

Activity No. Router : When a device in a Local Area Network, needs to communicate with a device on another LAN, it must send that traffic to a specialized device connected to LAN called "router".

Aim/Objective :

- Router purpose is to find best path for the msg to transmit to destination.
- Router is a physical or virtual interconnecting device that is designed to receive, analyze, forwards data packet b/w computers, N/w.
- Router examines a destination IP address of a given data packet. & it used header & forward tables to decide best path to transfer packet eg : Cisco, HP, Nortel etc.

* Features of Router / Advantages

- 1) Router used in LAN & WAN environment. eg it's used in office to provide connectivity.
- 2) It shares info with other router in N/w.
- 3) It uses routing protocol to transfer the data & it is more expensive than other connecting device : switches & hubs.
- 4) Router works on third layer (Network layer) of OSI model, use ICMP protocol
- 5) It provide redundancy.

* Types of Router

- 1) Wireless Router : Router used to offer wifi connectivity to laptops, smart phones, other wifi network capabilities device.
 - It can also provide standard ethernet routing for a small no of wired n/w system.
 - It allows computer to connect with router within a range, if connection is indoor, the range of WR is 150 feet, outdoor range : 300 feet.
- 2) Bridge : A router is a combination of Bridge & router.

Teacher's Signature

 - It allows transferring of data b/w n/w like a bridge.
 - It can also route within a n/w to individual system.
 - It can transfer data to other n/w.

3) Core Router \rightarrow It is a router which can route data within the NIW
 \rightarrow not able to route data b/w the NIW.
 \rightarrow It the backbone of NIW, help to link all NIW devices.
 \rightarrow It is used by (ISPs) Internet service provider.

4) Edge Router \rightarrow An edge router is a lower capacity device which is placed at the boundary of NIW

\rightarrow It allow internal NIW to connect external NIW.
 \rightarrow It uses external BGP to provide connectivity.

Subscriber Edge Router	Label ER
belong to an end-user org. it works in situation when acts as border Router.	used in the boundary of (MPLS) multi protocol label switching. It acts as gateway b/w LAN, WAN.

5) Broadband Routers: mainly used to provide ^{high} speed internet access to computer. It is needed when you connect to the internet through phones, & use VoIP.

\rightarrow It provide by the ISP also known as Broadband modem, ADSL, DSL (digital subscriber line)

Benefits

- 1) Security: provide security as LAN works in broadcast mode.
 \rightarrow data is available to each station but the station which is specifically addressed can read the data.
- 2) Performance: It enhance performance within the NIW.
- 3) Reliability: provide reliability, If one network gets down when the server has stopped, then router services & other network will not affected.
- 4) Network Range: cable is used to connect device, length cannot exceed (100mts).

⑧ Routing Protocols It specify a way for the router to identify other routers on the NIW & make dynamic decision to send all network msgs.

Types of Routing Protocols:

- 1) Open Shortest Path First (OSPF): It is used to calculate the best route for the given packet to reach a destination. It is identified by Internet Engineering Task Force (IETF) as Interior gateway Prot.
- 2) Topic: Border gateway protocol (BGP): It helps manage how packets are routed on the internet via exchange of info b/w edge routers.
 Aim/Objective:
 → It provide network stability, if one internet connection down it adopt other n/w connection.
- 3) IGRP (Interior gateway routing protocol): It specifies how routing info will be exchanged b/w gateways within an independent n/w.
- 4) Enhanced Interior gateway routing pr. (EIGRP): In this protocol, if a router is unable to find a path to destination from the table, it asks route to its neighbors, pass query to its neigh. until it finds path to route.
- 5) Exterior Gateway Protocol (EGP): It decides how routing info can be exchanged b/w 2 neighbors gateway hosts, each of which has its own router. → Exchanged info b/w hosts on the internet.
- 6) Routing Internet protocol (RIP): It determine how router share info while transferring traffic among connect grps of LANs.

* Routing Table

- A routing table determine the path for a given packet with the help of an IP addresses of a device from table & sends packet to destination
- All info of routing table stored in RAM of router.
- It is a set of rules, often viewed in table format.
- device use Routing table are: router & switches, all IP enabled dev.

eg

Destination	Subnet mask	Interface
128.75.43.0	255.255.255.0	Eth0
128.75.43.0	225.225.225.128	Eth1
192.12.17.5	225.225.225.225	Eth2

Teacher's Signature

Static Routing Table

1) When a router uses as manually-configured routing entry, rather than info from dynamic routing traffic.

2) High security

3) Implemented on small n/w
4) Uses complex routing algo's

5) Failure of link, disrupt the routing

6) It is manual

Dynamic Routing Table

1) When a router learns about routing info without an administrator's help and add the best route to table

2) Low security

3) Implemented on large n/w.

4) Uses complex routing algo.

5) Failure of link do not disrupt in routing.

6) It is automated

* Routing Table Entries

- Routing table contains info to forward packet to best path.
- Each packet contains info about its origin & destination.

Routing Table consist of following entries

- 1) Network ID → Network ID or destination comes to route.
- 2) Subnet mask → mask that is used to match dest. IP address to network ID
- 3) Next Hop → address to which packet has forwarded.
- 4) Outgoing Interface → packet should go out to reach dest. n/w.
- 5) Metric → use to indicate min. no. of hops to destination.

* Routing Information Protocol (RIP):

- It is a dynamic routing protocol which uses hop count as a routing metric find the best path b/w source & dest n/w.
- It is a distance vector routing protocol; AD value → 120
- RIP uses port no: 520 & it works on application layer of OSI model
- RIP prevent routing loop by limiting the no. of hops allowed in a path b/w route & destination.

⑦ RIP versions

Activity No.

RIP v1

- 1) ~~Sends~~ update as Broadcast
- Aim/Objective :
- 2) Broadcast at 255.255.255.255
- 3) Doesn't support authentication of update msg.
- 4) Classful Routing protocol because it doesn't send info of Subnet mask.

Disadvantage

- 1) It works only on hop count
- 2) Bandwidth utilization is high
- 3) Convergence is very low waste of time in finding path.

Advantage

- 1) Easy to configure, static routes are complex
- 2) No complexity
- 3) Less overhead

RIP v2

- Send update as multicast
- Multicast at 224.0.0.9
- Support authentication of update msg
- called classless protocol, support classful. It send info of subnet mask

Disadvantage

- 1) maximum hop count of 15 due to which 'count-to-infinity' vulnerability
- 2) No concept of neighbor.
- 3) exchange entire table with neighbor, every 30 sec.

Advantage

- 1) It provide fast convergence
- 2) It is VLSM compliant
- 3) It sends triggered update when n/w change.

Date

RIP v2

- Sends update as multicast
- Multicast at 224.0.0.9
- can only run on one IP
- classless updates are sent.

Advantage

- ⑧ (EIGRP) Enhanced Interior gateway routing protocol
- It works on NW layer of OSI model.
 - define : written on page (3).
 - It uses metric to find out best path b/w 2 layers 3 devices to deliver packet.

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→ It uses some message to communicate neighbor device that operates EIGRP.

- 1) Hello msg
- 2) Full update
- 3) Null update
- 4) Partial update

- 5) Query msg
- 6) Reply msg
- 7) Ack. message

Features:-

- 1) Reduced Bandwidth usage: EIGRP doesn't send periodically updates like other distance vec. routing protocol. Like RIP send full routing table over a period of time (30 sec)
- 2) Rapid convergence: EIGRP uses DUAL algo to support rapid convergence.
→ If one n/w goes down then other route can be used.
- 3) Support all LAN, WAN data link protocol: It support multi access n/w like fddi, token ring etc.
- 4) Best path selection using DUAL: use diffusion update algo to find out best path available in n/w.
→ It maintain a topology table in which all routes to n/w are maintained
- 5) Traffic control: It provide feature in which we can flag the interface as passive; not to take part in EIGRP
- 6) Support both IPv4 & IPv6
- 7) Support VLSM

(IGRP)

- 1) Interior gateway protocol
- 2) classical routing technique
- 3) Slow convergence
- 4) Bellman ford algo used
- 5) low high bandwidth
- 6) Hop count: 255
- 7) Provide 24 bits for delay

(EIGRP)

- Enhanced IGP.
- It use classical routing techniques, fast convergence
- DUAL algo used
- need less bandwidth
- Hop count 256
- provide 32 bits for delay.