
Ex. No: 7A — STUDY OF NETWORK SIMULATOR (NS)

Aim:

To explore Cisco Packet Tracer for network simulation and understand how to set up and configure a virtual lab.

Introduction:

Cisco Packet Tracer is a **network simulation software** developed by Cisco Systems.

It allows users to **design, configure, and test networks** without physical devices.

It provides a **virtual environment** for learning routing, switching, and network troubleshooting.

Features of Cisco Packet Tracer:

1. **Wide Device Support:** Includes routers, switches, PCs, hubs, and servers.
 2. **Real-Time Simulation:** Shows how data moves through a network.
 3. **Supports Protocols:** Simulates TCP/IP, DHCP, DNS, and HTTP operations.
 4. **Multi-User Mode:** Allows collaborative work among students.
 5. **Assessment Tools:** Teachers can assign tasks and evaluate students.
 6. **Custom Device Creation:** Users can add custom devices and networks.
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Setting Up Packet Tracer:

1. Download Packet Tracer from the **Cisco Networking Academy** website.
 2. Install and log in using your Cisco account.
 3. Open the workspace and start building your topology.
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Exploring the Interface:

- **Device Palette:** Contains all devices (routers, switches, PCs, etc.).
 - **Workspace:** Area where network devices are placed.
 - **Toolbar:** Tools for connecting devices and simulation.
 - **Menu Bar:** Options for file, edit, and help operations.
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Basic Configuration Steps:

1. **Connecting Devices:**
 - Use straight-through or crossover cables based on devices.
 - Connect routers, switches, and PCs as per the design.
 2. **Assigning IP Addresses:**
 - Configure IPs on routers and PCs in the same subnet.
 - Example:
 - PC1 → 192.168.10.2
 - Router → 192.168.10.1
 3. **Testing Connectivity:**
 - Use the **ping command** between PCs to verify connections.
 4. **Troubleshooting Tools:**
 - Use **ping** and **tracert** to find and fix errors.
 - Check device status lights and IP configuration.
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Advanced Configurations:

- **VLANs:** To separate network segments.
 - **DHCP:** To assign IPs automatically.
 - **NAT:** To enable Internet access.
 - **ACLs:** To secure network traffic.
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Conclusion:

Cisco Packet Tracer helps students **visualize and practice** networking concepts in a safe, simulated environment.

It provides **hands-on experience** with real Cisco commands, making it a powerful tool for learning network design and troubleshooting.

Ex. No: 8A — SIMULATION OF DISTANCE VECTOR ROUTING ALGORITHM

Aim:

To implement the **Distance Vector Routing Algorithm** and study how routers exchange routing information to find the shortest paths.

Theory:

In the **Distance Vector (DV)** algorithm, each router keeps a table showing the distance (cost) to every other router.

Routers share these tables with their **neighbors** and update them using the **Bellman-Ford algorithm**.

Key Concepts:

1. **Routing Table:**
Stores the best-known paths and their costs to all destinations.
 2. **Distance Vector:**
A list of distances from one router to all others.
 3. **Cost Metric:**
Usually based on **hop count**, bandwidth, or delay.
 4. **Periodic Updates:**
Routers share their tables regularly to stay updated.
 5. **Convergence:**
The state when all routers have consistent routing tables.
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Procedure in Packet Tracer:

1. **Create a Network:**
 - Add **3 routers (R1, R2, R3)** and **3 PCs (PC1, PC2, PC3)**.
 - Connect them using **serial or Ethernet cables**.
2. **Assign IP Addresses:**
 - R1: 192.168.10.1
 - R2: 192.168.20.1
 - R3: 192.168.30.1
 - PCs get IPs in the same subnet with proper default gateways.

3. Enable RIP (Routing Information Protocol):

```
4.Router(config)# router rip
5.Router(config-router)# network 192.168.10.0
6.Router(config-router)# network 10.0.0.0
```

Repeat similar steps for all routers with their respective networks.

7. Exchange of Tables:

Once RIP is enabled, routers share routing tables automatically.

8. Check Routing Table:

Use the command:

```
9.Router# show ip route
```

It displays the shortest path to every network.



Router0 Configuration

```
enable
configure terminal
hostname Router0

interface fastethernet0/0
ip address 192.168.1.1 255.255.255.0
no shutdown
exit

interface serial2/0
ip address 10.0.0.1 255.255.255.252
clock rate 64000
no shutdown
exit

interface serial3/0
ip address 10.0.0.5 255.255.255.252
clock rate 64000
no shutdown
exit

router rip
version 2
network 192.168.1.0
network 10.0.0.0
no auto-summary
exit

end
write memory
```



Router1 Configuration

```
enable
configure terminal
hostname Router1

interface fastethernet0/0
ip address 192.168.3.1 255.255.255.0
no shutdown
exit

interface serial3/0
ip address 10.0.0.6 255.255.255.252
no shutdown
exit

interface serial2/0
ip address 10.0.0.9 255.255.255.252
clock rate 64000
no shutdown
exit

router rip
version 2
network 192.168.3.0
network 10.0.0.0
no auto-summary
exit

end
write memory
```



Router2 Configuration

```
enable
configure terminal
hostname Router2

interface fastethernet0/0
ip address 192.168.2.1 255.255.255.0
no shutdown
exit

interface serial3/0
ip address 10.0.0.2 255.255.255.252
no shutdown
exit

interface serial2/0
ip address 10.0.0.10 255.255.255.252
no shutdown
exit
```

```
router rip
version 2
network 192.168.2.0
network 10.0.0.0
no auto-summary
exit

end
write memory
```

PC Configurations

PC	IP Address	Subnet Mask	Default Gateway
PC0	192.168.1.2	255.255.255.0	192.168.1.1
PC1	192.168.2.2	255.255.255.0	192.168.2.1

Observation:

Routers gradually update their tables with the **lowest-cost paths** after exchanging information multiple times.

Conclusion:

The Distance Vector Routing Algorithm allows routers to determine the shortest path by **sharing distance information** with neighbors.
RIP in Cisco Packet Tracer demonstrates how **dynamic routing** updates automatically without manual reconfiguration.

Ex. No: 9A — SIMULATION OF LINK STATE ROUTING ALGORITHM

Aim:

To simulate and study the **Link State Routing Algorithm (OSPF)** in Cisco Packet Tracer.

Theory:

In **Link State Routing**, each router shares information about its **direct neighbors** with all other routers in the network.

This is done using the **flooding process** to ensure every router knows the complete network topology.

Key Concepts:

1. **Neighbor Knowledge:**
Each router knows the cost and state of its direct links.
 2. **Flooding:**
Routers broadcast link information to all others.
 3. **Link-State Packet (LSP):**
Contains router ID, link IDs, and costs.
 4. **Database:**
Each router builds the same **link-state database** from all LSPs.
 5. **SPF Algorithm:**
Dijkstra's Shortest Path First (SPF) algorithm computes the shortest path.
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Procedure in Packet Tracer:

1. **Add Routers:**
Connect Router1 and Router2 using proper cables.
2. **Assign IP Addresses:**
3.Router1: Fa0/0 - 192.168.1.1 255.255.255.0
4.Router2: Fa0/0 - 192.168.1.2 255.255.255.0
5.Router2: Fa0/1 - 192.168.2.1 255.255.255.0
6. **Enable OSPF Routing:**
7.Router(config)# router ospf 1

```
8.Router(config-router)# network 192.168.1.0
0.0.0.255 area 0
9.Router(config-router)# network 192.168.2.0
0.0.0.255 area 0
10. Automatic Update:
    OSPF automatically finds and maintains the shortest path.
11. Verify Routing Table:
    Use the command:
12.Router# show ip route
```

Router0

```
enable
configure terminal
hostname Router0

interface fastethernet0/0
ip address 192.168.1.1 255.255.255.0
no shutdown
exit

interface serial2/0
ip address 10.0.0.1 255.255.255.252
clock rate 64000
no shutdown
exit

interface serial3/0
ip address 10.0.0.5 255.255.255.252
clock rate 64000
no shutdown
exit

router ospf 1
network 192.168.1.0 0.0.0.255 area 0
network 10.0.0.0 0.0.0.255 area 0
exit

end
write memory
```



Router2 (middle router)

```
enable
configure terminal
hostname Router2

interface fastethernet0/0
ip address 192.168.2.1 255.255.255.0
no shutdown
exit

interface serial3/0
ip address 10.0.0.2 255.255.255.252
no shutdown
exit

interface serial2/0
ip address 10.0.0.10 255.255.255.252
no shutdown
exit

router ospf 1
network 192.168.2.0 0.0.0.255 area 0
network 10.0.0.0 0.0.0.255 area 0
exit

end
write memory
```



Router1

```
enable
configure terminal
hostname Router1

interface fastethernet0/0
ip address 192.168.3.1 255.255.255.0
no shutdown
exit

interface serial3/0
ip address 10.0.0.6 255.255.255.252
no shutdown
exit

interface serial2/0
ip address 10.0.0.9 255.255.255.252
clock rate 64000
no shutdown
exit

router ospf 1
network 192.168.3.0 0.0.0.255 area 0
network 10.0.0.0 0.0.0.255 area 0
exit

end
write memory
```



PC Configurations

PC0

IP Address: 192.168.1.2
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.1.1

PC1

IP Address: 192.168.2.2
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.2.1

Conclusion:

Link State Routing (OSPF) provides **faster convergence** and more accurate routing than Distance Vector algorithms.
It efficiently updates only when changes occur, reducing network overhead.

Ex. No: 10A — STUDY OF TCP/UDP PERFORMANCE USING SIMULATION TOOL

Aim:

To study and compare the performance of **TCP and UDP protocols** using a network simulation tool.

Theory:

1. TCP (Transmission Control Protocol):

- **Connection-oriented** protocol.
- Ensures **reliable, ordered, and error-checked** data delivery.
- Used for web browsing, emails, file transfers.
- Uses **acknowledgments (ACKs)** and **retransmissions**.

2. UDP (User Datagram Protocol):

- **Connectionless** and **faster** than TCP.
 - No delivery guarantee; suitable for **real-time applications** like video streaming or gaming.
 - Lightweight and less overhead.
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Procedure in Packet Tracer:

1. Create a Network Topology:

Add one **multi-server** and connect multiple clients (HTTP, FTP, DNS, and Email) through a switch.

2. Assign IP Addresses:

Configure appropriate IPs for all devices and ensure connectivity.

3. Configure Servers:

- Enable **HTTP, FTP, DNS**, and **Email** services.
- Create a domain (e.g., `pvg.edu.in`).
- Add users to the mail server.

4. Edit Web Page:

- Open `index.html` on the server and add sample content.
- Access it via the HTTP client using the domain name.

5. FTP Access:

- Connect to `pvg.edu.in` domain using the FTP client.
- Upload or download test files.

6. Email Communication:

- Send and receive mails between configured clients.

Observation:

- **TCP** ensures all packets are delivered correctly (used by HTTP, FTP, Email).
- **UDP** sends packets without confirmation, achieving **higher speed** but **less reliability** (used by DNS, video apps).

Comparison Table:

Feature	TCP	UDP
Type	Connection-oriented	Connectionless
Reliability	Reliable	Unreliable
Speed	Slower	Faster
Header Size	20 bytes	8 bytes
Applications	HTTP, FTP, Email	DNS, Video streaming

Conclusion:

TCP provides **reliable communication** suitable for file transfers and web traffic, while UDP provides **faster but unreliable** communication ideal for real-time applications.

Simulation using Packet Tracer helps in visualizing how each protocol performs in real-world scenarios.
