

pool refers to range.

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#### (4) Excluded Reserved IP Addresses

=> Reserve the first few IP's in the range for static assignments.  
(e.g. routers, servers, etc).

=> ip dhcp excluded-address 192.168.10.1

192.168.10.10

=> If we don't specify DNS?

=> If the DHCP does not provide a DNS server, devices on the network will not know where to send DNS queries (i.e. request to request to resolve domain names like google.com into IP addresses).

=> 8.8.8 is a public DNS server operated by Google. It is globally available service that resolves domain names into IP addresses.

=> The DNS server (8.8.8.8) is simply a service that resolves domain names. It could be any service that provides DNS resolution, just Google.

For ex.

use . 1.1.1 from cloudflare.

#### (5) Create a DHCP Pool

=> Configure the DHCP pool to assign IP addresses dynamically.

MyPool

=> ip dhcp pool <pool-name>

=> network 192.168.10.0 255.255.255.0

=> default-router 192.168.10.1

=> dns-server 8.8.8.8

=> exit.

#### Important points

=> By including DNS server 8.8.8.8

=> DHCP ~~sends~~ dynamically tells each client where to send DNS queries.

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## DHCP IP Assignment Process:

Client sends a broadcast: "I need an IP" (DISCOVER)

Server offers an IP: "Here's one for you" (OFFER)

Client requests the IP: "I'll take this one" (REQUEST)

Server confirms: It's yours for now (ACK).

⇒ IP helper address < Server-IPaddress >

⇒ The ip helper-address command is used, on a router interface to DHCP request (and offer broadcast protocols) from one subnet to a DHCP server located in another subnet.

⇒ This is essential when the DHCP server is not in the same network as the client devices.

⇒ The ip helper-address command should only be applied on the interfaces connected to the subnet where DHCP request originate (clients).

⇒ The server does not need the ip-helper-address because server is directly reachable within this subnet.

## "Router in a Stick" (Inter-Vlan Routing)

⇒ Router on a Stick is a method of Inter-Vlan Routing, which allows packets to be sent from one VLAN to another VLAN.

⇒ Inter-Vlan Routing Explained

⇒ VLANs are isolated by default, which means devices in different VLANs cannot communicate with each other.

⇒ To enable communication b/w VLANs, a layer 3 device (like a router or layer 3 switch) is required.

⇒ In the Router on a Stick setup,

- A single physical router interface is used to handle traffic from multiple VLANs.

- Subinterfaces are created on the router, each representing a VLAN.

- These subinterfaces handle routing b/w the VLANs.

→ HOW IT WORKS

1 A PC in Vlan 10 p sends a packet to a PC in Vlan 20.

2 The packet is sent to the router because the destination is in a different subnet (Vlan)

3 The Router

- Router the packet from the Vlan 10 interfaces to the Vlan 20 subinterface

- Sends the packet back to the switch through the trunk link

4 The switch forwards the packet to the PC in Vlan 20.

Key features

→ This method enables communication b/w Vlans.

→ It is a cost-effective solution when a layer 3 switch is not available.

• Tricky Ans Why Switch can't send b/w Vlans?

→ A Switch operates at Layer 2 (Data Link Layer) it uses Mac-Address to forward frames within the same Vlan.

→ Since Vlans are logically isolated, a switch cannot forward packet between different Vlans because it doesn't work with IP address (Layer 3).

→ Whereas a Router (Layer 3, Network Layer) it uses IP Address to route packets b/w different networks or subnet (in this case, Vlans).

→ When devices in different Vlans communicate, their traffic is routed routers subinterfaces.

Key concept:

• Switch alone: Cannot forward packets b/w Vlans because it doesn't understand IP addresses or routing.

• Router can forward p b/w Vlans because it works with IP addresses and routes traffic b/w different subnets.

→ This is why the Router on a stick setup is necessary for enabling communication b/w VLAN's.

→ They are fragmented packets can span several across switch → Router with header (Vlan id) of different Vlan

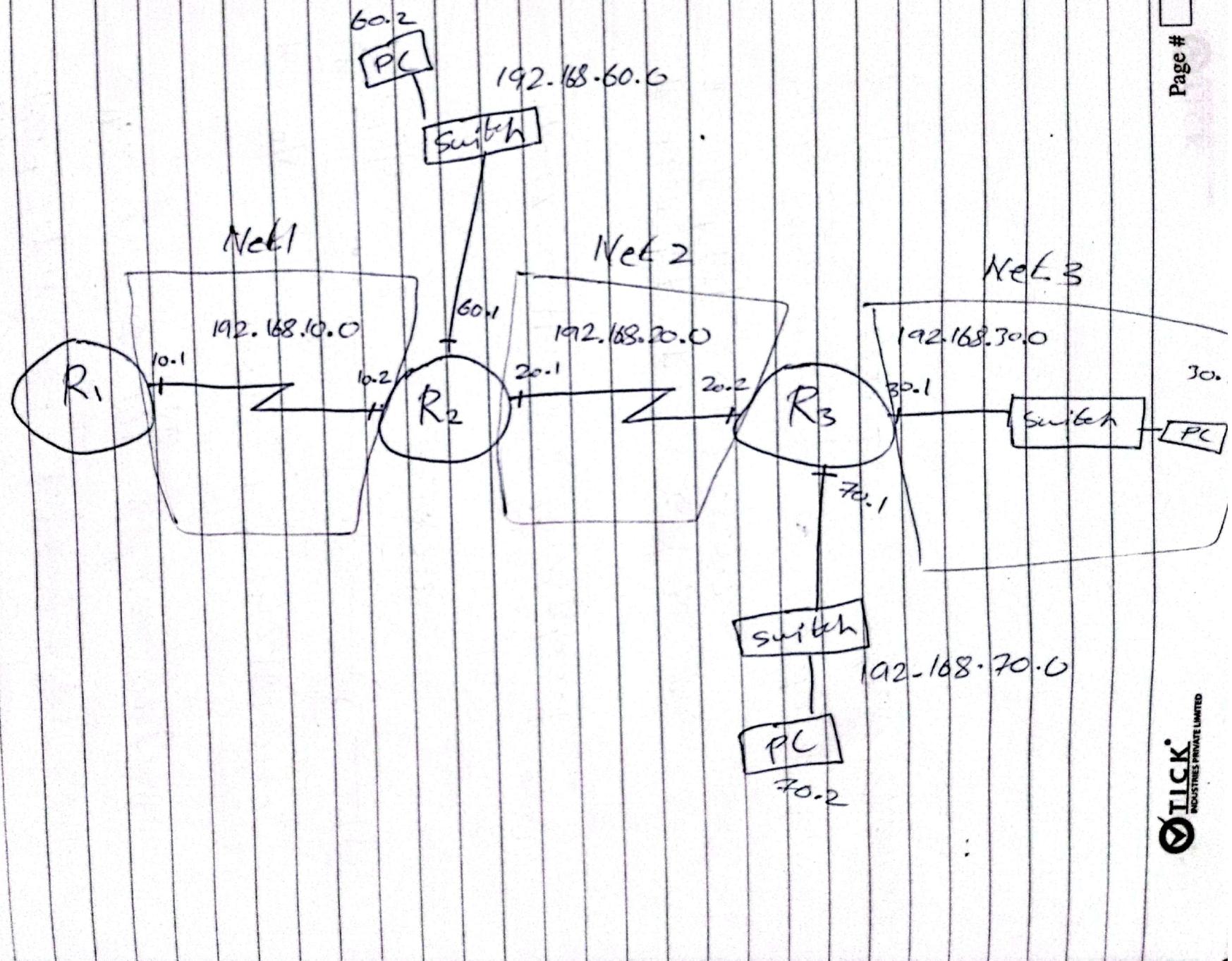
→ Unfragmented are sent within same Vlan.  
can switch knows based on the port configuration (mac address).

$$= 192.168.10.0 / 24 \Rightarrow \text{class C}$$

$$\downarrow 255.255.255.0$$

/24 indicates the Subnet mask

CIDR total is 32 bit if it is  
24 then class C, 16 → class B.



## "DNS and Email Server Config"

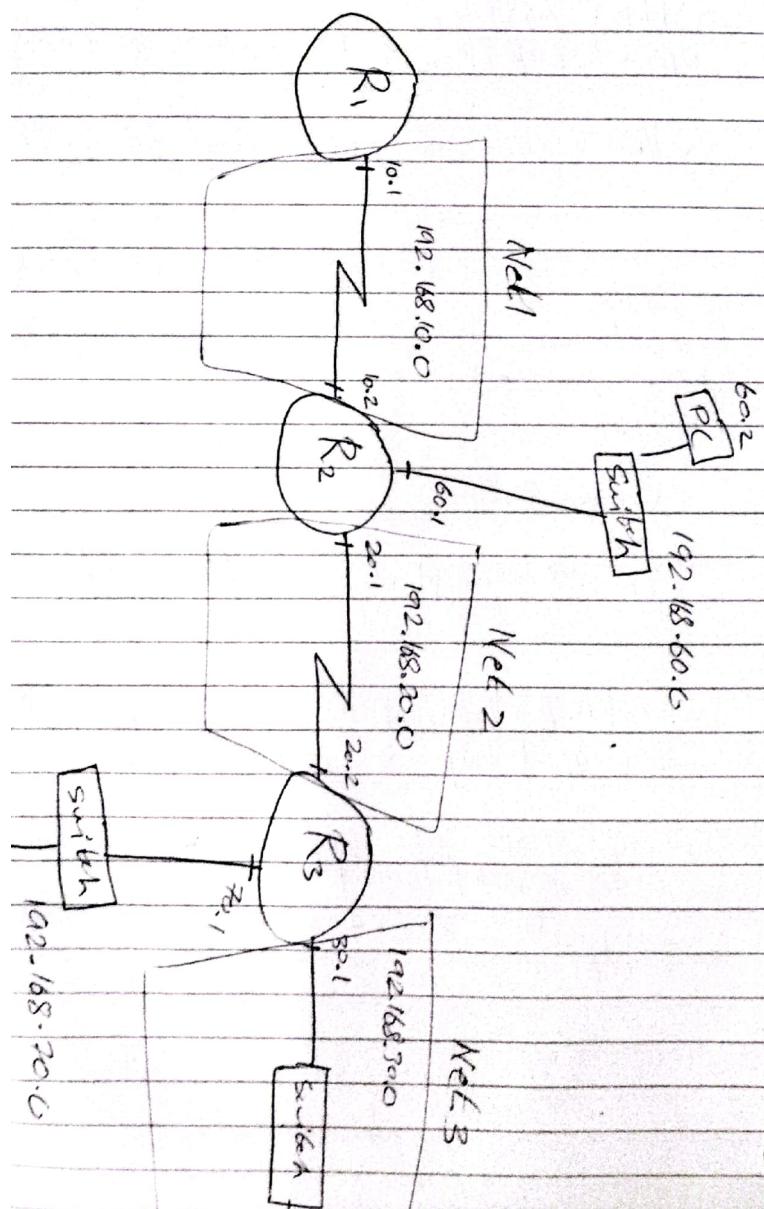
What is the Next Hop?

⇒ The next hop is the IP Address of the neighboring router's interface that a packet will be forwarded to in order to reach its destination.

⇒ It is part of the static route configuration and helps the router know where to send packets when they are not directly connected to the destination network.

⇒ If router doesn't have direct connection to the destination. It forwards the packet to the next router, which is identified by next hop.

⇒ When network is attached directly to a router's interface no next-hop is needed because the router already knows how to deliver packets.



## "DNS and Web"

There are three server's two Webserver and one DNS.

→ Assign the IPs to all server's and default gateway.

→ The DNS server's IP, assign to all PC, server DNS, including the DNS servers.

→ Make two Web pages in web server separately.

Web Server 1 → 192.168.20.2 Hello dsu

Web Server 2 → 192.168.20.3 Hello yahoo.

→ Go to Services then select HTTP File Manager then edit a new or old file. HelloWorld.html or index.html.

→ in DNS there are two types of records.

• A Record (Address Record).

→ Maps a domain name (e.g. www.yellowworld.com) to an IP (e.g., 192.168.20.2).

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• Add a CName Record (Canonical Name Record).

→ Creates an alias for a domain (e.g. alias yellowworld.com pointing to www.yellowworld.com).

In DNS go to the DNS

name → domain like gmail.com.

Address → IP of the other server (WebServer or server's)

↓ Same thing in email and file transfer protocol.

## "File transfer protocol"

- ⇒ FTP (IP)
- ⇒ Put
- ⇒ Get
- ⇒ Rename
- ⇒ delete

## 'Email Server Configuration'

⇒ An Email server that handles and delivers emails over a network, typically over a network.

Key protocols:

### 1) SMTP (Simple Mail Transfer Protocol)

- ⇒ Used for sending no email from clients to server or between servers
- ⇒ Activated when you click 'Send' in an email program.

⇒ POP3 (post office protocol versions).

⇒ Used for retrieving emails from servers to emails clients.

⇒ Allow users to download emails to their local system.

⇒ DNS → domain: gmail.com  
address: email server. [A record.]  
⇒ Settle DNS.

⇒ To go email server.

⇒ Services

⇒ Domain Name - that is seted in DNS.

⇒ Give name, password.

⇒ & Go the PCI (mail)

⇒ Email ⇒ Configuration  
fill all info.

⇒ ex name:  
Email add : name@gmail.com.

incoming server : gmail.com  
outgoing server : "

login

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Get the email.

Go to PC2 (Rumasa).

→ Click received.

### "File transfer Protocol"

→ FTP Server

→ Software running on a computer to store and share files using FTP.

→ Req: TCP / IP network.

• FTP Client: Software used to connect to an FTP server for file transfer.

→ Set the DNS same as before

Address: <sup>new</sup> ~~old~~ ~~ftps~~

A New

Address: FTP server's (IP).

→ ON FTP Server.

→ Make user give credentials.

→ Write on W, R, D, P, TEL

### Imp Commands of FTP

Open PC Command Prompt

→ To check directory

~~CD DIR~~ → dir

→ Connect to FTP Server:

→ ftp 192.168.1.2 without DNS

ftp ftpp with DNS.

→ Enter user, password.

ftp > . . .

→ Upload:

→ put Hello.txt

→ Rename:

→ rename Hello.txt NewHello.txt

→ Verify it by dir

quit FTP

→ quit

→ Go to P02.

→ connect FTP

→ get <filename> (download the file)

→ To delete the file

→ delete <filename>.