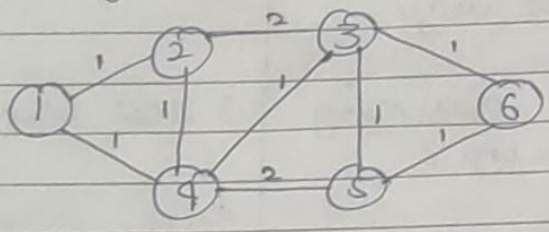
* Shortest Path computation with Candidate Path caching :-

→ there are certain networking environments where a list of possible paths is known or determined ahead of time such path are referred as candidate path list.

→ Path caching refers to storing of a candidate path list at a node ahead of time.

→ the link cost is periodically updated, then the computation of shortest path becomes very easy.

→ e.g.,



→ we look for least cost path, we find that 1-4-3-6 is most preferred path due to its lowest end-end cost.

→ Suppose link cost 4-3 changes from 1 to 5 so, if we know the list of candidate path we can recognize the path cost and find out that 1-4-3-6 is no longer the least cost.

→ It is imp. to note that candidate path list is not required to include all possible paths bet^n nodes i and j, only the preferrable path are considered

* Widest Path computation with Candidate Path caching :-

→ There are many networking environment in which the additive cost property is not applicable.
eg, Dynamic call routing in voice telephone network.
∴ Determining path when the cost is non-additive is also an important problem in network Routing.

→ Suppose than the bandwidth bet^n node i and m = 0, b[m] = 0
∴ link is not feasible since there is no bandwidth.

Consider a path between node 1 and node 2 consisting of 3 links, the first link has bandwidth = 10 units, 2nd = 5 units, 3rd = 3 units
Now,
if we say cost of path is additive
ie, 10 + 5 + 3 = 22
it is unlikely to make any sense.

Routing Table:

→ Communication n/w connects a set of nodes through link so that the routing traffic can be moved from source to destination.

→ For all the traffic to go to its destination, nodes in the n/w must provide directions.

→ To do that, each node in the n/w maintains a routing table. So that the traffic can be forwarded by looking up the routing table.

→ In an IP n/w nodes are routers.

→ It consists of necessary info. to forward packets along the best path towards destination.

→ Entries consist of:

1. Network ID
2. Subnet Mask.
3. Next Hop
4. Outgoing Interface / Destination N/w
5. Metric.

→ Routing tables can be maintained Manually / Dynamically.

→ Dynamically - with the help of Routing protocols.

→ The Routing table must be updated.

→ R.T tells the best path to the Router.

→ It also helps the Router in managing traffic.

Destination N/w	Hop	Metric

Network Routing Algorithms:

Types

Routing Protocols: (Routing Algorithms)

→ Specify a way for the router to identify other routers on the network and make dynamic decisions.
→ There are several protocols:

(*) OSPF: (Open shortest Path first):
→ used to calculate best routes for the packets to reach destination

(*) BGP: (Border Gateway Protocol):
→ It helps to manage how packets are routed on the internet via exchange of information b/w edge routers.
→ Provides N/w stability. If one connection goes down while forwarding, then it can adapt another network quickly

(*) IGRP (Interior Gateway Routing Protocol):
→ Specifies how routing information will be exchanged b/w gateways.

(*) EIGRP: (Enhanced Interior Gateway Routing Protocol):
→ If the router is unable to find a path through tables, then it asks its neighbours and further the neighbours ask their neighbours until a path is found.

(*) EGP (Exterior Gateway protocol):
→ decides how info. can be exchanged b/w two neighbour gateway hosts
→ Commonly used to exchang routing tables b/w hosts on internet

(*) RIP (Routing Information Protocol):
→ Max. no. of hops allowed is 15.
→ Determines how routers can share information while transferring traffic.

ROUTING ALGORITHMS:

→ The N/w layer must determine the best route through which packets can be transmitted from source to destination.
→ Routing protocols provide this job.

Le → Routing protocols are Routing Algorithms that provide best path (or the path with least cost) from source to destination.
→ Routing → Process of forwarding packets from source to destination.

Routing Algorithms (Classification)

Adaptive Routing Algo.	Non Adaptive Routing Algo.
① → also known as dynamic R.A	→ also known as static R.A.
→ Makes routing decisions based on topology & N/w traffic	→ does not make decisions based on topology & N/w traffic.
→ The main parameters are hop count, distance, estimated ② transit time.	

③

Adaptive Routing Algo.

Centralized Algo.	Isolation Algo.	Distributed Algo.
① A node has whole info about N/w & it can make decisions.	Obtains routing information by using local info. rather than gathering info. from other nodes.	① The node receives info from its neighbours.
② It requires only one single node to keep all the data.		② Disadvantage: The packet may be delayed if there is change in interval. Example, Distance Vector Algorithm.
③ Drawback: If the middle node goes down, then the whole N/w goes down. Eg: Link state algorithm.		

Non Adaptive Routing Algo

Flooding

→ Every incoming packet is sent to all the nodes except the one from which it has come.

→ Disadvantage is that node may contain several copies of a particular packet.

Random walks

→ A packet is sent by the node to one of its neighbours randomly.

→ Advantage is that it uses alternative routes very efficiently.

Difference b/w Adaptive & Non Adaptive

Adaptive	Non-Adaptive
① Used by dynamic Routing	① Used by static Routing.
② Routing table is constructed on the basis of n/w condition.	② Constructs a static table.
③ Routing decisions are made based on topology & n/w traffic	③ Not.
④ Complex	④ Simple.

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Destination	N/w	Hop	Metric