Performance Evaluation Of Different Scenario For Reactive TORA And Proactive OLSR Routing Protocols In MANETs

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ABSTRACT

The mobile ad hoc networks had become a main module of the future network development due to their ease of deployment, self-reconfigurability, flexibility and independence on any existing network infrastructure. A Mobile Ad Hoc Network (MANET) a mobile wireless network that doesn't require a pre-existing infrastructure, so it sometimes also call infrastructure less networking. A comprehensive number of MANET routing protocols will be examined and categorized, similarities are deduced and presented. This work focuses on evaluating the performance of protocols an OLSR(Optimized Link State Routing Protocol) table driven protocols, TORA (Temporally-Ordered Routing Algorithm) discovering end-to-end delay, packet delivery ratio, Media Access Delay and Throughput using OPNET simulator. An analysis was done to observed the performance of TORA and OLSR routing protocols using OPNET simulator.

Keywords: MANET, OLSR, TORA, OPNET, END-TO-END DELAY, THROUGHPUT, PACKET DELIVERY RATIO.

1. INTRODUCTION

A Mobile Ad-Hoc Network (MANET) a mobile wireless associations connecting mobile hosts through a wireless connection directly or indirectly relying on other nodes like routers which might be routers and terminals (Adam *et al.*, 2011). Various attributes such as distributed organization, multi-hop routing, well structured architecture and inadequate resources etc. Mobile nodes organize associations and disconnection the distances among them and the enthusiasm to collaborate through the configuration of medium size networks (Keshtgary and Babaiyan, 2012).

Owing to mobility of nodes, network topology in MANET might be change dynamically without turning to any existing centralized administration (Vats *et al.*, 2012). Network performance such as determining the topology and distributing data packets to be accomplish by the nodes either individually or cooperatively. In MANETs each node is a prospective router for added nodes (Nilesh and Mhala, 2010). The assignment of identifying a routing protocol for a mobile wireless network is not a inconsequential. The major difficulty in mobile network is the restricted bandwidth and the rapidity change of topological and link failure reason by node movement (Said *et al.*, 2011). Hence a routing in Ad-Hoc wireless

network cooperate an important responsibility to forwarding data wherever every mobile node be able to perform as a relay in addition to being a foundation or end at node (Kanakaris *et al.,* 2011).

Routing protocol is mainly exploited to find out the shortest, most efficient and correct path(s) while providing the data transmissions between different wireless devices in ad-hoc network. Routing algorithm establishes the connections and formalizes concurrence between nodes that are essential to the whole routine in a MANETs.

Due to different routing techniques, mobile Ad Hoc protocol categorized in proactive (table-driven), reactive (on-demand) and hybrid (mix features of proactive and reactive routing). Through on-demand routing, direction are just created and maintained while needed. Route discovery mechanism is used toward discovering path. Routes to the target remain maintained awaiting no longer needed or become inaccessible (Singh *et al.,* 2012). Proactive routing protocol: as well as table-driven protocols, protocols keep updated routing information at each node within the network. In Hybrid routing environment, grasp the attribute of both proactive and reactive routing protocols. (Keshtgary and Babaiyan, 2012).

Mobile ad hoc networks are designed to be scalable. As the network grows, various routing protocols perform differently. The amount of routing traffic increases as the network grows. An important measure of the scalability of the protocol, and thus the network, is its routing overhead. It is defined as the total number of routing packets transmitted over the network, expressed in bits per second or packets per second (Joshi, 2010).

2. WIRELESS NETWORKS

Recently wireless networks are getting more and more admiration due to their ease of utilization, its mobility, simplicity, affordable and cost saving installation. Consumer/user is no more dependent on wires where he/she is, easy to move and enjoy being connected to the network. As user wants wireless connectivity that enable users to communicate and transfer data with each other without any wired medium irrespective of their geographic position. Therefore all nodes are operating as routers and need to be capable to discover and maintain routes to every other node in the network and to propagate packets accordingly.

One of the immense features of wireless network that makes it captivating and distinguishable among the conventional wired networks is mobility. These features provide user the ability to move liberally, while being connected to the network. Wireless networks comparatively easy to install and could be configured according to the need of the users. These can range from small number of users to large full infrastructure networks where the number of users is in thousands.

MANETs are efficiently and quickly deployed and be a contemptible network solution. MANET (Taruna and Purohit, 2011) is an autonomous system of mobile nodes moving at any time in random dynamic topology, these mobile nodes are self organized and deployed with routing capabilities, communicate over wireless links in the form of peer-to-peer and multi-hop forwarding

connectivity independent of centralized authority.

3. LIMITATIONS OF ROUTING IN MANETS

There are lots of challenges when designing MANETs. While developing and implementing for MANETs bearing in mind installation, operation and maintenance should be offered. Numeral issues which in fact have an effect on the design, implementation and performance of MANETs are: routing, transport layer protocol, multi-casting, security, medium access scheme, quality of service (Qos), self organization, pricing scheme, scalability & deployment considerations,Transmission range limitation, band width of the protocol, rate of errors, Vulnerable to interferences and dynamic nature of frequent topological changes.

Routes between a source and a destination may potentially contain an ordered series of intermediate nodes that act as the routers. The multiple hops communication paradigm has three main performance advantages compared with single hop communication solution:

1) Adaptability. While maintaining a multiple hop data forwarding network, packets can be routed around obstructions captured by enemies, which is very crucial for the battlefield scenario.
2) Spatial reuse. Packet forwarding over multiple hops via small radii-transmissions exploited spatial reuse, by allowing multiple concurrent packet transmissions in different regions of the network and maximize throughput.
3) Energy consumption efficiency. Packet forwarding via multiple small radii transmissions as opposed to a single large radius transmission improved the throughput per unit energy (Qasim *et al.,* 2010).`

4. RESEARCH OBJECTIVE

The basic purpose of this research is to evaluate and examine the routine of OLSR (proactive) table driven protocols, TORA on demand and hybrid routing protocols in mobile ad hoc network. The presentation of routing protocols evaluated carefully by analyzing the affects of changing network parameters such as, number of nodes, pause time, workload and flows among three performance metric end-to-end delay, packet delivery ratio, Media Access Delay and Throughput using OPNET simulator. Finally, using the simulation environment, an analysis is carried out on the results obtained from above perspectives.

5.RELATED WORK

Several researchers have done the qualitative and quantitative analysis of Ad Hoc Routing Protocols by means of different performance metrics. They have used different simulators to measure the best performance for this purpose.

Annapurna and Shailendra (2010) explained that in OPNET simulator TORA the performance variation are made among protocols for different number of nodes. A detail analysis of the performance of protocols based on various important metrics as traffic sent and received, route discovery time and number of hops per route, load and throughput are performed. The network load selected for small size like 20, 50nodes and large size 150, 200 nodes in which one third are mobile nodes and the rest of them are stationary nodes.

Salar (2010) stated that the performance of routing protocols have been evaluated cautiously by analyzing the influence of varying network parameters such as, number of nodes, velocity, pause time, workload and flows on three performance metrics: packet delivery ratio, routing cost and average end- to- end delay. the simulation exertion has been conducted in OPNET simulator.

Kanakaris *et al.*, (2011) evaluated the widely used protocols TORA and OLSR. Their performances are evaluated using different size networks and in mobile circumstances have considered using simulations developed in Network Simulator.

Subramanya and Shwetha (2011) affirmed the performance evaluation of proactive (OLSR) and hybrid routing protocols for stationary and mobile nodes are studied by varying the node density (25, 50, 75, 100, 150, 200 and 250) using Qualnet 5.0.2 network simulator.

Singh *et al.*, (2012) evaluated the functionality of OLSR ad hoc routing protocols using OPNET done and the simulation of Mobile ad hoc network through every nodes in network getting File Transfer Protocol and HTTP transfer beginning to a ordinary source. Accumulating, the mobile nodes, randomly located within the network to present the opportunity of multi hop route beginning a node to the server.

Vats *et al.*, (2012) discussed and evaluated "Optimized Link State Routing Protocol" OLSR routing protocol to better performance. Using OPNET simulator tools for the performance of OLSR routing protocol simulation, created in small network (30 nodes), medium size network (40 nodes) and large network (50 nodes) the complexity of mobile ad-hoc network. Performance of OLSR protocol through a network different size carried out a comparative analysis of the performance and found it had better performance in all aspects in a network.

6. AD HOC NETWORK ROUTING PROTOCOLS

Routing protocols are used to determine paths through the network so a data packet can get from its source, hop by hop, to its destinations. In general, one goal of routing is to choose a suitably efficient path, where efficiency can be measured in terms of end-to-end delay, packet delivery ratio, Media Access Delay and Throughput (Qasim *et al.*, 2010).

6.1 OPTIMIZED LINK STATE ROUTING (OLSR)

An OLSR is table driven as well as proactive link state routing protocol that Link-state routing choose best path by determining a variety of characteristics as link load, delay, bandwidth etc. Link-state routes are more reliable, stable and accurate in calculating best route and more complicated than hop count (Keshtgary and Babaiyan, 2012). Conceptually, OLSR include three general elements: a means for neighbor sensing, a technique for competent flooding of organizing traffic (Srikanth, 2011) and a condition how to choose and disperse adequate topological information inside the network order to establish optimal routes. Multi-point Relays (MPRs), in OLSR reduce the flooding through establish the links of neighbors inside its MPRs as a replacement of other links.

The tasks are performed by periodically maintaining fresh lists of routes for each destination in the entire

network by constantly maintaining the updated topological network. Every node in the network knows about the other node in advance, in other words the whole network is known to all the nodes making that network. All the routing information is usually kept in tables (Saika *et al.,* 2010). Whenever there is a change in the network topology, these tables are updated according to the change. The nodes exchange topology information with each other; they can have route information any time when they needed (Vats *et al.,* 2012).

Nodes in the network use topology information derived from HELLO packets and Topology Control (TC) messages to discover their neighbors. Not all nodes in the network route broadcast packets(Vats et al., 2012). Only Multipoint Relay (MPR) nodes route broadcast packets. Routes from the source to the intended destination are built before use. Each node in the network keeps a updated routing table information (Michael and Blondia, 2006).

6.2 TEMPORALLY ORDERED ROUTING ALGORITHM (TORA)

Temporally Ordered Routing Algorithm (TORA) be a resource initiated on-demand routing protocol that utilize a link reversal algorithm and present a loop gratis multi-path routes to node's destinations. TORA organizes every node to one-hop local topology information along with a ability to distinguish partitions (Keshtgary and Babaiyan, 2012). TORA is anticipated to manage in a extremely dynamic mobile networking atmosphere. The designing perception of TORA is the locality of organizing messages to a extremely small set of nodes due to the occurrence of a topological changes. Three basic functions performed by TORA (a) route construction (b) route maintenance and (c) route assurance (Singla1 *et al.,* 2010). Each node broadcasts a query packet and the recipients broadcast an update packet. It supports the loop-free, multiple route facilities. Minimize the communication overheads to maximize the utilization of bandwidth. It provides the support of link status sensing and neighbor's delivery, reliable control packet delivery and security authentication.

7. RESEARCH METHODOLOGY

Our research is based on the actual data regarding working and comparisons of OLSR and TORA. This is a comparison study. A typical scenario has been developed compared and implement with OLSR and TORA protocols. While comparing the results, assumption of this scenario have been made in lined so that the results must be more effective for use. OPNET 14.5 has a wide range of implementation over many enterprise level networks. OPNET gives us real time results which are then evaluated.

8. ME T R I C S

In our simulation study, performance comparisons are made using following parameters:

A. Throughput is the total number of packets received by the destination.

B. End to End Delay is the average end to end delay of data packets from senders to receivers.

C. Media Access Delay is the media transfer delay for multimedia and real time traffics' data packets from senders to receivers.

D. Packet delivery ratio (PDR) is ratio between the number of packets received by the TCP sink at the final destination and number of packets generated by the traffic sources.

Moreover, it is the ratio of the number of data packets received by the destination node to the number of data packets sent by the source mobile node.

9. RESULTS AND DISCUSSION

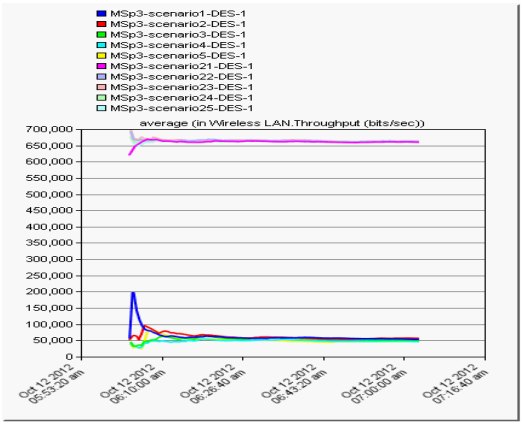
9.1 SIMULATION MODEL AND RESULTS

SIMULATION MODEL

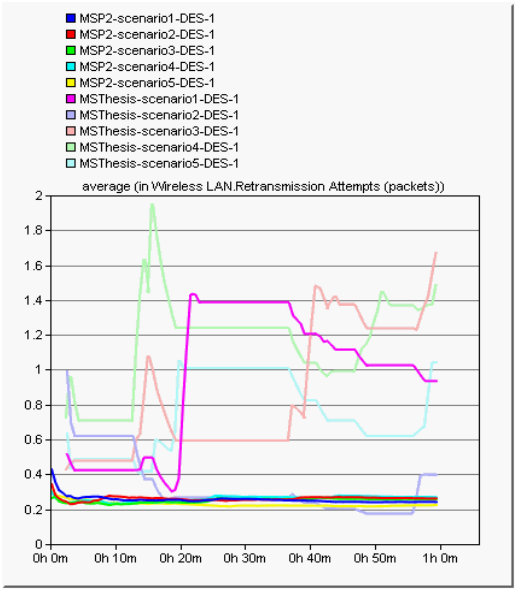
The objective of this paper is to evaluate the performance of three routing protocol for mobile ad hoc networks by using OPNET network simulation tool. Routing protocols:OLSR, and TORA have been considered for performance evaluation in this work.

Different methods and different simulation environments give different results and there is therefore need to broaden the spectrum to account for effects not taken into consideration in a particular environment. Our simulations do provide a link between the theoretical concepts associated with ad-hoc routing protocols and the expected performance in practical implementations.

The area used in network simulation was set to 1000m *1000m and simulation of network was carried out having simulation time of 3600 sec. the performance parameters used in the simulation Packet Delivery Ratio, End to End Delay, Throughput, retransmission attempt, node speed. The no of nodes 10,20,30,40 and 50 and node speed is set to 10, 20, 30, 40 and 50 m/s. random mobility model is used using FTP application with high load.



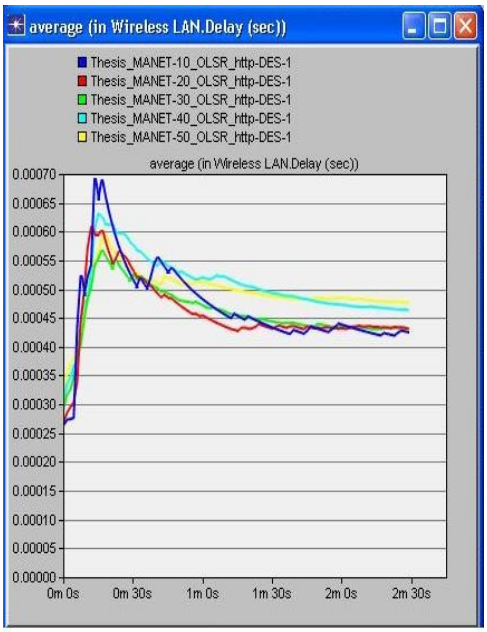
Average Throughput In OLSR



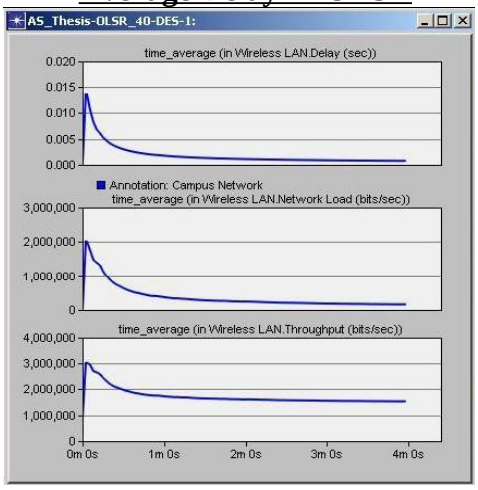
9.2 Average re-transmission Attempt in OLSR

The study of these routing protocols shows that the OLSR is better in MANET. According to our simulation results but it is not necessary that OLSR perform always better in all the networks, its performance may vary by varying the network. At the end we came to the point from our simulation and analytical study that the performances of routing protocols vary with network and selection of accurate routing protocol ls according to the network, ultimately

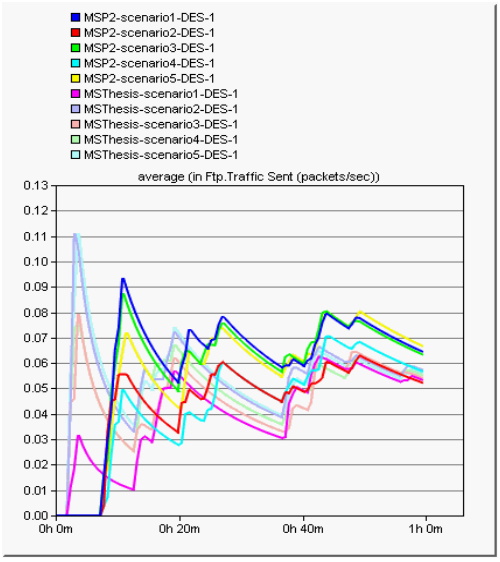
influence the efficiency of that network in magnificent way



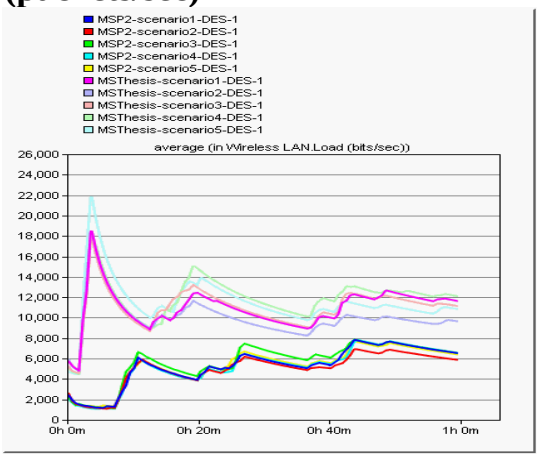
Average Delay In OLSR



AVERAGE ROUTE DISCOVERY TIME IN OLSR

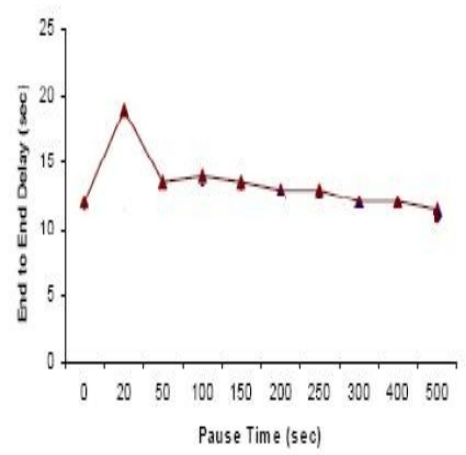


Average (in Ftp.Traffic Sent (packets/sec)

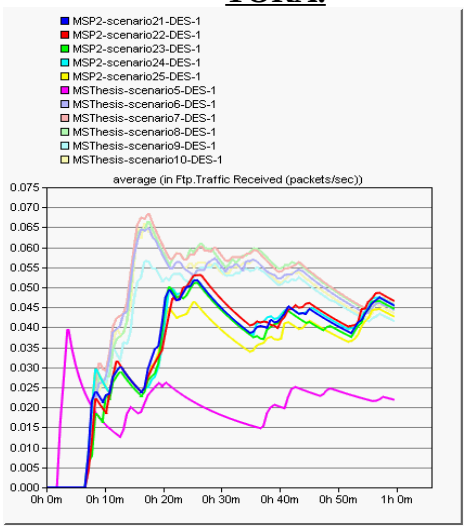


Average (in Wireless LAN.Load (bits/sec)

The OLSR routing protocol can be checked when the numbers of mobile nodes were 40 and the wlan fixed server is one. The upper part of the shows delay. The middle part shows network load and the third part shows the OLSR throughput. The OLSR delay has very minor changes when the numbers of nodes were 20 and the numbers of nodes were 40.



End to End delay Vs Pause Time in TORA.



AVERAGE RECEIVED PACKET GRAPH OF TORA(BYTES/SEC).

Graphs of TORA show that if the node increases proportionately to the increment of network area, then the throughput is higher for lesser number of nodes and it shows only a marginal change, for a large variation of nodes (Fras *et al.*, 2008).

The variation of number of nodes and area causes similar characteristics in both OLSR and TORA where for few nodes, the amount of received packet is high, but it automatically goes down on the basis is of increment of nodes. It causes much influence on the end- to-end delay of TORA

10. CONCLUSION

Mobile Ad-Hoc Networks has the ability to deploy a network where a traditional network infrastructure environment cannot possibly be deployed. In this paper we have presented a comprehensive study and performance evaluation of three OLSR, and TORA routing protocols. We analyze various factors that affect their routing performance. The major performance matrices which are used for analysis and evaluate their performance are End to end delay, Packet delivery and Throughput. They are observed through simulation that in the entire module OLSR performed batter regarding packet delivery ratio and end-to-end delay. Optimized link state routing are more reliable, stable and accurate in calculating best route and more complicated than hop count. TORA, although did not perform adequate in our simulation runs in terms of routing packet delivery ratio, delivered over fifty percentage of the packets. In small network size TORA can perform batter, but when network size above to 50 node TORA's performance decreases.

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