Themed Section : Engineering and Technology
© 2018 IJSRSET | Volume 5 | Issue 3 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099

Quality of Service Aware Routing Protocol in Mobile Ad-Hoc Network

S. Kanchanamalai[1], Dr K Devarajan[2]
[1]PG Scholar, Annamalai University, Chidambaram, Tamil Nadu, India
[2]Assistant Professor, Annamalai University, Chidambaram, Tamil Nadu, India

ABSTRACT

A Mobile Ad-hoc NETwork (MANET) is a collection of wireless mobile nodes forming an infrastructure less network that has no centralized manager. Recently the work on quality of service guaranties in ad-hoc networks have attracted more attention. Routing is challenging task in MANETs due to the dynamic behavior. Multipath routing allows load balancing to use of multiple paths for routing between a source-destination pair. Load balancing is a general technique that is applied to achieve Quality of Service (QoS) in MANETs. Multipath routing can increase end-to-end throughput and provide quality of service in networks. It exploits the resource redundancy and diversity in the underlying network to provide benefits such as fault tolerance, load balancing, increase throughput, and improvement in QoS metrics such as delay and packet loss. In this work, a modified Dynamic Source Routing (DSR) and Ad-hoc On-demand Distance Vector (AODV) protocol is purposed which extend the existing DSR and AODV protocol. The proposed work is implemented in Network Similator-2 (NS2), evaluates its performance, and compared with existing protocol.

Keywords: MANET's, QoS Quality of Service, DSR Dynamic Source Routing, AODV Ad-Hoc On-Demand Distance Vector Routing

I. INTRODUCTION

MANET is a self-organized, infrastructure less, decentralized and self configuring multi-hop wireless network. The dynamic nature of MANETs makes network open to attacks and un-reliability. Routing is always the most significant part for any networks. Each node should not only work for itself, but should also be cooperative with other nodes. Due to in built characteristics of MANETs, such as periodic change in topology, nodes mobility makes QoS routing is the hardest task. QoS (Quality of Service) refers to a broad mobilization of networking technologies and techniques. The goal of QoS is to accommodate guarantees on the capability of a network to deliver predictable results.. QoS routing is the task of routing data packets from source to destination. All mobile nodes perform functioning of routers that search and maintain routes to other nodes in the network. Routing is the method of moving the information from a source to a destination in an intermediate network. Mainly two type of routing protocols are used. Pro-active protocols like DSR and AODV are used to maintain updated information of the network, by continuously evaluate the known routes and attempt to discover new ones. Reactive protocols initiate a route only when a node wants to start communication with another node. Route request and Route reply messages are used to initialize and finalize the route found between source to destination. After finding the route, a suitable shortest path is discovered by the source node for the transmission of data packets. Route discovered by reactive algorithms having problems like congestion problems as the

centre of network carry more traffic. This causes poor performance in reactive protocol like DSR and AODV. To remove all these flaws and drawback, multi-hop forwarding routing algorithm have been proposed. Multi-hop forwarding Routing algorithm is the act of moving information from a source to a destination in an intermediate using multiple paths.

II. RELATED WORK

Sanjeev Kumar et.al., [1] have proposed a new protocol Modified Dynamic Source Routing (MDSR) to provide data transmission with higher end-to-end reliablity in wireless ad hoc networks, the objective to provide a reliable route for packet transmission with a minimum network overhead.

Mamoun Hussein Mamoun et.al., [2] fined problems in QoS routing in MANET and introduce new routing algorithm (NRRA).

A.Valarmathi et.al., [3] defines modification to original DSR protocol. DSR was modifying to monitor the occurrence of congestion by using multiple resource utilization thresholds as Quality of Service.

Ramesh et al., [4] have proposed proposes a congestion aware multi-path Dynamic Source Routing Protocol. The resultant protocol will generate set of highly disjoint paths and calculate the correlation factor between the paths to decrease the end to end delay.

Dhirendra Kumar Sharma et al.,[5] enhances the performance of SMR protocols by using route update mechanism. The MANET, routing protocols are used to provide the specific path for sending the data packets. Multipath routing provides the multiple paths in the MANET. So, in this paper we enhance the performance of Split Multipath Routing protocols by using route update mechanism. This proposal is useful in route recovery process.

Venkata Subramanian et al., [6] have suggested a Mobile ad- hoc networks, the unstable transport layer and inhibited amount of traffic being carried out by the network is owing to the high packet loss rates and frequent topological changes. Develops a Qos-based Robust Multipath Routing (QRMR) protocol for mobile ad hoc networks. Multipath allot weights to individual links depending on the metrics link quality, channel quality and end-to-end delay.

Mujing Jin ZhaoweiQu et al., [7] exploits that in Ad Hoc network, the multi-hop networks as the characteristics of the dynamic changing of the interconnection topology make the routing very important. They defines an optimized scheme of SMR. Which allows the SMR having better performance in low-speed environment especially can decrease the end-to-end delay and also expands the range.

Zafare et al., [8] have suggested that Multipath routing in mobile ad-hoc networks allows the establishment of multiple paths for routing between a source-destination pair. Itprovides benefit of fault tolerance, load balancing, bandwidth aggregation and the improvement in quality-of-service.

David B et al., [9] have suggested that the Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes.describes stable tradeoffs between delay and routing load. Scheme uses two routes for each session; the shortest delay route and the one that is maximally disjoint with the shortest delay route.

Johnson, et.al [10] describes Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol. The protocol is composed of the two mechanisms of Route Discovery and Route Maintenance, which work together to allow nodes to discover and maintain source routes to arbitrary destinations in the ad hoc network.

Linifang Zhanget al., [11] have suggested a load-balancing scheme define load-balancing scheme for performance improvement of the multipath routing protocol. End to end delay improve and network resource utilized efficiently. In order to analyze the effect on the distribution of input traffic.

III. A NEW TECHNIQUE: MODIFIED AODV

A. Multi-Hop Packet Forwarding Process

The proposed algorithm is based on MAODV and MDSR. AODV and DSR enables "active, dynamic, multipath routing between mobile nodes wishing toestablish and maintain an ad hoc network". AODV and DSR allows for the construction of routes to specific destinations and does not require that nodes keep these routes when they are not in active communication. AODV or DSR avoids the "counting to infinite" problem by using destination sequence numbers. This makes AODV and DSR loop-free.

AODV defines 3 message types:

- Route Requests (RREQs) intilialize the route finding process
- Route Replies (RREPs) finalize the routes based on request
- Route Errors (RERRs) RERR alert the network of a link failure in an active route.

In this Algorithm, the Route is selected based on the trust Index of all nodes.

Let
Z = {N1, N2,….Nn} be the network of nodes.
Tibe the trust index of node Ni,
Tinc be the value of trust increment, Trust Based Multi-Hop Forwarding Scheme for Data
Security in Mobile Ad Hoc Networks
Te be the value of Trust node energy,
Tc be the trust node cost.
Nk be the node which forwards a data packet Pk.
p be positive constant for trust increment and decrement.

Algorithm 1

Initially, each node maintains a lookup table, which includes sequence numbers, source and destination IP addresses and port numbers, and the address of the next hop.

Node Ni receives the data packet Pk.
If Pk is a retransmitted packet, then Node i decrements trust index of Nk by
Te = Te – 2*p
Compare Ti-1 with Tc.
If T0 < Ti-1 < Tc,
Packet is dropped.
Else
Packet is forwarded to node Ni+1.
Ni updates the lookup table with current trust values.
End if
Else
If Pk is an acknowledgement packet, then
If Nk originally forwarded Pk, then
Ni
increments trust index of Nk by
Tinc= Tinc + p
End if
End if

B. Load Balancing Technique

Load balancing is a networking method to shell out assignment across multiple network links, central processing unit, disk drives. Load balancing is partioning the amount of work that a network has to do between two or more networks so that more work is done in the same amount of time and, in general, all users are furnished quicker. Load balancing can be implemented with hardware, software, or a combination of both. Typically, load balancing is the main reason for computer server aggregate.

IV. RESULT AND DISCUSSION

In order to demonstrate the effectiveness of Ad hoc On Demand Distance Vector (AODV), Modified

AODV. The performance of protocol proposed is compared with the performance of Dynamic Source Routing (DSR), Modified DSR. The proposed protocol is implemented using the Network Simulator (NS-2). In this simulation to compare the four on–demand ad-hoc routing protocol to implement the best performance. However, the traditional routing protocols, such as AODV, MAODV, DSR and MDSR, may find their limitations in industrial installations due to the harsh environmental conditions, interference issues, and other constraints. In MANETs, transmission breakage will result in lost or procrastinating of process or restrict data, and lost the process or restrict deadline is normally impossible for industrial applications, as it may cause discord in industrial automation or possibly end the automation, ultimately results in economic failure. The sensed data should be continuously and accurately transmitted to the sink node, and the programming or re tasking data for sensor node operation, command, and query should be reliably delivered to the target nodes. It is also required that these networks can operate for years without replacing the device batteries.

Since the varying wireless channel conditions and sensor node failures may cause network topology and connectivity changes over time, to forward a packet reliably at each hop, it may need multiple retransmissions. These result in undesirable delay as well as additional energy consumption. Opportunistic routing (OR) has been proposed as an effective cross-layering technique to combat fading channels, thus improving the robustness and energy efficiency in wireless networks. The aim of opportunistic routing is to catch the advantage of the broadcast nature of wireless communication, associate the multiple neighbors of the sender into local forwarding. Since the wireless medium is shared, each node can overhead the data packets sent by its neighbors. In the network layer, a set of forwarding candidates are list in the data packet and these nodes will follow the assigned priorities to relay the packet. Essentially, only one node is chosen as the actual forwarder at the MAC layer in an a posteriori manner. Reactive routing protocols are designed to decrease the bandwidth and storage cost consumed in table driven protocols. These protocols apply the on-demand procedures to dynamically build the route between a source to destination. Routes are generally desinged and maintained by two different phases, namely: route discovery and route maintenance. Route discovery usually maintain on-demand by flooding an RREQ (Route Request) through the network, i.e., when a node has data to send, it broadcasts an RREQ. When a route is initiate, the destination returns an RREP (Route Reply), which contains the route information (either the hop-by-hop information or complete addresses from the source to the destination) traversed by the RREQ.

V. PERFORMANCE METRICS

Performance in throughput: It is defined as the total number of packets delivered over the total simulation time. The throughput comparison shows that the three algorithms performance margins are very close under traffic load of 50 and 100 nodes in MANET scenario and have large margins when number of nodes increases to 200. It is defined as Mathematically: Throughput= N/1000 Where N is the number of bits derived successfully by all destinations.

Performance in packet delivery ratio: Packet delivery ratio is defined as the ratio of data packets received by the destinations to those generated by the sources. Mathematically, it is defined as: PDR= S1÷ S2 Where, S1 is the sum of data packets received by the each destination and S2 is the sum of data packets generated by the each source.

Performance in packet loss: When one (or) more packet of data travelling across a network fail to reach their destination. It is measured as percentage of packet loss with respect to packet sent.

Performance in energy consumption: Energy consumption of a node at time t is defined as the summation of the number of packets transmitted by

the node at time t (Nt) with the number of packets received by the node at time t (Nr).

Performance in routing overhead: The routing load is defined as the total number of routing control packets normalized by the total number of received data packets.

VI. SIMULATION RESULT

The simulation results are presented and analysed, focusing on metrics like Throughput, Packet Delivery Ratio, Packet loss, Energy Consumption and Routing Overhead. The results of the Ad-Hoc On demand Distance Vector (AODV), Modified Ad-Hoc On demand Distance Vector (MAODV), Dynamic Source Routing (DSR) and Modified Dynamic Source Routing (MDSR) model are compared to choose the best model.

A. Packet Delivery Ratio

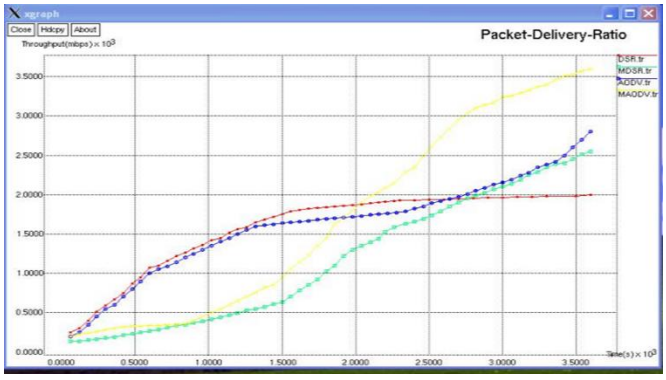

Figure 1. Packet Delivery Ratio Vs. Time

This figure 1, it can inferred that the Packet Delivery Ratio for four on demand routing protocol DSR, MDSR, AODV, and MAODV. This graph shows the Time Vs Throughput comparison of four reactive routing protocol. From this comparison AODV and MAODV routing protocol shows the better performance when compared to DSR and MDSR routing protocol.

B. Packet Loss

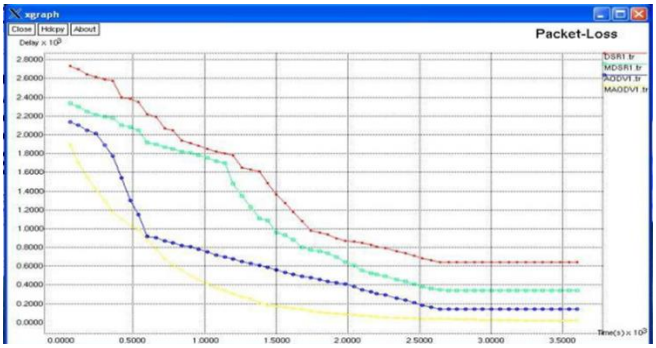

Figure 2. Packet Loss Vs Time

This figure 2, shows the Packet Delivery Ratio for four On-demand routing protocol DSR, MDSR, AODV and MAODV. This graph shows the Time Vs shows the Packet Delivery Ratio for four On-demand routing protocol DSR, MDSR, AODV and MAODV. This graph shows the Time Vs Delay comparison of four reactive routing protocol. From this comparison AODV and MAODV routing protocol shows the better performance when compared to DSR and MDSR routing protocol.

C. Routing Overhead

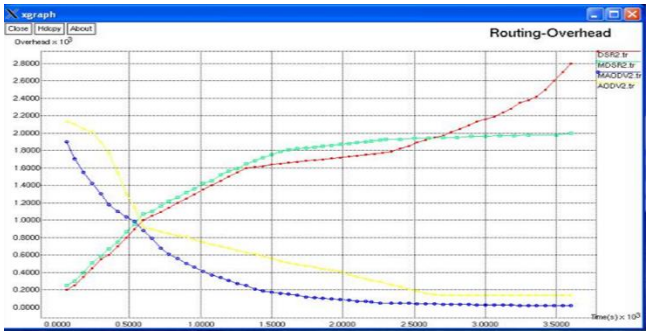

Figure 3: Routing Overhead Vs. Time

From figure 3, it can inferred that the Routing Overhead for four On-demand routing protocol DSR, MDSR, AODV and MAODV. This graph shows the Time Vs Overhead comparison of four reactive routing protocol. From this comparison AODV and MAODV routing protocol shows the better performance when compared to DSR and MDSR routing protocol.

VII. CONCLUSSION

In this work, we presented AODV, MAODV, which can augment most existing reactive routing protocols in MANETs to provide reliable and energy-efficient packet delivery against the unreliable wireless links. We introduced a biased back off scheme in the route discovery phase to find a robust virtual path with low overhead. Without utilizing the location information, data packets can still be greedily progressed toward the destination along the virtual path. Therefore, AODV, MAODV provides very close routing performance to the geographic opportunistic routing protocol. We extended AODV, MAODV to demonstrate its effectiveness and feasibility. Simulation results showed that, as compared with other protocols, AODV, MAODV can effectively improve robustness, end-to-end, energy efficiency and latency.

VIII. REFERENCES

[1] Sanjeev Kumar, Yogesh Chaba, "Quality of Service Aware – Modified DSR Protocol in Mobile Ad-Hoc Network", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 10, October 2014, pages.876-882

[2] Mamoun Hussein Mamoun, "A New Reliable Routing Algorithm for MANET", International Journal of Research and Reviews in Computer Science, 3, June 2011, pages.638-642

[3] Valarmathi, R.M. Chandrasekaran, "Performance of improved dynamic source routing algorithm for military communication logistics", International Journal of Enterprise Network Management, November 3/2011, pages.302-310

[4] Ramesh, V. Subbaiah, P. Chaitanya, N. S. Supriya, "Performance Comparison of Congestion Aware Multi-Path Routing (with Load Balancing) and Ordinary DSR", IEEE 4th International Conference, 15-17 Dec. 2010, pages. 1 - 5

[5] Dhirendra Kumar Sharma, Sanjay Kumar Biswash, Chiranjeev Kumar "Enhancement of Split Multipath Routing Protocol in MANET", International Journal on Computer Science and Engineering, 03, 2010, pages. 679-685

[6] Venkatasubramanian, S.Gopalan, N.P., "A QoS-Based Robust Multipath Routing Protocol for Mobile Ad hoc Networks", First Asian Himalayas International Conference, 3-5 Nov. 2009, pages. 1 – 7

[7] Mujing Jin Zhaowei Qu, "Improvement for Split Multipath Routing Protocol in Ad Hoc Network", IEEE International Conferences, 16-18 Oct. 2009, pages. 299 – 302

[8] Zafar, H. Harle, D. Andonovic, I. Khawaja, "Performance evaluation of shortest multipath source routing scheme", Communications. IET, May 2009, pages. 700 - 713

[9] Rookhosh, F.; Haghighat, A.T.; Nickmanesh, S., " Disjoint Categories in Low Delay and On-Demand Multipath Dynamic Source Routing Ad hoc Networks", First International Conference on, 21-22 Oct. 2008, pages. 207-213

[10] David B. Johnson David A. Maltz Josh Broch, "DSR: The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks", Proceedings of INMC 2004. 8th International, 24-26 Dec. 2004, pages. 516 – 521.

[11] Linifang Zhang, Zenghua Zhao, Yantai Shu, Lei Wang, Yang, O.W.W., "Load Balancing of Multipath Source Routing in Ad Hoc Networks", Communications, 2002. ICC 2002. IEEE International Conference, 2002, pages. 3197 - 3201 vol.5

[12] R.Leung, Jilei Liu; E.Poon, A-L.C Chan, Baochun Li, "MP-DSR: A QoS-aware Multi-path Dynamic Source Routing Protocol for Wireless Ad-Hoc Networks", Proceedings LCN 2001. 26th Annual IEEE Conference, 2001, pages. 132 - 141

[13] Lee, S.-J., Gerla, M., "Split Multipath Routing with Maximally Disjoint Paths in Ad hoc Networks", ICC 2001. IEEE International Conference, 2001, pages. 3201 - 3205 vol.10

[14] Kui Wu Harms, "Performance Study of a Multipath Routing Method for Wireless Mobile

Ad Hoc Networks", Proceedings Ninth International Symposium, 2001, pages. 99 – 107

[15] A. Nasipuri, R. Castaeda, and S. R. Das, "Performance of multipath ad hoc networks", in ACM/Baltzer Mobile Networks and Applications (MONET) Journal, 2001, pages. 339–349. vol. 6

[16] Lei Wang, Yantai Shu, Miao Dong, Lianfang Zhang, Yang, O.W.W., "Adaptive Multipath Source Routing in Ad Hoc Networks", ICC 2001. IEEE International Conference on; 2001, pages. 867 - 871 vol.3

[17] Lei Wang, Lianfang Zhang, Yantai Shu, Miao Dong, "Multipath source routing in wireless ad hoc networks", Proceedings of Canadian Conference on Electrical and Computer Engineering, 2000, pages.479-483, vol. 1.