PERFORMANCE ANALYSIS OF DISTANCE VECTOR AND LINKED STATE ROUTING PROTOCOL

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Abstract - *Routing and the network topology are very important to transmit data packets from source to destination. A set of operations are performed by network layer that regulates the flow of traffic for effective and efficient communication. One of the functionalities of router is to deliver packets to destination with best effort. Hence routing algorithm gives best and least-cost path. In this paper, Performance of Distance Vector Protocol over Linked State Routing Protocol is analysed using simulation environment NS 2.3.5. Receiving throughput and the number of dropped packets is estimated using NS 2.3.5*

Keywords: Routing, Linked State (LS) Routing Protocol, Distance Vector (DV) Routing Protocol, NS 2.3.5

1.INTRODUCTION

Routers evaluate the best route from a sender to a receiver. Routers are the mixture of hardware and software. The hardware is a physical interface to the network and software consists of routing protocol and operating system that handles the routing process.

Routers generally monitor the network conditions to adapt to the dynamic changes in the network conditions.

Routing algorithms decides the path to take for incoming packets. It determines destination reachable by each node and stores local

Information on each node and computes the best path by interacting with the neighbouring nodes. Routing protocols are broadly classified as static and dynamic. These are the two methods to construct the routing table of the network.

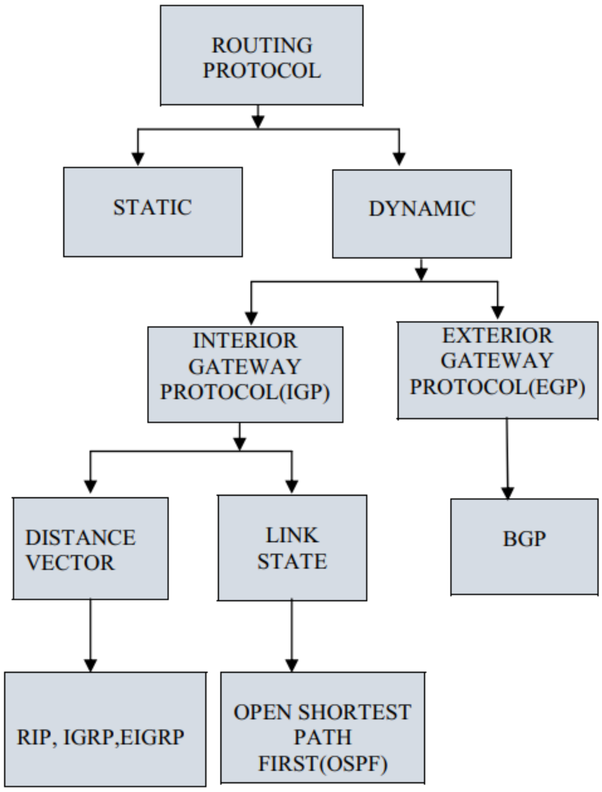


Fig-1. Categorization of Routing Protocol

Modern Routing protocols use two main distributed algorithms: Distance Vector (DV) and Linked State (LS) routing protocol

2. LITERATURE SURVEY

Routing protocol determines how routers propagate the data that empowers them to choose routes among any two nodes on a computer network. It helps to indicate best route possible whereas router's internal knowledge of networks connect the nodes directly [1]

Distance Vector Routing is a grouping of two words Distance and Vector. Distance deals with the location of the end node in the network while Vector refers to route. Target/end path is selected on basis of the best path first. It also looks after a metric performance like hop count and packet loss. Vector guides the packet to reach the end through specific flow. Here entire routing data is shared with the adjacent node.[2]

In a distance vector routing protocol, the router has the awareness of only the direction and the subsequent interface/next hop address where the packet will be forwarded but it does not have any thought of the complete path in a network. Three things are enclosed in the Distance vector which are target address, shortest distance and next hop address.

Link State Routing Protocol is a routing protocol which is based on the idea of shortest path first. In link state routing protocol, data about each link which is going to take part in routing is asked to remember. The collected data is then scattered into three dissimilar routing tables. The first table contains data about adjacent nodes only, the second node contains data about all nodes present in topology and the third node holds real data i.e. data about routing path from starting to end. Load balancing can be simply achieved in such type of routing [2]

The shortest path selected among the starting network and the end network is preferred as the best path which is calculated by the shortest path routing protocol, also identified as link state routing protocol. Every router in the domain keeps the link state data that holds the list of the routers in the network. Each and every router in the network has the similar database. Routing data is exchanged between the routers in the network which is prepared by the Link State Advertisement (LSA). Every time when the LSA is received, the router gets the routing data from its neighbour router. The routing uses the flooding method to send the LSA [3]. DV-based routing algorithms are not considered for source routing; hence it is inappropriate for opportunistic data forwarding. The reason is that every node in these protocols only knows the next hop to get to a given target node but not the entire path whereas LS-based routing protocols could bear source routing but their overhead is still reasonably high [4].

3. PSEUDOCODE

3.1 The Link-State (LS) Routing Algorithm:

Each node builds' a map of the connectivity to the network, which is in the form of a graph, screening which nodes are linked to which former nodes. All nodes then separately compute the next finest logical path from it to all possible destinations in the network.

Instead of transferring its routing table, a router sends the data about its adjacent node only. A router screens its identities and cost of the straight attached links to other routers. Linked state protocol has two phases: Initial state and Final state.

In Initial State each node knows the cost of its neighbour and in final state each node knows the entire graph from one source to considering all other nodes as destination.

Initialization:
N'={u} : u is the root node
for all the nodes v
if v is a neighbour of u
then D(v)=c(u,v)
else
d(v)=∞

Loop:
Find w not in N' such that D(w) is a minimum
Add w to N'
Update D(v) for each neighbour v of w and not in N
D(v)= min(D(v),D(w)+c(w,v))
Until N'=N

Here D (v) is the of the least-cost path from the starting node u to target v. As the algorithm executes N' is the will act as subset of nodes N; v will enter N' if the least-cost path from the starting node u to v is known as immediate neighbour of u.(i , j) is the Link cost from node i to node j. If i and j nodes are not directly linked, then c(i , j) = ∞. Number of times the loop is executed is equal to the number of nodes in the network.

3.2 The Distance-Vector (DV) Routing Algorithm

The Distance vector algorithm is iterative, asynchronous and distributed algorithm. Each node maintains its own routing table which contains information from all the nearest neighbour nodes. When the neighbouring nodes detect any changes in the least cost path, they broadcast the changes to all the nodes .the moment the broad cast data is received the routing table will be updated. This follows every time if any changes with path is detected in the network.

At each node x
Initialization:
For all destinations y in N:
Dx(y)=c(x,y)
For each neighbour w
Dw(y)=unknown
For each neighbour w
Send distance vector Dx={dx(y): y in N} to w

Loop:
Wait until a change in link cost
For each y in N:
Dx(y)=minv{c(x,v)+dv(y)}
If dx(y) changed for any destination y
Send distance vector
Dx={dx(y): y in N}to all neighbours forever

Here D (v) is the of the least-cost path from the starting node u to target v. As the algorithm executes N' is the will act as subset of nodes N; v will enter N' if the least-cost path from the starting node u to v is known as immediate neighbour of u.(i , j) is the Link cost from node i to node j.

If i and j nodes are not directly linked, then c(i , j) = ∞. Number of times the loop is executed is equal to the number of nodes in the network

4. SIMULATED RESULTS

A) Linked state routing protocol Results

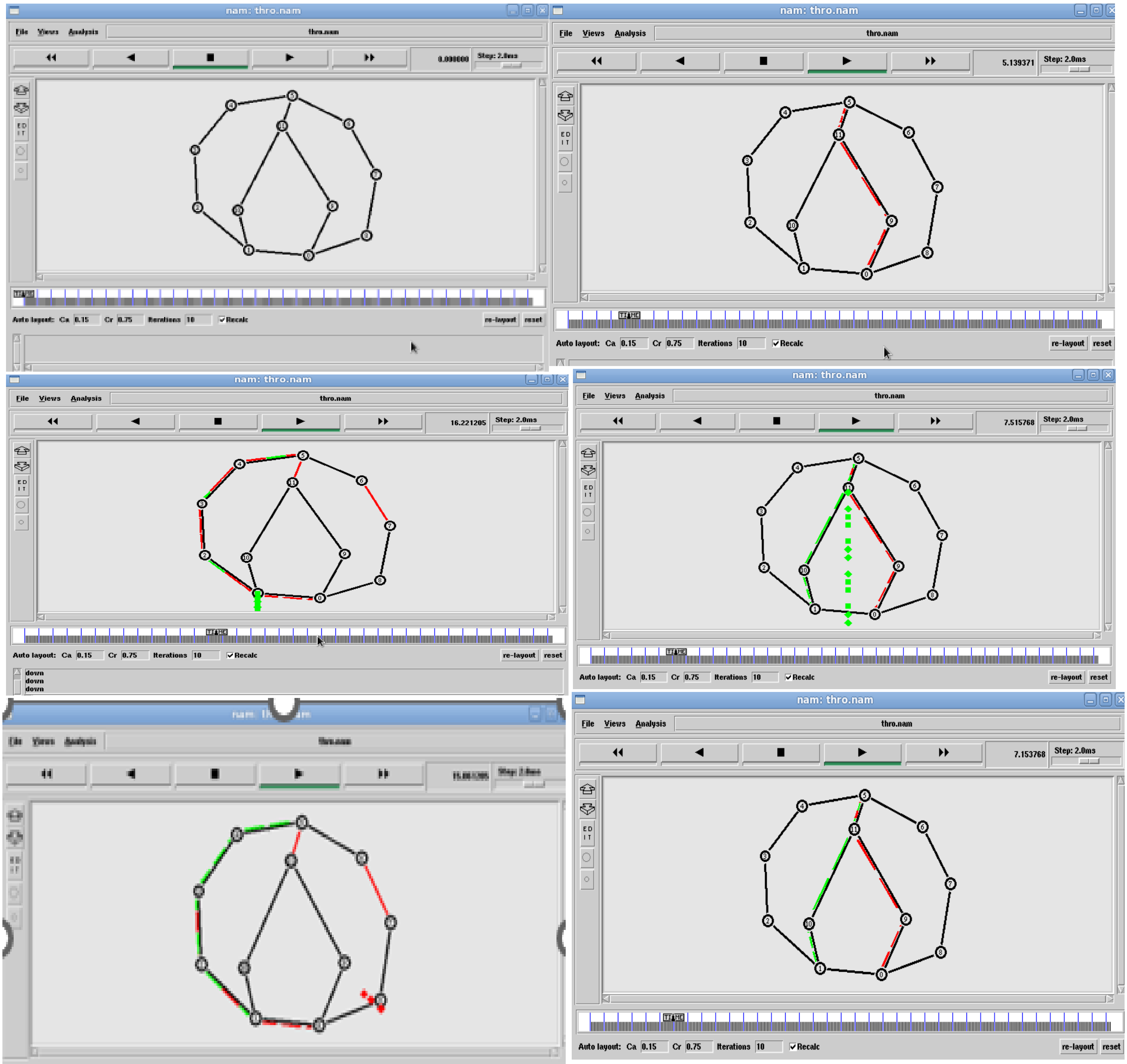
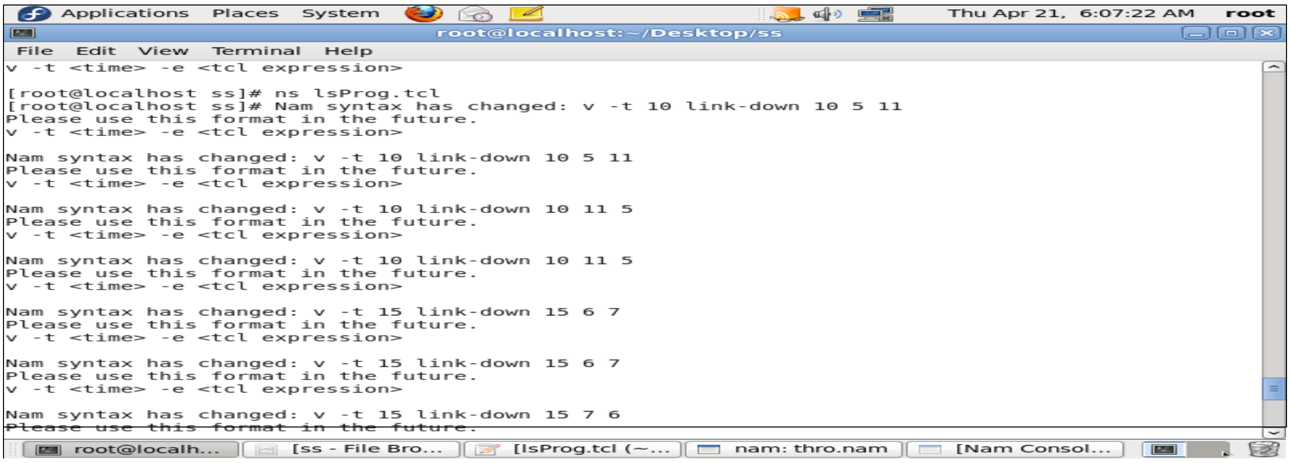


Fig-2 Linked state Protocol simulation results



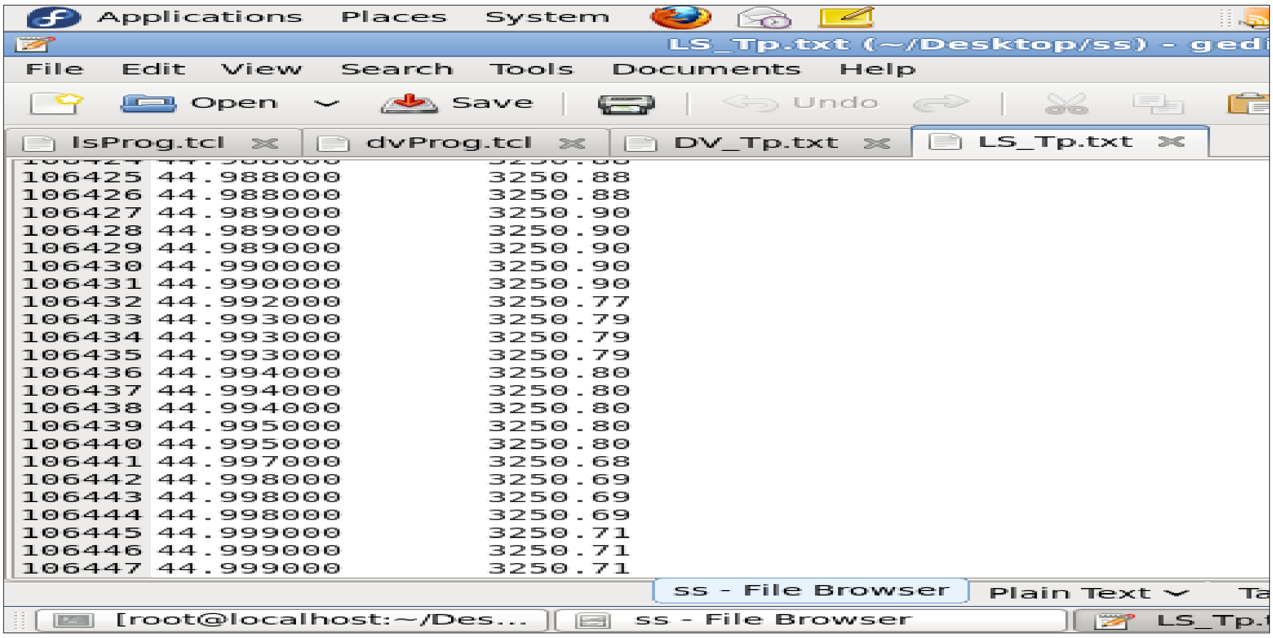


Fig. 4 Linked State Throughput results

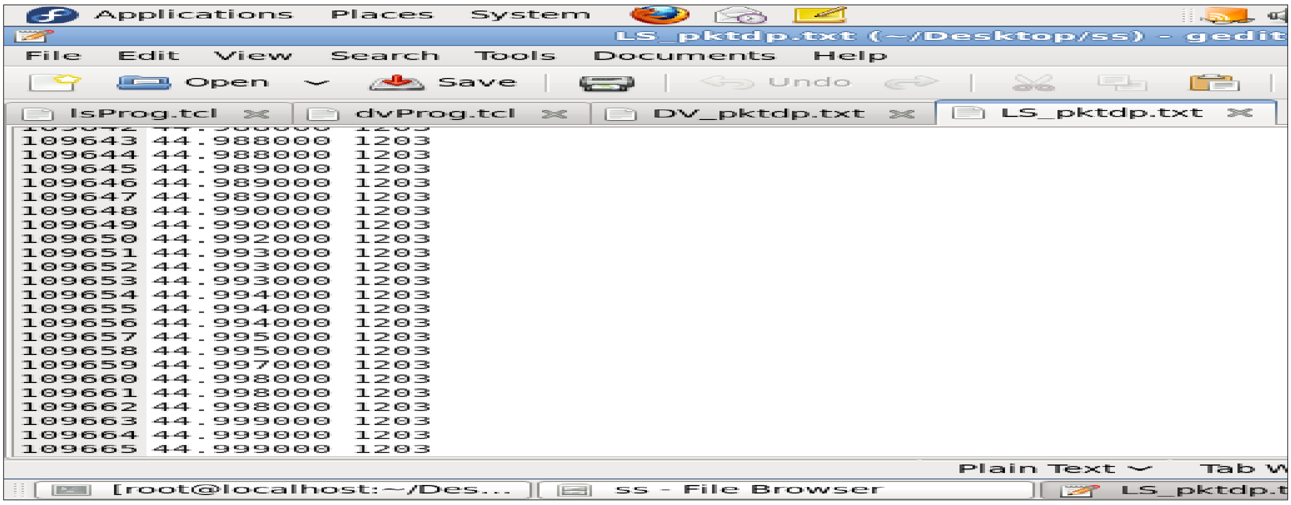


Fig.5 Linked State Packet dropped Data

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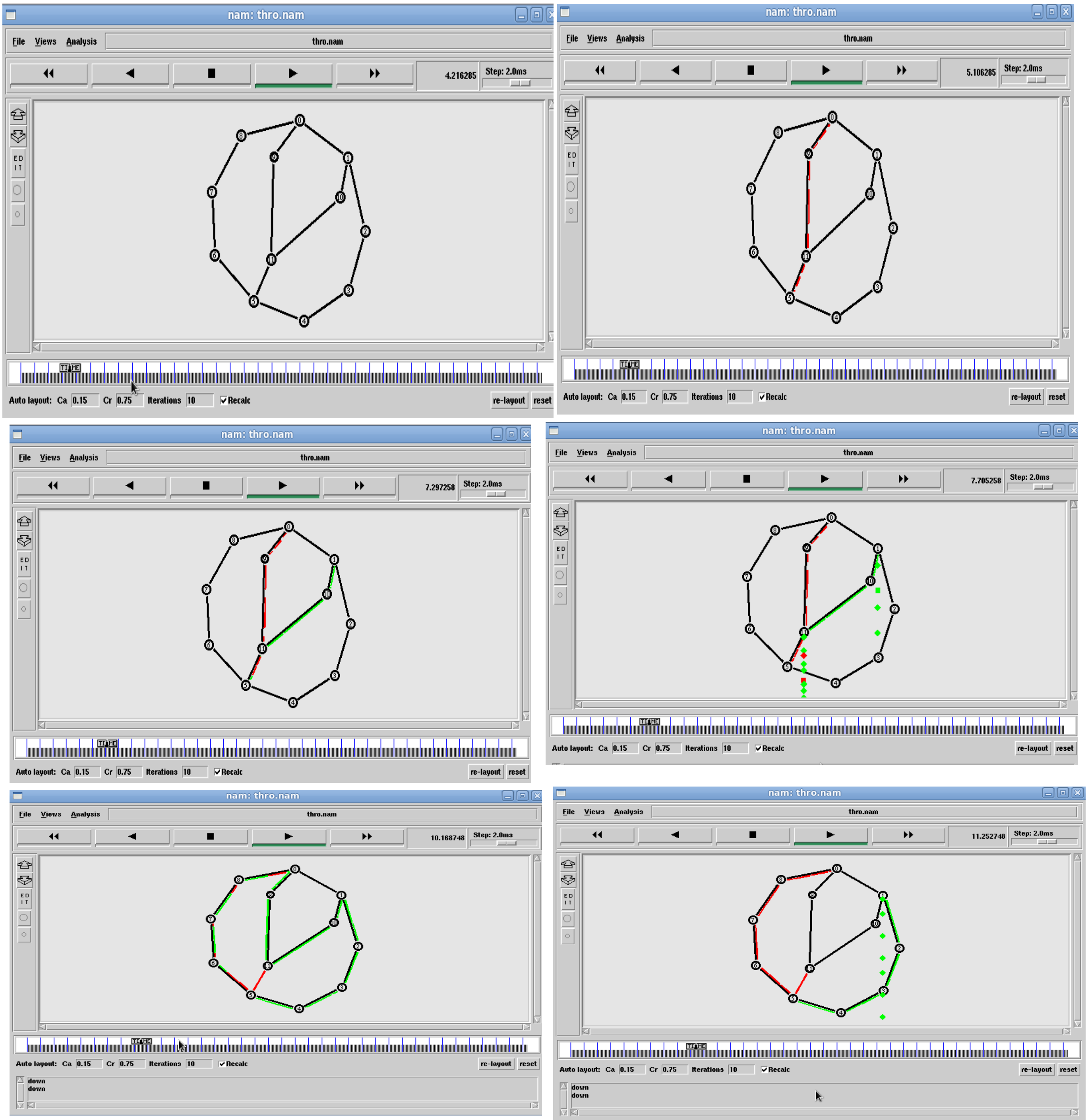
B) Distance Vector Routing Protocl Simulation Results



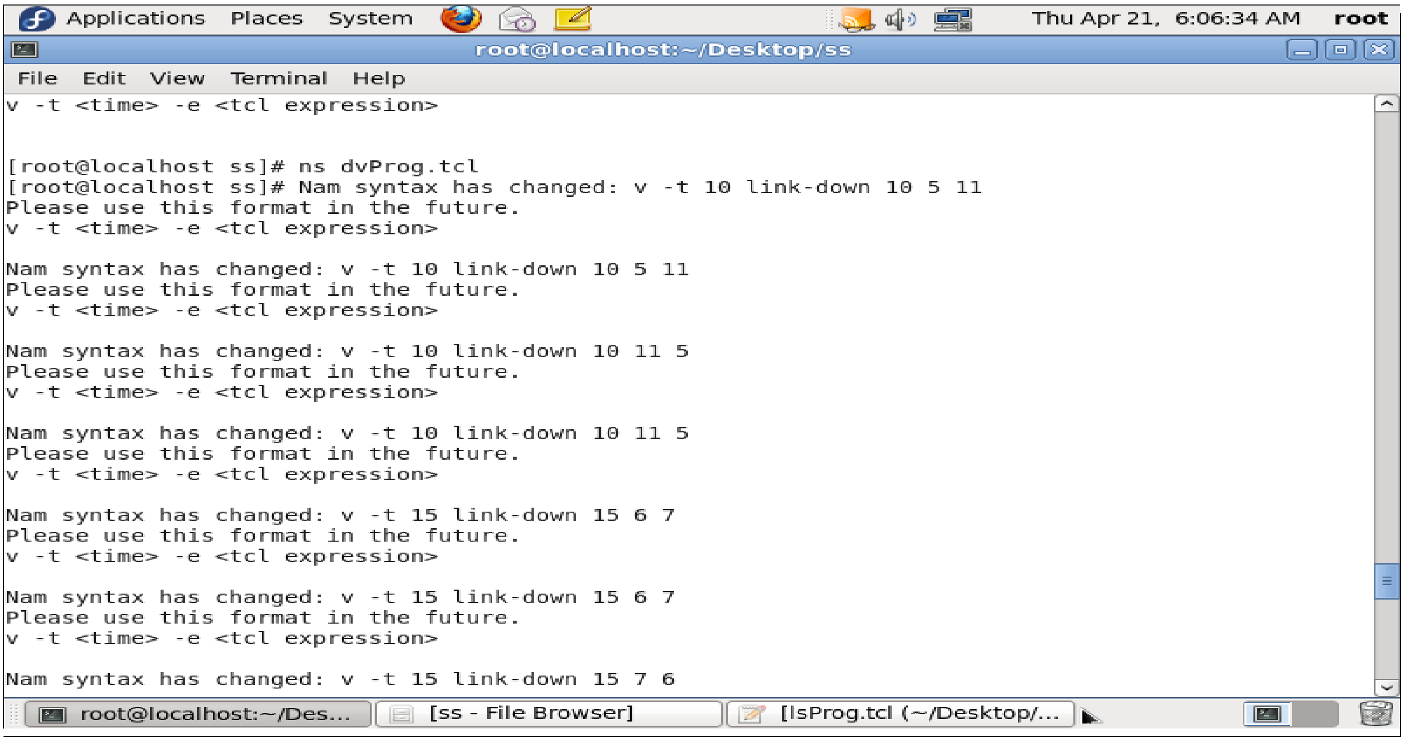
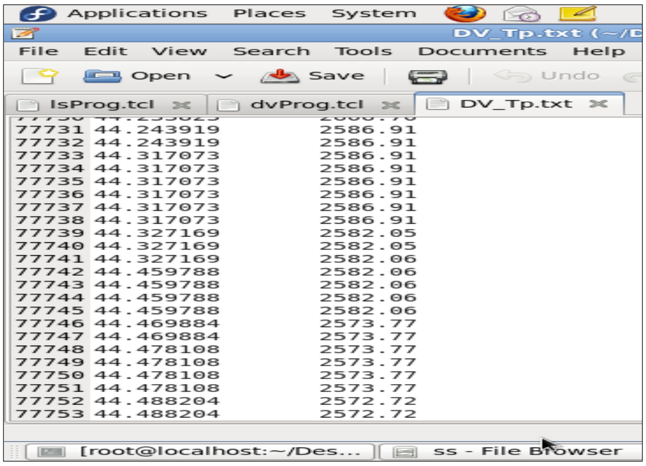


Fig 6: Distance vector Simulation Graph



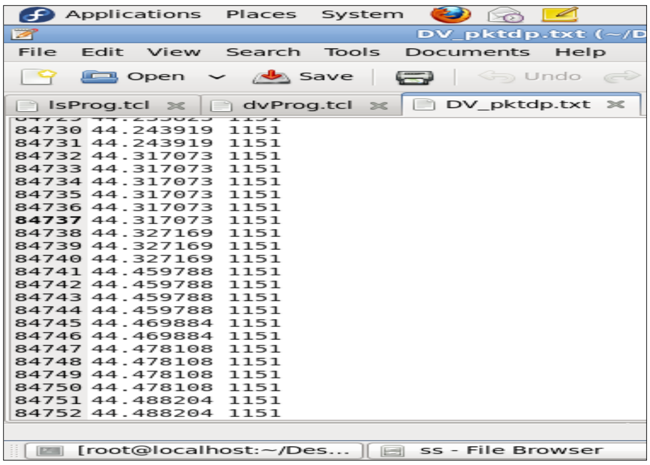
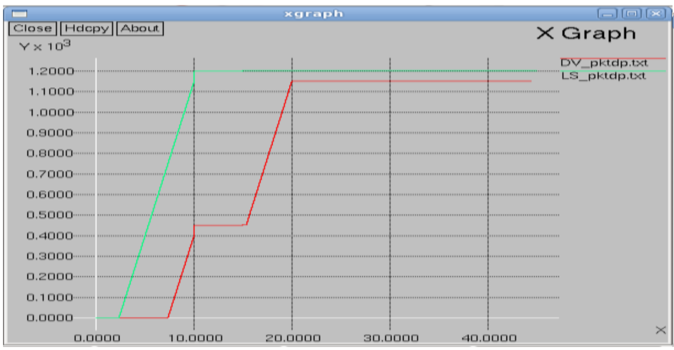
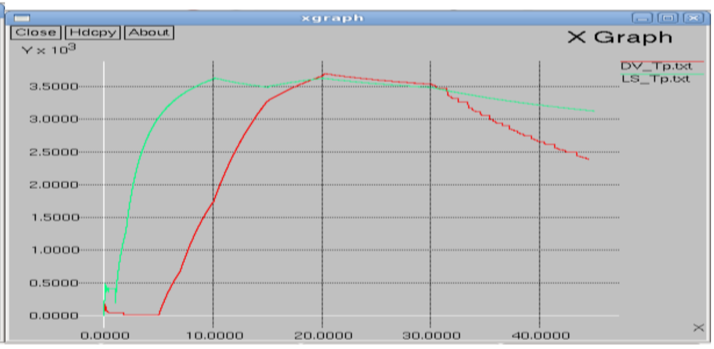


Fig 7 : Through Put Results of Distance Vector **Fig 8 : Packet Dropped Results of Distance Vector**

C : XGraph





```
[root@localhost ss]# awk -f pktd.awk thro.tr>DV_pktdp.txt
[root@localhost ss]# awk -f pktd.awk throls.tr>LS_pktdp.t
[root@localhost ss]# xgraph DV_pktdp.txt LS_pktdp.txt
```

Fig 9: Xgraph depicting Packet Dropped in LS vs DV

The Fig 9 Xgraph clearly shows that Distance vector throughput gradually drops as traffic increases where as link state shows constant maintenance in throughput. The Fig 10 XGraph clearly shows that packets dropped at Distance vector are less compare to link state algorithm

5. CONCLUSION

DV and LS algorithms are complementary to each other. We conclude that as network density increases throughput of Linked State (LS) Routing Protocol seems to be better than Distance Vector (DV) Routing Protocol. Packet drop of DV Routing Protocol is less than LS Routing Protocol because number of broadcast messages in case of DV is less than LS. So we can say DV proves to be a better protocol in cases of less packet drop.

```
[root@localhost ss]# awk -f thp.awk thro.tr>DV_Tp.txt
[root@localhost ss]# awk -f thp.awk throls.tr>LS_Tp.txt
[root@localhost ss]# xgraph DV_Tp.txt LS_Tp.txt
```

Fig 10: Xgraph depicting throughput in LS vs DV

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