

# 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

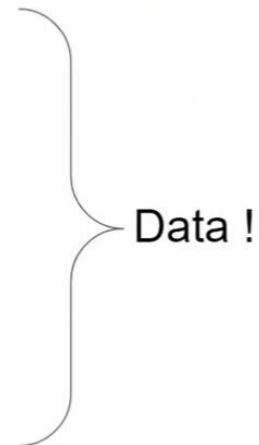
> Receive from one side

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
Transport Layer	It is segmenting data into smaller units called segments
Network Layer	The segments are further encapsulated into packets. It contains source and destination IP address
Data Link Layer	This layer adds physical addresses, known as MAC and packets are boxed in frame
Physical Layer	The frames are converted into electrical or optical signals that can be transmitted over the RJ 45 cable

Reception & Decoding	NIC - It receives the signals and converts them back into frames.
Data Link	It checks the MAC address, if the frame is for the receiving NIC then frame is accepted else ignored.
Network	It extracts the packet from the accepted frame and checks the destination IP address
Transport	If above correct, then it will extract the segments and reassembles them into the original data.
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

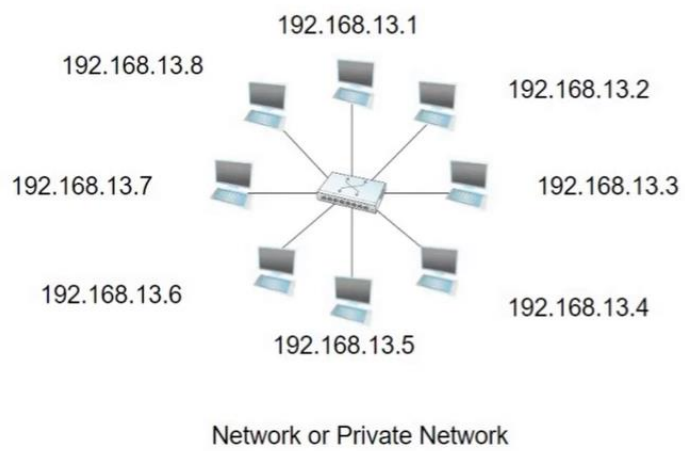
Reading the Packet Source and Destination IP >

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

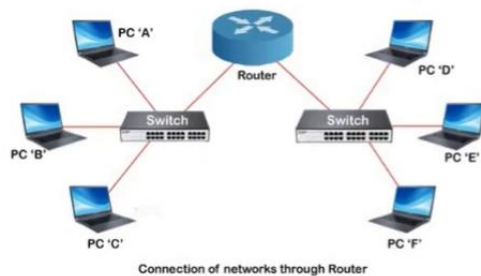
## Example



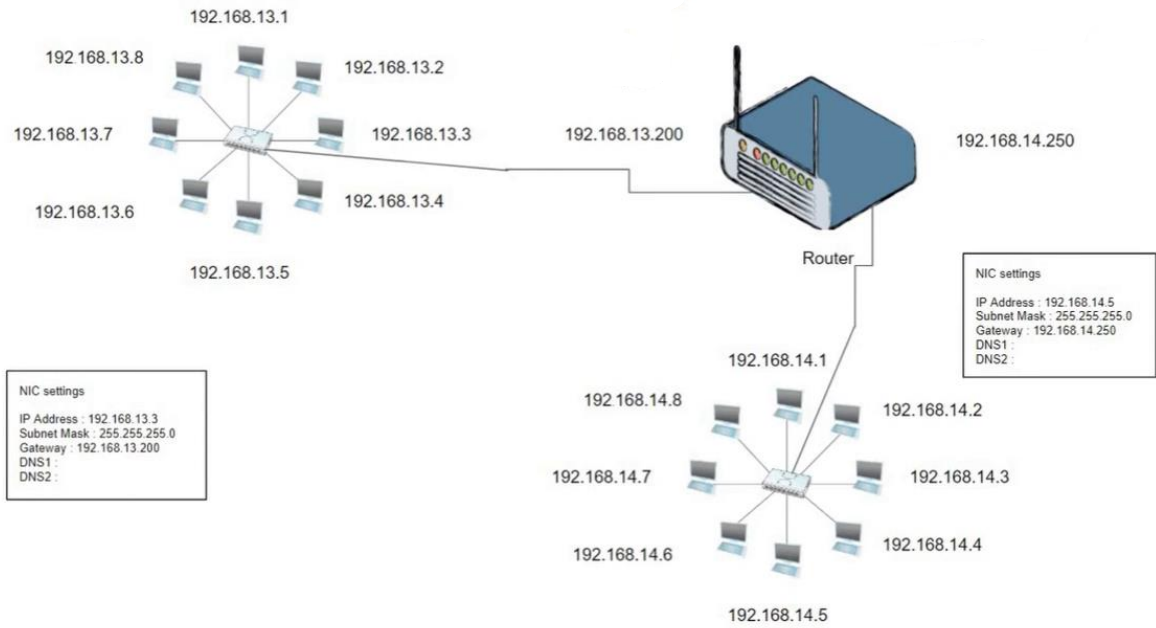
IP	MAC	Port
192.168.13.1	xxxx:xxxx:xxxx:xxx	3
192.168.13.2	xxxx:xxxx:xxxx:xxx	4
192.168.13.5	xxxx:xxxx:xxxx:xxx	7
192.168.13.24	xxxx:xxxx:xxxx:xxx	20

## 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.pavilagam.com](http://www.pavilagam.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

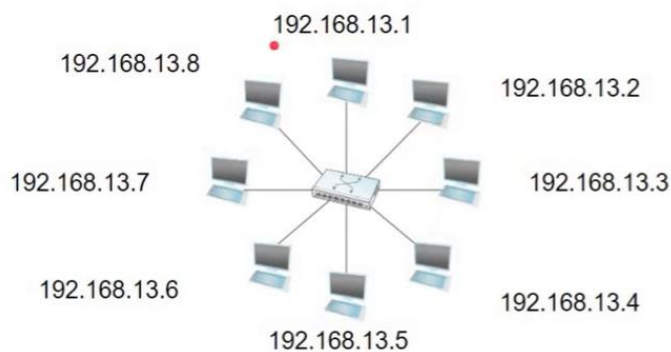
Class	Start Address	End Address
A	10.0.0.0	10.255.255.255
B	172.16.0.0	172.31.255.255
C	192.168.0.0	192.168.255.255

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

## IP Addressing

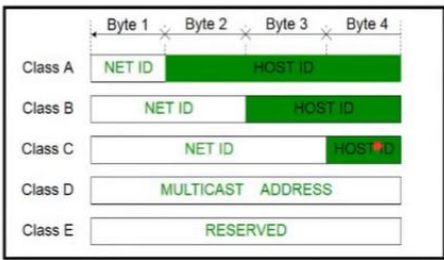
### IP Address:

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

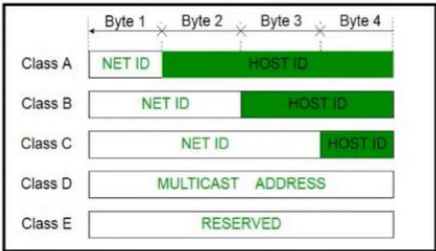
IPv4 = 32 bit

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

## IPv4 Vs IPv6

IPv4 = 32 bit

8 bit	8 bit	8 bit	8 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		7.9x10 <sup>28</sup> 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		172.16.0.0	172.16.1.1		192.168.0.1	192.168.1.1	
10.0.0.2	10.0.1.2		172.16.0.1	172.16.1.1		192.168.0.2	192.168.1.2	
...	...		...	...		...	...	
10.0.0.255	10.0.1.255	10.255.255.255	172.16.0.255	172.16.1.255	172.31.255.255	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

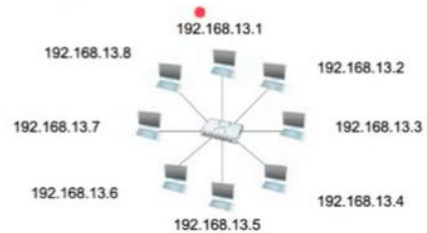
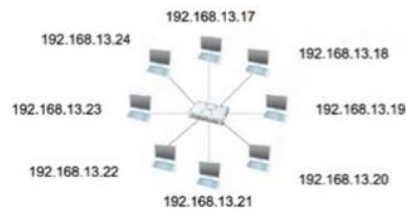
## Benefits

- 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 Inst... South BU - Google... TECHY0056 | Ethnik... 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 **D**

First Octet Range: 192 - 223

IP Address: 192.168.13.16 Hex IP Address: C0 A8 0D 10

Subnet Mask: 255.255.255.240 Wildcard Mask: 0.0.0.15

Subnet Bits: 4 Mask Bits: 28

Maximum Subnets: 16 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: [empty]

### 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

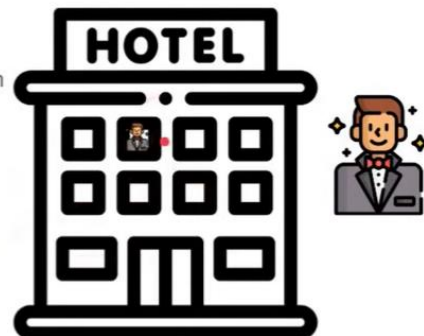
- Your family informed you that, your "Fav" actor stayed in hotel in your area for shooting
- Now you are trying to meet him.
- And, you found the receptionist is your friend.
- You are asking about the actor stay to your friend receptionist
- He said, he is staying in 6th Room and you can go and meet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

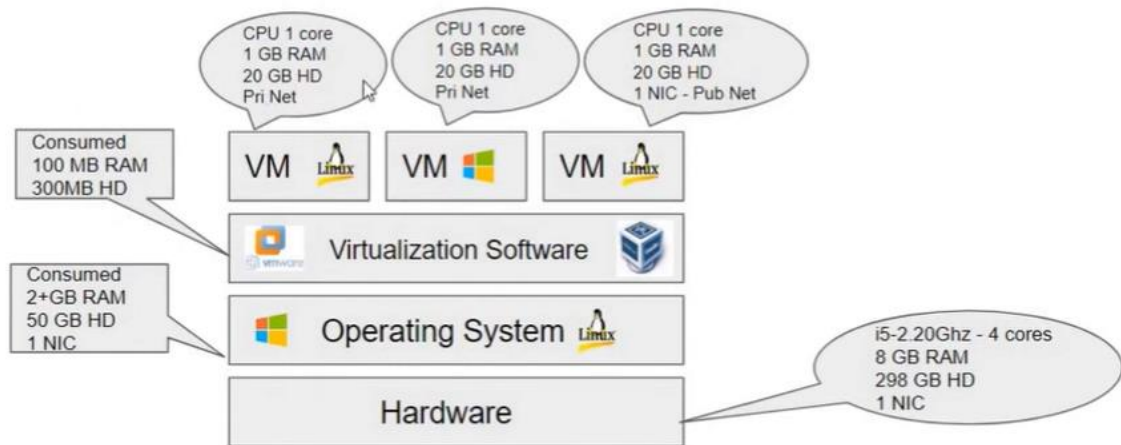
- Port forwarding is a networking technique that allows you to redirect incoming network traffic from one port on a router or firewall to another port on a different device in your local network.
- Inside your local network, you have various devices (computers, servers, IoT devices, etc.) that run services 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**

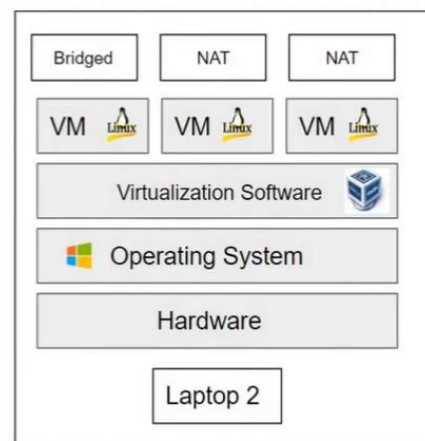
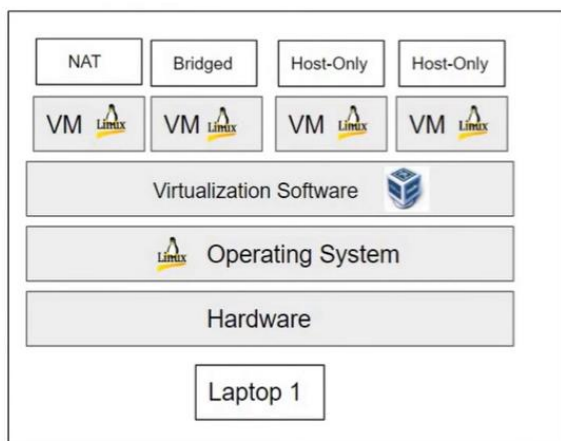
Mode	VM→Host	VM←Host	VM1↔VM2	VM→Net/LAN	VM←Net/LAN
Host-only	+	+	+	-	-
Internal	-	-	+	-	-
Bridged	+	+	+	+	+
NAT	+	Port forward	-	+	Port forward
NATservice	+	Port forward	+	+	Port forward



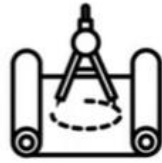


Type 2 - Virtualization

## Example



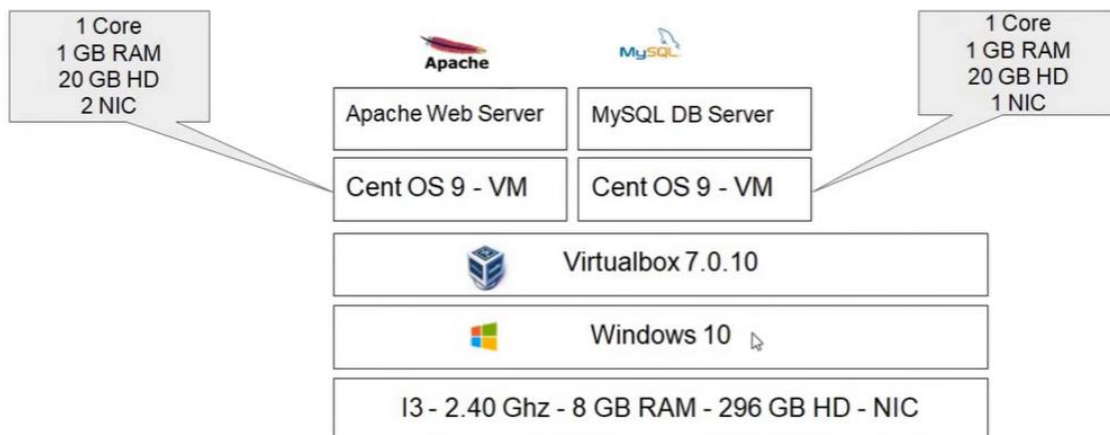




## Test Environment - Plan & Build



## 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](http://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](http://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 shown 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 followin  
g 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):**
  - Yum is one of the older package managers and was widely used in Red Hat Enterprise Linux (RHEL) and its derivatives.
  - Yum resolves package dependencies automatically. If a package relies on other packages, Yum will find and install those dependencies for you.
  - It works with "repositories," which are online locations that store software packages.
  - 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

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### 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?

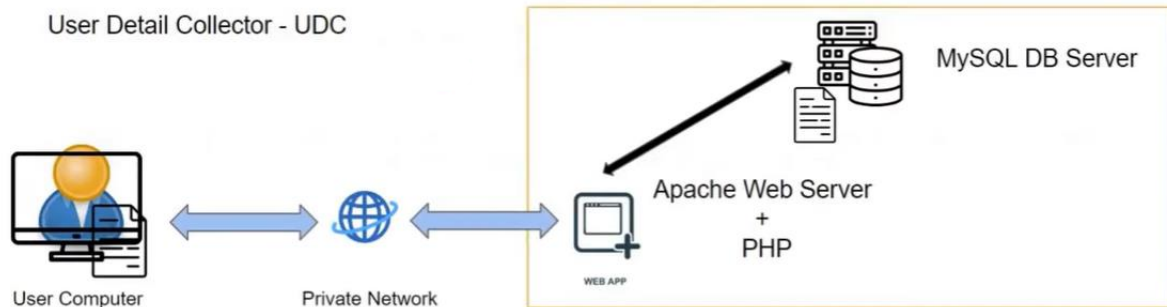
Step 6 : Deploy & Test your Application !

## 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

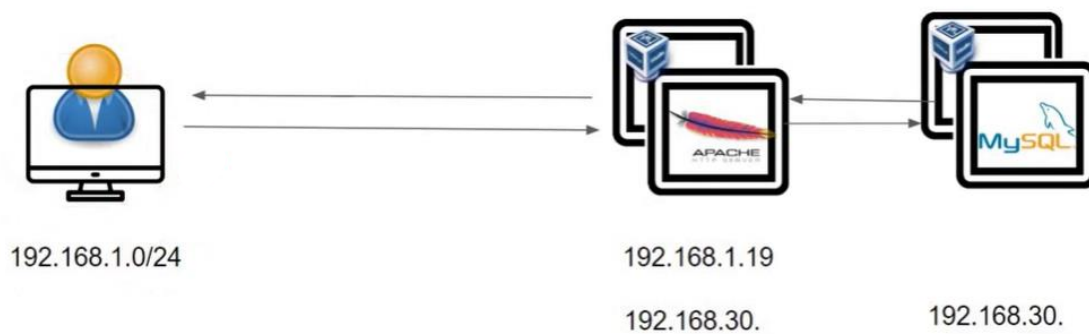


# Write your Application

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.