Mini Project On

Comparative analysis Of Link State Routing And Distance Vector Routing using NS2 Simulation

There are two main classes of adaptive routing protocols on the internet i.e., distance vector and link state. In this mini project, we try to present the comparison between link state and distance vector. We have used Network Simulator (NS2) to obtain the performance results of two classes using different metrics such as throughput, average packet delay, and packet loss, all performed on a virtual bus topology

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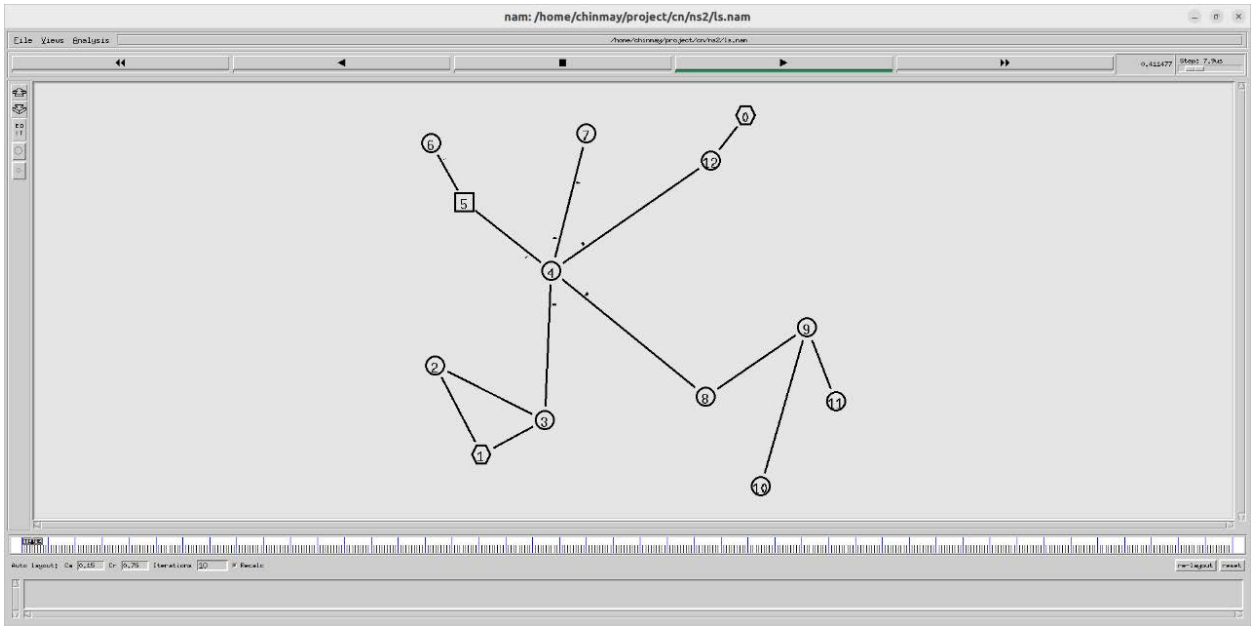
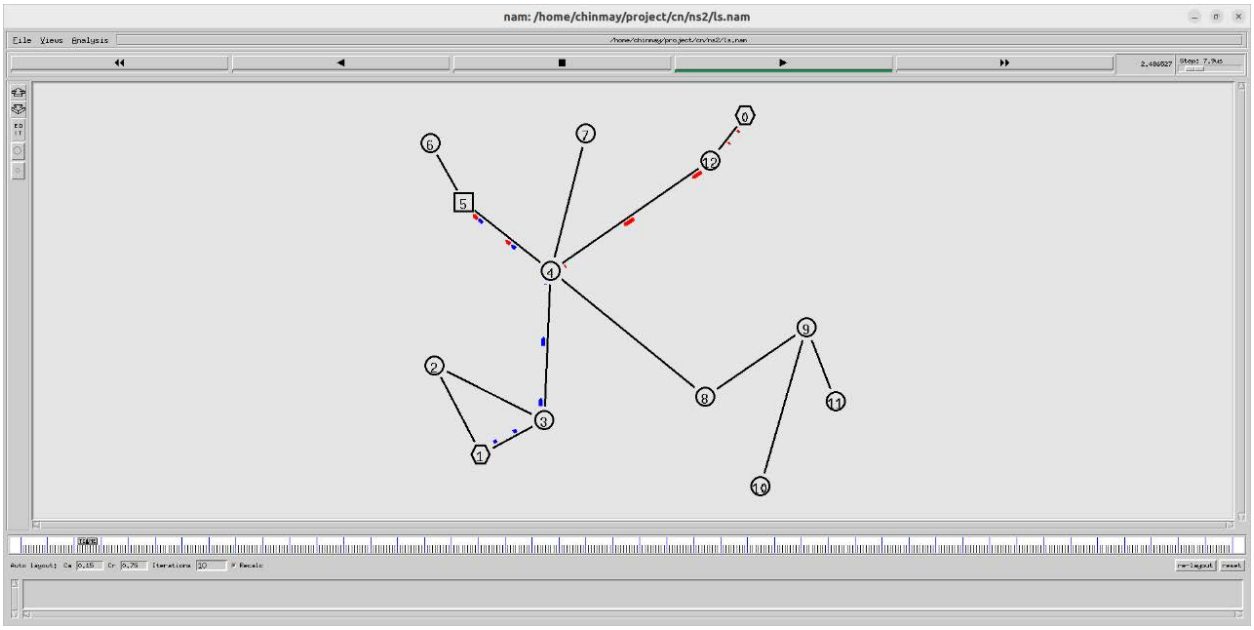
Step-by-Step Simulation of Link State Routing Algorithm

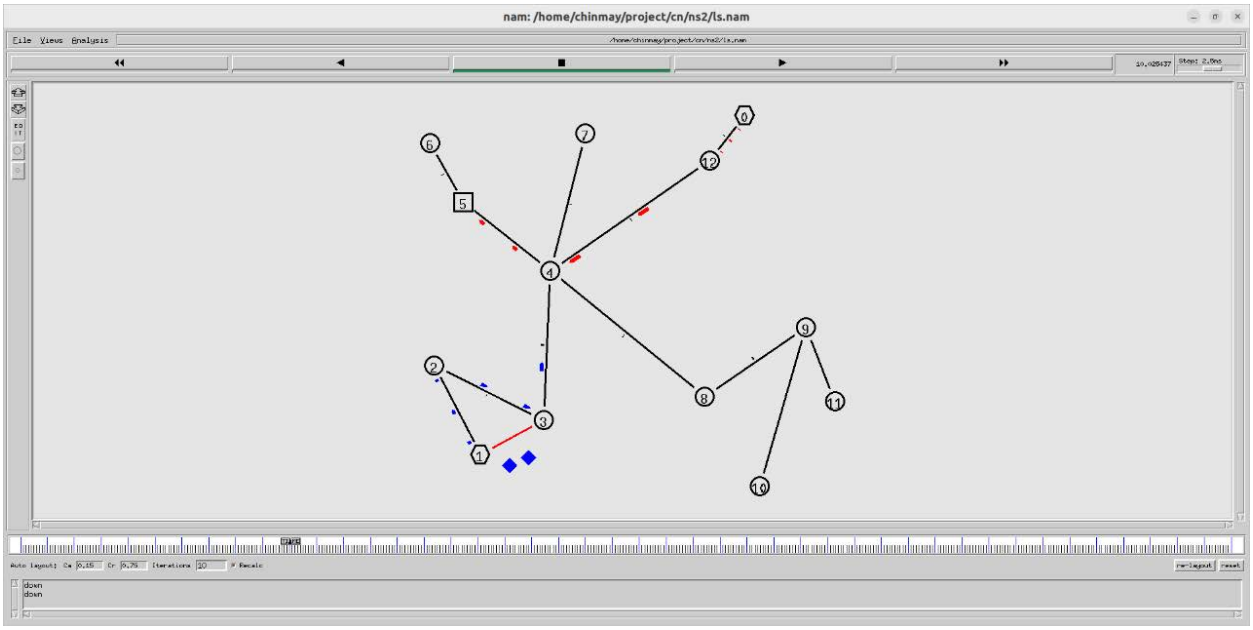
1) At the time of starting the simulation, all nodes share their distance vector with all nodes in the network to create a routing table known as flooding

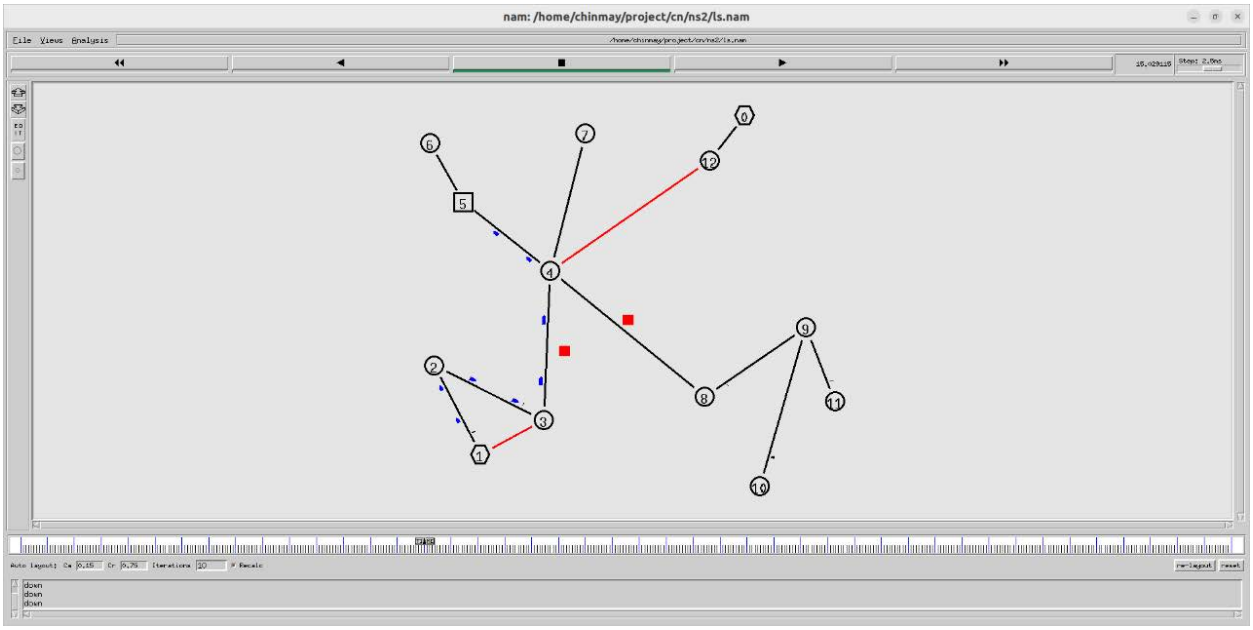


2) After flooding it starts sending packets to node5



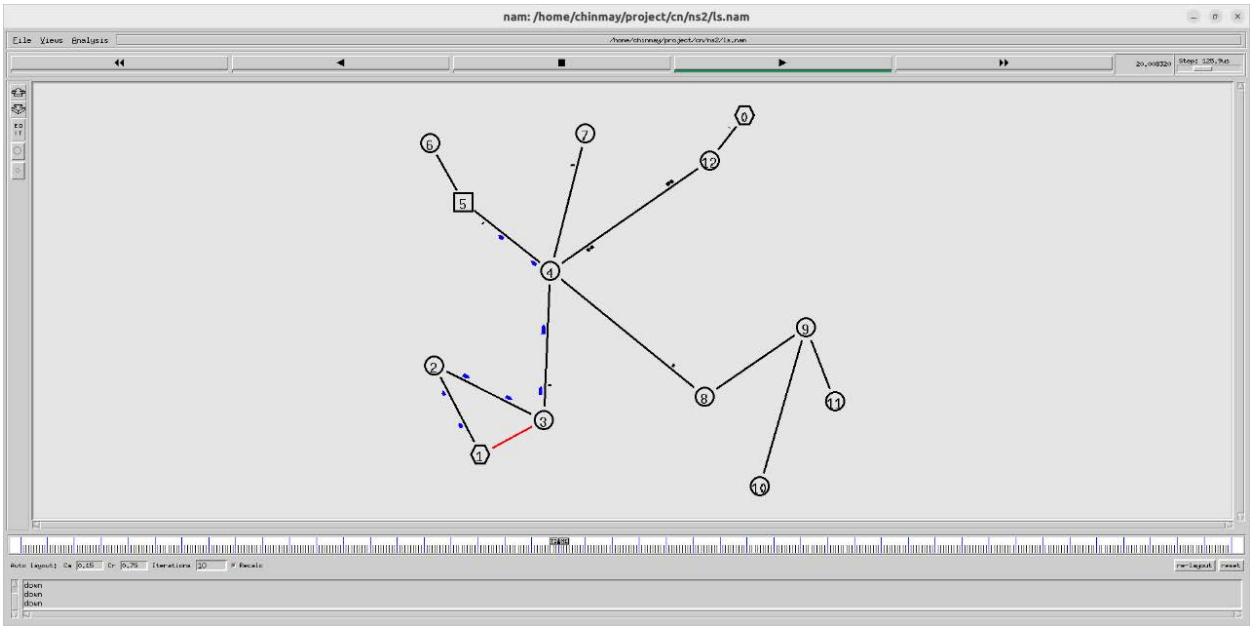
3) After 10 sec, the link between node 1 and node 3 and after 15 sec the link between node 4 and node 12 gets down and breaks the path of packets travelling gets change



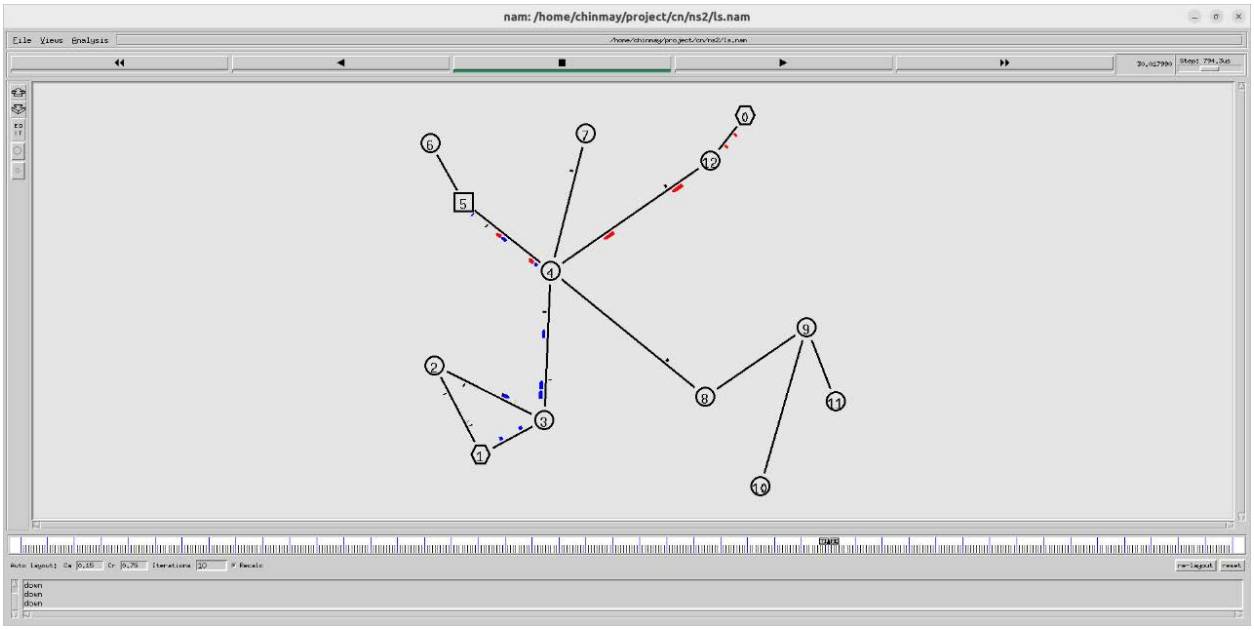


4) After 20 sec the link between node 4 and node 12 gets up or is restored and after 30 sec the link between node 1 and node 3 gets up and the path of travelling of the node gets restored

After 20 sec:



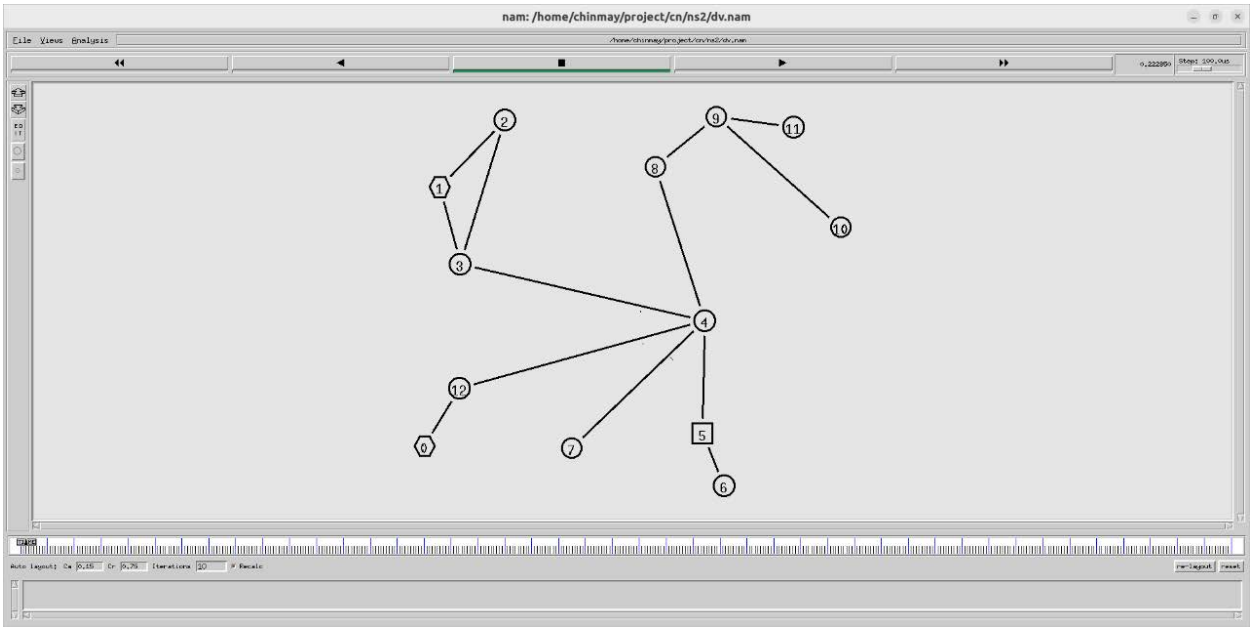
After 30 sec:



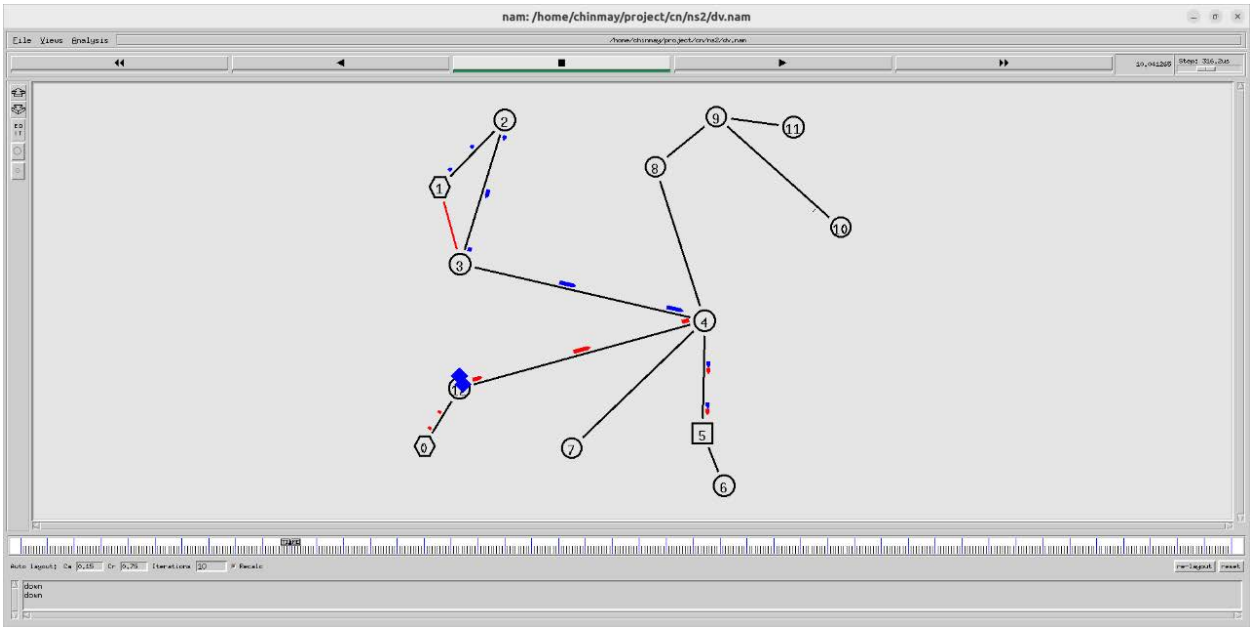
Simulation of Distance Vector Routing Algorithm

1) At the time of starting the simulation, All nodes share their distance vector with all neighboring nodes in the network to create a routing table

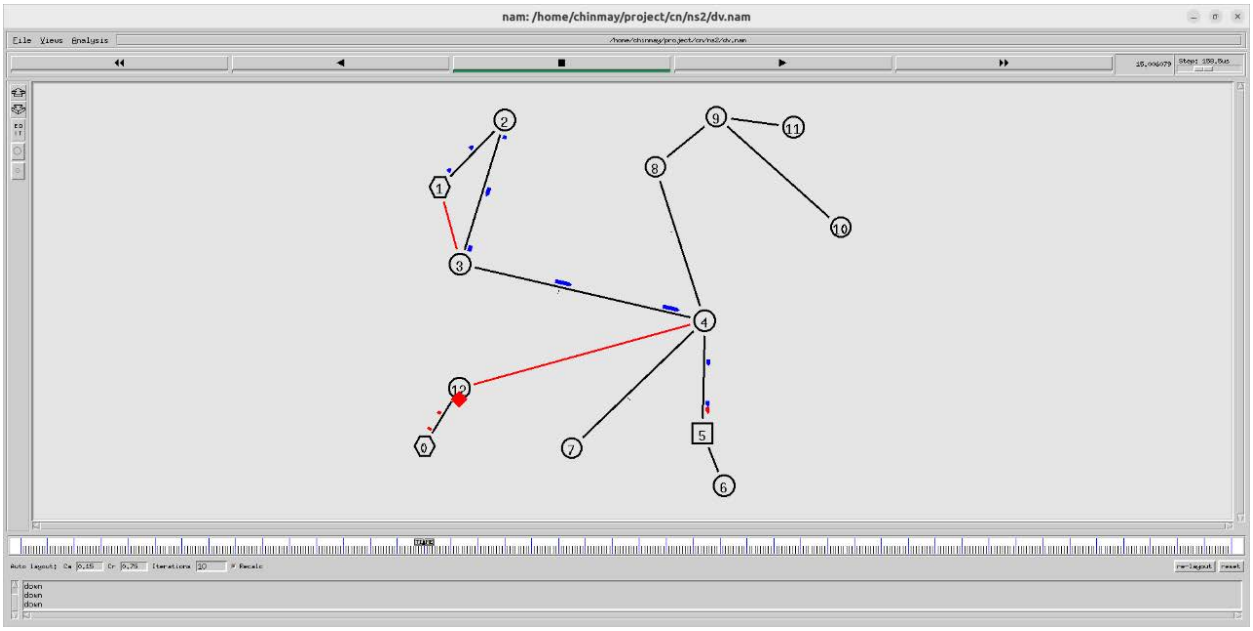
   In this image: Node 4 sends distance vector with node7,3,12,8



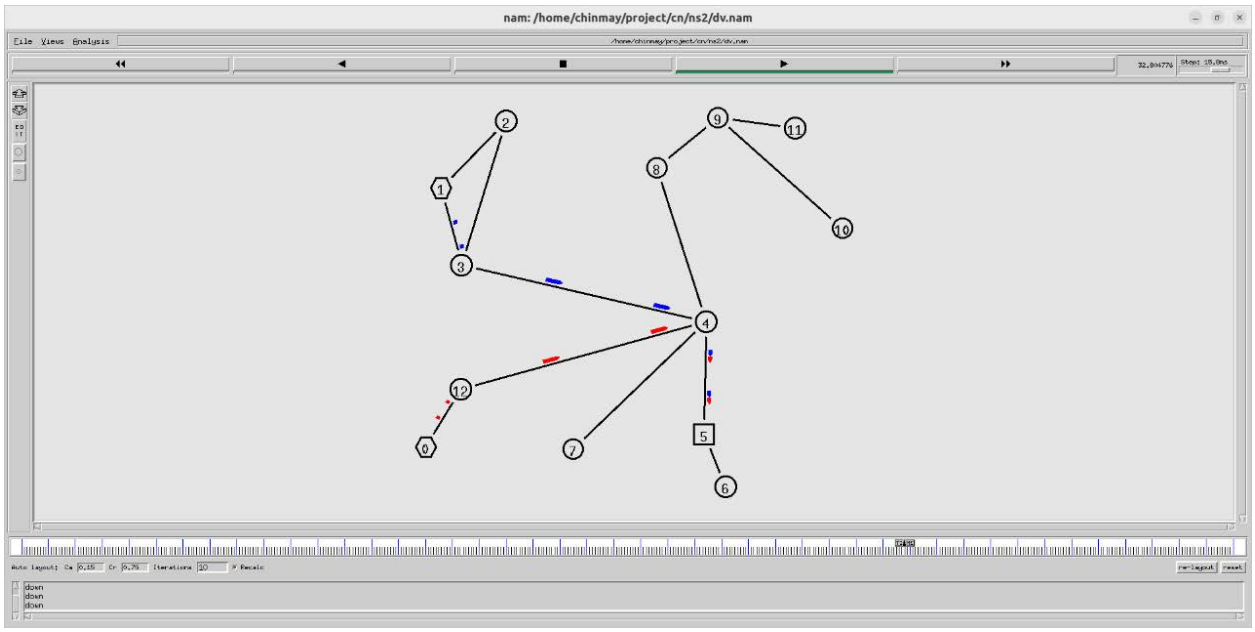
2) After 10 sec, the link between node 1 and node 3 gets broken; after 15 sec, the link between node 4 and node 12 gets down. The path of packets travelling is changed in this image: Due to the downing of the link between nodes 1 and 3 packet drop takes place



After 15 sec



3) After 20 sec the link between node 4 and node 12 goes up and after 30 sec the link between node 1 and node 3 goes up and the path gets restored

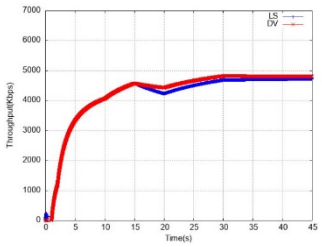


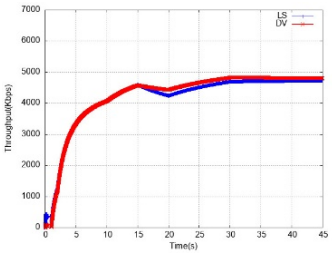
Comparative Analysis

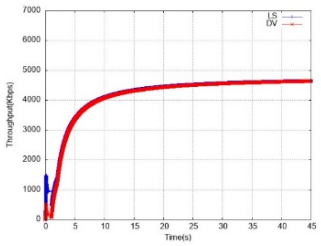
No. of Nodes

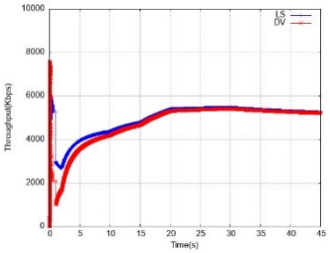
7 12 20 50

Throughput vs Time

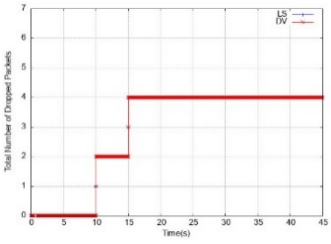


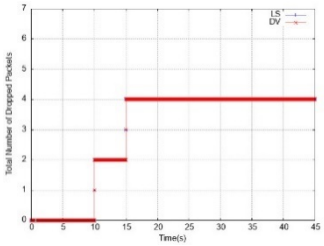


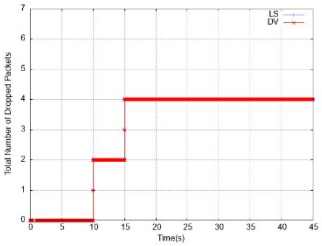


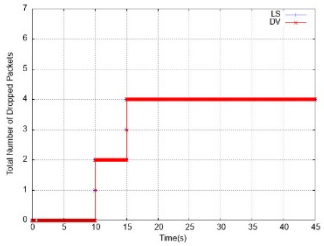


No. of Packets Dropped vs Time

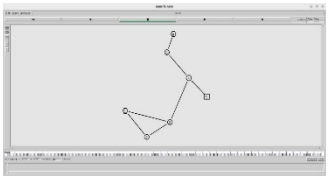


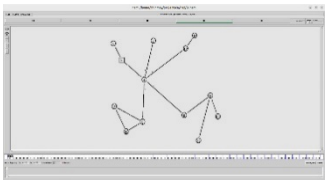


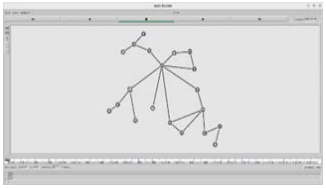


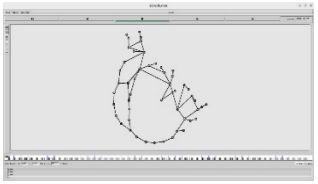


Node Structure

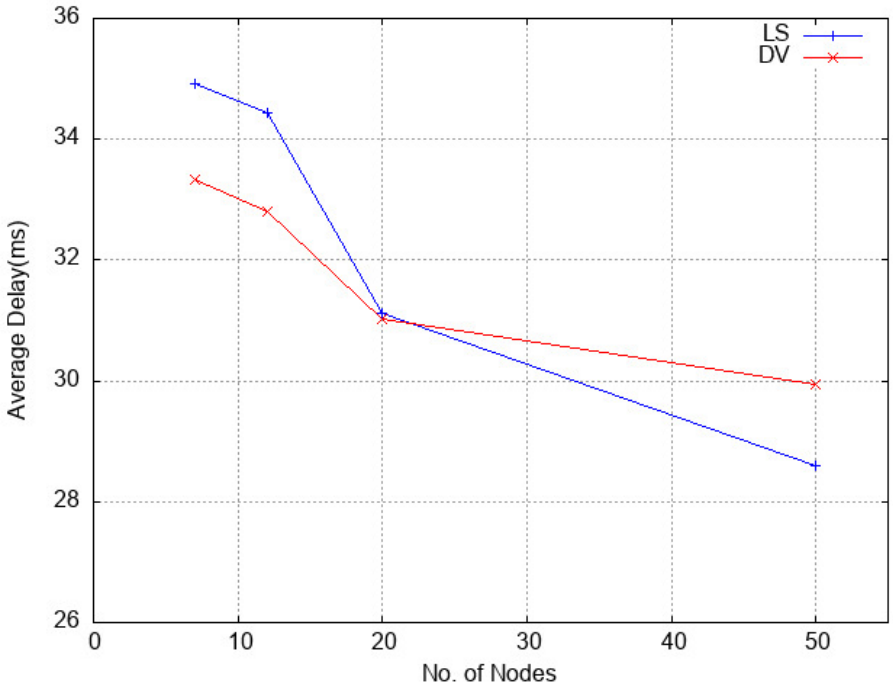




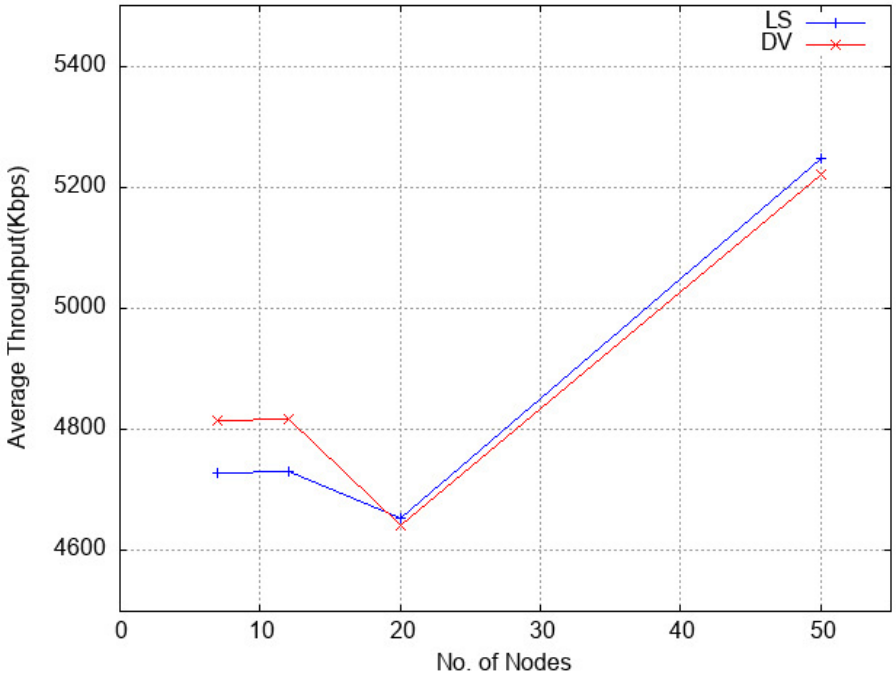




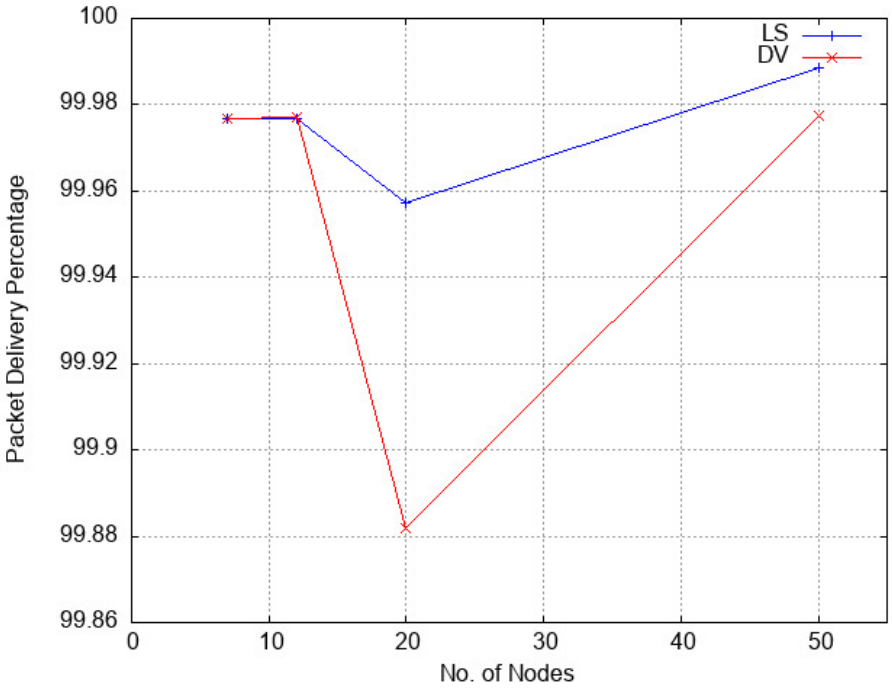
Average Delay(ms) vs No. of Nodes



Average Throughput vs No. of Nodes



Highly magnified view of Packet Delivery Percentage vs No. of Nodes



Inferences: -

1. The number of packets dropped remains constant even though the number of nodes increases
2. The Packet Delivery Percentage slightly decreases for Distance Vector (DV) routing compared to Link State (LS) routing. This can be attributed to the fact that the number of packets sent gradually decreases in DV as we increase the number of nodes.
3. As we increase the number of nodes, the average throughput of LS increases in comparison to that of DV routing
4. On increasing the number of nodes, the average delay of both LS and DV routing seems to decrease and intersect at a point beyond which the average delay of DV happens to be greater than that of LS routing. This inference goes along with our theoretical knowledge that Delay vectors get too big as network size increases for DV routing.
5. The initial throughput for LS routing increases according to the increasing number of nodes which can be explained well by the concept of flooding in Link State routing

Conclusion: -

From the above inferences we can conclude that when a system is scaled up, the number of packets sent in link state routing is greater than the corresponding value of distance vector routing. Also, the average delay for distance vector routing comparatively increases in value which is not favorable when a system must be scaled up.

Hence, we conclude that Link State routing seems to be more scalable compared to Distance Vector routing.

References: -

1. http://dmnicol.web.engr.illinois.edu/papers-cv/cnds03.pdf
2. http://cva.stanford.edu/classes/ee382c/ee482b/research/tjleong.pdf
3. https://www.isi.edu/nsnam/ns/
4. https://en.wikipedia.org/wiki/AWK
5. https://people.duke.edu/~hpgavin/gnuplot.html