Volume 5, Issue 7, July 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Performance Analysis of DSR and TORA Using Different Networks

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Abstract: ***The field of Mobile Ad hoc Networks (MANETs) has gained an important part of the interest of researchers and become very popular in last few years. MANETs can operate without fixed infrastructure and can survive rapid changes in the network topology. They can be studied formally as graphs in which the set of edges varies in time. The main method for evaluating the performance of MANETs is simulation. This paper is subjected to the on-demand routing protocols with identical loads and environment conditions and evaluates their relative performance with respect to the two performance metrics: traffic sent and traffic received. From the detailed simulation results and analysis, a suitable routing protocol can be chosen for a specified network and goal. [1]***

Keywords- MANET; routing protocols; TORA

I. INTRODUCTION

Mobile Ad-hoc Network (MANET)

MOBILE AD-HOC NETWORKS (MANET) is an infrastructure less collection of mobile nodes that can arbitrarily change their geographical locations such as these networks have dynamic topologies which are composed of bandwidth constrained wireless links. MANET is the quick remedy for any disaster situation. MANET is a collection of mobile network nodes with the capability of transmitting & receiving information wirelessly. Since 1980s, mobile cellular networks have been in use and the use of wireless networks is increasing tremendously. Three types of mobile wireless networks exist: infrastructure-networks, ad-hoc networks and hybrid networks. An infrastructure-network consists of a group of mobile nodes with some bridges. These bridges called base-stations connect the wireless network to the wired network. Communication takes place between two or more nodes by first searching for the nearest base-station and information flow takes place between the two nodes with the base-station as a bridge between them. In ad-hoc networks, there are no centralized base-stations, fixed routers and central administration. All nodes move randomly and are capable of discovering and maintaining the routes between them. Each node acts as a router and communicates to other for a short interval of time like: emergency searches, quickly sharable information like meetings etc. A hybrid-network makes use of both the networks: infrastructure and ad-hoc networks.

Characteristics of MANET's

- Dynamic topology: Topology of network changes rapidly and randomly consisting of both bidirectional and unidirectional links
- Bandwidth-constrained, variable capacity links: The capacity of wireless-networks is significantly lesser than the hardwired systems. Considering the multiple access, fading, noise, and interference conditions, etc. the throughput of wireless networks is often much less than a radio's maximum transmission rate.
- Energy-constrained operation: All MANET nodes rely on exhaustible means for their energy like battery, so energy-conservation is taken into care.
- Limited physical security: Wireless systems are less secure than the hardwired ones. The possibility of eavesdropping, spoofing and denial of-service attacks should be considered.
- Decentralized nature of network control in MANETs provides additional robustness against the single points of failure of more centralized approaches to reduce threats in wireless networks.

Applications of MANET

Cooperative and mobile data exchange in case of industrial and commercial applications. MANETs combined with satellite-based information delivery, provides an extremely flexible method for establishing communications for fire/safety/rescue operations [3] [8]. MANET can also be used by students to participate in an interactive lecture using laptop computers. MANET can also be used in disaster relief operations after a hurricane or earthquake and mine site operation [2]

II. ROUTING PROTOCOLS

Routing protocols for Mobile ad hoc networks can be broadly classified into two main categories:

- Proactive or table-driven routing protocols
- Reactive or on-demand routing protocols.

Table Driven Routing Protocols (Proactive)

In proactive or table-driven routing protocols, each node continuously maintains up-to-date routes to every other node in the network. Routing information is periodically transmitted throughout the network in order to maintain routing table consistency. Thus, if a route has already existed before traffic arrives, transmission occurs without delay. Otherwise, traffic packets should wait in queue until the node receives routing information corresponding to its destination. However, for highly dynamic network topology, the proactive schemes require a significant amount of resources to keep routing information up-to-date and reliable. Certain proactive routing protocols are Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), Global State Routing (GSR) and Cluster head Gateway Switch Routing (CGSR).

On-Demand Routing Protocols (Reactive)

In contrast to proactive approach, in reactive or on demand protocols, a node initiates a route discovery throughout the network, only when it wants to send packets to its destination. For this purpose, a node initiates a route discovery process through the network. This process is completed once a route is determined or all possible permutations have been examined. Once a route has been established, it is maintained by a route maintenance process until either the destination becomes inaccessible along every path from the source or until the route is no longer desired. In reactive schemes, nodes maintain the routes to active destinations. A route search is needed for every unknown destination. Therefore, theoretically the communication overhead is reduced at expense of delay due to route research. Some reactive protocols are Cluster Based Routing Protocol (CBRP), Ad hoc On-Demand Distance Vector (AODV), Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA), Associativity - Based Routing (ABR), Signal Stability Routing (SSR) and Location Aided Routing (LAR).[1]

III. OVERVIEW OF DSR AND TORA

- **Dynamic Source Routing (DSR)**

Dynamic Source Routing (DSR) is an Ad Hoc routing protocol which is based on the theory of source-based routing rather than table-based. This protocol is source-initiated rather than hop-by-hop. This is particularly designed for use in multi hop wireless ad hoc networks of mobile nodes. Basically, DSR protocol does not need any existing network infrastructure or administration and this allow the Network to be completely self-organizing and self-configuring. This Protocol is composed of two essential parts of route discovery and route maintenance. Every node maintains a cache to store recently discovered paths. When a node desires to send a packet to some node, it first checks its entry in the cache. If it is there, then it uses that path to transmit the packet and also attach its source address on the packet. If it is not there in the cache or the entry in cache is expired (because of long time idle), the sender broadcasts a route request packet to all of its neighbors asking for a path to the destination. The sender will be waiting till the route is discovered. During waiting time, the sender can perform other tasks such ascending/forwarding other packets. As the route request packet arrives to any of the nodes, they check from their neighbor or from their caches whether the destination asked is known or unknown. If route information is known, they send back a route reply packet to the destination otherwise they broadcast the same route request packet. When the route is discovered, the required packets will be transmitted by the sender on the discovered route. Also an entry in the cache will be inserted for the future use. The node will also maintain the age information of the entry so as to know whether the cache is fresh or not. When a data packet is received by any intermediate node, it first checks whether the packet is meant for itself or not. If it is meant for itself (i.e. the intermediate node is the destination), the packet is received otherwise the same will be forwarded using the path attached on the data packet. Since in Ad hoc network, any link might fail anytime. Therefore, route maintenance process will constantly monitors and will also notify the nodes if there is any failure in the path. Consequently, the nodes will change the entries of their route cache.

- **Benefits and Limitations of DSR**

One of the main benefit of DSR protocol is that there is no need to keep routing table so as to route a given data packet as the entire route is contained in the packet header. The limitations of DSR protocol is that this is not scalable to large networks and even requires significantly more processing resources than most other protocols. Basically, In order to obtain the routing information, each node must spend lot of time to process any control data it receives, even if it is not the intended recipient.[3]

- **Temporary Ordered Routing Protocol (TORA)**

Temporally Ordered Routing Algorithm TORA comes under a category of algorithms called "Link Reversal Algorithms". TORA is an on demand routing protocol. Unlike other algorithms the TORA routing protocol does not uses the concept of shortest path for creating paths from source to destination as it may itself take huge amount of bandwidth in the network. Instead of using the shortest path for computing the routes the TORA algorithm maintains the "direction of the next destination" to forward the packets. Thus a source node maintains one or more "downstream paths" to the destination node through multiple intermediate neighboring nodes. TORA reduces the control messages in the network by having the nodes to query for a path only when it needs to send a packet to a destination. In TORA three steps are involved in establishing a network.

A) Creating routes from source to destination.
B) Maintaining the routes.
C) Erasing invalid routes.

TORA uses the concept of "directed acyclic graph (DAG) to establish downstream paths to the destination". This DAG is called as "Destination Oriented DAG". A node marked as destination oriented DAG is the last node or the destination node and no link originates from this node. It has the lowest height. Three different messages are used by TORA for establishing a path: the Query (QRY) message for creating a route, Update (UPD) message for creating and maintaining routes and Clear (CLR) message for erasing a route. Each of the nodes is associated with a height in the network. A link is established between the nodes based on the height. The establishment of the route from source to destination is based on the DAG mechanism thus ensuring that all the routes are loop free. Packets move from the source node having the highest height to the destination node with the lowest height. It"s the same top to down approach.[4]

Benefits and Limitations of TORA

One of the benefits of TORA is that the multiple routes between any source destination pair are supported by this protocol. Therefore, failure or removal of any of the nodes is quickly resolved without source intervention by switching to an alternate route. TORA is also not free from limitations. One of them is that it depends on synchronized clocks among nodes in the ad hoc network. The dependence of this protocol on intermediate lower layers for certain functionality presumes that the link status sensing, neighbor discovery, in order packet delivery and address resolution are all readily available. The solution is to run the Internet MANET Encapsulation Protocol at the layer immediately below TORA. This will make the overhead for this protocol difficult to separate from that imposed by the lower layer.[3]

IV. SIMULATION MODEL

The simulation is performed using the OPNET (Optimized Network Engineering Tool) Modeler 14.5 simulator. OPNET s a discrete event network simulator that provides virtual network communication environment. OPNET Modeler 14.5 is chosen because it is one of the leading environments for network modelling and simulation. It offers easy graphical interface. This tools is highly reliable, robust and efficient. It supports large number of built-in industry standard network protocols, devices, and applications [5].

SIMULATION ENVIRONMENT

In this paper we are using 50 and 100 nodes for both DSR and TORA. Every node in the network is configured to execute AODV, DSR and TORA respectively. The nodes are distributed over the office network of 100*100 meters [6]

V. RESULTS

- **TRAFFIC SENT** :- In this we have taken scenario of 50 nodes for both DSR and TORA protocol and then we have analysed our results by taking traffic sent as parameter

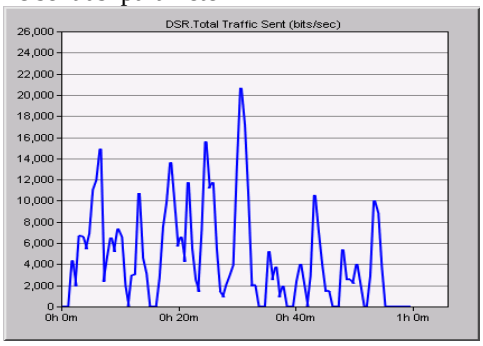

Fig: Total Traffic sent for DSR Protocol in MANET network

Fig shows variation of data received in bytes per second and for DSR protocol. From fig it has been concluded that maximum value of data traffic sent is approx 21000 bits per second for 50 nodes.

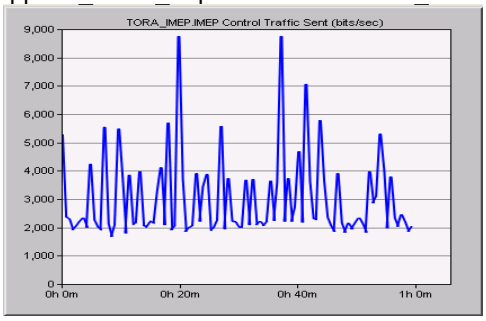

Fig: Total Traffic sent for TORA Protocol in MANET network

Fig shows variation of data received in bytes per second and for TORA protocol. From fig it has been concluded that maximum value of data traffic sent is approx 8,800 bits per second for 50 nodes.

- **TRAFFIC RECEIVED:-** In this we have taken scenario of 50 nodes for both DSR and TORA protocol and then we have analyzed our results by taking traffic received as parameter

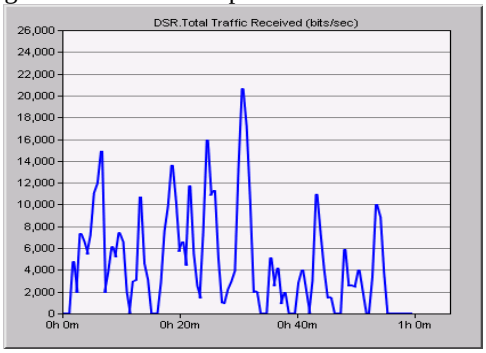

Fig: Total Traffic received for DSR Protocol in MANET network

Fig shows variation of data received in bytes per second and for DSR protocol. From fig it has been concluded that maximum value of data traffic sent is approx 21000 bits per second for 50 nodes.

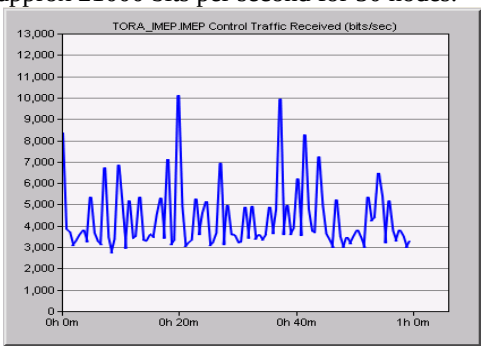

Fig: Total Traffic received for TORA Protocol in MANET network

Fig shows variation of data received in bytes per second and for TORA protocol. From fig it has been concluded that maximum value of data traffic sent is approx 10,100 bits per second for 50 nodes.

- **TRAFFIC SENT: -** In this we have taken scenario of 100 nodes for both DSR and TORA protocol and then we have analyzed our results by taking traffic sent as parameter **.**

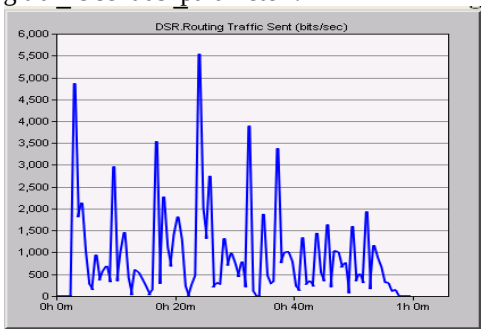

Fig: Total Traffic sent for DSR Protocol in MANET network

Fig shows variation of data received in bytes per second and for DSR protocol. From fig it has been concluded that maximum value of data traffic sent is approx 5,500 bits per second.

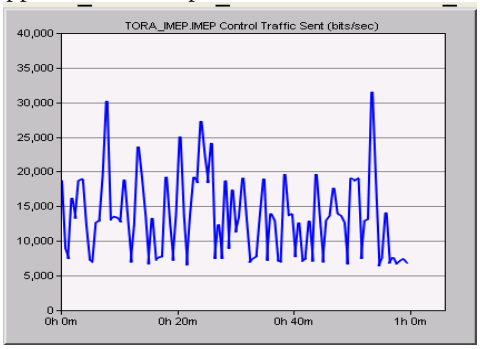

Fig: Total Traffic sent for TORA Protocol in MANET network

Fig shows variation of data received in bytes per second and for TORA protocol. From fig it has been concluded that maximum value of data traffic sent is approx 32,000 bits per second.

- **TRAFFIC RECEIVED:-** In this we have taken scenario of 100 nodes for both DSR and TORA protocol and then we have analysed our results by taking traffic received as parameter

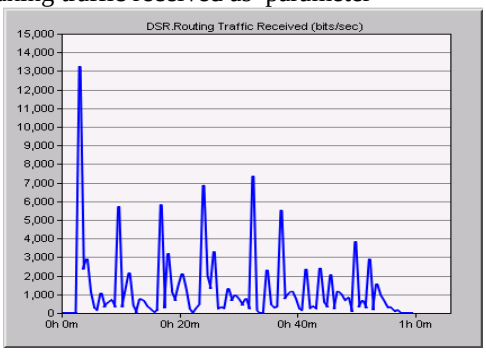

Fig: Total Traffic received for DSR Protocol in MANET network

Fig shows variation of data received in bytes per second and for DSR protocol. From fig it has been concluded that maximum value of data traffic sent is approx 13,200 bits per second.

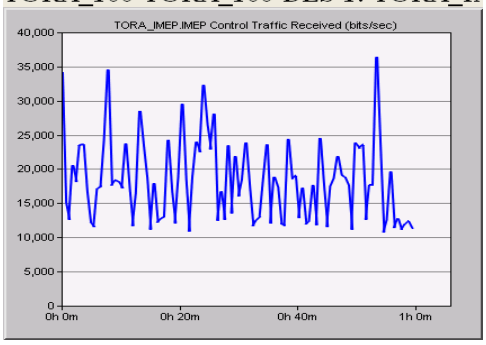

Fig: Total Traffic received for TORA Protocol in MANET network

Fig shows variation of data received in bytes per second and for TORA protocol. From fig it has been concluded that maximum value of data traffic sent is approx 36,000 bits per second.

VI. CONCLUSION

Mobile Ad-Hoc Networks has the ability to deploy a network where a traditional network infrastructure environment cannot possibly be deployed. With the importance of MANET comparative to its vast potential it has still many challenges left in order to overcome. Performance comparison of routing protocol in MANET is one of the important aspects [7]. In this paper I have analyzed the behavior and performance matrices for MANETs using different protocols (DSR, TORA) and compared their performance matrices like traffic sent and traffic received. Above figures show the performance comparisons of routing protocols DSR, TORA using opnet simulator. As we can clearly see that TORA performs best in comparison to DSR protocol in MANET.

REFERENCES

[1] Anuj K. Gupta, Member, IACSIT, Dr. Harsh Sadawarti, Dr. Anil K. Verma **"***Performance analysis of AODV, DSR & TORA Routing Protocols* " IACSIT International Journal of Engineering and Technology, Vol.2, No.2, April 2010 ISSN: 1793-8236

[2] Er. Pragati1 , Dr. Rajender Nath "*Performance Evaluation of AODV, LEACH & TORA Protocols through Simulation"* International Journal of Advanced Research in Computer Science and Software Engineering. Volume 2, Issue 7, July 2012 ISSN: 2277 128X.

[3] Vishant Kumar , Joginder Singh Chauhan Ankit Kumar "*A Comparative Study of Broadcast Based Routing Protocols in Mobile Ad Hoc Networks*" International Journal of Application or Innovation in Engineering & Management (IJAIEM: Volume 2, Issue 12, December 2013 ISSN 2319 – 4847.

[4] Er.Punardeep Singh Er.Harpal Kaur Er. Satinder Pal Ahuja *"Brief Description of Routing Protocols in MANETS And Performance And Analysis (AODV, AOMDV,TORA)"* International Journal of Advanced Research in Computer Science and Software Engineering Volume 2, Issue 1, January 2012 ISSN: 2277 128X.

[5] Harpreet Singh, Manpreet Kaur "*Simulation and Performance Analysis of AODV, TORA & OLSR Routing Protocols"*International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-2, Issue-5, November 2013 .

[6] Amritpal Kaur *"Performance Evaluation of AODV, TORA and DSR in MANET Multimedia Applications using OPNET*"International Journal of Advanced Research in Computer Science and Software Engineering © 2015, IJARCSSE All Rights Reserved Page | 486Volume 5, Issue 4,2015 ISSN: 2277 128X

[7] Manjeet Gupta, Sonam Kaushik "*Performance Comparison Study of AODV, OLSR and TORA Routing Protocols for MANETS"* /International Journal Of Computational Engineering Research/ ISSN: 2250–3005

