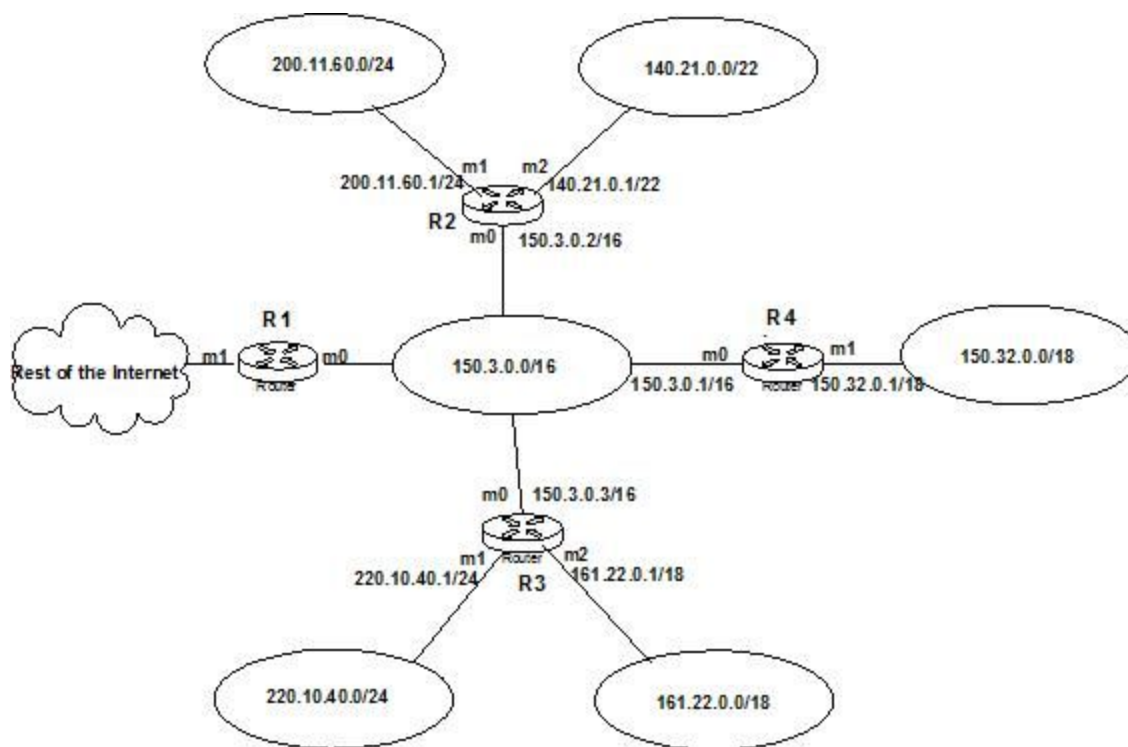# Assignment-2 (Scenario Based Questions)

Fundamentals of Networking : Enterprise Network Engineering

Question 1 – Routing table construction:

Given the following network, construct the routing table for routers <u>R2</u> and <u>R3</u>.

Question 2– Allocating subnets from a block

You are the Network Administrator for a startup company that has been granted a new block of addresses starting with the address **139.145.56.0/22**.

1. Calculate the total number of addresses available in this block including all the special addresses. Show your calculation (1 mark)

1. As Network Administrator, you need to distribute the available addresses on a departmental needs basis (meaning not allocating more than you have to), with 4 new subnets determined as follows:

Marketing needs 65 addresses

Accounting needs 100 addresses

Head Office needs 33 addresses and,

Customer Services needs 13 addresses.

Create the 4 subnets. For each subnet, list the subnet or first address, the last address, and the subnet mask in CIDR format. Show your calculations for all subnets, briefly showing how you arrived at the sub-block addresses.   (4 marks or 1 mark for each correct subnet)

1. How many addresses are left unallocated? Show your calculation. (1 mark)

Quick Summary to read

Switch, Hub, Bridge, Router

hub is the simplest of these devices. Any data packet coming from one port is sent to all other ports. It is then up to the receiving computer to decide if the packet is for it. Imagine packets going through a hub as messages going into a mailing list. The mail is sent out to everyone and it is up to the receiving party to decide if it is of interest.

The biggest problem with hubs is their simplicity. Since every packet is sent out to every computer on the network, there is a lot of wasted transmission. This means that the network can easily become bogged down.

Hubs are typically used on small networks where the amount of data going across the network is never very high.

A bridge goes one step up on a hub in that it looks at the destination of the packet before sending. If the destination address is not on the other side of the bridge it will not transmit the data.

A bridge only has one incoming and one outgoing port.

To build on the email analogy above, the bridge is allowed to decide if the message should continue on. It reads the address bob@smith.com and decides if there is a bob@smith.com on the other side. If there isn't, the message will not be transmitted.

Bridges are typically used to separate parts of a network that do not need to communicate regularly, but still need to be connected.

A switch steps up on a bridge in that it has multiple ports. When a packet comes through a switch it is read to determine which computer to send the data to.

This leads to increased efficiency in that packets are not going to

computers that do not require them.

Now the email analogy has multiple people able to send email to multiple users. The switch can decide where to send the mail based on the address.

Most large networks use switches rather than hubs to connect computers within the same subnet.

A router is similar in a switch in that it forwards packets based on address. But, instead of the MAC address that a switch uses, a router can use the IP address. This allows the network to go across different protocols.

The most common home use for routers is to share a broadband internet connection. The router has a public IP address and that address is shared with the network. When data comes through the router it is forwarded to the correct computer.

This comparison to email gets a little off base. This would be similar to the router being able to receive a packet as email and sending it to the user as a fax.

What is mac address and why it is required?

MAC address is a number created by the manufacturer to identify the computer on the network.

Define Address Resolution Protocol (ARP)

Address Resolution Protocol (ARP) is a required TCP/IP standard defined in RFC 826, "Address Resolution Protocol (ARP)." ARP resolves IP addresses used by TCP/IP-based software to media access control addresses used by LAN hardware. ARP provides

the following protocol services to hosts located on the same physical network:

- Media access control addresses are obtained by using a network broadcast request in the form of the question "What is the media access control address for a device that is configured with the enclosed IP address?"
- When an ARP request is answered, both the sender of the ARP reply and the original ARP requester record each other's IP address and media access control address as an entry in a local table called the ARP cache for future reference.
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What is the difference between broadcast and collision domain?

Broadcast Domain:

- A logical set of computer systems those are reachable without using a router.
- Broadcast Domain is limited to the specific IP sub network for all the IP broadcasts.
- Broadcast domain uses a switched environment to broadcast.
- The network systems will have 255 at the end of the IP addresses.

Collision Domain:

- It refers a set of devices in which packet collision could occur.
- The devices can include the devices of another IP sub networks.

- **There is a potential packet collision as multiple devices transmit data on one wire / link.**
- **A collision can occur on cable , hub or repeater.**
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Explain about three functions of a Switch .

There are three distinct functions of layer 2 switching : address learning, forward/filter decisions, and loop avoidance.

Address learning :

Layer 2 switches and bridges remember the source hardware address of each frame received on an interface, and they enter this information into a MAC database called a forward/filter table.

Forward/filter decisions :

When a frame is received on an interface, the switch looks at the destination hardware address and finds the exit interface in the MAC database. The frame is only forwarded out the specified destination port.

Loop avoidance :

If multiple connections between switches are created for redundancy purposes, network loops can occur.

Spanning Tree Protocol is used to stop network loops while still permitting redundancy.

What is Proxy Address Resolution Protocol (Proxy ARP)?

Proxy Address Resolution Protocol (Proxy ARP) is a variation of the ARP protocol in which an intermediate device, such as a router, sends an ARP response on behalf of an end node to the requesting host.

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Benefits of Proxy ARP :

- **No need to configure clients with a gateway**
- **Load balancing, although this is somewhat random**
- **Immediate fault tolerance for addresses not recently contacted**