



Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

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Aim: Perform environment simulation for Dynamic Routing using Cisco packet tracer/GNS3

Objective: Understand the importance of environment simulation for Dynamic Routing using Cisco packet tracer/GNS3.

Theory:

Dynamic routing is a critical component of modern networking, enabling routers to automatically adjust to changes in the network topology and ensuring optimal data paths. Tools like Cisco Packet Tracer and GNS3 are invaluable for simulating and studying dynamic routing protocols, providing a hands-on environment to test and understand their functionalities.

Overview of Cisco Packet Tracer and GNS3

Cisco Packet Tracer: Cisco Packet Tracer is a powerful network simulation tool designed by Cisco Systems. It allows users to create network topologies, configure devices, and simulate network behavior. It's particularly user-friendly and widely used in educational settings for learning and practicing networking concepts.

GNS3 (Graphical Network Simulator-3): GNS3 is an open-source network software emulator that provides more advanced network simulation capabilities compared to Packet Tracer. It allows for the integration of real Cisco IOS images, enabling more realistic and complex network simulations. GNS3 is ideal for professional network engineers preparing for certifications like Cisco CCNA, CCNP, and beyond.

Setting Up a Dynamic Routing Environment

Step-by-Step Guide Using Cisco Packet Tracer:

1. **Download and Install Cisco Packet Tracer:** Ensure you have the latest version of Cisco Packet Tracer installed on your computer.
2. **Create a New Network Topology:**
 - Open Cisco Packet Tracer and create a new project.
 - Drag and drop the required network devices (e.g., routers, switches, and end devices) onto the workspace.
 - Connect the devices using appropriate cables (e.g., Ethernet or serial cables).
3. **Configure Basic Router Settings:**
 - Click on each router to open its configuration interface.
 - Assign IP addresses to the router interfaces.
 - Configure routing protocols such as OSPF, EIGRP, or RIP.
4. **Enable Dynamic Routing:**
 - For OSPF:
 - Enter the router's CLI and configure the OSPF process.
 - Define OSPF areas and assign networks to these areas.
 - For EIGRP:
 - Enter the EIGRP configuration mode.
 - Assign the autonomous system number and networks.
 - For RIP:



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- Enable RIP routing and specify the networks to be advertised.

5. Verify Configuration:

- Use commands like show ip route to verify that the routing tables are populated correctly.
- Test connectivity between end devices to ensure the dynamic routing protocol is functioning as expected.

Step-by-Step Guide Using GNS3:

1. Download and Install GNS3:

- Download GNS3 from the official website and follow the installation instructions.
- Install any additional dependencies or virtual machines as required.

2. Create a New Project in GNS3:

- Open GNS3 and create a new project. ○ Add routers, switches, and other network devices to the workspace.
- Connect the devices using virtual network cables.

3. Import Cisco IOS Images:

- Import Cisco IOS images into GNS3 for realistic router simulations.
- Assign these images to the virtual routers in your topology.

4. Configure Basic Router Settings:

- Start each router and access its CLI. ○ Assign IP addresses to the router interfaces. ○ Configure hostname and other basic settings.

5. Enable Dynamic Routing:

- For OSPF:
 - Configure the OSPF process and assign areas.
 - Add network statements to include interfaces in OSPF. ○

For EIGRP:

- Configure EIGRP with an autonomous system number.
- Define network statements for EIGRP.

- For RIP:
 - Enable RIP and specify the networks to be advertised.

6. Verify Configuration:

- Use commands like show ip route, show ip ospf, or show ip eigrp neighbors to verify the routing tables and protocol operation.
- Test end-to-end connectivity to ensure the dynamic routing protocol is correctly distributing routes.

Practical Applications and Benefits

1. Learning and Certification:



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- Both Cisco Packet Tracer and GNS3 provide an excellent platform for learning and preparing for networking certifications.
- They allow hands-on practice with dynamic routing protocols, which is essential for understanding their operations and troubleshooting issues.

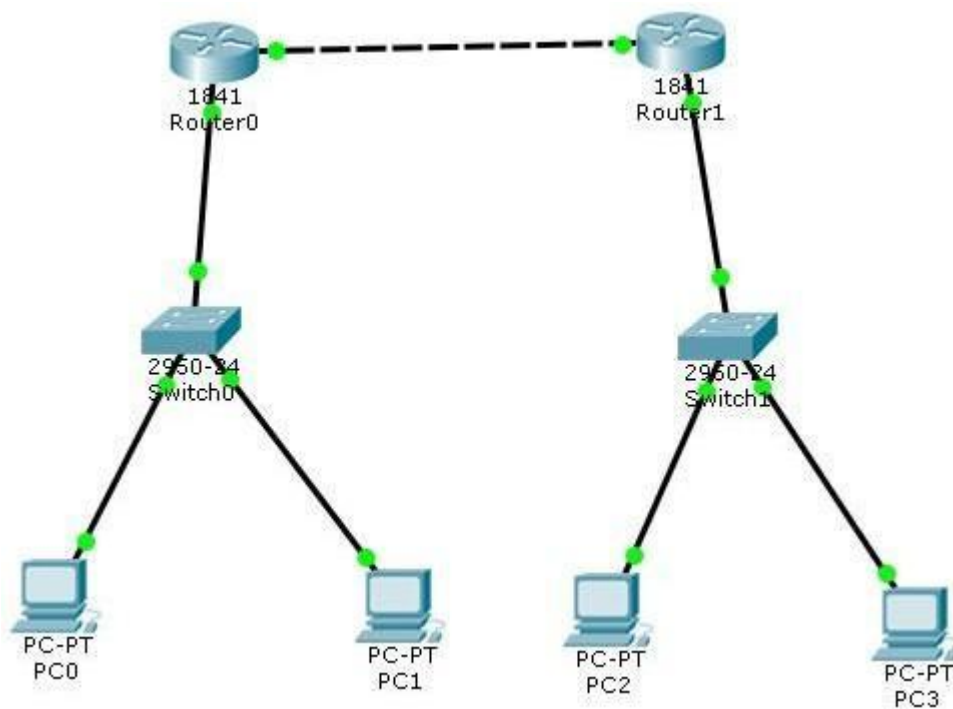
2. Network Design and Testing:

- Network engineers can design and test network topologies and routing configurations before deploying them in a live environment.
- This reduces the risk of network disruptions and allows for fine-tuning configurations.

3. Experimentation and Research:

- Students and researchers can use these tools to experiment with different network scenarios and study the behavior of dynamic routing protocols under various conditions.
- This can lead to a deeper understanding of network dynamics and the development of new networking solutions.

Output:





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Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>ping 192.168.3.5

Pinging 192.168.3.5 with 32 bytes of data:

Request timed out.
Reply from 192.168.3.5: bytes=32 time=1ms TTL=126
Reply from 192.168.3.5: bytes=32 time=0ms TTL=126
Reply from 192.168.3.5: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.3.5:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 192.168.3.7

Pinging 192.168.3.7 with 32 bytes of data:

Reply from 192.168.3.7: bytes=32 time=0ms TTL=126
Reply from 192.168.3.7: bytes=32 time=0ms TTL=126
Reply from 192.168.3.7: bytes=32 time=0ms TTL=126
Reply from 192.168.3.7: bytes=32 time=0ms TTL=126

Ping statistics for 192.168.3.7:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>
```

Conclusion

Simulating dynamic routing using Cisco Packet Tracer and GNS3 provides invaluable practical experience for both novice and experienced network engineers. These tools offer a realistic environment to study and experiment with complex routing protocols, ensuring that users can design, configure, and troubleshoot networks effectively. By mastering dynamic routing in these simulated environments, network professionals can enhance their skills and better prepare for real-world networking challenges.