PAK AUSTRIA FACHHOCHSCHULE: INSTITUTE OF APPLIED SCIENCES AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEEING

Computer Networks

COMP-352L

LAB TASK 12

School of Computing Sciences

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BGP, OSPF & RIP Configuration

Introduction:

Cisco Packet Tracer is a powerful network simulation tool widely used for learning and practicing networking concepts. This manual guides you through configuring three critical routing protocols:

- **RIP (Routing Information Protocol):** Simple distance-vector protocol, ideal for smaller networks, with a hop limit of 15.
- **OSPF (Open Shortest Path First):** A robust and scalable link-state protocol that uses Dijkstra's algorithm to find the shortest path.
- **BGP (Border Gateway Protocol):** The cornerstone of internet routing, used for exchanging routing information between autonomous systems.

These protocols will be implemented in a simulated network environment, enhancing your practical understanding of network routing.

Objectives:

By the end of this lab, you will be able to:

- **RIP:**
  - Configure RIP in a network of multiple routers.
  - Verify routing tables and observe route advertisement.
  - Analyze limitations of RIP, such as scalability and convergence time.
- **OSPF:**
  - Implement OSPF in a multi-area setup.
  - Configure OSPF metrics (cost) and authentication.
  - Examine OSPF database and neighbor relationships.
- **BGP:**
  - Configure BGP between two or more autonomous systems.
  - Advertise and filter specific prefixes using route maps.
  - Observe how BGP convergence works and troubleshoot issues

Scope:

This lab is designed for:

- Networking students preparing for CCNA/CCNP certifications.
- Professionals looking to reinforce routing concepts using Packet Tracer.
- Network enthusiasts interested in hands-on routing practice.

BGP PROTOCOL:

Steps:

Step 1: Set up the network topology

1. Add Devices:
    - 2 Routers (1841-Router) from network devices.
    - 2 Switch (2950-Switch) from network devices.
    - 2 PCs from end devices.
2. Connect Devices:
    - Use straight-through cables to connect PC0 to Switch0 and Switch0 to Router0.
    - Use straight-through cables to connect PC1 to Switch1 and Switch1 to Router1.
    - Connect the router1 to router2 using a serial DTE cable.
3. Add new port to Routers:
    - Go to Router, then to Physical tab:
        - Turn OFF the Router and drag WIC-2T to the vacant slot and drop. Turn ON the Router again.

Step 2: Configure IP addresses to devices

- Open the Desktop tab of each PC, click on IP Configuration, and assign the following IP addresses
    - **PC0:**
        - IP: 192.168.1.2
        - Subnet Mask: 255.255.255.0
        - Default Gateway: 192.168.1.1
    - **PC1:**
        - IP: 192.168.2.2
        - Subnet Mask: 255.255.255.0
        - Default Gateway: 192.168.2.1
- Open the Config tab of Router0
    - Click on FastEthernet0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.1.1
        - Subnet Mask: 255.255.255.0
    - Click on serial0/0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.3.1
        - Subnet Mask: 255.255.255.0
- Open the Config tab of Router1
    - Click on FastEthernet0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.2.1
        - Subnet Mask: 255.255.255.0
    - Click on serial0/0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.3.2
        - Subnet Mask: 255.255.255.0

Step 3: Configuring BGP protocol on routers

- Open the CLI tab of Router0, and run the following commands:

```
enable
configure terminal
router bgp 10
network 192.168.1.0
network 192.168.3.0
network 192.168.2.0
neighbor 192.168.3.2 remote-as 20
neighbor 192.168.2.2 remote-as 20
```

- Open the CLI tab of Router1, and run the following commands:

```
enable
configure terminal
router bgp 20
network 192.168.2.0
network 192.168.3.0
network 192.168.1.0
neighbor 192.168.3.1 remote-as 10
neighbor 192.168.1.2 remote-as 10
```

Step 4: Verifying the connection by ping command

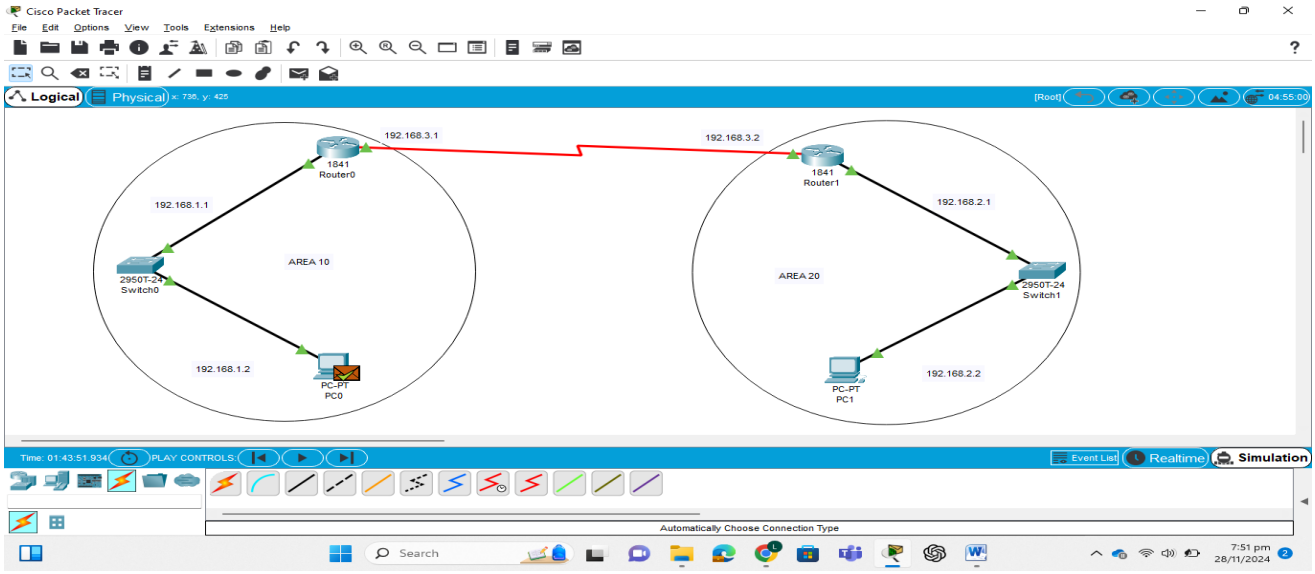
- Open the Desktop tab of PC0, click on Command Prompt, and ping the following IP addresses:

```
ping 192.168.3.2
```

```
ping 192.168.2.2
```

Step 5: Verifying the connection by using PDU

- Take a PDU and first drop it to PC0 and then to PC1 and shift to simulation mode for checking the packet transfer



OSPF PROTOCOL:

Steps:

Step 1: Set up the network topology

1. Add Devices:
    - 2 Routers (1841-Router) from network devices.
    - 2 Switch (2950-Switch) from network devices.
    - 2 PCs from end devices.
2. Connect Devices:
    - Use straight-through cables to connect PC0 to Switch0 and Switch0 to Router0.
    - Use straight-through cables to connect PC1 to Switch1 and Switch1 to Router1.
    - Connect the router1 to router2 using a serial DTE cable.
3. Add new port to Routers:
    - Go to Router, then to Physical tab:
        - Turn OFF the Router and drag WIC-2T to the vacant slot and drop. Turn ON the Router again.

Step 2: Configure IP addresses to devices

- Open the Desktop tab of each PC, click on IP Configuration, and assign the following IP addresses
    - **PC0:**
        - IP: 192.168.1.2
        - Subnet Mask: 255.255.255.0
        - Default Gateway: 192.168.1.1
    - **PC1:**
        - IP: 192.168.2.2
        - Subnet Mask: 255.255.255.0
        - Default Gateway: 192.168.2.1
- Open the Config tab of Router0
    - Click on FastEthernet0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.1.1
        - Subnet Mask: 255.255.255.0
    - Click on serial0/0/0, turn it ON and assign the following IP addresses:
        - IP: 10.0.0.1
        - Subnet Mask: 255.0.0.0
- Open the Config tab of Router1
    - Click on FastEthernet0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.2.1
        - Subnet Mask: 255.255.255.0
    - Click on serial0/0/0, turn it ON and assign the following IP addresses:

- IP: 10.0.0.2
- Subnet Mask: 255.0.0.0

Step 3: Configuring OSPF protocol on routers

- Open the CLI tab of Router0, and run the following commands:

```
enable
configure terminal
router ospf 1
network 192.168.1.0 0.0.0.255 area 0
network 10.0.0.0 0.255.255.255 area 0
exit
```

- Open the CLI tab of Router1, and run the following commands:

```
enable
configure terminal
router ospf 2
network 192.168.2.0 0.0.0.255 area 1
network 10.0.0.0 0.255.255.255 area 0
exit
```

Step 4: Verifying the connection by ping command

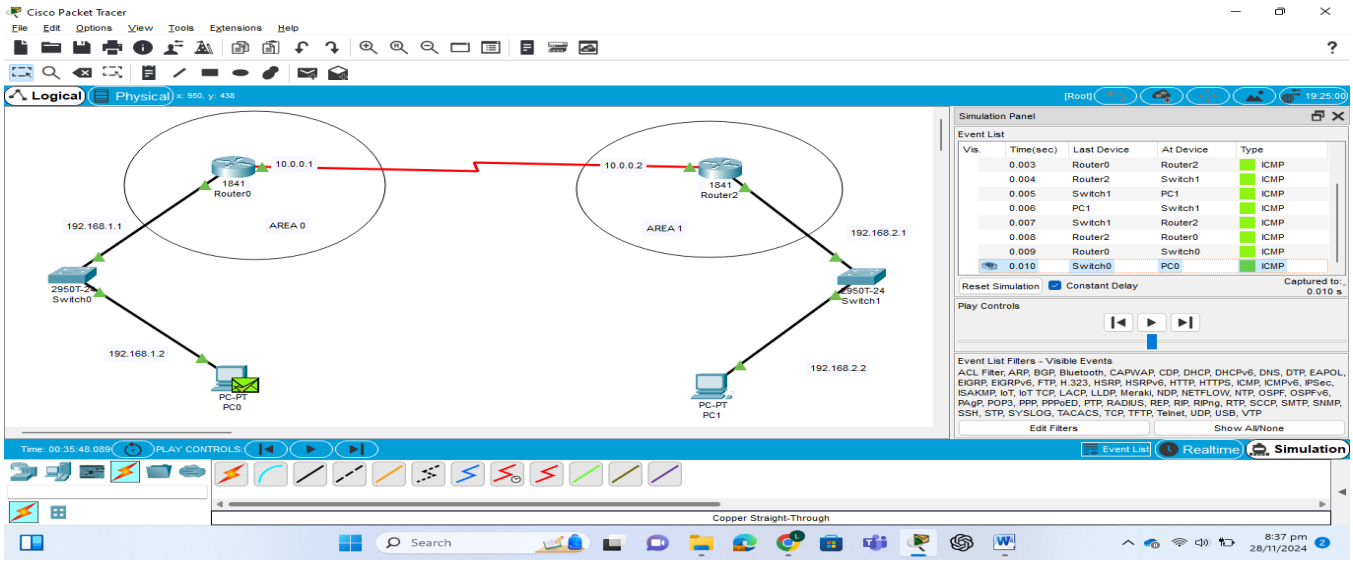
- Open the Desktop tab of PC0, click on Command Prompt, and ping the following IP addresses:

```
ping 192.168.2.2
```

NOTE: It will display Request timeout for first packet and transfers 3 packets.

Step 5: Verifying the connection by using PDU

- Take a PDU and first drop it to PC0 and then to PC1 and shift to simulation mode for checking the packet transfer



RIP PROTOCOL:

Steps:

Step 1: Set up the network topology

4. Add Devices:
    - 2 Routers (2811-Router) from network devices.
    - 2 Switch (2950-Switch) from network devices.
    - 2 PCs from end devices.
5. Connect Devices:
    - Use straight-through cables to connect PC0 to Switch0 and Switch0 to Router0.
    - Use straight-through cables to connect PC1 to Switch1 and Switch1 to Router1.
    - Connect the router1 to router2 using a serial DTE cable.
6. Add new port to Routers:
    - Go to Router, then to Physical tab:
        - Turn OFF the Router and drag WIC-2T to the vacant slot and drop. Turn ON the Router again.

Step 2: Configure IP addresses to devices

- Open the Desktop tab of each PC, click on IP Configuration, and assign the following IP addresses
    - **PC0:**
        - IP: 192.168.1.2
        - Subnet Mask: 255.255.255.0
        - Default Gateway: 192.168.1.1
    - **PC1:**
        - IP: 192.168.2.2
        - Subnet Mask: 255.255.255.0
        - Default Gateway: 192.168.2.1
- Open the Config tab of Router0
    - Click on FastEthernet0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.1.1
        - Subnet Mask: 255.255.255.0
    - Click on serial0/3/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.3.1
        - Subnet Mask: 255.0.0.0
- Open the Config tab of Router1
    - Click on FastEthernet0/0, turn it ON and assign the following IP addresses:
        - IP: 192.168.2.1
        - Subnet Mask: 255.255.255.0

- Click on serial0/3/0, turn it ON and assign the following IP addresses:
  - IP: 192.168.3.2
  - Subnet Mask: 255.0.0.0

Step 3: Configuring RIP protocol on routers

- Open the Config tab of Router0, Go to RIP from side bar, Add two networks to it:
  - 192.168.1.0
  - 192.168.3.0
- Open the Config tab of Router1, Go to RIP from side bar, Add two networks to it:
  - 192.168.2.0
  - 192.168.3.0

Step 4: Verifying the connection by ping command

- Open the Desktop tab of PC0, click on Command Prompt, and ping the following IP addresses:

```
ping 192.168.2.2
```

NOTE: It will display Request timeout for first packet and transfers 3 packets.

Step 5: Verifying the connection by using PDU

- Take a PDU and first drop it to PC0 and then to PC1 and shift to simulation mode for checking the packet transfer