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Comparative Study of AODV and DSR Routing Protocols for MANET: Performance Analysis

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Abstract

An ad hoc network is an assortment of wireless mobile nodes dynamically forming a transitory network lacking the use of any presented network communications or centralized management. A number of routing protocols like Dynamic Source Routing (DSR), Ad Hoc on-Demand Distance Vector Routing (AODV) and Temporally Ordered Routing Algorithm (TORA) have been projected. In this work an attempt has been ended to evaluate the performance of two outstanding on demand reactive routing protocols for mobile ad hoc networks: DSR and AODV.

The performance differentials are analyzed using varying time, packet delivery ratio, throughput and end-to-end delay. These simulations are carried out using the ns-2 network simulator, which is used to run ad hoc simulations.

Keywords: Ad-hoc networks, routing protocols, wireless networks, simulation, performance evaluation.

I. INTRODUCTION

MANET stands for Mobile Ad hoc Network. It is a self-governing wireless arrangement which owns complimentary joins. Wireless feeler networks commencing this standpoint are the most up-to-date trend [1]. This asset makes these networks highly robust.

MANET has mobile joins, a router with numerous hosts in addition to wireless statement policies. The wireless announcement strategies are transmitters, receivers and elegant antennas. These antennas can be of whichever type and nodes can be preset or portable. The capability of identity formation of such joins prepares them added fitting in favour of immediately requisite set of connection. For instance in catastrophe strike regions where communication infrastructure is not accessible. MANET is an impulsive set of connections becomes more valuable whilst handling with wireless strategy wherein a number of the strategies are ingredient of the set of connections only for the extent of a communication session. The MANET functioning cluster mechanism particularly on developing IP routing protocols topologies. To perk up portable direction-finding and crossing point classification principles for exercise surrounded by the Internet code of behaviour matching set [2].

II. ITERATURE REVIEW

The 1990s encompass seen a swift enlargement of study benefit in mobile impromptu arrangements. MANETs utilize the conventional TCP/IP configuration to offer uninterrupted announcement amid joins. Routing in the MANETs is a tricky assignment and owns acknowledged a marvelous sum of concentration commencing researches. Consequently, it is relatively complicate to conclude which one of the protocols may perhaps execute finest in a figure of divergent set of connections cases, for instance escalating node density and traffic [3].

We have identified several pieces of key literature in the field of MANET routing protocols which highlight existing protocols as well as the current thinking within the field and the directions researchers are moving in the future. An effective MANET routing protocol must be equipped to deal with the dynamic and unpredictable topology changes associated with mobile nodes, whilst also being aware of the limited wireless bandwidth and device power considerations which may lead to reductions in transmission range or throughput [4]. This is expanded upon by [5] who propose that in addition to these core requirements.

III. AD-HOC ROUTING PROTOCOLS

Several routing protocols have been developed for ad hoc Mobile networks [1] [6]. Such protocols must deal with typical limitations of these networks which

include high power consumption, low bandwidth and high error rates. Routing is the act of moving information from a source to a destination in an internetwork.

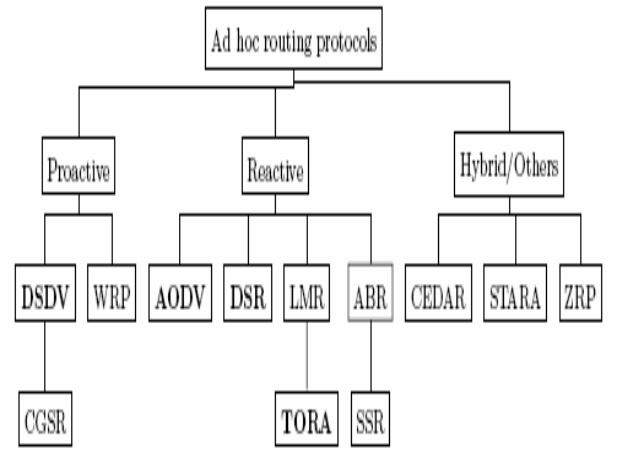

Figure1: Classification of MANET Routing Protocols

A. Proactive Protocols (Table Based Steering Set of rules)

i. Destination-Sequenced Distance-Vector (DSDV)

The Destination-Sequenced Distance-Vector (DSDV) direction-finding Algorithm is relied on the thought of the conventional Bellman-Ford Routing Algorithm by means of rigid improvements. All mobile location updates a routing table with the purpose of listing all easily reached objectives, the digit of hops to get to the objective and the series numeral taken over by them to the objective join.

ii. Wireless Routing Protocol (WRP)

WRP is an added code of behavior relied on distributed Bellman-Ford algorithm (DBF). It is to a large extent decreases the numeral of cases wherein direction-finding loops can come about. It consumes details concerning the measurement lengthwise and the antecedent of the undeviating route to each and every one goal.

iii. The Cluster head Gateway Switch Routing (CGSR)

DSDV is used as a fundamental code of behavior. Portable joins are hooked on clusters and by using a distributed algorithm a cluster start is voted. Every single one in the announcement assortment of the group beginning joins its group.

B. Reactive routing protocols

On-demand routing protocols were designed to reduce the overheads in proactive protocols by maintaining information for active routes only. The major drawback with source routing protocols is that in large networks they do not perform well. This is due to two main reasons; firstly as the number of intermediate nodes in each route grows, then so does the probability of route failure. Secondly, as the number of intermediate nodes in each route grows, then the amount of overhead carried in each header of each data packet will grow as well. A number of different reactive routing protocols (e.g. AODV [8], DSR [7], TORA [8], ZRP [9]) have been proposed to increase the performance of reactive routing. Our focus is on DSA and AODV routing protocols which come under the category of Reactive approach.

C. Hybrid Protocol (Blend of Reactive and Proactive set of rules)

Based on combination of both table and demand driven Routing protocols, some hybrid routing protocols are proposed to combine advantage of both proactive and reactive protocols. The most typical hybrid one is zone routing protocol [9].

IV. ON-DEMAND ROUTING PROTOCOLS

A. DSR

As stated earlier, the DSR protocol requires each packet to carry the full address (every hop in the route), from source to the destination. Therefore in highly dynamic and large networks the overhead may consume most of the bandwidth. However, this protocol has a number of advantages over routing protocols such as AODV, LMR [10] and TORA [11], and in small to moderately size networks (perhaps up to a few hundred nodes), this protocol may perform better. An advantage of DSR is that nodes can store multiple routes in their route cache, which means that the source node can check its route cache for a valid route before initiating route discovery, and if a valid route is found there is no need for route discovery. This is very beneficial in network with low mobility.

B. Ad hoc on-demand distance vector (AODV)

AODV maintains one route per destination and destination sequence numbers. Destination sequence numbers is a process of preventing loops and to determine routes freshness [12]. AODV uses similar route discovery process of DSR.

AODV depends on routing table entries to route data packets to the destination and to propagate Route

Reply back to the source. In using of individual routing table entries, AODV maintains timer-based states in each node. The recent specification of AODV [13] includes an optimization technique to control the RREQ flood in the route discovery process. It uses an expanding ring search initially to discover routes to an unknown destination. In the expanding ring search, increasingly larger neighbourhoods are searched to get the destination. The search is controlled by the Time-To-Live (TTL) field in the IP header of the RREQ packets. If the route to a previously known destination is needed, the prior hop-wise distance is used to optimize the search.

V. PERFORMANCE ANALYSIS

Some important performance metrics can be evaluated:-

Packet delivery Ratio: The percentage of the data packets sent to the objectives to individuals yielded through the CBR sources. Packets delivered and packets lost are intriguing in to contemplation.

Throughput: There are two representations of throughput; solitary is the sum of data broadcasted over the epoch of instant uttered in kilobits per second (Kbps).

End-to-end Delay: The packet end-to-end delay is the moment of production of a packet through the source up to the destination reaction. This time is articulated in second.

VI. RESULTS AND DISCUSSION

My objective here is to implement AODV and DSR routing protocol and compare their performance relied on packet delivery ratio, throughput and end-to-end delay. Nodes are conveying cbr packets with indiscriminate velocity. Initially the cbr files and scenario files are yielded and then by means of aodv protocol replication are ended which gives the nam file and trace file. Then a different nam and Trace files are formed dsr protocol. In my work the simulation and comparison is done by creating DSR and AODV tcl scripts for 3, 6 and 15 nodes respectively.

Table 1: Simulation parameters for implementation of AODV and DSR

Parameter	**Value**
Number of Nodes	3,10
Radio-propagation Model	Propagation/ TwoRayGround
Network interface	Phy/WirelessPhy
Type	
MAC Type	Mac/802_11
Channel Type	Channel/Wireless Channel
Interface Queue Type	Queue/DropTail/ PriQueue
Link Layer Type	LL
Maximum Packet	300
Routing Protocols	AODV/DSR
Simulator	Ns-2.35
Antenna Type	Antenna/OmniAntenna

A. Different scenarios for Simulation based on performance metrics

i. Scenario based on End-to-End Delay

DSR is an On-Demand source routing protocol, and this is the major rationale for it owing an elevated End-to-End Delay, wherever route is looked only at what time needed and there is a route Discovery means occurring all time and it also has to clutch a bulky transparency apiece of time, in consequence the elevated delay. AODV conversely has only one route per destination in the routing table, which is persistently updated rooted in sequence number.

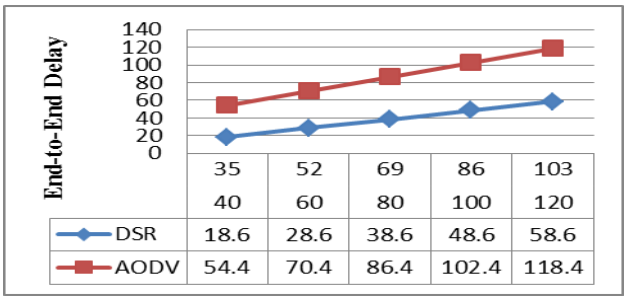

Figure (i): For 3 nodes of DSR and AODV

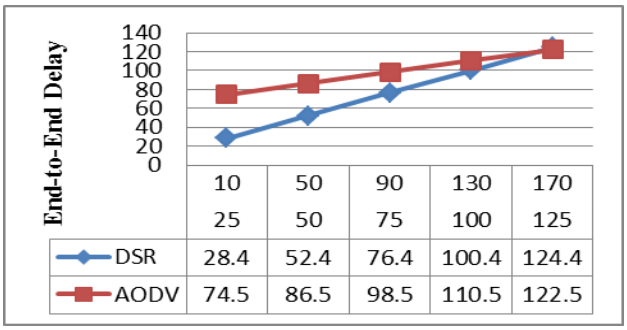

Figure (ii): For 10 nodes of DSR and AODV

Figure 2 (i) and (ii): End-to-End Delay vs. Time

In figures (i) and (ii) respectively the end to end delay does not amend with enlarge in the numeral of nodes since the source and destination are in the identical position poignant with identical speed, the enlarged numeral of nodes only might boost numeral of hops. The End to End delay diminishes with boost with speed, since when it moves further recurrently the routing updates are exchanged supplementary recurrently and quicker it reaches the destination.

ii. Scenario based on Packet Delivery Ratio

While it can be observed from the above results, the packet delivery ratio leftovers the identical in every single one scenario regardless of the boost of pause time (lessen in speed) and enlarge in the numeral of nodes which could be at the same time as a outcome of the multihop distinctiveness of the Ad hoc Routing protocol. DSR has a little more packet delivery ratio as compare to AODV since it until the end of time looks out for the very unmarked and consistent route when considered necessary and does not come across for it from the routing table resembling AODV. As conventional, Packet delivery fraction for AODV diminishes as speed towers, seeing as pronouncement of the route desires to a greater extent routing traffic.

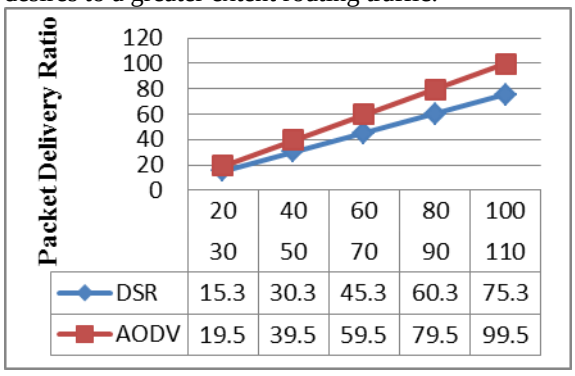

Figure (i): For 3 nodes of DSR and AODV

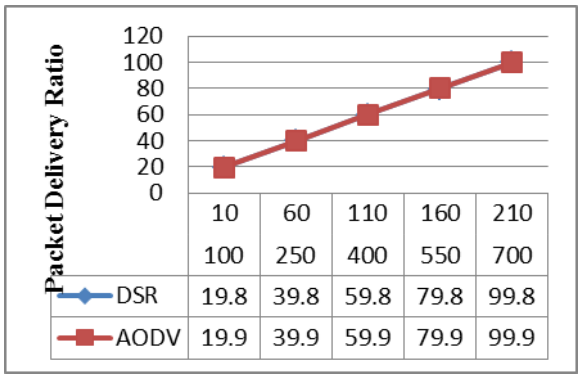

Figure (iii): For 10 nodes of DSR and AODV

Figure 3 (i) and (ii): Packet Delivery Ratio vs. Time

Accordingly a reduced amount of the channel will be adopted for data transfer, consequently diminishing the packet delivery. Furthermore, at the same time as the numeral of nodes towers, supplementary routing passage will be yielded (for the reason that AODV owns flooding for route discovery), which makes the packet delivery fraction diminishes at the same time as the numeral of nodes towers.

iii. Scenario based on Throughput

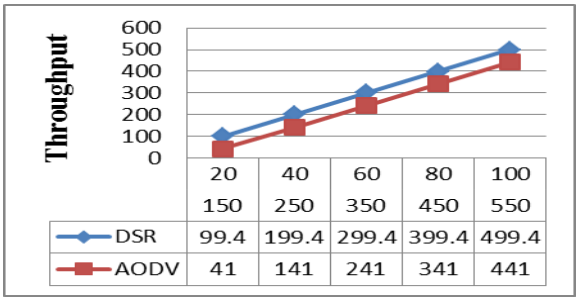

Figure (i): For 3 nodes of DSR and AODV

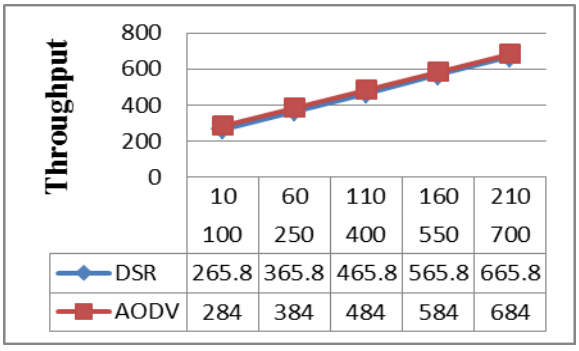

Figure (i): For 10 nodes of DSR and AODV

Figure 4 (i) and (ii): Throughput vs Time

Figure 4: In (i) and (ii) of above figures AODV depicts elevated throughput than the DSR. The AODV has a large amount of routing packets than DSR since the AODV avoids loop and freshness of routes whereas DSR owns obsolete routes. Its throughput is elevated than further routing protocols at towering mobility.

VII. CONCLUSION

Simulation results illustrate that amid all the protocols, AODV owns a constant End to End Delay regardless of mobility as it has the trait of On-Demand Routing protocol and moreover transforms a Routing table. DSR owns the peak End to End Delay and Routing load increases the bandwidth and intense the battery life. Anchored in the above simulation set-up, parameter, assumption and results AODV could be well thought-out as a competent more quicker routing protocol than DSR.

It is pragmatic that the packet loss is exceptionally not as much of in case of AODV, to commence with but it increases extensively on the simulation time increases. In case of DSR simulation the packet loss is exceedingly towering primarily but it decreases radically on the simulation time increases.So, we can wrap up with the intention if the MANET has to be associated for a miniature sum of time then AODV should have a preference as a result of squat preliminary packet loss and DSR should not be yearning to associating a MANET for a spot amount of time in view of the fact that in the beginning there is packet loss is awfully towering. If we have to use the MANET for a longer extent then mutually the protocols can be adopted, seeing that later than now and again both the protocols have equivalent ratio of packet delivering. But AODV owns exceedingly superior packet receiving ratio in contrast to DSR.

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