Performance analysis of different routing protocol for 802.11 in MANET

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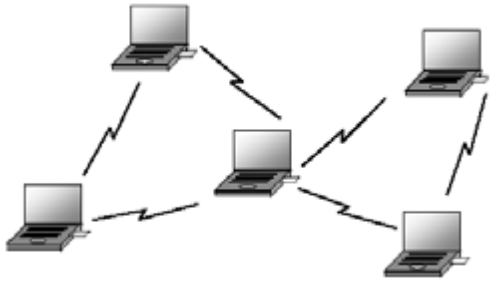
ABSTRACT

A Mobile-Ad-Hoc-Network (MANET) is a collection of wireless nodes that can be set up dynamically anywhere and anytime without using any pre-existing network infrastructure. Nodes within each other's radio range communicate directly via wireless links, while those that are far apart use other nodes as relays in a multi-hop routing fashion. Traditionally Ad-Hoc routing protocols are typically used to deal with the dynamic nature of these networks, which is mainly due to mobility. These protocols typically suffer from a number of shortcomings, such as high routing over head and limited scalability. This motivates the work presented in this paper, which provides a comparison of AODV and DSR protocols in Mobile-Ad-Hoc-Network where mobile clients are connected to the wireless network and they are varying with a constant speed .Based on extensive simulations; we present a comparative analysis covering performance metrics such as PDF, Average End-to End Delay, and Packet Loss in 1. Deferent scenario in all these cases AODV is best result compare to DSR

1.INTRODUCTION

A mobile ad-hoc network or MANET is a collection of mobile nodes sharing a wireless channel without any centralized control or established communication backbone. They have no fixed routers with all nodesescapable of movement and arbitrarily dynamic. These nodes can act as both end systems and routers at the same time. When acting as routers, they discover and maintain routes to other nodes in the network. The topology of the ad-hoc network depends on the transmission power of the nodes and the location of the mobile nodes, which may change from time to time [1].One of the main problems in ad-hoc networking is theefficient delivery of data packets to the mobile nodeswhere the topology is not pre-determined nor does thenetwork have centralized control. Hence, due to thefrequently changing topology, routing in ad-hocnetworks can be viewed as a challenge.



2. ADHOC ROUTING PROTOCOLS

A Mobile Ad-hoc Network (MANET) is a dynamic Wireless network that can be formed without the need for any pre-existing infrastructure in which each node can act as a router. A fundamental assumption in ad-hoc networks is that any node can be used to forward packets between arbitrary sources and destinations. Some sort of routing protocol is needed to make the routing decisions. A wireless ad-hoc environment introduces many problems such as mobility and limited bandwidth which makes routing difficult. This paper compares the different ad hoc protocols on the basis of QoS parameters like Throuput, Delay and Fairness.

2.1 Throughput

It is the average rate of successful message Delivery over a communication channel. These data can be Delivered over a physical or logical link. It is measured in bits per second.

2.2 Delay

It is a time required for packets to reach to destination node from source node.

2.3 Fairness

Fairness reflects the ability of different users, nodes, or applications to share the channel equally. It is an important attribute in traditional voice or data networks, since each user desires an equal opportunity to send or receive data for their own applications. It is the parameter for measuring the congestion in the network. Fair network means less congestion. There are three types of Ad hoc Routing protocols. They are pro-active protocols,active protocols and hierarchical protocols. For comparison purpose we have taken the few protocols from each type. They are Dynamic Source routing Protocol (DSR), Ad hoc on demand Distance vector protocol (AODV)

2.4 DSR Protocol

DSR is a reactive routing protocol i.e. determines the proper route only when packet needs to be forwarded. For restricting the bandwidth, the process to find a path is only executed when a path is required by a node(On-Demand Routing). In DSR the sender (source, initiator) determines the whole path from the source to the destination node (Source-Routing) and deposits the addresses of the intermediate nodes of the route in the packets. DSR is beacon-less which means that there are no hello-messages used between the nodes to notify their neighbors about their presence. DSR was
for MANETs with a small diameter between5 and 10 hops and the nodes should only move around at a moderate speed. DSR is based on the Link-State Algorithms which mean that each node is capable to save the best way to a destination. Also if a change appears in the network topology, then the will get this information by flooding. The DSR protocol is composed of two main mechanisms that work together to allow discovery and maintenance of source routes in MANET.

2.6 AODV Protocol

AODV is a very simple, efficient, and effective routing protocol for Mobile Ad-hoc Networks which do not have fixed topology. It does not require nodes to maintain routes to destinations that are not actively used. The protocol uses different messages to discoverand maintain links: Route Requests (RREQs), RouteReplies (RREPs), and Route Errors (RERRs). Thesemessage types are received via UDP, and normal IPheader processing applies. This algorithm wasmotivated by the limitedbandwidth that is available inthe media that are used for wireless communications.The ondemand route discovery and route maintenancefrom DSR and hop-by-hop routing, usage of nodesequence numbers from DSDV make the algorithmcope up with topology and routing information.Obtaining the routes purely on-demand makes AODVa very useful and desired algorithm for MANETs.

2.7 Routing Prorocols

Routing support for mobile hosts is presently being formulated as "mobile IP" technology [5]–when the mobile agent moves from its home network to a foreign (visited) network, the mobile agent tells a home agent on the home network to which foreign a gent their packets should be forwarded. In addition, the mobile agent registers itself with that foreign agent on us, the foreign network. Thus, all packets intended for the mobile agent on the foreign network. Thus, all packets intended for the mobile a gent are forwarded by the home agent to the foreign agent **who sends them to the mobile agent on the foreign network. When the mobile agent returns to its original network, it informs both agents (home and foreign) that the original configuration has** been restored. No one on the outside networks need to know that the mobile agent moved [5].

But in Ad hoc networks there is no concept of home agent a sit itself may be "moving". supporting mobile IP form of host (or named city) requires address management, protocol inter operability and enhancements and the like, but core network function such as hope by hope routing still presently relay up on existing routing protocols operating with in the fixed network.

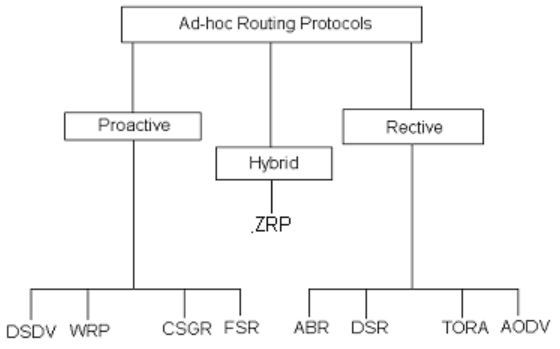


Fig. : Categorization of Ad-Hoc Routing Protocols

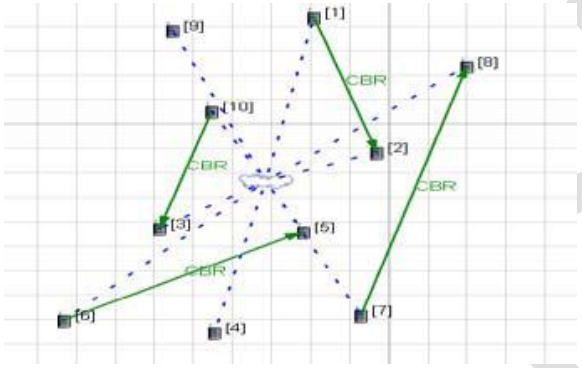
2.8 SIMULATION ENVIRONMENT

A. SETUP

To evaluate and compare the effectiveness of these routing protocols in a Mobile Ad-Hoc network, we performed extensive simulations inQualNet5.0. Each simulation is carried out under a constant mobility. The simulation parameters are listed in Table 1.

PARAMETERS	VALUE
Simulator	*NS-2.27*
Routing protocol	AODV & DSR
Area	500mX500m
Packet size	size 512byte
Simulation time	100
Pause time	1.0
Traffic type	CBR
Mac protocol	Mac/802.11
Number of Nodes	50

B.SCENARIO DESIGN



C. Mobility Model

We use the random waypoint model [2], in which a node waits for the pause interval time and then moves to a randomly chosen position with a velocity chosen randomly between 0 m/s to 10m/s, wait there for the pause time, and then moves to another position [4].

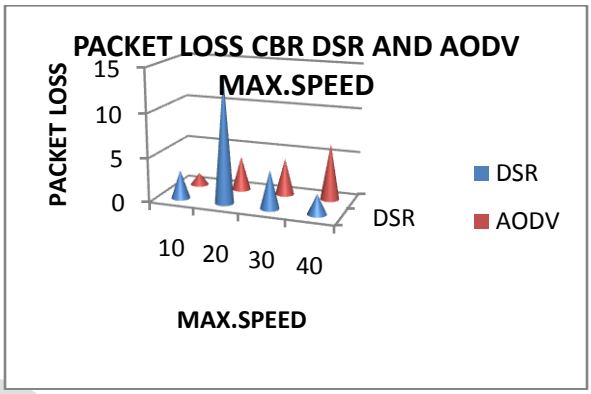
D. Communication Model

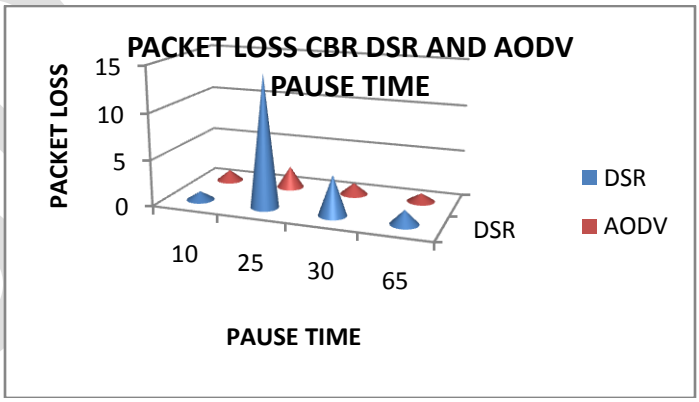
The 802.11 Distribution Coordination Function (DCF) is used as the MAC layer. All ROUTE_REQUEST packets are broadcastedusing the un-slotted Carrier Sense Multiple Access protocol withCollision Avoidance (CSMA/CA).In CSMA/CA, each sendingnode waits for a vacant channel by sensing the channel. If The channel is clear, then the node seizes the channel and transmitsthe packet. In case of a collision, the colliding stations abort transmission and wait for making the channel free.

E. Performance Metrics

1. Packet Loss

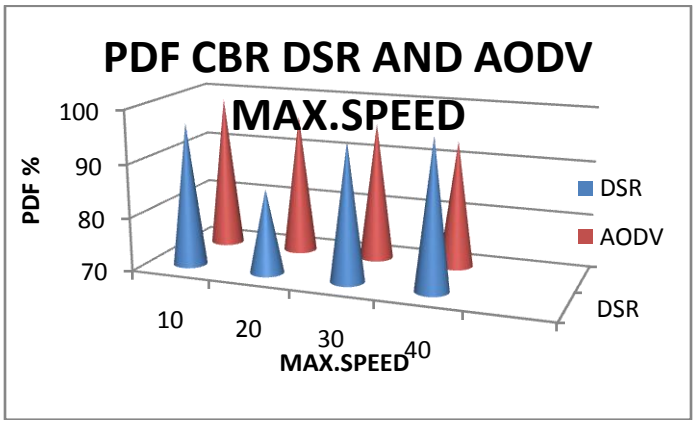
This is the number of packets lost due to incorrect or unavailableroutes and MAC layer collisions.

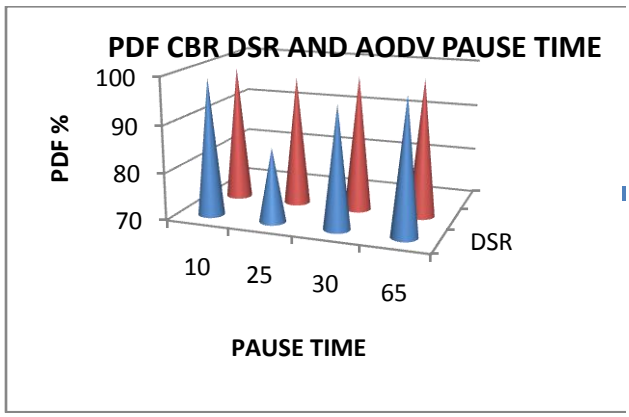




2. Packet Delivery Fraction

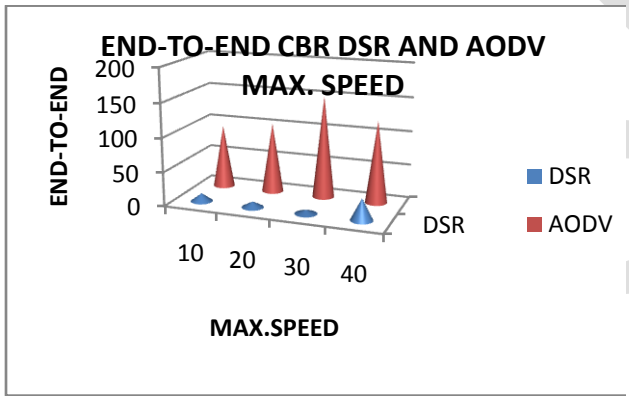
It is the ratio between the numbers of packets received by the application layer of destination nodes to the number of packets sent by the application layer of source nodes

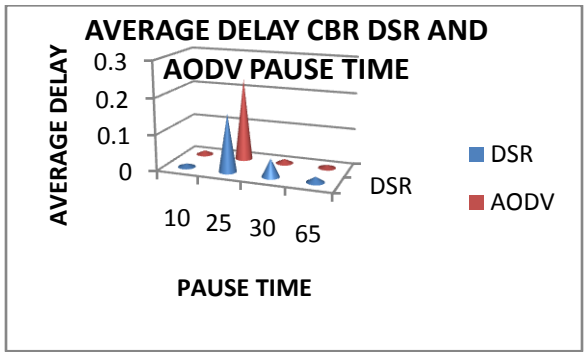




3.Average End to End Delay

End-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination.





2.9 Conclusion

The performance of routing protocols AODV and DSR dependsheavily on much kind of design scenarios. One of these designs isshown here. I use QualNet5.0 to show the performance of AODVand DSR protocols during data communication.This study wasconducted to evaluate two of MANET routing protocols which areAODV and DSR. These routing protocols are compared in term ofpacket delivery ratio, routing overhead, throughput and averageend to end delay using QualNet5.0Simulator on the Windowsplatform. Performance of each routing protocol has been analyzedand evaluated accordingly based on different number of nodes overdifferent area size with different pause time. For the simulationresult, all routing protocols perform well according to performancemetrics that have been selected. For packet loss ratio, AODV andDSR perform equally well. For average good put, DSR submitsmore number of bits on to the network. For packet delivery ratiometric, performance of DSR routing protocol is better than AODV.In terms of throughput, DSR perform well. Finally, for averageend to end delay, DSR is lower than AODV, for the nodes equal to 10. Hopefully, the result of this study can be used as referencefor the future work.

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