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A Review Study on the Use of MANET for Routing Protocol.

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Abstract - Mobile Ad Hoc network is a collection of mobile devices which form a communication network. In MANET, nodes do not know the topology of their network instead, they have to discover it on their own as the topology in the ad-hoc network is dynamic topology. The basic rule is that a new node whenever enters into an ad-hoc network must announce its arrival and presence and should also listen to similar announcement broadcasts made by other mobile nodes. There are multiple types of routing protocols designed for MANETs. This paper presents an investigation of four MANET protocols' performance, namely the Ad Hoc On-Demand Distance Vector (AODV), Destination-Sequenced Distance-Vector (DSDV), Dynamic Source Routing (DSR) and Ad Hoc On-Demand Multipath Distance (AOMDV). These protocols are evaluated using three difference performance metrics; average end-to-end, throughput and packet delivery ratio. Simulations of MANET is conducted to analyze the behavior of these protocols with different node mobility and node speed. From the results, it is indicated that different protocols performs better than the other on different performance metrics. For Average end-to-end metric, AODV is shown as the best performer even with the increment of speed. All four protocols meanwhile shows similar performance when node speed are increased for the throughput performance metric. For the final metric, it is shown that AOMDV returns the highest packet delivery ratio.

Keywords;- MANET AODV AOMDV DSDV Average end-to-end Throughput Packet delivery ratio

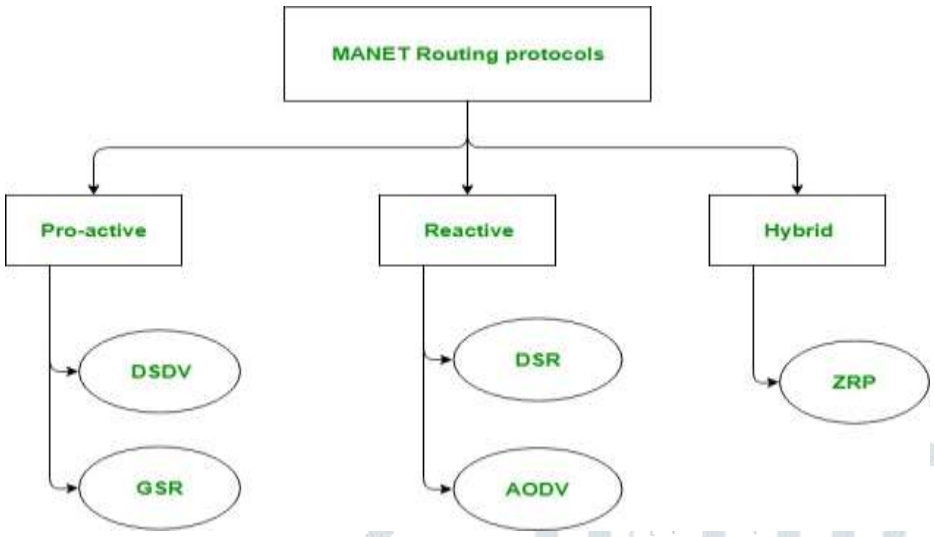
1 Introduction

Mobile Ad Hoc network (MANET) is an infrastructure-less system that has no central server or specialized hardware and fixed routers [1]. Each device plays the role of an independent router and generates independent data as it functions in a dispersed peer-to-peer style. MANET can be operated as a stand-alone network or connected to the internet via a cellular network [2]. This brings different possibilities towards employing MANET technology. In addition, MANET is a Multi-Hop Routing as it does not need a router to operate. There are two types of ad hoc routing which are single-hop and multi-hop routing [3]. Single-hop is simpler than multi-hop as it is low cost, simple structure and easy to implement. Every node plays the role of router and forward packets for information distribution among portable hosts [4].

Previous research shown that MANET are independent from the central network administration as its network is self-configured [5]. Furthermore, MANET does not depend on other networking devices such as servers, switches or even router [6]. This therefore minimizes the number of device used as the nodes themselves can act as routers.

MANET is a technology that allows easier communication due to its dynamic topologies. Nodes in MANET are free to move randomly anywhere in the network [7]. Due to the arbitrary movement of nodes, the network topography (which is classically multi-hop) changes regularly and randomly. Nodes are also free to move with different momentum and speed on unpredictable time [8]. Therefore, it is imperative to know which routing protocols can be employed to provide the best all round performance when connecting multiple nodes in MANET. In this paper, the performance of four different MANET routing protocols namely the Destination-Sequenced Distance-Vector (DSDV), Dynamic Source Routing (DSR), Ad Hoc On-Demand Distance Vector (AODV), and Ad Hoc On-Demand Multipath Distance

(AOMDV) are assessed for comparison. These all are also represented into three different categories , which shown in below diagram .



Diag-1

Pro-active routing protocols are also known as table-driven routing protocols. Each mobile node maintains a separate routing table that contains the information of the routes to all the possible destination mobile nodes.

Since the topology in the mobile ad-hoc network is dynamic, these routing tables are updated periodically as and when the network topology changes. It has a limitation that it doesn't work well for the large networks as the entries in the routing table becomes too large since they need to maintain the route information to all possible nodes.

Reactive routing protocols are also known as on-demand routing protocol. In this type of routing, the route is discovered only when it is required/needed. The process of route discovery occurs by flooding the route request packets throughout the mobile network. It consists of two major phases namely, route discovery and route maintenance.

Hybrid Routing protocol It basically combines the advantages of both, reactive and pro-active routing protocols. These protocols are adaptive in nature and adapts according to the zone and position of the source and destination mobile nodes.

2. Literature Review

Destination-Sequenced Distance-Vector (DSDV) the protocol is a table-driven routing based on an update of the classic Bell-man-Ford routing algorithms in MANET [8]. Each node has a routing table that indicates for each destination, which is the next-hop and the number of hops to the destination. DSDV is also based on the distance vector routing that uses a bidirectional link [10]. In this context, DSDV requires each node periodically to update routing. Each DSDV node maintain routing tables to list the "next hop" so that every destination can be reached. The main advantage of DSDV is loop freedom is guaranteed through distance vector routing.

Dynamic Source Routing (DSR) the protocol composes of two main mechanisms to allow the discovery and maintenance of source routes in the ad hoc networks [11]. Source routing does not need to maintain a middle node to update the routing information to route packets as all routing decisions are continuously updated inside the mobile nodes. DSR contains two mechanisms, namely the Route Discovery and Route Maintenance. In route discovery, DSR floods Route Request Packet to the network [12]. Route Discovery is a mechanism whereby node S sends packets to the des- tination D and have access to the source D. For Route maintenance, DSR provides three successive steps [13]. Route Maintenance is the mechanism whereby the packet forwarding S detect if the network topology has change, the route to the destination D cannot be used because the two nodes that are listed in the route have been out of range of each other. Hence, when Route Maintenance indicates source routing damaged, S notified the route error packet. Sender S can try to use any other route to D for requesting Route Maintenance to seek new password again.

Ad Hoc On-Demand Distance Vector (AODV) is considered as a combination of both DSR and DSDV [8]. This is because AODV borrow the basic mechanism for requesting Route Discovery and Route Maintenance of DSR. In addition, this protocol performs Route Discovery using control messages Route Request (RREQ) and Route Reply (RREP) [9]. When the source node S wants to send data packets to the destination node D but could not find a route in the routing table, the node spreads the message of Route Request (RREQ) to neighboring nodes, including the last known sequence number for the destination. Neighbors

and spread the message RREQ to its neighbors if they do not have a good route to the destination node. This process continues until the message RREQ reaches the destination node or an intermediate node that has a good track.

Ad Hoc On-Demand Multipath Distance (AOMDV) is a multipath extension to the AODV protocol [14]. In AOMDV pro- tocols, multiple routes are founded between the source and destination. In this context, When AOMDV builds multiple paths, it will select the main path for data transmission which is based on the time of routing establishment. The earliest one will be regarded the best, and only when the main path is down other paths can be effective. In fact, numerous studies indicate that this scheme does not necessarily produce the best pat.

3 Methodology

AODV, DSDV, DSR, and AOMDV protocols in different node numbers in MANET are examined in terms of average end-to-end delay, throughput, and packet delivery ratio performance metrics. The end-to-end delay of a path is the sum of all the above delays incurred at each link along the path. Packet Delivery Ratio is the ratio of the successful data packets to the destination generated by the CBR source. Meanwhile, throughput is the number of packets that pass through the network in one unit of time in kbps size.

This research proposes a development of a network simulations that involves three steps; identifying the required research data, identifying the required software and identifying the parameters that affect the network simulation. For verification purpose, the network simulation is analyzed and evaluated. To develop a network simulation, Network Simulator 2 (NS2) is employed. NS2 software is employed to reduce the range of deviations and data errors while improving the accuracy of the research results.

4 Results and Discussion

The performance in terms of average delay end-to-end, throughput and packet delivery ratio are evaluated and compared for AODV, DSDV, DSR and AOMDV. Simulations are conducted on the Network Simulator 2 (NS-2) with network comprising of 3 nodes, 5 nodes, 10 nodes, 15 nodes, 30 nodes and 40 nodes moving over an area of 800 m 800 m for 150 s of simulated time. Constant bit Rate (CBR) traffic is presumed. A 512-byte data packet with 2

packets/second sending rate is assumed for all the experiments. The simulations are set with three different node speed which are 5, 25 and 55 m/s.

5 Conclusion

In general, AODV can be considered more ef*fi*cient routing protocols as the packet delay rate is lower than other protocols. For throughput and packet delivery ratio, we can conclude that AOMDV and DSDV protocols are the two protocols that show the best performance since these two protocols have the highest value. For 15 nodes, better performance of average end to end delay is indicated in general. This is largely due to the movements of the node or the energy of the node that in the simulations.

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