C.N

Assignment no. 2

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Q.1) What is routing? Explain different routing protocols - Distance vector and Linked State.

Ans) Network routing is the process of selecting a path across one or more networks. Routers refer to internal routing table to make decision about how to route packets along network paths. A routing table records the path that packets should take to reach every destination that router is responsible for.

a) Static Routing: It is a technique in which the administrator manually adds the route in routing table. Useful in long term Virtual circuit.

b) Dynamic Routing: It is a technique in which a router adds a new route in the routing table for each packet in response to changes in condition or topology of network.

c) Default Routing: It is technique in which a router is configured to send all packets to same hop devices.

- Distance Vector:

A distance vector routing algorithm operates by having each router maintain a table giving best known distance to each destination and which link to use to get there. These tables are updated by exchanging information with the neighbours.

Eventually every router knows the best kind to each destination.

In distance vector, each router maintains a routing table indexed by and containing one entry for each router in network. The entry has two parts: the preferred outgoing line to use for that destination and an estimate of the distance to the destination. The distance might be measured as the numbers of hops, delay in propagation Bandwidth or using any suitable metric.

The routes is assumed to know the distance to each of its neighbours. If the metric is hops, the distance is just one hop. If the metric is delay in propagation, the router can measure it directly with special ECHO packets that the reciever just timestamps and send back as fast as it can.

- Link-State Routing:

It is one of the main classes of routing protocols used in packet switching network for computer communication.

The Basic concept of link-state routing is that every node constructs a map of the connectivity ~~of the connectivity~~ to the network, in form of graph showing which nodes are connected to which other nodes.

Each node then independently calculates the next best logical path from it to every possible destination in the network. Idea behind link state routing is fairly simple and can be stated as five parts

a) Discover its neighbour and learn their network address.
b) Set the distance or cost metric to each of its neighbours.
c) Construct the packet telling all it has just learned.
d) Send and recieve packet from all other routers
e) Compute the shortest path to every other router.

- Learning about neighbours: When the router is boot its first task is to learn who its neighbours are, It accomplish this goal by sending a special 'Hello' packet on each port to point. The router on other end is expected to send back a reply giving it name. These name must be globally unique

- Setting Link Costs: The Link state routing algorithm requires each link to have distance or cost metric for finding shortest path. The cost to reach neighbours can be set automatically or configured by the network operator. If the network is geographically spread out the delay of the links maybe

factored into cost so that paths over shorter link are better choices.

- Building link state packet: Once the information needed for the exchange has been collected ne the next step is for each router to build a pa packet containing all the data. The packet starts with the identity of the sender t followed by a sequence number and age and list of neighbours. Cost of each neighbour is also given.

- Distributing link state packet: All of the routers must get all the link state quickly and reliably. If different routers are using different version of topology the routes they compute can have inconsistencies such as loops, unreachable machine etc. Flooding algorithm can be use to distribute the link state packet to routers. Each packet contains a sequence number that is incremented for each new packet sent. Second, if a router ever crashes it will lose track of its sequence number. If it starts again at 0, the next packet it sends will be rejected as duplicate. Therefore, to tackle this problem age info is used the information router has expires if the age ~~is~~ time is exceeded & in this way it will accept the new packet even if its sequence number is 0 or has some defects.

- Computing new routes: Once a router has accumulated a full set of link state packets, it can construct entire network graph because every link is represented twice for each direction. Compared to distance vector routing link state routing requires more memory and computation. For a network with n routers each of which has k neighbours the memory required to store input data is proportional to kn which is atleast as large as routing table listing all the destinations.

Q.2) Explain TCP Header

Ans)

← 16 bits →								← 16 bits →
Source Port								Destination Port
Sequence Number								
Acknowledgment Number								
TCP Header Length (4-bits)	Reserved bits (6-bits)	U R G	A C K	P S H	R S T	S Y N	F I N	Window Size (Advertisement window)
Options (0-32 bit words)								
Checksum								Urgent Pointer
Options (0-40 bytes)								
Data (Optional)								

TCP Header

1. Source Port: 16-bit field identifies the port of the sending application.

2. Destination Port: 16-bit field identifies the port of the receiving application.

3. Sequence Number: 32 bit field contains the sequence number of the first data byte.

4. Acknowledgment Number: 32 bit field always contain sequence number of the last received data byte incremented by 1

5. Header length: 4-bit field helps in knowing from where the actual data begins because of varying size of option field always consider in multiple of 4 and start from 5. Range [20 bytes, 60 bytes]

6. Reserved Bit: 6-bit field not used.

7. Urgent Bit: 1-bit field set to 1 if data is to be treated on urgent basis.

8. ~~Acknowledg~~
8. ACK bit: 1-bit field set to 1 if acknowledgement number is valid. For all TCP segments except ~~se~~request segment, ACK bit is set to 1

9. PSH Bit: 1-bit field set to 1 if the entire buffer is ~~w~~ to pushed immediately to the receiving application.

10. RST Bit: 1-bit field used to reset TCP connection when set to 1. It causes both the sides to release the connection and all its resources abnormally.

11. SYN Bit: It is used to Synchronize the Sequence numbers.

12. FIN Bit: FIN bit is used to terminate the T-C-P connection.

13. Window Size: 16-bit ~~con~~field contains the size of the receiving window of the Sender. When congestion detected, the window size is reduced dynamically.

14. Checksum: 16-bit field used for error control. It verifies the integrity of data in TCP payload.

15. Urgent Pointer: 16 bitfield indicates how much data in the current Segment from the first data byte is urgent. It is consider valid only if URG bit is set to 1.

16. Options: options field vary from 0 bytes to 40 bytes.
Use for following purposes:
1. Time Stamp.
2. window size extension.
3. Parameter negotiation.
4. Padding.

Q.3) Write short note on HTTP and SMTP.

Ans) HTTP: (i) Stands for Hyper text transfer protocol.

(ii) It can be used to carry data in form of MIME format.

(iii) It is a connectionless protocol. HTTP client ~~initia~~ initiates a request and waits a response from the server.

(iv) HTTP protocol is media independent as data can be sent as long as both the client and server know how to handle the data content.

(v) It is a Stateless protocol as both the client & server know each other during request.

SMTP: (i) It stands for simple mail transfer protocol.

(ii) It is a program used for sending messages to other computer based on e-mail address.

(iii) SMTP server is always on listening mode.

(iv) Client initiates a T.C.P connection with SMTP server.

(v) SMTP server listens for a connection and initiates a connection on that port.

(vi) Connection is estabilished and client informs SMTP that it would like to send an email.

(vii) Assuming server is ok, client sends the mail to its mail server and client map server use DNS to get IP address.

(viii) SMTP then transfer mail from sender to received mail server.