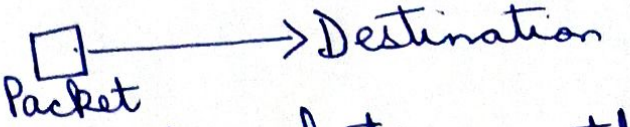
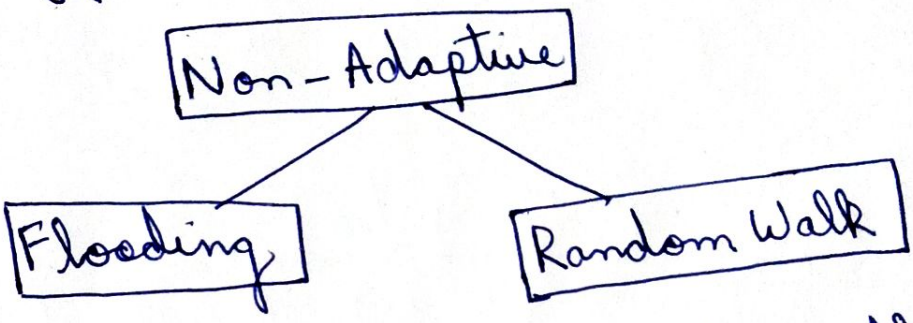
Routing



- Routing is a process of selecting path along with the data that can be transferred from source to the destination.
- Routing is performed by special device known as router.
- A router works at Network layer in OSI Model and internet layer in TCP/IP Model.
- A router is a networking device that forwards the packet based on the information available in packet header & forwarding table.
- The routing algorithms are used for routing the packets. The routing algorithm is nothing but s/w responsible for deciding the optimal path through which packet can be transmitted.
- The routing protocols use the metric to determine the best path for packet delivery.
- The routing algorithm initializes and maintains the routing table for the process of path determination.

① Non Adaptive Routing Algorithms

* Also Known as static Routing
* Routing process will designed in advance
* All the routing process will be stored in routers when the booting completes.
* It doesn't effect with change in Network Topology and Traffic.

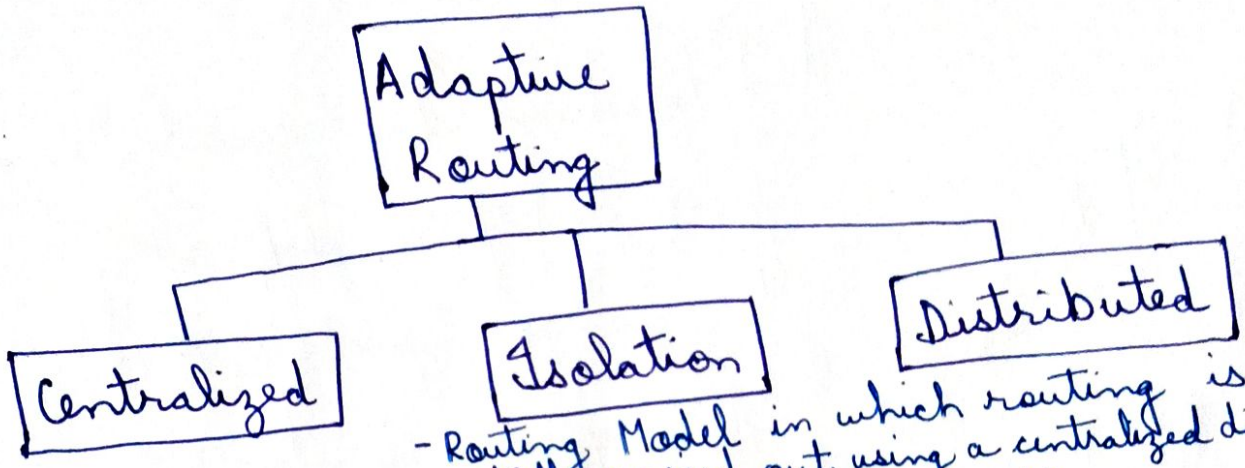


Flooding :- All incoming packets will be transmitted to all outgoing links.
- Multiple copies of packets.

Random Walk :- Incoming packet will be transmitted to the neighbour links randomly.
* Best for alternative path.

(2) Adaptive Routing Algorithm

* Dynamic Routing Algorithm
* Routing will change dynamically based on change in Topology & Traffic
* Parameters — Hop Count
  Distance
  Transmit Time



- Routing Model in which routing is centrally carried out using a centralized database.

- Centralized :- Global Routing Algorithm
  - Computes least cost path based on global information.

- Isolation :- Routing will be decided based on local information rather than global. [instead of gathering info. from other nodes.]

- Distributed :- Computes least-cost path based on iterative and distributed manner.
  - Decentralized
  [No node has the knowledge about the cost of all the network links.]

① Non-Adaptive Routing (static)

* shortest-Path
* Flooding
* Flow Based

② Adaptive Routing (Dynamic)

* Link state Routing — Centralized
* Distance Vector — Distributed

③ Hierarchical Routing

④ Routing in Mobile Hosts

⑤ Broadband Routing

⑥ Multicast Routing

Shortest Path Routing Algorithm

Route → Travelling a packet from source to Destination

Route → Shortest Route

↓

Function between nodes

↓

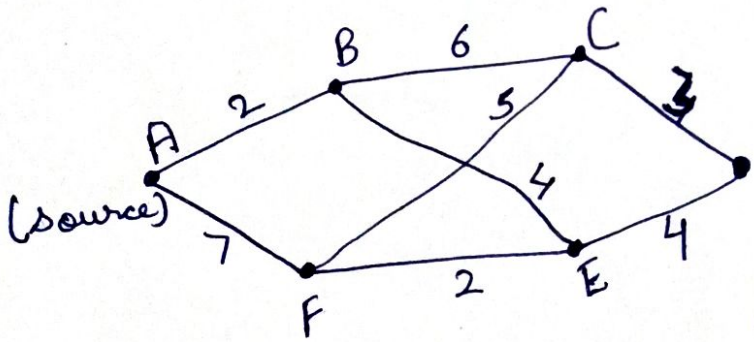
Cost

Distance

Traffic

Bandwidth

Time

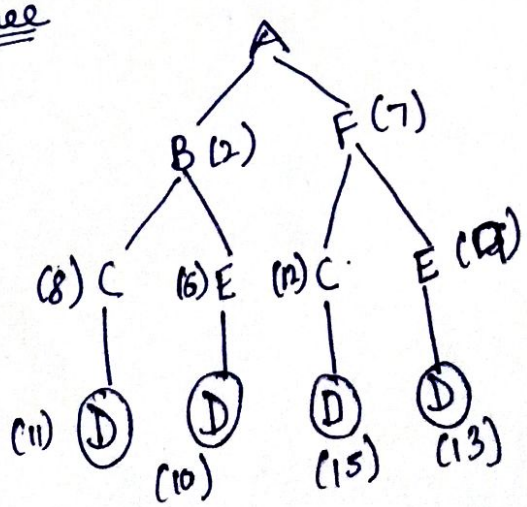


ABCDEF = Nodes

Time = constant

(Forwarding direction)

Tree

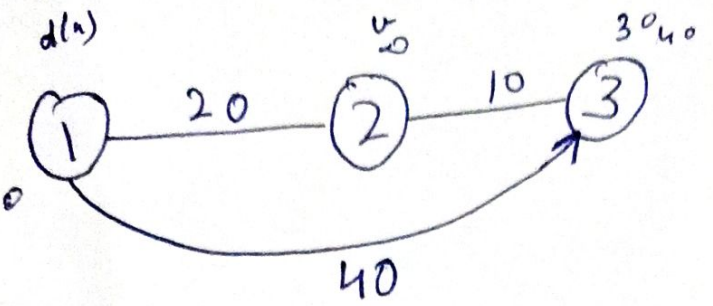


A B C D – 11

A B E D – 10

A F C D – 15

A F E D – 13



if $d(u) + c(u,v) < d(v)$
$d(v) = d(u) + c(u,v)$

$0 + 20 < \infty$

$20 < \infty$

$1 \rightarrow 3$

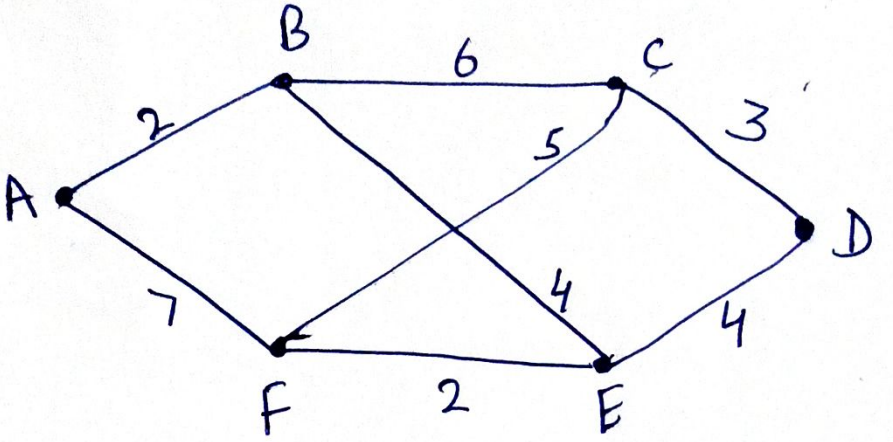
$0 + 40 < \infty$

$40 < \infty$

$20 + 10 < 40$

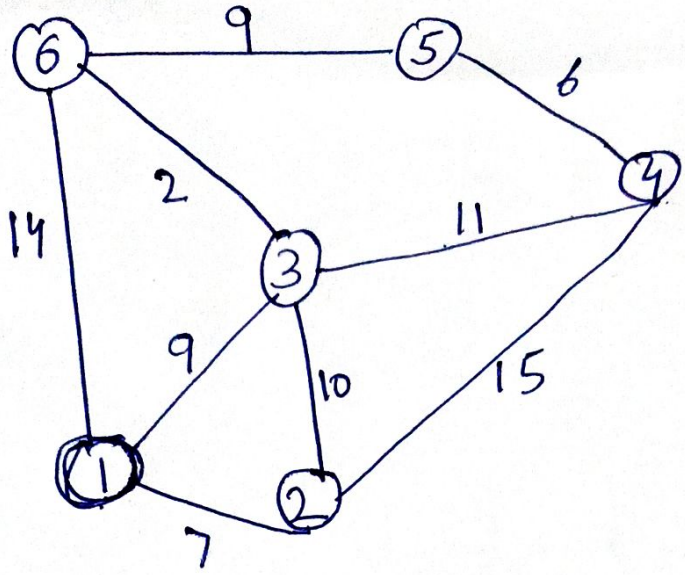
$30 < 40$

Dijkstra's Shortest Path Algorithm
(Single Source Shortest Path)



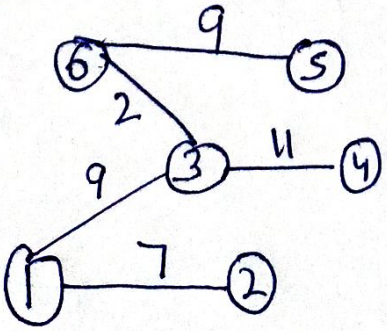
Source	Destination				
	B	C	D	E	F
A	∞	∞	∞	∞	∞
	(2)	∞	∞	∞	7
A, B	(2)	8	∞	(6)	7
A, B, E	(2)	8	10	(6)	(7)
A, B, E, F	(2)	(8)	10	(6)	(7)
A, B, E, F, C, D					

A – B – E – D



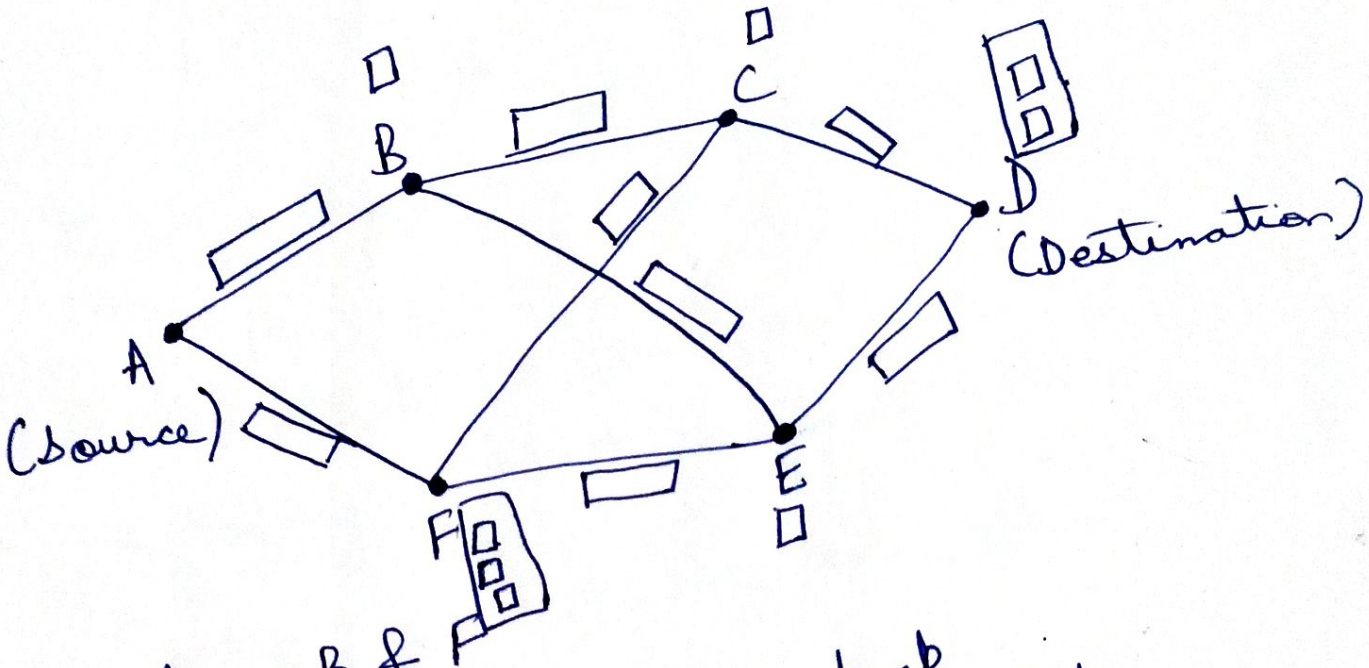
source	Destination					
1	1	2	3	4	5	6
0	0	∞	∞	∞	∞	∞
1, 2	0	(7)	9	∞	∞	14
1, 2, 3	0	(7)	(9)	22	∞	14
1, 2, 3, 6	0	(7)	(9)	20	∞	(11)
1, 2, 3, 6, 4	0	(7)	(9)	(20)	20	(11)
1, 2, 3, 6, 4, 5	0	7	9	20	20	11

1, 2, 3, 6, 4, 5



Flooding

* Broadcast the Packet
* Sends the packet to all outgoing links except to the link from which it was received.



A — B & F

B — C, E

C — F, D.

E — F, D

F -

Drawback

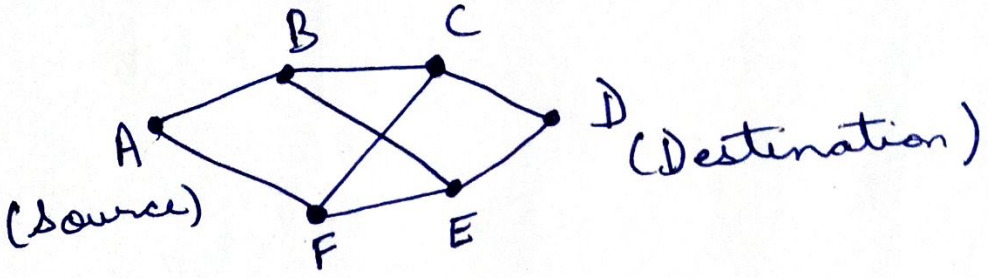
* Duplicate Packets
  Avoid duplicates
* Use Sequence Numbers

Flow Based Routing (Static Algorithm)

→ Routing is done based on

(1.) Topology

(2.) Load / Traffic



A B E D → Load / Traffic

* Moving to Next shortest Path

A F C D → Next shortest Path