PERFORMANCE COMPARISON BETWEEN DSDV AND AODV ROUTING PROTOCOLS IN MANET

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ABSTRACT

An ad-hoc network is the cooperative rendezvous of a collection of mobile nodes without the required intervention of any centralized access point or existing infrastructure. Due to infrastructure less and dynamic nature of such networks, there is requirement of new set of networking strategies which is to be implemented for efficient end-to-end communication. This paper provides an overview of two different routing protocols, first routing protocol is the Destination Sequenced Distance-Vector routing protocol (DSDV), it belongs to the table driven category (proactive) routing protocols. The second routing protocol is the Ad-Hoc On-demand Distance Vector Routing protocol (AODV), it belongs to the on-demand category (reactive) routing protocols, in this paper we will study that two routing protocols by presenting their characteristics and functionality, and then provides a performance comparison. This paper also includes simulation for that tow routing protocols by using Network Simulation program (NS-2). This paper also includes future research directions in this area.

Keywords: Ad-Hoc, Routing Protocol, DSDV, AODV, performance comparison.

I. INTRODUCTION

Ad Hoc Networks (MANETs) [3, 4, 5] being researched by many different organizations and academia. MANETs employ the traditional TCP/IP structure to provide end-to-end communication between the nodes. However, due to their mobility and the limited resource in wireless networks, each layer in the TCP/IP model requires redefinition or modifications to function efficiently in MANETs. One interesting research area in MANET is routing. Routing in the MANETs is a challenging task due to its characteristics and has received a tremendous amount of attention from researchers. Therefore, it is quite difficult to determine which protocols may perform best under a number of different network scenarios (after considering static or dynamic parameters), such as increasing node density and traffic. A wireless device (cellphone) within these networks connects to, and communicates with, the nearest base station that is within its communication radius. As the device (wireless cellphone) 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. Typical applications of this type of network include office *Wireless Local Area Networks (WLANs)*. Wireless Networks is a network which has

no fixed routers; all nodes are capable of movement and can be connected dynamically in an arbitrary manner. This paper examines two routing protocols designed for such kind of ad hoc networks by describing the operation of each of the protocols and then comparing their various characteristics. The remainder of this paper is organized as following: Section 2 gives a definition of a routed and a routing protocol, Section 3 discusses current table-driven routing protocols by Destination Sequenced Distance Vector (DSDV) [2, 3, 7, 8] routing protocol, while a section 4 describes those protocols which are classified as on-demand routing protocols by Ad-Hoc On-demand Distance Vector routing protocol (AODV) [1, 3, 7, 8, 10] and finally a general comparison of table-driven and on-demand routing protocols.

II. RELATED WORK

Before explaining the details of routing in an Ad Hoc network a definition of a routed and a routing protocol should be done.

• ***Routed protocols*:** IP (Internet Protocol), Telnet, RPC (Remote Procedure Call), SNMP (Simple Network Management Protocol) are examples of routed protocols.

• ***MANET routing protocols:*** Routing in a MANETs is an important aspect of a protocol, and will influence on the overall end to end *"quality"* of the link. Each routing protocol has a specific domain and purpose in which it can be used. The following are the major requirements of a routing protocol in ad hoc wireless networks: - Network size/scalability, Minimum route acquisition delay, Change of topology rate, QoS: (Quality of Service), Energy-constrained operation, Support for time-sensitive traffic, Limited physical security, Minimum control overhead

III. TABLE-DRIVEN OR PROACTIVE ROUTING PROTOCOLS

Proactive protocols are extensions of the wired network routing protocols. They maintain the global topology information in the form of tables at every node. These tables are updated frequently in order to maintain consistent and accurate network state information. The destination sequenced distance-vector routing protocol (DSDV) [2, 3, 7, 8], is example for the protocols that belong to this category.

(DSDV) is one of the first protocols proposed for ad hoc wireless networks. In Bellman-Ford algorithm, each node maintains a table that contains the shortest distance and the first node on the shortest path to every other node in the network. Table updates are initiated by a destination with a new sequence number which is always greater than the previous one.

The following graphs are the results of the simulation to DSDV routing protocol by using NS-2. This Performance Graph (Figure 1) represent Time (x-axes) and Number of Nodes during exchange the packets with changing Nodes location (y-axes), (Figure 2) illustrate the differences performance of the distance-vector routing protocol (DSDV) after increasing the nodes number. The availability of

routes to all destinations at all times implies that much less delay is involved in the route setup process.

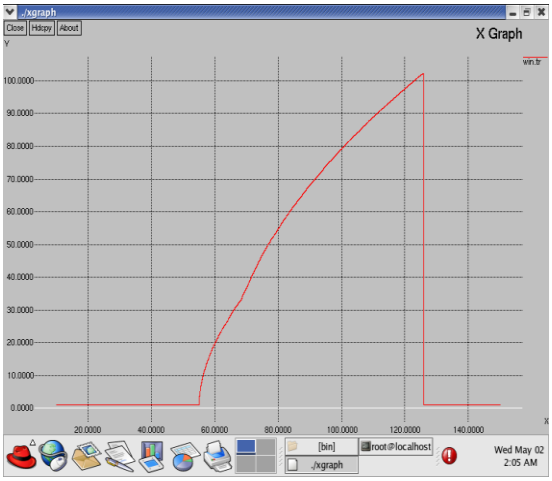

Figure 1

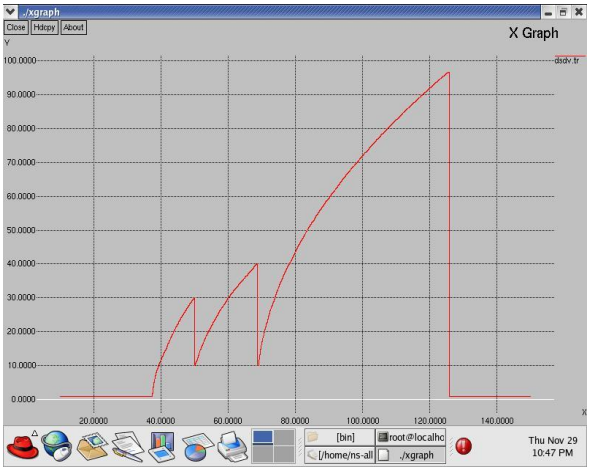

Figure 2

The updates due to broken links lead to a heavy control overhead during high mobility, this protocol suffers from excessive control overhead that is proportional to the number of nodes in the network and therefore is not scalable in ad hoc wireless networks, which have limited bandwidth and whose topologies are highly dynamic.

IV. ON-DEMAND OR REACTIVE ROUTING PROTOCOLS

On demand driven or the source initiated protocol is the second category under ad hoc mobile routing protocols. For these types of protocols, it creates routes only when desired by source nodes. When a node requires a route to destination, it initiates route discovery process within the network.

Ad-Hoc On-demand Distance Vector routing protocol [1, 3, 7, 8, and 10] uses route request (RREQ) messages flooded through the network in order to discover the paths required by a source node. An

intermediate node that receives a RREQ replies to it using a route reply message only if it has a route to the destination whose corresponding destination sequence number is greater or equal to the one contained in the RREQ. This effectively means that an intermediate node replies to a RREQ only if it has a fresh enough route to the destination. Otherwise, an intermediate node broadcasts the RREQ packet to its neighbors until it reaches the destination. As the (RREP) is propagated back to the source, all intermediate nodes set up forward route entries in their tables. The route maintenance process utilizes link-layer notifications, which are intercepted by nodes neighboring the one that caused the error. These nodes generate and forward route error (RERR) messages to their neighbors that have been using routes that include the broken link. Following the reception of a RERR message a node initiates a route discovery to replace the failed paths.

The following graphs are the result of the simulation to AODV routing protocol by using NS-2. This Performance Graph (Figure 3) represent Time (x-axes) and Number of Nodes during exchange the packets with changing Nodes location (y-axes), (Figure 4) illustrate the differences performance of the Ad-Hoc On-demand Distance Vector routing protocol after increasing the nodes number.

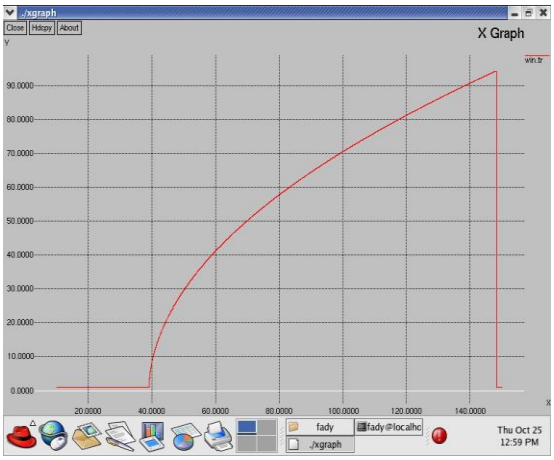

Figure 3

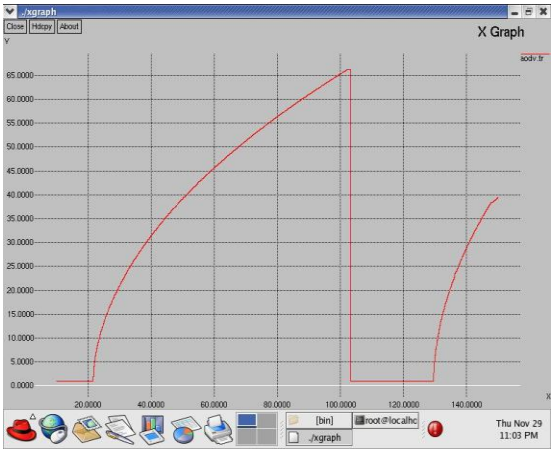

Figure 4

V. COMPARISON BETWEEN ON DEMAND AND TABLE DRIVEN PROTOCOLS

These two types of protocols have their own working areas. At some places one type is suitable and in others second category is used. Choices of protocol depend on the type of network in operation and working requirements. Some of the differences between Table-driven and On-demand are shown in the Table below, The table-driven ad hoc routing approach is similar to the connectionless approach of forwarding packets, with no regard to when and how frequently such routes are desired. It relies on an underlying routing table update mechanism that involves the constant propagation of routing information. This is not the case, however, for on-demand routing protocols. When a node using an on-demand protocol desires a route to a new destination, it will have to wait until such a route can be discovered. On the other hand, because routing information is constantly propagated and maintained in table-driven routing protocols, a route to every other node in the ad hoc network is always available, regardless of whether or not it is needed. This also considers signaling traffic and power consumption. Since both bandwidth and battery power are sacred resources in mobile computers, this becomes a serious limitation.

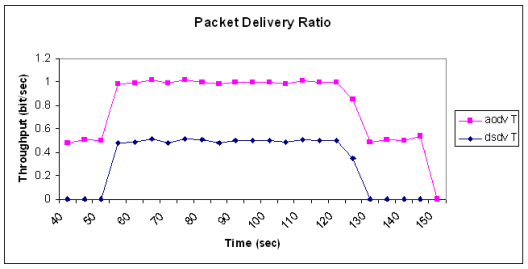

Figure 5

The figure above showing the differences in the packet delivery ratio between DSDV and AODV routing protocols.

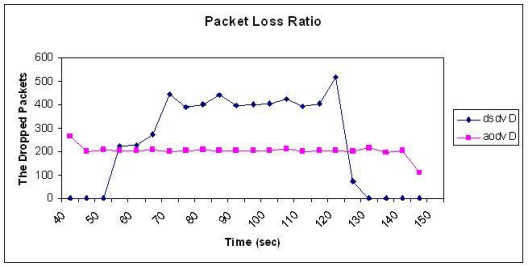

Figure 6

The figure above showing the differences in the packet loss ratio between DSDV and AODV routing protocols.

TABLE

Features	***Reactive- on demand***	***Proactive- table driven***
Overhead	Low	High
Memory requirement	Low	High
Cope with mobility	Good	Bad
Sleep time	High	Low
Purpose	Relatively high mobility	Low - mobility

VII. CONCLUSION AND FUTURE WORK

In this paper we have studied the routing performance in MANETs for table driven (DSDV) and On Demand (AODV) routing protocols. As future work, we intend to develop simulations to analyze the performance of routing protocols with security and power aware aspects. We also plan to study the impact of such aspects and techniques for their identification.

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