Chapter 5 : Understanding the Cloud Computing

Overview

In this module we will discuss the fundamentals of cloud computing, why business are moving on cloud. We will also be introduced to Microsoft Azure. We will discuss about services offered in Azure. We will also learn about networking protocols and implement them with different services in Azure.

Contents

- Introduction to Microsoft Azure
- Cloud Deployment and Service Delivery Models
- Getting Started with an Azure Cloud
- Fundamentals of Networking
- Networking Protocols

Learning Objectives

In this module, we will achieve following objectives.

- Introduction to Cloud Computing as a domain.
- Learning about Microsoft Azure Portal and offered services.
- Working knowledge of networking protocols and integration to Azure services.
- Real time implementation of services like virtual machines and virtual networks.
- Understand the prospects with Cloud Computing.

Cloud Computing

Cloud computing means providing software and hardware services over some network, mostly internet. These software and hardware services include compute services, storage, databases, and network services. All these services can be scaled up or down, as per user requirement, and are available on demand over some network.

Reference:Cloud Computing

Introduction to Microsoft Azure

Microsoft Azure, as the name suggests, is a cloud platform from Microsoft.

It is a continually expanding set of cloud services that help an organization meet its current and future business challenges.

Why Microsoft Azure?

Scenario: A group of students have a great business idea. They plan to develop it and start a production.

For that, they need to buy new Computing resources and a variety of software licences.

But, Buying and understanding the entire set up would be :

✓Time Consuming and Costly

✓Requires Physical Space with sufficient power and cooling

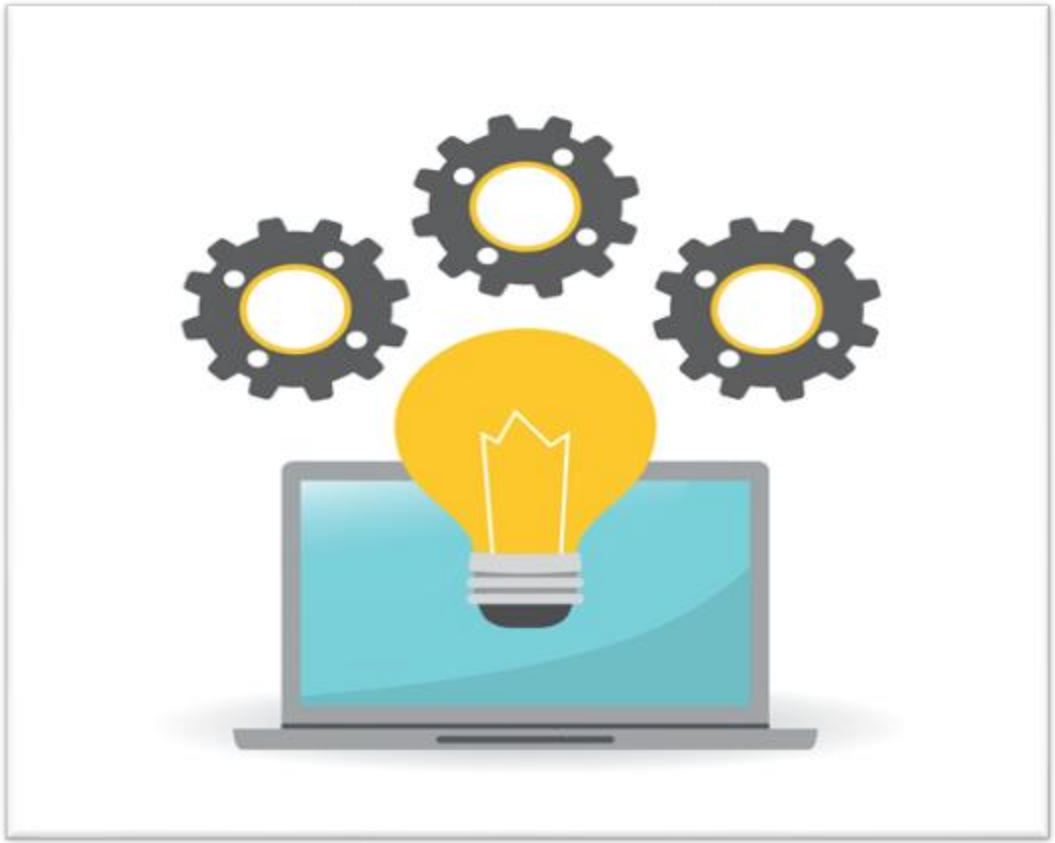
Why Microsoft Azure?

- ✓Maintain and manage them requires experts
- ✓Acquire maximum computing resources than needed.
- ✓Ending up with less utilization.
- ✓Focusing more on troubleshooting at the infrastructure level than the end business goal.

Solution: Microsoft Azure

Microsoft Azure provides:

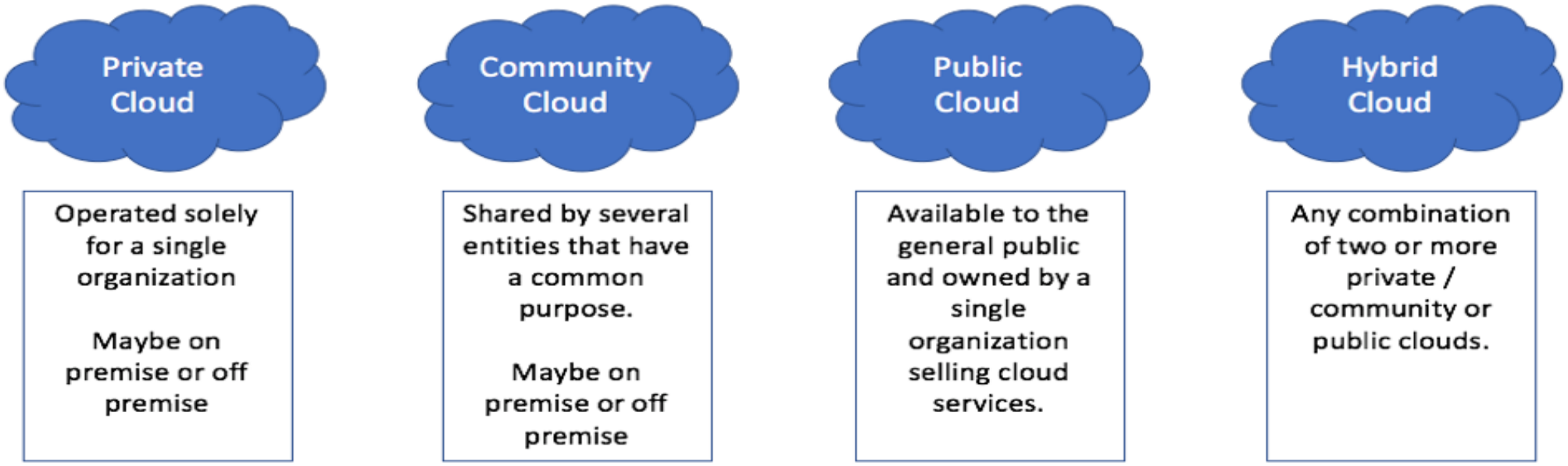
- High availability
- Scalability
- Elasticity
- Agility
- Geo-distribution
- Disaster recovery



solution

Cloud Deployment and Service Delivery Models

Cloud Computing Deployment Models



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Deployment Models

Private Cloud

- The cloud services are offered on a private infrastructure.
- Most of the times private cloud is for internal developers
- Misses most if not all the benefits of the cloud.
- Similar to an on-premise data center.

Deployment Models

Community Cloud

- Specific group of users band together to build a community cloud
- Like a private club cloud.
- Not a go to concept.

Deployment Models

Public cloud

- Most common form of cloud deployment.
- Every online user is using at least a few services deployed on public cloud.
- Accessible through the public Internet.

Deployment Models

Hybrid cloud

- The hybrid cloud combines and unifies public cloud, private and on-premises infrastructure to create a single, flexible and cost optimal IT infrastructure.

- With hybrid cloud business objective can be achieved more effectively and efficiently than public or private cloud.

Service Models

Three service models

- Infrastructure as a Service (IaaS)
- Platform as a Service(PaaS)
- Software as a Service (SaaS)

Note: Boundaries between them are breaking down.

Service Models

Infrastructure as a Service (IaaS)

- The most basic form services
- Virtual hardware resources and system software.
- The consumer installs and manages the needed software.
- High Control but high engagement.

Service Models

Platform as a Service(PaaS)

- Can be used to develop applications by the service consumer
- Allows to write code and configure the service
- Vendor manages the underlying infrastructure

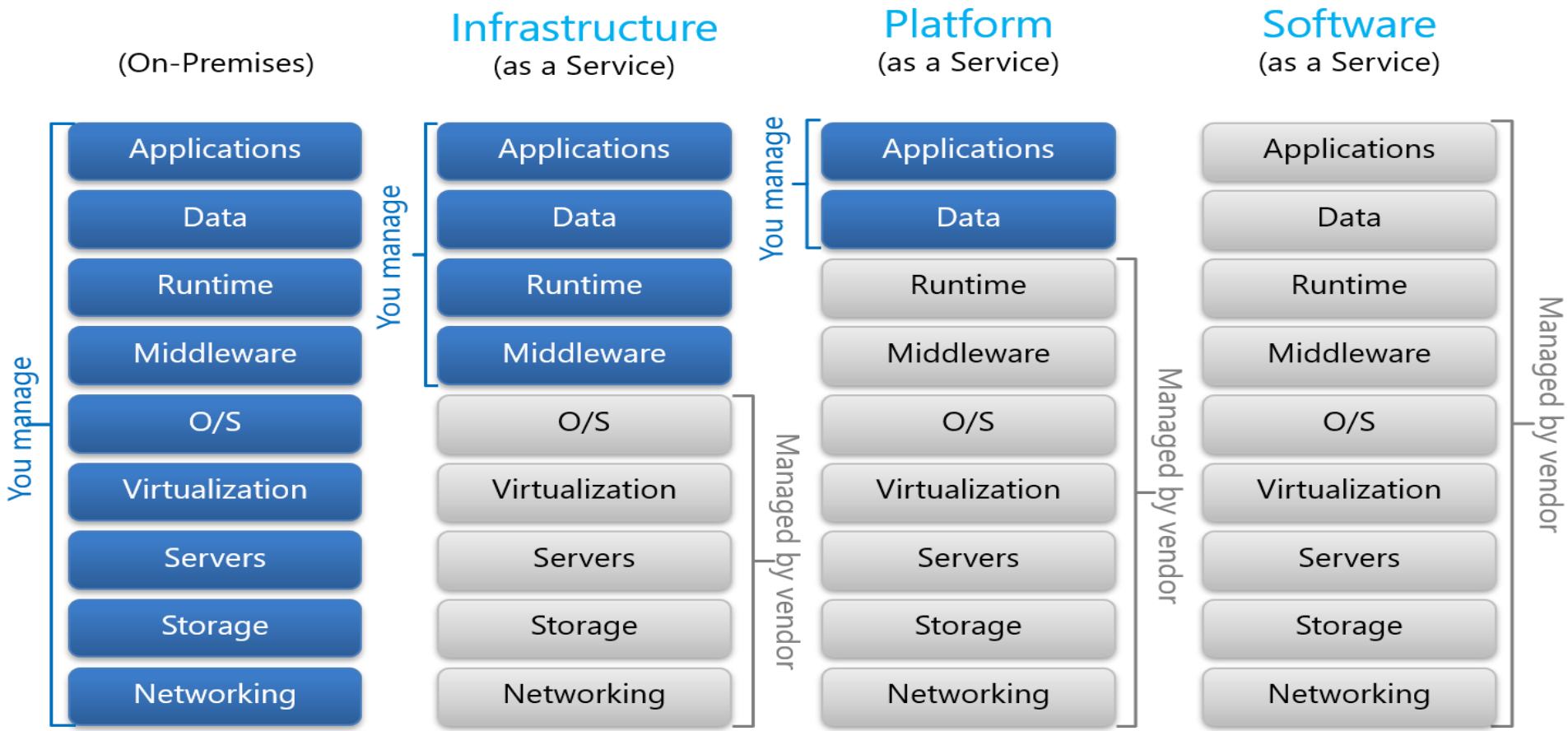
Service Models

Software as a Service (SaaS)

- Everything is managed by the vendor
- You only configure and use it through a web browser.
- Common examples are Google's services like Docs, Calendar, and Sheets or Microsoft's Office 365.

These provide the user with only limited options to configure the software.

Service Models



cloud service models - Bing images

Fundamentals of Networking

Fundamentals of Networking

When you connect two or more than two computing devices together, they become connected by a network.

- This connection may be wired or wireless.

The connection, maintenance and administration of this network is called Networking.

Types of Networks

There are various types of networks. This is based on coverage. The types are as follows:

- LAN aka Local Area Network
- MAN, aka Metropolitan Area Network
- WAN aka Wide Area Network

Topologies

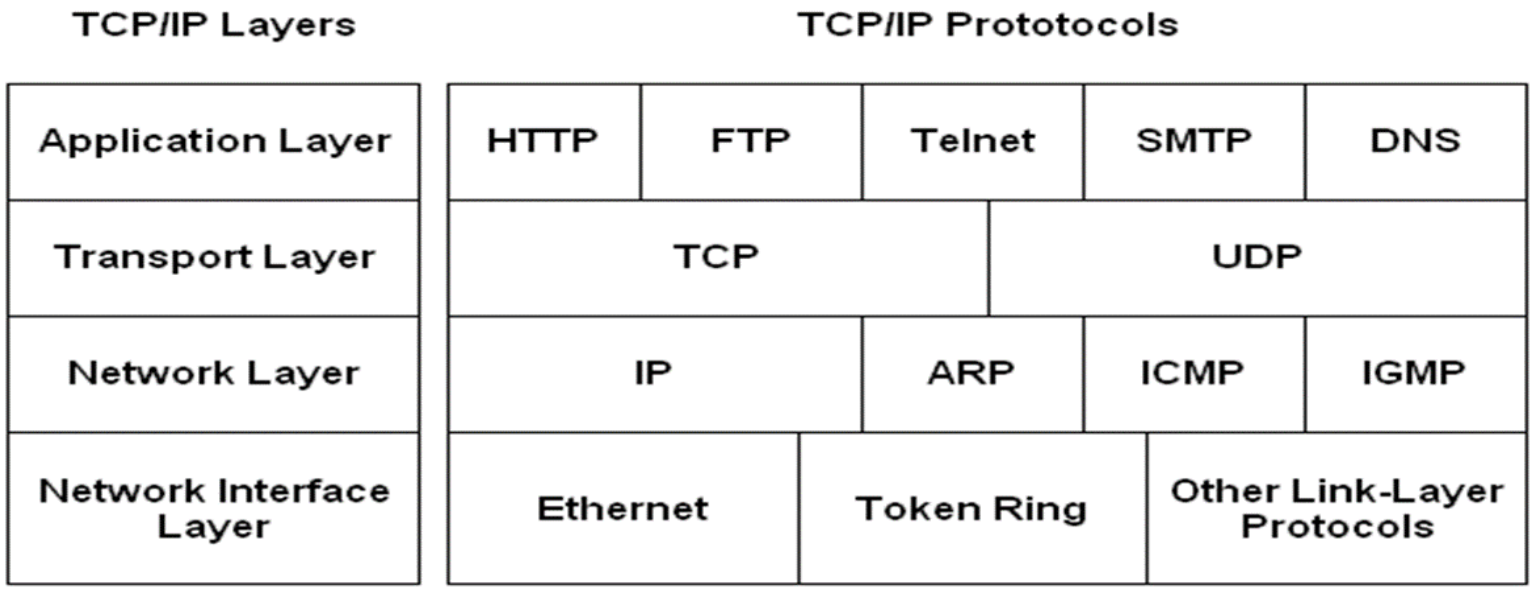
Topology is about the logical pattern of connection. There are six types of topologies.

- Bus Topology
- Ring Topology
- Star Topology
- Tree Topology
- Mesh Topology
- Hybrid Topology

Networking Protocols

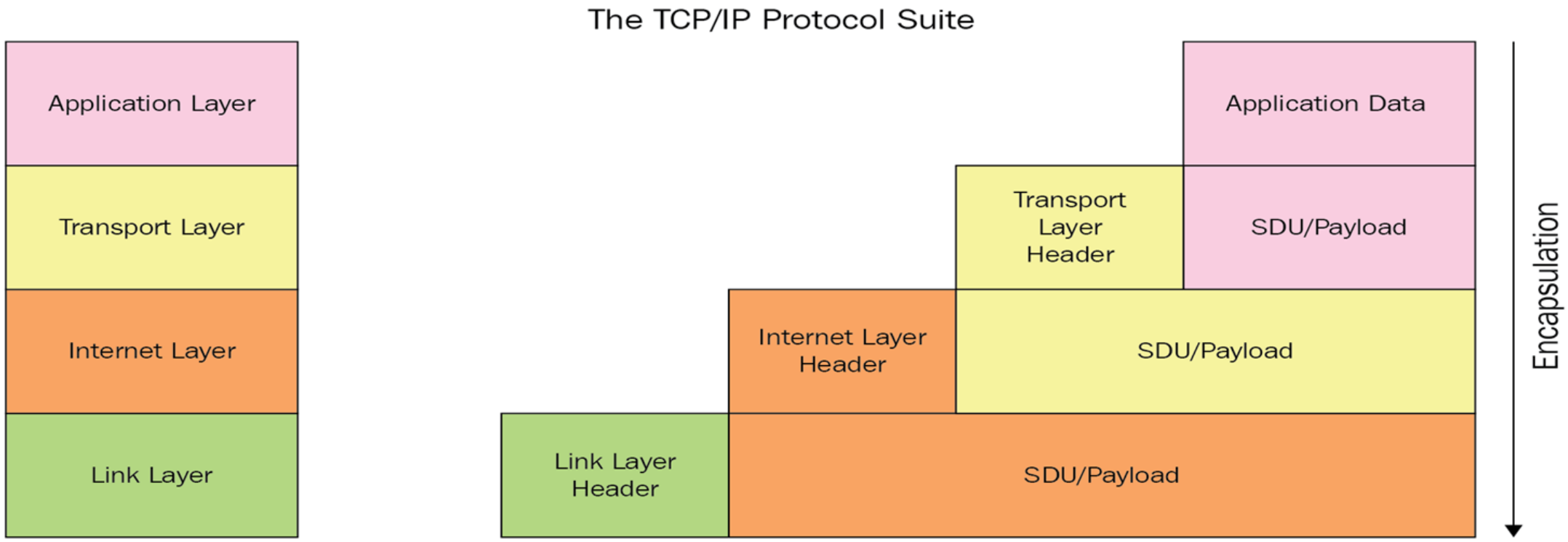
Networking Protocols

The TCP/IP suite is named after its most important protocols, the Transmission Control Protocol (TCP) and the Internet Protocol (IP).



TCP/IP Layered Architecture

TCP/IP Suits



Reference: https://static.packt-cdn.com/products/9781789340501/graphics/11178d65-a95d-461c-86a7-2f6958a6ed70.png

Transmission Control Protocol(TCP) and User Datagram Protocol (UDP)

- TCP is connection-oriented communication protocol
- User Datagram Protocol (UDP)

Transmission Control Protocol(TCP) Features

- Establishes a Session
- Ensures Reliable Delivery
- Provides Same-Order Delivery
- Supports Flow Control

User Datagram Protocol (UDP) Features

UDP features include the following:

- Connection status
- Data sequencing
- Guaranteed delivery
- Retransmission of data
- Error checking
- Method of transfer
- Speed
- Broadcasting
- Optimal use

Internet Protocol

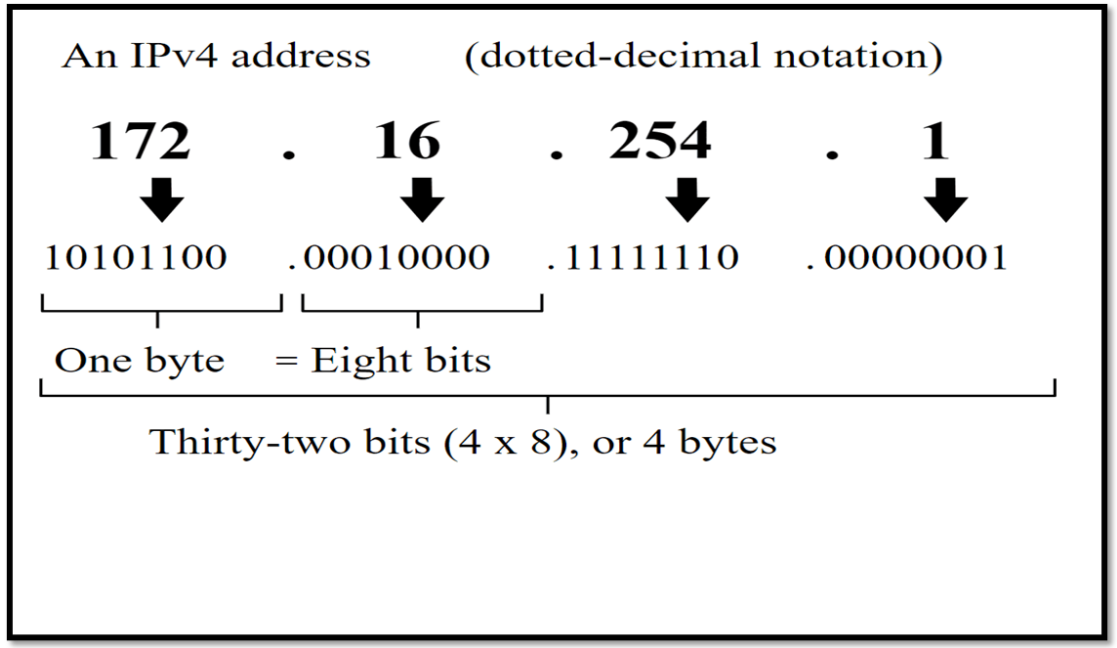
- IP stands for internet protocol.

- IP specifies formats of packets also called as datagrams and the addressing scheme.

- Most networks combines IP with higher level protocol called Transmission Control Protocol which establish virtual connection between destination and source.

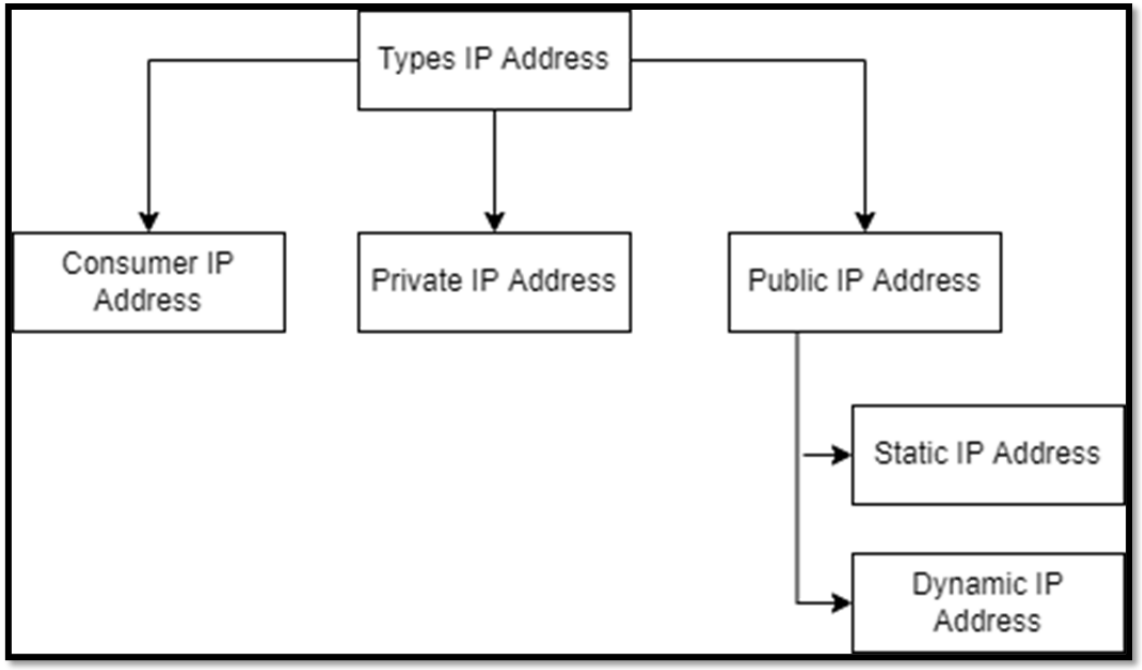
What is Internet Protocol ?

An IP address is a unique identifier assigned to a device or domain that connects to the Internet. An IP address can contain information about its network, sub network and host.



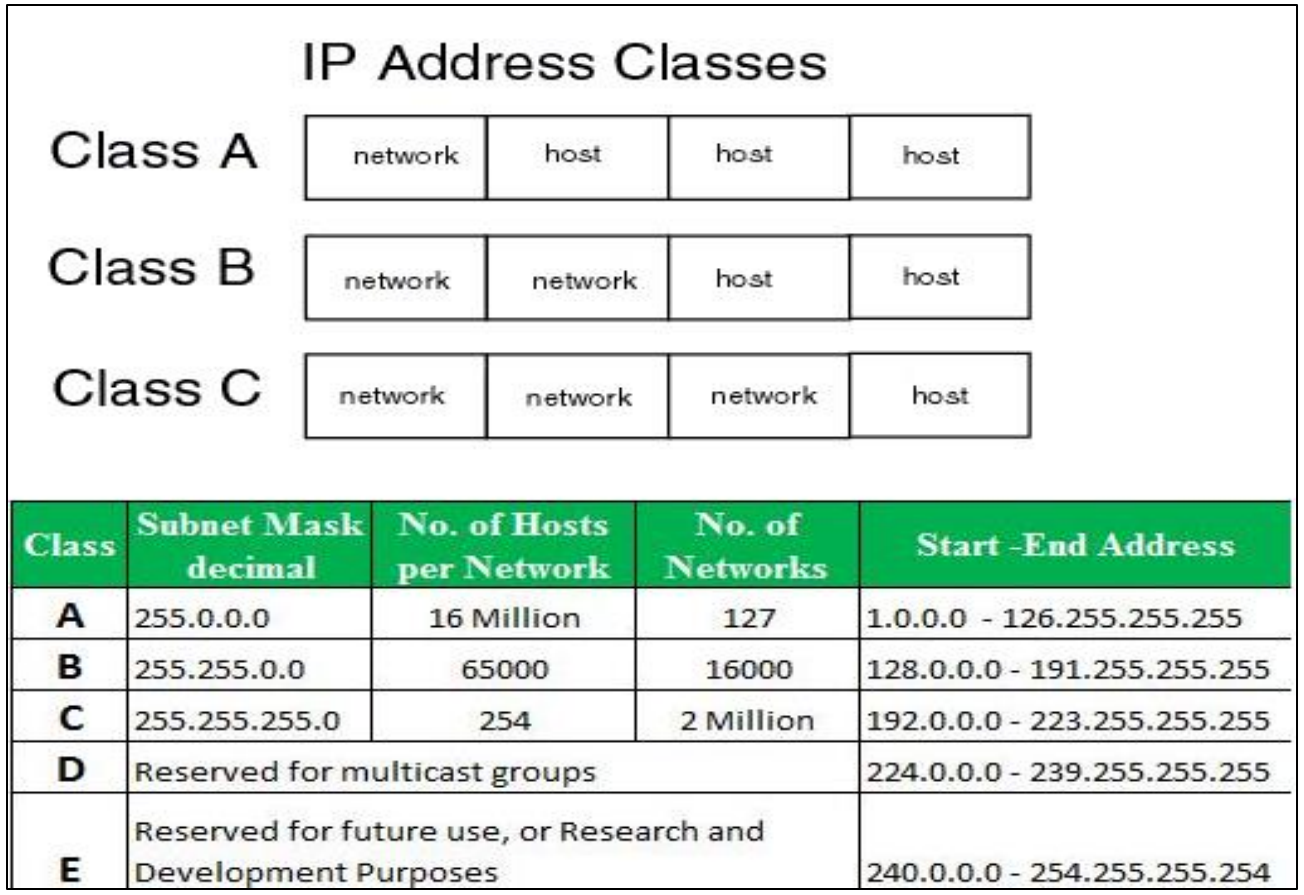
Reference : IP Address Structure

Types of Internet Protocol



Types of IP Address

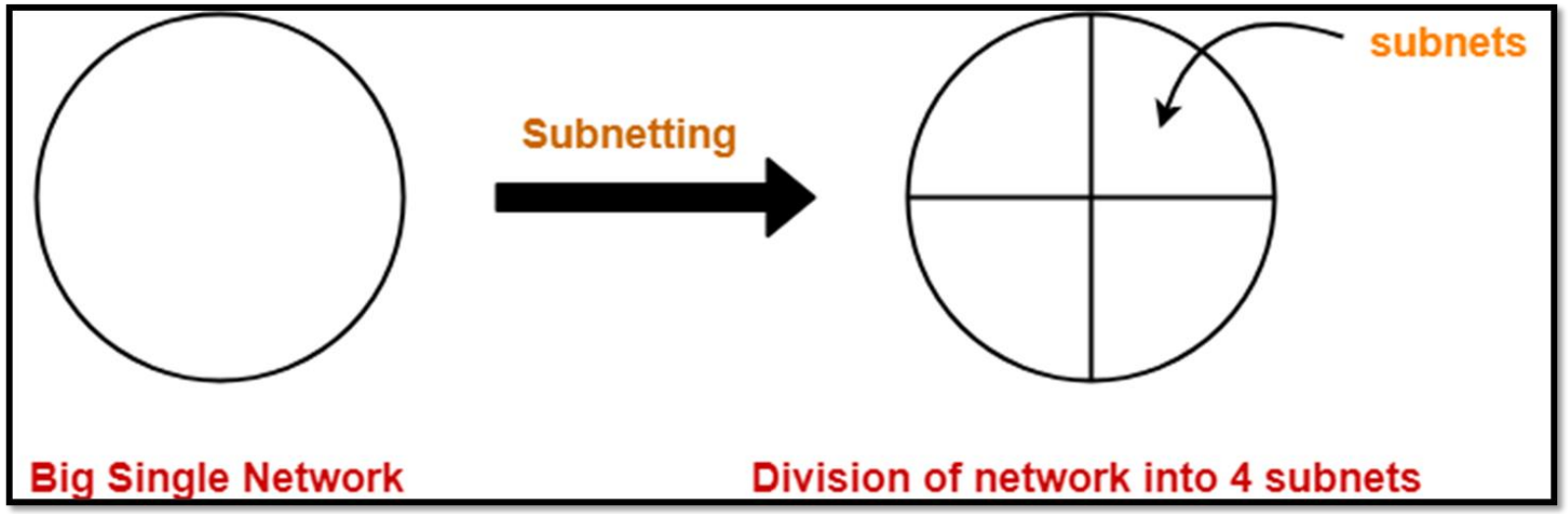
Classes of IPv4 Address



Class	Subnet Mask decimal	No. of Hosts per Network	No. of Networks	Start -End Address
A	255.0.0.0	16 Million	127	1.0.0.0 - 126.255.255.255
B	255.255.0.0	65000	16000	128.0.0.0 - 191.255.255.255
C	255.255.255.0	254	2 Million	192.0.0.0 - 223.255.255.255
D	Reserved for multicast groups			224.0.0.0 - 239.255.255.255
E	Reserved for future use, or Research and Development Purposes			240.0.0.0 - 254.255.255.254

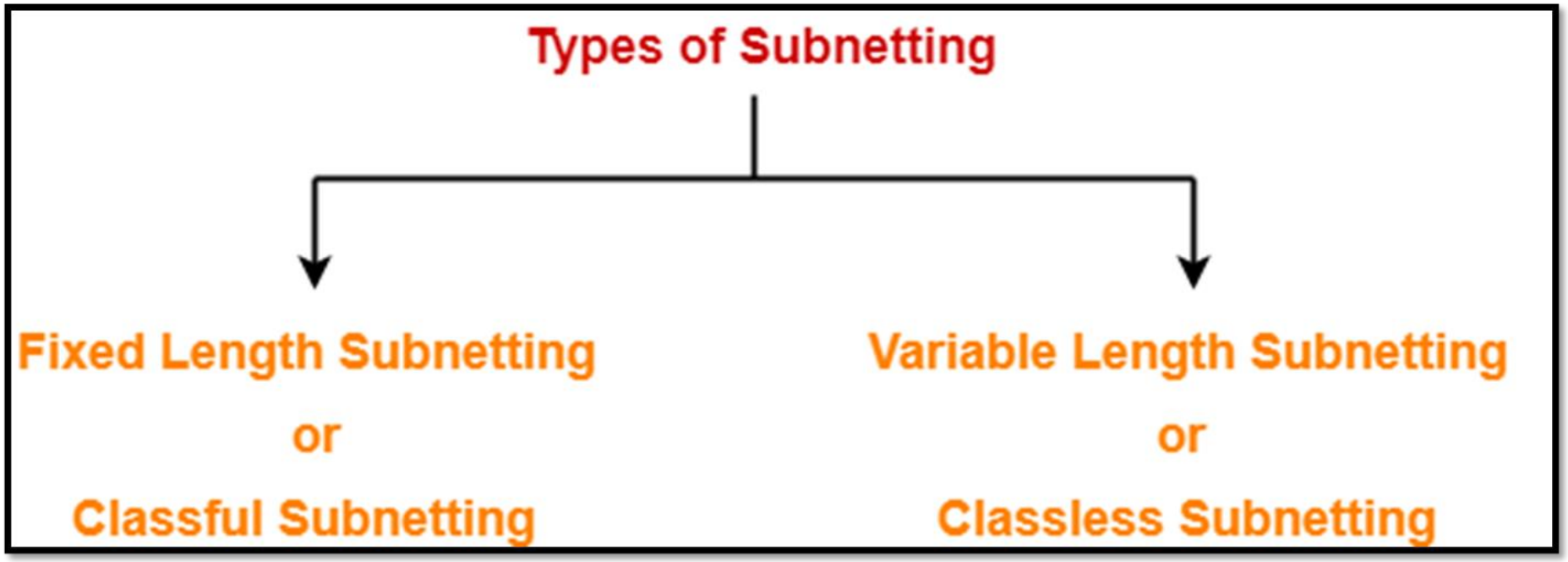
Classes of IPV4 Address

Subnetting



Example of Subnetting

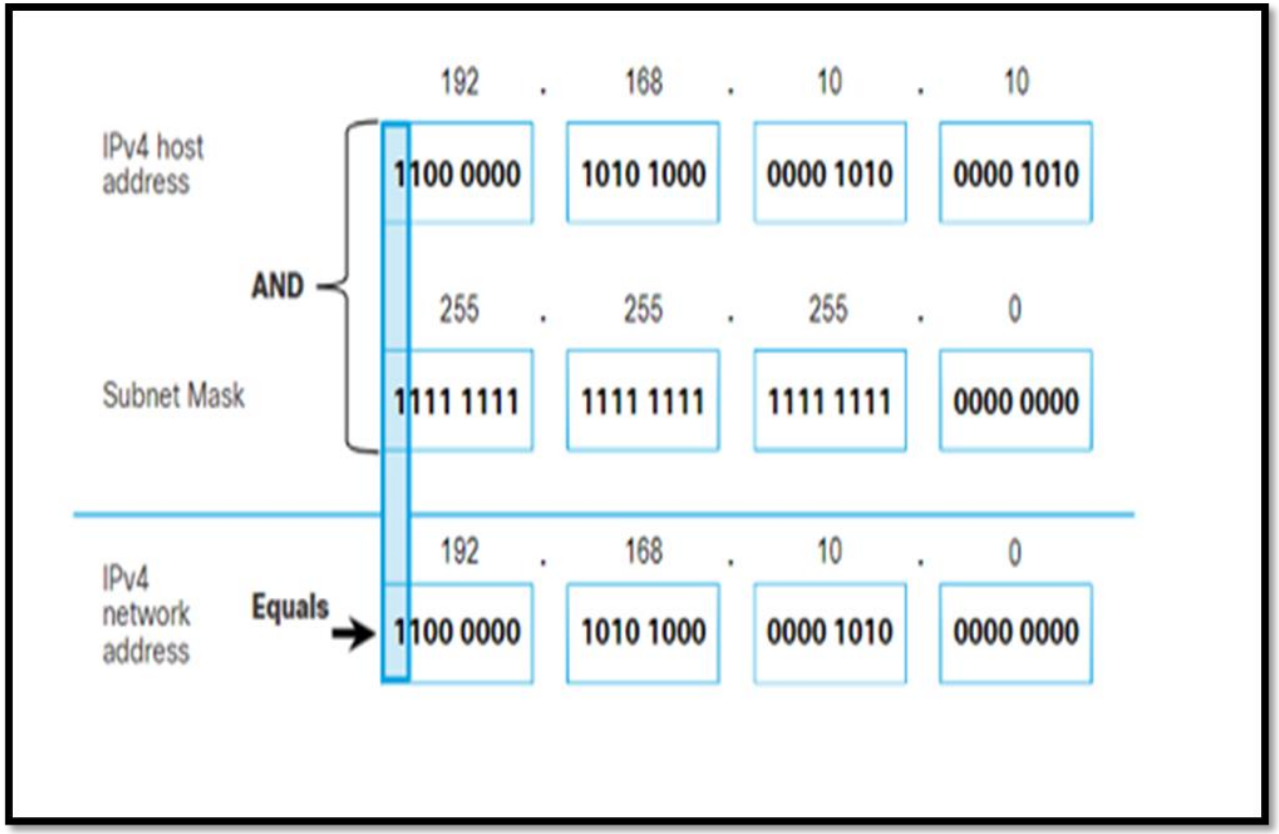
Types of Subnetting



Types of Subnetting

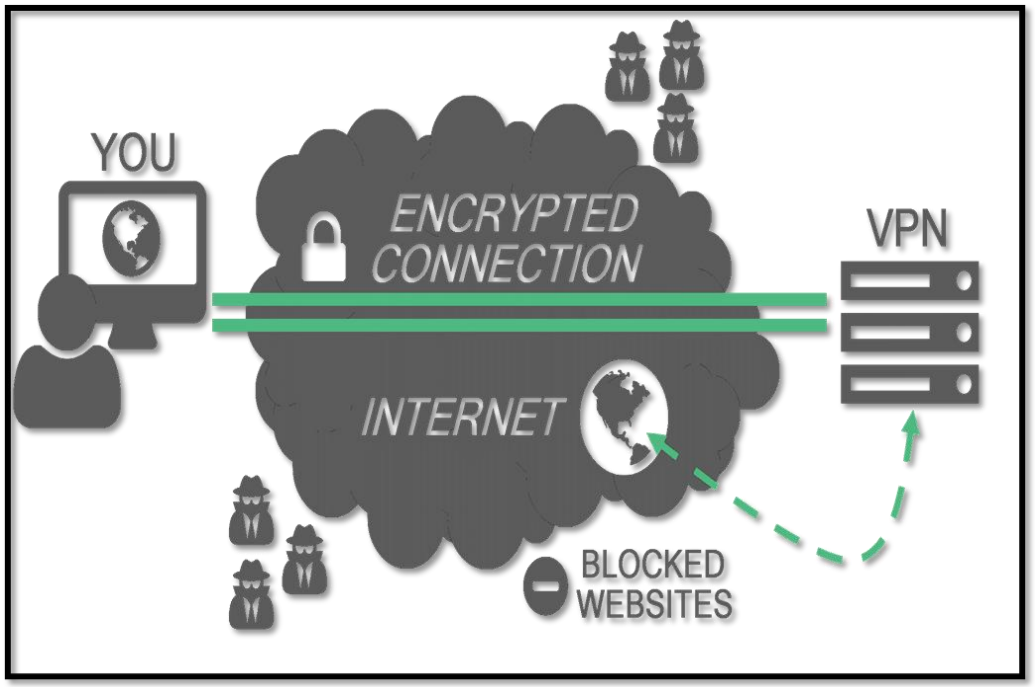
Subnet Mask

- A **subnet mask** is a 32-bit number created by setting host bits to all 0s and setting network bits to all 1s.
- Routers use subnet mask to distinguish between host and network address.
- It extracts network address from the given IP address.



Virtual Private Network

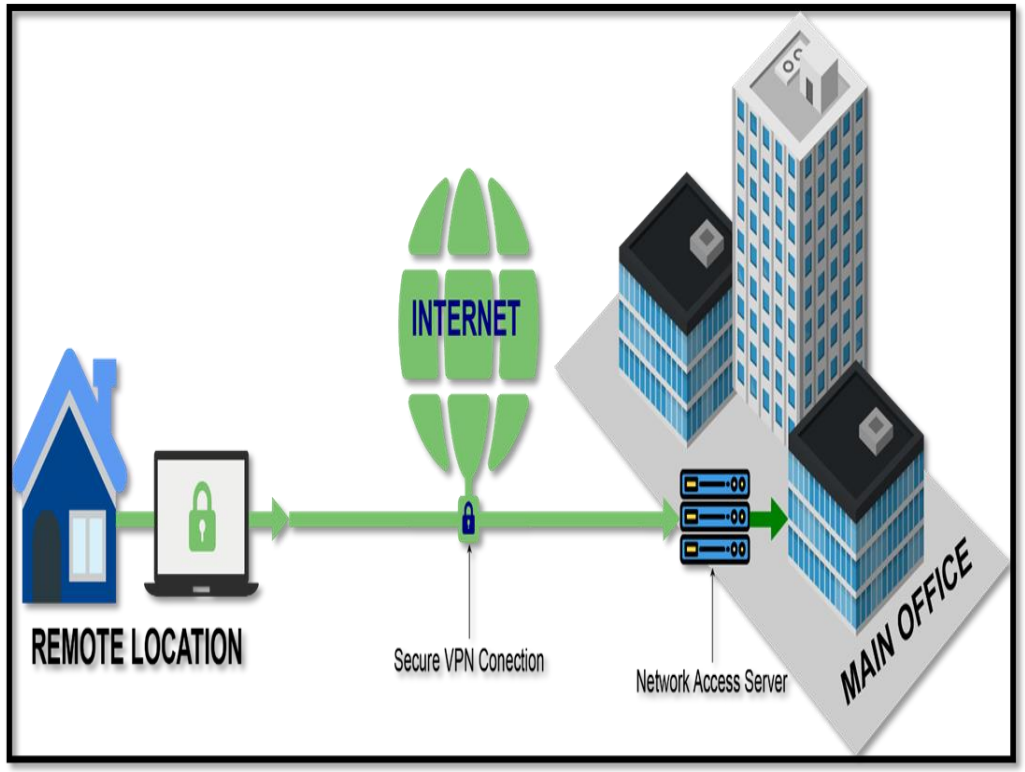
A virtual private network, or VPN, is an encrypted connection over the Internet from a device to a network.



Types of Virtual Private Network

Remote access

A remote access VPN securely connects a device outside the corporate office.

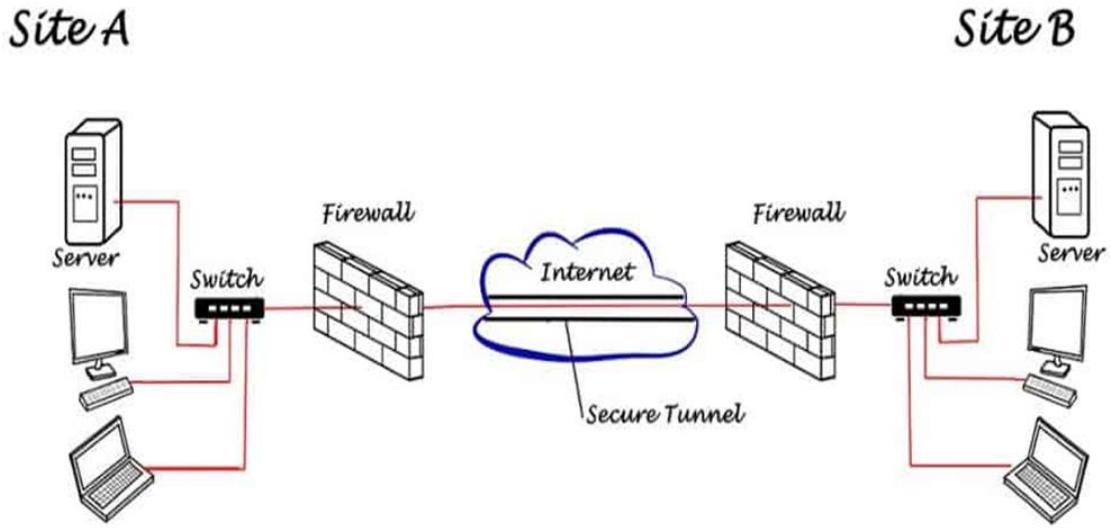


Reference:: https://www.greyson.com/wp-content/uploads/2020/03/remote-access-vpn-1.png

Types of Virtual Private Network

Site-to-site

A site-to-site VPN connects the corporate office to branch offices over the Internet.



Reference: https://d107a8nc3g2c4h.cloudfront.net/images/blog/wp-content/uploads/VPN-Types-Site-To-Site-VPN-1024x466.jpg

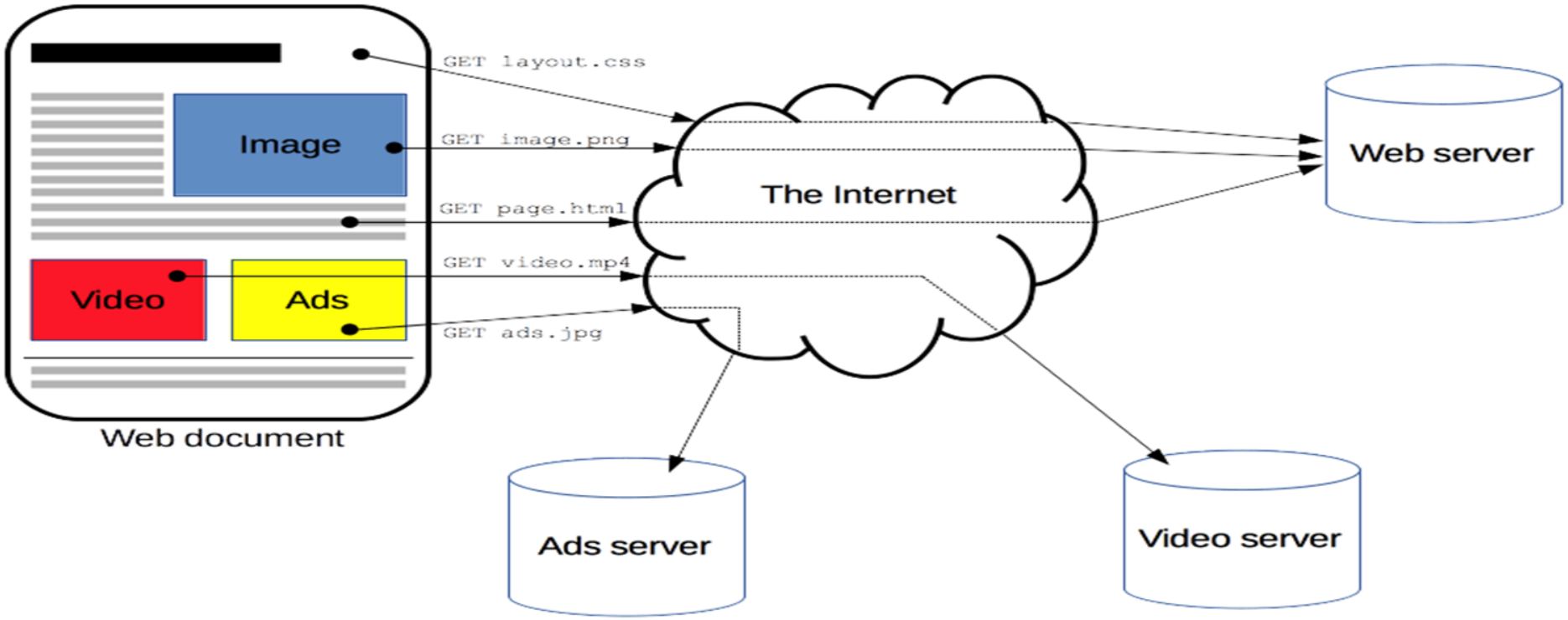
Benefits of Virtual Private Network

- Secure encryption
- Disguising your whereabouts
- Access to regional content
- Secure data transfer

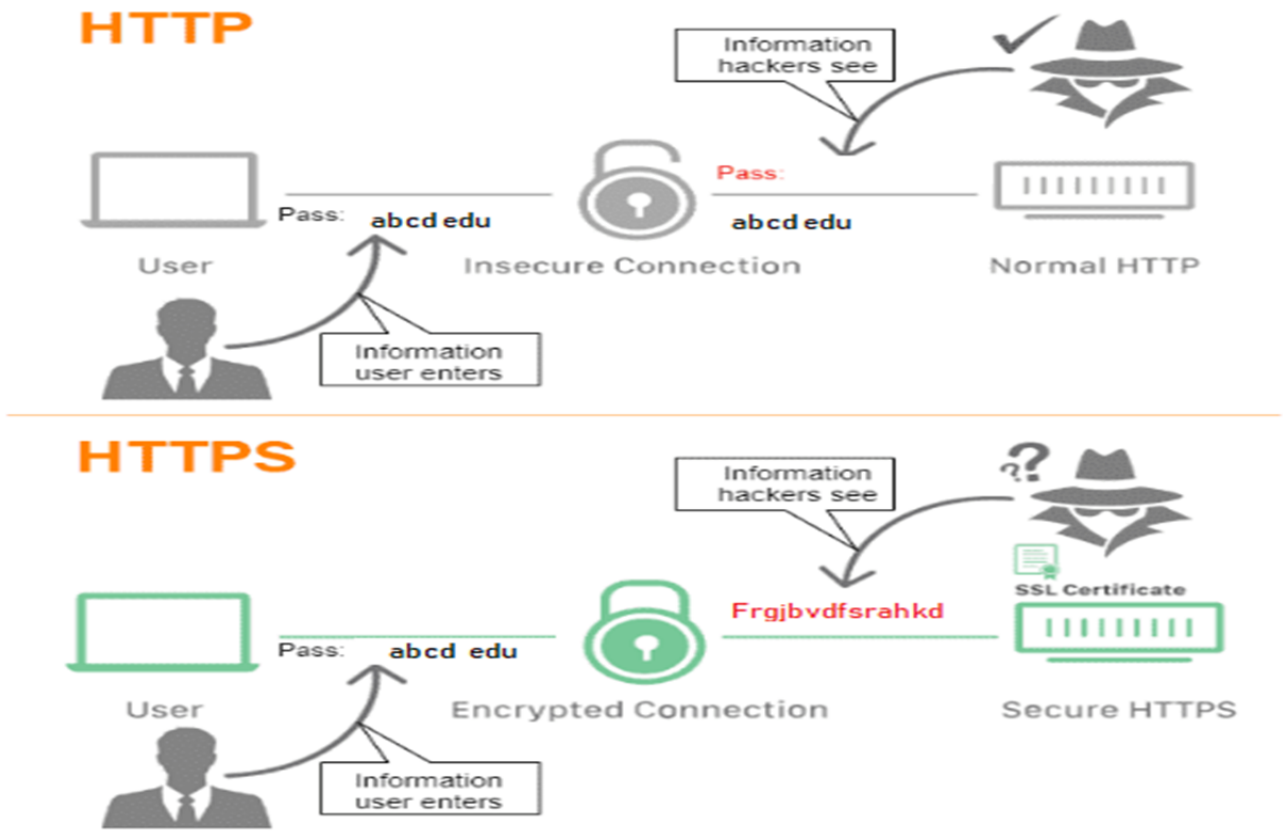
Features of Virtual Private Network

- Encryption of your IP address
- Encryption of protocols
- Kill switch
- Two-factor authentication

Hypertext Transfer Protocol



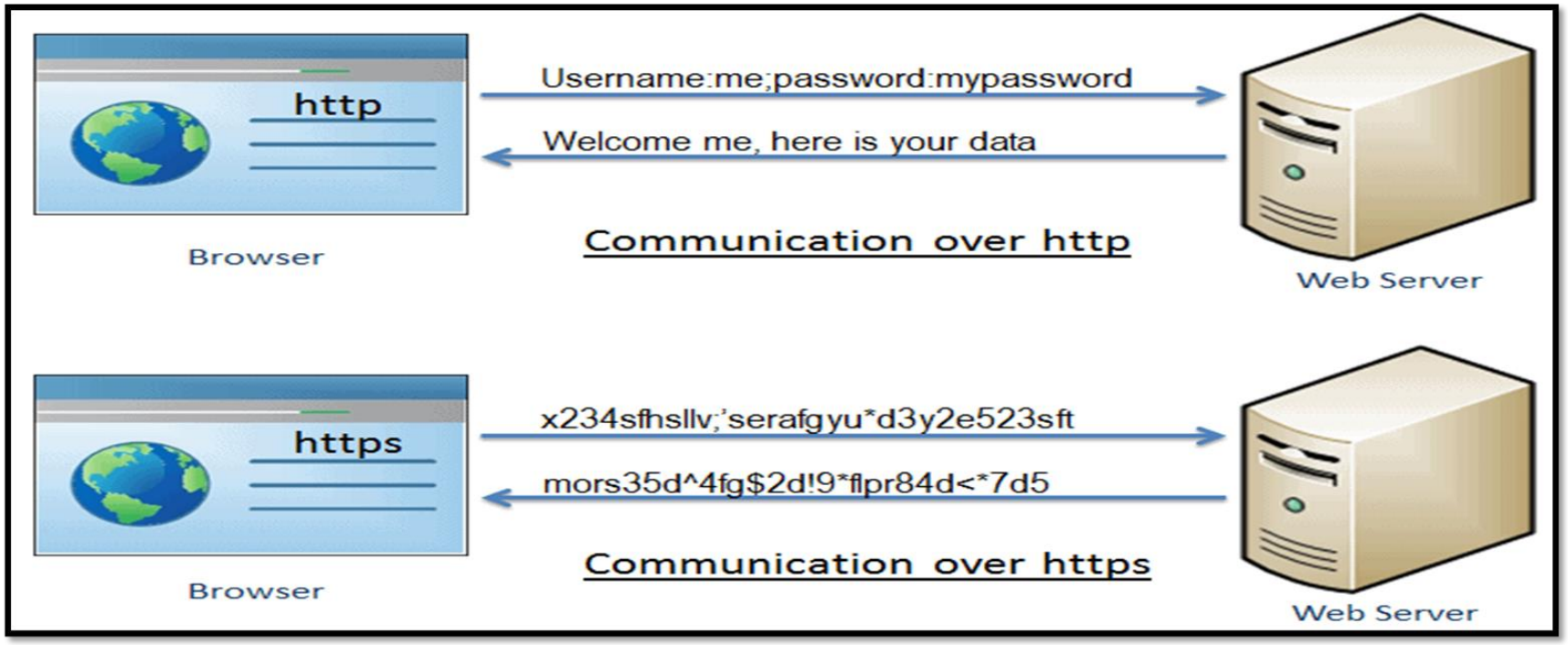
Secure Socket Layer



Hypertext Transfer Protocol Secure(HTTPs)

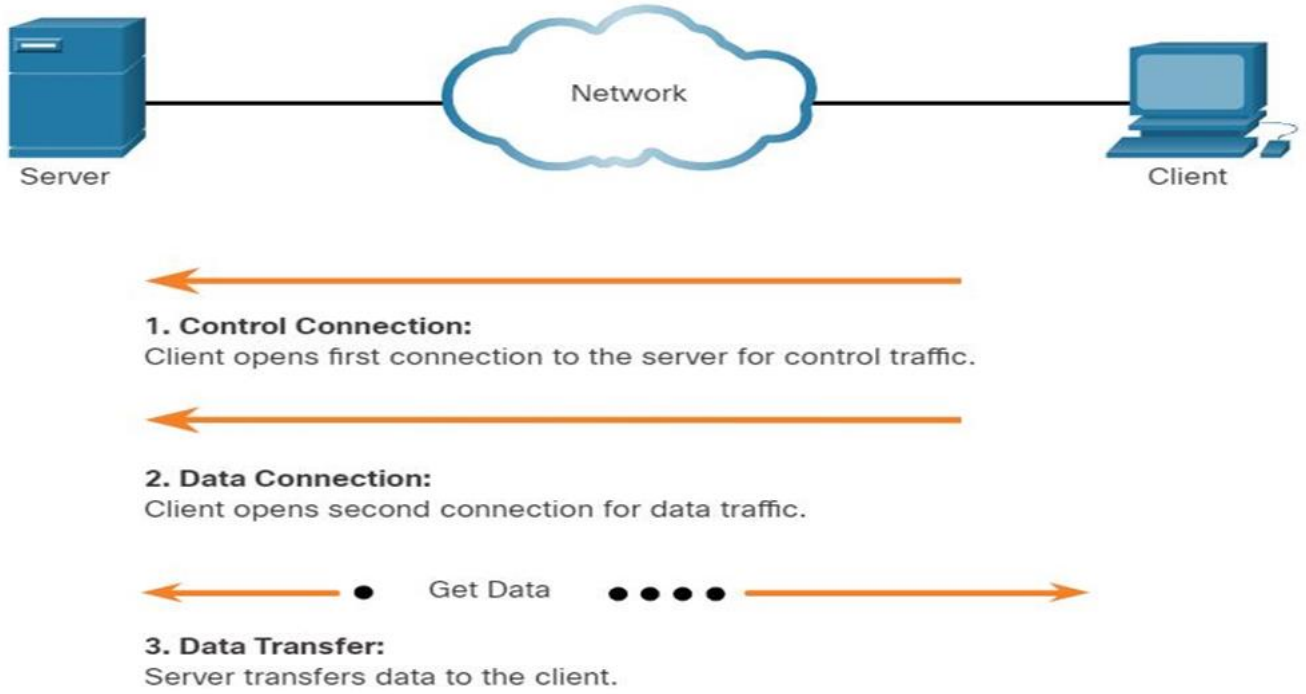
The HTTPS protocol makes it possible for website users to transmit sensitive data such as credit card numbers, banking information, and login credentials securely over the internet. For this reason, HTTPS is especially important for securing online activities such as shopping, banking, and remote work. However, HTTPS is quickly becoming the standard protocol for *all* websites, whether or not they exchange sensitive data with users.

Hypertext Transfer Protocol Secure



File Transfer Protocol

FTP was developed to allow for data transfers between a client and a server. An FTP client is an application which runs on a computer that is being used to push and pull data from an FTP server.

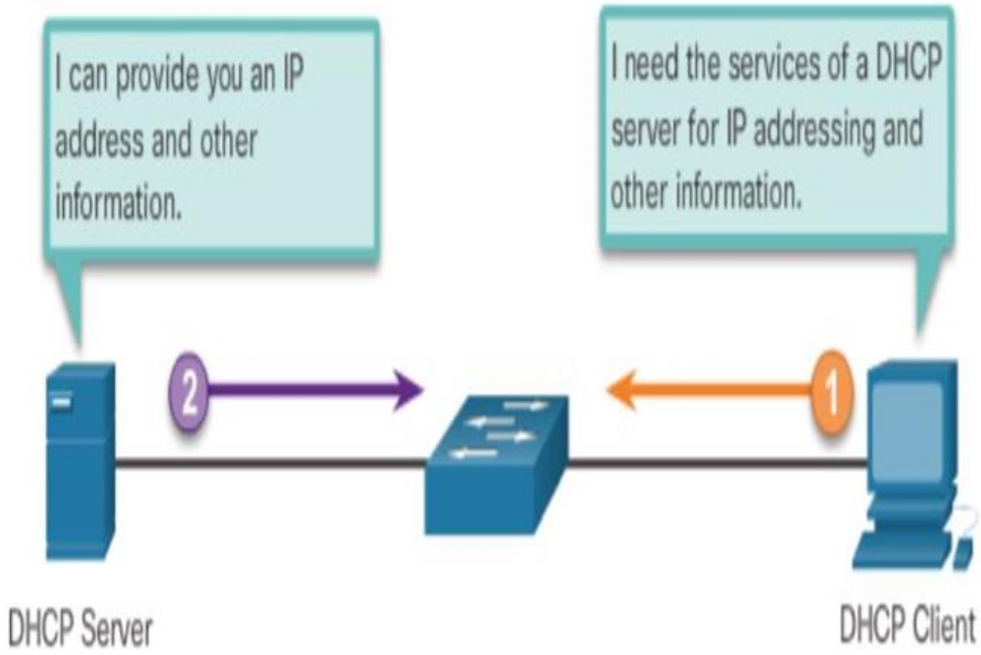


SSH

SSH is a software package that enables secure system administration and file transfers over insecure networks. It is used in nearly every data center and in every large enterprise.

Dynamic Host Configuration Protocol

Dynamic Host Configuration Protocol (DHCP) is a network protocol that is used to configure network devices to communicate on an IP network.



Conclusions

- Cloud Computing is an answer to ever-increasing need of computation power.
- Azure is a cloud solution from Microsoft.
- We have different delivery and deployment models in Cloud environment.
- Knowing how packets are transmitted and delivered gives you a better understanding of what can happen to packets as they travel from source to destination.
- A VPN connection establishes a secure connection between you and the internet.

References

- What is cloud computing? A beginner's guide | Microsoft Azure
- Cloud Deployment Model - javatpoint
- Cloud Service Models - javatpoint
- https://www.ibm.com/docs/en/i/7.3?topic=networking-concepts
- https://www.techtarget.com/searchnetworking/definition/subnet#:~:text=One%20goal%20of%20a%20subnet,space%2C%20improves%20address%20allocation%20efficiency.
- https://www.geeksforgeeks.org/explain-working-of-https/

THANK YOU