CS & IT ENGINEERING

Computer Networks

Routing Protocols

Lecture No.- 04

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Recap of Previous Lecture

Topic One DVR

Topic Two Disadvantage of DVR

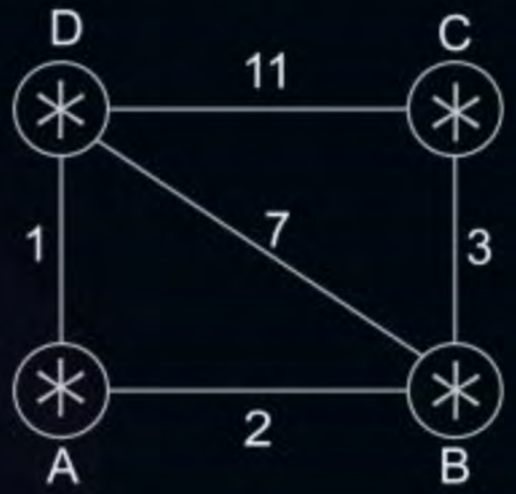
Topics to be Covered

Topic

Topic

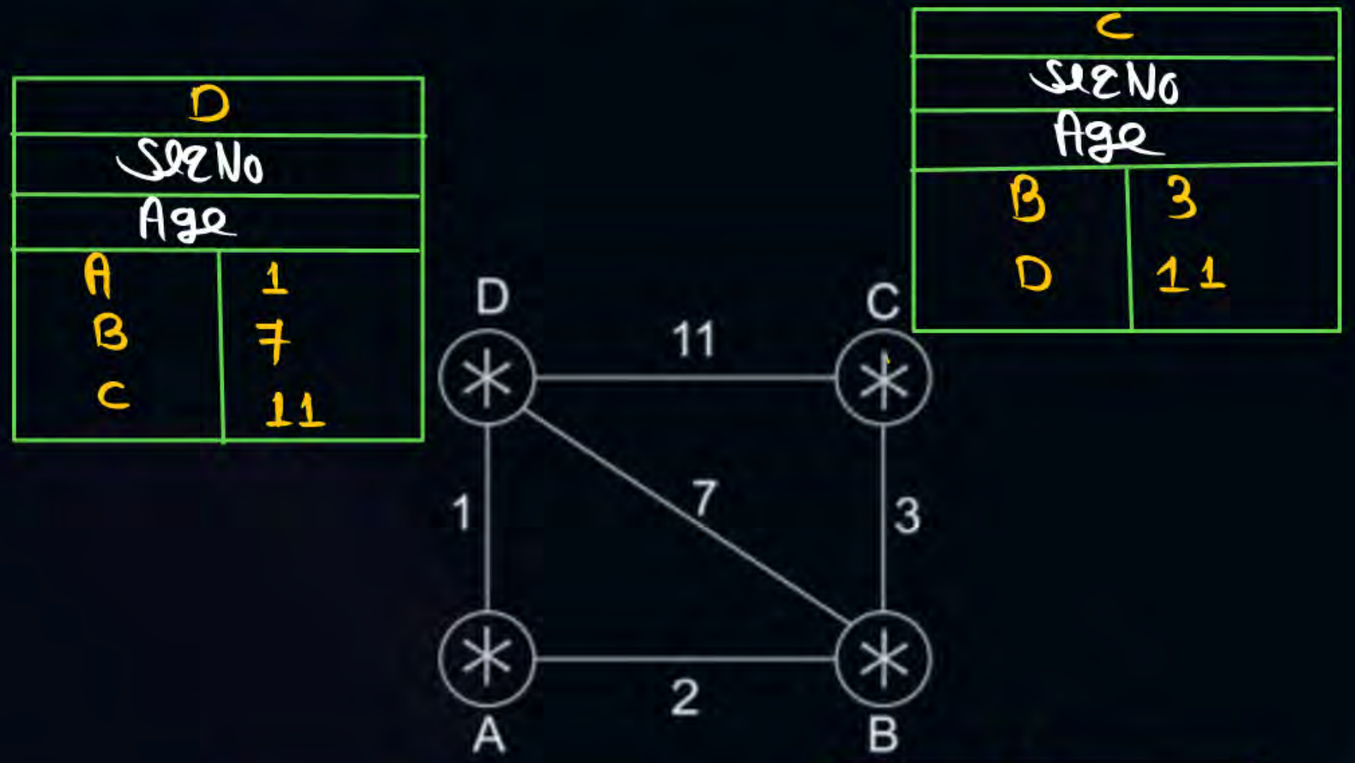
Link state Routing

Link State Routing



Slide 10

Step 1: Prepare the Link state packet at every Router Based on the local knowledge



D	
SeqNo	
Age	
A	1
B	7
C	11

C	
SeqNo	
Age	
B	3
D	11

Link state Pkt

A	
SeqNo	
Age	
B	2
D	1

B	
SeqNo	
Age	
A	2
C	3
D	7

Step 2: Every router flood the link state packet to every other router

At A

A Received Link state Packet From B, C, D

From-B

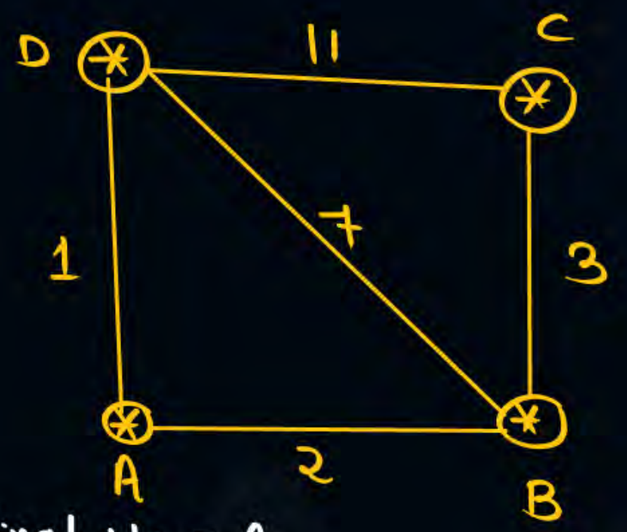
A	2
C	3
D	7

From-C

B	3
D	11

From-D

A	1
B	7
C	11



Routing table of A

Dest.	Dis.	NH
A	0	A
B	2	B
C	5	B
D	1	D

Dijkstra Algorithm

At B

'B' Received Link state Packet From A, C, D

From - A

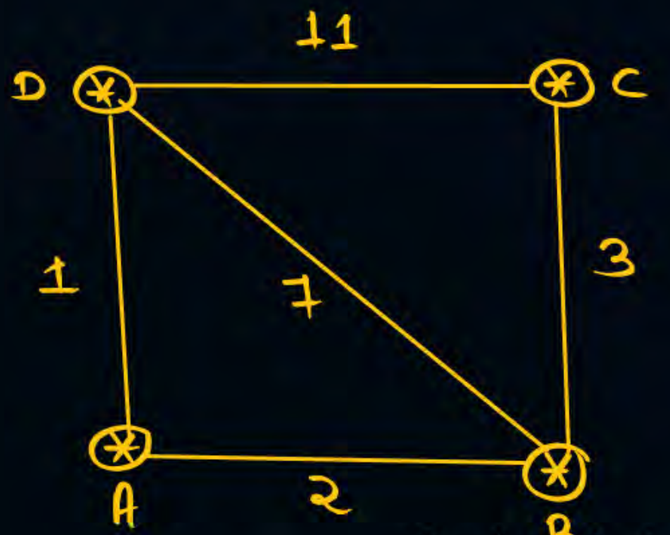
B	2
D	1

From - C

B	3
D	11

From - D

A	1
B	7
C	11

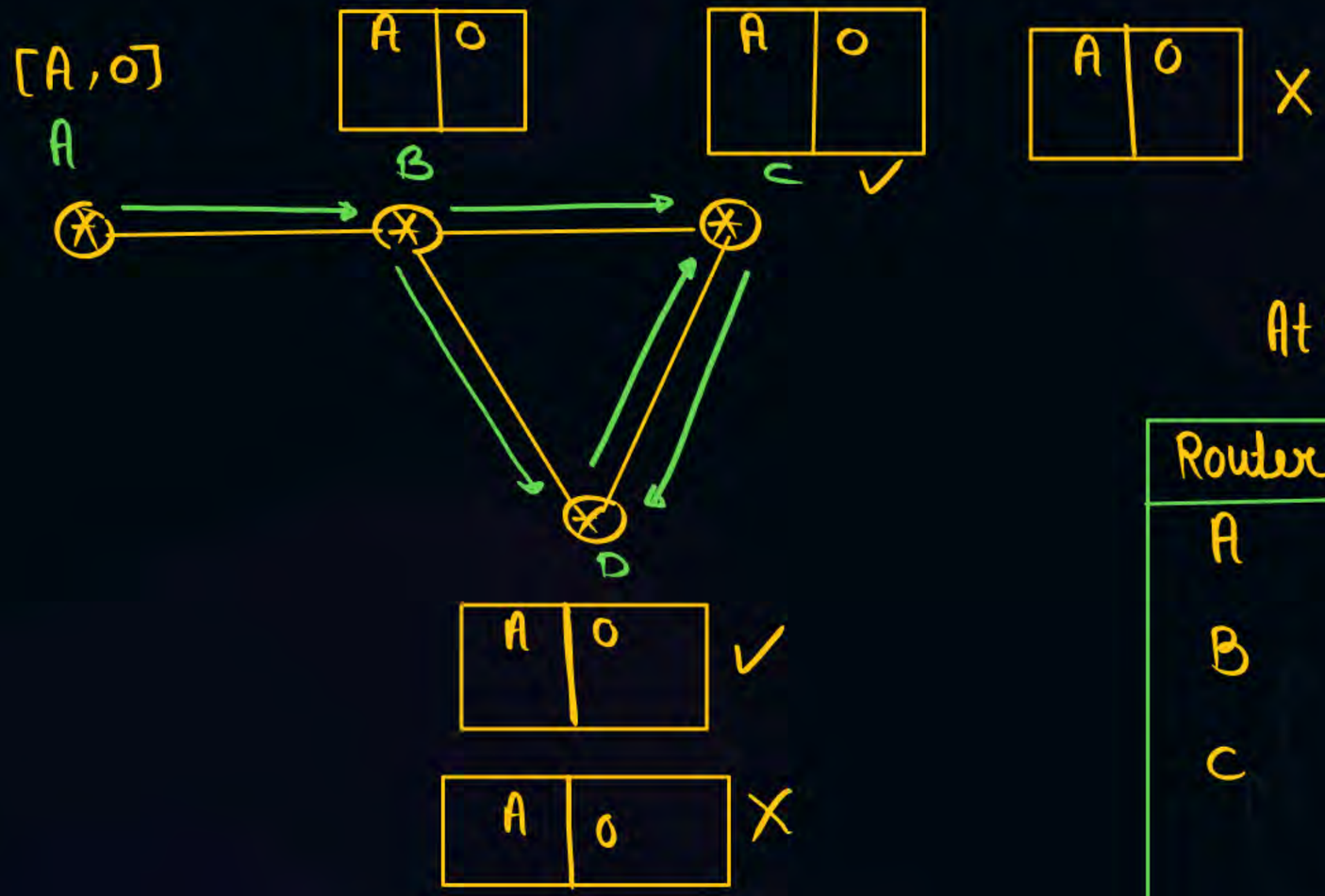


Routing table of - B

Des.	Dis.	NH
A	2	A
B	0	B
C	3	C
D	3	A

Problems in the Link state Routing

Infinite Looping



At D [Data Base]

Router	Latest seq No
A	~~10~~ 15
B	20
C	30

(A, 8) X
(A, 15) ✓
(A, 12) X
(A, 15) X

The fundamental idea is to use flooding to distribute the link state packets to all routers. To keep the flood in check, each packet contains a sequence number that is incremented for each new packet sent. Routers keep track of all the (source router, sequence) pairs they see. When a new link state packet comes in, it is checked against the list of packets already seen. If it is new, it is forwarded on all lines except the one it arrived on. If it is a duplicate, it is discarded, If a packet with a sequence number lower than the highest one seen so far ever arrives, it is rejected as being obsolete as the router has more recent data

This algorithm has a few problems, but they are manageable. First, if the sequence numbers wrap around, confusion will reign. The solution here is to use a 32-bit sequence number. With one link state packet per second, it would take 137 years to wrap around, so this possibility can be ignored.

Problem in Seq No

At D[Data Base]

Router	Latest Seq No
A	~~15~~ 47
B	20
C	30

47 → 00000 ..... 00 1 11 11 (15)

(A, 16) X
(A, 17) X
(A, 18) X
(A, 19) X
(A, 30) X
(A, 42) X
(A, 47) X
(A, 48) ✓

Valid Packet Rejected

0000 ..... 0010 1111

At D [Data Base]

Router	Latest Seq No	LT / Age / Validity
A	47	2 min
B	20	
C	30	

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 a duplicate.

Third, if a sequence number is ever corrupted and 65,540 is received instead of 4 (a 1-bit error), packets 5 through 65,540 will be rejected as obsolete, since the current sequence number will be thought to be 65,540.

The solution to these problems is to include the age of each packet after the sequence number and decrement it once a second. When the age hits zero, the information from that router is discarded. Normally, a new packet comes in, say, every 10 sec, so router information only times out when a router is down (or six consecutive packets have been lost, an unlikely event). The Age field is also decremented by each router during the initial flooding process, to make sure no packet can get lost and live for an indefinite period of time (a packet with age zero is discarded).

17th bit

00 ..... 1 0000000000000000 100 [4]

2^{16} ... $4\ 2^3\ 2^2\ 2^1\ 2^0$

$65536 + 4 = 65,540$

Topic : Node instability after split horizon

Distance vector Routing	Link state Routing
1. 1980's	1. 1990's
2. Bandwidth required very less because we sent only distance vector	2. Band width required High because we sent entire link state packet
3. Local knowledge	3. Global knowledge
4. Bellman Ford Algrithm	4. Dijkstra Algorithm
5. Traffic is very less	5. Traffic is very High
6. Convergence is very low	6. Convergence is Faster

Topic : Node instability after split horizon

Distance vector Routing	Link state Routing
7. Count to infinity Problem	No problem of count to infinity
8. Persistent Loops	8. Transient Loops
9. RIP	9. OSPF

Routing Information Protocal

Open shortest Path First

Topic : Node instability after split horizon

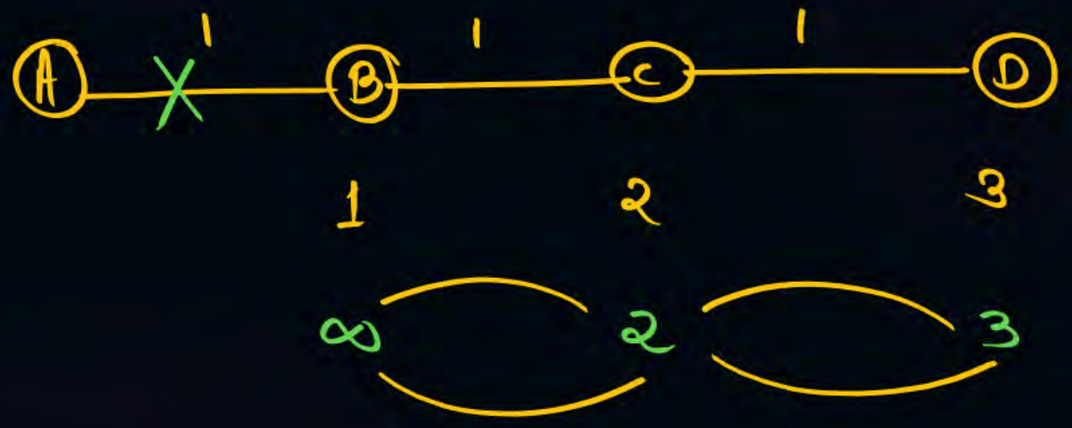
RIP : Routing Information protocol is a dynamic Routing Protocol which uses Hop count as a Routing metric to find the shortest path b/w source and destination.

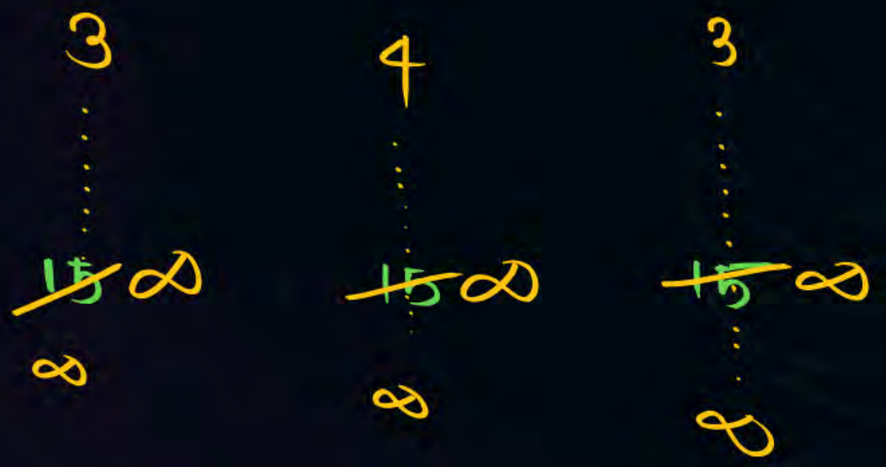
→ The path with the lowest Hop count is considered as the best path from source to detonative.

→ RIP prevent infinite looping by limiting the number of Hops allowed in a path from source to destination.

→ The maximum Hop count allowed For RIP is 15 and Hop count of 16 is considered as Destination unreachable

→ Note :- RIP uses UDP as its transport protocol with the part No - 530


A
B
C
D
1
1
1
1
2
3
∞
2
3


3
4
3
∞
∞
∞

Topic : Disadvantage of DVR

#Q. Which of the following is true about routing information protocol (RIP) and open shortest path (OSPF)

Gate

A. RIP uses distance vector routing and OSPF uses link state routing

B. OSPF uses distance vector routing and RIP uses link state routing

C. Both RIP and OSPF uses link state routing

D. Both RIP and OSPF uses distance vector routing

#Q. Consider the following statement about routing information protocol (RIP) and open shortest path (OSPF) in an ipv4 network

1. RIP uses distance vector routing (T)
2. RIP Packet are sent using UDP (T)
3. OSPF packet are sent using TCP
4. OSPF operation is based on link state routing (T)

Which of the statement above are correct

A. 1 and 4 only

B. 1 ,2 and 3 only

C. 1,2 and 4 only ✓

D. 2, 3 and 4 only

Gate

Slide

#Q. Two popular routing algorithms are Distance Vector(DV) and Link State (LS) routing. Which of the following are true?

(S1): Count to infinity is a problem only with DV and not LS routing (T)

(S2): In LS, the shortest path algorithm is run only at one node (F)

(S3): In DV, the shortest path algorithm is run only at one node (F)

(S4): DV requires lesser number of network messages than LS (T)

A. S1, S2 and S4 only
B. S1, S3 and S4 only
C. S2 and S3 only
D. S1 and S4 only ✓

Gate

Slide

2 mins Summary

Topic One

Topic Two

Topic Three

Topic Four

Topic Five

Disadvantage of DVR

THANK - YOU