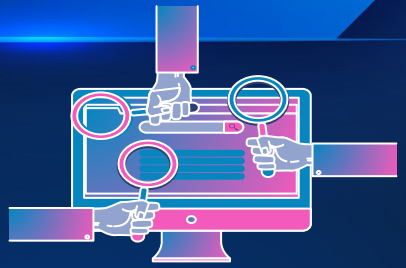
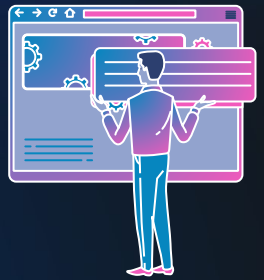




Computer Networking

Basics

Contents

Here's what you'll find in this.

What is a Computer Network?

Communication between two or more network Interfaces.

Components of Computer Network

1. Two or more computers/Devices
2. Cables as links between the computers
3. A network interfacing card(NIC) on each
4. computer
5. Switches
6. Routers
7. Software called Network operating system(NOS)

OSI Model

- People around the world uses computer network to communicate with each other.
- For worldwide data communication, systems must be developed which are compatible to communicate with each other.
- There should be standard communication methods & devices.
- ISO (International Organization of Standardization) has developed this standard.

OSI Model

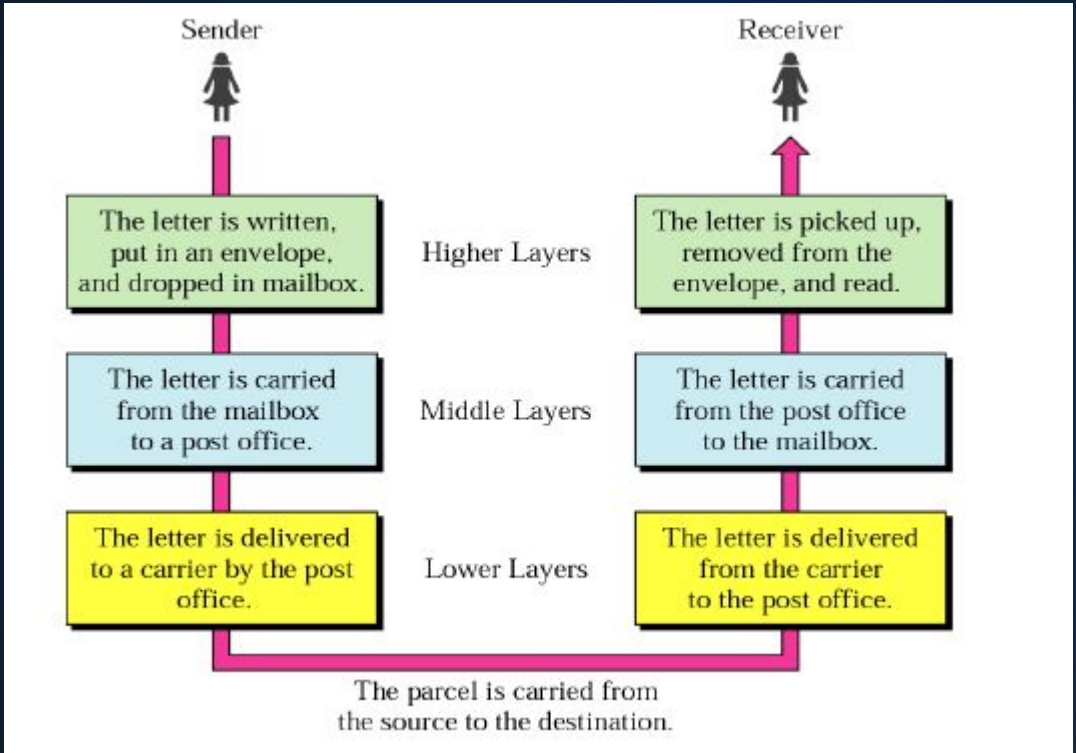
- This communication model is called as **Open System Interconnection (OSI).**
- ISO-OSI model is a seven layer architecture developed in 1984.

OSI Model

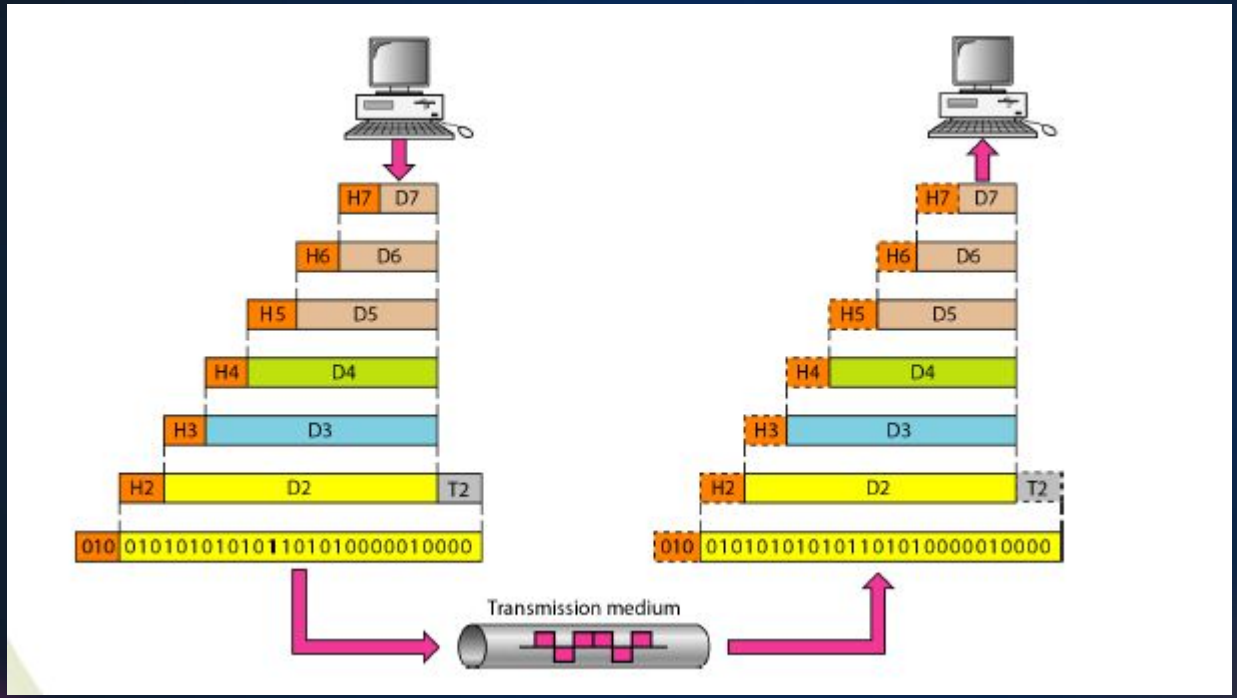
- The basic elements of a layered model are
  - services
  - protocols
  - and interfaces.

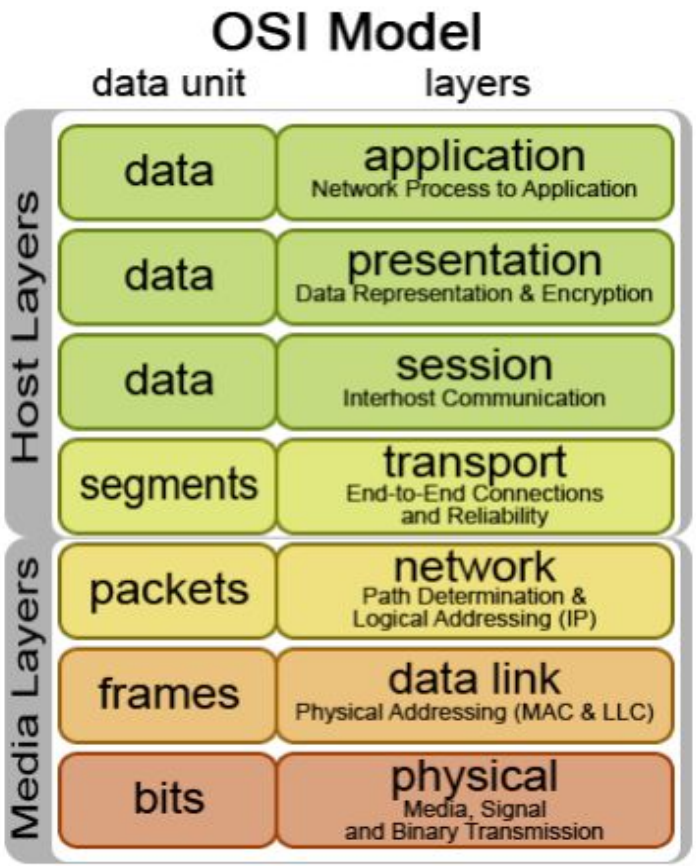
1. A service is a set of actions that a layer offers to another (higher) layer.
2. A Protocol is a set of rules that a layer uses to exchange information.
3. A Interface is communication between the layers.

Sending - Receiving Letters



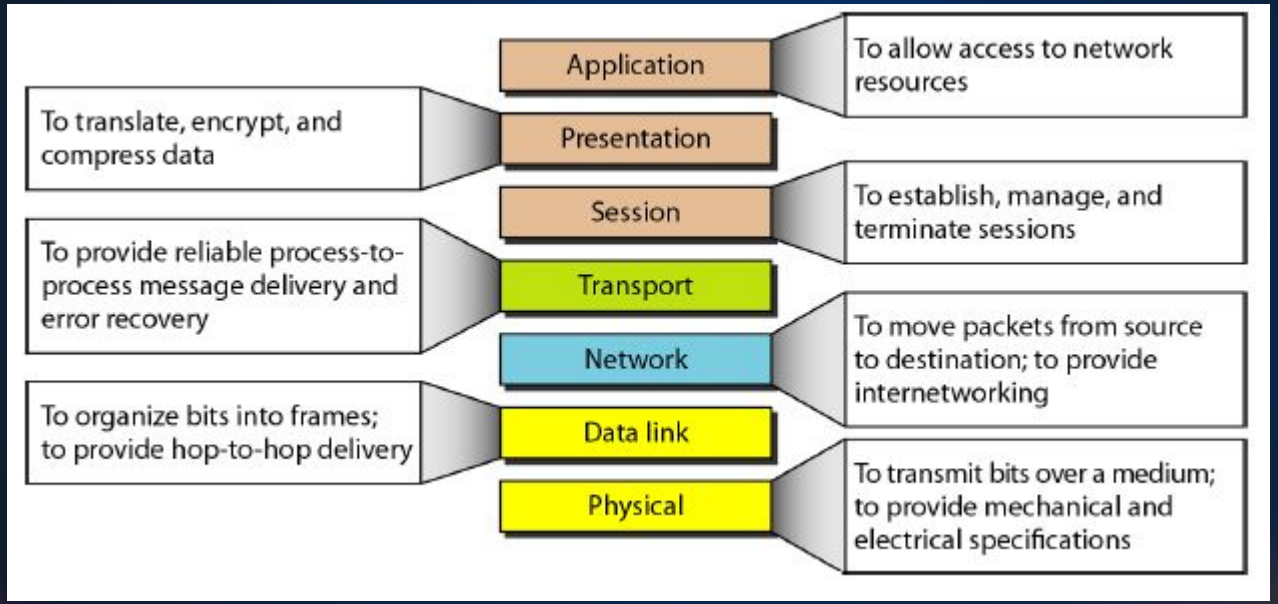
Sending - Receiving Data




OSI Model
data unit
layers
Host Layers
Media Layers
data
application
Network Process to Application
data
presentation
Data Representation & Encryption
data
session
Interhost Communication
segments
transport
End-to-End Connections and Reliability
packets
network
Path Determination & Logical Addressing (IP)
frames
data link
Physical Addressing (MAC & LLC)
bits
physical
Media, Signal and Binary Transmission

OSI Model	DoD Model	protocols		devices/apps
layer 5, 6, 7	application	dns, dhcp, ntp, snmp, https, ftp, ssh, telnet, http, pop3... others		web server, mail server, browser, mail client...
layer 4	host-to-host	tcp	udp	gateway
layer 3	internet	ip, icmp, igmp		router, firewall layer 3 switch
layer 2	network access	arp (mac), rarp		bridge layer 2 switch
layer 1		ethernet, token ring		hub

Summary of Layers

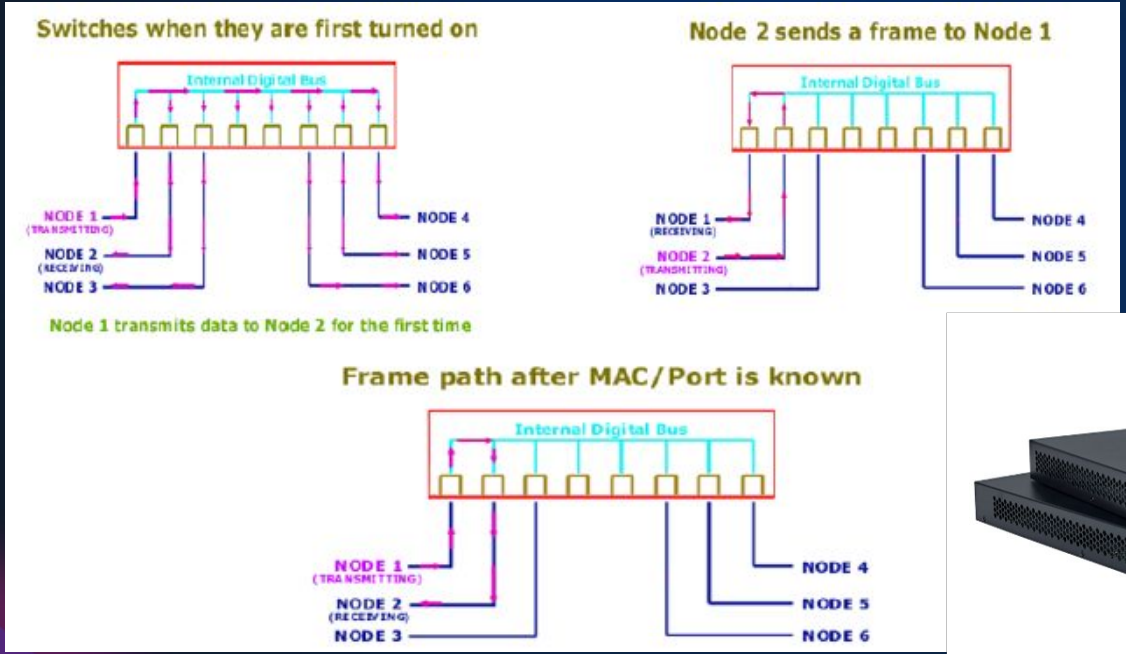


Classification of network By Geography

- LAN
  - Local area Network
- WAN
  - Wide Area Network
- MAN
  - Metropolitan area network
- CAN
  - Campus Area Network
- PAN
  - Personal Area Network

Switches

Switches facilitate the sharing of resources by connecting together all the devices, including computers, printers, and servers, in a small business network

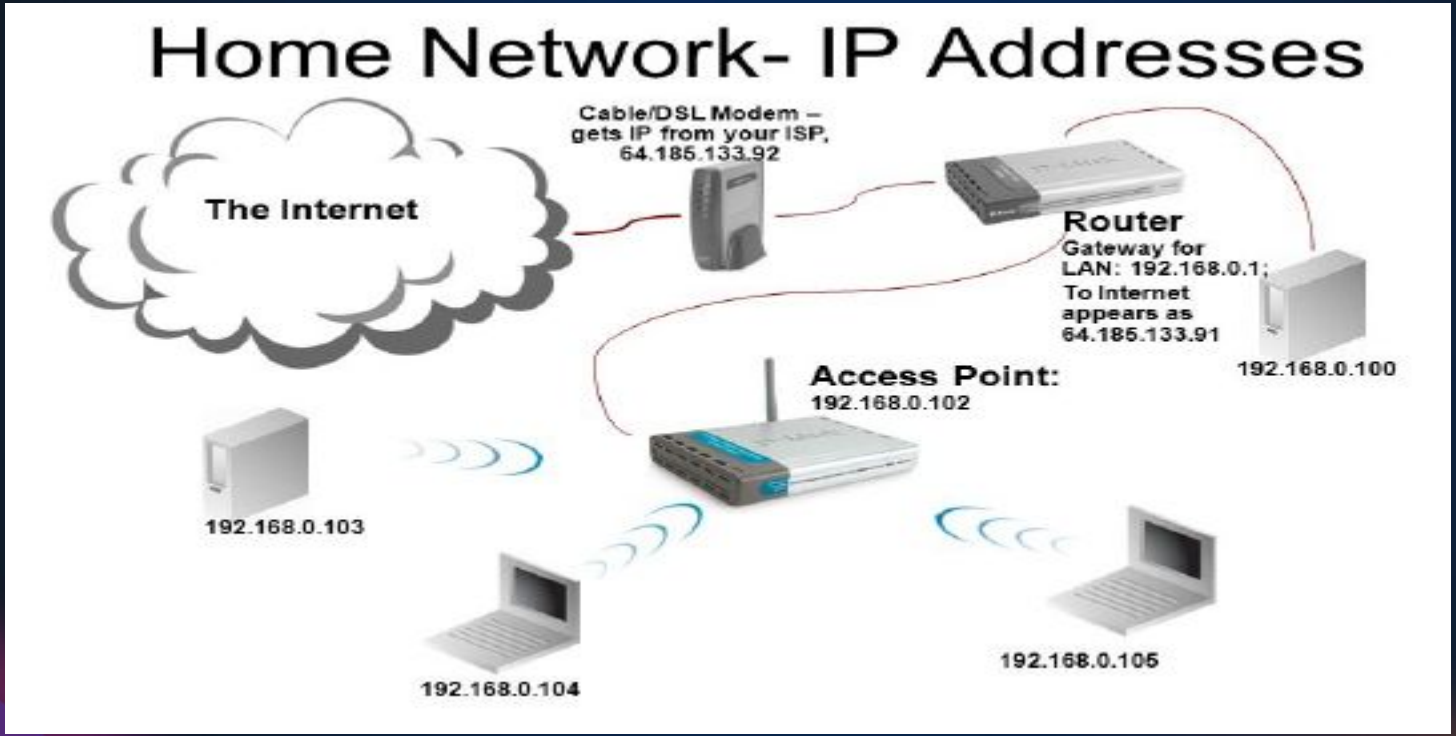


ROUTERS

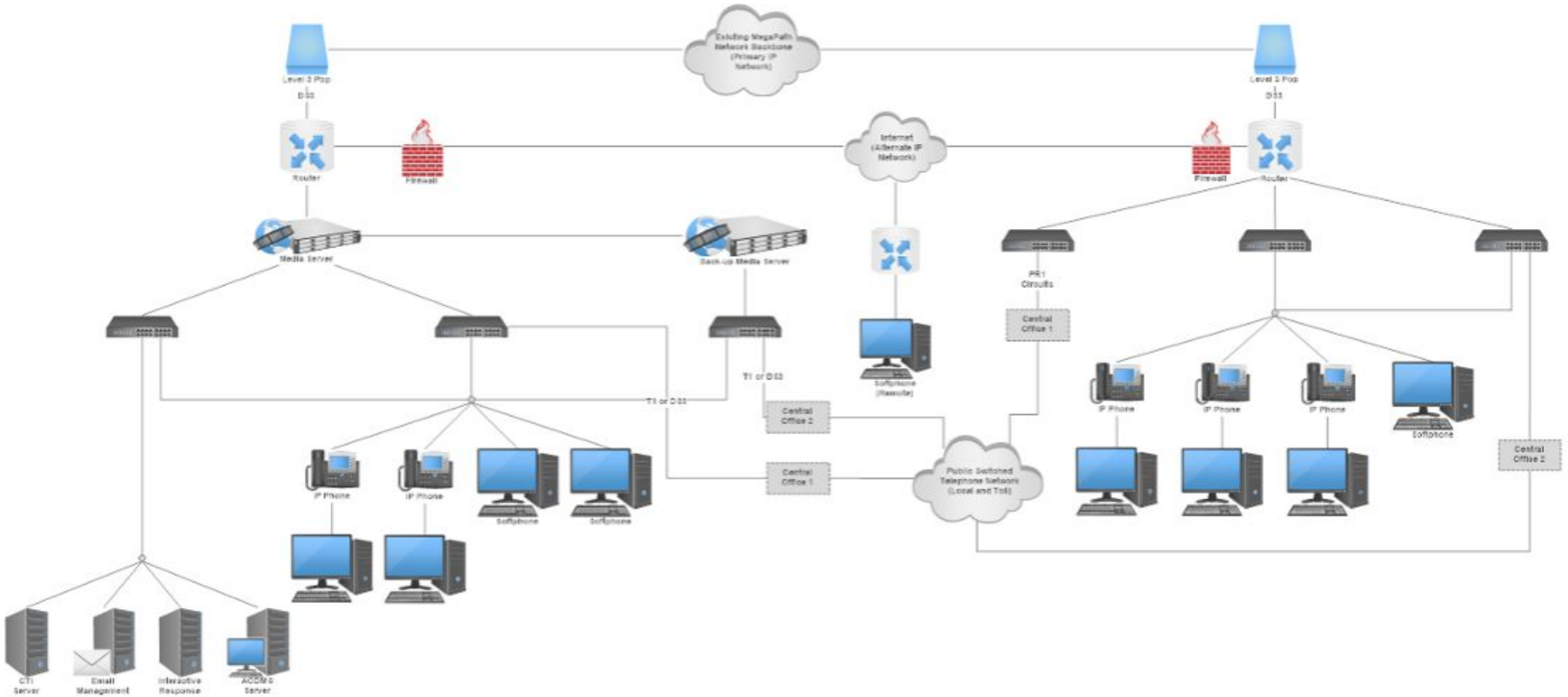
A router receives and sends data on computer networks. Routers are sometimes confused with network hubs, modems, or network switches. However, routers can combine Multiple Networks together.

Home Network

Home Network

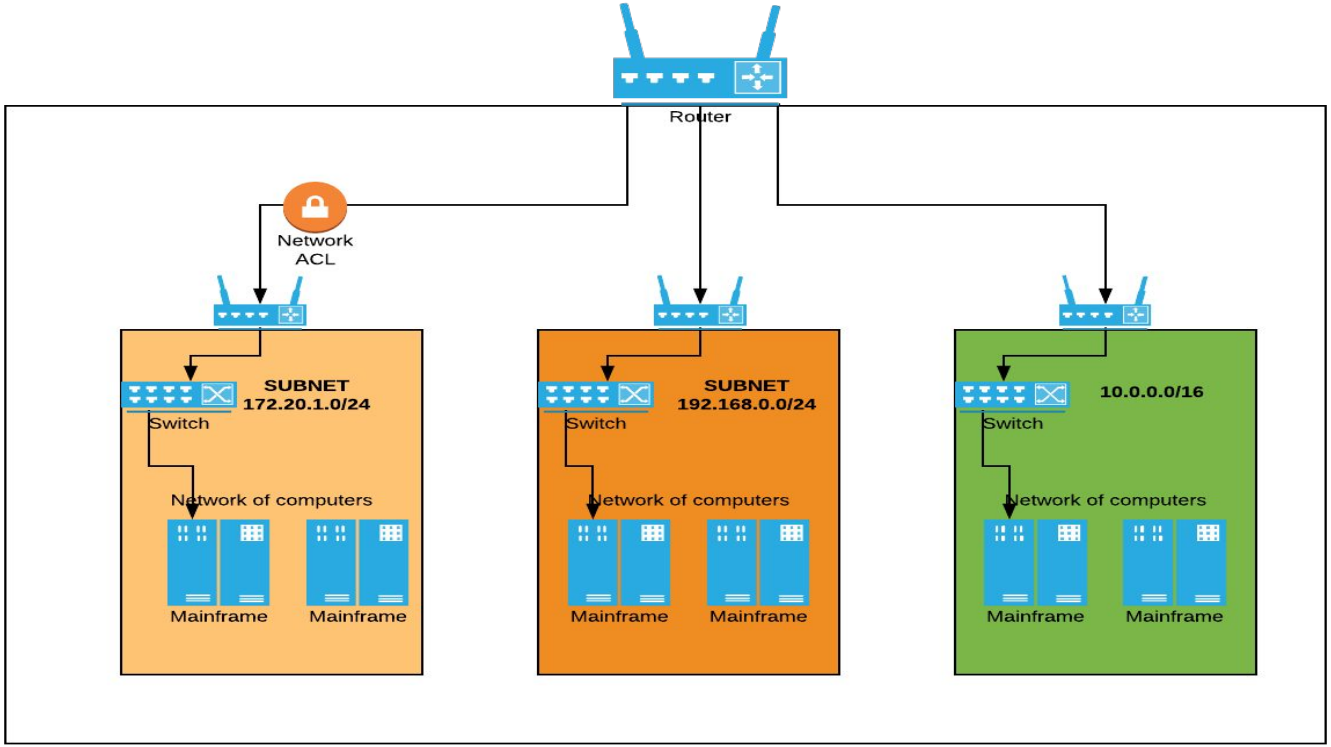


Network Diagram: Telecommunications Network Architecture

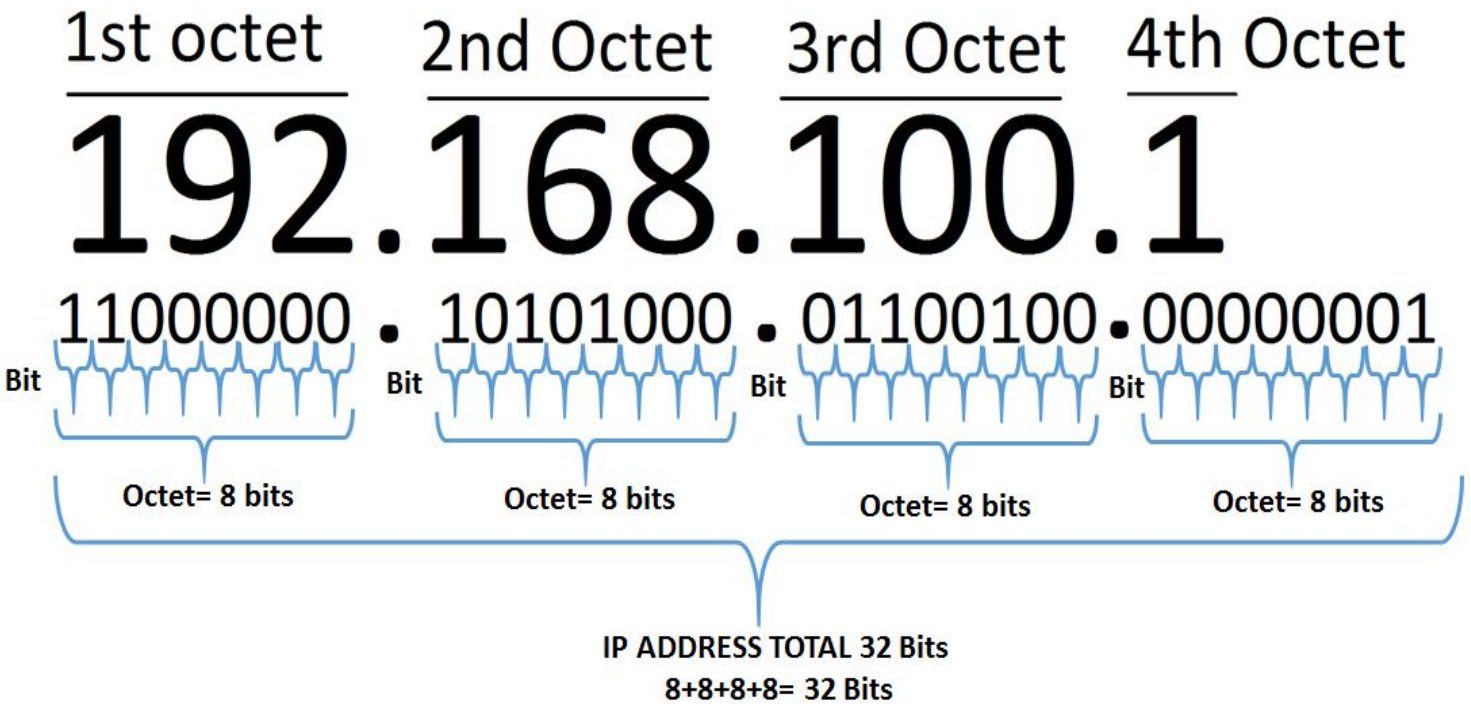


Corporate Datacenter

AMAZON VPC



IPv4 Address



IPv4 Range

- 0.0.0.0 – 255.255.255.255
- 00000000.00000000.00000000.00000000 (0.0.0.0)
- 11111111.11111111.11111111.11111111 (255.255.255.255)

Public and Private IP Division

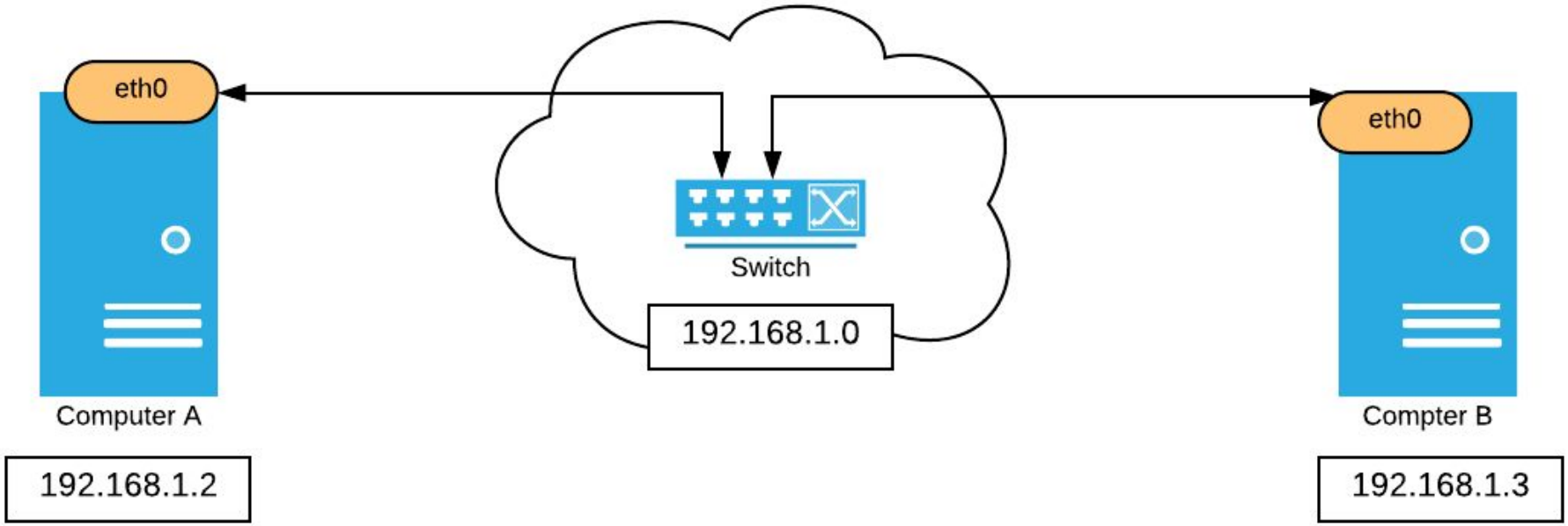
- Public IP => Internet
  - E:g 54.86.23.90
- Private IP => For local network design
  - E:g 192.168.1.10

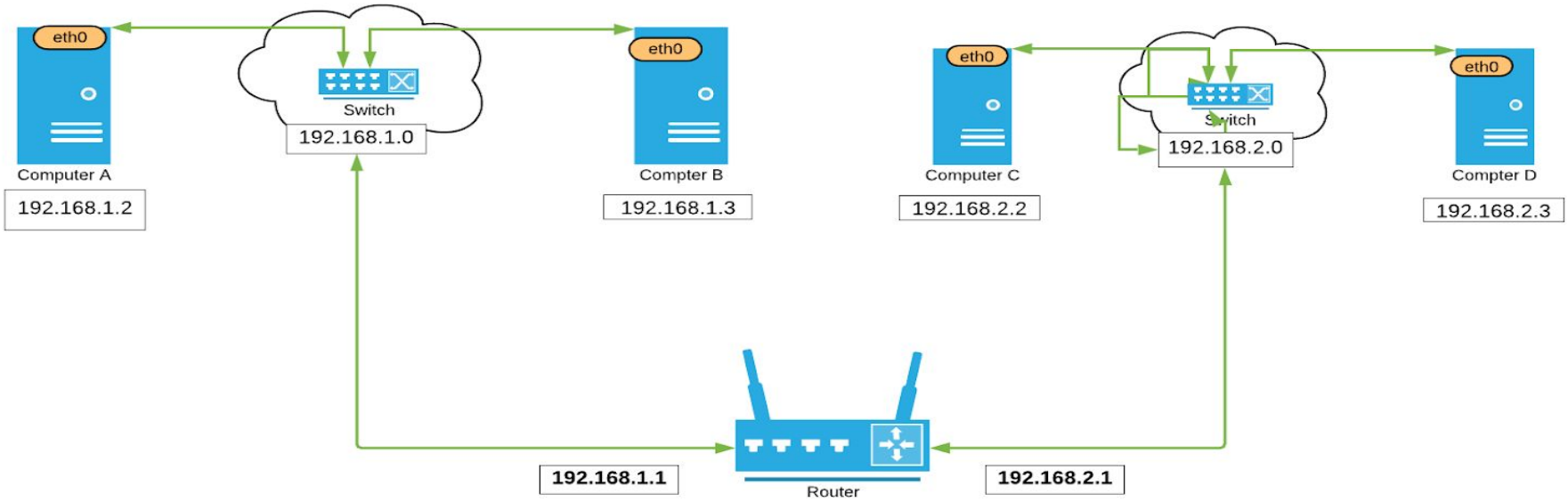
Private IP Ranges

- Class A 10.0.0.0 - 10.255.255.255
- Class B 172.16.0.0 - 172.31.255.255
- Class C 192.168.0.0 - 192.168.255.255

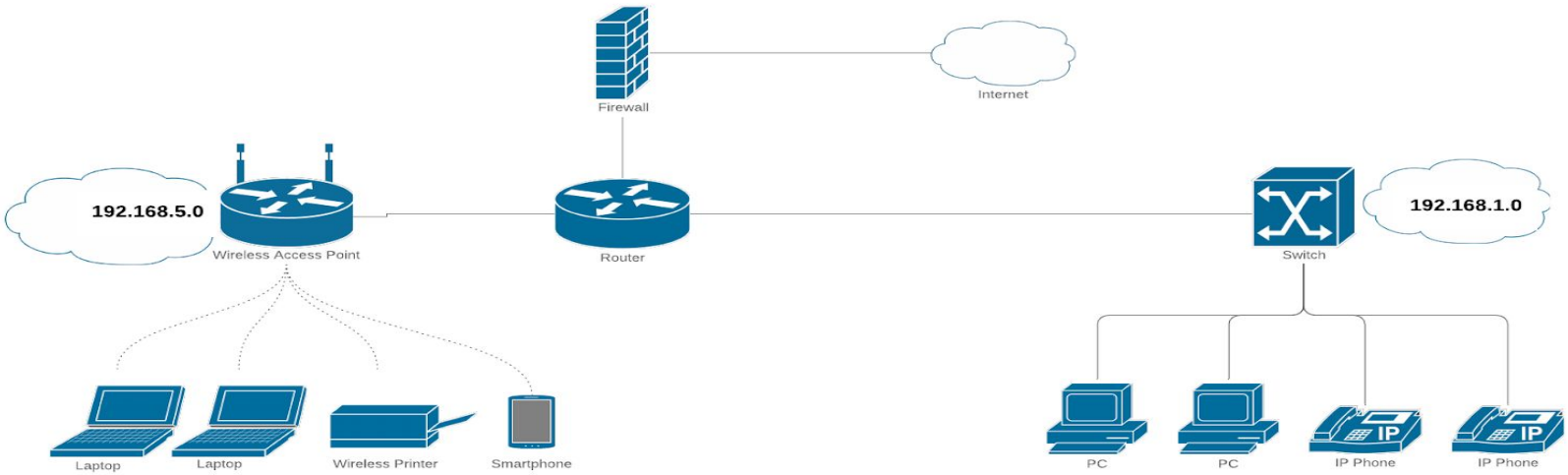
Subnet Masks

- 255.0.0.0
- 255.255.0.0
- 255.255.255.0


eth0
Switch
192.168.1.0
eth0
Computer A
Compter B
192.168.1.2
192.168.1.3


eth0
Computer A
192.168.1.2
Switch
192.168.1.0
eth0
Compter B
192.168.1.3
eth0
Computer C
192.168.2.2
Switch
192.168.2.0
eth0
Compter D
192.168.2.3
192.168.1.1
Router
192.168.2.1

Network Diagramme



Protocols

In the networking and communications area, a protocol is the formal specification that defines the procedures that must be followed when transmitting or receiving data. Protocols define the format, timing, sequence, and error checking used on the network.

TCP

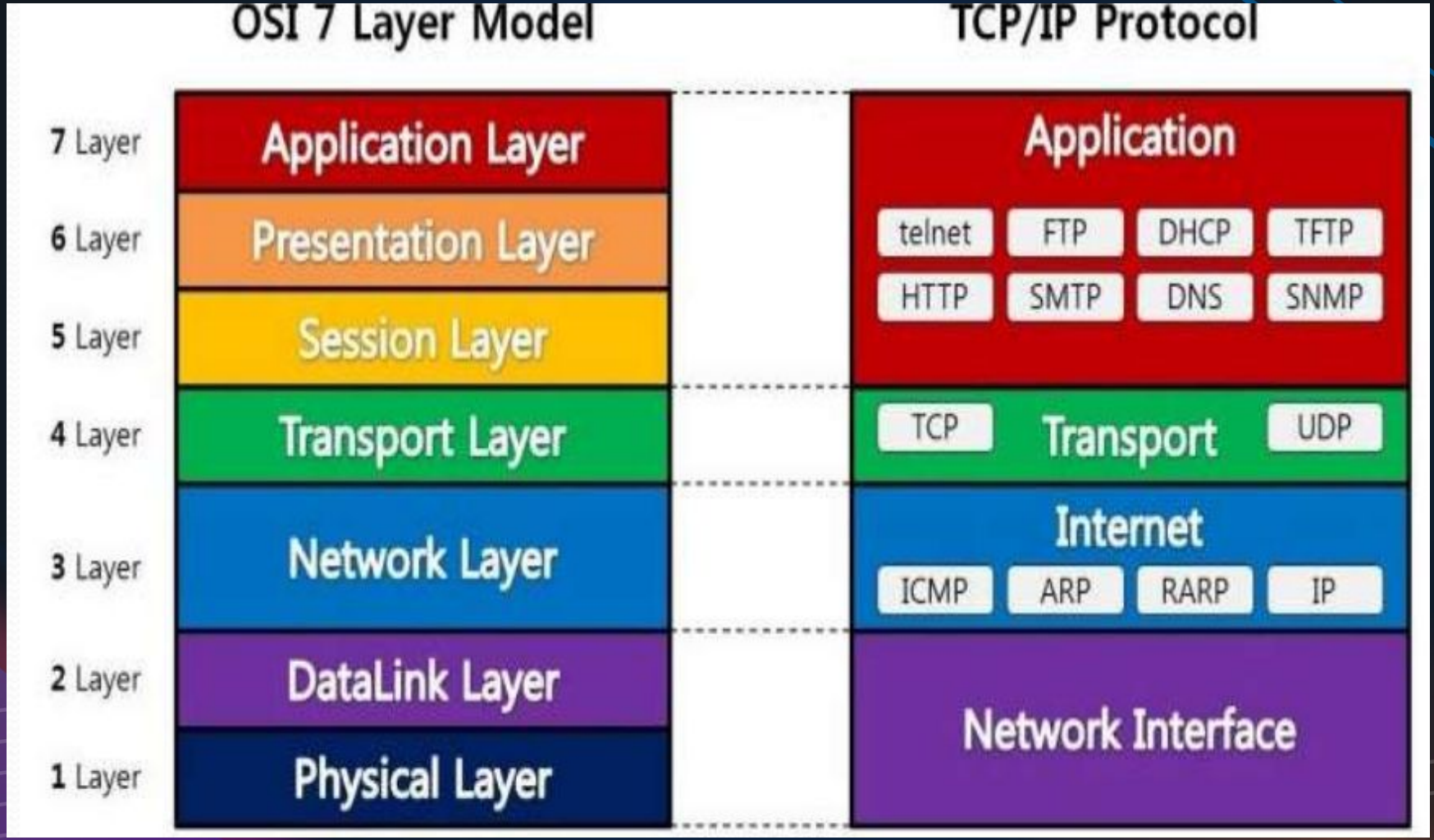
- Reliable Protocol
- Connection Oriented
- Performs three ways handshake
- Provision for error detection and retransmission
- Most applications use TCP for reliable and guaranteed transmission
- FTP,HTTP,HTTPS

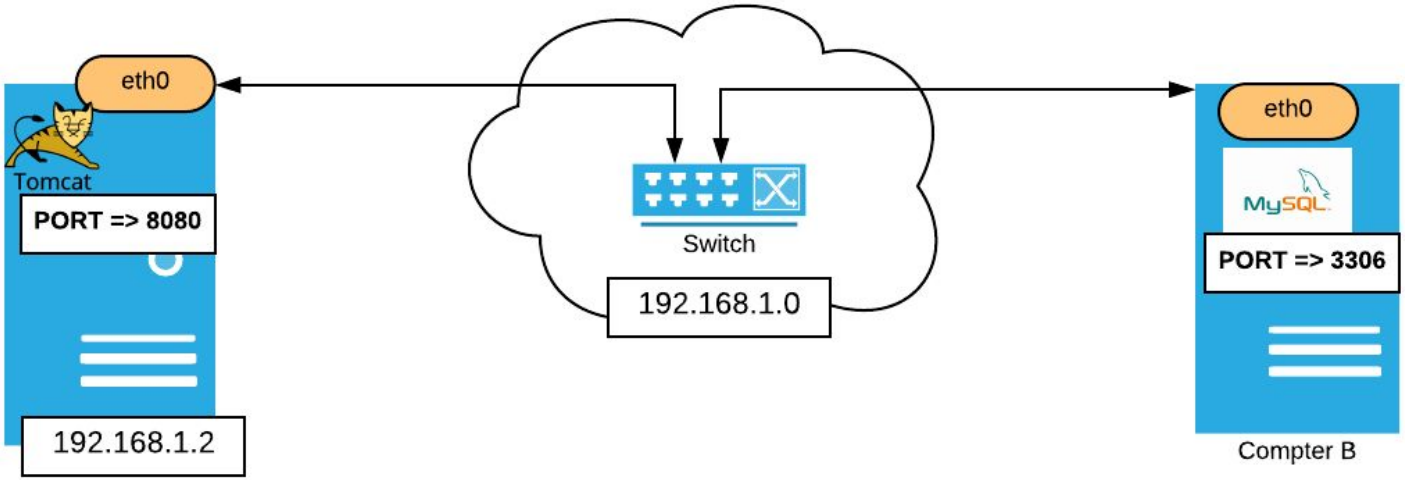
UDP

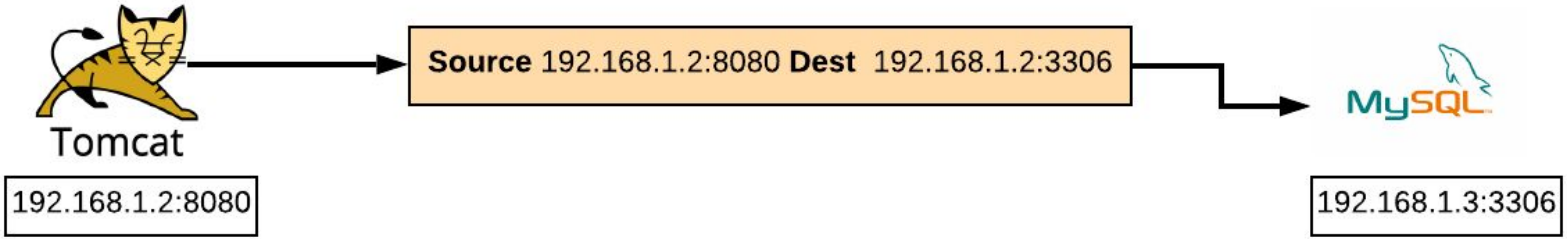
- Unreliable Protocol
- Connectionless
- Much faster than TCP
- No acknowledgement waits
- No proper sequencing of data units
- Suitable for applications where speed matters more than reliability
- DNS,DHCP,TFTP,ARP, RARP

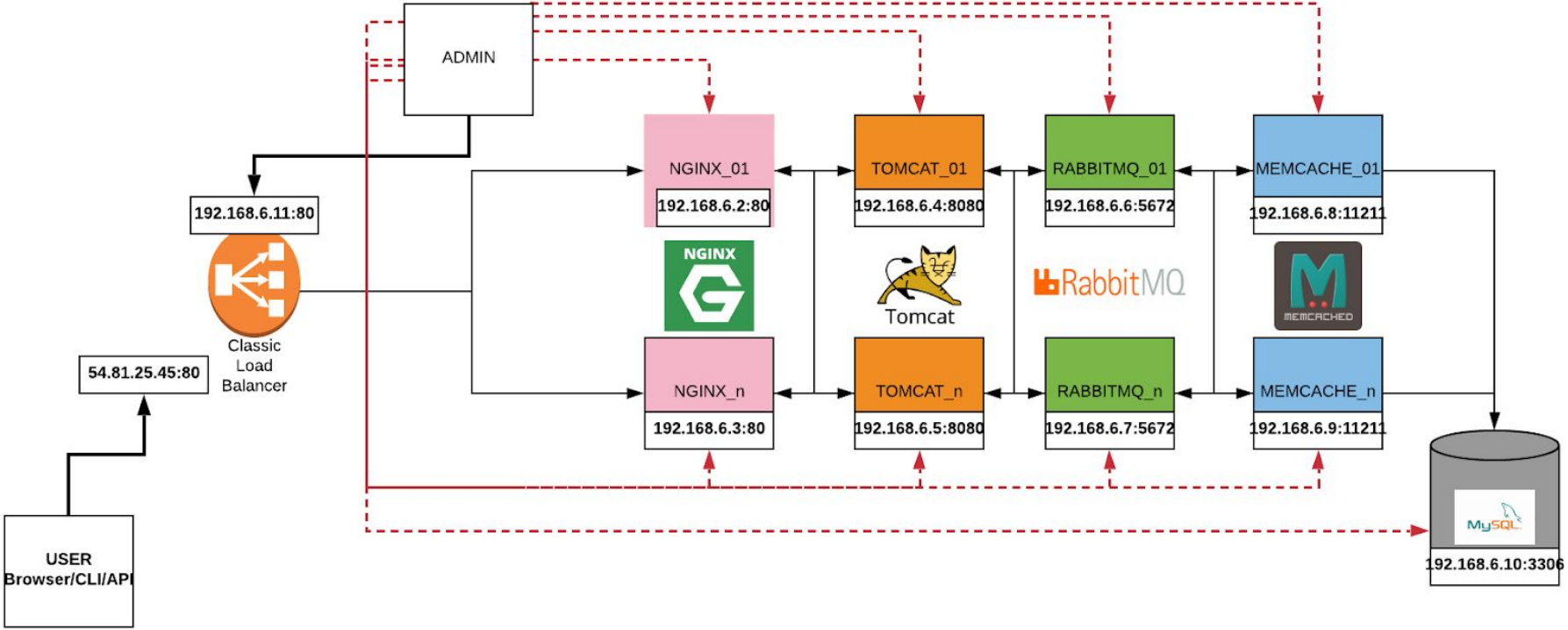
Protocols & Port Numbers

Label on Column	Service Name	UDP and TCP Port Numbers Included
DNS	Domain Name Service – UDP	UDP 53
DNS TCP	Domain Name Service – TCP	TCP 53
HTTP	Web	TCP 80
HTTPS	Secure Web (SSL)	TCP 443
SMTP	Simple Mail Transport	TCP 25
POP	Post Office Protocol	TCP 109, 110
SNMP	Simple Network Management	TCP 161,162 UDP 161,162
TELNET	Telnet Terminal	TCP 23
FTP	File Transfer Protocol	TCP 20,21
SSH	Secure Shell (terminal)	TCP 22
AFP IP	Apple File Protocol/IP	TCP 447, 548

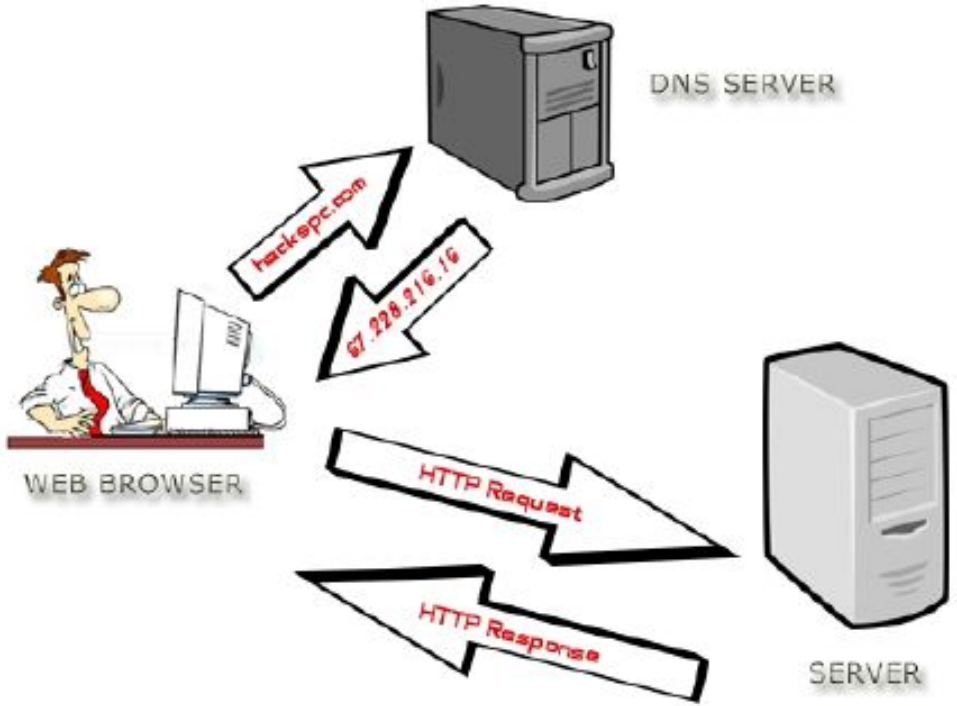

OSI 7 Layer Model
TCP/IP Protocol
7 Layer
Application Layer
6 Layer
Presentation Layer
5 Layer
Session Layer
4 Layer
Transport Layer
3 Layer
Network Layer
2 Layer
DataLink Layer
1 Layer
Physical Layer
Application
telnet
FTP
DHCP
TFTP
HTTP
SMTP
DNS
SNMP
TCP
Transport
UDP
Internet
ICMP
ARP
RARP
IP
Network Interface


eth0
Tomcat
PORT => 8080
192.168.1.2
Switch
192.168.1.0
eth0
MySQL
PORT => 3306
Compter B


Source 192.168.1.2:8080 Dest 192.168.1.2:3306
Tomcat
192.168.1.2:8080
MySQL
192.168.1.3:3306


ADMIN
192.168.6.11:80
Classic
Load
Balancer
54.81.25.45:80
USER
Browser/CLI/API
NGINX_01
192.168.6.2:80
NGINX_n
192.168.6.3:80
TOMCAT_01
192.168.6.4:8080
TOMCAT_n
192.168.6.5:8080
Tomcat
RABBITMQ_01
192.168.6.6:5672
RABBITMQ_n
192.168.6.7:5672
RabbitMQ
MEMCACHE_01
192.168.6.8:11211
MEMCACHE_n
192.168.6.9:11211
MEMCACHED
MySQL
192.168.6.10:3306

DNS


DNS SERVER
hackepc.com
67.228.216.16
WEB BROWSER
HTTP Request
HTTP Response
SERVER

How DNS Works

Computer browser requests
to vist http://www.computerhope.com

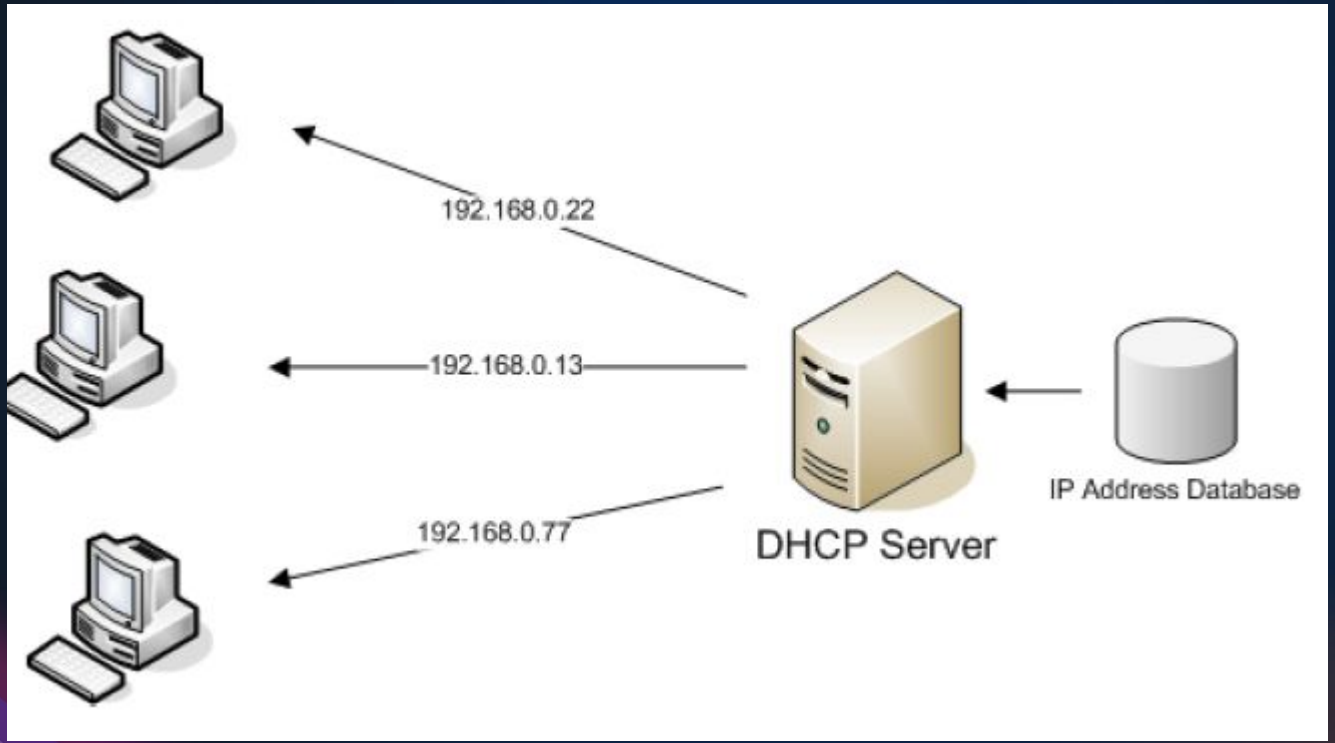
Company or local DNS is checked and is unable to find address.

ISP DNS is checked and is unable to find address.

Root DNS is checked and finds the IP address as 45.79.151.23. IP address is returned to computer.

Computer recieves IP address and has browser open that address.

DHCP


192.168.0.22
192.168.0.13
192.168.0.77
DHCP Server
IP Address Database