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Analysis of Application Level Traffics and Routing Protocols in Mobile Ad Hoc Network

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Abstract: ***MANET is abbreviation of mobile ad-hoc network. Mobile ad-hoc network is a set of mobile nodes that communicate with radio links. MANET network infrastructure is not defined and there is no centralized administration for controlling the other activities. MANET consist several routing protocols. AODV is reactive MANET routing protocol. OLSR is a proactive routing protocol and TORA is adaptive MANET routing protocol. In this paper analysis of AODV, OLSR and TORA MANET routing protocols are done on the basis of different application level traffic like HTTP, E-mail, FTP and Voice. Analysis of memory used in simulation with different application traffic is also done. The whole analysis is done on the basis of Delay, Network Load and Throughput using OPNET simulator 14.5.***

Keywords: MANET, AODV, OLSR, TORA, HTTP, E-mail, FTP, Voice, OPNET 14.5

1. Introduction

MANET stands for mobile Ad-hoc network in which there is no defined infrastructure and it does not have centralized administrator for the control over mobile nodes in the network [1].There is no any fixed topology for Mobile Ad Hoc network because of random movement of mobile nodes. A MANET node communicates either wireless links or radio channels hence the topologies are dynamic in nature.

MANET nodes work as router for other mobile nodes in the ad-hoc network , because of this routing in MANET is an important job .The performance is analyzed in MANET then it is necessary condition to know that which types of application generate traffic can be used on the MANET. Here the AODV, OLSR, TORA routing protocols are analyzed with HTTP, FTP, E-mail and Voice.

Ad-hoc network systems communicate directly with each other in the absence of router. In Ad hoc networks, node does not start out with the known topologies of its own network; instead of, they have to discover it. The main idea is that a new mobile node may proclaim its attendance and should pay attention for announcements broadcast by its neighbors. Each system in MANET is free to travel alone in any direction. The main challenge is to make a MANET such that each node continuously maintains information necessary to route the traffic in proper way. In this paper the evaluation of performance of AODV, OLSR and TORA routing protocols for 70 nodes is done using HTTP, FTP, E-mail and Voice traffic with the help of OPNET modeler 14.5. Simulation time memory analysis and HTTP, FTP, E-mail and Voice traffic analysis with individual routing protocols is also done.

1.2. Routing Protocols

Routing protocol define the route to travel the information form source to destination.

1.1.1 AODV-(Ad-Hoc on Demand Distance Vector): AODV [6] is an on demand routing algorithm. The AODV protocol provides a simple method to get change in the link state. AODV creates unicast route from sender to receiver and that's why the network usage is minimum [2].

1.1.2 OLSR-(Optimized Link State Routing: It is Optimized Link State Routing protocol [5] .It is also known as table – driven, proactive routing protocol used in MANET [2]. This is an optimization of pure link state protocols so it decreases the size of control packet as well as the no. of control packets spread required. Entire nodes of the network do not transmit the route packets. Just Multipoint Relay nodes transmit route packets [10].

1.1.3 TORA-(Temporally Ordered Routing Algorithm): TORA is Temporally Ordered routing algorithm. It is highly adaptive algorithm, most efficient and much scalable distributed routing algorithm based on the concept of link reversal. It is anticipated for highly dynamic network, mobile Ad hoc network, multi-hop wireless networks. TORA is a source-initiated on-demand routing Protocol like DSR. This finds numerous routes from a source to a destination node. The main feature of TORA is that the control messages are localized to a very small set of nodes near the occurrence of a topological change.

1.2 Application Level Traffic-

In the simulation environment of HTTP,FTP,E-MAIL and Voice traffic effect evaluation ,one scenario have been implemented and design separately for HTTP,FTP,E-MAIL and Voice heavy traffic load and other parameters. HTTP, FTP, E-MAIL and Voice traffic have been selected because of its importance in the Internet applications. The simulation result shows the effect of HTTP, FTP, E-mail and Voice traffic load on the different routing protocols of MANET. It is understood that the network consists of 70 nodes with speed of 50 m/s. For each simulated scenarios, the analysis parameters are throughput, network load and delay have been analyzed.

2. Background

MANET is a very dynamic network, there is a great scope of MANET applications which make it ideal to use. It is very easy to deploy minimal pact of MANET in emergencies like natural disaster area makes it more suitable. A vast research work has been completed on the performance evaluation of mobile ad-hoc network routing protocols using NS-2.Some dissimilar methods and simulator give several dissimilar results for routing protocols performance. We need to a look in a vast view for the impact of routing protocols those are not analyzed in a particular environment. The idea of this project is to analyze the performance of AODV, OLSR and TORA MANET protocols on OPNET Modeler 14.5. For all these analysis we will use HTTP, FTP, E-MAIL and Voice traffic to show the impact of the ad hoc network routing protocols and memory analysis for simulation.

3. Related Work

There are enormous number of research papers for analyzing several numbers of routing protocols of MANETs under numerous conditions for different mobile nodes and variable mobility parameters. The main motto of this paper is to search that what will be the performance of routing protocols AODV,OLSR and TORA with different traffic loads (FTP, E-mail, Voice and HTTP) with same size network (70 nodes) before using it into real world. It is much difficult to believe all applicable events that can occur in mobile networks and their effect on the performance of the routing protocols. Simulative comparisons frequently make use of the standard simulator such as NS-2 or OPNET. We take OPNET modeler 14.5 to simulate the MANET network under different circumstances.

Pietro Manzoni and Juan-Carlos Cano [8] concentrated on the energy utilization issues of routing protocols and nodes. They evaluate the performance of AODV, DSR, TORA and DSDV MANET routing protocols on energy consumption. Uzmi and Ehsan [7], compared AODV, TORA, DSR and, DSDV performance based on simulations implemented by NS-2. They take, three metrics for normalizing packet delivery fraction average delay (end to end), and, routing overhead, for measuring performance.

4. Performance Metrics

4.1 Delay

The end-to-end delay is the time needed to traverse from the source node to the destination node in a network.

4.2 Network Load

When there is lot of traffic going on in a network and it becomes difficult for a network to handle the traffic. It is said that network is having a load on it and is known as network load.

4.3 Throughput

The average rate at which the data packet is delivered successfully from one node to another over a communication network is known as throughput. Throughput = (no. of delivered packet* packet size)/total time duration of simulation.

5. Simulation Setup

In this research, for analyzing the performance of different MANET routing protocols with respect to different application traffics, we use different parameters. The scenario has been created with 70 mobile nodes and one fixed WLAN server. For traffic generation in the network application definition is used. The application traffic is processed by profile definition so use profile definition node. MANET is the network of mobile node so mobility configuration is used to provide the random mobility to node.

Table 1: Simulation Parameters

Parameter	*Value*
Simulator	OPNET 14.5
Area	2000X2000(m)
Number of nodes	70 node
Mobility model	Random way point
Application Traffic	HTTP,FTP,E-MAIL Voice
Packet reception power threshold	-95
Simulation time	360 sec
Address mode	IPv4(auto assigned)
Start time offset	Constant(100 sec)
Pause time	Constant(10 sec)
Speed	50 (m/s)
Data rate(bps)	11 Mbps
Transmit power	0.005 W
Buffer size(bits)	256000

6. Simulation Results

A network size of 70 nodes and the file size of 20000 bytes (for E-MAIL,HTTP ,FTP and Voice), in a (2000×2000) square meter area .This paper represent the scenarios of 70 nodes which are simulated by taking Reactive routing protocols AODV,OLSR and TORA and showing graphically their delay, network load and throughput. The simulation time is 360 seconds for all cases.

A. Analysis of AODV, OLSR and TORA with E-mail traffic

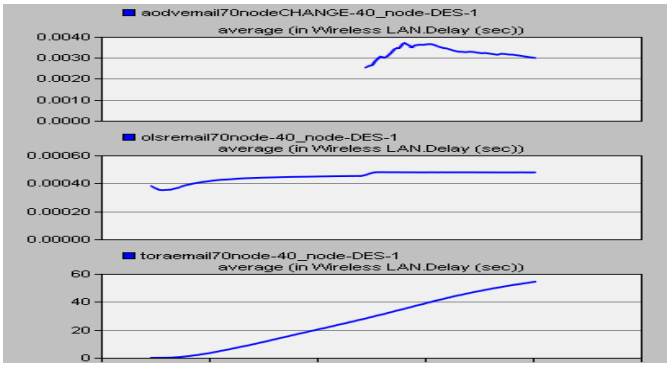

Figure 1: AODV OLSR TORA delay analysis with email traffic

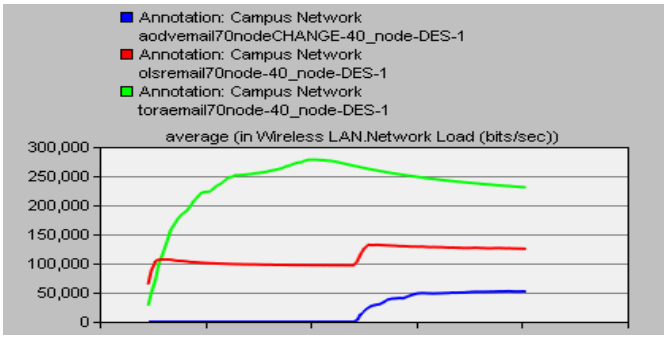

Figure 2: AODV OLSR TORA network load analysis with email traffic

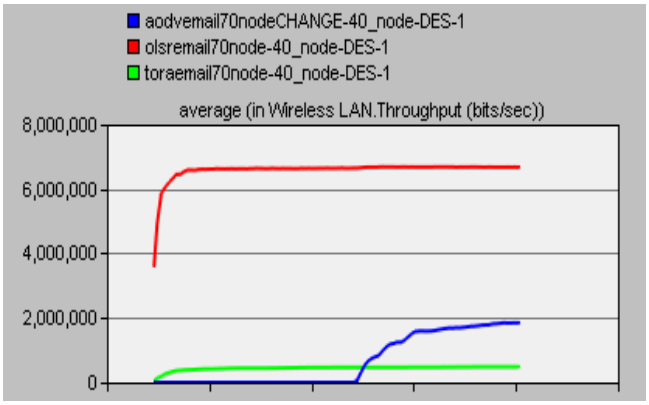

Figure 3: AODV OLSR TORA throughput analysis with email traffic

B. Analysis of AODV OLSR TORA delay, network load and throughput with HTTP traffic

Figure 4: AODV OLSR TORA delay analysis with http traffic

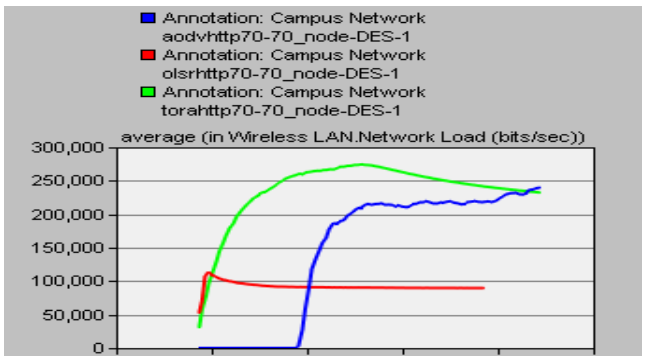

Figure 5: AODV OLSR TORA network load analysis with http traffic

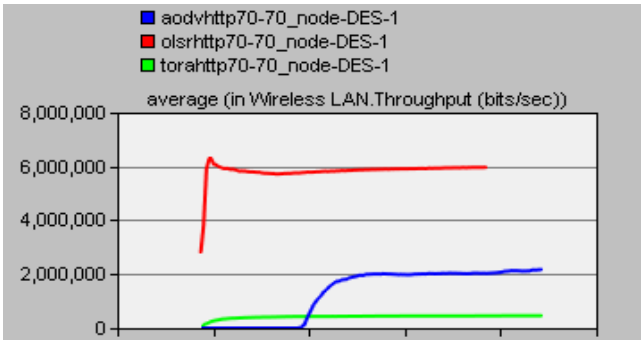

Figure 6: AODV OLSR TORA throughput analysis with http traffic

C. Analysis of AODV OLSR TORA delay, network load and throughput with ftp traffic

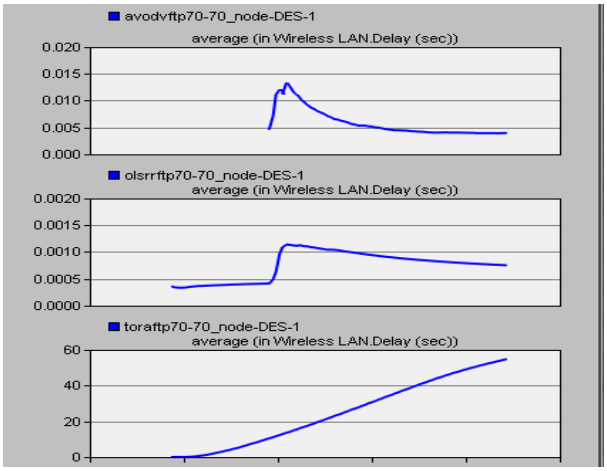

Figure 7: AODV OLSR TORA delay analysis with ftp traffic

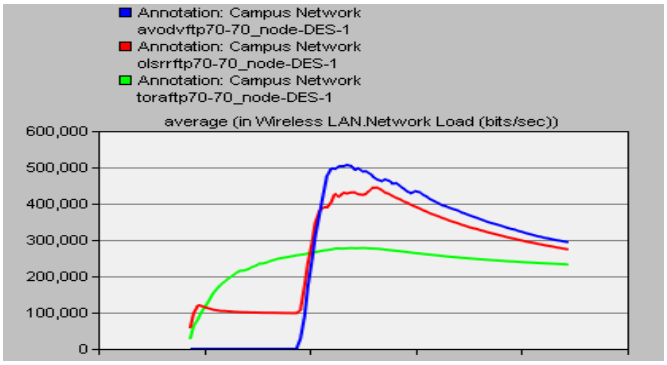

Figure 8: AODV OLSR TORA network load analysis with ftp traffic

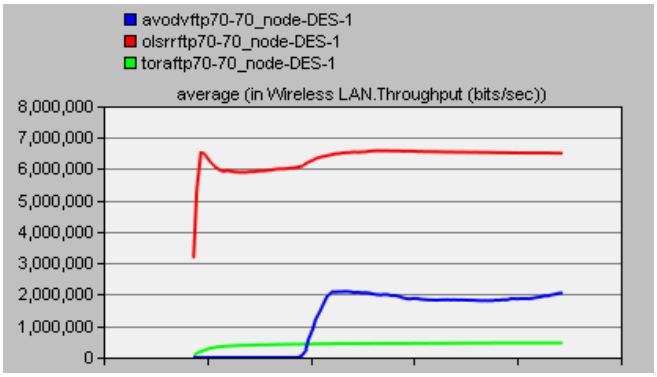

Figure 9: AODV OLSR TORA throughput analysis with ftp traffic

D. Analysis of AODV OLSR TORA delay, network load and throughput with voice traffic

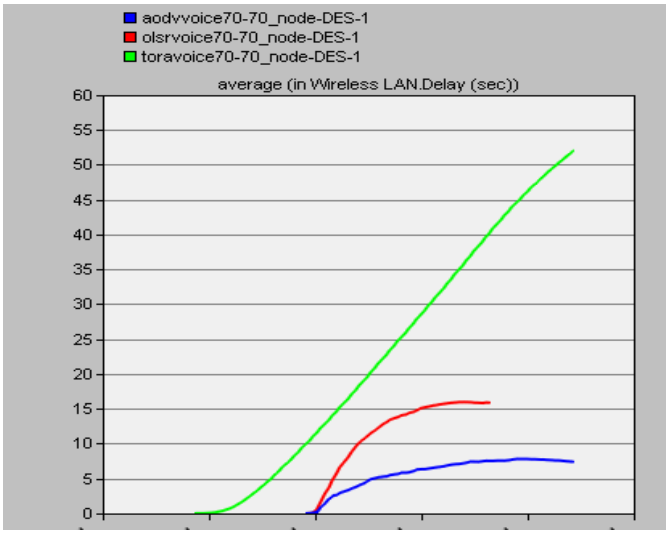

Figure 10: AODV OLSR TORA delay analysis with voice traffic

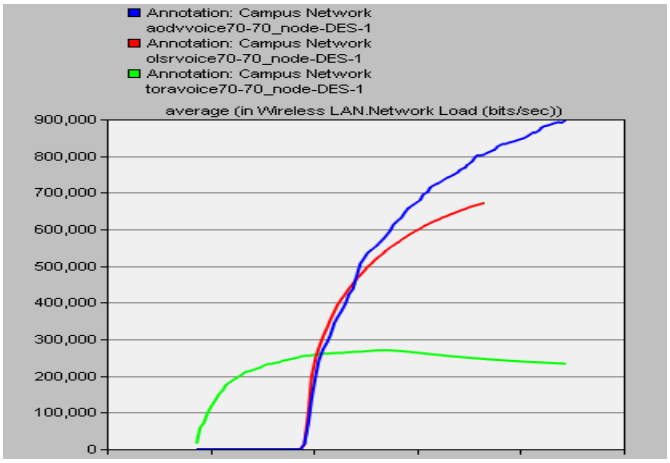

Figure 11: AODV OLSR TORA network load analysis with voice traffic

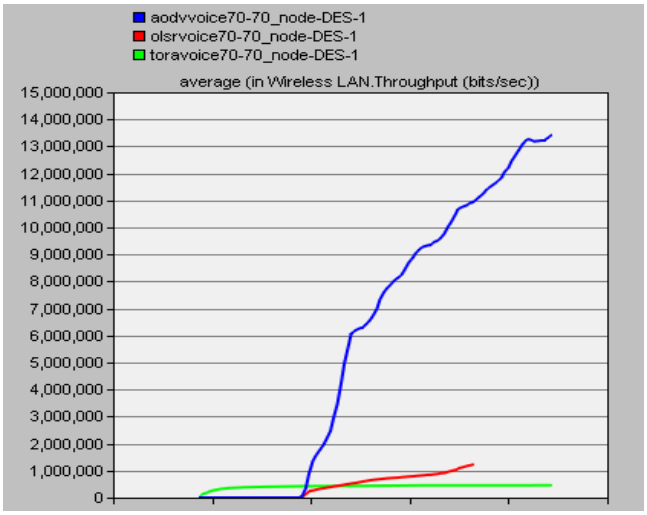

Figure 12: AODV OLSR TORA throughput analysis with voice traffic

7. Conclusion

This paper's objective is to evaluate the performance analysis of various MANET routing protocols AODV, OLSR, and TORA protocols. This analysis considers the effect of network application traffic Ftp, E-mail, voice and HTTP traffic load on different types of MANET routing protocols is taken.

7.1 Performance Analysis of AODV, OLSR and TORA with Application Traffic-

7.1.1 E-mail

AODV has good performance as compare to TORA. AODV has less network load and delay. OLSR has highest throughput and TORA has lowest performance with email traffic.

7.1.2 HTTP:

OLSR has high performance and TORA has low performance with HTTP traffic.

7.1.3 FTP:

Performance of OLSR is good with FTP traffic and TORA perform bad with this traffic.

7.1.4 Voice:

Throughput is high of AODV with Voice. AODV has better performance for voice traffic and TORA has low throughput so it has less performance as compared with AODV and OLSR.

7.2 Performance Analysis of AODV, OLSR and TORA with Memory Usage

AODV performs best because memory usage is very low as compare with OLSR and TORA with E-mail, HTTP, and FTP. Memory usage of TORA is very high in comparison with AODV.

Here the conclusion about Voice traffic, memory usage high with AODV and low with OLSR so OLSR has high performance with voice traffic

8. Future Work

There is a number of works from this research for future such as evaluate the routing protocols with different mobility models. The work of future is to evaluate the performance of different hybrid routing protocol with different application level traffics.

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