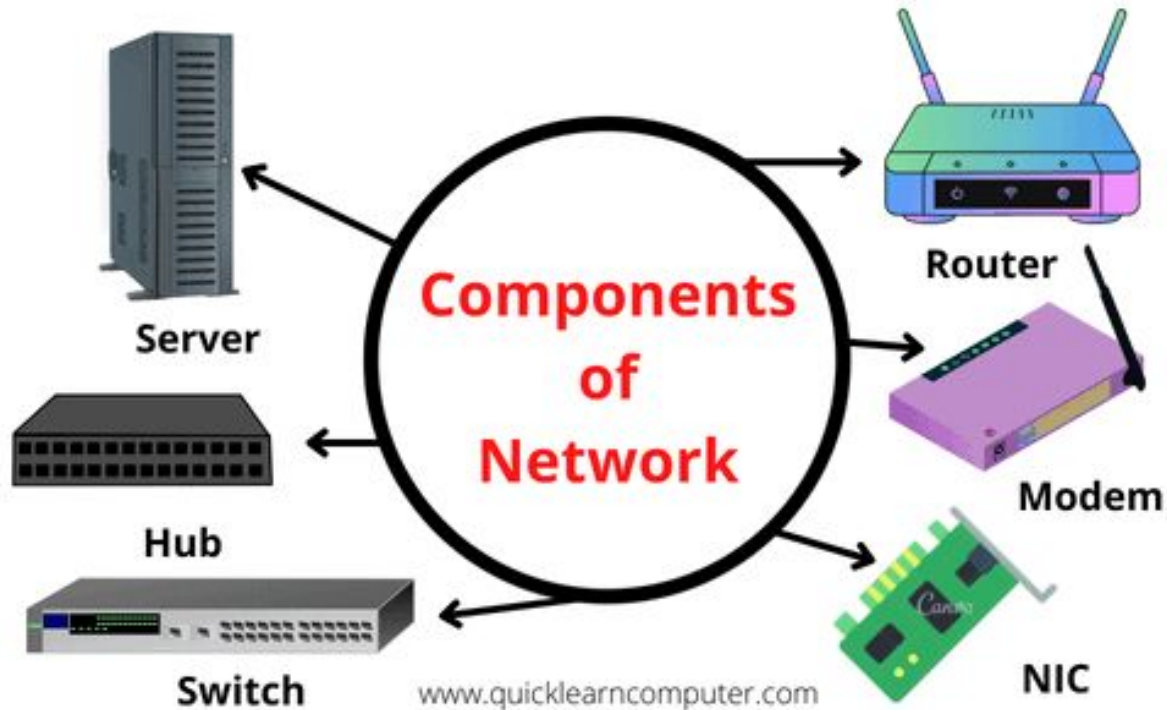
A server is a computer that **holds (hosts) content and services** such as a website, a media file, or a chat application.

A client is a different computer, such as your laptop or cell phone, that **requests to view, download, or use the content**. The client can connect over a network to exchange information.

# Clients & Servers



# Components



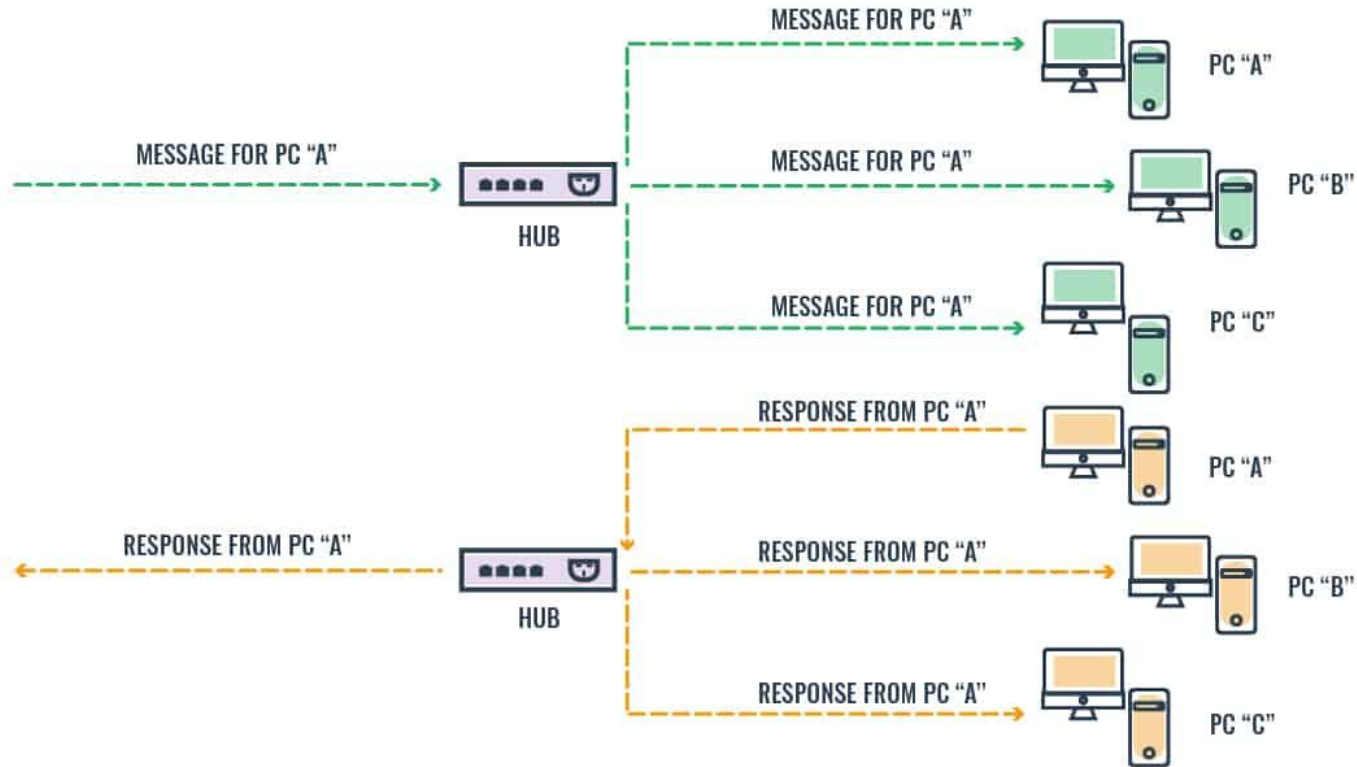
# Network Hub

A network hub is a node that **broadcasts data** to **every computer or Ethernet-based device connected** to it.

Network hubs are best suited for small, simple local area network (LAN) environments.

Network hubs associate devices with a **MAC address**.

# Network Hub

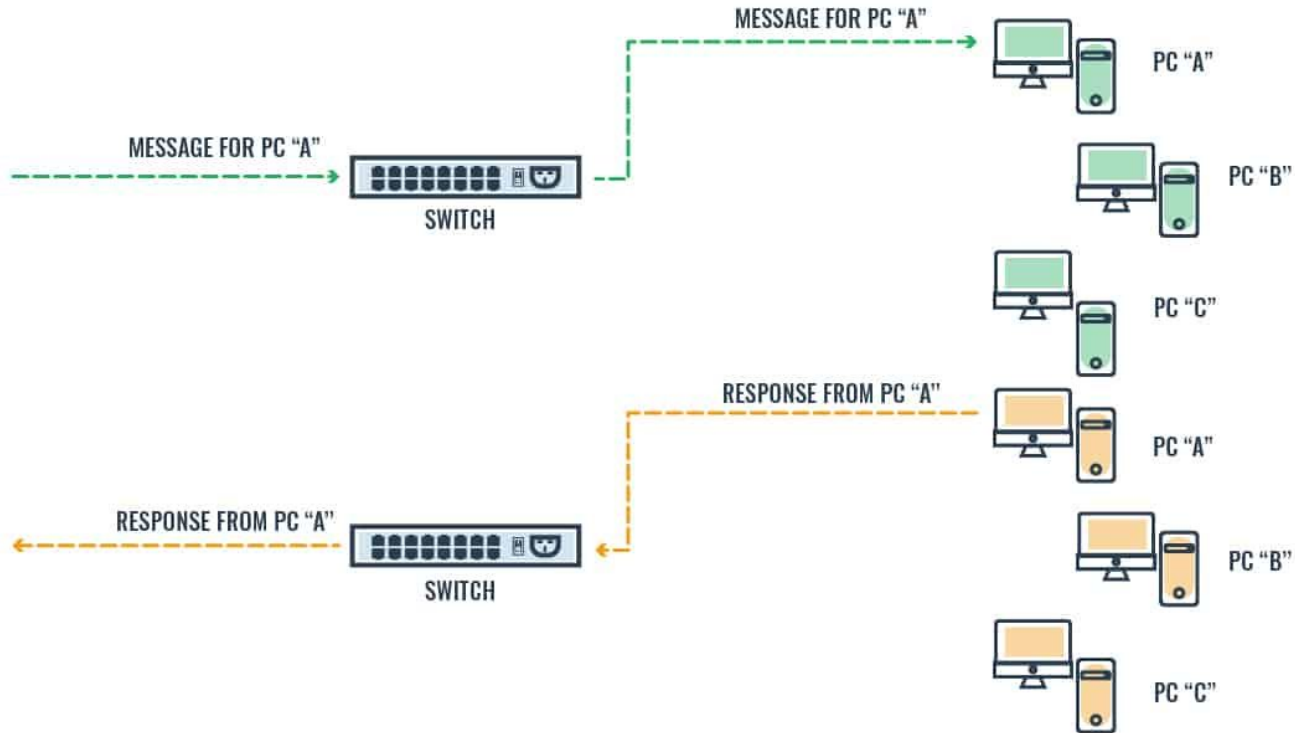


# Network Switch

A network switch, on the other hand, is a node that **broadcasts data to a specific computer** or Ethernet-based device connected to it.

Network switches associate devices with a **MAC address**.

# Network Switch



# Network Router

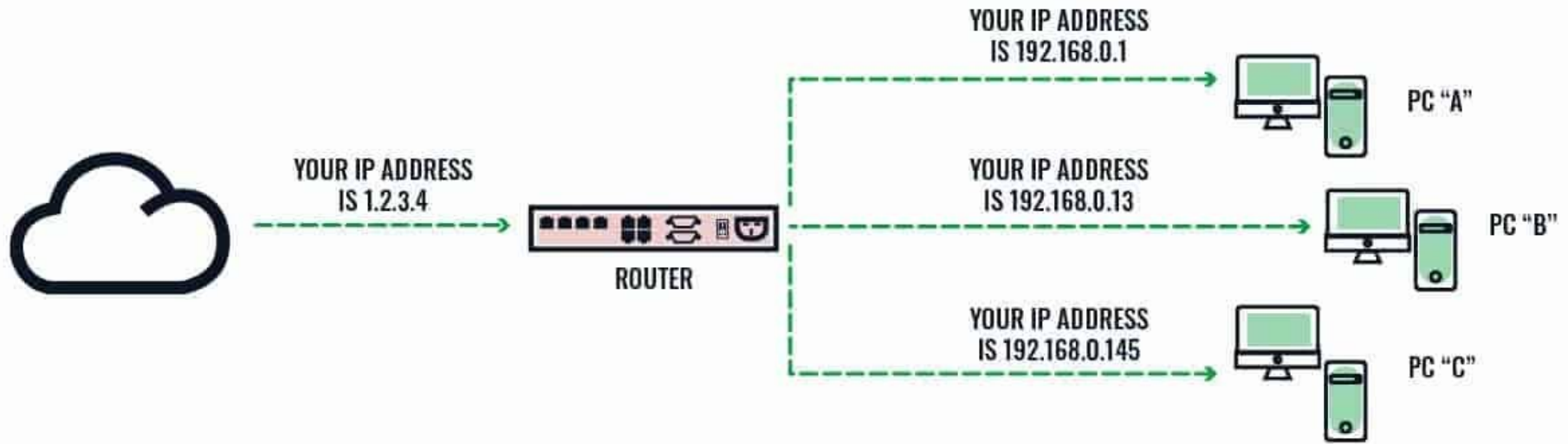
A network router is specialized at **sending data between networks**.

It enables the sharing of a single internet connection and saves money.

Network routers operate through the use of **IP Addresses**.



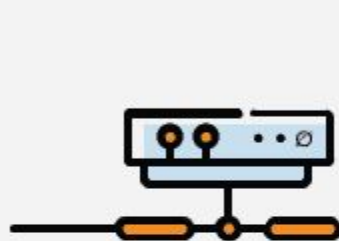
# Network Router



# Question

Are routers and modems the same thing?

# Modem or Router?



## MODEM

A modem is the connection between your house and the internet.

**A modem does not require a router to function.**



## ROUTER

A router is the connection between your modem and your wireless devices.

**A router does need a modem to function.**



## Wireless Devices



# Types of Network

1	Personal Area Network (PAN)
2	Local Area Network (LAN)
3	Wireless Local Area Network (WLAN)
4	Metropolitan Area Network (MAN)
5	Wide Area Network (WAN)

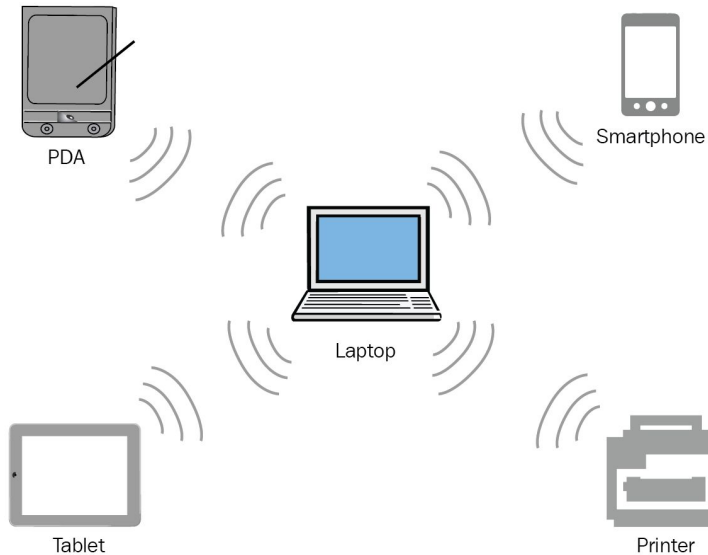
# Personal Area Network (PAN)

**Smallest** and most basic network.

Most commonly used for one individual and to connect to a handful of devices e.g. computer, smartphone, printers etc.

Most well-known PAN technology is Bluetooth

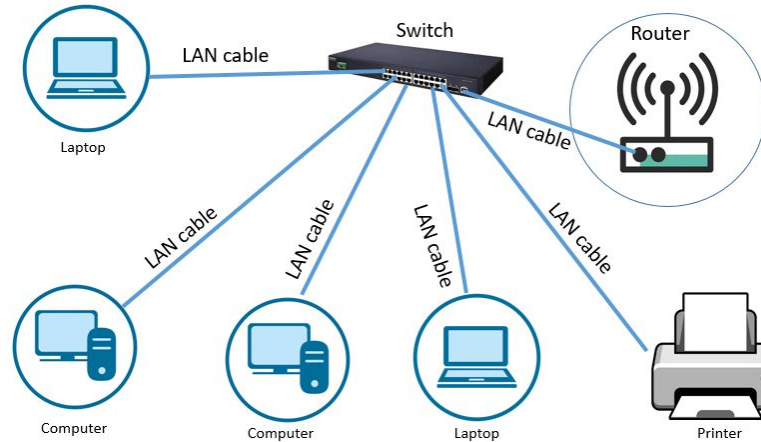
# Personal Area Network (PAN)



# Local Area Network (LAN)

Connects a group of computers or devices together **across a local area**.

Most commonly found in offices, buildings etc.



# Wireless Local Area Network (WLAN)

Similar to LAN but doesn't not rely on cables to connect to the network.

Depends on whether you'd prefer an on-premises or remote cloud solution.

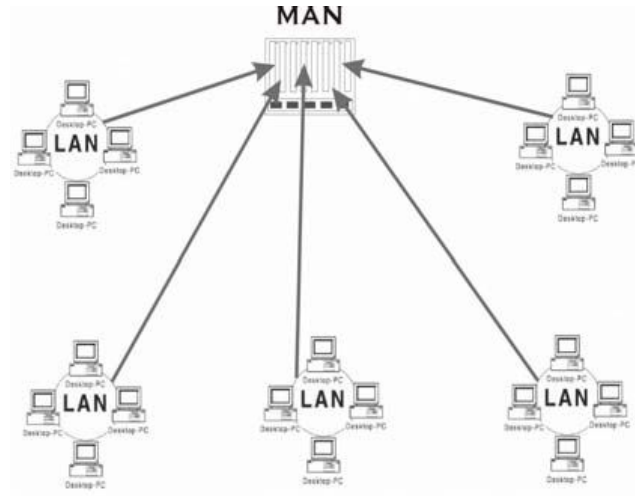




# Metropolitan Area Network (MAN)

Larger than LAN but smaller than WAN,

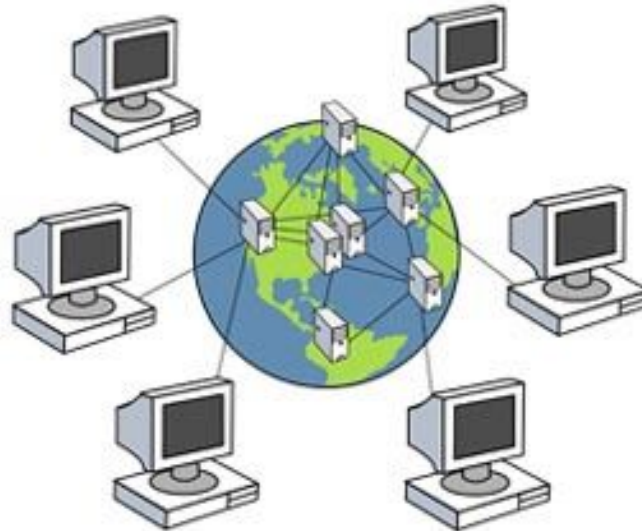
Connects **multiple LANs together** and spans an entire geographical area such as a city or town.



# Wide Area Network (WAN)

Covers a much larger area than LANs and MANs.

A network that extends over a **large geographical area** such as states or countries.



# Activity Time

In this activity, **draw your home network** using draw.io

Once done, take a break!

# Unique Identifiers of Networking



# IP Address

IP (**Internet Protocol**) addresses are used to **identify hardware devices on a network**. The addresses allow these devices to connect to one another and transfer data on a local network or over the internet.

IP Addresses are **assigned by your ISP**

There are two versions of IP addresses: **IPv4** and **IPv6**

# IPv4

IPv4 addresses are written in **four parts separated by dots** like this:  
45.48.241.198.

Each part written in conventional Base 10 numerals represents an eight-bit binary number from 0 to 255.

# IPv6

The newer version of the protocol, IPv6, is slowly displacing IPv4, and its addressing looks like this: 2620:cc:8000:1c82:544c:cc2e:f2fa:5a9b

In practice, **IPv4 addresses are still widely used** and not that hard to come by. This has to do with how IP addresses are assigned to network-connected devices and how private networks can be created with their own restricted set of IP addresses.

# MAC (Media Access Control) Address

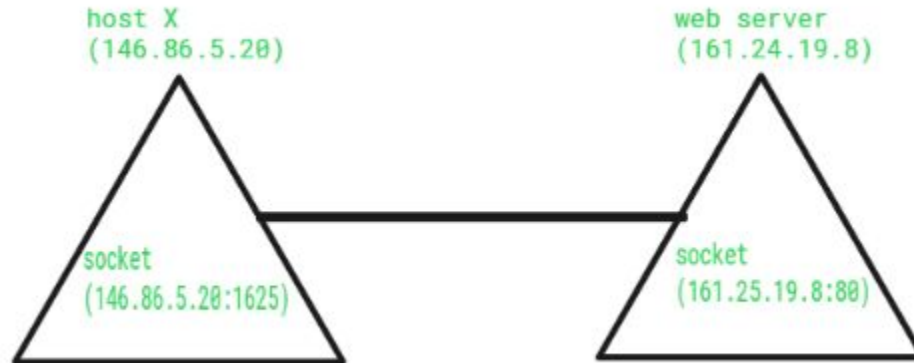
Also known as physical address, is the unique identifier of each host and is associated with the [NIC](#) (Network Interface Card).

MAC address is assigned to the NIC at the time of manufacturing. Length of the MAC address is : 12-digit/ 6 bytes/ 48 bits



# Socket

A web connection that is a **combination of the IP address and port** e.g.  
172.3.144.87:3306



# DNS

**Domain Name System** is the phonebook of the Internet.

Humans access websites via domain names e.g. [www.facebook.com](http://www.facebook.com) but web browsers interact through IP Addresses.

DNS **translates domain names to IP addresses** so browsers can load Internet resources.

# Common Linux Commands

***ifconfig*** - display the current network interface configuration information

***traceroute*** - record the route through the internet from one computer to another

***dig*** - command-line tool for querying the Domain Name System

***ping*** - test your connection to the IP address/ DNS

***nslookup*** - command for obtaining DNS records

***netstat*** - displays the contents of various network-related data structures for active connections

# Goals of Networking



# Goals Of Networking

## Resource Sharing

Many organization has a substantial number of computers in operations, which are located apart. Ex. A group of office workers can share a common printer, fax, modem, scanner, etc.

# Goals Of Networking

## High Reliability

If there are alternate sources of supply, all files could be replicated on two or, machines. If one of them is not available, due to hardware failure, the other copies could be used.

# Goals Of Networking

## Inter-process

Communication Network users, located geographically apart, may converse in an interactive session through the network. In order to permit this, the network must provide almost error-free communications.

# Goals Of Networking

## **Flexible Access**

Files can be accessed from any computer in the network. The project can be begun on one computer and finished on another.



# Goals Of Networking

## Other goals

- Distribution of processing functions,
- Centralized management, and allocation of network resources,
- Compatibility of dissimilar equipment and software,
- Good network performance,
- Scalability,
- Saving money,
- Access to remote information,
- Person to person communication, etc.

# Break

**Take a break!**



# What's Next?



# Assignment

In this assignment, find the following:

**Question 1:** Get the IP Address of skillsunion.com.

**Question 2:** Determine the network latency of skillsunion.com?

**Question 3:** Identify all devices on the path between your computer to skillsunion.com.

**Question 4:** Look up the DNS of skillsunion.com without using nslookup.

**Question 5:** Find out the whois details of skillsunion.com.

**Once done, submit them on Blackboard!**

# Useful Links

<https://commotionwireless.net/docs/cck/networking/learn-networking-basics/>

<https://www.comparitech.com/net-admin/hub-vs-switch-vs-router/>

<https://www.sierraexperts.com/7-types-of-computer-networks-explained>

