

AIM - Study of Networking devices, Network cable Topologies & Network Troubleshooting Commands.

• Theory

① Networking Device

Router :- A Router is a device that forwards data forwards packets between computer networks. It connects different network together, like a home LAN To the internet (WAN) it assigns IP address dynamically using DHCP & works on the network layer (layer 3) of the OSI model.

Switch - A switch connects multiple devices within the same LAN. it uses MAC addresses to forward data only to the intended recipient device works on the data link layer (layer 2). it's faster & more secure than a hub.

hub - A hub is a basic networking device that broadcast data to all connected devices, regardless of destination.

AIM - Study of Networking Device, Network Cable, Topology & Network Troubleshooting Commands

C : \user \shiva > ipconfig

Windows IP Configuration

Wireless LAN adapter Local

Media State - - - - - Media disconnected

Connection - Specific DNS Suffix

Wireless LAN adapter Local Area disconnected

Media State - - - - - Media disconnected

Connection - Specific DNS Suffix

Wireless LAN adapter Wi-Fi :

Connection - Specific DNS Suffix :

IPv6 address - - - - - 2401 4900 0000

Temporary IPv6 Address - - - - - 2401 9000

Link Local IPv6 Address - - - - - 241 9900

IPv4 address - - - - - 74 72 108

Subnet mask - - - - - 255 255 255

C : \user \shiva > ping

option

-A

ping the specific host until swapped
Resolve address of echo request

-A count

-L size

send data size

Don't fragment flag is forced

modem - A ~~to~~ modulator-demodulator, it converts digital signals into analog signals & vice versa for transmission over telephone line. It connects users to the internet via ISPs.

Access Points (AP) :- An AP allows wireless-capable devices to connect to a wired network using Wi-Fi. It connects transmission & reception of ~~the~~ wireless signals.

Repeater :- It regenerates & amplifies signals in long-distance communication to prevent signal loss over the bits in wired & wireless networks.

Bridge :- Connects two different LANs & filters traffic at the data link layer. Used in segmenting traffic to improve performance.

Gateway :- A gateway connects networks using different protocols.

2 TYPES OF NETWORK CABLES :

A Twisted Pair Cable :- Commonly used in LAN environments. They have pairs of wires twisted together to reduce electromagnetic interference. Categories: Cat 5, Cat 6, Cat 7, Cat 8.

C:\user\shina > ping www.google.com

Pinging www.google.com [2404 6800 4009 820 2004] 5ms

Reply from 2404 6800 4009 820 2004: time=5ms

Reply from 2404 6800 4009 820 2004: time=5ms

Reply from 2404 6800 4009 820 2004: time=5ms

Reply from 8404 6800 4009 820 2004: time=5ms

Ping Statistics for 2404 6800 4009 820 2004

Packets: Sent = 4 Received = 4 Lost = 0 (0.0%)

Approximate Round Trip Time in Milliseconds

Minimum : 45ms Maximum : 55ms Avg 42ms

C:\user\shina > tracert google.com

Tracing route to google.com [2404 6800 4009 820 2004]

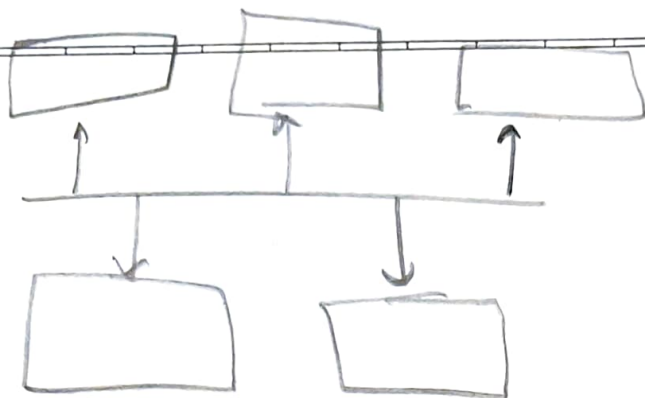
over a maximum of 30 hops:

1	2ms	2ms	2ms	2401	4300	100	23	3000	60
2	52ms		40ms	2401	4900	ad23	3000		2
3	30ms	40ms	50ms	2401	4900	ad23	4923		4
4	45ms	50ms	48ms	2401	4900	ad23	1400		0
5	45ms	50ms	48ms	2401	4900	ad23	1401		0
6	51ms	49ms	50ms	2401	4900	ad23	1430		2
7	54ms	42ms	51ms	2401	4900	ad23	1420		10

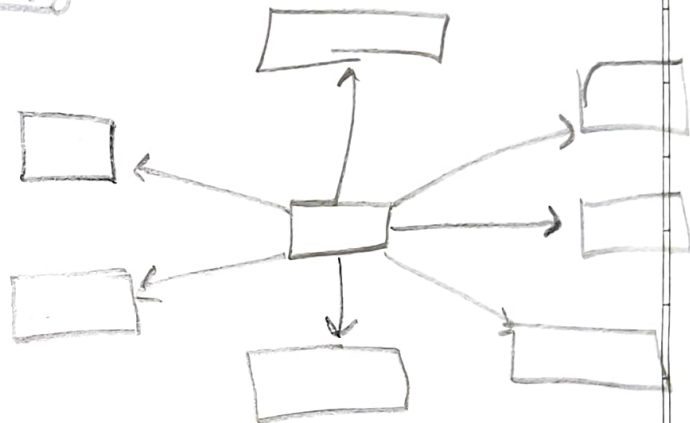
- B. Coaxial cable → Used in Cable TV, CCTV & broadband internet
→ Moderate Speed 10 Mbps to 1 Gbps
- C. Fiber optic cable → Uses glass or plastic fibers to transmit data using light signals
→ Supports speeds up to 100 Gbps & beyond.
→ Immune to electromagnetic interference
Support long-distance high speed communication.

3 TYPES OF NETWORK TOPOLOGIES

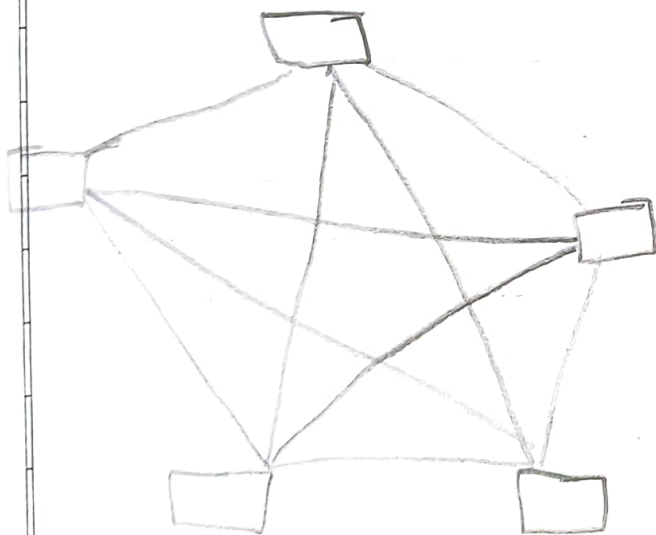
- A. BUS Topology - ALL devices are connected to a single cable. Data travels in both directions. Cost effective for small networks.
- B. Star Topology :- All nodes are connected to a central device (hub/switch). Easy to manage, if the central device fails the network goes down.
- C. Ring topology :- Devices are connected in a circular loop. Data travels in one direction.



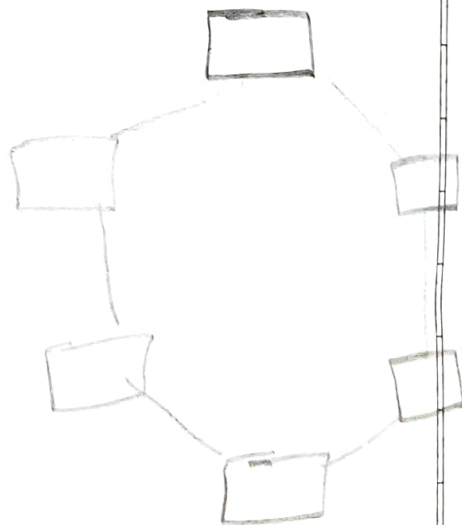
Bus Topology



Star Topology



Mesh Topology



Ring Topology

TYPES of TOPOLOGY

d. Mesh topology :- Every node is connected to every node. It provides high redundancy & fault tolerance.
- Expensive & complex to setup.

4. Network Troubleshooting Commands

ipconfig :- Display IP configuration of your system such as IP address, subnet mask, gateways etc.

PING :- Sends test packets to check connectivity.
:- Checks if a device / website is reachable. eg - Ping google.com.

tracert :- Display route taken by packets to reach a host.

:- Help identify when delays or failures occur.
:- tracert google.com

nslookup :- Queries DNS to get IP address of a domain.

:- nslookup openai.com

:- Use in trouble shoot domain name resolution issues.

C:\user\shiva > nslookup opendai.cn

Server unknown

Address: 152 108 176 466

Non authoritative answer

Name: opendai.cn

Address: 172 04 154 211

104 18 37 45

C:\user\shiva > route print

IP v4 . Route Table

Destination	Gateway	Interface	Metric
0.0.0.0	158.162.11.1	1521021100	75

Routeprint :- This command displays the routing table of your computer. It shows how the system decides which path to use to send network packets.

Conclusion :- This practice provides details knowledge about essential computer network - including device, cable, & topologies.