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OBJECTIVE: Introduction to Network Simulation. CISCO Packet Tracer.

THEORY: CISCO - Packet Tracer is a widely-used network simulation tool that helps network professionals to design, configure, and troubleshoot network in a safe, virtual environment. This tool simulates network protocols and devices, allowing users to experiment with different network topologies, configurations and scenarios. without needing physical hardware.
Cisco Packet Tracer gets used by network proffessionals, students and educators

Features Of Cisco Packet Tracer:

- Supports multiple protocols and technologies such as TCP/IP, OSPF, EIGRP, BGP.
- Provides a comprehensive set of networking tools
- Includes a range of network devices and topologies
- Allows for multi-user collaboration.
- Provides a safe and virtual environment for network experimentation
- Reduces the need for Physical hardware
- Helping to develop essential network hardware and knowledge

Installation:

Step1: Visit the Cisco Networking Academy website at netacad.com
Step2: Log in or create an account if new user.
Step 3: Click on the "Resources" tab at the top of the page.
Step 4: Click on the "Packet Tracer" in drop down menu.
Step 5: Click on the "Download Packet Tracer".

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Step6: Select the Packet Tracer version and Click "Download".

Result: Understand the benefits and features of Cisco packet tracer and installed it successfully.

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OBJECTIVE: Establish Peer to Peer Network

REQUIRED TOOLS: Cisco Packet Tracer.

THEORY: A peer-to-peer network is a distributed network architecture where all connected devices, or "peers", have equal status and can communicates, directly with each other without relying on a central server. Each device in the network can both request and provide resources, services or information to other devices. This decentralized structure enables efficient sharing of data, files and computing resources among peers without the need for centralized authority are infrastructure

PROCEDURE:

Step1: Launch the Cisco Packet Tracer application on own computer.

2: Started by creating a new network topology by digging routers, switches, PCs, or other network devices on the works pace.

3: Connect the devices using appropriate cables. For P2P network, we typically connects PCs using Ethernet cables.

4: Assign IP address to each PC in the network. Go to each PC in the network. Go to each PC's configurations and set the IP Address, subnet mask. and default gateway IP network are different and subnet mask are same for each PC.

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step 5: We can test connectivity between the PC's by pinging each other's IP Address. Type "ping (PCs IP)" in CMD

RESULT: Successfully established Peer to Peer network in Cisco Packet Tracer.

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OBJECTIVE: To establish a network using switch and hub.

REQUIRED TOOL: Cisco Packet Tracer.

THEORY:

Switch

1. Efficiently forwards data packets to there intended destination based on MAC Address, reducing network congestion & improving performance.
2. Creates dedicated communication paths between devices, allowing simultaneous data transmission without interference, thereby enhancing network reliability.

Hub:

1. Broadcasts incoming data to all connected devices indiscriminality. Lacking the ability to target specific recipients which can lead to unnecessary traffic to network slowdowns.
2. Operates at the physical layer of OSI Model. Simply repeating incoming signals to all connected devices, without the intelligence to filter or manage data traffic efficiently.

PROCEDURE:

Step 1: Open Cisco Packet Tracer.

Step 2: Start a new Topology by dragging hub/switch and PC's

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on to the workspace.

Step3: ~~Start a new topology~~ Connect the PC's to the hub / switch using Ethernet cables.

Step4: Make sure that all devices are powered on.

Step5: Go to each PC's configuration and set the IP address and subnet mask.

Step6: Test connectivity between PC's.

RESULT: Successfully established the connections through hub and switch with PCs and understood the working through simulation.

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EXPERIMENT-3

OBJECTIVE: TO estabolish all the topology of network

TOOL REQUIRED: Cisco Packet Tracer.

THEORY: Network topology refers to the arrangement of nodes (devices). There are several types of network topologies.

1) Bus topology → All devices are connected to a single backbone cable. It's simple & inexpensive but can suffer from a singlepoint of failure.

2) Star topology → Each device is connected to a central hub or switch. If one connection fails, it doesn't effect the rest to the network, but the central hub can be a single point of failure.

3) Ring Topology → Devices are connected in a circular manner where each devices is connected to exactly two other devices. Data flows in one direction around the ring failure of one device can disrupt the entire network.

4) Mesh Topology → Every device is connected to every other device in the network. Its robust & fault tolerant but expensive & complex to setup

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5) Hybrid Topology :→ Combines two or more different types of topologies. for example, a network might have a combination of star & mesh topologies to balance cost & performance.

Procedure :

→ BUS Topology

Step1: Open Cisco Packet Tracer.
Step2: Drag all devices such as PCs and switch.
Step3: Connect all the switches with each other.
Step4: Connect each switch to a PC and give IP Address to it
Step5: Test community between devices.

→ STAR Topology

Step1: Open Cisco Packet Tracer.
Step2: Drag a switch and some PCs.
Step3: Connect all PCs to switch & give IP-address to it.
Step4: Test the connectivity.

→ RING Topology

Step1: Start by placing devices on workspace.
Step2: Connect the switch/hub in a circular manner, ensure that each switch is connected to exactly 2 devices.
Step3: Connect all switches/hub to a PC.
Step4: Give IP address to PCs
Step5: Test the connectivity.

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→ MESH Topology

1. Drag all devices to the workspace
2. Connect each switch to every other device using appropriate cables.
3. Connect PCs to the switches.
4. Configure IP addresses to each PC.
5. Test the connectivity.

→ HYBRID Topology

1. Combine elements from two or more established topologies (mesh, Bus, etc).
2. Performance simulation to test the connectivity of hybrid network and check its functions as intended.

RESULT:

Successfully established the topologies of network (Bus, star, Ring, Mesh and Hybrid).

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EXPERIMENT-4

OBJECTIVE: Introduction to network Protocol analyzer. wireshark.

THEORY: Wireshark is a metwod protocol analyzer tool. It is a powerful tool used for capturing, analyzing and interpreting network traffic in real time. Wireshark allows user inteface providing detailed information about the protocol communication happening on the network. Its commonly used for network troubleshooting, security analysis, and protocol development.

FEATURES OF WIRESHARK:

1) Packet capture — Wireshark allows user to capture live network traffic from various network inteface in real time.

2) Offline Packet Analysis: Users can also analyse pre-captured packet capture files (PCAP or other formats).

3) Graphical Packet Analysis: It provides graphical representations of packet data including packet size distribution, protocol wireframes, etc.

4) Cross Platform Compatibility: It is available for multiple operating systems including windows, MAC OS & various linux distribution, making it accessible to a wide range of users.

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5) Packet Reconstruction: Users can reconstruct and re-assemble fragmented and segmented packets to analyse computer data streams such as TCP streams in HTTP session.

LEARNING OUTCOMES: Understood the function and features of network protocol analyzer that is wireshark.

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EXPERIMENT-5

AIM: Running and using services / commands related to Networking

TOOL USED: Command Prompt.

THEORY:

1) IP Config: This command is used in windows operating system to display the current TCP/IP network configuration values. It shows details such as IP address, ~~subnetwork~~ subnetmask, default gateway and DNS servers of the network interface on the local machine.

2) nslookup: This command is used to query DNS Server. to obtain domain name or IP address mapping, or to perform other DNS lookups. It is commonly used to ~~to~~ query DNS server to obtain name or IP address mapping, or to perform other DNS lookups. It is commonly used to troubleshoot DNS-related issues. as it can help you diagnose problems with domain name resolution.

3) IP config/all: This ~~is~~ is an extension of IPconfig/all. It displays more detailed information about all network interfaces on system including MAC address and additional configuration details.

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4. Ping: It is a command line utility used to test the reachability of a host on an IP network. It works by sending ICMP (Internet Control Message Protocol) echo request packets to the targets host and waiting for ICMP echo reply packets to come back.

5. Tracert: This commands is used to trace the route that packets take from your computer to a destination IP address or domain name. It shows the IP address of routers that the packets traverse as they travel to destination.

RESULT:

Successfull run all the commands (IPConfig, IPConfigall, nslookup, tracert and ping) on command prompt.

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AIM: Analysis various parameters for TCP protocol in action.

THEORY: Simulation mode in Packet Tracer allows users to visualize network protocol, breaking down data into PDUs for analysis. It facilities understanding TCP & UDP functionalities, highlighting the role of port numbers in application data exchange. TCP, a reliable transport protocol over IP, resolves packet-related issues in a connection oriented approach. Its three-way handshake initiates & four way handshake terminates session with SYN, SYN-ACK & ACK message carrying relevant flags. This mechanism ensures orderly communication, reducing errors like packet loss & duplication. Simulation mode guides users through service requests, demonstrating multiplexing & PDU association with protocols layers. Its a valuable tool for comprehending network operations & troubleshooting.

PROCEDURE:

Steps to configure TCP & UDP protocol simulation in Cisco Packet Tracer:

1) Open Cisco Packet Tracer.
2) Make a topology by selecting 4PC's, 1 2960 switch and 1 server.
3) Connect all the devices using copper straight through cable, connecting all using fast Ethernet port.
4) Assign IP address to all devices.
5) Double Click on Multi-server, from the pop-up window. Select services tab and go to DNS service. Turn on DNS service and name record to be www.google.com, adress - 192.168.11.5

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6) Double click on Multi-server, select service tab, under which, select HTTP service and Turn On HTTP & HTTPs option ON. Select index.html & click on edit option. Type on the following text

```
<html>
    Welcome to Computer Networks Lab
    We are learning about Simulation Of TCP
</html>
```

Click save, Click on YES.

7) Double click on DNS Client.
Within the DeskTop, Select Command Prompt option. Type nslookup www.google.com. This statement lets us know whether DNS client can connect to server or not resolve the IP address issues. Within the Desktop Tab. Select web browser option. In URL type google.com.

8) Double click on web client and select Email option.
In the configure maibox write:
Name: Apoorav Email address: apoorav7@gmail.com
Incoming mailsever: 192:168.11.5
Outgoing mail sever: 192.168.11.5
Username: Apoorav
Password: Cisco_aids.
Click on Save.

9) Double Click on Email Client.
Within the DeskTop Tab, select Email option.
In the configure mail dialouge box, write:

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Name: Ranjan
Email: Ranjan@gmail.com
IMS: 192.168.11.5
OMS: 192.168.11.5
UserName: Ranjan.
Password: Cisco_aids.
Click on Save.

10) Double Click on Multi-Sever and select email option. Switch on SMTPand POP3 service. Type domain name = gmail.com
Under user setup: Name: Vikram; Password: Cisco_aids.
Click on Add.
Under user setup: Name: Ranjan; Password: Ciso_aids
Click on add.

11) Double Click on Web client within the Desktop tab. Select Email option. Send a mail by composing mail. In the To section write: Ranjan @ gmail.com.
Subject: Hi!, MailBox: Hellow; Click Send Mail.

12) Double click con Email client within Desktop tab, Select Email option. In the pop-up window; Select Recieve option.

13) Double click on Email client & Select Email option. Send a mail by composing a mail. In the To section write: Vikram812@gmail.com.
Subject: Hi, MailBox: I recieved the mail.
Click on Send Mail.

14) Double click on Web Client. Select Email option. In the

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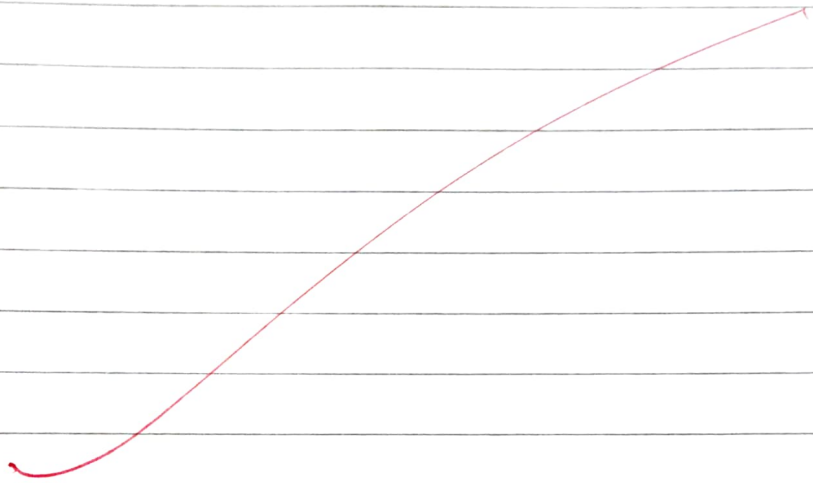
Pop-up window, Select Recieve option



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AIM: Introduction to Datadog tool for data monitoring in network

THEORY:

→ Datadog is a monitoring service for cloud scale. application, providing monitoring of ~~services~~ servers database tools & services through a SaaS-based data analytics platform.
→ It is used for ~~long~~ log management, infrastructure monitoring & application monitoring.
→ It can collect data from servers, databases, containers & cloud services.
→ With Datadog, users can monitor their Network in real-time & get alerts when anomalies occur.
→ Datadog make it easy to itegrate services such as slack & Pager Duty for notification.
→ Datadog was build to a cloud infrastructure monitoring service, with a dashboard, alerting & visualization of metrics.
→ Datadog was found in 2010 by Oliver Pomel & Alexis Le Quoc.
→ It provides functionalities in an easy to use manner that would be difficult to build and maintain ourselves.

PROCEDURE:

1) Register for Datadog — Monitoring as a service.

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Go to website : https://www.datadog.com/
Click "Start free trial" buttom
Fill form & Click "Create Account" button.

2. Installation of agent on Windows.
→ Log in to Datadog account
→ Go to Agents Download Page.
→ Download the Datadog Agent Installer.
→ Run the installer by opening datadog-agent-7-latest.amd64.msi
→ Follow the prompts & enter Datadog API key;
→ Then enter your Data dog Region : datadoghq.com.
→ Follow the on-screen instructions to install datadog.

3. Log into Datadog account.
→ Navigate to Integration page.
→ Select the corresponding window services. that we want to monitor.

4. Navigate to Monitoring Page.
→ Customize the dashboard as per requirement. Add weights to the services that we want to monitor. Configure alerts for anomalies in network data.

RESULT: Successfully installed Datadog & monitor network data using it. It was observed how Datadog helps analyze the data trends & identifies anomalies in real time.

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AIM: Introduction to network bandwidth analyser tool for network monitoring

OVERVIEW:

Network bandwidth analyser tools play a critical role in modern network monitoring & management. These tools provide administrators with invaluable insights into network performance, traffic patterns, and resource utilization. By capturing and analyzing network data in real time, bandwidth analyser tool help optimize network efficiency, troubleshoot issues & ensure smooth operation of network infrastructure.

Network Bandwidth Analyser Tools:

It comes in various forms, ranging from open-source software like Wireshark to enterprise-grade solutions with advanced features and reporting capabilities. These tools typically offer the following functionalities.

1. Packet Capture & Analysis: Bandwidth analyser tools capture network packets traversing the network & provide detailed analysis of packet headers, payload, and protocols. This allows administrators to inspect network traffic at a granular level & identify the source, destination & type of traffic.

2. Traffic Visualization: Many bandwidth analyzer tools offer intuitive graphical interfaces for visualizing network traffic patterns. Graphs, charts and dashboards provide administrators with a clear understanding of network utilization, trends & anomalies.

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3. Alerting & Notification.
Advanced bandwidth analyzer tools can be configured to generate alerts & notifications based on predefined thresholds or anomalous network behaviours.

4. Reporting & Historical Analysis:
Bandwidth analyzer tools often include reporting features that allow administors to generate comprehensive reports on network performances utilization & trends overtime.

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