ASSIGNMENT # 2

By

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Subject: COMPUTER NETWORK

Date: 1-02-2025

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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:

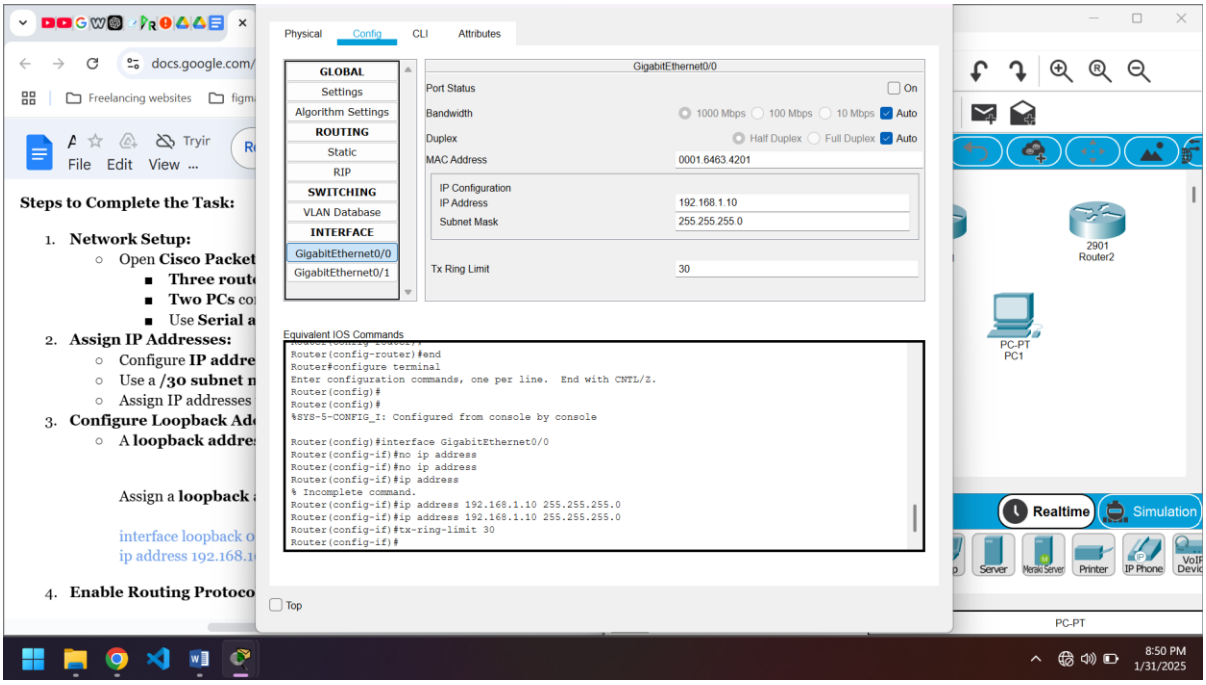
- **Bandwidth Efficiency**: Multicast significantly reduces network traffic compared to unicast when delivering the same content to multiple recipients.
- **Scalability**: Multicast can efficiently scale to many recipients without overloading the network.
- **Reduced Network Load**: Only a single copy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

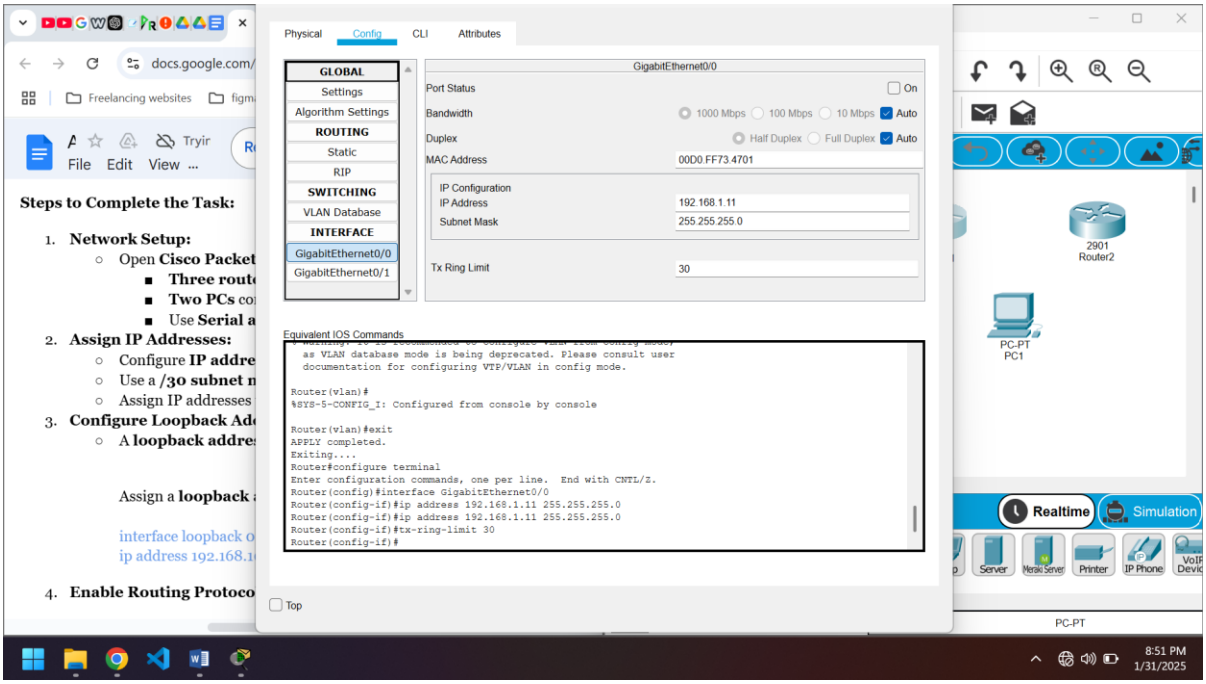
- **Provide real-world examples where multicast protocols are used (e.g., video streaming, IPTV).**

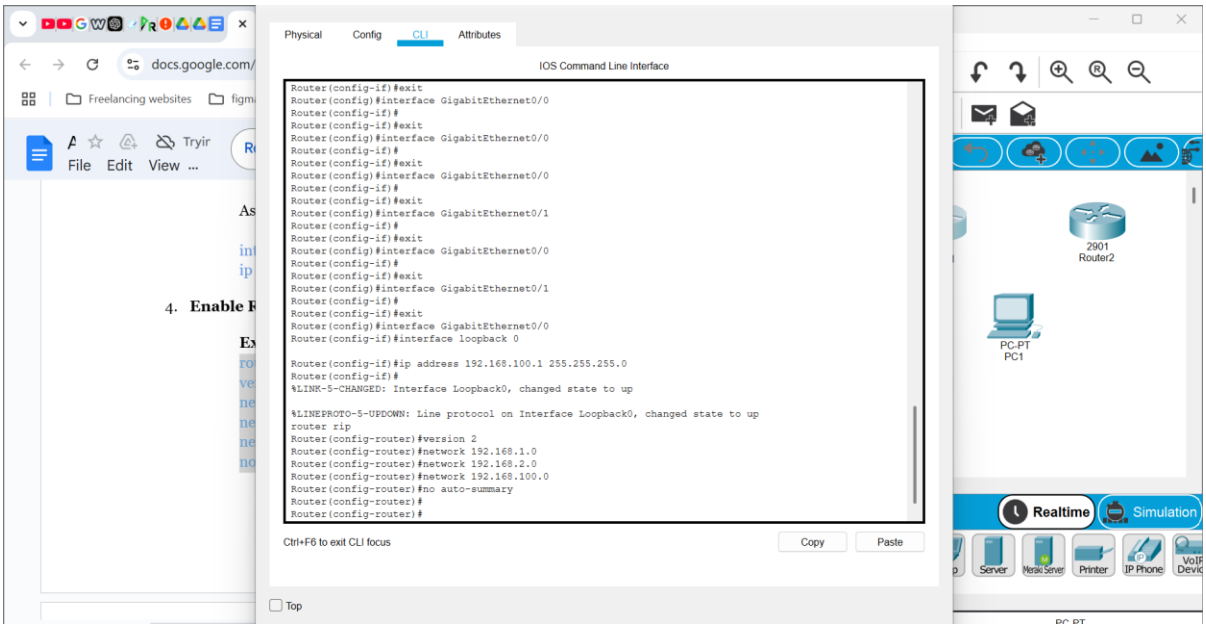
  - **Video Streaming**: Multicast is used to stream video content to multiple users, such as in IPTV services. Multiple viewers can watch the same live broadcast or on-demand content without consuming additional bandwidth for each viewer.

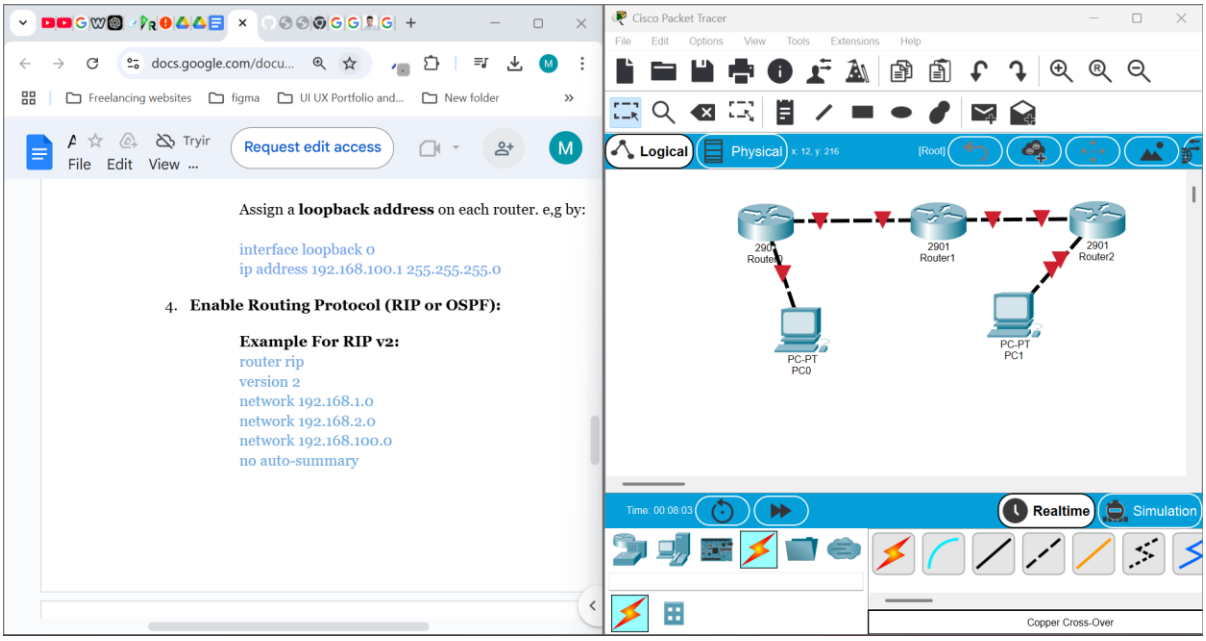
- **Video Conferencing**: Applications like Zoom or Microsoft Teams use multicast protocols for real-time video conferencing, where multiple users can receive the same video feed from a single source.
- **Online Gaming**: Multiplayer online games often use multicast to send game state updates (e.g.,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

Q3: Packet Tracer Task – Configuring RIP or OSPF with




Steps to Complete the Task:
1. Network Setup:
2. Assign IP Addresses:
3. Configure Loopback Ad
4. Enable Routing Protoco
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
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.
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)#
Top
2901
Router2
PC-PT
PC1
Realtime
Simulation
Server
Printer
IP Phone
PC-PT
8:51 PM
1/31/2025


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
Top
2901
Router2
PC-PT
PC1
Realtime
Simulation
Server
Printer
IP Phone



Github repository link:

https://github.com/Musadiqaman/computer-network-assignment.git