PERFORMANCE EVALUATION OF ROUTING PROTOCOLS IN MANET

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ABSTRACT – Mobile Ad-Hoc Network (MANET) is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized administration. The primary goal of any ad-hoc network routing protocol is to meet the challenges of the dynamically changing topology. The design of these routing protocols is challenging due to the mobility and the dynamic nature of the mobile ad-hoc networks. In this study, the MANET characteristics and challenges are highlighted. A comparative analysis has been carried out among three protocols DSR, DSDV and AOVD in terms of network parameters which based on the specific simulation setting such as size of network nodes (100, 150, and 200). The findings indicate that AOVD protocol works more efficient than the others in varying node density in term of packet loss, Normalized routing load (NLR), and Packet delivery ratio (PDR). According to the examined parameters, AODV shows more efficiency in comparison with DSR and DSDV in term of large scale of network. However, DSR shows a worst efficiency in comparison due to the huge number of loss-packet in contrary with the packet delivery which is very low amount.

1. INTRODUCTION

Wireless networks have become increasingly popular in decades, especially during the period of the 1990s when they have been adapted to allowing mobility and wireless devices to become popular[1]. The proliferation of mobile devices, computing and communications (e.g., mobile phones, laptops, portable digital devices, personal digital assistants) drove the change revolution in the information. Because there are many interesting future applications for mobile ad-hoc networks (MANETs), there still challenges the critical and open problem to be solved. MANET is a technology that efficiently to support communication between a mobile node and is suitable for the entire communications environment areas[2].

Wireless networks are becoming more popular and are wanted in many current and future applications. One of its unique features is that data can be transmitting from one point to another through wireless links. Wireless networks can generally be divided into Infrastructure wireless networks and infrastructure less or ad hoc wireless networks. The wireless networks depend heavily on the concept of the coverage area. The wireless communications technology has made crucial economical, high mobility and efficient working advantages[3].

Many researchers in the last few decades evaluated the performance of various MANET routing protocol and conclude differently. However, the behavior of these routing protocols can be tested to the limit only if several parameters are considered to be a broader scale. Mobile ad-hoc network performance is sensitive to many factors such as the burden of mobility, scalability and traffic. Past research studies about network performance analysis of mobile ad-hoc routing protocols has shown its own results, based on different types of network traffic, network size parameters, by using different network software simulators. One of the key challenges in designing routing protocols for impromptu systems originates from the way that, on one hand, the hub has to know in any event achieve capacity data to neighbors and to decide the way parcel and then again, Network Topology can change regularly in a specially appointed system. Furthermore, as the quantity of system hubs can be extraordinary, additionally discover the way to a goal that requires continuous and Exchange steering control data between hubs. Along these lines, add up to activity updates can be very high, and it is higher when there is the high versatility hub. High versatility hub can influence overhead upkeep way steering conventions such that transfer speed isn't may stay secured for information bundle transmission[4].

2. METHODOLOGY

The simulation environment is set up in a way that three major protocols can be analyzed with different parameters. this research, focuses on the optimizing traffic in MANET. For this purpose, the network will connect with graph. Then the proposed algorithm finds the best path using the nearest neighbor algorithm. The protocols will find the best path for controlling multimedia communication sessions. It is possible to negotiate and select the most suitable measuring for protocols to adopt in the communication from the source to destination. This proposal is to look a suitable codec and paths in order to address the effects of traffic, number of nodes, speed and random movement of nodes in and out of the communication range. The next step is to set the variables, parameters and metrics for the network that is going to be simulated, The suggested scenario consists of selecting the number of nodes with 100,150 and 200 mobile node, node speed is 10 m/s, and pause time with 5 s for all the mentioned protocols, The simulation area is 1500 x 1500 m, with simulation time 50 s, using random way mobility model, MAC type 802.11 and traffic type CBR. We will use three parameters for the comparison of overall network

performance. These parameters are Packet Delivery Ratio, Normalized Routing Load, and number of dropped data packets for protocols evaluation. These parameters are important in the consideration of evaluation of the routing protocols in a communication network. The process flow is shown in figure 1.
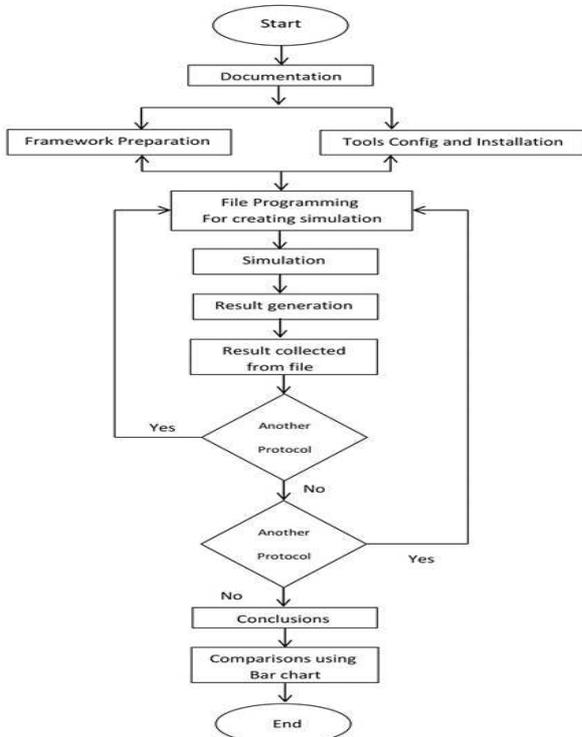

Figure 1: The procedure of protocols analyzing process

3. RESULTS AND DISCUSSION

In this study applied NS-3 to evaluate the DSR, DSDV, AODV routing Protocols with different numbers of mobile nodes, the simulation area of 1500 x 1500 m, with simulation time 50 s, random way mobility model, MAC type 802.11 and CBR traffic. Table 1 shows DSR measured values of the MANET parameters resulted after performing many simulation runs with 100,150 and 200 mobile nodes.

Figure 2 show the varying node density for DSR, DSDV and AODV protocols in which indicate whenever the network density increases, the packet delivery ratio decreased. This is because the more network density is increased the more network being congested, which causes more link failure. In that case, the packet delivery at the destination side is also decreased. Packet delivery ratio is one of those fundamental factors to evaluate the routing protocol effectiveness as well as its efficiency.

Table 1 Shows DSR measured values of the MANET parameters resulted after performing many simulation runs with 100,150 and 200 mobile nodes. DSR shows a worst efficiency in comparison due to the huge number of loss-packet in contrary with the packet delivery ratio which is very low amount. The recorded values indicate a low performance with increase large scale of network.

Table 1 Simulation results for 100,150 and 200 Nodes

Parameter	100 Nodes	150 Nodes	200
Loss-	860	1240	1896
PDR	66	55	43
NLR	33546.1	35641.9	31456.3

As indicated in Figure below, when the number of nodes is 100, it shows that AODV has highest packet delivery ratio , while AODV performance it decreases gradually as the number of nodes increased up to 200, but it remains better from others.
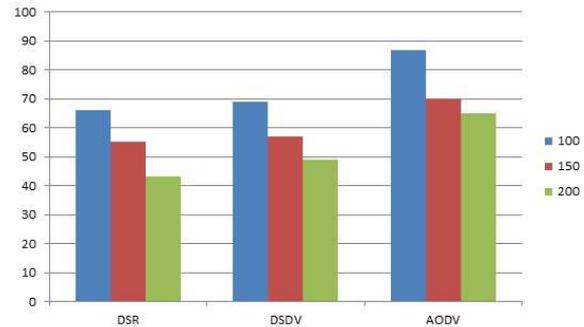

Figure 2 Varying node density vs. Packet delivery ratio

4. CONCLUSIONS

In this study a simulation study using NS-3 was performed to find the impact of routing protocol selection in critical information exchange as a MANET. DSR, DSDV and AODV routing protocols were used and applied to calculate the values of Packet Delivery Ratio, Normalized Routing Load (NRL), No. of dropped data (packets) in many designed network scenarios. Simulation results conclude that The performance differences are analyses basing on varying the simulation time and number of nodes. The study shows that the AODV (reactive protocol) is given better performance in MANET according to simulation results but it is not necessary that AODV perform always better in all the networks. While, DSR shows a worst efficiency when compared between the huge number of losses-packet with the packet delivery low.

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