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Comparative Analysis of DSDV & DSR Routing Protocol for Mobile Ad-hoc Network

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ABSTRACT

A Wireless ad hoc network is a collected works of independent mobile nodes that converse with each other over wireless links without any fixed infrastructure. The routing algorithms considered are classified into two categories proactive and reactive. Researches in this area have been done in the last ten years. In this paper, we present an overview of major directions in previous researches on DSDV & DSR routing protocol. We first review the various aspects of network architecture and discuss the main differences between DSDV & DSR routing protocol and comparison between these two routing protocol in ad-hoc network.

Keywords: Wired network, Wireless network, Comparison, Mobile Ad hoc Network, Routing, Reactive, Proactive, DSR, DSDV

1. INTRODUCTION

MANET: A mobile ad-hoc network (MANET) is a self-configuring transportation network of independent mobile devices associated by wireless links. MANETs are somewhat wireless ad hoc networking which has a routable network environment on the top of a Link Layer ad hoc network [1].

Fig 1 MANET Environment [2]

Classification of Routing Protocols in MANET's:

There are many ways to Classify routing protocols in MANET's, but most of these are done depending on routing strategy and network structure. The routing protocols can be categorized as Table-driven and source initiated depending on routing strategy , while according the network structure these are classified as flat routing hierarchical routing and geographic position assist routing. Both the Table-driven and source initiated protocols come under the Flat routing [3].

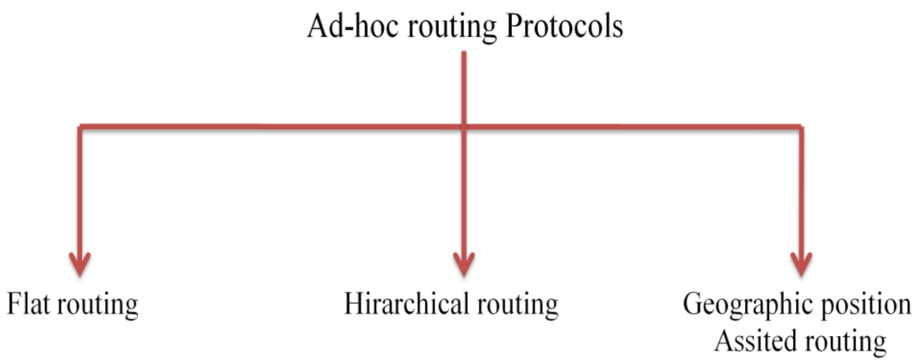

Fig 2 Ad-hoc routing Protocols [3]

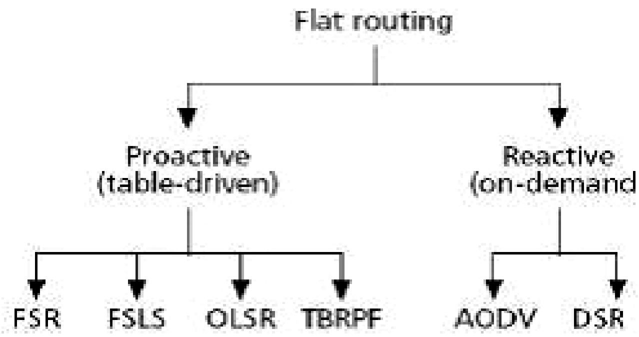

Fig 3 Flat Routing [3]

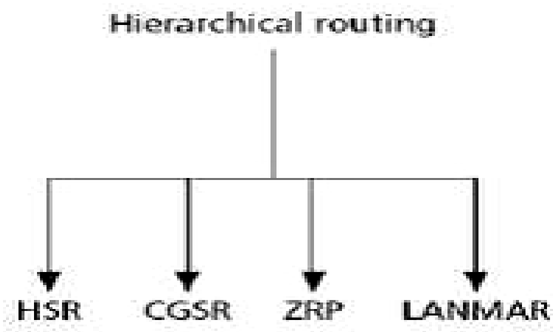

Fig 4 Hierarchical Routing [3]

Destination-Sequenced Distance-Vector Routing (DSDV):

Based on the Bellman-Ford algorithm for MANETs, the DSDV is a table-driven routing scheme. To solve the routing loop problem was the main contribution of the algorithm and was developed by C. Perkins and P. Bhagwat in 1994. Each entry in the routing table contains a sequence number, the sequence numbers are generally **even** if a link is present; else, an **odd** number is used.

The emitter needs to send out the next update with a number and this number is generated by the destination. By sending *full dumps* infrequently and smaller incremental updates more frequently the routing information is distributed between nodes [8].

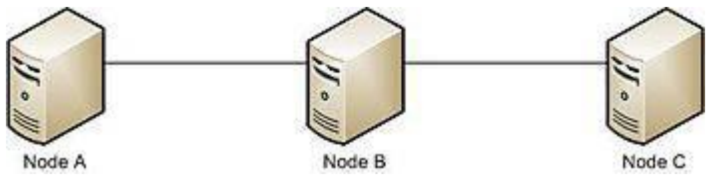

Fig 5 Three nodes connected in network [8]

Table1: Routing table of Node A in this network [8]

Destination	Next Hop	Number of Hops	Sequence Number	Install Time
A	A	0	A 46	001000
B	B	1	B 36	001200
C	B	2	C 28	001500

Naturally the table contains description of all possible paths reachable by node A, along with the next hop, number of hops and sequence number [8]. Every mobile station maintains a routing table that lists all available destinations, the number of hops to reach the destination and the sequence number assigned by the destination node.

The sequence number is used to distinguish stale routes from new ones and thus avoid the formation of loops. The stations periodically transmit their routing tables to their immediate neighbors. A station also transmits its routing table if a significant change has occurred in its table from the last update sent. So, the update is both time-driven and event-driven. The routing table updates can be sent in two ways: a "full dump" or an incremental update. A full dump sends the full routing table to the neighbors and could span many packets whereas in an incremental update only those entries from the routing table are sent that has metric change since the last update and it must fit in a packet.

If there is space in the incremental update packet then those entries may be included whose sequence number has changed. When the network is Relatively stable, incremental updates are sent to avoid extra traffic and full dump are relatively infrequent. In a fast-changing network, incremental packets can grow big so full dumps will be more frequent. Each route update packet, in addition to the routing table information, also contains a unique sequence number assigned by the transmitter.
The route labeled with the highest (i.e. Most recent) sequence number is used. If two routes have the same sequence number then the route with the best metric (i.e. shortest route) is used. Based on the past history, the stations estimate the settling time of routes. The stations delay the transmission of a routing update by settling time so as to eliminate those updates that would occur if a better route were found very soon[1].Example for DSDV operation:

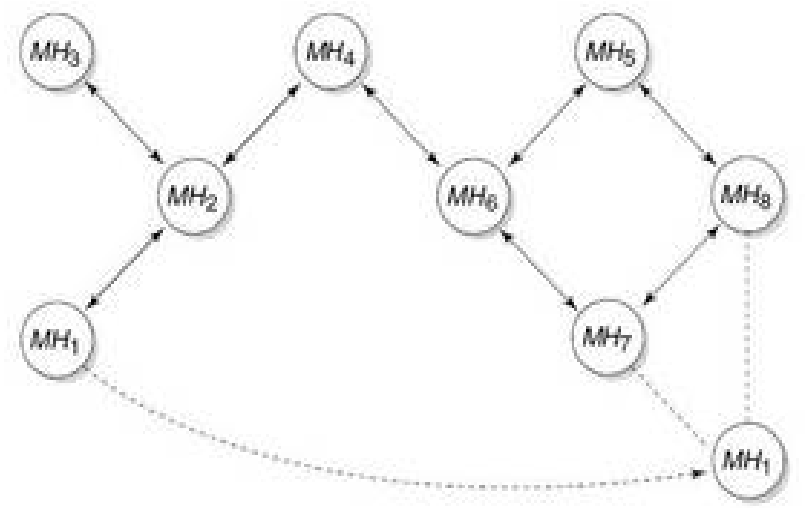

Fig 6 Movement of Mobile host in Ad-hoc Networks [3]

Consider the above fig.2 which has 8 hosts in the network. We will have a look at the changes to the MH4 routing table with reference to the movements of MH1. Initially, all the nodes advertise their routing information to all the nodes in the network and hence the routing table at MH4 initially looks like and the forwarding table at the MH4 would look like this

Table 2: Routing table of MH4 [3]

Destination	Next Hop	Metric	Sequence Number	Install	Stable Data
MH1	MH2	2	S406_MH1	T001_MH4	Ptr1_MH1
MH2	MH2	1	S128_MH2	T001_MH4	Ptr1_MH2
MH3	MH2	2	S564_MH3	T001_MH4	Ptr1_MH3
MH4	MH4	0	S710_MH4	T001_MH4	Ptr1_MH4
MH5	MH6	2	S392 MH5	T002_MH4	Ptr1_MH5
MH6	MH6	1	S076 MH6	T001_MH4	Ptr1_ MH6
MH7	MH6	2	S128_MH7	T002_ MH4	Ptr1_ MH7
MH8	MH6	3	S050_MH8	T002_ MH4	Ptr1_ MH8

But, when the host MH1 moves its location as shown in the fig. 6.1 nearer to MH7 and MH8 then, the link between MH2 and MH1 will be broken resulting in the assignment of infinity metric at MH2 for MH1 and the sequence number will be changed to odd number in the routing table at MH2. MH2 will update this information to its neighbor hosts. Since, there is a new neighbor host for MH7 and MH8; they update their information in the routing tables and they broadcast. Now, MH4 will receive its updated information from MH6 where MH6 will receive two information packets from different neighbors to reach MH1 with same sequence number, but different metric. The selection of the route will depend on less hop count when the sequence number is the same. Now the routing table will look like

Table 3: Forwarding table at MH4 [3]

Destination	Next Hop	Metric	Sequence Number
MH1	MH2	2	S406_MH1
MH2	MH2	1	S128_MH2
MH3	MH2	2	S564_MH3
MH4	MH4	0	S710_MH4
MH5	MH6	2	S392 MH5
MH6	MH6	1	S076 MH6
MH7	MH6	2	S128_MH7
MH8	MH6	3	S050_MH8

Table 4: Routing table after MH1 movement [3]

Destination	Next Hop	Metric	Sequence Number	Install	Stable Data
MH1	MH6	3	S516_MH1	T001_MH4	Ptr1_MH1
MH2	MH2	1	S238_MH2	T001_MH4	Ptr1_MH2
MH3	MH2	2	S674_MH3	T001_MH4	Ptr1_MH3
MH4	MH4	0	S820_MH4	T001_MH4	Ptr1_MH4
MH5	MH6	2	S502_MH5	T002_MH4	Ptr1_MH5
MH6	MH6	1	S186_MH6	T001_MH4	Ptr1_ MH6
MH7	MH6	2	S138_MH7	T002_ MH4	Ptr1_ MH7
MH8	MH6	3	S160_MH8	T002_ MH4	Ptr1_ MH8

Table 5 Forwarding table at MH4 after Movement of MH1 [3]

Destination	Next Hop	Metric	Sequence Number
MH1	MH6	3	S516_MH1
MH2	MH2	1	S238_MH2
MH3	MH2	2	S674_MH3
MH4	MH4	0	S820_MH4
MH5	MH6	2	S502_MH5
MH6	MH6	1	S186_MH6
MH7	MH6	2	S138_MH7
MH8	MH6	3	S160_MH8

Dynamic Source Routing (DSR):

The Dynamic Source Routing Protocol is a source-routed on-demand routing protocol. The DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure or administration [2].The node updates entries in the route cache as and when it learns about new routes [1].The DSR protocol is composed of two mechanisms that work together to allow the discovery and maintenance of source routes in the ad hoc network: Route Discovery : is the mechanism by which a node S wishing to send a packet to a destination node D obtains a source route to D. Route Discovery is used only when S attempts to send a packet to D and does not already know a route to D.

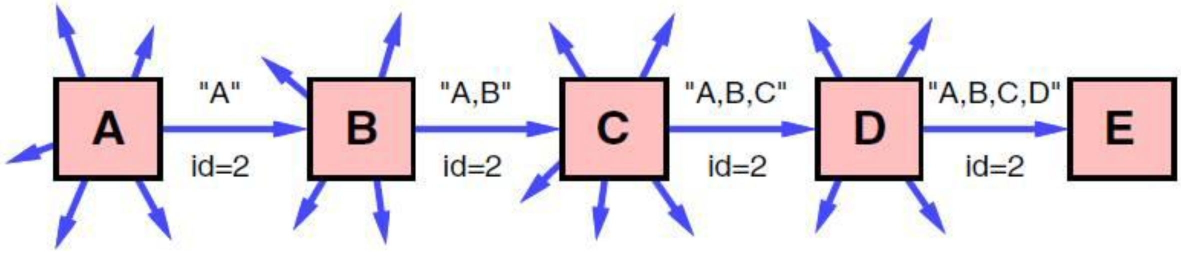

Fig 7 Route Discovery example: Node A is the initiator, and node E is the target [2]

Route Maintenance: is the mechanism by which node S is able to detect, while using a source route to D, if the network topology has changed such that it can no longer use its route to D because a link along the route no longer works. When Route Maintenance indicates a source route is broken, S can attempt to use any other route it happens to know to D, or can invoke Route Discovery again to find a new route. Route Maintenance is used only when S is actually sending packets to D [2].

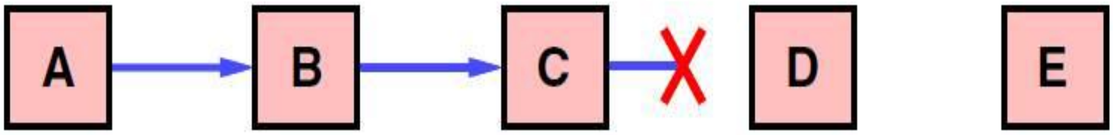

Fig 8 Route Maintenance example: Node C is unable to forward a packet from A to E over its link to next hop D [2]

In order to reduce the overhead from such Route Discoveries, we use exponential back-off to limit the rate at which new Route Discoveries may be initiated by any node for the same target. If the node attempts to send additional data packets to this same node more frequently than this limit, the subsequent packets should be buffered in the Send Buffer until a ROUTE REPLY is received, but the node must not initiate a new Route Discovery until the minimum allowable interval between new Route Discoveries for this target has been reached. This limitation on the maximum rate of Route Discoveries for the same target is similar to the mechanism required by Internet nodes to limit the rate at which ARP REQUESTs are sent for any single target IP address[2].

When the source node wants to send a packet to a destination, it looks up its route cache to determine if it already contains a route to the destination. If it finds that an unexpired route to the destination exists, then it uses this route to send the packet. But if the node does not have such a route, then it initiates the route discovery process by broadcasting a route request packet. The route request packet contains the address of the source and the destination, and a unique identification number. Each intermediate node checks whether it knows of a route to the destination. If it does not, it appends its address to the route record of the packet and forwards the packet to its neighbors. To limit the number of route requests propagated, a node processes the route request packet only if it has not already seen the packet and it's address is not present in the route record of the packet[1].

A route reply is generated when either the destination or an intermediate node with current information about the destination receives the route request packet [1]. Dynamic Source Routing is a routing protocol for wireless mesh networks. It is similar to AODV in that it forms a route on-demand when a transmitting computer requests one. However, it uses source routing instead of relying on the routing table at each intermediate device. Dynamic source routing protocol (DSR) is an on-demand protocol designed to restrict the bandwidth consumed by control packets in ad hoc wireless networks by eliminating the periodic table-update messages required in the table-driven approach.

The major difference between this and the other on-demand routing protocols is that it is beacon-less and hence does not require periodic hello packet (beacon) transmissions, which are used by a node to inform its neighbors of its presence. The basic approach of this protocol (and all other on-demand routing protocols) during the route construction phase is to establish a route by flooding Route Request packets in the network. The destination node, on receiving a Route Request packet, responds by sending a Route Reply packet back to the source, which carries the route traversed by the Route Request packet received [9].

Table 6: Comparison Table of DSDV & DSR [8][1][4]

DSDV	DSR
On-demand routing protocol/ reactive	Table driven routing protocol/proactive.
This eliminates the need to periodically flood the network with table update messages	There is need to periodically flood the network with table update messages
Route is established only when it is required	Each routing table will contain all available destinations, with the associated next hop, the associated metric (numbers of hops), and a sequence number originated by the destination node.
The intermediate nodes also utilize the route cache information efficiently to reduce the control overhead	The intermediate nodes does not utilize the route cache information efficiently to reduce the control overhead
The connection setup delay is higher	The connection setup delay is slower.
The protocol performs well in static and low-	The protocol Performance is low in static and low-

mobility environments	mobility environments
The performance degrades not much rapidly with increasing mobility	The performance degrades rapidly with increasing mobility
Routing overhead is involved due to the source routing mechanism employed	Routing overhead is not involved due to the source-routing mechanism employed
Routing overhead is directly proportional to the path length	Routing overhead is not directly proportional to the path length
It is not suitable for highly dynamic networks.	It is not suitable for highly dynamic networks.
DSDV guarantees for loop free path.	DSR does not guarantee for loop free path.
Concept of full dump & incremental dump is present	Concept of full dump & incremental dump is not present
DSDV doesn't support Multi path Routing.	DSR doesn't support Multi path Routing.

CONCLUSION

A study is given about two different MANET Protocols and their comparison. In this paper, we have presented comparison studies about On-Demand (DSR) and Table-Driven (DSDV) routing protocols. Our comparison indicates that the performance of the demand protocol namely DSR is superior to the DSDV. The routing overhead is consistently low for DSR than in comparison with DSDV especially for large number of nodes. This is due to the fact that in DSDV the routing table exchanges would increase with larger number of nodes. Our comparison also indicate that as the number of nodes in the network increases DSDV would be better with regard to the packet delivery ratio, but it may have considerable routing overhead. As far as packet delay and dropped packets ratio are concerned, DSR performs better than DSDV with large number of nodes For less number of nodes and less mobility, DSDV's performance is superior. 3. FUTURE SCOPE The work presented in this paper is survey work of DSDV and DSR routing protocol in Ad-hoc network including their comparisons.. Nothing in the world which can be said complete. There are many applications of both routing protocols. In future, a lot of work can be done to produce new technologies to improve the performance regarding interference, efficiency, security and various other issues related to both routing protocol.

REFERENCES

[1]. Mona N. Alslaim ; Haifaa A. Alaqel ; Soha S. Zaghloul, " A comparative study of MANET routing protocols" The Third International Conference on e-Technologies and Networks for Development (ICeND2014). 18 December 2014

[2]. Chamkaur Singh , Vikas Gupta, Gurmeet Kaur. "A Review Paper on Introduction to MANET" International Journal of Engineering Trends and Technology (IJETT) – Volume 11 Number 1 - May 2014

[3]. Veronica Maldonado Manuel Qui ´ nones Katty Rohoden Rommel Torres, "Comparison Routing Protocols and Mobility Models for Vehicular Ad-Hoc Networks using Real Maps"

[4]. Raghuvaran E, "A Survey Paper on Performance of Routing Protocols in Wireless Ad-Hoc Network" International Journal of Computer Science and Information Technologies, Vol. 5 (1) , 2014, 770-773

[5]. Cunera M. Buys, Pamela L. Shaw, "Data Management Practices Across an Institution: Survey and Report", Volume 3, Issue 2 (2015)

[6]. D. B. Jagannadha Rao, Karnam Sreenu, Parsi Kalpana, "A Study on Dynamic Source Routing Protocol for Wireless Ad Hoc Networks" International Journal of Advanced Research in Computer and Communication Engineering Vol. 1, Issue 8, October 2012

[7]. Teressa Longjam, and Neha Bagoria, "Comparative Study of Destination Sequenced Distance Vector and Ad-hoc On-demand Distance Vector Routing Protocol of Mobile Ad-hoc Network" International Journal of Scientific and Research Publications, Volume 3, Issue 2, February 2013 1 ISSN 2250-3153

[8]. Mohsin Ur Rahman Salfi, "A STUDY OF MOBILE AD-HOC NETWORKS -ISSUES AND CHALLENGES" International Journal of Advanced Research in Computer Science, Volume 6, No. 7, September-October 2015