Based on MANET the Correctness and Efficiency Evaluation of DSR, AODV and TORA Routing Protocols for Best QOS

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ABSTRACT
An ad-hoc wireless network is an infrastructure-less network which is an autonomous system of mobile routers (associated hosts) connected by wireless links. The optimization techniques are achieved to improve performance and reduce overhead in ad-hoc networks, to discover and implement optimized techniques for best performance for 0n-demand routing protocols. In this paper I compare the performance of ad-hoc routing protocols like AODV, DSR and TORA in order to prove its correctness and efficiency evaluation of the proposed protocols. And to implement AODV and DSR routing protocols by OPNET simulator to check the performance with respect to different parameters that mobility model changes with a significant impact on their performance and QoS support in different ways.

General Terms
Performance, simulation, efficiency evaluation.

Keywords
MANET, comparison, mobility, on-demand routing protocols.

1. INTRODUCTION
In modern world wireless communication technology, mobile computers are using very increasingly in many areas for different activities. Mobile Ad hoc Networks or peer to peer networks are an old concept defined in modified form by the invention of the wireless technologies like Bluetooth and WiFi etc. Mobile Ad hoc Networks (MANETS) are dynamic independent networks consists of mobile nodes. Such networks represent a fully mobile infrastructure due to the wireless communication between nodes. Mobile Ad hoc Network can be created and used at any time, any where without any pre-existing base station infrastructure and central administration. The nodes in the network are used to provide connectivity and services, i.e. the nodes communicate directly with one another in peer-to-peer fashion. MANETS are used in applications such as disaster recovery, conferences, lectures, emergency situation in hospitals, meetings, crowd control, and battle fields. In such applications there is no need for central administration or fix infrastructure. The only way to add or delete nodes in Mobile Ad hoc Network is by interaction with other nodes [3].

In the fast world of growing technology the advancement in computers and mobile wireless communication technology have increasingly used applications in every area of life. Most of the technology operates in the traditional Internet Protocol (IP) suite. In the competition of this modern technology the aim of Mobile

Ad-hoc networking is to provide efficient communication in wireless technology by adopting routing functionality in mobile nodes. The main aim behind the developing of ad hoc networking is multi-hop relaying. In recent years Mobile Ad Hoc networks gained tremendous attention and popularity because of self-configuration and self-maintenance capabilities. The mobile nodes in MANETS can be located any where within the cell and are free to move randomly at any time. Due to the node mobility, network topology and connection between nodes can change quickly and unpredictably. There are no dedicated routers in MANETS; every node in MANETS can function both as a sender and receiver or a router. As a sender the node can send messages to any specified node through one of the selected route. The node acting as a receiver can receive messages from other nodes. MANET node acting as a router is responsible for directing information, discovering and maintaining routes to other nodes in a random way to build a network [27]. Ad-hoc networks are multi-hop wireless network where each node with a radio link can serve as a router or access point to maintain network connectivity. Loads of research work and efforts have been done since last decade to provide support and solution to different problems and challenges related to mobile ad hoc networks. But still the fast growing technology needs attention in many areas such as routing, bandwidth, security, power consumption, collisions, simulations, and topology control due to moving nodes. In mobile ad hoc network we cannot use the existing techniques for better quality as we are using in fixed wireless network for better efficiency. It is a new technology which requires new techniques for better efficiency and easy organizing mobile ad hoc networks in the next generation of wireless communication.

Thus in this paper we extend and evaluate proposed routing protocols to be suitable for mobile ad hoc networks based on QoS framework. In order to prove its correctness and efficiency the evaluation of the proposed protocols (DSR, AODV) should be done theoretically and implemented through simulation using OPNET version 12.0 network simulators. In this paper I also compare the result of ad- hoc routing protocols with the result of routing protocols of global ad-hoc networking protocols.. Thus the purpose of this research is to understand the functioning of ad hoc networks and implement three proposed routing protocols for mobile ad hoc networks. After analyzing the existing QoS models with respect to the dynamic and rapidly changing behavior of ad hoc networks, this research attempts to present some of the fundamental routing issues when developing a QoS framework for ad hoc networks.

The paper is organized as follows. In section 2 I describe classification and routing protocols of MANETS. In section 3 proposed routing protocol and their theoretical implementation for QoS in respect to the way nodes communicate to each other. In section 4 to examine problems they are facing, how to recover from broken links in selected routes etc. In section 5 I describe implementation of AODV and DSR routing protocols in OPNET simulator to check performance with respect to different parameters and QoS support in different ways, section 6 covers the analytical comparison of hop-by-hop AODV and DSR protocols. Section 7 concludes the paper.

2. MANET CLASSIFICATION AND ROUTING PROTOCOLS

The routing function of transferring data packets in mobile ad hoc network is performed by mobile nodes itself. Due to un-centralized and limited transmission range of ad hoc network, routing between mobile nodes consists of multiple hops depend on one another to forward packets to destination node. As discussed in above section, routing protocol uses several metrics to calculate best suitable path for routing data packets between source and destination node. The routing protocol of ad hoc network must be distributed in nature and have the capability to compute multiple routes during the dynamic changes in network topology Routing protocols for ad hoc network can be classified into different categories based on different criteria such as; type of routing information, when and how routing information is exchanged, and when and how routes are computed etc.

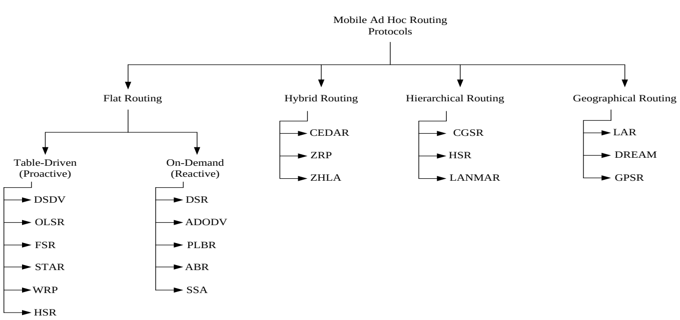

Figure 1. Classification of Routing Protocols

2.1 Proactive or Table Driven Routing Protocols

The name implies, these routing protocols maintain information about global network topology in the form of routing tables at every node all time. Proactive Routing protocols are enhanced version of traditional wired/wireless network routing protocols. These protocols maintain routing information on every single node in network even before it needed. In other words it provides complete picture of network topology on every node. Routing information's in routing tables is updated periodically and therefore actively determines layout of the network as network topology changes. These protocols are ideal in time-critical environment as it takes less time to determine best route for packets, but are not suitable for larger networks as it needs new node entry in table on every node which cause overhead and consumption of bandwidth. When a host node in the network requires a path to destination to send data packets, proactive routing protocol runs path finding algorithm to find best available route [19]. The common proactive routing protocols used by MANET are DSDV, OLSR, STAR, CGSR, FSR, HSR, GSR, and WRP.

2.2 Reactive or On-Demand Routing Protocols

Ad Hoc networks using the reactive protocols do not maintain network topology information on all nodes at all time. As clear form the name on-demand routing these protocols do not exchange routing information periodically but use flooding method to obtain information when required for a node to send data packet. The host node which needs to transmit packets to destination in network, broadcasts a route request to all nodes in network. The host node will be waiting for reply of the nodes in the network to provide a path to destination before transmitting packets [20]. The common reactive routing protocols used by MANET are DSR, AODV, TORA, ABR, SSA, LAR, FORP, LMR, ROAM and PLBR.

2.3 Hybrid Routing Protocols

Hybrid routing protocols are combinations of basic properties of both proactive and reactive routing protocols to provide optimal solutions for MANET. Thus hybrid protocols are both proactive and reactive in nature. The primary objectives of these protocols are to reduce bandwidth usage and minimize route construction delay. In different areas of ad hoc network hybrid protocols uses proactive as well as reactive routing mechanism at certain time appropriate to best suite.

Thus for routing within a small domain or zone proactive approach is used to control overheads and delays. For nodes that are located out side domain or zone reactive approach is used to efficiently use the bandwidth. The hybrid routing protocols are ZRP, CEDAR, and ZHLS.

3. OVERVIEW OF THE SELECTED ROUTING PROTOCOLS AND QOS IN MANET'S

To discuss in details the current Mobile Ad Hoc Network (MANET) routing protocols concept as described by Internet Engineering Task Force (IETF) MANET working group and IEEE 802.11 standards. In particular, Ad Hoc On-Demand Distance Victor (AODV) Routing, Dynamic Source Routing (DSR), and Temporally Ordered Routing Algorithm (TORA) are discussed along with a review of previous research implementation of these routing protocols, which have tremendous approaches for QOS In ad-hoc networks.

3.1 Ad-hoc on-demand distance vector routing protocol (AODV)

AODV routing algorithm is a routing protocol design for mobile Ad-hoc networks and is using on-demand routing approach for establishment of route between nodes. As it uses on-demand routing therefore it built route to transmit data packets when the source node desired and is trying to maintain established route as long as they are needed. AODV protocol has quality to support unicast, multicast and broadcast routing with loop free, self starting and scalable characteristics. AODV protocol routes data packets between mobile nodes of ad hoc network. This protocol allows mobile nodes to pass data packets to required destination node through neighbor's node which cannot directly communicate. Nodes of network periodically exchange information of distance table to their neighbors and ready for immediate updates. AODV protocol is responsible to select shortest and loop free route from table to transfer data packets. In case of errors or changes in selected route, AODV is able create a new route for the rest of transmission of establishment and maintenance.

3.2 Dynamic source Routing (DSR)

Dynamic Source Routing (DSR) Protocol is an on-demand routing protocol developed at Carnegie Mellon university Pittsburgh USA for use of multi-hop wireless mobile ad hoc networks. DSR routing protocol is designed for mobile ad hoc network to keep features of both on-demand routing protocol and source routing protocol. DSR protocol performing as on-demand routing establishes a route between source and destination node when source node wants to send data packets. In source routing, as clear from name DSR controls route through source node and data packets are sends only on those route for which source node provide information [5], like other on-demand reactive routing protocols, routing of data packets in DSR protocol between mobile nodes of ad hoc network is based on request/reply method. DSR control the wastage of bandwidth by eliminating need of periodic table updating. As discussed earlier that DSR protocol can establish a route to destination through source routing, therefore it does not require transmission of periodic hello message by a node to inform its neighbor about his presence [28]. Attractive point of DSR source routing protocol is that intermediate nodes of ad hoc network do not need to keep route information. The path is clearly defined in data packet of source node. DSR routing protocol supports uni-directional communication between mobile nodes [3]. In mobile wireless ad hoc network communication between mobile nodes through DSR routing protocol is achieved by two phases: Route establishment and maintenance.

3.3 Temporally Ordered Routing Protocol (TORA)

TORA is a source initiated on-demand routing protocol presented by Park and Corson in 1997 for wireless mobile ad hoc network. TORA is an efficient, highly adaptive, and scalable routing protocol based on link reversal algorithm. TORA provide multiple routes to transmit data packet between source and destination nodes of mobile ad hoc network. TORA is an adaptive routing protocol for multi-hop networks that contains different attributes such as; distributed execution, loop free and multi-path routing. This routing protocol is designed to reduce communication overhead by adapting local topological changes in ad hoc network. Another smart function of TORA routing protocol is the localization of control packets to a small region (set of nodes) near the occurrence of a topological changes due to route break. Therefore each node of network needs to contain its local routing and topology information about adjacent (one hop) nodes [9]. TORA is a highly adaptive routing protocol which provides loop free routing of data packets in ad hoc network at every instant. Each node of network has capability to contain information about its local topology changes and regular coordination with their neighbor nodes in order to detect partitions occurs in network. TORA has three basic route functions: Establishment, Maintenance, and Erasing as shown in figure 4. In TORA routing protocol, each node has capable to contain a structure of network describing node's height and status of all connected links. The importance of these heights in TORA routing protocol are that a node in network may only forward data packets downstream instead of upstream. Each node height metric is represented by quintuple **(τ, oid, r, δ, i)** which includes the following values.

τ : Logical Time of a link failure

oid : Unique ID of the node that defined the reference level

r : Reflection indicator bit

δ : Propagation ordering parameter

i : Unique ID of the node

where source node A wants to establish a route to destination node G to send data packets. A QRY packet is propagated by source node A through network. The QRY packet is forwarded by intermediate nodes B, C, D, E, and F to reach destination node G, or any other node which has route information to destination. TORA routing protocol maintaining routes only for those nodes whose height is not null. During route discovery TORA does not use intermediate node whose height is null. In TORA a node i in network is said to have no downstream links if height of node i is less than height of non- null neighbor node k.

Height[i] < Height Neighbor[k] Height[i] < Height Neighbor[k]

One in five different cases are possible depend on node status and event occurrence [10].

Case 1: Generate

In TORA routing case1, i.e. Generate occurs for mobile node i when there is no downstream node from stream from node I due to link failure.i.e.

$(\tau[i], oid[i], r[i]) = (\tau, i, 0) \Rightarrow (\delta[i], i) = (0, i)$

If node i contains any upstream neighbor it defines a new reference level otherwise node i sets its height to null.

Case 2: Propagate

This case occur when node i in the network has no downstream link due to link reversal following recipient of UDP packet and all neighbor node k have not the same reference level,i.e.

$$(\tau[i], oid[i], r[i]) = \max\{ (\tau[k], oid[k], r[k]) \}$$

(δ[i], i)= (δ [m-1], i), m is the lowest neighbor with max reference level. Thus in propagate case node i propagates its highest neighbor reference level and select a lower height in all neighbor related to the propagated reference level.

Case 3 Reflect: oThe reflect case in TORA maintaining routes decision tree has occurred when node i has no downstream link in network due to link reversal following receipt of an UPD packet and all neighbours node k have same reference level but not reflected, i.e

(τ[i], oid[i], r[i]) = (τ[k], oid[k], 1), => (δ[i], i) = (0, i)

Thus the neighbor nodes propagated the same non reflected reference level to node i. When node I receive these it reflects back with a higher sub level.

Case 4 Detect:

During TORA route maintenance detect case has occurred when node i has no downstream link due to link reversal following the receipt of an UPD packet and all the neighbors' node k have the same reflected reference level defined by node i, i.e.

oid[k] = i → node i defined the level

(τ[i], oid[i], r[i]) = (-, -, -)

(δ[i], i) = (-, i)

TORA routing protocol detect partition in the network when the last reference level defined by node i has been reflected and propagated back in the neighbors' node of the network.

Case 5: Generate

The last case Generate in TORA route maintenance decision tree has occurred when node i has no downstream link due to link reversal following the receipt of an UPD packet and all the neighbors' node k have the same reflected reference level but not defined by node i, i.e.

oid[k] != i → node I did not define the reference level

(τ[i], oid[i], r[i]) = (τ, i, 0)

(δ[i], i) = (0, i)

Thus in such situation node i defines a new reference level for route discovery and flooded again in network.

Route Erasing in TORA

In rout erasing phase of TORA routing when a node in the ad hoc network has detected a partition, it assigns a null value to its own height and heights of its entire neighbor's node for the destination in its table. The node also floods a broadcast clear packet (CLR) through the network to erase invalid routes to destination and updates all entries in its link state table. The CLR packet consists of reflected reference level, destination ID, and reflected reference bit which is always 1 (CSC, TORA).

CLR (τ, oid, 1)

The intermediate nodes that receive the CLR packet set the heights in the same way and rebroadcast the CLR packet to next neighbors' node. By this process the height of each node in the partitioned portion of the network is set to null and all invalid routes are erased from link table.

3.4 Quality of service (QOS) in MANET

The widely accepted definition of QoS is defined by the consultative committee for international telephony and telegraph (CCIT) recommendation E.800 as "the collective effect of service performance which determines satisfaction degree of a service user". The maturity of wireless mobile technologies and the evolution of different applications provide a reason for the introduction of QoS in wireless ad hoc networks. The goal of QoS routing in MANET is to select routes with sufficient resources for data packets with QoS requirements to increase possibility that network will be capable of supporting and maintaining them. The following figure 2 shows the QoS components. Achieving QoS in mobile ad hoc network corresponds to a real need and is difficult as compared with traditional wired networks. QoS is essential element in routing which informs source node about successful availability of destination node. QoS guarantees in mobile ad hoc networks.

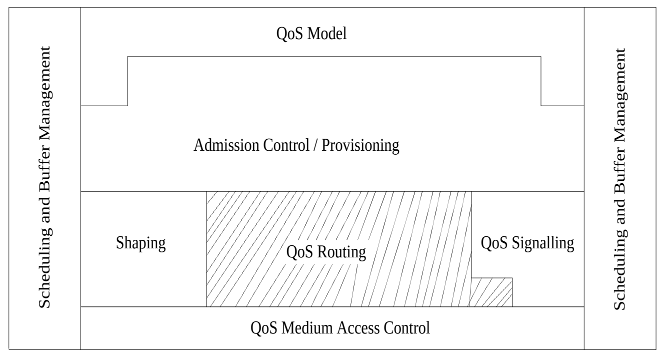

Figure 2. QOS components in routing protocol

4. SIMULATION STUDY

Conducting real world mobile ad hoc network experiments for researchers are difficult and costly. Therefore MANET research communities commonly rely on computer simulation to evaluate and analyze their experiments on different routing protocols for dynamic ad hoc networks. The simulation results are far from perfect real environment but still provide a better understanding. Simulation is the process of designing a model of real system and conducting experiments for purpose of understanding behavior and verification of proposed system control at different stages. The selection of good simulation tool helps a lot in better testing of proposed mechanism in several different possible environments. The emerging MANET routing algorithm studies shows that some sensitive simulation parameters affect simulation results. In this paper the simulation result of two previously published MANET routing protocols AODV and DSR are presented using TCP based application. AODV and DSR are most popular MANET on-demand routing protocols. The analysis of proposed protocols is done using the MANET model in OPNET simulator.

4.1 MANET Node Model Structure of OPNET

Routing protocols AODV, DSR, and TORA are implemented at IP layer in MANET model structure as shown in the following figure. Models of AODV, DSR, TORA, and OLSR are available in OPNET version.12, to explains node model architecture of MANET nodes as in figure 3.

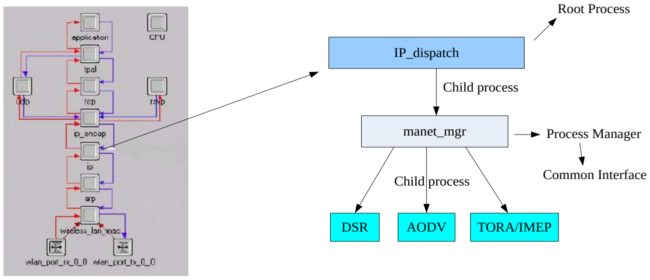

Figure 3. MANET node model structure (OPNET model)

Ip_dispatch is root process for IP in MANET node and creates a child process manet_mgr. The manet_mgr function as manager process and provides a common interface to multiple mobile ad hoc routing protocols in OPNET. The manet_mgr is further child process for required MANET protocol as configured in parameter in the proceeding table.1 of section 4.2

4.2 Analysis and Simulation Results

Here I explain how to model and simulate two different routing protocols AODV and DSR in ad hoc network with different parameters in table1 using MANET models and The main parameters that effect mobility in Ad Hoc Network are maximum speed of mobile host nodes and pause time between each moving. In this paper I discuss different phases such as design, simulation, data collection, and analysis. In this simple scenario of ad hoc network the following parameters are used for simulation purpose.

Table 1. Simulation parameters

Routing Protocols	AODV, DSR, and TORA
Number of wireless nodes	6 nodes
Movement space	4000m x 3000m
Maximum speed	2, 10, and 20 m/s
Maximum pause time	0 and 200s
Transmission rates	2, 5, and 10 packets/s
Packet size	512 bytes
Simulation time	300s

4.2.1 Analysis of AODV Routing protocol

The simulated scenario evaluates the performance of important TCP parameters for AODV based 6 nodes network. All nodes in the network are configured to run AODV protocol and FTP sessions. In simulation process different AODV parameters are used as suggested by RFC and WLAN data rate. A single TCP connection is established between wireless nodes of scenario. Two different self mobility trajectories are defined for mobile. The results shows amount of routing traffic generated, route discovery time and the number of hops per route, TCP/IP traffic, no; of RREQ and RREP packets and FTP download and upload time. Simulation of mobile ad hoc network consist of six nodes was run for 300 seconds and the following results were generated as in figure 4.

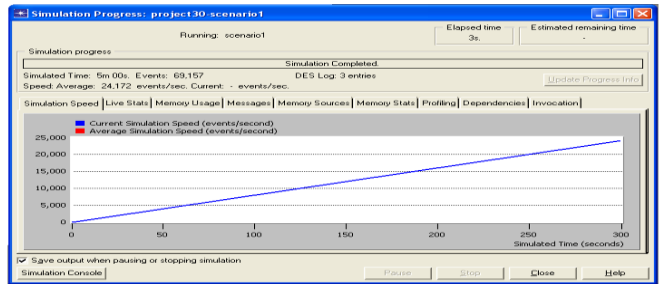

Figure 4. Simulation progress report for AODV routing protocol.

4.2.1.1Object Statistics of AODV Mobile nodes 1 and 2

The individual statistics of both mobile nodes in simulated scenario are shown in figures 5(a), 5(b) respectively. The mobile node 2 is used as a hop in selected route for data transmission from source to destination. The AODV routing traffic sent and received in both packets and bits of mobile node 2 is high than mobile node 1. As the graph shows both mobile nodes are used in establishment of routes but OPNET internal mechanism selects the route of mobile node 2 because of shortest way to destination. Mobile node 1 graph shows that it sent routing traffic only in the establishment of route but is not use any more in the communication of data packets.

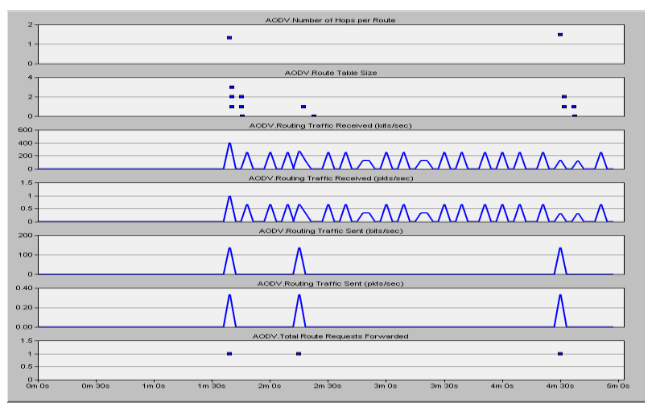

Figure 5(a). object statistics of AODV node 1

Figure 5(b). Object statistics of AODV node 2

4.2.1.2 Object Statistics of AODV Intermediate nodes 1 and 2

The individual statistics of both wireless intermediate nodes in simulated scenario are shown in figures 6(a), 6(b) respectively. The intermediate node 2 is used as a hop in selected route for data transmission from source to destination. The AODV routing traffic sent and received in both packets and bits of intermediate node 2 is high than intermediate node 1.

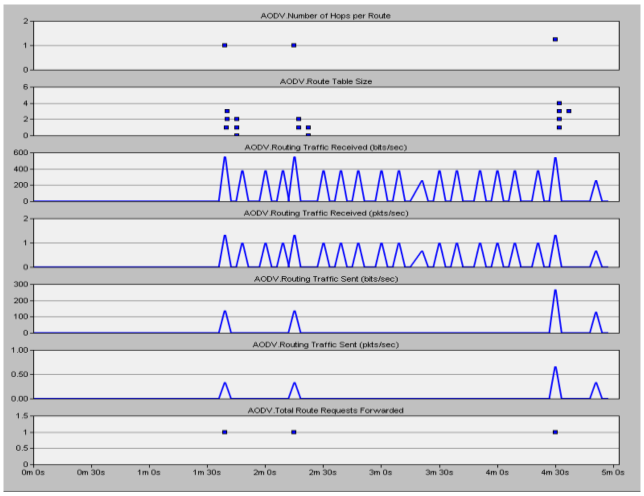

Figure 6(a). object statistics of AODV intermediate node 1

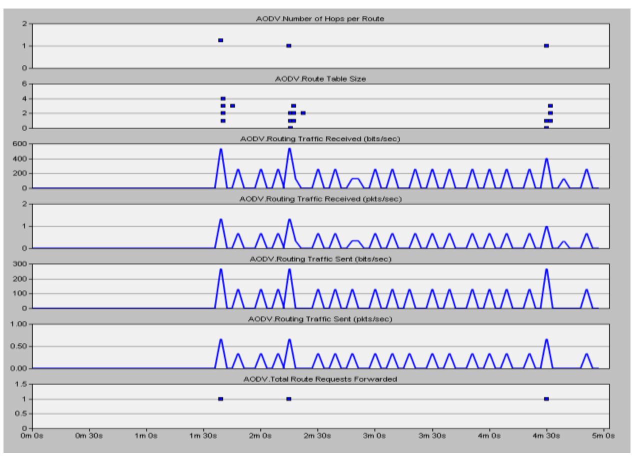

Figure 6(b) object statistics of AODV intermediate node 2

4.2.1.3Total AODV traffic sent and received

During transmission of data in simulated ad hoc network routing traffic sent by all wireless nodes is shown in the above figures 6(a), 6(b) respectively. As discussed earlier that the selected route consist of four nodes, i.e. source, mobile node 2, intermediate node 2, and destination. The high level of traffic is sent by intermediate node 2 and mobile node 2 during simulation time. The source node sent a bit high routing traffic of 300 bits/sec once during first route discovery process. The intermediate node 2 sends extra high traffic of 290 bits/sec each time the route discovery process occurs. The detail analysis of the graph shows that routing data generated at source node and destination node is nearly the same as the intermediate nodes show the high traffic signals because of 'Hello' messages to keep alive the next neighbor nodes. The routing traffic received by all wireless nodes of ad hoc network during simulation time is shown in the following figures 7(a), 7(b) respectively. The traffic received individually by destination node is less than source node. The high traffic received by nodes occur in selected route are mobile node 2 and intermediate node 2. As discussed above that intermediate nodes have high routing traffic because of Hello messages. During simulation time these nodes receive more than 600 bits/sec traffic as shown below.

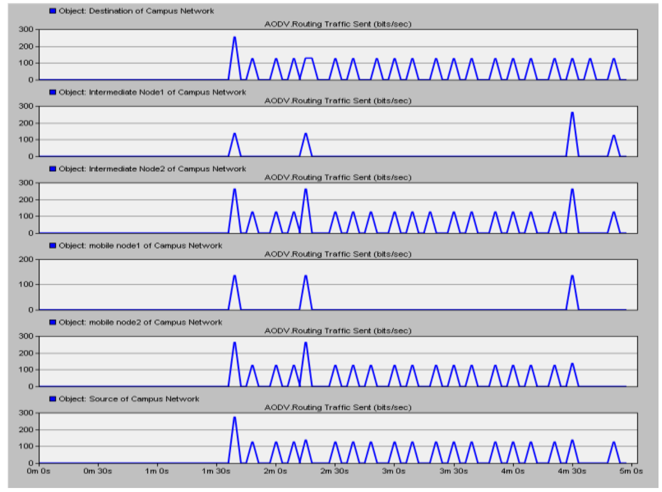

Figure 7(a).Total traffic sent in AODV

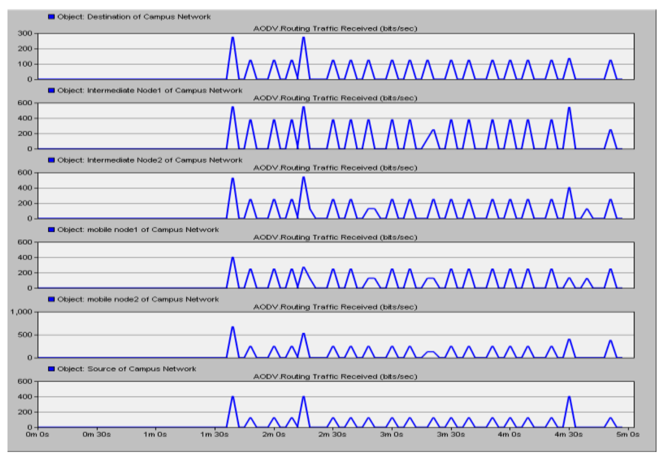

Figure 7(b).Total traffic received in AODV

4.2.2 Analysis of DSR Routing protocol

The simulated scenario evaluates performance of important TCP parameters for DSR based 6 nodes network. All nodes in network are configured to run DSR protocol and FTP sessions. In simulation process different DSR parameters are used as suggested by RFC and WLAN data rate. A single TCP connection is established between wireless nodes of scenario. The mobility pattern for mobile nodes is defined by two different self defined trajectories. Different results are taken which shows the amount of routing traffic generated the route discovery time and number of hops per route, TCP/IP traffic, no of RREQ and RREP packet.

4.2.2.1 Global Statistics of DSR Routing Protocol

The simulated scenario for DSR routing protocol is the same as for AODV protocol. The different parameters defined for AODV protocol is kept same for DSR protocol to get best results for comparison of these two widely used routing protocols. The route request table of the wireless nodes in simulated ad hoc network is defined to hold 10 nodes towards destination. The number of hops in discovered route from source to destination in DSR routing protocol is 1 as shown in the figure 8(a) and figure 8(b) respectively. The route is established only once during start of data transmission in simulation run time. The route establishment phase in DSR protocol consists of three parts, i.e. RREQ, RREP, and route cache, Route cache is used to hold maximum number of routes at any time during simulation. The expiry time for a route in the route cache is defined as 300 seconds for this simulation scenario. The DSR routing global traffic sent and received in both packets and bits per seconds in simulated six node ad hoc network.

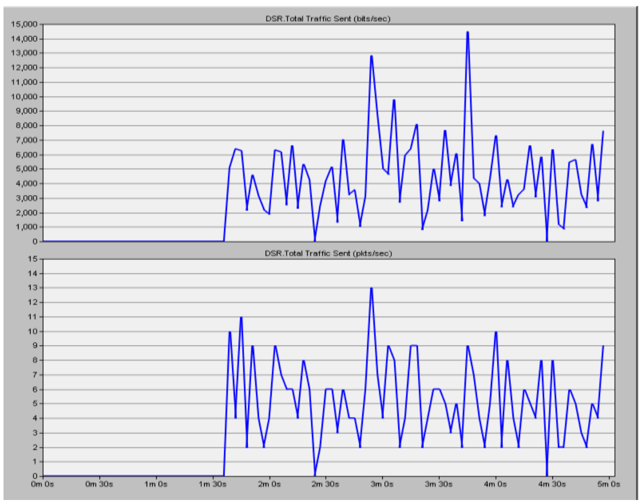

Figure 8(a). Global statistic of DSR total traffic sent

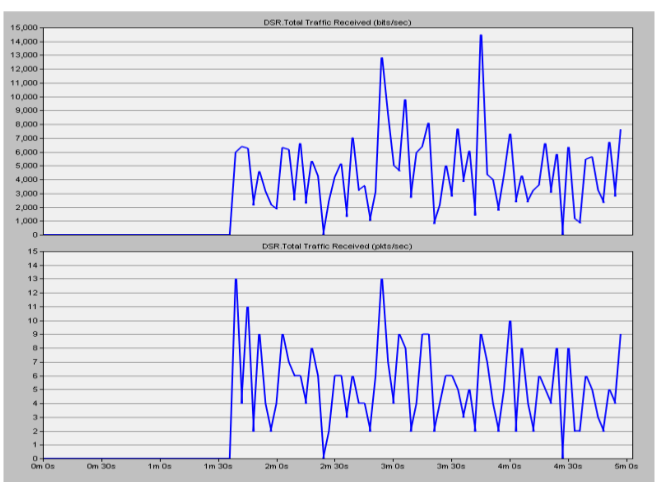

Figure 8(b). Global statistic of DSR total traffic received

4.2.2.2 Total DSR Traffic sent and received

During transmission of data in simulated ad hoc network routing traffic sent and received by all wireless nodes as route selected by DSR protocol in simulated scenario for transmission of data between source and destination nodes consists of four nodes, i.e. source, mobile node 2, intermediate node 2, and destination. Source node sent traffic only once during start of transmission. During reply by destination node a lot of traffic is added to the data as is shown in figure 8(c) and figure 8 (d) respectively. The intermediate node 2 and mobile node 2 ads nearly same data traffic during simulation time. The source node sent less than 100 bits/sec traffic where a mobile and intermediate node 2 sent more than 500 bits/sec traffic.

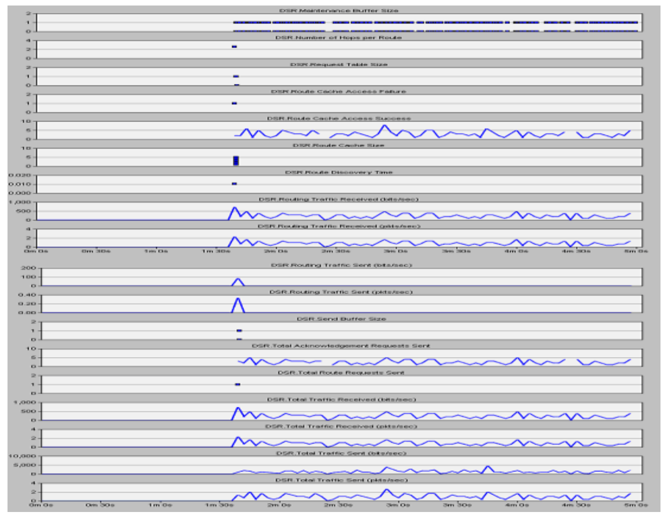

Figure 8(c). Object statistics of DSR source node

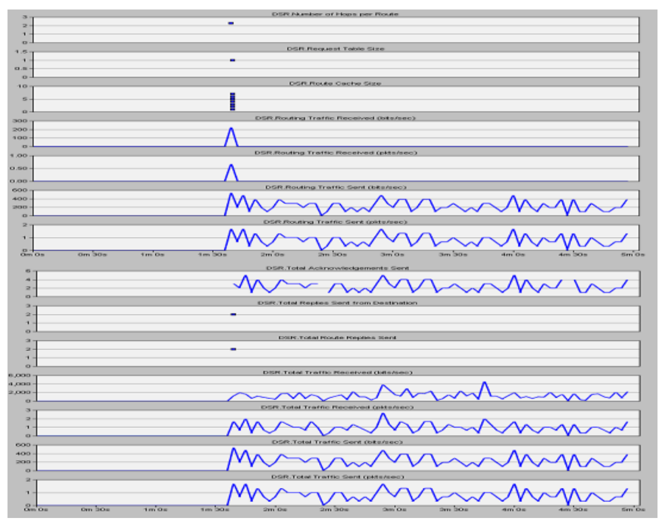

Figure 8(d). Object statistics of DSR destination node

5. MANET ROUTING PROTOCOLS COMPARISION SUMMARY

From the above detail research on two MANET routing protocols, to judge the performance of any routing protocol one needs to know different metrics. Both AODV and DSR routing protocols deliver a greater percentage of originated data packets where there is node mobility occur. Both DSR and AODV are on-demand protocols whose basic characteristic is demonstrated in the shape of its overhead. DSR routing protocol limits scope and overhead of RREQ packets by using route cache. The simulation environment shows fraction of data packets as a function of both mobility rate and network load for each protocol deliver. The global statistics shows that traffic sent and received by DSR protocol is greater than AODV routing protocols. Data traffic is high in AODV during re-establishment of route between source and destination node, where in DSR traffic is going high and low during whole transmission. . In order to check how AODV and DSR protocols react as rate of topology change varies; I changed the maximum node speed from 30 m/s to 5 m/s which show effect on both routing protocols. The global statistic of DSR MANET delay is very low than AODV delayed. The DSR delay is high only in start of transmission and a bit high during second and third time when route was established. On the other side AODV delay is very high in start of transmission and through out the simulation time. The results also shows that total MANET traffic sent and received by DSR routing protocol is higher than AODV. The route discovery time of DSR is good than AODV routing protocol.

Thus our simulation results show that some parameters of AODV are good as compared to DSR. But the overall performance of DSR is good than AODV routing protocol in this small simulated ad hoc six node scenarios.

6. PROPOSED PERFORMANCE BASED ROUTING PROTOCOL

From For best routing between wireless nodes of ad hoc network a number of qualitative properties is desirable. For best and effective routing loop freedom is very necessary for data packets to avoid collision and waste of time. MANET uses time to live (TTL) to avoid such loops, but more structured approach is required to get best results. The MANET delay effects on routing very badly, as the mobile nodes are battery powered and scarce memory. The routing protocol needs to be routed intelligently and utilize network bandwidth and energy resources in a better way in case of network route delay. One of the important characteristics of MANET is dynamic topology based on node mobility. Mobile nodes in ad hoc network are free to change position frequently, therefore routing protocol needs to quickly adopt topology changes. Due to dynamic mobility and limited energy resources a unique wireless node in MANET cannot be trusted for auto configuration in case of break down. Therefore support of distributed operation is required by routing protocols to solve such type of problems. Due to lack of physical security, MANET protocols are highly exposed to different types of attacks. In MANET it is very easy for attacker to disturb network traffic, corrupt packet header, change addresses of routing messages, and increase traffic to waste bandwidth. To avoid all these threats a sufficient security protection is highly desirable in all MANET routing protocols.

7. Conclusion

In this paper I present the simulation results of two wireless routing protocols under scalable mobile condition for the correctness and efficiency in QOS framework. In my six nodes scenario, size of the network, traffic load, and delay affects for both AODV and DSR routing protocols, and also study cases explains theoretically that TORA has also great impact for better QOS support. So results shows that DSR routing protocol is not efficient for large networks with many mobile nodes with high load balancing in terms of traffic and delay which increases overhead. In such situation AODV routing protocol is ideal because of its hop-to-hop routing. Here I explain how to model and simulate two different routing protocols AODV and DSR which indicate that the combined performance of both AODV and DSR routing protocol could be best solution for routing in MANET instead of separate performance of both AODV and DSR routing protocols. Simulation of TORA is my next chapter of research.

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