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Simulation Results and Performance Evaluation of Routing Protocols in Mobile Ad-Hoc Networks

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Abstract— One of the majority vital issues in mobile ad hoc network(MANET) is collecting and processing data apparent from the atmosphere and sending that data to be processed and evaluated. Routing in MANETs is a challenging task due to the unpredictable changes in the network topology. MANETs are a heterogeneous mix of different wireless and mobile devices , ranging from little hand- held devices to laptops that are dynamically and arbitrarily located in such a manner that the interconnections between nodes are capable of changing on a continual basis. The major goal of the proposed paper is to analyze the behavior of the both reactive Ad hoc On- demand Distance Vector protocol (AODV) and proactive Destination Sequenced Distance Vector (DSDV) in high mobility scenario under dense and sparse medium. Unlike military applications, most of the other applications of MANETs require moderate to high mobility. That's why it becomes important to analyze the behavior of high mobility. Simulation is done using ns2 in different scenarios in MANET.

Keywords: MANET, Routing protocol, AODV, DSDV, NS2.

I. LITERATURE SURVEY

The area of mobile ad hoc network or commonly termed as MANET [1] is currently under the scanner of extensive research due to the massive advantages it permits on its application. MANET can be termed as a system of wireless mobile nodes which dynamically self-organize in random and impermanent network topologies. Using this technology, various users can therefore be connected in networking areas without any presence of pre-existing networking infrastructure. The mobile nodes can directly communicate with each other within their transmission ranges. In this environment, dual condition can surface where all the mobile nodes which have participated in the transmission involuntarily generate a wireless network, consequently, such types of wireless ad hoc network can be visualized as mobile ad hoc network. For the purpose of introducing diversified power issues in MANET [2], various power effective routing strategies has already been seen in the review of literature.

Any transitional node holds the request packet for an epoch of time previous to forwarding to next mobile node. The time period is set to be inversely proportional to its existing power so that nodes with lower level of power can be protected.

The tradeoff between the cost of power utilization for distribution traffic and the enhanced spatial allocation of power overloads is discussed. Unwanted power utilization due to overhearing is considered, which involved not only the battery reservation of the mobile nodes in the routes, but also the amount of neighbors that these nodes may potentially interfere. The most favorable cardinality of the cooperation sets at each hop on a path to minimize the total power cost per transmitted bit, while a traffic-adaptive routing protocol was proposed to optimally combine the proactive and reactive strategies. The idea that each mobile node evaluates if the route request control message should be forwarded by comparing its residual power with a threshold, where the threshold is attuned incessantly as the network runs. Almost all mobile devices are supported by battery powers, so the power-efficient issue is one of the most important design issues in MANET. Solutions to the energy-efficient issue in MANET can generally be categorized as follows:

1) Low-Power Mode, in which mobile devices can support low-power sleeping mode. The main research challenges in low-power mode are that at what time mobile node can turn to sleeping mode, and at what time it should wake up. Corresponding issues are addressed in [3], [4], [5] and etc;

2) Transmission Power Control: In wireless communication, transmission power has strong impact on transmission range, bit error rate and inter-radio interference, which are typically contradicting factors. By adjusting its transmission power, mobile node can select its immediate neighbors from others, thus the network topology can be controlled in this way. How to determine transmission power of each node so as to determine the best network topology has been addressed in [6], [7], [8] and etc;

3) Power-Aware Routing: Other than the common shortest-hop routing protocols, such as DSDV [9], AODV [10].

II. WORKING OF AODV

Each mobile host in the network acts as a specialized router and routes are obtained as needed, thus making the network self-starting. Each node in the network maintains a routing table with the routing information entries to its neighboring nodes, and two separate counters: a node sequence number and a broadcast-id. When a node (say, source node 'S') has to communicate with another (say, destination node 'D'), it increments its broadcast-id and initiates path find by broadcasting a route request packet RREQ to its neighbors. The (source-adder, broad case-id) pair is used to identify the RREQ uniquely. Then the dynamic route table entry establishment begins at all the nodes in the network that are on the path from S to D.

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As RREQ travels from node to node, it automatically sets up the reverse path from all these nodes back to the source. Each node that receives this packet records the address of the node from which it was received. This is called Reverse Path Setup. The nodes maintain this info for enough time for the RREQ to traverse the network and produce a reply to the sender and time depends on network size. If an intermediate node has a route entry for the desired destination in its routing table, it compares the destination sequence number in its routing table with that in the RREQ. If the destination sequence number in its routing table is less than that in the RREQ, it rebroadcasts the RREQ to its neighbors. Otherwise, it uncast a route reply packet to its neighbor from which it was received the RREQ if the same request was not processed previously (this is identified using the broadcast-id and source-addr). Once the RREP is generated, it travels back to the source, based on the reverse path that it has set in it until traveled to this node. As the RREP travels back to source, each node along this path sets a forward pointer to the node from where it is receiving the RREP and records the latest destination sequence number to the request destination. This is call Forward Path Setup. If an intermediate node receives another RREP after propagating the first RREP towards source it checks for destination sequence number of new RREP. The intermediate node updates routing information and propagates new RREP only, If the Destination sequence number is greater, OR If the new sequence number is same and hop count is small, or else, it just skips the new RREP. This ensures that algorithm is loop-free and only the most effective route is used.

III. WORKING OF DSDV

Each node in the network maintains routing table for the transmission of the packets and also for the connectivity to different stations in the network. These stations list for all the available destinations, and the number of hops required to reach each destination in the routing table. The routing entry is tagged with a sequence number which is originated by the destination station. In order to maintain the consistency, each station transmits and updates its routing table periodically. The packets being broadcasted between stations indicate which stations are accessible and how many hops are required to reach that particular station. The packets may be transmitted contain the layer2 or layer 3 addresses. Routing information is advertised by broadcasting or multicasting the packets which are transmitted periodically as when the nodes move within the network. The DSDV protocol requires that each mobile station in the network must constantly; advertise to each of its neighbors, its own routing table. Since, the entries in the table my change very quickly, the advertisement should be made frequently to ensure that every node can locate its neighbors in the network. This agreement is placed, to ensure the shortest number of hops for a route to a destination; in this way the node can exchange its data even if there is no direct communication link. The data broadcast by each node will contain its new sequence number and the following information for each new route:

The destination address

The number of hops required to reach the destination and

The new sequence number, originally stamped by the destination

The transmitted routing tables will also contain the hardware address, network address of the mobile host transmitting them. The routing tables will contain the sequence number created by the transmitter and hence the most new destination sequence number is preferred as the basis for making forwarding decisions. This new sequence number is also updated to all the hosts in the network which may decide on how to maintain the routing entry for that originating mobile host.

After receiving the route information, receiving node increments the metric and transmits information by broadcasting. Incrementing metric is done before transmission because, incoming packet will have to travel one more hop to reach its destination.

IV. SIMULATION PARAMETERS

Parameter	Value
Simulator	ns-2
Simulation time	750 seconds
Simulation area	1000 m x 1000 m
Max Packet	50
Node movement model	Random waypoint
Number of Mobile nodes	81
Network interface type	Phy/WirelessPhy
MAC Type	Mac/802.11
Node pause time	150s
Bandwidth	10 Mbps

V.PERFORMANCE MATRICES

Total Bytes: The byte is a unit of digital information in computing and Telecommunications that most commonly consist of eight bits.

Total Data Packets: In its simplest form, a packet is the basic unit of information in network transmission. Total data packets are the combination of packets send from source and received on destination.

Data Packets Sent: The Total data Packets that are sent from the source node in a network to receive at sink node.

Data Packets Received: Total Data Packets received finally at sink. They are the different between Total Sent packets and Drop packets.

VI. PROPOSED SYSTEM

The major goal of research is to analyze the behavior of the both reactive Ad hoc On- demand Distance Vector protocol (AODV) and proactive Destination Sequenced Distance Vector (DSDV) in high mobility scenario under dense and sparse medium. Unlike military applications, most of the other applications of MANETs require moderate to high mobility. That's why it becomes important to analyze the behavior of high mobility.

The behavior is analyzed with respect to delay, data delivery (bytes), total data send and receive. Simulation results give the behavior of both AODV and DSDV in both dense and sparse medium. An ad hoc mobile network is a collection of mobile nodes that are dynamically and arbitrarily located in such a manner that the interconnections between nodes are capable of changing on a continual basis.

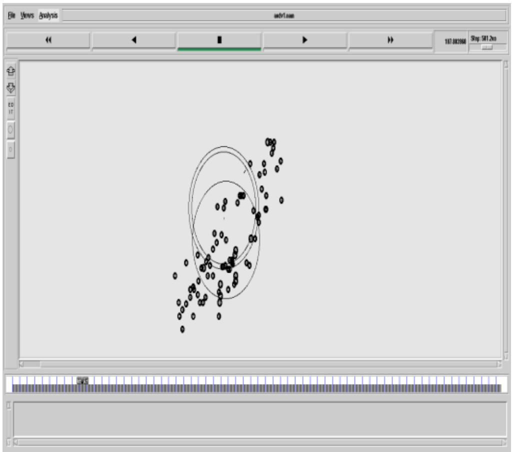

Figure 1. AODV for Dense Network Simulation Result- I

The above Figure 1 highlights the total of 81 mobile nodes in Dense Network in MANET

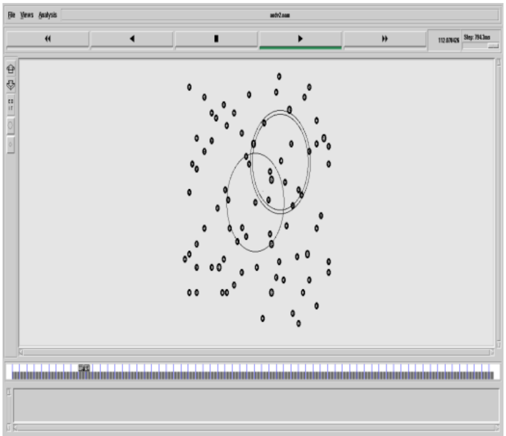

Figure 2. AODV for Sparse Network Simulation Result-II

The above Figure 2 highlights the total of 81 mobile nodes in Sparse Network in MANET.

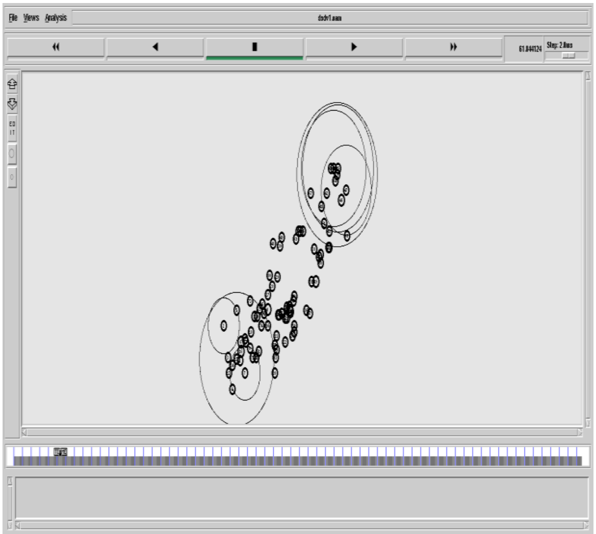

Figure 3. DSDV for Dense Network Simulation Result- III

The above Figure 3 highlights the total of 81 mobile nodes in Dense Network in MANET.

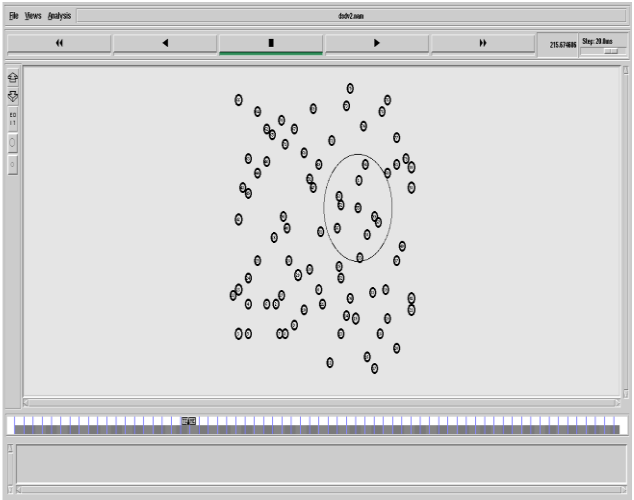

Figure 4. DSDV for Sparse Network Simulation Result- IV

The above Figure 4 highlights the total of mobile nodes in Sparse Network in MANET.

VII.RESULT ANALYSIS

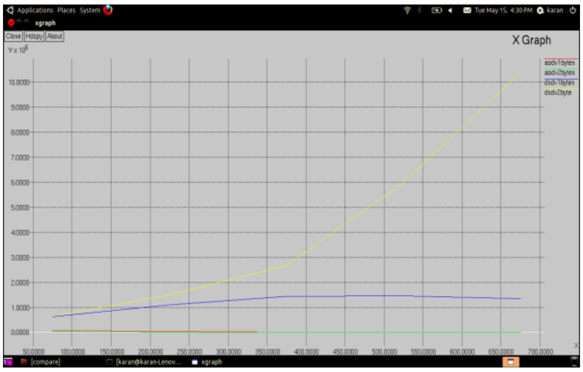

Figure 5 Comparisons of Total Bytes in AODV and DSDV in sparse and dense medium

In figure 5, we can see the Performance of DSDV in both dense and sparse medium increases in terms of Total bytes sent as the simulation time increases.

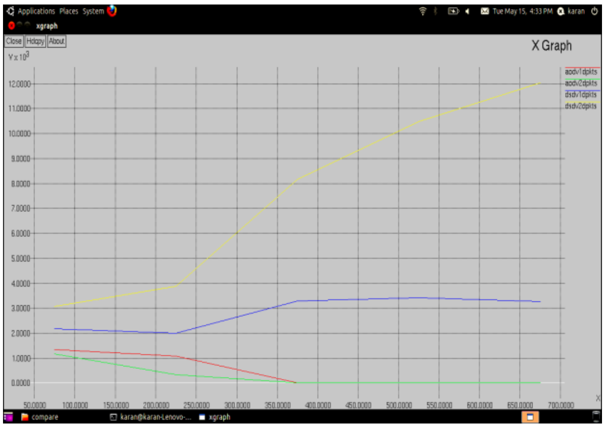

Figure 6 Comparisons of Total data packets in AODV and DSDV in sparse and dense medium

In figure 6, we can see as the simulation time increases the Performance of DSDV increases while the Performance of AODV Decreases in Terms of Total Data Packets.

Figure 7 Comparisons of Total sent packets in AODV and DSDV in sparse and dense medium

In figure 7, we can see that the Performance of AODV and DSDV in both Dense and Sparse initially Decreases as the simulation time increases but then the Performance of AODV in both Medium Decreases while Performance of DSDV in both Dense and Sparse Medium Increases.

Figure 8 Comparisons of Total received packets in AODV and DSDV in sparse and dense medium

In Figure 8, We can see that the Performance of both AODV and DSDV in both Dense Sparse Medium Decreases initially and then as Simulation time increases Performance of AODV decrease while Performance of DSDV in increases in Terms of Received Packets as **increase in Simulation time.**

VIII. CONCLUSION

The dissertation provides descriptions of several routing schemes proposed for ad hoc mobile networks. We also provide a classification of these schemes according to the routing strategy (i.e., table-driven and on-demand). We have presented a comparison of these two categories of routing protocols, highlighting their features, differences, and characteristics. Finally, we have identified possible applications and challenges facing ad hoc mobile wireless networks. While it is not clear that any particular algorithm or class of algorithm is the best for all scenarios, each protocol has definite advantages and disadvantages, and is well suited for certain situations. The field of ad hoc mobile networks is rapidly growing and changing, and while there are still many challenges that need to be met, it is likely that such networks will see widespread use within the next few years.

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