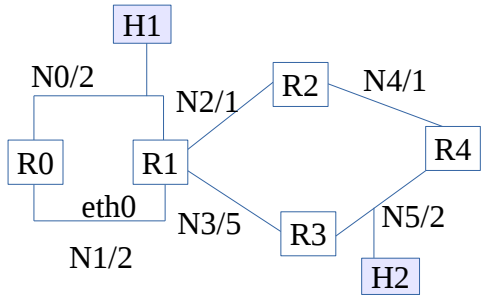
1. What are interior and exterior gateway protocols?
   (Ans: Interior gateway protocols are those which are used within an Autonomous System (AS) whereas exterior are those used between ASes)
2. Give examples of interior and exterior gateway protocols.
   (Ans: RIP and OSPF for interior, BGP for exterior)
3. State the three rules of routing table updation in distance vector algorithm.
   (Ans: Add any new n/w, Update iff the newhc < oldhc, Update if the same neighbor advertises the same n/w with a different cost)
4. What is split horizon?
   (Ans: Do not advertise networks learnt on an interface back on the same interface)
5. What is the purpose of using poison reverse?
   (Ans: Help spread bad news fast)
6. Why does the link state protocol use the sequence number?
   (Ans: To prevent duplicate messages from being advt. as well as to ensure that stale information is discarded)
7. Why does a distance vector protocol have slow convergence?
   (Ans: Due to count-to-infinity problem)
8. What is hold-down timeout and how is it useful?
   (Ans: Do not update an entry with cost 16 until at least 2 cycles of periodic update is done. This allows for information about unreachability to reach all the network before any alternate routes are learnt)
9. Give an example topology and explain the count-to-infinity problem.
10. State two major differences between RIPv1 and RIPv2.
    (Ans: RIPv1 uses bcast whereas V2 uses mcast. RIPv1 is for classful addressing only whereas V2 allows for CIDR)
11. What is the difference in the shortest path found by RIP and OSPF protocols?
    (Ans: RIP finds shortest paths in terms of hop count only whereas OSPF allows for any metric to be used for finding shortest paths as it uses a weighted graph)
12. What is the purpose of age timer in link state algorithm?
    (Ans: If a router reboots, its seq. no. is reset to 1. In such conditions, the routers do not update their network topology information until the seq. no. crosses the value before the router rebooted. This can lead to stale information about the network being maintained. Age timer deletes all entries from routers which are not updated within that time, thus allowing for quicker convergence)
13. The age timer is of duration 120s and a Link State message in the link state algorithm is sent out every 8s. How many messages are discarded by a neighbor if the sequence number was 18 at the time the sending router rebooted?
    (Ans: After 15 messages (15*8=120s), the age timer deletes the entry and the entry is updated)
14. Why is RIP not currently used often in networks and is limited to enterprises only?
    (Ans: RIP is limited to small networks because 16 is considered infinity and also because of its slow convergence)

Given that the routing table entries in a router R1 are as follows:

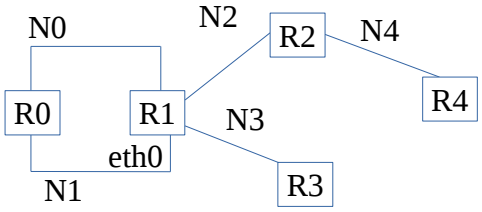
Dest. Network	Gateway	Interface	Hop Cost
N0	Direct	Eth0	1
N1	Direct	Eth1	1

15. If router R1 receives an advertisement from a router with ID N1.R2 at time 0 – ((N2, 1), (N3, 2)) in DV algorithm, what is the topology of the network?

16. What are the new routing table entries after the above advertisement is received by R1?
    (Ans: (N2, N1.R2, eth1, 2), (N3, N1.R2, eth1, 3))
17. At 20s, R1 receives a new advertisement from N1.R2 with the following: (N2, 16). Which of the optimizations to deal with count-to-infinity problem are definitely enabled based on the two advertisements received?
    (Ans: Split horizon, poison reverse, triggered updates)
18. R1 receives an advertisement of ((N3, 1), (N2, 2)) from N0.R3 at time 50s after the two above advertisements. If hold-down timeout is enabled in R1, what will be the routing table entries in R1 after receiving this advertisement?
    (Ans: N3, N0.R3, eth0, 2) – N2 is not updated because of hold-down timeout being enabled)
19. If triggered updates are enabled in R1, when will the triggered update be sent from R1?
    (Ans: As soon as any entry is changed – so at 50s)
20. What is the network topology based on all the advertisements received so far?
21. A router Ri has received the following messages in the link-state algorithm: (R1, 1, (R2, R5)), (R2, 10, (R1, R3, R4)), (R3, 5, (R5, R2)), (R4, 2, (R2)), (R5, 1, (R1, R3)). What is the network topology?
    (Ans: Use the neighbor info. to construct the topology)
22. Given the topology below, what is the path for packets destined from host H1 to H2 given that link-state algorithm is used?

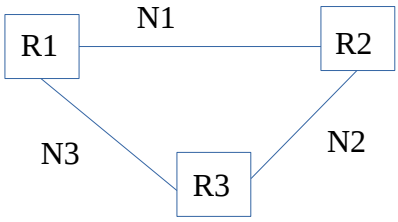


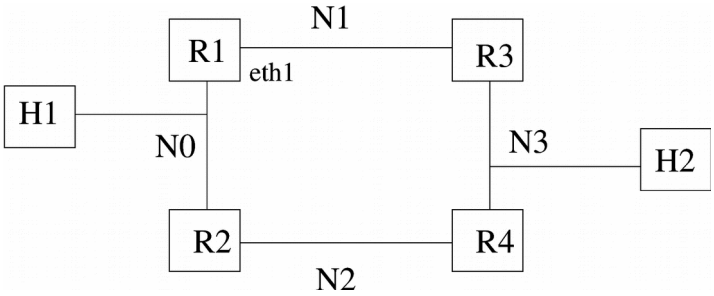
    (Ans: H1->R1->R2->R4->H2)
23. In the topology below, will split horizon be sufficient to prevent count-to-infinity problem?



    (Ans: Yes. All routers have information about N1 received only from R1 even though there is a cycle in the topology. And, there is no cycle back to R1 from the other routers which learn about N1 from R1)
24. If in the above topology only triggered updates are enabled, what will be the effect of eth0 going down? Will it lead to count-to-infinity problem or not?
    (Ans: It can still lead to it as while R1 advt. N1 unreachability to R2, R3 may advt. To R1)
25. What is the problem if the entry is changed when the hop cost is equal to the cost in RT?
    (Ans: Network oscillations leading to more bandwidth being consumed by control plane messages and a lot of churn in the paths followed by datagrams)
26. If in the below topology, R2's advt. reaches R1 first and then R3's advt., which one is used for the routing table entry to N2?

(Ans: Since the cost is the same, the first advt. is the one used)





27. Given the network above and the fact that the **interface eth1 on R1 has gone bad**, assuming that split horizon, triggered updates and poison reverse are all enabled, what is the effect of hold-down timeout on convergence? Will it help to avoid the count-to-infinity problem or unnecessarily delay the learning of alternate routes?

28. In the distance vector algorithm, a Router R1 receives the advertisement ((N2,1), (N3, 1), (N4, 2)) from a router with ID N1.R3. It receives an advertisement ((N3, 1), (N5, 1)) from router N4.R2. It then receives the advertisement ((N5, 2), (N6, 1), (N7, 1)) from router N2.R4. What is the topology of this network? If it receives the advertisement ((N5, 16), (N6, 1), (N7, 1)) from N2.R4 at a later point of time, what are the various mechanisms to prevent the count-to-infinity problem that are definitely enabled? In the topology that you have constructed, is split horizon sufficient to prevent the count-to-infinity problem?

29. Given the following routing tables of routers A and D, give the smallest network topology that satisfies these entries.

Routing Table of A

NWID	HopCost	GW
N1	1	direct
N2	2	B
N0	1	direct
N3	2	C
N4	3	C

Routing Table of D

NWID	HopCost	GW
N1	2	B
N2	1	direct
N0	2	C
N3	1	direct
N4	1	direct