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Performance Evaluation of DSDV and MDSDV Routing Protocol with Varying Node Density

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ABSTRACT
Mobile Ad Hoc Networks (MANET) is an important and challenging research area. The routing protocol should detect and maintain a good route between source and destination nodes in these dynamic networks. Many routing protocols have been proposed for mobile ad hoc networks, and none can be considered as the best under all conditions. This thesis work consist a systematic comparative evaluation of a new multipath routing protocol for MANETS. The new protocol, called Multipath Destination Sequenced Distance Vector (MDSDV) is based on the well known single path Destination Sequenced Distance Vector (DSDV) is compared with known protocol DSDV. This work containing evaluates the protocols on a range of MANETS with between 50, 75 and 100 nodes, which are static nodes. The protocol comparison metrics are Throughput and Residual Energy.

I. INTRODUCTION

Mobile Ad Hoc Networks (MANETs) have gained an increasing significance. Ad Hoc networking is needed in many applications such as military and battlefield operations, virtual classrooms or conference rooms, and rescue operations in natural disasters. These kinds of applications require a network regardless of any infrastructure, and this is the idea behind MANETs which can be considered as flexible networks and suitable for such applications. MANETs are typically characterized by high mobility and frequent link failures that result in low throughput and high end-to-end delay. The increasing use of MANETs for transferring multimedia applications such as voice, video and data, leads to the need to provide QoS support.

In mobile networks, node mobility makes the network topology change frequently, which is rare in wired networks. Mobile networks have a high error rate, bandwidth limitations and power restrictions. Due to the impacts from transmission power, receiver sensitivity, noise, fading and interference, wireless link capacity continually varies. Wireless networks can be deployed quickly and easily, and users stay connected to the network while they are moving around. Also, they play an important role in both civilian and military fields. We have seen great developments in Wireless networks infrastructure, availability of wireless applications, and proliferation of Wireless devices everywhere such as laptops, PDAs, and cell phones.

According to the deployment of network infrastructure, Wireless networks can be divided into two types [1]. The first type is Infrastructure-based wireless networks and the second are infrastructure-less mobile networks, commonly known as ad-hoc networks. Infrastructure networks are those networks with fixed and wired gateways. The bridges for this type of networks are known as base stations. A mobile node connects to the nearest base station which is within its communication radius. As the mobile travels out of range of one base station and into the range of another, a “handoff” occurs from the old base station to the new, and the mobile is able to continue communication seamlessly throughout the network.

II. CHARECTERISTICS

Compared to other wired or infrastructure-based wireless networks and according to [2], Mobile ad hoc networks have the following characteristics.

- Dynamic topology all nodes of mobile ad hoc network are free to move causing network topology changes rapidly at unpredictable times. Links between nodes are expected to break much more frequently than with wired and infrastructure based wireless networks.
- Self-organization: Due to the lack of infrastructure or central administration, nodes should be able to form themselves into a network.
- Multi-hopping: In a mobile ad hoc network, nodes use a wireless channel to transmit data, and due to the limited number of a node’s neighbors, intermediate nodes are used to relay the packets.
- Resource conservation: In mobile ad hoc networks, the nodes are limited in both energy

supply and processing power. Power conservation becomes a very important factor to be considered when designing a network. Therefore, optimizing all operations may minimize the energy consumption.

- Limited security: Mobile ad hoc networks are more prone to security threats than wired networks or infrastructure-based wireless networks because of their unique characteristics. Each mobile node in an ad hoc network can function as a router or packet forwarder for other nodes, both legitimate users and malicious attackers can access the wireless channel, and there is no well place where access control mechanisms can be deployed. As a result, separating the inside of the network from the outside world becomes imprecise.
- Scalability: In some applications (e.g., battlefield deployments), mobile ad hoc networks may grow up to several thousand nodes. Mobile ad hoc networks suffer from scalability problems in channel capacity, because channel capacities are very limited and maximum use of channel capacity can be reached faster. Due to the multihoping nature of mobile ad hoc networks, their scalability is related to the routing protocols they employ.

III. MANET ROUTING PROTOCOL

In mobile ad hoc networks, the topology changes frequently because of node mobility. Secondly packet losses may occur frequently because of the variable and unpredictable capacity of wireless links. Furthermore, the broadcast nature of the wireless medium introduces the hidden terminal and exposed terminal problems, mobile nodes have limited power, limited bandwidth resources and require effective routing schemes.

IV. DSDV

The Destination-Sequenced Distance-Vector Routing protocol (DSDV) described in [12] is a table-driven algorithm based on the classical Bellman-Ford routing mechanism [13]. The improvements made to the Bellman-Ford algorithm include freedom from loops in routing tables. Every mobile node in the network maintains a routing table in which all of the possible destinations within the network and the number of hops to each destination are recorded. Each entry is marked with a sequence number assigned by the destination node. The sequence numbers enable the mobile nodes to distinguish stale routes from new ones, thereby avoiding the formation of routing loops. Routing table updates are periodically transmitted throughout the network in order to maintain table consistency. To help alleviate the potentially large amount of network traffic that such updates can generate, route updates can employ two possible types of packets. The first is known as a full dump. This type of packet carries all available routing information and can require multiple network protocol data units (NPDUs).

In DSDV, each mobile node advertises its routing table (e.g., by broadcasting its entries) to its current neighbors. The entries in the routing table may change dynamically over time, so the routing information should be advertised to ensure that every node can always locate every other mobile node. Additionally, each mobile node agrees to relay data packets to other nodes upon request. Before each advertisement of a new routing table, mobile node increases its sequence number by 2.

DSDV takes care of topology changes by using a certain procedure which is based on two kinds of updating: time-driven updates, which are periodic transmissions of a node’s routing table, and event-driven updates which react to link failures. Nodes schedule the newly recorded routes for immediate advertisement to the current node’s neighbors. Routes with an improved metric are scheduled for advertisement at a time which depends on the average settling time for routes to the particular destination under consideration.

V. MDSDV OVERVIEW

Since MDSDV like DSDV is proactive, it has the same advantages as DSDV where it maintains an up-to-date view of the network, and every node has a readily available route to every destination node in the network. Nodes in MDSDV periodically broadcast Hello Messages or Available Messages (depending on the Neighbors Table (NT)). If the node’s NT is empty, the node broadcasts a Hello Message; otherwise it broadcasts an Available Message. If a new node is detected, it will receive copies of the routing tables of all its neighbors (Full Dumps), and perform a filtering operation to initialize its own routing table. After creating its routing table, the new node broadcasts Update Packets (the number of Update Packets depends on the number of neighbors) to inform nodes of network topology changes. Failing transmissions cause the transmitter to report the link as a failure in an Error Packet which it propagates to all nodes using that link, When an intermediate node fails to forward a data packet, it unicast a Failure Packet to the source node to stop using the link included in the Failure Packet.

VI. MDSDV TABLES

Using MDSDV, each node maintains two tables: a Neighbors Table (NT) and a Routing Table (RT) which are described below:

- **Neighbors Table (NT):** each node in the network maintains a Neighbors Table which contains all its neighbors. A node periodically checks its NT to decide whether to broadcast a Hello Message or an Available Message. If this table is empty, the node considers itself as an isolated node which means that it has to propagate a Hello Message (the node will be considered as a new node). Otherwise, it broadcasts an Available Message. Also, this table is used when the new node needs to initiate Update Packets. The NT is updated when the node receives a control packet from a neighbor or when one of its neighbors goes out of its transmission range. Table shows the structure of Neighbors Table entry.

- **Routing Table (RT):** each node maintains its routing table that lists a number of paths for each destination in the network. The routing table is used to transmit packets through the network. Nodes have to update their routing tables when there is a significant change in the network. The Timeout field is only used for adjacent nodes, i.e., nodes that are within wireless transmission range. For all other nodes it is simply set to Null. Table shows the structure of a routing table entry.

I. IMPLEMENTATION & RESULTS

In this work have implemented work i.e. Creation of MANET Scenario for NS-2 and then to create Different routing protocols with the use of various performance matrices Like Residual energy and Throughput. In this work firstly created scenario file for IEEE 802.11 standard which has to be used along with TCL Script than created a TCL script consist of various routing protocols in this case these are DSDV and MDSDV than a particular MANET scenario or topology in our case it consist of 50, 75 and 100 static nodes with 30sec simulation time.

Simulation Parameter:-

Simulation Tool	NS-2.35
IEEE Scenario	802.11
Propagation	Two Ray Ground
Number of nodes	50, 75, 100 nodes
Traffic Type	TCP
Antenna	Omni directional antenna
MAC Type	IEEE 802.11
Routing Protocol	DSDV, MDSDV
Queue limit	50 Packets
Simulation area (in metre)	2 KM
Queue type	Droptail
Channel	Wireless Channel
Simulation time	30 sec.

II. EVOLUTION OF RESULTS

This work to be done successfully have used MANET scenario with varying node density which are 50, 75 and 100 nodes and constant 30 sec under static scenario using various routing protocols and reached to the results with the help of various performance matrices for now we have used following performance matrices.

1. Residual Energy
2. Throughput

III. RESIDUAL ENERGY

It is the total amount of energy Consumed by the Nodes during the completion of Communication or simulation.

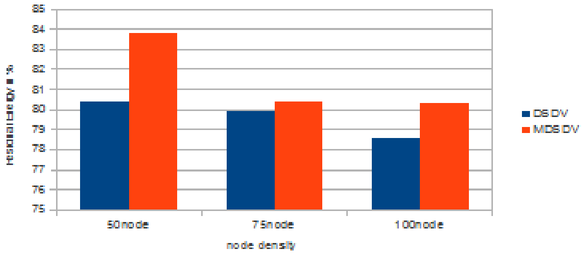

Figure 1:- Residual Energy for DSDV and MDSD

IV. THROUGHPUT

There are two representations of throughput; one is the amount of data transferred over the period of time expressed in kilobits per second (Kbps). The other is the packet delivery percentage obtained from a ratio of the number of data packets sent and the number of data packets received.

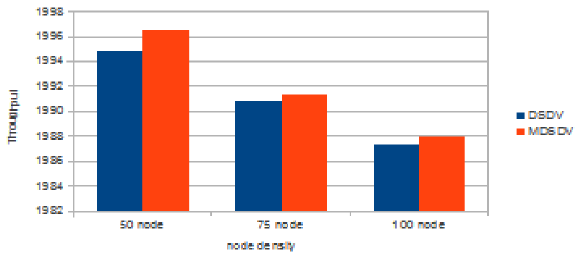

Figure2:- Overall Throughput for DSDV and MDSDV

V. CONCLUSION

In this work we analyzed all parameter which are Packet Delivery Ratio, End to End Delay, Routing Overhead, Overall Throughput Residual Energy and concluded that the MDSDV routing protocol is good as compare to the DSDV routing protocol for different node density which are 50 nodes, 75 nodes and 100 nodes with 30 sec simulation time for TCP traffic in IEEE 802.11 scenario with two ray ground propagation for Omni directional antenna.

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