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A Review of Performance Comparison of DSR, AODV and TORA Routing Protocols

Ritika Gupta
Department of Computer Science,
Punjabi University, India

Rekha Bhatia
Department of Computer Science,
Punjabi University, India

Abstract- A mobile ad-hoc network is a group of mobile nodes which don't have any fixed infrastructure. In MANETs each node acts as both host and router. The nodes in the network are free to move , so it does not have fixed topology. The routing is the major issue in the MANETs. In this paper the various routing protocols has been described. By considering the various performance parameters like routing structure ,complexity, type of routing, hello packet utilization etc. the DSDV,DSR,AODV and TORA routing protocols are compared.

Keywords—MANET ,DSR ,AODV, TORA, RREQ.

I. INTRODUCTION

MANET is Mobile Ad-Hoc Network (MANET) which is a group of wireless mobile nodes forming a temporary network devoid of using any centralized access point, infrastructure, or centralized Administration and every participating node voluntarily transmit the packets destined to some remote node using this wireless transmission. MANETs are used in the conditions where the development of the wired network is not affordable. Due to rapid change of topology in MANETs, MANETs routing protocols are required. The routing protocol is required whenever the source needs to communicates with destination. Routing protocols are classified as Proactive (Table Driven Routing Protocol), Reactive (On Demand Routing Protocol) and Hybrid (having the advantages of both proactive and Reactive routing protocols) routing protocols. In this paper we have chosen some of the routing protocols and our aim is to compare all the Routing protocols based upon parameters.

II. CLASSIFICATION OF ROUTING PROTOCOLS

Routing Protocols can be divided into basically 3 categories:

A. Centralized versus Distributed :

In centralized algorithms, a central node handles all the route choices, where as in distributed algorithms, among the network nodes the computation of routes is shared.

B. Static versus Adaptive

In static algorithms route is fixed between source and destination node for the communication. It can only change in case of link failure. The routes used to route between source-destination pairs may change in response to congestion in adaptive routing.

C. Reactive versus Proactive

Proactive routing protocols are also known as table driven routing protocols, because these types of protocols maintain up to date routing information from one node to another node in the network. This information is stored in the form of tables .each node have its own table which carries all the information of each node present in the network.

Reactive routing protocols create the routes only when desired by the source node. These types of protocols are called as On Demand Routing Protocols as the route is created on the demand. Here two basic mechanisms are involved: route discovery and route maintenance.

There is one another type of routing protocols which is combination of both the reactive routing and proactive routing protocols and these are called as hybrid routing protocols.

In this paper it is observed on the comparison of various reactive/ on-demand protocols such as DSR, AODV and TORA as these are best for Ad-hoc networks. The next sub-section describes the basic features of the protocols.

III. RELATED WORK

A. DSR (Dynamic Source Routing)

DSR is the best example of the on demand routing (Reactive routing). It is based on the concept of the source routing. In DSR, the sender knows complete source to destination route. The list of intermediate nodes for routing is explicitly contained in the header of the packet. The network in the DSR is completely self- organizing that is no administration is there.DSR is based on two basic mechanisms: route discover and route maintenance.

In Route discovery ,the source node starts broadcasting the request packet for route to all of its adjacent nodes within the network. This route request packet consists of the destination address, source address, a route record field and a unique identification number.

During the route discovery process, the route record field is used to accumulate the sequence of hops already taken. First of all the sender initiates the route record as a list with a single element containing itself. The next adjacent node appends itself to the list and so on. Each route request packet consists of a unique identification number called *request_id*. request_id is a simple counter which is raised whenever a new route request packet is being sent by the source node. So every route request packet can be uniquely identified through its source address and request_id.

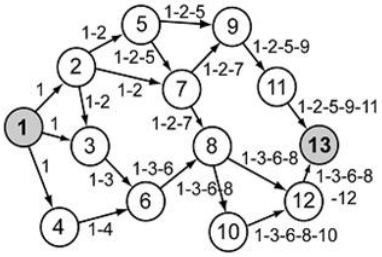

Figure 1 . Building of the record during route discovery in DSR[4]

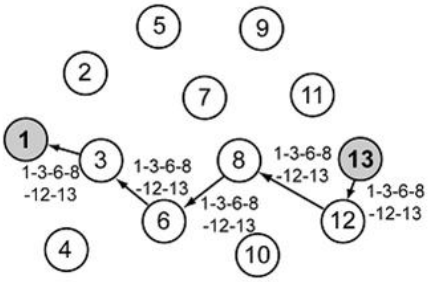

Figure 2 . Propagation of the route reply in DSR[4]

Route maintenance can be accomplished by two different processes[7]:-

i). Hop-by-hop acknowledgement at the data link layer allows an early and retransmission of lost or le corrupt packets.

ii). End-to-end acknowledgement may be used if wireless transmission between two hosts does not work equally well in both directions.

The main advantage of DSR is, it does not require periodic routing packets. it has also capability to handle unidirectional links and it does not require the route tables.

B. AODV (Ad-Hoc on Demand Distance Vector Protocol)

AODV is the combination of the properties of DSDV and DSR. It is on demand routing protocol. It does not maintain the routes until not requested by the nodes. AODV also uses two mechanisms: route discovery and route maintenance .In the route discovery process, the route request messages are used. Route request (RREQ) messages are broadcasted to all of the neighbour nodes of the source node. If the neighbour nodes have any route information of destination then RREQ message will be broadcasted further to their neighbors. This process of broadcasting to neighbors will go on until destination node is found. Destination node sends Route Reply Message to the source which has generated that route request message. The intermediate nodes keep the information about the route from source to the destination. The message floods through the network until the desired destination or a node knowing new route is reached. To remove the problem of loops sequence numbers are used.

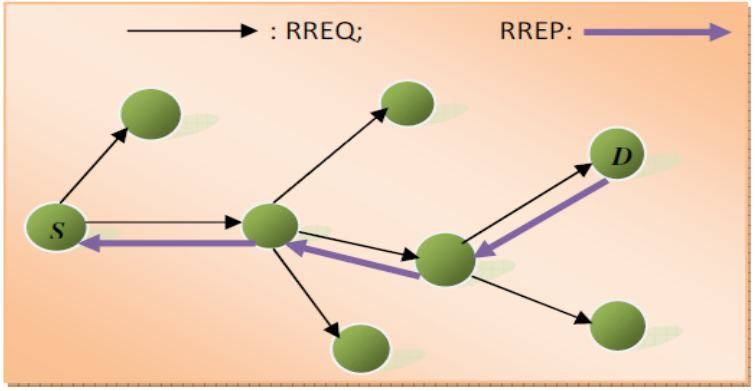

Figure 3.AODV routing protocol with RREQ and RREP message[5]

C. TORA(Temporally Ordered Routing Algorithm)

TORA is "Temporally Ordered Routing Algorithm". It is a highly efficient, scalable and adaptive. It distributed routing algorithm based on the concept of link reversal. TORA is proposed for highly dynamic, mobile, multi hop wireless networks. It is a source initiated routing protocol. It finds multiple routes from a source node to a destination node.

A destination- oriented directed acyclic graph is built for each destination. If the connectivity between the nodes loses its all outbound links, than the node will change the direction of its some or all inbound links. Initially, if the node has no direct route from source to destination it will broadcast a request (called route request) for the destination. The request will be rebroadcasted until it reaches to the destination node, which is de need to have zero height with respect to itself. The destination broadcasts an update message, indicating its height. Each node that receives the update message updates its height to be one higher than the height in the update message and broadcasts an update message, indicating its new height. The updates must be broadcast reliably and ordered by a synchronized clock or logical timestamp in order to prevent long-lived loops. This process creates a DAG from the source to the destination, which is used for hop-by-hop routing. A route failure is propagated only when a node loses its last downstream link [6].

The main advantage of TORA is it maintains the multiple routes from source to the destination node, with the intention that topological changes do not require any reaction at all.

IV. PERFORMANCE COMPARISON

In this section we have done the comparison between DSDV, DSR,AODV and TORA routing protocols on the basis of various performance parameters. The table below shows the comparison:

Table I: Comparison of DSDV, DSR, AODV, TORA

Parameters	**DSR**	**AODV**	**TORA**
Type of routing	Reactive	Reactive	Reactive
Free from loops	Yes	Yes	No
Routing Structure	Flat	Flat	Flat
Complexity	Medium	Medium	High
Links in Uni-directional	Yes	No	Yes
Hello packet utilization	No	Yes	No
Data structure for route maintenance	Route cache	Route table	Route table
Routing metric	Shortest path	Newest and shortest path	Shortest path
Disadvantages	Higher delay	Inconsistent routes	Depends on synchronized clocks among nodes

V. SIMULATION RESULTS

The simulation is done using OPNET 14.5 simulation tool. The various simulation parameters considered are listed below:

Table II: Simulation Parameteres

Parameter	**Value**
Simulation Time	4500
No. of Nodes	50
Data rate	1mbps
Environment Size	10×10 Km
Traffic Type	Constant Bit Rate
Cluster Head Speed	11 mbps
Packet Size	1024
Network Protocol	IP
Transport Protocol	TCP
Propagation Model	Random Way Point Model
MAC Protocol	802.11

VI. RESULTS

A. DELAY

Delay refers to the time taken for a packet to be transmitted across the network from source to destination. End-to-end delay has a critical importance when a packet arrives too late at the receiver as a consequence; the packet can be effectively lost.

Figure 4 shows the delay in DSR,AODV and TORA.

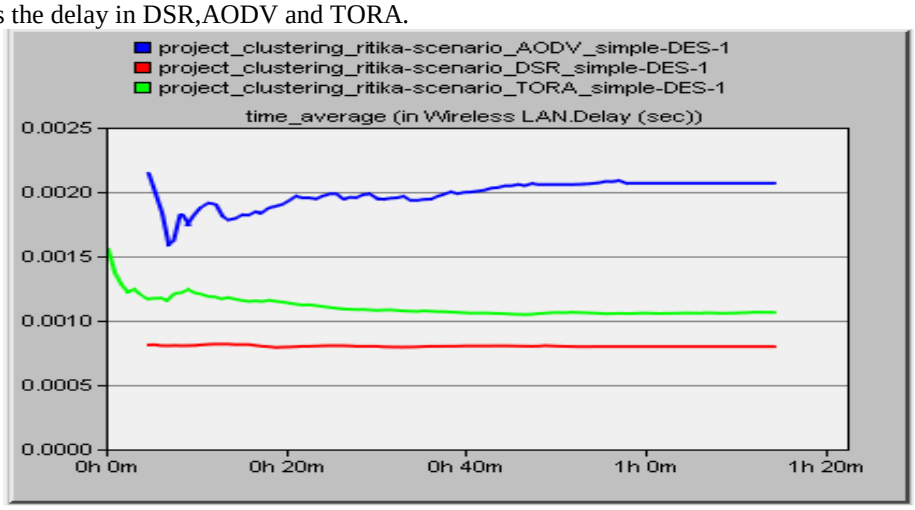

Figure 4: Delay

B. THROUGHPUT

The throughput is usually considered in bits per second. Throughput is a key parameter to determine the rate at which total data packets are successfully delivered and received through the channel in the network.

Figure 5 shows the throughput in DSR,AODV and TORA.

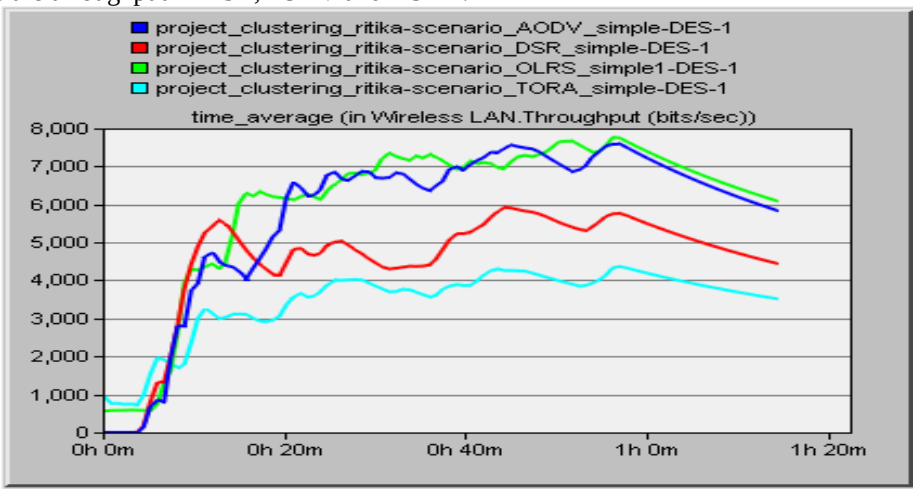

Figure 6: throughput

C. NETWORK LOAD

Network load is described as traffic across source and destination.

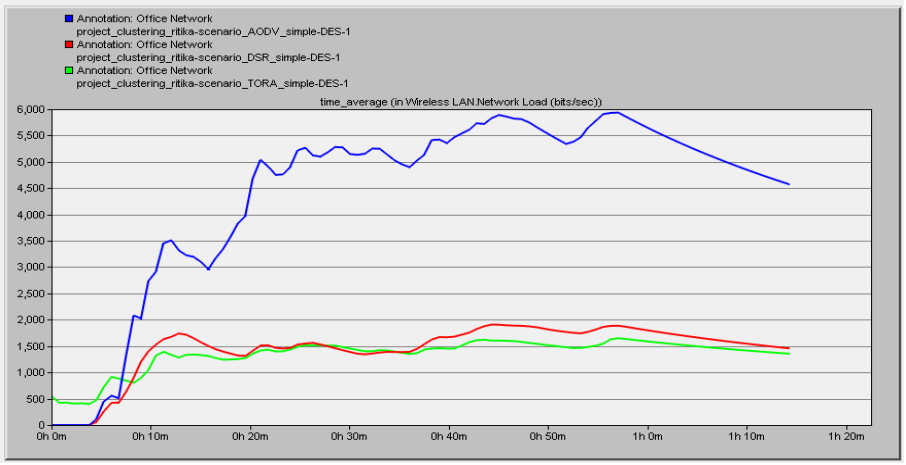

Figure 7: Network load

VII. CONCLUSIONS

In this paper we have basically described the routing protocols for MANETs. We have provided with the various categories of routing protocols i.e. Static versus Adaptive, Centralized versus Distributed and Proactive versus Reactive. The various routing protocols has been defined. By considering the various performance parameters ,the comparison between DSDV,DSR,AODV and TORA has been done.

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