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A Comparison Study of Qos Using Different Routing Algorithms In Mobile Ad Hoc Networks

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Abstract*:* In order to increase the routine of the network, Quality of Service (QoS) is the measure to achieve better routine. If the refuge is increased, the QoS of the network decreases. This is cause of the impact of the overload cause due to refuge, which degrades the routine. To overcome this problem, this paper proposes to use three routing protocols like Destination Sequenced Distance Vector (DSDV), Dynamic Source Routing (DSR) and Ad Hoc On-Demand Distance Vector Routing (AODV) and the routine have been implemented. This paper presents an analysis of refuge and QoS self-optimization which can automatically adapt the network refuge level and QoS with minimum requirements while aiming to provide more than the minimum refuge and QoS. Simulation results show that the routine of DSR is better than DSDV and AODV protocol. A variety of parameters, as characterized by mobility and size of the ad hoc network were simulated. The routine differentials are analyzed using varying mobility, and network size.

Keywords— AODV, DSR, DSDV.

I. INTRODUCTION

A Mobile Ad-hoc Network (MANET) is a kind of wireless ad-hoc network, and is the collection of mobile nodes where the nodes will self configure and self optimize themselves of mobile routers (and associated hosts) connected by wireless links. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a standalone fashion, or may be connected to the larger internet. It is also expected to play an important role in civilian forums such as campus recreation, conferences, and electronic classrooms, military, earthquake etc. Due to the mobility of nodes, the topology of the network may changes. In MANETs, the nodes must be able to relay traffic since communicating nodes might be out of range. The inherent feature of communications quality in a MANET makes it difficult to offer fixed guarantees on the services offered to a device. Providing different quality of service levels in changing environment will be a challenging issue. One of the main factors in Ad-hoc network is to develop a routing protocol which must be capable of handling large number of nodes in the network with secure communication among the nodes and improving the quality of service in the network. The existing routing techniques for network services, and poses a number of challenges ensuring the refuge of communication. Many ad hoc routing protocols have been proposed to solve the refuge issues to route packets among participating nodes. This paper mainly discusses the routine analysis of refuge and QoS of three wireless multi-hop routing protocols; reactive protocols like DSR and AODV, and proactive protocol, DSDV. It focus on the routine of both proactive and reactive protocols specifically AODV, DSR (reactive) and DSDV (proactive) protocols in dynamic environment. This motivates, to compare Ad Hoc routing protocols and analyze results of these protocols. This needs to study the behaviour of each protocol and how they performing in different scenarios and to find, which protocol performs better under a particular simulation.

The rest of this paper is organized as follows, System model is given in Section 2. Section 3 discusses the proposed routing protocol. Simulation results are presented in Section 4. Section 5 concludes this System Model.

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II. SYSTEM MODEL

Mobile Ad Hoc Networks are wireless networks which do not need any infrastructure support for transferring data between nodes. In this network, nodes also work as a router, which means that they also route packets for other nodes. Thus a node can be a host or router at different times depending upon the situation i.e. if the node wants to send or receive data, then it will act as a host and if it has to just transfer some data packet to other node, then it will act as a router. It is a standard that controls how the nodes decide which way to route packets between computing devices in a mobile ad-hoc network. Nodes are free to move, independent of each other. Topology of such networks keeps on changing dynamically which makes routing much difficult. Therefore routing is one of the most concerned areas in these networks. Normal routing protocols which work well in fixed networks do not show the same routine in Mobile Ad Hoc Networks because the requirements differ in the two scenarios. In wireless networks, routing protocols should be more dynamic so that they quickly respond to topological changes which occur frequently in these networks. The dynamic nature of MANETs is attributed to several inherent characteristics, such as variable link behaviour, node movements, changing network topology and application demands. Providing QoS in such a dynamic environment is very difficult. Quality Service and a related refuge framework that supports QoS functionalities to improve the system availability, and efficiency, while maintaining the refuge of the distributed system.

The routing protocols fall into two categories:

1. Reactive *2. Proactive*

In Reactive routing protocol does not use bandwidth except when needed. It establishes routes "on demand" by flooding a query. Much network overhead is present in the flooding process when querying for routes. The Proactive routing protocols are consistent and up-to- date routing information to all nodes is maintained at each node.

III. AD-HOC ROUTING PROTOCOLS DESCRIPTION

Many QoS routing algorithms represent an extension of existing classic best-effort routing algorithms. Many routing protocols have been developed which support establishing and maintaining multi-hop routes between nodes in MANETs. These algorithms can be classified into two different categories: on-demand (reactive) such as DSR and AODV and table-driven (proactive) such as Destination Sequenced Distance Vector protocol (DSDV).Table-driven routing protocols (DSDV) attempt to maintain up-to-date routing information from each node to every other node in the network. Every node in this network maintains the route table to store route information. On the other hand, on-demand routing protocols create route only when needs araise. When a source needs a route to a destination, it starts route discovery and maintenance.

A.DSR- Dynamic Source Routing Protocol:

DSR is one of the most well known routing algorithms for ad hoc wireless networks. DSR uses source routing, which allows packet routing to be loop free. It increases its efficiency by allowing nodes that are either forwarding route discovery requests or overhearing packets through promiscuous listening mode to cache the routing information for future use. DSR is also on demand, which reduces the bandwidth use especially in situations where the mobility is low. It is a simple and efficient routing protocol for use in ad hoc networks. It has two important phases, route discovery and route maintenance. The main algorithm works in the following manner. A node that desires communication with another node first searches its route cache to see if it already has a route to the of destination. If it does not, it then initiates a route discovery mechanism. This is done by sending a Route Request message. When the node gets this route request message, it searches its own cache to see if it has a route to the destination. If it does not, it then appends its id to the packet and forwards the packet to the next node; this continues until either a node with a route to the destination is encountered (i.e. has a route in its own cache) or the destination receives the packet. In that case, the node sends a route reply packet which has a list of all of the nodes that forwarded the packet to reach the destination. This constitutes the routing information needed by the source, which can then send its data packets to the

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destination using this newly discovered route. Although DSR can support relatively rapid rates of mobility, it is assumed that the mobility is not so high as to make flooding the only possible way to exchange packets between nodes.

B. AODV - The Ad Hoc On-demand Distance-Vector Protocol

AODV is another routing algorithm used in ad hoc networks. Unlike DSR, it does not use source routing, but like DSR it is on-demand. In AODV, to initiate a route discovery process a node creates a route request (RREQ) packet. The packet contains the source node's IP address as well as the destination's IP address. The RREQ contains a broadcast ID, which is incremented each time the source node initiates a RREQ. The broadcast ID and the IP address of the source node form a unique identifier for the RREQ. The source node then broadcasts the packet and waits for a reply. When an intermediate node receives a RREQ, it checks to see if it has seen it before using the source and broadcast ID's of the packet. If it has seen the packet previously, it discards it. Otherwise it processes the RREQ packet. To process the packet the node sets up a reverse route entry for the source node in its route table which contains the ID of the neighbour through which it received the RREQ packet. In this way, the node knows how to forward a route reply packet(RREP) to the source if it receives one later. When a node receives the RREQ, it determines if indeed it is the indicated destination and, if not, if it has a route to respond to the RREQ. If either of those conditions is true, then it unicasts a route reply (RREP) message back to the source. If both conditions are false, i.e. if it does not have a route and it is not the indicated destination, it then broadcasts the packet to its neighbours. Ultimately, the destination node will always be able to respond to the RREQ message. When an intermediate node receives the RREP, it sets up a forward path entry to the destination in its route cache. This entry contains the IP address of the destination, the IP address of the neighbour from which the RREP arrived, and the hop count or distance to the destination. After processing the RREP packet, the node forwards it toward the source. The node can later update its routing information if it discovers a better route. This could be used for QoS routing support to choose between routes based on different criteria such as reliability and delay. To provide such support additional QoS attributes would need to be created, maintained, and stored for each route in the routing table to allow the selection of the appropriate route among multiple routes to the destination.

C. DSDV - The Destination Sequenced Distance Vector Protocol :

DSDV is one of the most well known table-driven routing algorithms for MANETs. It is a distance vector protocol. In distance vector protocols, every node maintains for each destination a set of distances for each node *j* that is a neighbor of node *i* treats neighbor *k* as a next hop for a packet. The succession of next hops chosen in this manner leads along the shortest path. In order to keep the distance estimates up to date, each node monitors the cost of its outgoing links and periodically broadcasts to all of its neighbors its current estimate of the shortest distance to every other node in the network. The distance vector which is periodically broadcasted contains one entry for each node in the network. DSDV is a distance vector algorithm which uses sequence numbers originated and updated by the destination, to avoid the looping problem caused by stale routing information.

In DSDV, each node maintains a routing table which is constantly and periodically updated (not on-demand) and advertised to each of the node's current neighbors. Each entry in the routing table has the last known destination sequence number. Each node periodically transmits updates, and it does so immediately when significant new information is available. The data broadcasted by each node will contain its new sequence number and the following information for each new route: the destination's address, the number of hops to reach the destination and the sequence number of the information received regarding that destination, as originally stamped by the destination. No assumptions about mobile hosts maintaining any sort of time synchronization or about the phase relationship of the update periods between the mobile nodes are made. Following the traditional distance- vector routing algorithms, these update packets contain information about which nodes are accessible from each node and the number of hops necessary to reach them. Routes with more recent sequence numbers are always the preferred basis for forwarding decisions. Of the paths with the same sequence number, those with the smallest metric (number of hops to the destination) will be used. The addresses stored in the route tables will correspond to the layer at which the DSDV protocol is operated.

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D. NS2

The routine analysis has been done on Fedora 8 as the Operating System. NS 2.39 was installed on the platform for simulating the protocols along with necessary software such as perl and Trace graph for plotting graphs from the trace files. NS (version 2) is an object oriented, discrete event driven network simulator written in C++ and Otcl. It implements network protocols such as TCP and UDP, traffic source behavior such as FTP, Web, CBR and, router queue management mechanism such as Drop Tail, RED and CBQ, routing algorithms. NS also implements multicasting and some of the MAC layer protocols for LAN simulations.

IV. SIMULATION RESULTS

Simulations have been conducted with varying the node density and Source-Destination pairs. Following metrics are used for evaluation.

1. *Routing overhead:* The total number of routing packets transmitted by sending or receiving node which involved in the session during the simulation.

2. *Throughput*: It is the amount of data moved successfully from one place to another in a given time period.

3. Packet Drop ratio: It describes how many packets were lost in transmit between the source (or input) and destination (or output).

4. *Packet Received ratio:* It describes that number of packets received and number of packets sent.

Routing Overhead is an important metric for comparing these protocols. The degree to which congested and low bandwidth environments which should be secure transmits the packets and maintains the quality of service. The protocols which send large number of routing packets can increase with minimum delay time and minimize the dropping of packets. Fig 1 shows overhead of routing protocols, where it contains AODV, DSR, DSDV plots. And it decides that DSR is having less overhead than others. Fig 2 shows the comparison of Throughput analysis, whereas DSR Throughput is increased to that of AODV. Fig 3 Received ratio of DSDV, AODV, DSR, and it clearly shows that DSR have high receiving packets. In Fig 4 Drop ratio of DSDV, AODV, DSR where DSR shows less drop ratio than others.

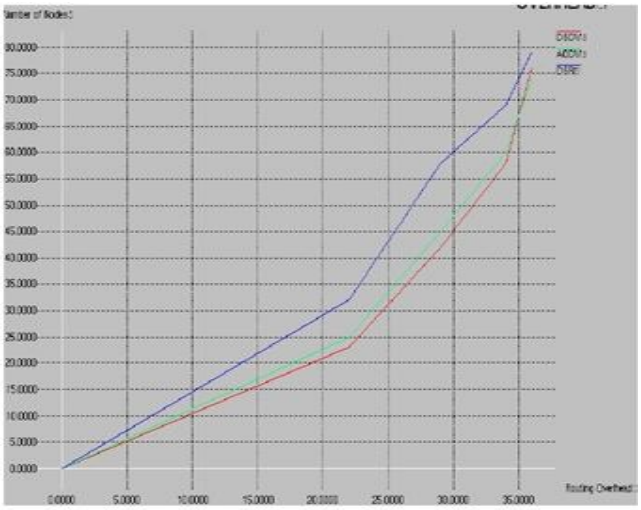

Fig1: Comparison of Routing Protocol Overheads

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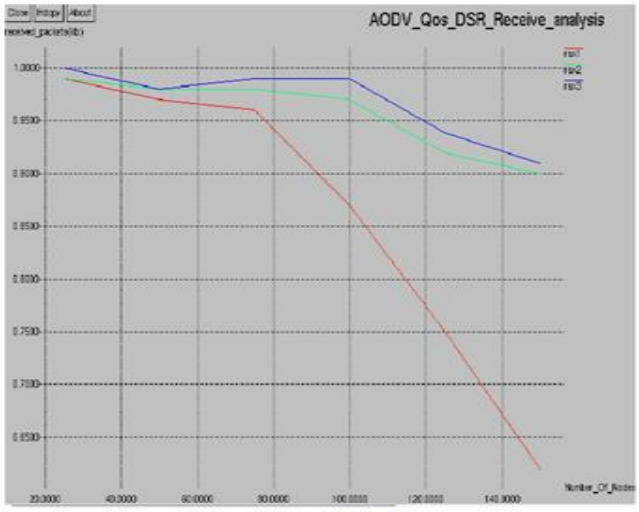

Fig 3: Received Ratio of DSR, AODV and DSDV

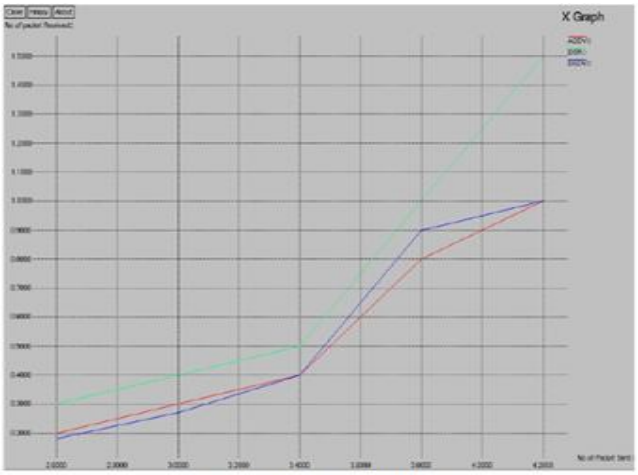

Fig 2 : Throughput of DSR, AODV and DSDV

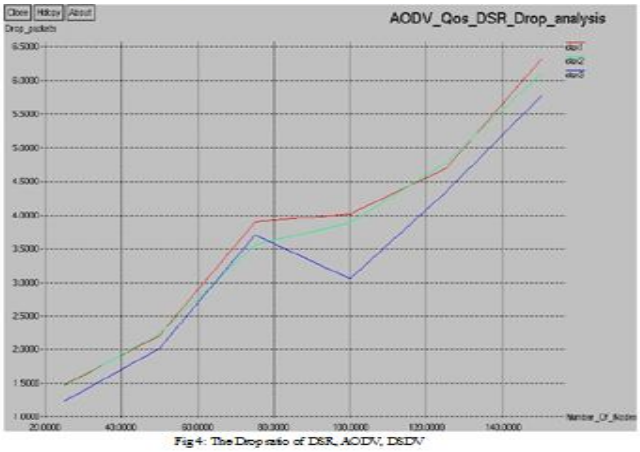

Fig 4: The Drop ratio of DSR, AODV, DSDV

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V. CONCLUSION

This work presents a detailed comparative analysis of routing protocols i.e., AODV, DSR, and DSDV for ad hoc networks. This concludes that the refuge and QoS is increased using the DSR routing protocols routine compared with the other two routing protocols. The overhead and the drop ratio of the DSR is better compared with the other two routing protocols.

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