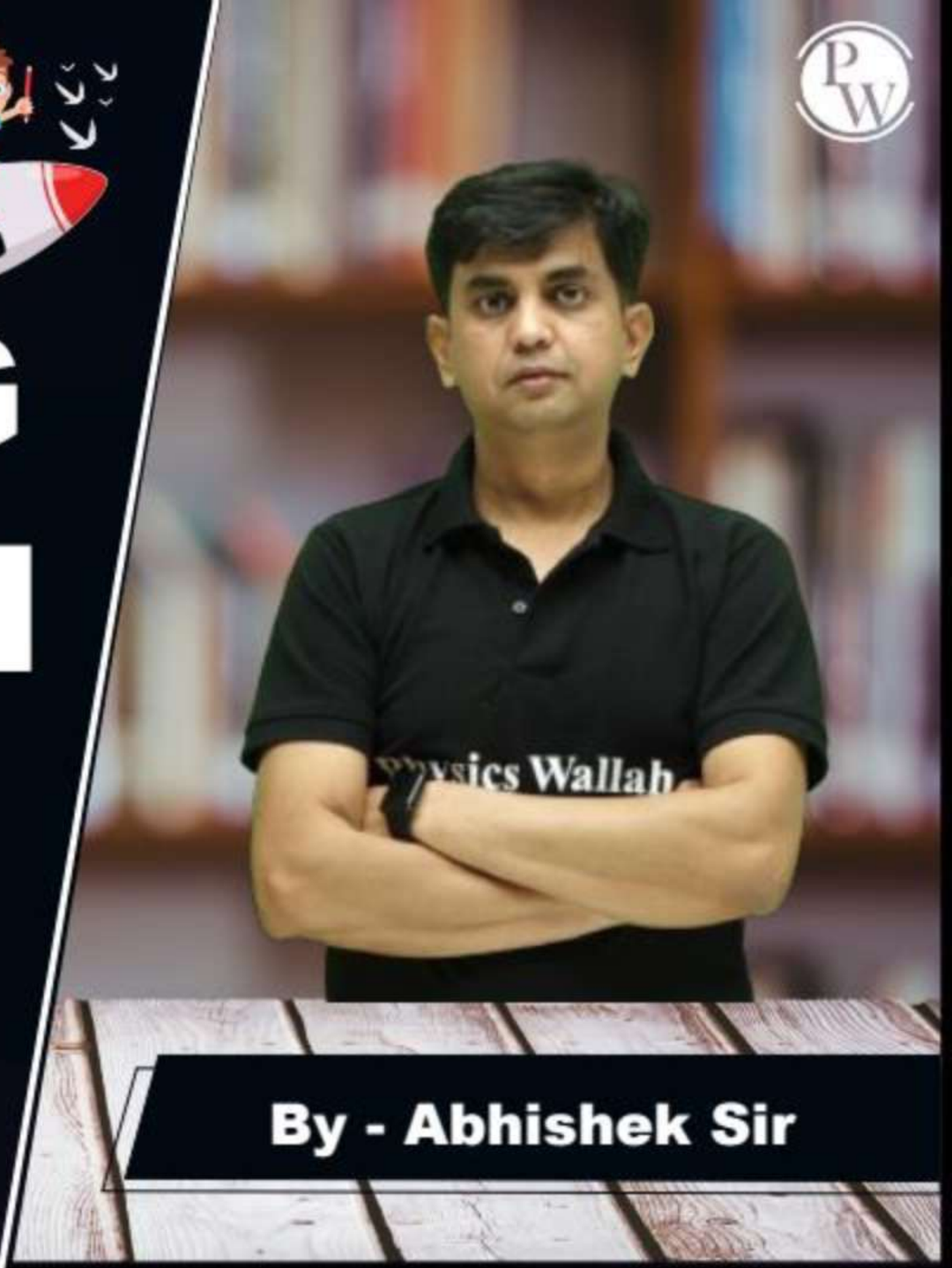
CS & IT ENGINEERING

Computer Network

Switching & Routing

Lecture No. - 06



Recap of Previous Lecture

Topic Distance Vector Routing

Topics to be Covered

- Topic: Routing Protocol
- Topic: Traffic Shaping
- Topic: DHCP

ABOUT ME

Hello, I'm Abhishek

- GATE CS AIR - 96
- M.Tech (CS) - IIT Kharagpur
- 12 years of GATE CS teaching experience

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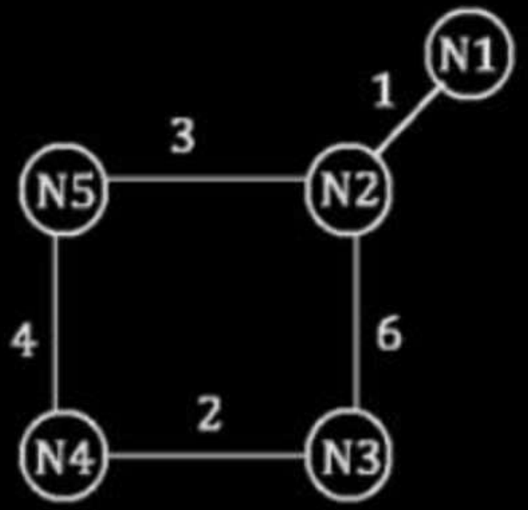
Statement for Linked Answer Questions.

Consider a network with five nodes, N1 to N5, as shown below. The network uses a Distance Vector Routing protocol. Once the routes have stabilized, the distance vectors at different nodes are as following.

Nl : (0, 1, 7, 8, 4)
N2 : (1, 0, 6, 7, 3)
N3 : (7, 6, 0, 2, 6)
N4 : (8, 7, 2, 0, 4)
N5 : (4, 3, 6, 4, 0)

$N_1 N_2 N_3 N_4 N_5$



Each distance vector is the distance of the best known path at that instance to nodes, N1 to N5, where the distance to itself is 0. Also, all links are symmetric and the cost is identical in both directions. In each round, all nodes exchange their distance vectors with their respective neighbors. Then all nodes update their distance vectors. In between two rounds, any change in cost of a link will cause the two incident nodes to change only that entry in their distance vectors.

[MCQ]

#Q. The cost of link N2-N3 reduces to 2 (in both directions). After the next round of updates, what will be the new distance vector at node, N3?

[GATE-2011]

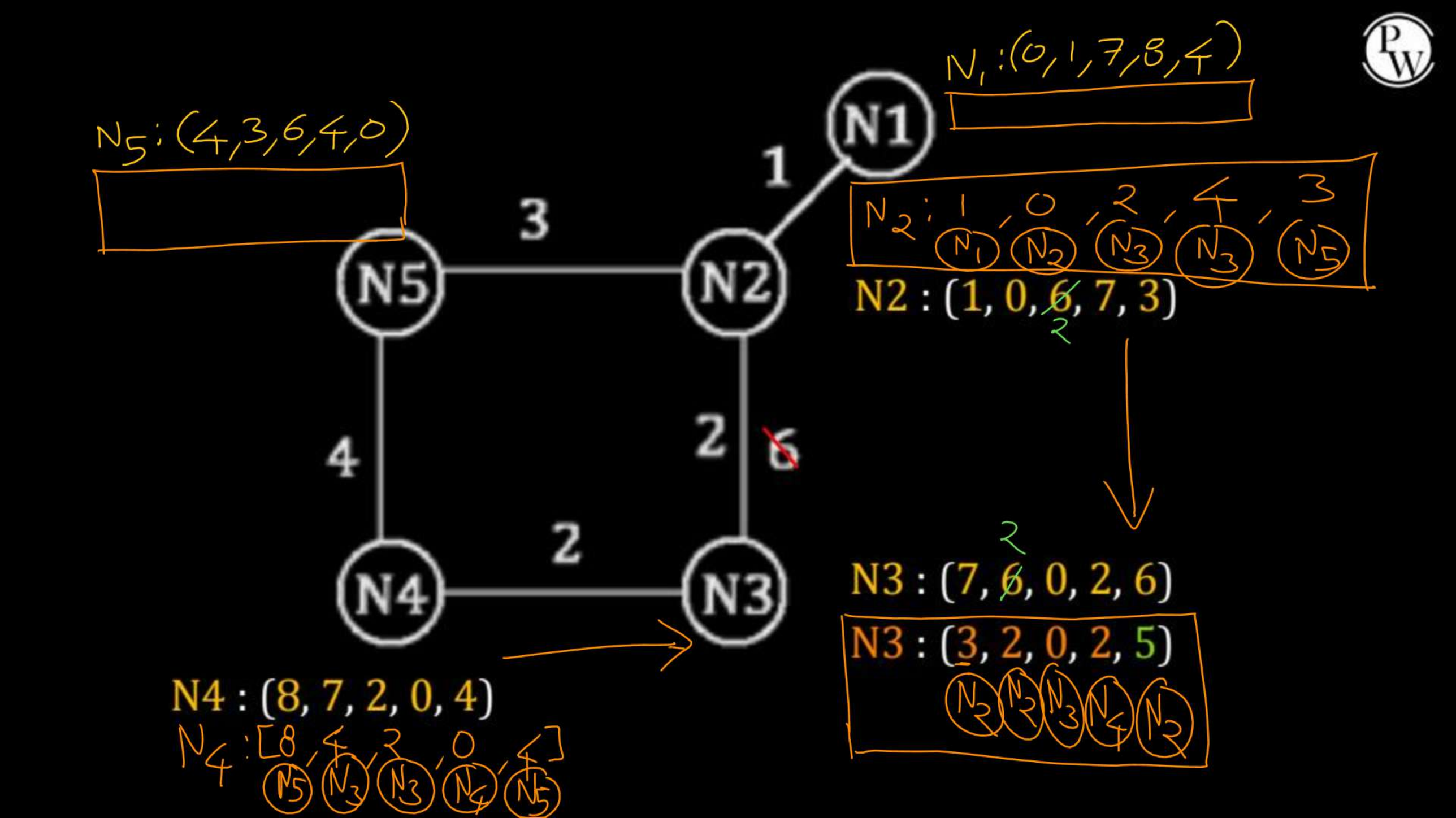
(A) (3, 2, 0, 2, 5)

(B) (3, 2, 0, 2, 6)

(C) (7, 2, 0, 2, 5)

(D) (7, 2, 0, 2, 6)

Ans: A


N1
N2
N3
N4
N5
1
3
4
2
6
2
N1 : (0, 1, 7, 8, 4)
N5 : (4, 3, 6, 4, 0)
N2 : (1, 0, 6, 7, 3)
N2 : (1, 0, 2, 7, 3)
N3 : (7, 6, 0, 2, 6)
N3 : (3, 2, 0, 2, 5)
N4 : (8, 7, 2, 0, 4)

[MCQ]

#Q. Consider the same data as given in previous question. After the update in the previous question, the link N1-N2 goes down. N2 will reflect this change immediately in its distance vector as cost, infinite. After the NEXT ROUND of update, what will be cost to N1 in the distance vector of N3?

[GATE-2011]

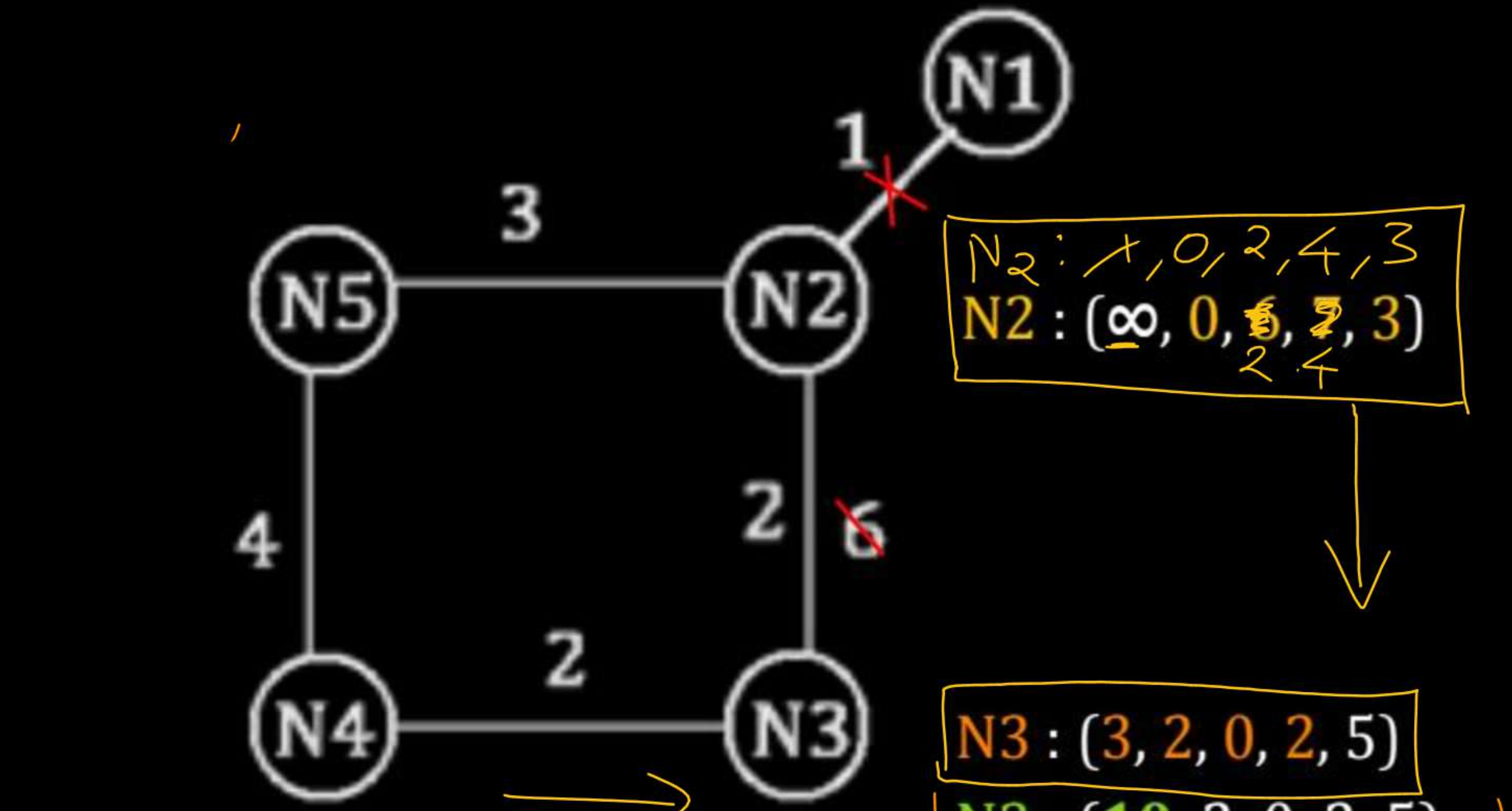
(A) 3

(B) 9

(C) 10

(D) Infinite

Ans: C


N1
N2
N3
N4
N5
1
3
4
2
6
2
N2 : (∞, 0, 6, 7, 3)
N3 : (3, 2, 0, 2, 5)
N3 : (10, 2, 0, 2, 5)
N4 : (8, 7, 2, 0, 4)

Topic : OSPF

→ Routing Protocol operate at Network Layer

→ Classic Link State Routing Algo. [OSPF-LS]

→ OSPF packets are directly encapsulated into IP datagram payload field
[OSPF → IP]

→ Link cost metric : Bandwidth or delay

→ Each router has full topology
[Uses Dijkstra's algorithm to compute 'forwarding table']

Topic : RIP

[RIP-DV] ✓

→ RIP : Routing Information Protocol

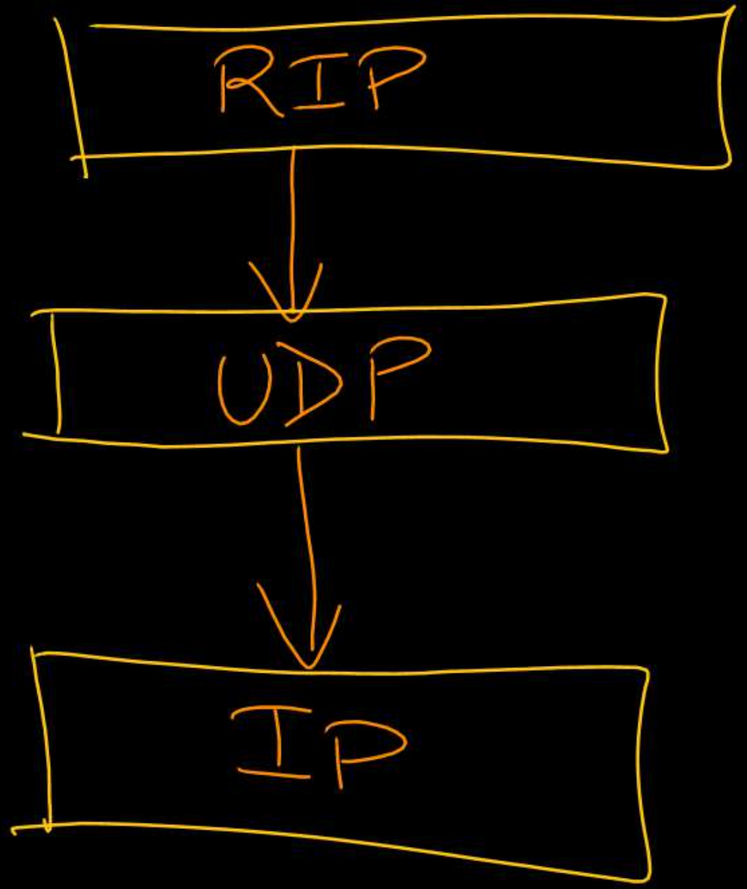
→ Routing Protocol operate at Application Layer / Network layer

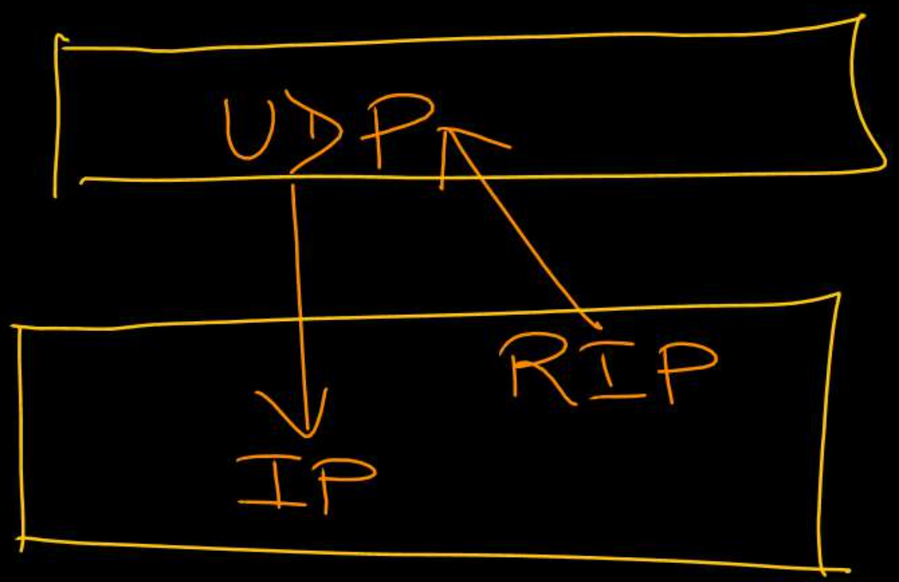
→ Classic Distance Vector Routing Algo.
[Distance Vector exchanged every 30 second] / Synchronous DV

→ Based on the Bellman-Ford algorithm ✓

→ RIP packets are directly encapsulated into UDP datagram payload field
[RIP → UDP → IP] ✓

→ Link cost metric : Hop count


RIP
UDP
IP


UDP
RIP
IP

#Q. Consider the following statements about the routing protocols, Routing Information Protocol (RIP) and Open Shortest Path First (OSPF) in an IPv4 network.

I. RIP uses distance vector routing [RIP-DV] TRUE

II. RIP packets are sent using UDP [RIP→UDP→IP] TRUE

III. OSPF packets are sent using TCP FALSE [OSPF→IP]

IV. OSPF operation is based on link-state routing [OSPF-LS] TRUE

Which of the following above are CORRECT?

[GATE-2017, Set-2, 1-Mark]

IIT-R

(A) I and IV only

(B) I, II and III only

(C) I, II and IV only

(D) II, III and IV only

Ans: C

Topic : BGP

→ BGP : Border Gateway Protocol

→ EGP : Exterior Gateway Protocol
[Inter-ISP routing]

→ Path Vector Routing
[Routing messages contains complete routes]

→ Routing Protocol operate at Application Layer

→ BGP packets are directly encapsulated into TCP segment payload field
[BGP → TCP → IP]

Topic : Source Routing

→ Source host determine the route (partial or complete) for a packet [before transmission]

→ Each packet carry determined routing path

#Q. Which of the following is NOT true with respect to a transparent bridge and a router?

[GATE-2004, 1-Mark]

(A) Both bridge and router selectively forward data packets TRUE

(B) A bridge uses IP addresses while a router uses MAC addresses FALSE

(C) A bridge builds up its routing table by inspecting incoming packets TRUE [SELF LEARNING]

(D) A router can connect between a LAN and a WAN TRUE

Ans: B

#Q. Consider the following statements about the functionality of an IP based router.

I. A router does not modify the IP packets during forwarding. FALSE

II. It is not necessary for a router to implement any routing protocol. TRUE

III. A router should reassemble IP fragments if the MTU of the outgoing link is larger than the size of the incoming IP packet. FALSE

Which of the above statements is/are TRUE ?

[GATE-2020, 1-Mark]

IIT-D

(A) I and II only

(B) I only

(C) II and III only

(D) II only

Ans: D

Topic : Traffic Shaping

→ Congestion control at router
[Congestion occur due to bursty traffic]

→ Two traffic shaping algorithm :-

1. Leaky Bucket Algorithm
2. Token Bucket Algorithm

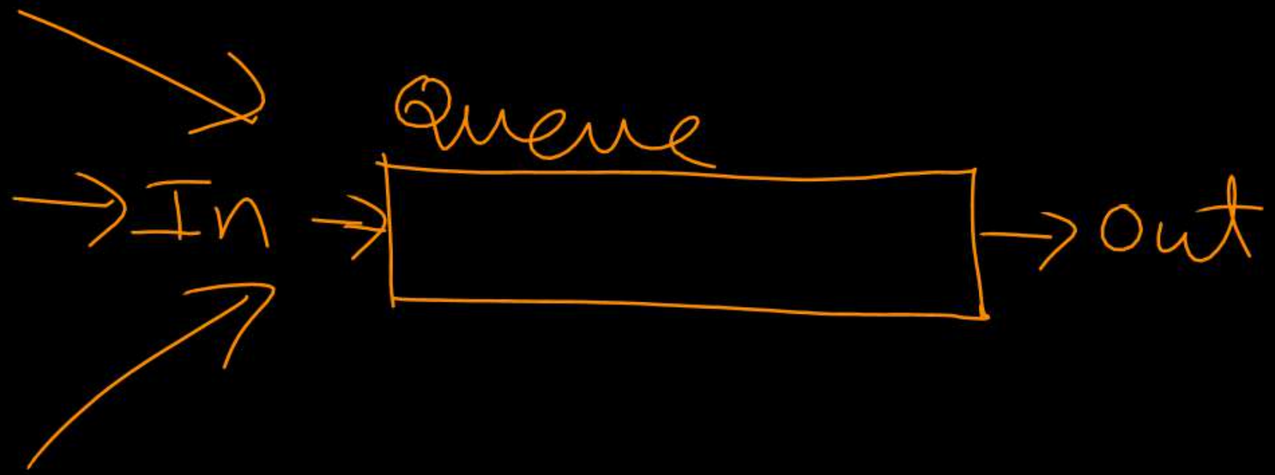
Bursty Traffic

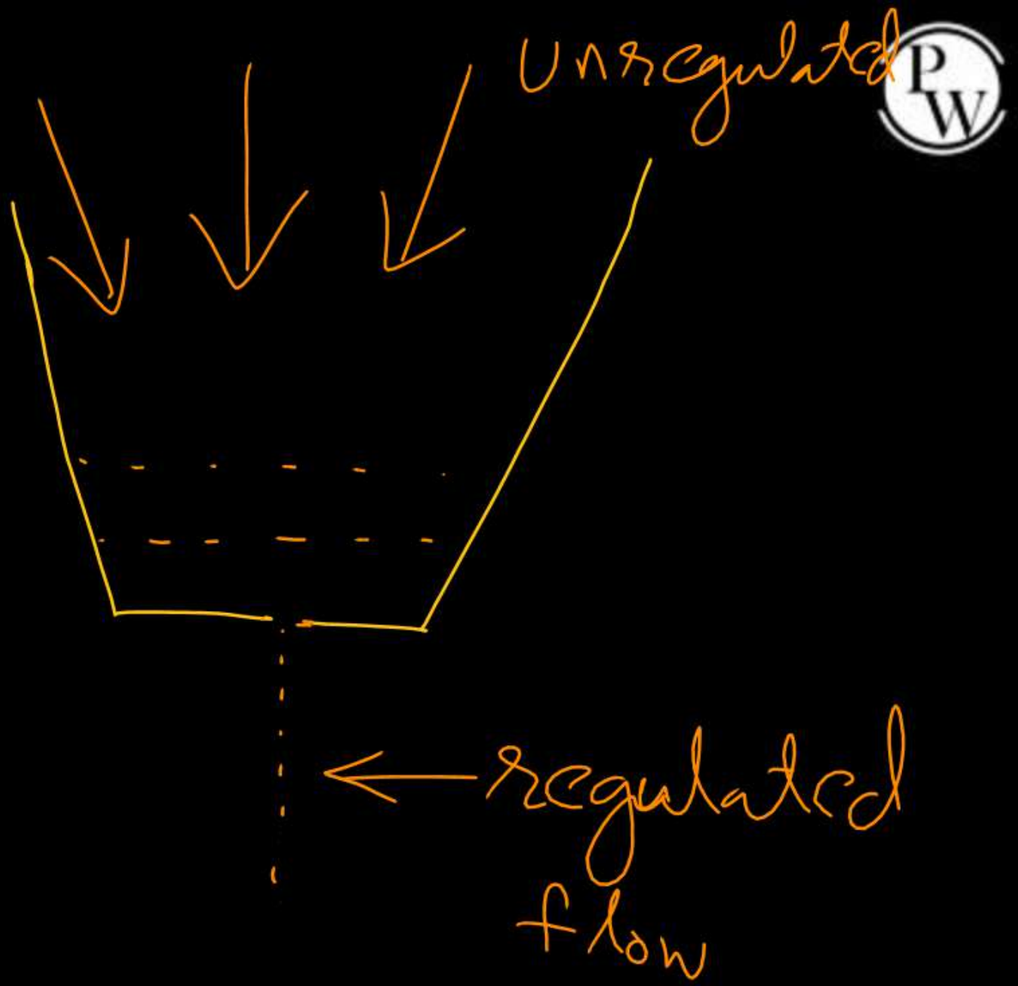
[Outgoing Rate < Incoming Rate]

Topic : Leaky Bucket Algorithm

→ Convert unregulated flow into regulated flow

→ Outflow is at a constant rate





#Q. A computer on a 10Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2Mbps. It is initially filled to capacity with 16Megabits. What is the maximum duration for which the computer can transmit at the full 10Mbps?

[GATE 2008]

11sec

(A) 1.6 seconds

(B) 2 seconds

(C) 5 seconds

(D) 8 seconds

Solution :-

C = 16 Mb (Megabits)

M = 10 Mbps

R = 2 Mbps

S = Maximum duration for which
the computer can transmit at the full capacity

$$S = \frac{C}{(M - R)}$$

#Q. For a host machine that uses the token bucket algorithm for congestion control, the token bucket has a capacity of 1 megabyte and the maximum output rate is 20 megabytes per second. Tokens arrive at a rate to sustain output at a rate of 10 megabytes per second. The token bucket is currently full and the machine needs to send 12 megabytes of data. The minimum time required to transmit the data is _____ seconds.

[GATE 2016]

IISc
H.W.

Solution :-

Data Size = 12 MB

C = 1 MB (Megabytes)

M = 20 MBps

R = 10 MBps

S = Maximum duration for which the computer can transmit at the full capacity

$$S = \frac{C}{(M - R)}$$

Minimum time required to transmit the data = $S + \frac{(DataSize - M * S)}{R}$

2 mins Summary

Topic Routing Protocol

Topic Traffic Shaping

Topic DHCP

THANK - YOU