

ASSIGNMENT # 2

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Assignment Tasks

Q1: Unicast Protocols:

- **Define unicast communication and explain how it works in networking.**

Unicast communication is a one-to-one communication model in which data is sent from a single source to a single destination. In networking, unicast refers to the transmission of a data packet from one device to another device over a network, using a unique destination IP address.

How it works:

- In a unicast transmission, the sender sends data to one specific receiver.
- Each data packet is directed to a specific IP address, which corresponds to the destination device.
- Unicast is used primarily for point-to-point communication, where the data needs to be delivered directly to a single device, such as browsing a website, downloading a file, or sending an email.

- **List and describe at least three unicast protocols.**

1. TCP (Transmission Control Protocol):

- Description: TCP is a connection-oriented protocol used for reliable, ordered, and error-checked delivery of data between applications over a network. It ensures that all data packets reach the destination in the correct order, retransmitting lost packets if necessary.
- Use Case: Commonly used in applications that require reliability, such as web browsing (HTTP), file transfer (FTP), and email (SMTP).

2. UDP (User Datagram Protocol):

- **Description:** UDP is a connectionless protocol that sends packets without establishing a connection or ensuring reliability. It is faster but does not guarantee that packets will reach the destination.
- **Use Case:** Used in applications where speed is crucial, and some packet loss is acceptable, such as live video streaming, online gaming, and VoIP.

3. HTTP (Hypertext Transfer Protocol):

- **Description:** HTTP is the protocol used for transmitting web pages over the internet. It is a stateless protocol used to request and transfer web resources between a client (web browser) and a server.
- **Use Case:** Used in web browsing and web application communication, where each request from a browser (client) to a web server is a unicast communication.

• Explain the advantages and disadvantages of unicast communication.

Advantages:

- **Reliable:** Since data is sent directly from the sender to a specific receiver, there is a higher chance of ensuring reliable delivery.
- **Easy to Implement:** Unicast is straightforward and widely supported in most network protocols, making it easy to set up and use.
- **Efficient for Small Data:** Ideal for applications where only a single recipient needs the data.

Disadvantages:

- **Inefficient for Large-Scale Data Distribution:** Unicast becomes inefficient when sending the same data to multiple recipients, as multiple copies of the data need to be transmitted, leading to high bandwidth usage.
- **Provide real-world examples of unicast protocol usage.**
 1. **Web Browsing:** When you visit a website, your browser sends a request (using HTTP) to a server, and the server responds with the requested page data. This is a classic example of unicast communication, where one client communicates with one server.
 2. **File Transfers:** When you download a file from the internet (FTP or HTTP), the server sends the file to your device via unicast communication.
 3. **Email Transmission:** When an email is sent, the email server transmits the message to the recipient's mail server via unicast communication (SMTP), and then the recipient downloads it.

Q2: Multicast Protocols:

- **Define multicast communication and how it differs from unicast.**

Multicast communication is a one-to-many or many-to-many communication model where data is sent from a source to multiple receivers simultaneously. Unlike unicast, where data is sent to a single receiver, multicast allows a single transmission to be delivered to a group of interested recipients, identified by a multicast group address.

Differences from Unicast:

- Unicast is one-to-one, sending data to a single device, while Multicast is one-to-many, delivering data to a group of devices.

- Unicast requires a separate copy of data to be sent to each recipient, which increases the load on the network, whereas multicast sends a single copy of data to all group members, making it more efficient.
- **List and describe at least three multicast protocols (e.g., IGMP, PIM, RTP).**
- **IGMP (Internet Group Management Protocol):**
 - **Description:** IGMP is used by hosts and adjacent routers to manage multicast group memberships in IPv4 networks. It allows devices to join or leave multicast groups.
 - **Use Case:** Essential for the operation of multicast applications on IPv4 networks, such as streaming or video conferencing.
- **PIM (Protocol Independent Multicast):**
 - **Description:** PIM is used to route multicast traffic efficiently across large-scale networks. PIM does not rely on a specific underlying unicast routing protocol and can be used with any routing protocol (e.g., OSPF or RIP).
 - **Use Case:** Used in large-scale multicast networks, like IPTV and video conferencing.
- **RTP (Real-time Transport Protocol):**
 - **Description:** RTP is used for delivering real-time data, such as audio and video, over multicast networks. RTP works in conjunction with RTCP (Real-time Control Protocol) to manage and monitor data delivery.
 - **Use Case:** Commonly used for multimedia streaming services, such as VoIP and video conferencing.

- **Explain how multicast routing works and its benefits.**

Multicast Routing: Multicast routing allows routers to deliver multicast packets from a source to multiple receivers. It uses multicast group addresses, and routers forward data packets to all devices in a multicast group.

How it Works:

- **Join Group:** Devices wishing to receive multicast data join a multicast group using IGMP.
- **Route Data:** Multicast routers use protocols like PIM to manage the routing of multicast traffic to interested receivers.
- **Delivery:** The data is delivered to all receivers in the multicast group without needing to send multiple copies.

Benefits:

- **Bandwidth Efficiency:** Multicast significantly reduces network traffic compared to unicast when delivering the same content to multiple recipients.
- **Scalability:** Multicast can efficiently scale to many recipients without overloading the network.
- **Reduced Network Load:** Only a single copy of data is transmitted, and routers manage the replication to multiple recipients.

- **Provide real-world examples where multicast protocols are used (e.g., video streaming, IPTV).**

- **Video Streaming:** Multicast is used to stream video content to multiple users, such as in IPTV services. Multiple viewers can watch the same live broadcast or on-demand content without consuming additional bandwidth for each viewer.

- **Video Conferencing:** Applications like Zoom or Microsoft Teams use multicast protocols for real-time video conferencing, where multiple users can receive the same video feed from a single source.
- **Online Gaming:** Multiplayer online games often use multicast to send game state updates (e.g., player positions, game events) to many players simultaneously.

Q3: Packet Tracer Task – Configuring RIP or OSPF with

The screenshot displays the Cisco Packet Tracer interface with three main windows open:

- Left Window (Google Docs):** Contains a document titled "Steps to Complete the Task:" with the following instructions:
 - 1. Network Setup:**
 - Open Cisco Packet Tracer
 - Three routers
 - Two PCs connected to the routers
 - Use Serial 0/0/0
 - 2. Assign IP Addresses:**
 - Configure IP addresses on the routers
 - Use a /30 subnet mask
 - Assign IP addresses to the PCs
 - 3. Configure Loopback Address:**
 - Assign a loopback address to the routers
 - 4. Enable Routing Protocol:**
 - Configure the routing protocol (RIP or OSPF)
- Middle Window (Cisco Packet Tracer Configuration):** Shows the configuration for the GigabitEthernet0/0 interface. The IP address is set to 192.168.1.10 and the subnet mask is 255.255.255.0. The Tx Ring Limit is set to 30. The interface is configured as a static IP.


```

      Router(config-if)#ip address 192.168.1.10 255.255.255.0
      Router(config-if)#no shutdown
      Router(config-if)#
      
```
- Right Window (Cisco Packet Tracer Topology):** Shows a network diagram with two routers (2901 Router1 and 2901 Router2) and two PCs (PC-PT1 and PC-PT2) connected to them.

Steps to Complete the Task:

- Network Setup:**
 - Open Cisco Packet Tracer
 - Three routers
 - Two PCs connected
 - Use Serial and Ethernet connections
- Assign IP Addresses:**
 - Configure IP addresses on all interfaces
 - Use a /30 subnet mask
 - Assign IP addresses to the PCs
- Configure Loopback Address:**
 - Assign a loopback address to the routers
- Enable Routing Protocol:**
 - Configure the routing protocol (RIP or OSPF)

Assign a loopback address to the routers:

```
interface loopback 0
ip address 192.168.1.1 255.255.255.0
```

Physical Config CLI Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/0

Port Status: ☐ On

Bandwidth: ☒ 1000 Mbps ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex: ☒ Half Duplex ☐ Full Duplex ☒ Auto

MAC Address: 00D0 FF73 4701

IP Configuration

IP Address: 192.168.1.11

Subnet Mask: 255.255.255.0

Tx Ring Limit: 30

Equivalent IOS Commands

```
Router(vlan)#
%SYS-5-CONFIG_I: Configured from console by console

Router(vlan)#exit
APPLY completed.
Exiting....
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 192.168.1.11 255.255.255.0
Router(config-if)#ip address 192.168.1.11 255.255.255.0
Router(config-if)#tx-ring-limit 30
Router(config-if)#
```

Realtime Simulation

Server, Web Server, Printer, IP Phone, VoIP Device

2901 Router2

PC-PT PC1

PC-PT

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4. Enable R

Ex

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Physical Config CLI Attributes

IOS Command Line Interface

```
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#interface loopback 0
Router(config-if)#ip address 192.168.100.1 255.255.255.0
Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
router rip
Router(config-router)#version 2
Router(config-router)#network 192.168.1.0
Router(config-router)#network 192.168.2.0
Router(config-router)#network 192.168.100.0
Router(config-router)#no auto-summary
Router(config-router)#
Router(config-router)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

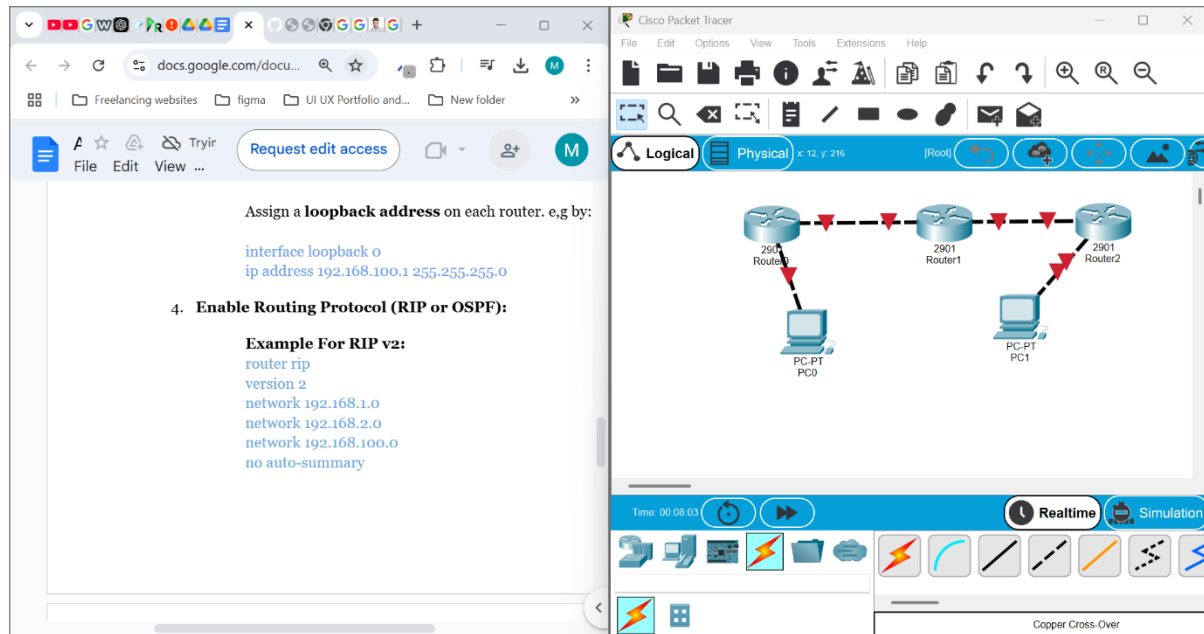
Realtime Simulation

Server, Web Server, Printer, IP Phone, VoIP Device

2901 Router2

PC-PT PC1

PC-PT



Github repository link:

<https://github.com/Musadiqaman/networking-assignment.git>