RESEARCH PAPER | Engineering | Volume : 5 | Issue : 8 | August 2015 | ISSN - 2249-555X

Quality of Service Based Improved Dynamic Source Routing in MANETs

KEYWORDS: Quality of Service (QoS), routing, mobile ad hoc network, distance, node connectivity

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ABSTRACT *Offering theQuality of Service (QoS)guarantee in a Mobile Ad-hoc Network (MANET) is a complicatedowing to node mobility, disputation for channel access, limitation centralized coordination and unreliable wireless channel. In Dynamic Source Routing (DSR) Protocol,the route breakages occur due to two main reasons: node mobility and node fault. This broken route is purged and a new route is discovered from source to destination this affects the network performance. In this paper, we propose QoSbased improved DSR in MANETs. In this scheme, the next forward node selection is based on distance, quality of service and node connectivity. Thus, it is possible to avoid the link breakages and improve the performanceof the network.*

I. Introduction

Mobile ad-hoc Network is an elastic and self-awareness wireless network that can be quickly deployed and reconfigured lacking infrastructure support or centralized management. It does not need any infrastructure support. MANETs are useful in many application environments; shared computing and communications in smaller areas can be arrangement-using MANETs. Interactions in battlefields as well as calamity improvement areas are other examples of application environments. Likewise, transportation using a network of sensors is another potential application of MANETs.

In MANET, the node mobility induces repeated changes of the network topology also causes high transmission error probability. A lot of work has been done on the area of routing in mobile ad hoc networks; however, the QoS necessities are invariably ignored. The important task for QoS routing is to find a possible path through the network between the source and destination that meet the QoS constraints. The QoS routing is applied based on Source routing or distributed routing.

Initially, we evaluate the nodes in the neighbor list of the current hop for the next hop selection. Next, we choose the forward node based on the node distance, QoS and node connectivity. The rest of this paper is structured as follows. The section II describes the related works. In section, III discusses the proposed method and section, IV describes the Simulation and Analysis. Section V presents the conclusion of the paper.

II. Related Works

Mohapatra et al (2003) proposed The QoS features are unreliable link, node mobility, lack of battery life, hidden terminal problems, maintenance of route, and security. Wireless network is especially volatile. Collision of packet is occurring in wireless network. These properties are making the wireless link is an unreliable. Node mobility leads to dynamic network topology. Dynamic nature of the network topology and the altering performance of the communication medium cause the accurate maintenance of network information very complex.

Adaptive routing for Ad-hoc Networks was proposed by Barua, and Chakraborty (2002).It worked in case of imprecise information by transmission weights along with the probability of each information. This information can be used for routing decision. A significant advantage is that this protocol offers scalability. Kiruthika, and Rani (2013) discussed A reliable path selection mechanism was proposed to improve the QoS during the node stability, capacity of transmits data and bandwidth vital to the data. This method selects the routes based on the QoS parameters like delay and bandwidth. Transmission path is selected based on the greatest bandwidth and least delay. The decrease in the flooding cost during data discovery, delay and routing overhead are some of the advantages of this method.

Fauzia and Fatima (2014) proposed the stable route selection according to Received Signal Strength Indication and QoS. It discover link break at the same instant of time and repair routes for all affected data flow. Gui et al (2008) proposed Entropy based Long life Multipath Routing algorithm (ELMR). The ELMR protocol is based on the new metric entropy and it selects the stability path by diminishing the number of route rebuilding also it decline the protocol complexity during the local broadcasting in the networks.

Asraf et al (2010) introduced Genetic Algorithm is a search and optimization technique that is based on natural selection and genetics. This intends to get the optimal tree that can satisfy the applications' QoS criteria. The tree should provide optimal path that meets delay, bandwidth, and cost requirements. The nodes move in a randomized approach without any relation to its previous co-ordinate, which can make limited connectivity.

Yadav, and Chavan (2013) explained QoS aware routing chooses the path based on bandwidth, nominal search, distance, and traffic condition Hanzo and Tafazolli (2011) discussed to improved the QoS and admission control protocol in the face of mobility, shadowing and varying link in the SNR. It proactively maintained backup routing for active session, adaptive transmission rate, and routing around temporarily low SNR link can perceptible improve the reliability of assured throughput services. It also evaluated the shadow fading.

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Quality of Service for Ad-hoc On-Demand Distance Vector Routing was proposed by Zhangand Gulliver (2005). It establishes a list of paths with minimal cost. The greatest cost node is selected for data transmission. This protocol is used for hierarchical routing QoS-AODV in order to use the energy metric for extension takes into account the end-to-end delay and replaces the bandwidth metrics with the energy consumed along the path. Bandwidth-aware multicasting protocol Hu, et al (2008) can determine a bandwidth fulfilled multicast tree to declare a flow with the requested bandwidth. This scheme, aims to minimize the number of forwarders to reduce bandwidth and power consumption.

A novel QoS architecture was proposed by Calafate et.al (2009). It is modular and combines with the IEEE 802.11e to offer soft QoS support to MANETs heavily loaded by both best effort and QoS traffic. The architecture allows the plugging in of different protocols, which present great flexibility. It offers good performance when the topology changes. It includes the cross layer optimization to improve the performance of the network. It is also used in heterogeneous network where not all the terminals participate in QoS task, while maintaining the high degree of effectiveness in homogeneous MANETs.

Dynamic Source Routing Time to Live (DSR_TTL) was proposed by Tambuwal, et.al (2013). It improves the performance of DSR protocol. It was based on the small network size with constant and variable speed. This study indicates that a medium number of TTL revealed a high performance.

III. Proposed Method

In a MANET, the communication linkage between two nodes breaks repeatedly. This causes more delay in transmission and degrades the performance of QoS. Route breakages are caused by mobility of node or node fault in DSR protocol [13]. If any link failure occurs, then a new route discovery is initiated at the source to send data to the destination. This provides scalability and performance problem in the large networks. To facilitate and to accomplish the maximum efficiency, we propose a QoS improved DSR in MANETs. This scheme takes into consideration more than a few criteria for routing performance. Distance, QoS and node connectivity are used to for next hop selection. The forward node selection factor (FN_{FACTOR}) is estimated by the equation is given below.

$$FN_{FACTOR} = \frac{\sqrt{D^2_{i,j} + Qos^2_{\ j} + NC^2_{i,j}}}{100}$$

Where,

$D_{i,j}$ is the distance.

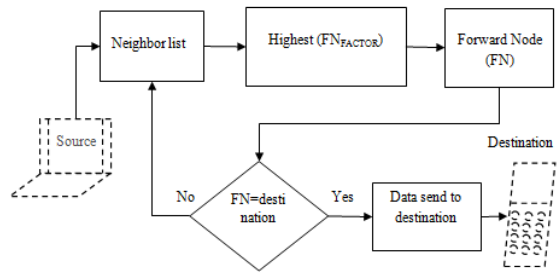
Qos_j is the Quality of service,

$NC_{i\ j}$ is the node connectivity.

i represents the current hop.

j represents the next hop

Fig 1: Architecture of forwarding node selection in MANETs



This scheme can be explained by the above figure 1. Initially, the source node discovers all nodes that are present in its transmission range and store them in the neighbor list. Then the source checks whether the destination node is present in the neighbor list or not. If the list has the destination, the data is sent directly to the destination. Otherwise, it selects the best forward node based on the following steps.

Step 1: Observe the node connectivity of the nodes in the neighbor list.

Step 2: Calculate the QoS and distance.

Step 3: The forward node selection factor is estimated for all neighbor nodes. The highest FN_{FACTOR} node is a next forward node.

Step 4: Repeat the step until the data reach the destination.

While the forward node selection, every node validate the following parameters.

Distance:

The distance is the main factor of the data transmission in the networks. Therefore, the distance measurement is a significant function in the forward node selection. The distance is measured between the node *i* and *j*. The distance is estimated from the received signal strength.

Quality of Service:

Quality of Service indicates the performance of a network. Packet Delivery Rate (PDR), Packet Loss Rate (PLR) and delay are the most important factors to measure the QoS, which is measured the formula is shown below.

$$QoS_j = \frac{PDR_j - PLR_j}{DLR_j}$$

Packet delivery ratio is the ratio of the number of packets delivered to the destination. Packet delivery ratio is measured by the equation is given below.

$$PDR \quad \frac{\sum Pkt\ deliv}{\sum Pkt\ sent}$$

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Packet loss ratio is the ratio of number of packets dropped during the data transmission. The Packet loss ratio is measured by the given equation.

$$PLR = \frac{\sum Pkt\ lost}{\sum Pkt\ sent}$$

Delay is the time of packet received and time of packet sent. Delay is measured by the following equation.

$$Delay = T_{pkt\ rcvd} - T_{pkt\ sent}$$

Node Connectivity:
The connectivity represents the number of nodes presents within the transmission range. Node connectivity is the face of rising node mobility and provides an optimal node density for maintaining connectivity in the network.

IV. Simulation and Analysis
The performance of proposed scheme is analysed using the Network Simulator. To ensure that the proposed method is more proficient than the existing method, we have performed simulations to evaluate some of the essential parameters. The parameters used for the simulation of proposed scheme are tabulated in table 1 below.

Table 1: Simulation Parameters of HSM-DSR

Parameter	Value
Simulation Area	500x500
Simulation Time	100ms
Channel Type	WirelessPhy
Radio Model	TwoRayGroundModel
MAC Type	IEEE 802.11
Antenna Type	Omni Antenna
Number of Nodes	37
Mobility	Random way point

Packet Delivery Rate:

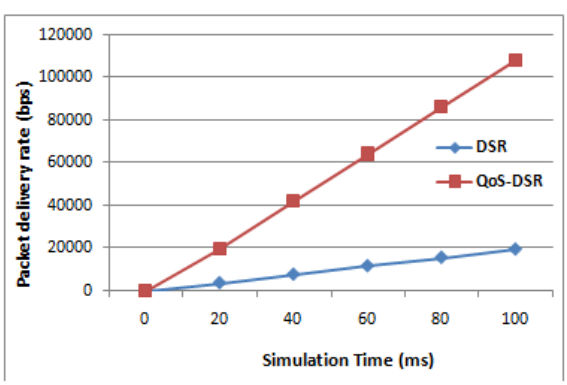

Fig 2: Packet Delivery Rate
Packet delivery rate is the ratio of number of packets delivered to the all destinations to the number of packets send by the source. The figure 2 explained that the proposed method QoS-DSR provide higher packet delivery rate compared to the existing protocol.

Packet Loss Rate:
Packet loss Rate is the number of packets lost over time in the network. Figure 3 shows that the QoS-DSR has the lowest loss rate when compared to the DSR routing protocol.

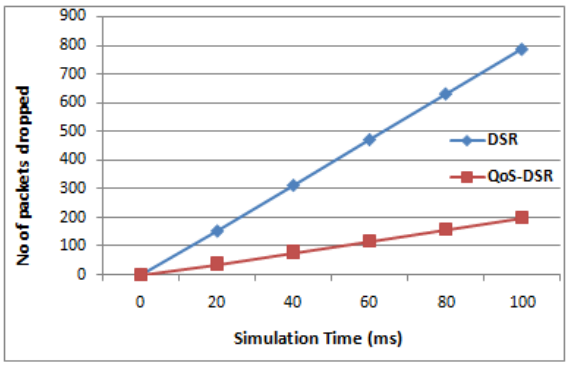

Fig:3 Packet Loss Rate

Average Delay:
The average delay is defined as the time difference between the current packets received and previous packet received. The figure 4 shows that the QoS-DSR has the lowest delay rate when compared to the DSR routing protocol.

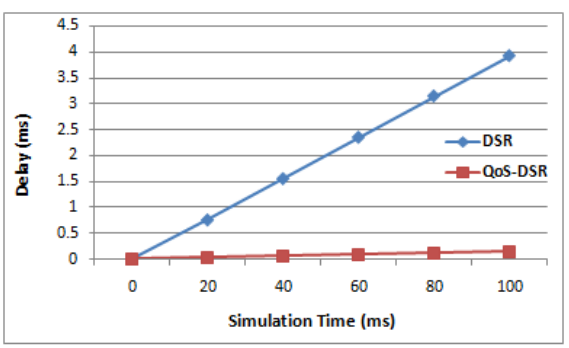

Fig4: Delay Rate

Throughput:
Throughput is the most important parameter used to access the network. Throughput is the total number of successfully delivered packets in the networks. The throughput is calculated by the equation is given below.

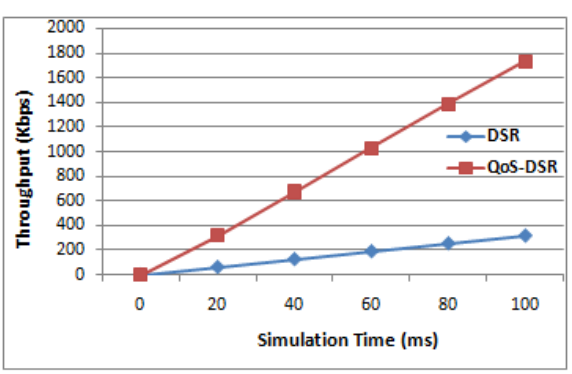

Fig 5: Throughput Rate

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$$Throughput = \frac{\sum_{0}^{n} pkts\ rcvd(n) * pkt\ size}{1000}$$

Figure 5 indicates that the QoS-DSR achieved higher throughput rate compared to the Dynamic Source routing protocol.

V. Conclusion:

Node distance, node connectivity and Quality of service are dynamically assessed during routing to improve the routing in MANETs. The protocol estimates a forward node selection factor using these parameters for each consecutive set of neighbor list of current hop. This not only reduces the number of hops during communication but also improves the routing performance. In addition, QoS-DSR minimizes the packet loss and delay rate in MANET routing.

REFERENCE

Asraf, N. M., Ainon, R. N., & Keong, P. K. (2010, May). QoS parameter optimization using multi-objective genetic algorithm in MANETs. InMathematical/Analytical Modelling and Computer Simulation (AMS), 2010 Fourth Asia International Conference on (pp. 138-143). IEEE. | Barua, G., & Chakraborty, I. (2002, December). Adaptive routing for ad hoc wireless networks providing QoS guarantees. In Personal Wireless Communications, 2002 IEEE International Conference on (pp. 196-200). IEEE. | Calafate, C. T., Malumbres, M. P., Oliver, J., Cano, J. C., & Manzoni, P. (2009). QoS support in MANETs: a modular architecture based on the IEEE 802.11 e technology. Circuits and Systems for Video Technology, IEEE Transactions on,19(5), 678-692. | Fauzia, S., & Fatima, K. (2014). Routing in FSO MANETs—QoS and directionality. In Wireless and Optical Communications Networks (WOCN), 2014 Eleventh International Conference on (pp. 1-5). IEEE. | Gui, C., Sun, B., & Xia, C. (2008, October). An entropy-based long-life multipath routing algorithm in manet. In Natural Computation, 2008. ICNC'08. Fourth International Conference on (Vol. 5, pp. 174-178). IEEE. | Hanzo, L., & Tafazolli, R. (2011). QoS-aware routing and admission control in shadow-fading environments for multirate MANETs. Mobile Computing, IEEE Transactions on, 10(5), 622-637. | Hu, C. C., Wu, E. H. K., & Chen, G. H. (2008). Bandwidth-satisfied multicast trees in MANETs. Mobile Computing, IEEE Transactions on, 7(6), 712-723. | Johnson, D., Hu, Y., & Maltz, D. (2007). The dynamic source routing protocol (DSR) for mobile ad hoc networks for IPv4 (No. RFC 4728). | Kiruthika, R., & Rani, R. U. (2013). A Reliable Path Selection Mechanism to Enhance QoS in MANET Routing Protocols. International Journal of Engineering Trends and Technology (IJETT), 5 (3). | Mohapatra, P., Li, J., & Gui, C. (2003). QoS in mobile ad hoc networks. IEEE Wireless Communications, 10(3), 44-53. | Tambuwal, A. B., Noor, R. M., & Michael, O. (2013). Improvement of DSR routing protocol using TTL-based scheme in Mobile Ad Hoc Networks. In RFID-Technologies and Applications (RFID-TA), 2013 IEEE International Conference on (pp. 1-6). IEEE. | Yadav, M. M., & Chavan, G. T. (2013). Predictive Location-Based QoS Routing with Admission Control in Mobile Ad-hoc Networks to improve QoS. Extraction,2(7). | Zhang, Y., & Gulliver, T. A. (2005). Quality of service for ad hoc on-demand distance vector routing. In Wireless And Mobile Computing, Networking And Communications, 2005.(WiMob'2005), IEEE International Conference on(Vol. 3, pp. 192-196). IEEE.