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Comparative Study of Various Qos Based Routing Protocols in Mobile Adhoc Networks

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ABSTRACT
The provision of quality of service (QoS) guarantees is much more challengeable and difficult mobile adhoc networks (MANETs) than traditional wired networks. It is mainly due to node's movement, hop-to-hop communications, channel access contention, and a lack of central coordination. For most multimedia and other time sensitive applications, the QoS guarantees are very much needed. Usefulness of MANET is limited due to the difficulties in the provision of QoS. However, in the recent past few years, much research attention has focused on providing QoS assurances in MANET protocols. The QoS routing protocol is an integral part of any QoS solution since its function is to ascertain which nodes, if any, are able to serve applications' requirements (e.g. bandwidth/delay). So in this paper author presents a comparative study of various QoS based routing protocols in MANETs.
Keywords -quality of service, QoS routing, MANET, ad hoc network, routing.

I. INTRODUCTION

Quality of service (QoS) is a measure of the level of service that a particular data gets in the network. The network is expected to guarantee a set of measurable prespecified service attributes to the users in terms of end-to-end performance such as delay, bandwidth, probability of packet loss, delay variance (jitter), and so forth. Power consumption is another QoS attribute which is more specific to mobile ad hoc networks (MANETs).

Traditional Internet QoS protocols like Resource Reservation Protocol (RSVP) cannot be easily migrated to the wireless environment due to the error-prone nature of wireless links and the high mobility of mobile devices. As stated earlier, many routing protocols such as DSDV, DSR and AODV have paid little attention to QoS support in the early development of MANETs. However, QoS provision is becoming more important nowadays due to the rising popularity of real-time applications.

Depending on the application involved, the QoS constraints could be available bandwidth, end-to-end delay, delay variation (jitter), probability of packet loss, and so on. This kind of demand puts more pressure on the network and the routing protocols which are used to support the communications. Establishing multi-hop routes between nodes is not sufficient in this case. The discovered routes can only be considered if they provide guarantees of the QoS parameters, such as bandwidth required by the application.

II. ISSUES AND CHALLENGES INVOLVED IN PROVIDING QOS

QoS can be measured in terms of parameters like data rate, delay, delay variation (jitter), and packet loss. Providing QoS in MANETs has its own challenges and problems.

1. Varying physical link properties: Because the wireless link is unpredictable and time varying, it becomes difficult to ensure that a minimum level of service is satisfied.

2. Medium access issues: Because the wireless channel is shared by many devices, managing them in such a way that the QoS guarantees are fulfilled is difficult.

3. Routing: Because the nodes are mobile, the network topology changes randomly with time, and the routing protocol needs to update the routes and links.

4. Power consumption: Nodes, being mobile, have a limited power capacity.

5. Characterization of the link state: Because the network state changes with time, one needs to have some mechanism in place which can continue to update the network state and, based on it, predict whether it will be able to achieve a particular quality of service requirement or not.

6. Dynamic topologies: Nodes are free to move arbitrarily; thus, the network topology which is typically multihop may change randomly and rapidly

at unpredictable times, and may consist of both bidirectional and unidirectional links.

III. COMPARATIVE STUDY OF VARIOUS QOS BASED ROUTING PROTOCOLS

As per [1], the explosive growth in the use of mobile devices coupled with users' desires for real-time applications has provided new challenges in the design of protocols for mobile ad hoc networks. Chief among these challenges to enabling real-time applications for mobile ad hoc networks is incorporating support for quality of service (QoS), such as meeting bandwidth or delay constraints. In particular, it is important that routing protocols incorporate QoS metrics in route finding and maintenance to support end-to-end QoS. This article [1] extensively and exclusively presented the issues involved with QoS-aware routing and an overview and comparison of existing QoS-aware routing protocols. In addition, the open issues that must be addressed to fully support QoS-aware routing are discussed.

As per [2], authors have proposed a solution taking into account radio interferences in mobile ad hoc network routing and optimizing flooding. This solution is based on a modified version of the OLSR routing protocol that considers bandwidth requests and radio interferences in the route selection process while providing a very efficient flooding. A comparative performance evaluation based on NS simulations shown that despite the overhead due to QoS management, this solution outperforms classical OLSR in terms of QoS perceived by the users (e.g. bandwidth amount granted to a flow and delivery rate). The efficiency of the optimized flooding is equal to that provided by the native version of OLSR.

As per [3], It is important to deal with the optimal parameter setting of the optimized link state routing (OLSR), which is a well-known mobile ad hoc network routing protocol, by defining an optimization problem. This way, a series of representative meta-heuristic algorithms (particle swarm optimization, differential evolution, genetic algorithm, and simulated annealing) are studied in this paper to find automatically optimal configurations of this routing protocol. In addition, a set of realistic VANET scenarios (based in the city of Málaga) have been defined to accurately evaluate the performance of the network under our automatic OLSR. In the experiments, proposed tuned OLSR configurations result in better quality of service (QoS) than the standard request for comments (RFC 3626), as well as several human experts, making it amenable for utilization in VANET configurations. In this paper, authors have addressed the optimal parameter tuning of the OLSR routing protocol to be used in VANETs by using an automatic optimization tool. For this task, authors have defined an optimization strategy based on coupling optimization algorithms (PSO, DE, GA, and SA) and the ns − 2 network simulator.

As per [4], the QOLSR is a multimedia protocol that was designed on top of the optimized link state routing (OLSR) protocol for mobile ad hoc network. It considers the quality of service (QoS) of the nodes during the selection of the multi-point relay (MPRs) nodes. One of the drawbacks of this protocol is the presence of selfish nodes that degrade the network lifetime. The limited energy and resources, and the absence of any motivation mechanism cause mobile nodes to behave selfishly during the MPRs selection. A new MPR selection based on cluster head election was proposed in previous work to increase network lifetime. In this paper, authors considered the selfishness during the election and selection process by proposing the use of reputation system that will motivate nodes to participate during the selection of MPRs, where the reputation is calculated based on VCG mechanism design. After solving the selfishness during network formation, authors have discovered that nodes can misbehave after being selected/elected. Such a passive malicious behavior could lead to a denial of service attack due to the drop of packets. As a solution, authors proposed a hierarchal cooperative watchdog detection model for the cluster-based QOLSR, where nodes cooperate in a hierarchical manner to detect selfish nodes.

As per [5], a heuristics for highly efficient selection of multipoint relays (MPR) in optimized link state routing (OLSR) protocol is proposed. MPR selection is one of the most important and critical function of OLSR protocol. This paper proposes a Fuzzy logic based novel routing metric for MPR selection based on the energy, stability and buffer occupancy of the nodes. An algorithm is designed to cope with these constraints in order to find quality MPR (QMPR) that guarantees the QoS in OLSR. The aim of this paper is to formulate, build, evaluate, validate and compare rules for QMPR selection using fuzzy logic. It has been validated that proposed composite metric (based on energy, stability and buffer occupancy) selects a more stable MPR. By mathematical analysis and simulation, it is shown that efficiency of OLSR protocol has been improved using this new routing metric, in terms of energy efficiency and network life time.

IV. TABLES

Finally, a following table can be generated by evaluating various recent articles on QoS based routing protocols.

Sr.No.	Article & Method	Identified Drawbacks/Future Directions
1	A Survey of Routing Protocols that Support QoS in MANET [1]	OLSR-based QoS-aware routing protocol looks more promising than other routing protocols. It has still some open issues which can be worked

		for future like MPR set setup, selfish nature of MPR nodes, delay estimation is missing etc.
2	Quality of Service Routing in a MANET with OLSR [2]	Delay estimation is not done, while bandwidth estimation method is missing.
3	Intelligent OLSR Routing Protocol Optimization for VANETs [3]	Same can be applicable to the MANET as it less comparatively less mobility than VANET
4	Reputation-Based Cooperative Detection Model of Selfish Nodes in Cluster-Based QoS-OLSR Protocol [4]	Reputation as one of the QoS metric does not affect the performance and quality of service QoS of the network.
5	The fuzzy based QMPR selection for OLSR routing protocol [5]	The combination of FIS and ANN, called Neuro-fuzzy can be used for better results.

V. CONCLUSION

After going through the various articles on the QoS routing protocols and from comparative study of various QoS based routing protocols, we conclude that OLSR based QoS routing is best for MANET to assure QoS provisioning. QOLSR routing protocol is already proposed in the literature. So we can find out various ways to optimize the functioning of QOLSR. Also after identifying drawbacks/future directions of the surveyed articles, one can research in that area.

REFERENCES

[1] Lei Chen and Wendi B. Heinzelma, A Survey of Routing Protocols that Support QoS in Mobile Ad Hoc Networks, *IEEE Network, Nov/Dec 2007*

[2] Dang-Quan Nguyen, Pascale Minet, Quality of Service Routing in a MANET with OLSR, *Journal of Universal Computer Science, vol. 13, no. 1 (2007), 56-86*

[3] Jamal Toutouh, José García-Nieto, and Enrique Alba, Intelligent OLSR Routing Protocol Optimization for VANETs, *IEEE Transactions on Vehicular Technology, Vol. 61, No. 4, May 2012*

[4] Nadia Moati, Hadi Otrok, Azzam Mourad, Wireless Pers, Commun,Reputation-Based Cooperative Detection Model of Selfish Nodes in Cluster-Based QoS-OLSR Protocol, *Springer Science, Business Media, New York, 2013*

[5] Ashish Kots, Manoj Kumar, Wireless Netw, The fuzzy based QMPR selection for OLSR routing protocol, *Springer Science, Business Media, New York, 2013*