International Journal of Recent Trends in Engineering & Research

ISSN : 2455-1457 Impact Factor : 3.344

ROUTE STABILITY MODEL FOR DSR IN WIRELESS ADHOC NETWORKS

Ganga S[1], Binu Chandran R[2]
[1, 2] *Mohandas College Of Engineering And Technology*

Abstract: Wireless Ad-Hoc Network is a collection of wireless mobile nodes without using any centralized access point forming a temporary network. All nodes move randomly and are capable of discovering and maintaining the routes between them. Applications of MANETs include, but are not limited to, military operations, security, emergency, and rescue operations, among other applications where intense utilization of a communication networks is available for a very limited time. In wireless ad-hoc networks, routing algorithm is necessary to find specific routes between source and destination. This paper presents a performance evaluation of proactive and reactive protocols DSDV and DSR based on the metrics throughput and packet delivery fraction. Also to improve the performance of DSR a simple stability model is used. The stability of the route is analyzed by the received signal strength.
Keywords – DSDV, DSR, Throughput, Packet Delivery Fraction, QoS, Route Stability

I. INTRODUCTION

A Wireless ad hoc network is a collection of self-organized wireless mobile nodes dynamically forming a temporary network without the aid of any established or fixed infrastructure and centralized administration control stations. Wireless Ad-hoc networks are self-organizing and self-configuring multi-hop wireless networks where, the structure of the network changes dynamically. One of the distinctive features of MANET is, each node must be able to act as a router to find out the optimal path to forward a packet. As nodes may be mobile, entering and leaving the network, the topology of the network will change continuously. MANETs provide an emerging technology for civilian and military applications. Since the medium of the communication is wireless, only limited bandwidth is available. Another important constraint is energy due to the mobility of the nodes in nature.

One of the important research areas in MANET is establishing and maintaining the adhoc network through the use of routing protocols. Though there are so many routing protocols available, this paper considers DSDV and DSR for performance comparisons due to its familiarity among all other protocols. These protocols are analyzed based on the important metrics such as throughput, packet delivery fraction and is presented with the simulation results obtained by NS-2 simulator.

II. PROBLEM STATEMENT

Performance evaluation of routing protocols DSDV and DSR based on the metrics throughput and packet delivery fraction. And to improve the performance of DSR a simple stability model is used.

III. MOBILE AD HOC NETWORK ROUTING PROTOCOLS

Proactive Protocols

These types of protocols are called table driven protocols in which, the route to all the nodes is maintained in routing table. Packets are transferred over the predefined route specified in the routing table. In this scheme, the packet forwarding is done faster but the routing overhead is greater because all the routes have to be defined before transferring the packets. Proactive protocols have lower latency because all the routes are maintained at all the times. Example protocols: DSDV, OLSR (Optimized Link State Routing)

Destination Sequenced Distance Vector (DSDV)
DSDV is a table-driven routing protocol for ad hoc mobile networks which is based on the Bellman-Ford algorithm. 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, by using update information of route, nodes can easily transmit packets to the destination within network.

Reactive Protocols
These types of protocols are also called as On Demand Routing Protocols where the routes are not predefined for routing. A Source node calls for the route discovery phase to determine a new route whenever a transmission is needed. This route discovery mechanism is based on flooding algorithm which employs on the technique that a node just broadcasts the packet to all of its neighbors and intermediate nodes just forward that packet to their neighbors. This is a repetitive technique until it reaches the destination. Reactive techniques have smaller routing overheads but higher latency.
Example Protocols: DSR, AODV

Dynamic Source Routing (DSR)
DSR is an on demand routing protocol based on source routing. DSR maintains a route cache in which it caches source routes that it has learned. When one host wants to send a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet. If no route is found, the sender may attempt to discover route by using the route discovery protocol. There are two major phases performed by DSR:
1. Route Discovery
2. Route Maintenance

1. *Route Discovery:* In route discovery process, a node broadcasts a route request packet which may be received by that node within wireless transmission range of it. Each node receiving an RREQ rebroadcasts it, unless it is the destination or it has a route to the destination in its route cache. Such a node replies to the RREQ with a route reply (RREP) packet that is routed back to the original source. RREQ and RREP packets are also source routed. The RREQ builds up the path traversed across the network. The route carried back by the RREP packet is cached at the source for future use. If any link on a source route is broken, the source node is notified using a route error (RERR) packet. The source removes any route using this link from its cache. DSR makes use of source routing and route caching. A new route discovery process must be initiated by the source if this route is still needed.
2.Route Maintenance: While waiting for the route discovery to complete, the host may continue normal processing and may send and receive packets with other hosts. However, it uses source routing instead of relying on the routing table at each intermediate device. This protocol is truly based on source routing whereby all the routing information is maintained (continually updated) at mobile nodes. Route Reply would only be generated if the message has reached the intended destination node (route record which is initially contained in Route Request would be inserted into the Route Reply.

IV. ROUTE STABILITY ROUTING IN DSR

The link stability is calculated by the received signal strength. Intermediate node receiving a packet, checks its signal strength of the packet and simply drops the packet if its strength is very poor. If the signal strength is strong the receiving node stores the value in Neighbor information Table (NIT). In DSR each node maintains a route cache and it has all active routes to the destination. The route cache in source node maintains the complete path information to the destination but in intermediate nodes it will store only the next node information in route cache. When QoS violation occurs, the destination sends the Route Update message to the sender. When a path breakage occur, the upstream node of the link breakage send the route error message to the sender and then the sender selects a alternate path from the route cache and sends the packet to the destination.

Packet Format

In this work DSR uses QoS and route stability related fields along with route request/reply packet of the DSR.This packet is QRREQ (QoS Route Request) and QRREP (QoS Route Reply). In DSR mobile nodes should satisfy the QoS requirements that a route to the destination must satisfy. The QRREQ includes minimum throughput (Bmin) and maximum delay (Dmax) requirements of the user applications. In addition, to support route stability measurements the QRREQ packet includes two values- APS (Accumulated Path Stability) and APU (Accumulated Path Uncertainty).

Operations Performed by Intermediate Node

An intermediate node i after receiving a QRREQ packet, checks the signal strength of QRREQ and simply drops the packet if its strength is very poor. Otherwise, the node i performs the delay and throughput admission control. When the QRREQ passes the delay and throughput admission control, node i makes a temporary reverse route entry in RT (Routing Table) and also remembers the sequence number of QRREQ packet. Node i compute the Link Stability (LS) or Link Uncertainty (LV) using Routing Stability Model of the link through which the QRREQ is received. Before rebroadcasting of QRREQ, node i stores the relevant information from QRREQ packet and it is stored in a table called Route Request Forwarded Table (RFT). Seq.no field in QRREQ packet is used to detect the duplicate of QRREQ packet. On Receiving a QRREP packet, node i performs the same process as done by the QRREQ packet.

Operations Performed by Destination Node

Destination node may receive multiple QRREQ packets that reach the destination by following different candidate routes. After receiving a QRREQ packet the destination node performs admission control and computes route stability as performed by an intermediate node. After receiving the first QRREQ packet which satisfies the QoS constraints, it waits for a small period of time called Route Reply Latency (RRL) to receive more QRREQ packets belonging to the same route request. We set to collect sufficient QRREQ packets for computing highest stable QoS routes. After the expiry of the waiting time, destination generates a QRREP packet for the QRREQ packet which corresponds to QoS route with highest route stability value. In DSR route selection algorithm it prefers a route corresponding to the route request that will reaches the destination node first. The reason for selecting the first route request/reply because the route is less congested than the others.

V. SIMULATION SETUP

Simulation Tool

The simulation tool used for analysis is NS-2 which is highly preferred by research communities. NS is a discrete event simulator targeted at networking research. NS provides substantial support for simulation of TCP, routing, and multicast protocols over wired and wireless (local and satellite) networks. NS2 is an object oriented simulator, written in C++, with an OTcl interpreter as a frontend. This means that most of the simulation scripts are created in Tcl (Tool Command Language). If the components have to be developed for ns2, then both Tcl and C++ have to be used.

Simulation Analysis and Performance Metrics

Parameter	Value
Simulator	NS-2
Protocols studied	DSDV and DSR
Simulation time	200 sec
Simulation area	500 x 500
Transmission range	250 m
Node movement model	Random waypoint
Traffic type	CBR (UDP)
Data payload	512 Bytes / packet

Performance Metric

Packet Delivery Ratio:- The ratio of the data packets delivered to the destinations to those generated by the CBR sources. This performance metric will give us how well the protocol is performing in terms of packet delivery at different speeds.

Throughput (messages/second):- The ratio of the number of data packets sent and the number of data packets received. Throughput of the protocol shows number of messages delivered per one second.

VI. CONCLUSION

In this paper we have evaluated the performance of DSDV and DSR routing protocols for ad hoc networks using NS-2 event simulator keeping packet size of 512 Byte**.** In our experimental evaluation we have taken up comparison of DSR and DSDV protocols with varying number of nodes. DSDV uses the proactive table-driven routing strategy whereas DSR uses the reactive on demand routing strategy with different routing mechanisms. Experimental results showed that DSR perform better for Packet Delivery Fraction as well as Throughput. DSDV apply the sequence numbers and contains one route per destination in its routing table whereas DSR uses source routing and route caches and maintains multiple routes per destination. By using the route stability model in DSR, it will improve the performance of this protocol. During QoS transmission the number of route recoveries required is reduced by the route stability model and also it reduces control overhead.

REFERENCES

i. Rajeshwar Singh, Dharmendra K Singh, Lalan Kumar. Performance Evaluation of DSR and DSDV Routing Protocols for Wireless Ad Hoc Networks. *Int. J. Advanced Networking and Applications 732 Volume: 02, Issue: 04, Pages: 732-737 (2011)*
ii. Vinothkumar.S, Asokan.R, Improving the Quality of Service Based on Route Stability in MANETs using Dynamic Source Routing Protocol, IEEE-20180, ICCCNT 2012.
iii. Azzedine Boukerche. Performance Evaluation of Routing Protocols for Ad Hoc Wireless Networks. *Kluwer Academic Publishers, Netherlands, Mobile Networks and Applications Vol.9,* No.4. pp 333-342, 2004.
iv. C. Cheng, R. Riley, Srikanta P. R. Kumar, J. J. Garcia-Luna Aceves. A Loop free Bellman-Ford reouting protocol without bouncing effect. *In ACM SIGCOMM'89,* September 1989, pp 224-237.

v. Charles E. Perkins and Pravin Bhagwat. Highly dynamic Destination-Sequenced Distance-Vector routing (DSDV) for mobile computers. In *Proceedings of the SIGCOMM ’94 Conference on Communications Architectures,* Protocols and Applications, pages 234–244, August 1994.

vi. The CMU Monarch Project’s Wireless and Mobility Extensions to ns, Website:*http://www.monarch.cs.cmu.edu/*

vii. Charles E. Perkins, Pravin Bhagwat. Highly dynamic Destination-Sequenced Distance-Vector routing (DSDV) for mobile computers. In *Proceedings of the SIGCOMM ’94 Conference on Communications Architectures, Protocols and Applications*, pages 234–244, August 1994. A revised version of the paper is available from *http://www.cs.umd.edu/projects/mcml/papers/Sigcomm94.ps Dynamic Source Routing Protocol Internet Draft http://www.ietf.org/html.charters/manetcharter.html*.

viii. D. Johnson, D. Maltz. Dynamic source routing in ad hoc wireless networks. In T. *Imielinski and H. Korth, editors, Mobile computing,* Chapter 5. Kluwer Academic, 1996.

ix. Josh Broch, David Johnson, and David Maltz. The dynamic source routing protocol for mobile ad hoc networks. *IETF Internet Draft http://www.ietf.org/internet-drafts/draft-ietf-manetdsr-01.txt*, Dec 1998.

x. D. Johnson, D. Maltz and J.Jetcheva, The Dynamic Source Routing Protocol for Mobile Ad hoc networks, *Internet Draft, draft-ietf-manet-dsr-07.txt*, 2002. The Network Simulator - ns-2, Website : *http://www.isi.edu/nsnam/ns/*