

Evaluation and Comparison of DSDV, AODV and DSR Routing Protocols For Random Waypoint Mobility Model In Mobile Ad Hoc Networks

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ABSTRACT

Mobile ad hoc network is made up of mobile nodes. Without centralized control, the nodes are interconnected. The node communication is conducted using the wireless nodes which serve as routers. Routing is a very important issue in a mobile ad hoc network. In this paper, using random waypoint mobility model for node travel, we compared three routing protocols DSDV, AODV and DSR. Throughput, Packet Transmission Fraction, and Drop Rate are the parameters to be measured. The simulation was performed using NS 2.33. Trace files has been analyzed for evaluation purpose. The comparison of three protocols has been done by using XGRAPH.

Keywords — MANETs, Routing Protocol, AODV, DSDV, DSR.

1. Introduction

In MANETs, after receiving any type of memo, mobile or mobile nodes send information to their neighbor nodes. This information is delivered by the intermediate nodes and acts like a router in a situation where some node wishes to direct a memo to a mobile node but it is out of the dispatcher node's communication coverage. Because of the node's arbitrary motion, it is not possible to acquire permanent routes for sending information. After receiving any type of memo, the mobile or mobile nodes send the information to their neighbor nodes. This information is delivered by the intermediary nodes and behaves like a router in a situation when some user desires to direct memo to a movable node but it is out of communication coverage of dispatcher node. The acquirement of permanent routes for sending information is not possible because of the arbitrary measure of the node. As a result, the routing process in the mobile ad-hoc network is becoming a Puzzling task. The node in MANET therefore changes its link case with other mobile nodes in an orderly manner. Figure 1 shows a basic mobile ad hoc network with 6 numbers of nodes [1][4][6].

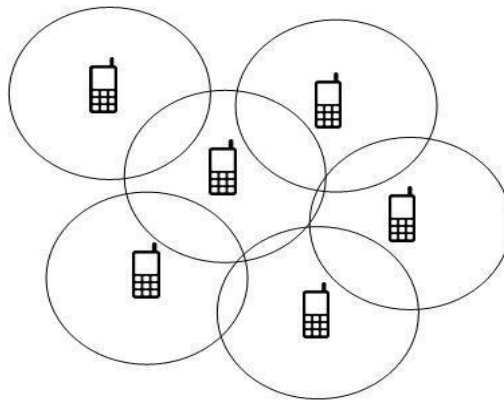


Figure 1: A Mobile Ad Hoc Network with Six Nodes

2. Routing Protocols in MANET

MANET routing protocols can be classified into two major categories:

A. Reactive Routing Protocol

These are the lazy type protocol in which nodes discover routes to destination only when it is needed. These protocols may use the lesser bandwidth but delay caused in route discovery may be large. These are also called on-demand routing protocols because route to the destination is always created on demand [3].

Ad hoc on Demand Routing Protocol: AODV is a routing protocol in which route is decided on demand i.e. route to the destination is created whenever it is required. In AODV first of all source node initiate a route discovery by broadcasting route request packet(RREQ) to all the neighboring nodes then again RREQ packet is transferred to all the other user node in the network then the required endpoint unicast the route reply packet(RREP) to the source node in the reverse order. In this fashion route discovery is done by traversing the path saved. In AODV RREQ packet contain various information like IP address of node, sequence number, broadcast ID and most recent sequence number to destination node. Now there are cases when link fail in that case RERR packet is broadcasted to sender [6][7].

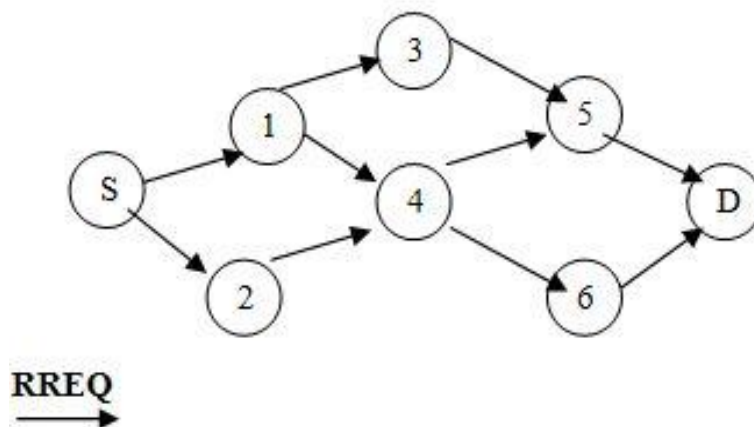


Figure 2: Route Discovery Process in AODV.

Dynamic Source Routing: DSR is just like AODV which is based on dynamic, on demand routing. The route to the destination is established on demand. In this protocol first of the entire source node identifies the sequence of nodes in its neighbors and broadcast a route request packet to all the nodes in its neighbors. If discovery is completed and it is successful then a response packet is returned to the source node which initiated the route discovery. The response packet usually contains the list of nodes through which the discovery was made. The route submission packet therefore comprises a record field that accumulates the node arrangement visited during the dissemination of the network interrogation [4] [7].

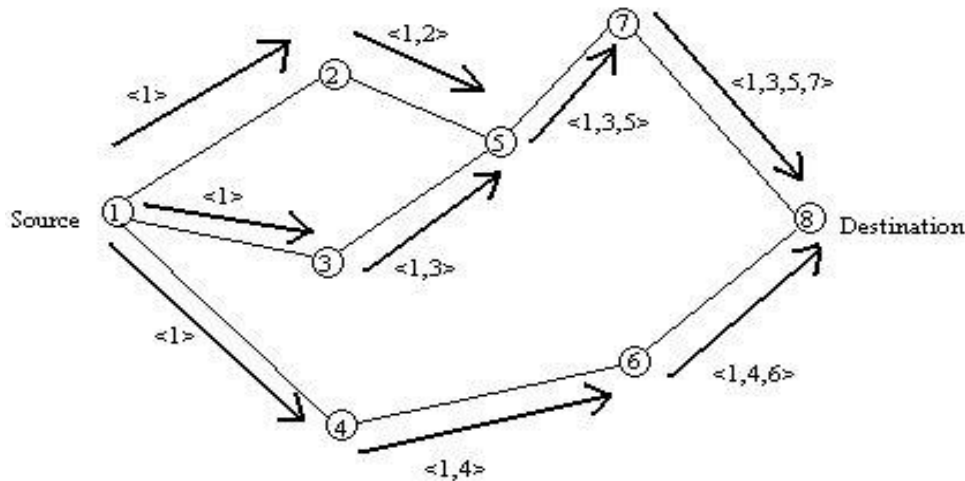


Figure 3: Route building process in DSR protocol

B. Proactive Routing Protocol

Distance Sequenced Distance vector:

DSDV is table ambitious protocol which is created upon the Bellman-ford algorithm. Arrangement number is used to tag the entries in the routing table of DSDV which are originated by destination. This is the responsibility of node to update the old sequence number with new one whenever a new route is discovered. There are two ways in which appries are diffused in DSDV either occasionally or proximately whenever a topology change is identified. Appries can either be occupied dump where user nodes convey their direction-finding table entrances or incremental where user’s nodes convey newly rationalized records only. Resolving time data is used for route stability and fragmented associates are detected via layer-2 procedure [4] [5] [6].

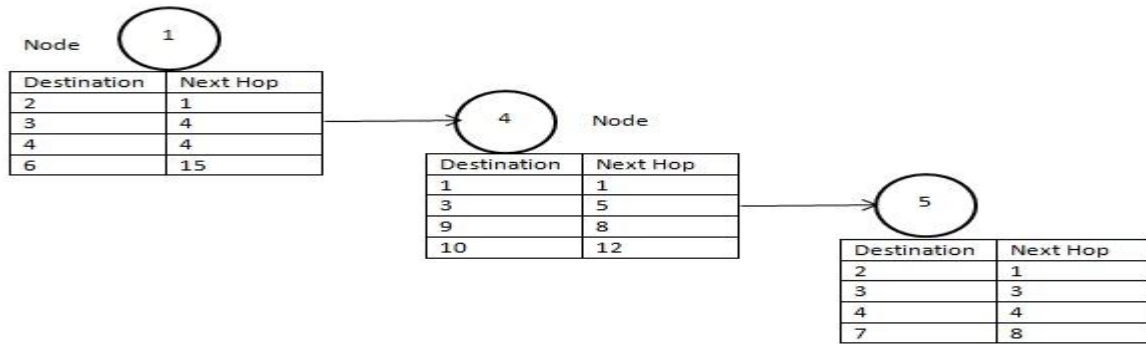


Figure 4: Flow of information in routing table in DSDV

3. MOBILITY MODELS

A Mobile Ad hoc network is characterized by moving nodes which is called mobility. Mobility is identified by speed and direction of mobile node. Different models of mobility were proposed depending on node movement.

Random Waypoint Mobility Model

The random waypoint model in mobility administration is an arbitrary model that informs us about mobile user movement and changes in position, speed and acceleration in time. Thanks to its simplicity and comprehensive availability, Random waypoint model is the most common usability model for mobile ad hoc network (MANET) evaluation routing protocols. The speed, direction and destination are all arbitrarily and individually selected from additional users with regard to their specifications. The node motion is controlled by resting a node for a fixed number of seconds, so node selects an arbitrary endpoint in the simulation area and speed is also arbitrary ranges from 0 (excluded) to peak. The user travels to this endpoint before additional arbitrary pace and location, and again hiatuses for a stable period. As regards the simulation size, the same has been replicated again [9] [10].

Reference Point Group Mobility Model (RPGM)

Often, RPGM is used to analyze a group's actions where each client belongs to a group and all groups attached to a central point called the group leader. The group's members were randomly distributed. All user nodes have their own model of mobility. That node has a direction and velocity that is different from the group leader's central point. Different group models can be applied for similar accessibility applications. At the time, the movement of the group leader was meant by the motion vector V_{tgroup} . It also involves the movement of the entire group as well as the group member movement by group leader movement. The movement of whole group or its member is based on the reference point [8] [9].

Column Mobility Model (CMM)

The Mobility Model (CMM) column used in the node to scan and search objects in a particular network area. The model represents the set of mobile nodes in the wise order of the column as a group of soldiers would strike the enemy together. Another example of a column flexibility model is transferring a line of kids to their classroom. To incorporate this template, an initial reference matrix must be built with the aid of mobile nodes. Each mobile node in the aforementioned model can move arbitrarily regarding its reference point [7] [10].

4. SIMULATION RESULTS

Simulation has been performed using NS 2.33 to regulate the influence of mobility on different direction-finding protocol. The procedures are to be compared are DSDV, AODV and DSR.

Packet Delivery Ratio (PDR)

Packet Delivery Ratio which is also known as packet delivery fraction is defined as the ratio between the overall figure of packets received at the destination node and the overall quantity of packets created by the node. The PDR shall be as follows:

$$PDR = (Pr/Ps) \times 100$$

Where Pr is the total packets received and Ps is the total number of packet sent.

Throughput:

Throughput can be defined as the maximum usable packet size recognized in a particular duration of time by all destination nodes.

Packet Dropped

It can be defined as the total number of packets sent and transmitted minus the packets received.

Parameter	Values
Area	1200 * 1200 m ²
Speed	30 m/sec
Pause	10s
Packet Size	512B
Simulation Time	10s
Number of Nodes	10

Table 1: Simulation Parameters

3. RESULTS AND DISCUSSION

We used three AODV, DSR and DSDV routing protocols throughout the test. We have been associating the protocols. For three protocols, the simulation was replicated three periods. The network's figure of nodes is 15. The ideal used for movement is the Random Way point model.

Throughput Evaluated:

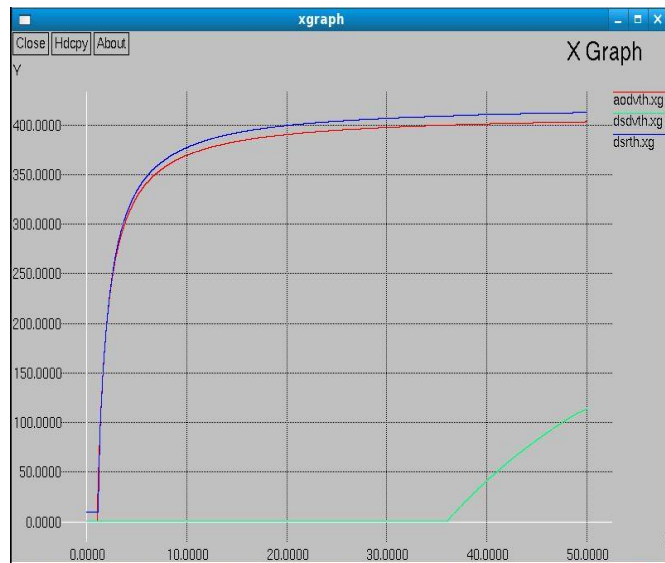


Figure 2: Throughput versus Simulation Time for Random Waypoint Mobility Model

Figure 2 shows the simulation time versus throughput and from the figure 2 it has been observed that DSR outperforms AODV and DSDV in throughput. The DSR has the highest value in case of throughput. Secondly AODV outperforms DSDV in case of throughput.

Packet Delivery Fraction Evaluated

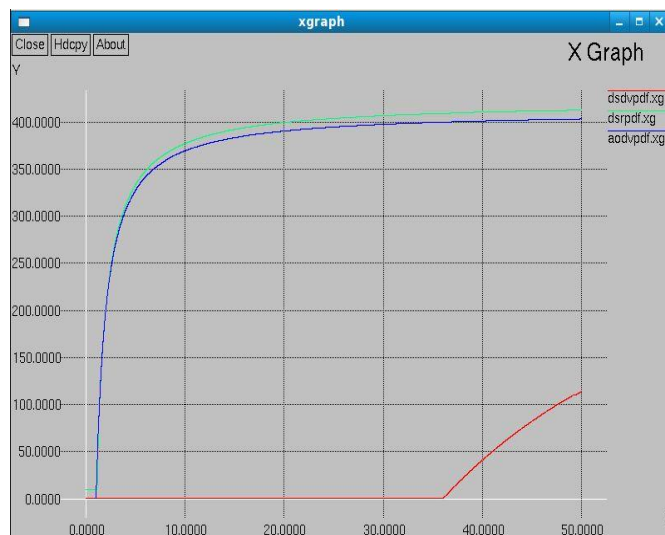


Figure 3 Packet Delivery Fraction Versus Simulation Time for Random Waypoint Mobility Model

Figure 3 shows the simulation time versus packet delivery fraction and from the figure 3 it has been observed that DSR outperforms AODV and DSDV in PDF. The DSR has the highest value in case of PDF. Secondly AODV outperforms DSDV in case of throughput. DSDV has the lowest PDF as expected from the simulation.

Number of Packet Dropped Evaluated



Figure 4 Numbers of Dropped Packets Versus Simulation Time for Random Waypoint Mobility Model

Figure 4 illustrate the simulation time versus Number of dropped packets and from the figure 2 it has been observed that DSR outperforms AODV and DSDV in number of dropped packets. In case of number of dropped packets, the DSR has the lowest value. Furthermore, in the case of number of dropped packets, AODV exceeds DSDV. DSDV has the maximum number of packets that are lost.

5. Conclusion

In this paper we compared four AODV, DSR and DSDV routing protocols. Three network parameters were used to compare the protocols, i.e. bandwidth, packet distribution ratio and number of dropped packets. The simulations have been performed and it has been concluded from results that the different protocol behave separately. The DSR shows good network performance in all the three chosen parameters. On the other hand AODV shows better performance than DSDV. NS 2.33 simulator has been used for evaluation of three protocols and for comparing them. In future we can compare the more routing protocol with more parameters. The routing protocols can also be compared for other type of networks such as wireless sensor networks, vehicular ad hoc networks and FANETS.

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