

Important topics !

- Computer
- Data
- Operating System
- Network
- Virtualization
- Virtual Machine
- Cloud



What is Computer?

- Computer is an electronic machine
 - CPU > RAM > Hard-disk > SMPS > Motherboard > Cabinet > Monitor > Keyboard & Mouse
- Invented by Charles Babbage - 1837
- We can use computer to store, access and transfer our data.

How computer came?

Mankind was in need to store the "Information's".

What are those informations ?

Experiences or something

Why they need to store informations?.

To pass it to other people or their next generations

How people started to store informations?

Languages > Writings > Inscription & Maple leaves > Paper !



Paper Vs Computer

Paper	Computer
Need huge storage space	Very less storage space
Took more time for copy	Very quick in copy / move
Heavy risk	Low risk
Need number of resources	Need low resources

We are migrating from Paper to Computer age !

- > Floppy
- > CD / DVD drive
- > Pen drive
- > External Hard Disk
- > Memory cards

How we are handling Informations?

Simple Duplex =====> Radio & TV

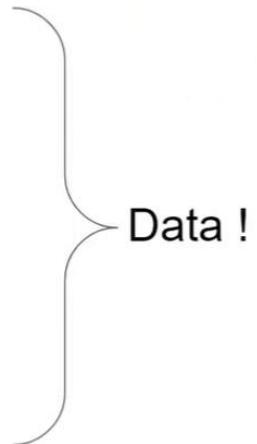
> Receive from one side

Half Duplex =====> Walkie-Talkie

> Sending and receiving from 2 sides

Full Duplex =====> Landline / Mobile / Internet communication

> Sending and receiving simultaneously from 2 sides



What is Data?

- Collection of information is called Data.
- Programs are designed to process and manipulate data, while data serves as the input to these programs and the output produced by them.
- A program, in the context of computing, refers to a set of instructions written in a programming language that defines a sequence of operations to be performed by a computer.
- Collection of program is called an Application Software.
 - System Software
 - Application Software
- Operating System = System Software

Operating System !

- Interface between user and machine (Computer)
- Resource manager of a computer
- It will manage the processes, memory and files.

Different types of OS !

- Linux
- Microsoft Windows
- Apple Mac OS

How server is controlling client computer?

- Server computers and client computers are connected in “Network”.
- We need to configure server computer configuration in client computer.
- Client requests will handle by the server and it will respond to the client.



Network

Data Transfer between two computers !



Application > Data > NIC > Packet > Transfer in cable > Packet > NIC > Data > Application

Application Layer	Sending a .doc file	Reception & Decoding	NIC - It receives the signals and converts them back into frames.
Transport Layer	It is segmenting data into smaller units called segments	Data Link	It checks the MAC address, if the frame is for the receiving NIC then frame is accepted else ignored.
Network Layer	The segments are further encapsulated into packets. It contains source and destination IP address	Network	It extracts the packet from the accepted frame and checks the destination IP address
Data Link Layer	This layer adds physical addresses, known as MAC and packets are boxed in frame	Transport	If above correct, then it will extract the segments and reassembles them into the original data.
Physical Layer	The frames are converted into electrical or optical signals that can be transmitted over the RJ 45 cable	Application	Finally, the data is delivered to application, it will process and use the received information.

Transmission Medium

- How data transfers between two computers?
- Network Devices
- IP Addressing
- Subnetting
- Public Network
- Private Network
- Virtual Network
- VPN - Virtual Private Network

Network Devices

- RJ45
- Ethernet cable
- NIC - Network Interface Card
- Switch
- Router
- Internet Modem / Gateway



Switch

- Smart Traffic cop for data on a computer network.

Data > Packet > NIC > Switch

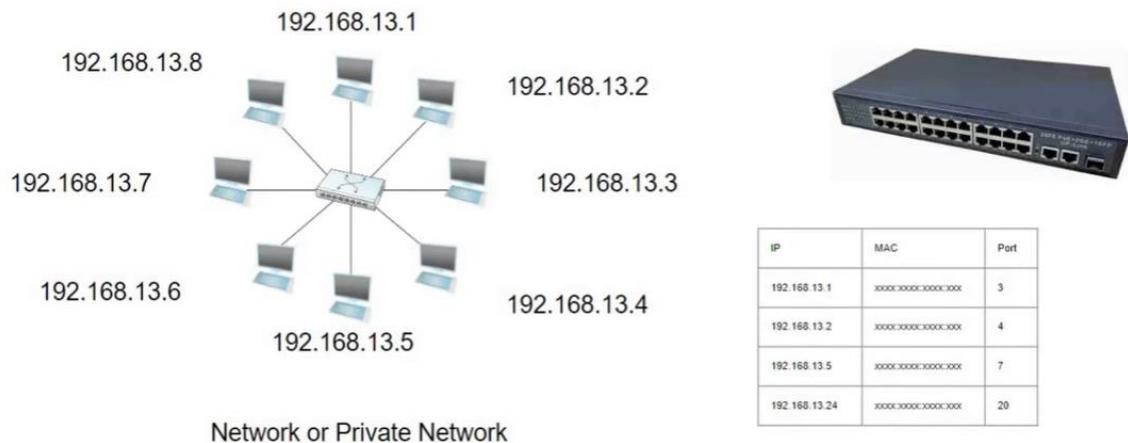
Reading the Packet Source and Destination IP >

Sending packet to the port > NIC > Packet > Data



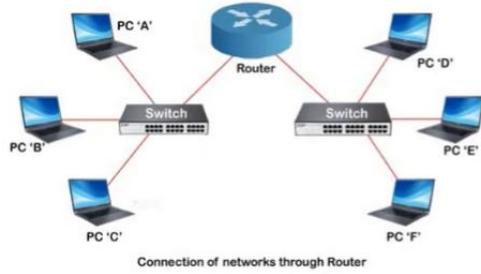
IP	MAC	Port
192.168.13.1	xxxx:xxxx:xxxx:xxx	13
192.168.13.2	xxxx:xxxx:xxxx:xxx	18
192.168.13.24	xxxx:xxxx:xxxx:xxx	20

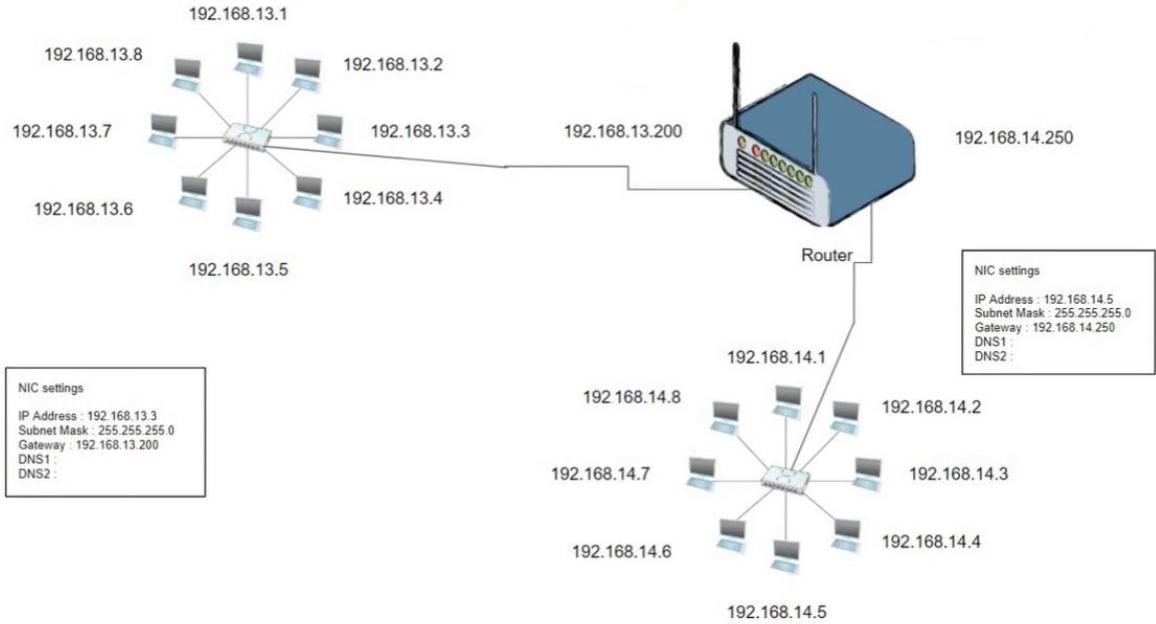
Example



Router

Router: A router connects different networks together. It reads data packets' addresses to decide where to send them. It directs data between devices within your home network and manages traffic between your local network and the internet.





How internet works in our home?



IP Address : 192.168.1.1
Subnet-mask : 255.255.255.0
Gateway : xxx.xxx.xxx.xxx
DNS1 : xxx.xxx.xxx.xxx
DNS2 : xxx.xxx.xxx.xxx



IP Address : 192.168.1.3
Subnet-mask : 255.255.255.0
Gateway : 192.168.1.1
DNS1 : 192.168.1.1
DNS2 :

Step 1 : Browser - www.payilagam.com

- Step 2 : DNS - Name to IP conversion
- Step 3 : Public IP will be received by the host
- Step 4 : NIC request the web page to Public IP (packets)
- Step 5 : NIC will receive the response from Public IP

Public IP

Class	Start Address	End Address
A	0.0.0.0	126.255.255.255
B	128.0.0.0	191.255.255.255
C	192.0.0.0	223.255.255.255

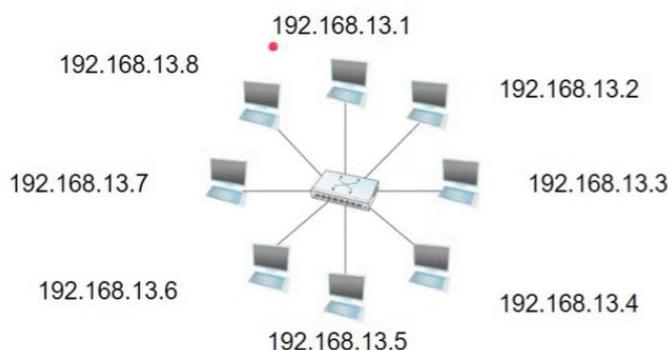
Class	Start Address	End Address
A	10.0.0.0	10.255.255.255
B	172.16.0.0	172.31.255.255
C	192.168.0.0	192.168.255.255

Note : No need to memorize but just save it for your reference

IP Addressing

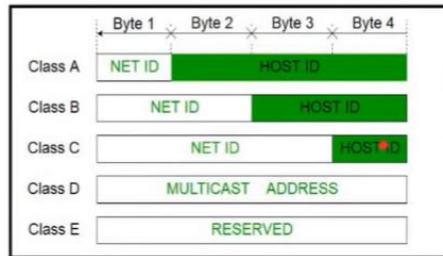
IP Address:

An IP (Internet Protocol) address is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication. It serves as a unique identifier for devices within a network, allowing them to send and receive data across the internet or other networks.



IP Address Classes & Range

Class	Ranges
A	1.0.0.1 to 126.255.255.254
B	128.1.0.1 to 191.255.255.254
C	192.0.1.1 to 223.255.254.254
D	224.0.0.0 to 239.255.255.255
E	240.0.0.0 to 253.255.255.254



255	255	255	255
8 bit	8 bit	8 bit	8 bit

128	64	32	16	8	4	2	1
1	1	1	1	1	1	1	1

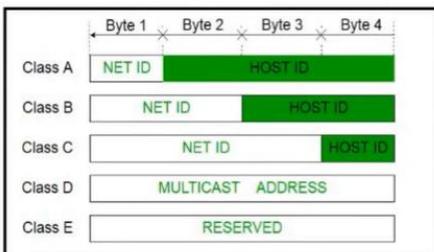
IPv4 = 32 bit

IPv4 Vs IPv6

IPv4 = 32 bit

8 bit	8 bit	8 bit	0 bit
11111111	11111111	11111111	xxxxxxxx
255	255	255	0

IPv4	vs.	IPv6
Deployed 1981		Deployed 1998
32-bit IP address		128-bit IP address
4.3 billion addresses		7.9×10^{28} addresses
Addresses must be reused and masked		Every device can have a unique address
Numeric dot-decimal notation		Alphanumeric hexadecimal notation
192.168.5.18		50b2:6400:0000:0000:6c3a:b17d:0000:10a9
(Simplified - 50b2:6400::6c3a:b17d:0:10a9)		
DHCP or manual configuration		Supports autoconfiguration



Private IP Address - Ranges

10.0.0.1	10.0.1.1	
10.0.0.2	10.0.1.2	
...	...	
10.0.0.255	10.0.1.255	10.255.255.255
172.16.0.0	172.16.1.1	
172.16.0.1	172.16.1.1	
...	...	
172.16.0.255	172.16.1.255	172.31.255.255
192.168.0.1	192.168.1.1	
192.168.0.2	192.168.1.2	
...	...	
192.168.0.255	192.168.1.255	192.168.255.255

Subnetting

In networking, it means taking a large group of IP addresses and splitting them into smaller groups, called subnets. This helps manage and organize devices on a network more efficiently, allowing different parts of the network to be treated separately while still being connected

Benefits

- Security
- Performance
- Simplified N/W Management
- Easy to solve the network issue

Example



Department	Members	Network ID - Subnet Mask - IP Range
Human Resource	10	192.168.13.0 - 255.255.255.240 - 192.168.13.1 to 192.168.13.14
Sales & Marketing	10	192.168.13.16 - 255.255.255.240 - 192.168.13.17 to 192.168.13.30
Production	50	192.168.13.32 - 255.255.255.192 - 192.168.13.33 to 192.168.13.94
IT Team	8	192.168.13.96 - 255.255.255.240 - 192.168.13.97 to 192.168.13.110
Finance	5	192.168.13.112 - 255.255.255.248 - 192.168.13.113 to 192.168.13.118



subnet-calculator.com/subnet.php?net_class=C

Gmail ELITE | Trainer - Nas... My Meetings - Zoom Tech BU - Google D... Free Download Insti... South BU - Google... TECHY0056 | Ethinkr... ZOOM IDs Mapping... TANGEDCO Online... All Bookmarks

IP Subnet Calculator

Subnets CIDR Wildcard Contact Us

No more silos. It's time to evolve and simplify. For a safer network. Learn how

Subnet Calculator

Network Class: A ● B ● C ○ First Octet Range: 192 - 223

IP Address: 192.168.13.16 Hex IP Address: C0.A8.00.10

Subnet Mask: 255.255.255.240 Subnet Bits: 4 Wildcard Mask: 0.0.0.15

Maximum Subnets: 16 Subnets per Subnet: 14 Hosts per Subnet: 14

Host Address Range: 192.168.13.17 - 192.168.13.30 Subnet ID: 192.168.13.16 Broadcast Address: 192.168.13.31 Subnet Bitmap:

IP Subnet Calculator

The IP Subnet Mask Calculator enables subnet network calculations using network class, IP address, subnet mask, subnet bits, mask bits, maximum required IP subnets and maximum required hosts per subnet.

Results of the subnet calculation provide the hexadecimal IP address, the wildcard mask, for use with ACL (Access Control Lists), subnet ID, broadcast address, the subnet address range for the resulting subnet network and a subnet bitmap.

For classless supernetting, please use the CIDR Calculator. For simple ACL (Access Control List) wildcard mask calculations, please use the ACL Wildcard Mask Calculator.

What is Port Number?



- Port numbers are an essential part of the Transport Layer in the Internet Protocol (IP) suite and are used to enable communication between different applications or services on the same computer or between computers on a network.
- When data is sent over a network using the Transmission Control Protocol (TCP) or the User Datagram Protocol (UDP), it is addressed to a specific IP address and port number. This combination of IP address and port number helps the network stack on the receiving end route the data to the appropriate application or service running on that device.
- Example
 - When you are trying to access a website, your web browser sends a request to the web server's IP address on port 80 (the default for HTTP). The server's operating system then forwards that request to the web server software, which listens on port 80 for incoming HTTP requests.

Port numbers range from 0 to 65535. They are divided into three categories:

- Well-known ports (0-1023): Reserved for commonly used services like HTTP (port 80), FTP (port 21), and SMTP (port 25).
- Registered ports (1024-49151): Used by applications and services that aren't as widely recognized but are still officially registered with the Internet Assigned Numbers Authority (IANA).
- Dynamic or private ports (49152-65535): Available for use by applications and services on a temporary or ad-hoc basis.

Example

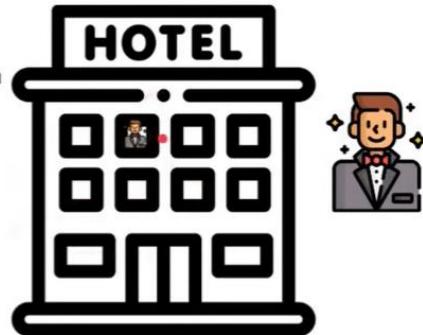
- Your family informed you that, your "Fav" actor stayed in hotel in your area for shooting
- Now you are trying to meet him.
- And, you found the receptionist is your friend.
- You are asking about the actor stay to your friend receptionist
- He said, he is staying in 6th Room and you can go and meet him
- You met your "Fav" actor and happily informed your family.

Actor = Destination Service

Hotel = IP Address

Port = Room number

Packets = You



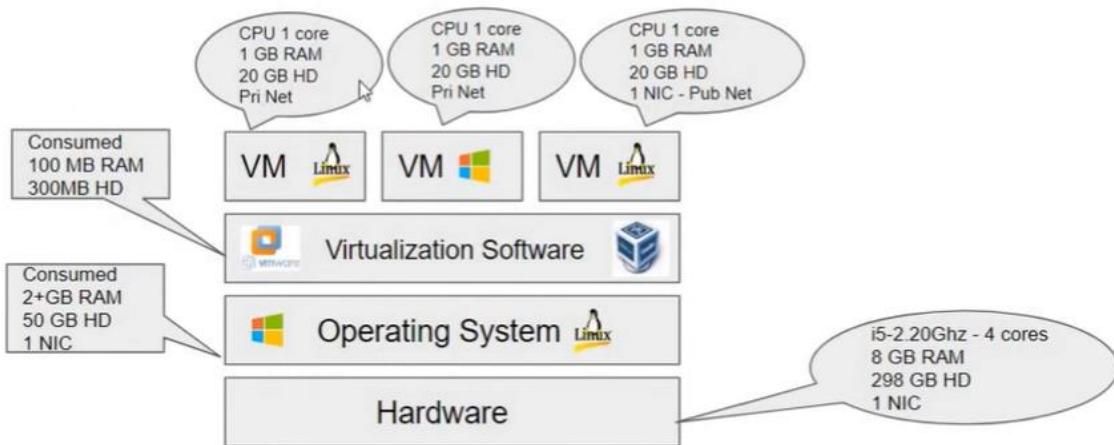
What is Port Forwarding?

- Port forwarding is a networking technique that allows you to redirect incoming network traffic from one port on a router or firewall to another port on a different device in your local network.
- Inside your local network, you have various devices (computers, servers, IoT devices, etc.) that run services or applications. Each of these devices may have a private IP address.
- You can configure your router or firewall to forward incoming traffic on a specific port (external port) to a specific device and port on your local network (internal port).
- This configuration tells the router/firewall how to route incoming traffic to the correct destination.

Virtualbox - Networking Modes

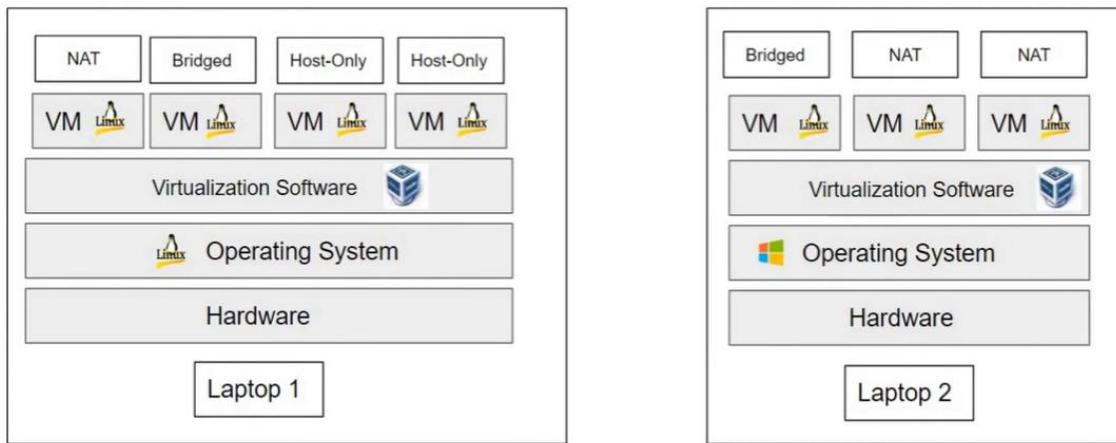
Table 6.1. Overview of Networking Modes

Mode	VM→Host	VM←Host	VM1↔VM2	VM→Net/LAN	VM←Net/LAN
Host-only	+	+	+	-	-
Internal	-	-	+	-	-
Bridged	+	+	+	+	+
NAT	+	Port forward	-	+	Port forward
NATservice	+	Port forward	+	+	Port forward



Type 2 - Virtualization

Example

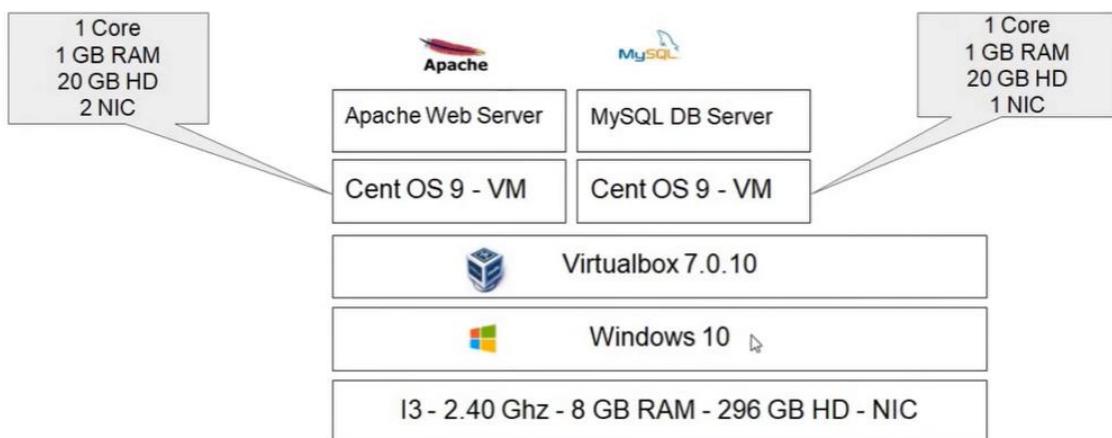




Test Environment - Plan & Build



Test Environment - Plan



Steps

- Install Virtualbox
- VM Network setup
 - Including Port Forwarding setup
- Create and Configure new Virtual Machine
- VM backup and restore
- SSH (Putty) and FTP (WinSCP) connection setup

Virtualbox Setup

Step 1 : Remove unwanted applications and files to free up space.

Step 2 : Download Virtualbox setup from “www.virtualbox.org” site.

Step 3 : Install the setup file

Virtualbox Network Setup

Step 1 : Virtualbox > Tools > Network

Step 2 : NAT Networks > Create New > Configure IP Address setup

Step 3 : Port Forwarding > Configure SSH and Web port forwarding setup

Virtual Machine Setup

Step 1 : Download CentOS Stream 9 ISO file from “www.centos.org”

Step 2 : Create Virtual Machine

Step 3 : Install CoS Stream 9 ISO file in Virtual Machine

Virtual Machine Network Setup

Step 1 : Ensure the Network Adapter for Bridged Network.

- This is for web server VM and we need internet access for our VM
- Please consider this is Public Network.

Step 2 : Configure “NAT Network”

- This is for Database Server VM and only web server host should access the VM
- It should have internet access and consider this is Private Network.

Virtual Machine Backup & Restore Setup

Step 1 : Take VM Snapshot

- It will capture a state of a VM
- We can take clone from a VM snapshot

Step 2 : Take VM Clone

- This will save time to create new VM
- It will be backup of our VM setup

SSH and FTP connection setup

- Download “Putty” software tool to create SSH connection
- Download WinSCP for “File Transfer” support
- Let me show you the live configuration !

Topics

- Hostname Setting
- IP Address Setting
- Checking the Time & Date, System & OS information
- Understanding the Directory Structure
- Basic User Management
- Basic File Management
- Basic Package Management

Hostname Setting

Step 1 : Type “hostname <provide your name>”

Step 2 : Check the provided hostname, type “hostname”

Step 3 : We need to open “/etc/hostname” file and write our hostname.

IP Address Setting

Step 1 : Type “nmtui”

Step 2 : “Edit a connection” > Select N/W card > Configure > Ok > Back > Activate the connection

Note : Use mostly direct interface, Don't use remote interface

Date, System & OS Information

- Type "Date"
- Type "uname -a", it will show below important details
 - Hostname, Processor Architecture, Kernel and Date
- Type "cat /proc/version" for some more information about Linux
- To check RAM details, type "cat /proc/meminfo" or "top" command.
- To check HD details, type "cat /proc/partitions" and "df -h" command.

Directory Structure

- / - slash
 - It is the parent directory for all other file and folders. Only root user is having permissions to make changes.
- /home
 - It contains normal user profiles. By default, the normal users don't have permission to make changes in other folders.
- /boot
 - It contains Linux OS bootable files. GRUB2 - Boot Loader and VMLINUZ - Kernel files
- /bin
 - It contains binary files (commands) for the normal users.
- /sbin
 - It contains binary files (commands) for the root user.
- /etc
 - It contains system and server configuration files.
- /dev
 - It contains system's device file informations.

Basic User Management

- Usually a User is a person. A user account contains permissions to perform operations in the operating system.
 - 3 Types of user, "root user" - "normal user" - "service user"
- We know, how to login in OS after the boot process but how to switch user account in same terminal?
 - Type "su <user name>" and provide password.
- How to add new user? - How to assign password to the new user? - How to check the user informations.
 - Type "useradd <new user>" - Type "passwd <type new password>" - Open "/etc/passwd" file
- How to create a group? - How to add user in the group? - How to check group informations?
 - Type "groupadd <new group name>" - Type "usermod -aG <groupname> <username>" - Open "/etc/group"

Basic File Management

- Type "pwd" - to check the present working directory.
- Type "ls" - to check files in the directory.
- Type "cd <provide location>" - to move other directory location.
- Type "mkdir <provide location>" - to create new directory.
- Type "touch <name>" - to create empty files.
- Type "cp <file name> /<location>/<new file name>/" - to copy the files to some other location.
- Type "cp -r <folder name> /<location>/<new folder name>/" - to copy the files to some other location.
- Type "mv <file name> /<location>/<new file name>/" - to move the files to some other location.
- Type "rm <file name>" - to delete the file.
- Type "rm -r <folder name>" - to delete the folder.

Basic File Management - File Editor

CAT VI and VIM

CAT

Cat <file name> - Help us to show the content from the file

Cat > <file name> - Help us to write or overwrite from the file

Cat >> <file name> - Help us to addon new lines from existing file content

Vi

Vi <file name> - Help us to show, edit, save the content from the file in separate editor mode

```
:w //Save the file  
:q //exit the editor, if the file has been modified use the following command  
:q! //exit the editor without saving  
:wq //exit the editor and save the file  
:set nu //setting numbers to each line  
:search // searching the words
```

If you want get : (you need to enter escape and click full : symbol)

Vim

1. If you have not installed vim package kindly install the vim using "yum install vim -v"
2. Vim also having same features as vi editor
3. It has new feature of showing contents in colour full styles

Basic Package Management

How to manage packages in Centos with YUM?

1. Yum (Yellowdog Updater Modified):

- o Yum is one of the older package managers and was widely used in Red Hat Enterprise Linux (RHEL) and its derivatives.
- o Yum resolves package dependencies automatically. If a package relies on other packages, Yum will find and install those dependencies for you.
- o It works with "repositories," which are online locations that store software packages.
- o You can use Yum to install, remove, or update packages with simple commands like
 - yum install package_name.
 - Yum update package_name
 - Yum remove package_name

Basic Package Management

How to manage packages in Centos with DNF?

1. DNF (Dandified YUM) is the next-generation package manager, designed to replace Yum in newer versions of Red Hat-based systems.
2. Like Yum, DNF manages packages from repositories, but it offers improved performance and features.
3. DNF uses a more modern architecture, which makes it faster and more reliable than Yum.
4. You can perform operations like package installation or updates using DNF, just as you would with Yum.



Web Application

For Test Environment

Steps to follow :

Step 1 : Install and Configure Apache Httpd and PHP service in web server host

Step 2 : Install and Configure MySQL Database in DB host.

Step 3 : Design your **Application** in PHP

Step 4 : Write your Application code in PHP

Step 5 : Understand, how the Application works in local environment?

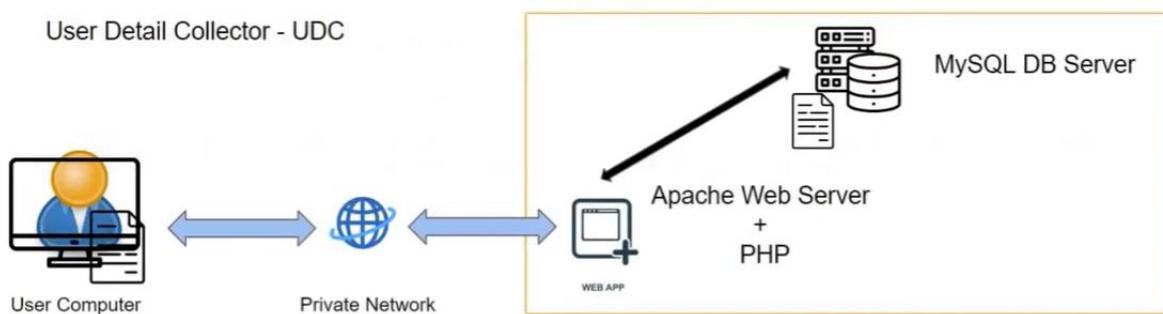
Step 6 : Deploy & Test your Application !

Domain Name Service

It is used for Name to IP conversion and IP to Name conversion

- We need to configure DNS temporarily for this project in Windows and Linux.

Design your Application

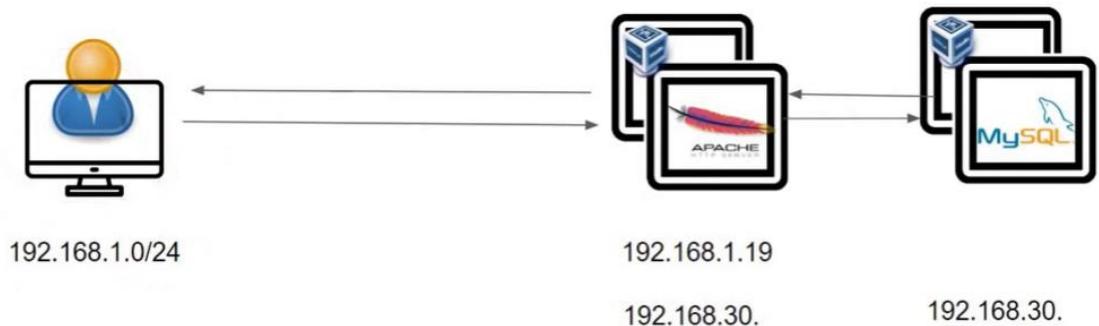


Write your Application

I have already written the code in PHP so please download the PDF document and follow the steps with me



How Application Works?



Deploy the Application

Step 1 : Prepare the MySQL DB for our PHP Application.

Step 2 : Ensure the connectivity with PHP - DB.

Step 3 : Paste the PHP code in required location.

Step 4 : Restart the required services and check the service status.

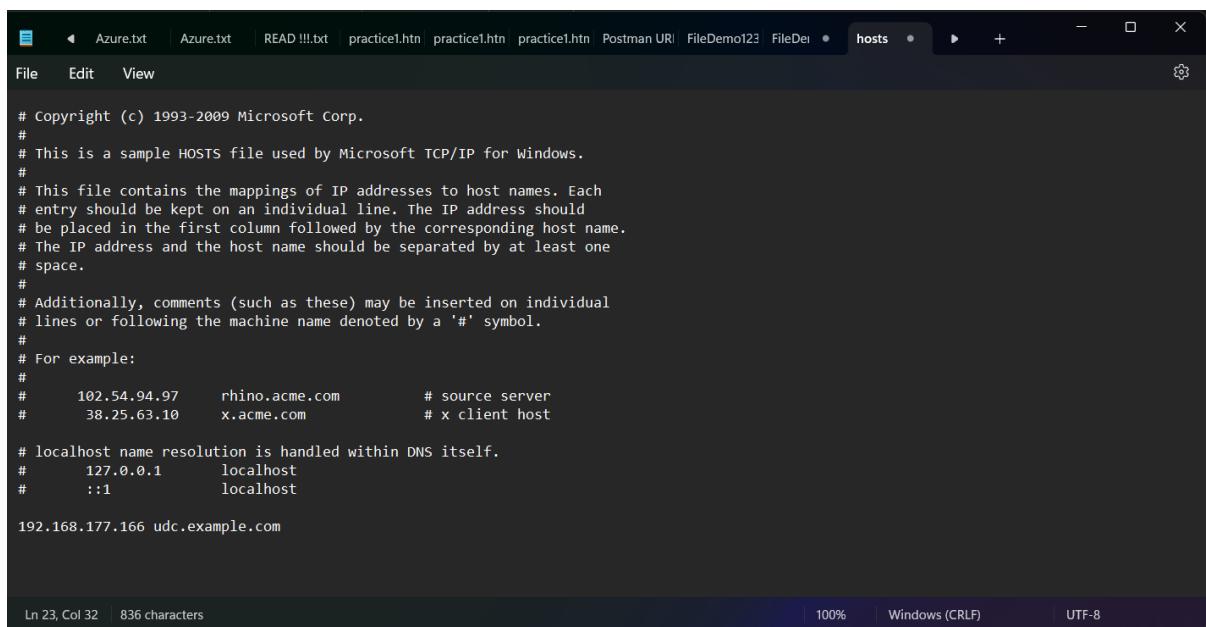
Step 5 : Access the PHP application from user end.

Configure Temporary DNS

- Now you are able to access the PHP web-app in browser with IP address.
- How to configure temporary DNS in Windows and Linux?
- Why we are configuring this now?

Configure Domain Name Server in Windows :

1. Open Run Panel and type system32
2. Open drivers folder
3. Under drivers -> etc folder
4. Under etc -> hosts
5. Open the hosts file with read and write access (Properties – Security - Users(jayanth Lenovo) – Edit – Full control – allow – close)
6. Open the file in Notepad and enter your IP and domain new name and save it.s



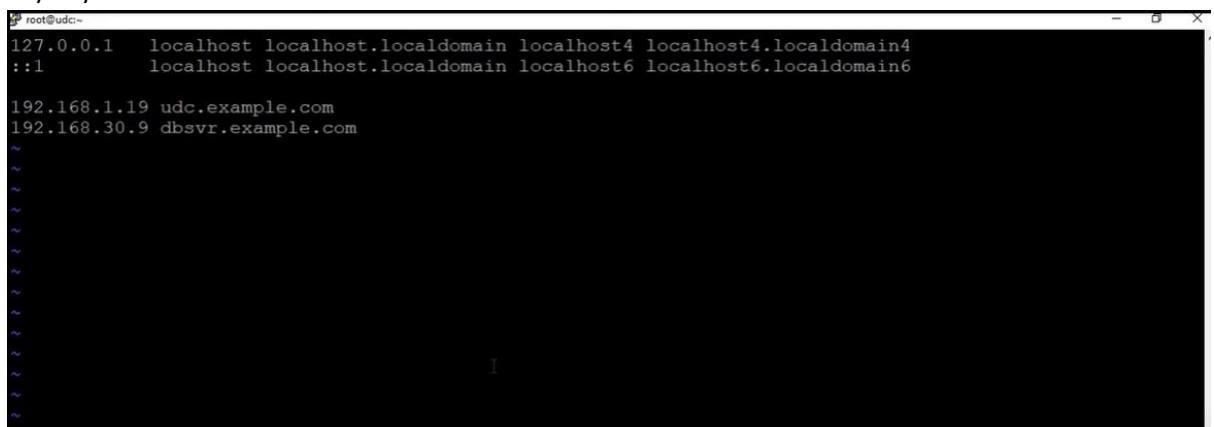
The screenshot shows a Windows Notepad window with the file 'hosts' open. The content of the file is as follows:

```
# Copyright (c) 1993-2009 Microsoft Corp.  
#  
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.  
#  
# This file contains the mappings of IP addresses to host names. Each  
# entry should be kept on an individual line. The IP address should  
# be placed in the first column followed by the corresponding host name.  
# The IP address and the host name should be separated by at least one  
# space.  
#  
# Additionally, comments (such as these) may be inserted on individual  
# lines or following the machine name denoted by a '#' symbol.  
#  
# For example:  
#  
#      102.54.94.97    rhino.acme.com        # source server  
#      38.25.63.10     x.acme.com            # x client host  
  
# localhost name resolution is handled within DNS itself.  
#      127.0.0.1        localhost  
#      ::1              localhost  
  
192.168.177.166 udc.example.com
```

At the bottom of the window, it says 'Ln 23, Col 32 | 836 characters' and has buttons for '100%', 'Windows (CRLF)', and 'UTF-8'.

Configure Domain Name Server in Linux :

1. Vi /etc/hosts



The screenshot shows a terminal window with the command 'root@udc:~\$' followed by the contents of the /etc/hosts file:

```
127.0.0.1    localhost localhost.localdomain localhost4 localhost4.localdomain4  
::1          localhost localhost.localdomain localhost6 localhost6.localdomain6  
  
192.168.1.19 udc.example.com  
192.168.30.9 dbsvr.example.com
```

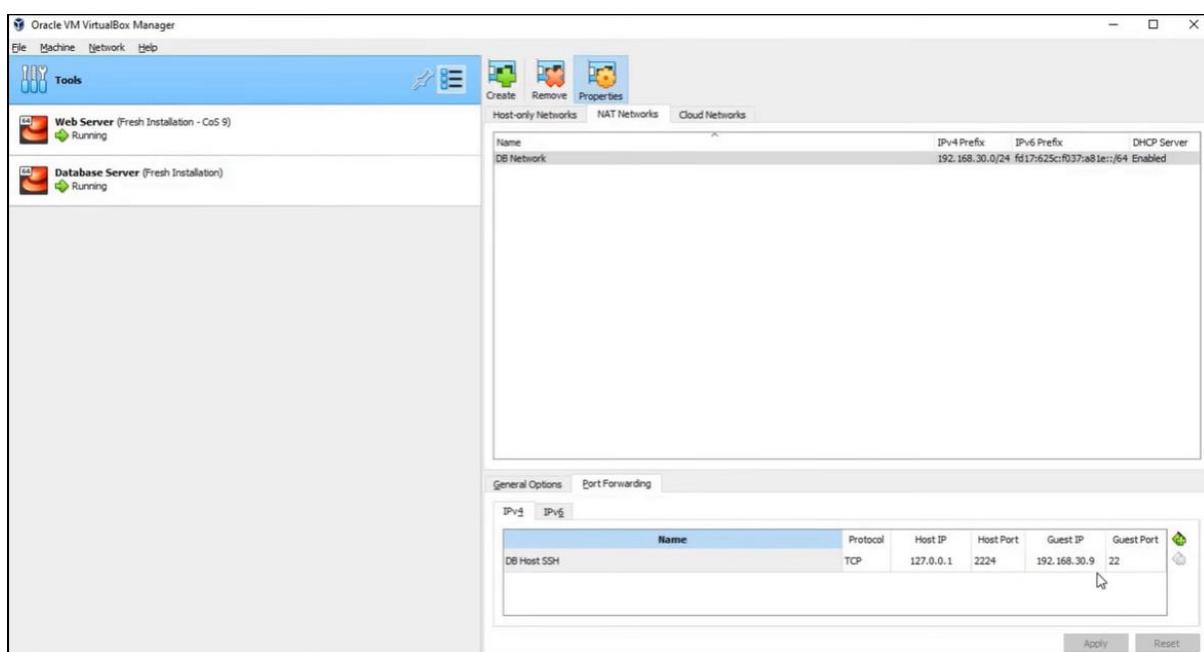
The terminal window has a cursor at the end of the last line.

1. Vi /etc/hosts
2. [empty]
3. Save it and check (wq!)

User Files and DB Informations - Backend

- Accessing “/var/log/uploads” location files in web server.
- Accessing DB informations in mysql
- Why port forwarding then?

Port Forwarding :



```
C:\Users\test>ssh -p 2224 root@127.0.0.1
The authenticity of host '[127.0.0.1]:2224 ([127.0.0.1]:2224)' can't be established.
ECDSA key fingerprint is SHA256:LUozG2TB4GeAZ41kQpPblEAR6P8+iQ8Tyz+/odOhUc.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '[127.0.0.1]:2224' (ECDSA) to the list of known hosts.
root@127.0.0.1's password:
Last login: Tue Oct 17 21:40:17 2023 from 192.168.30.8
[root@dbsvr ~]#
```

Introduction

Amazon Web Services



Amazon Web Services

- AWS is a comprehensive cloud computing platform.
- AWS provides a wide range of cloud services, including computing, storage, databases, content delivery, machine learning and analytics as services to help individuals, businesses, and organizations.
- They will build and deploy scalable and cost-effective applications and services in AWS.

What is Cloud Computing?

Cloud computing is a technology that allows you to access and use computer services and resources, like storage, processing power, and software, over the internet, rather than on your local computer.

It's like renting or sharing a computer infrastructure with others, and you can use as much or as little as you need.

Common examples of cloud services include online storage (e.g., Dropbox), web-based email (e.g., Gmail), and cloud platforms like Amazon Web Services (AWS) or Microsoft Azure for businesses to run applications and store data.

Why Cloud Computing?

- Quick Infrastructure Deployment
- Scalability and Flexibility
- Cost Savings
- Prevent Data Loss
- Advanced Security

Virtualization connection with Cloud Computing

- Virtualization technology plays a fundamental and interconnected role in cloud computing.
- Foundation of Cloud Infrastructure:
 - Virtualization is the underlying technology that enables the creation of virtual machines (VMs) or virtual environments within a single physical server or across multiple physical servers. Cloud computing relies heavily on virtualization to create the building blocks for cloud infrastructure.
 - It often involves the use of virtualization technologies within data centers to create and manage virtual servers, storage, and networking.

Data Center

- Data centers are physical facilities that contain servers, networking equipment, and storage.
- Multiple data centers can be used for redundancy and high availability. Data and applications can be replicated or distributed across different data centers to ensure continuity in case of failures or disasters.
- Managing multiple data centers can be complex and costly, as it involves maintaining hardware, networking, and power infrastructure

AWS - Architecture !

- AWS architecture is the structure and layout of AWS services and components that work together to create a scalable and reliable cloud computing environment.
- Mainly, below three we need to know
 - Regions
 - Availability Zones
 - Edge Locations



Availability Zone

- Availability Zones are like separate data centers in the same city.
- AWS sets up multiple Availability Zones in each AWS region, and they're located close to each other but designed to be physically isolated from one another.
- They provide redundancy and fault tolerance. If one Availability Zone experiences an issue, your data or applications can continue running in another without disruption.
- You can think of Availability Zones as AWS's way of making sure your applications and data are highly available and reliable.

Edge Location

- Edge Locations are like small data centers located in different cities and regions around the world.
- They are part of Amazon CloudFront, which is a content delivery network (CDN) service provided by AWS.
- Edge Locations store cached copies of frequently accessed data, like images and videos, to reduce the load on the main servers.
- When a user requests content, it's served from the nearest Edge Location, which makes the content load faster and reduces the load on the central server.
- Edge Locations are crucial for delivering web content quickly to users all over the globe.

Things required to create AWS account

- Email Address
 - Phone number
 - Credit or Debit Card
-
- ❖ Visit “aws.amazon.com” to create your account.

Identity and Access Management IAM



What is IAM?

Users

Groups

Roles

Policies

IAM Account Settings



What is IAM?

- IAM helps you to manage users and their level of access in AWS.
 - Create users and assign permissions
 - Create groups and roles
 - Control access to AWS resources (like S3, EC2, etc)
- We have two types of AWS user account.
 - **Root Account** - It is associated with your email address. The account owner with complete access to all AWS services and resources. You're the root user if you created the AWS account and you sign in using your root user email and password.
 - **IAM user** - The IAM user represents the human user or workload who uses the IAM user to interact with AWS service.

Roles and Policies

- AWS IAM roles and policies are fundamental components of Amazon Web Services (AWS) that help control and manage access to AWS resources.
- IAM roles determine who gets access to AWS resources, and IAM policies define what they can do with that access. Roles and policies work together to help you manage and secure your AWS environment by ensuring that only authorized entities have the right level of access to AWS services and data.

IAM Roles

- It is predefined sets of permissions that you can assign to AWS resources.
- These roles help ensure secure access to AWS resources by granting permissions on a temporary and as-needed basis.

IAM Policies

- IAM policies are like rulebooks that specify what actions are allowed or denied for AWS resources or users.
- Policies are written in a JSON format and define the permissions associated with roles, users, or groups.
- These policies are used to control who can do what within AWS, which resources they can access, and under what conditions.

What we are going to do now?

- Create a group and assign any AWS resource permission.
- Create new user and assign this user to the group.
- Try to login via new IAM user and check the permissions.
- Understand programmatic access and IAM Account Settings.
- Install & Configure AWS CLI using new user account.

Note : IAM is not region specific, it is universal !

Programmatic Access

1. Go to IAM Service
2. Click user's section
3. Select the user which you want to give programmatic access
4. Click the 'Security credentials'
5. Click the Access Keys
6. Choose the Command Line Interface (CLI)
7. Create access Key and download the key details
8. Programmatic access is created and we can configure later

IAM Account Settings

1. Go to Account Settings
2. Edit your Password policies – according to pattern
3. Then all alerts will be gone

AWS – CLI Install

1. Open the VM
2. Take snapshot of web server and give a name as Before Cloud
3. Start the web server
4. Mkdir aws-cli and cd aws-cli and install the bellow
5. Install the AWS CLI - `curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"`
6. `yum install unzip`
7. `unzip awscliv2.zip`

8. `cd aws`
9. `./install and check the version aws --version`

AWS – CLI Configure

1. Run the command : `aws configure`

```
[root@udc aws]# aws configure
AWS Access Key ID [None]: AKIAIXYKJTN27MPH7LNE6
AWS Secret Access Key [None]: iBFzzzyzias9f17FKY+ne1gyuhjwCtE3MilReA8MOP
Default region name [None]:
Default output format [None]:
[root@udc aws]# aws sts get-caller-identity
{
    "UserId": "AIDAXYKJTN27EE5DEJ53C",
    "Account": "533267181246",
    "Arn": "arn:aws:iam::533267181246:user/jayanth123"
}
[root@udc aws]#
```



What we are going to learn?

- What is S3?
- Benefits of S3
- S3 Operations
- Host a static website in S3
- S3 Storage classes
- S3 Objects - Lifecycle Management Policy
- S3 Versioning
- S3 Replications

What is S3

Amazon Simple Storage Service (Amazon S3) is an object storage service that offers industry-leading scalability, data availability, security, and performance.

Amazon S3 provides management features so that you can optimize, organize, and configure access to your data to meet your specific business, organizational, and compliance requirements.

- User can store and retrieve any type or amount of data (objects or files) in S3 over the web.
- User can upload files from 0 bytes to 5 TB in size to S3 buckets (folder).
- Bucket names must be unique across all AWS accounts in all the AWS Regions within a partition

Benefits of S3

- Unlimited Storage Space
- Data High Availability - 99.99%
- Data Durability - 99.9999999999%
- Simple Interface - Web & CLI
- Data Security

S3 Operations

- Create a bucket.
- Upload a file (object) and check properties.
- Enable Public Bucket Access.
- Enable Public access for object via Object ACL.
- Accessing all objects in the bucket publicly.
- Deleting the objects.

How to create a static website in S3?

- Create a sample HTML file.
- Create a bucket with Public access.
- Upload the sample HTML file to the bucket
- Create a public access over the file (Object ACL).
- Create a public access over the bucket.

S3 Storage Classes

- S3 Standard
- S3 Intelligent Tiering
- S3 Standard IA (Infrequent Access)
- S3 One Zone IA
- S3 Glacier
- S3 Glacier Deep Archive

					
S3 Standard	S3 Intelligent-Tiering	S3 Standard-IA	S3 One Zone-IA	S3 Glacier	S3 Glacier Deep Archive
Frequent			Access frequency		
<ul style="list-style-type: none"> • Active, frequently accessed data • Milliseconds access • ≥ 3 AZ • \$0.0210/GB 	<ul style="list-style-type: none"> • Data with changing access patterns • Milliseconds access • ≥ 3 AZ • \$0.0210 to \$0.0125/GB • Monitoring fee per object • Min storage duration 	<ul style="list-style-type: none"> • Infrequently accessed data • Milliseconds access • ≥ 3 AZ • \$0.0125/GB • Retrieval fee per GB • Min storage duration • Min object size 	<ul style="list-style-type: none"> • Re-creatable, less accessed data • Milliseconds access • 1 AZ • \$0.0100/GB • Retrieval fee per GB • Min storage duration • Min object size 	<ul style="list-style-type: none"> • Archive data • Select minutes or hours • ≥ 3 AZ • \$0.0040/GB • Retrieval fee per GB • Min storage duration 	<ul style="list-style-type: none"> • Long-term archive-data • Select hours • ≥ 3 AZ • \$0.00099/GB • Retrieval fee per GB • Min storage duration

Why S3 Storage Classes?

- Amazon S3 offers a range of storage classes that you can choose from based on the data access, resiliency, and cost requirements of your workloads.
- S3 storage classes are purpose-built to provide the lowest cost storage for different access patterns. S3 storage classes fit virtually for any use case, including those with demanding performance needs, data residency requirements, unknown or changing access patterns, or archival storage.

Keep in Mind !



S3 - Versioning

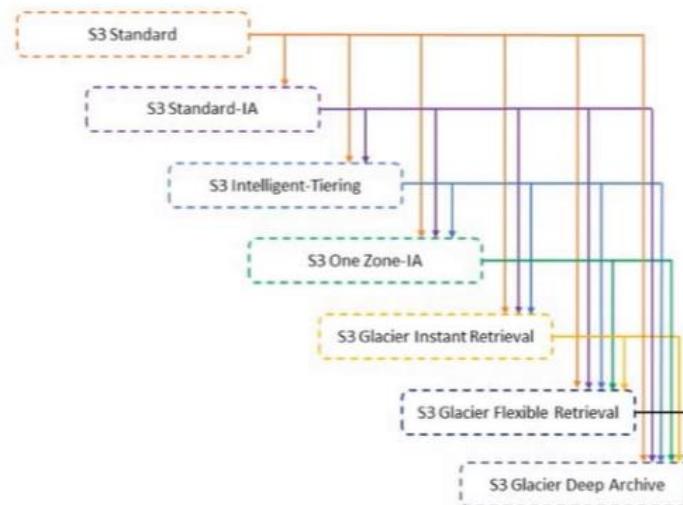
Versioning in Amazon S3 is a means of keeping multiple variants of an object in the same bucket.

You can use the S3 Versioning feature to preserve, retrieve, and restore every version of every object stored in your buckets.

With versioning you can recover more easily from both unintended user actions and application failures.

After versioning is enabled for a bucket, if Amazon S3 receives multiple write requests for the same object simultaneously, it stores all of those objects.

S3 - Object Lifecycle Management Policy



S3 - Replication Policy

Replication enables automatic, asynchronous copying of objects across Amazon S3 buckets.

Buckets that are configured for object replication can be owned by the same AWS account or by different accounts.

You can replicate objects to a single destination bucket or to multiple destination buckets.

The destination buckets can be in different AWS Regions or within the same Region as the source bucket.

Recap

- Handling S3 buckets, files and its access.
- S3 (public) static website configuration.
- S3 Storage Class models and its pricing structure.
- S3 Versioning
- S3 Lifecycle Management Policy
- S3 Replication Policy

Project - User Data Collector - Web App

Test Environment



AWS S3



Amazon S3