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A SURVEY ON QUALITY OF SERVICE IN WIRELESS NETWORKS

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ABSTRACT

Quality of service (QoS) is an important consideration in networking, but it is also a significant challenge. Providing QoS guarantees becomes even more challenging when complexity increases in wireless and mobile networks. To support multimedia applications, it is desirable that a wireless network has a provision of Quality of Service. The QoS is the performance evaluation of the network particularly the performance seen by the users of the network. To measure the Qos various metrics are considered, like bandwidth, throughput, transmission delay, availability, scalability etc. This paper focus on various techniques involved in providing quality if service in wireless networks.

Index Terms- Quality of Service, scalability, bandwidth, reliability, hybrid wireless networks

1 INTRODUCTION

The quality of service is the overall measurement of the performance in the network. Quality of Service (QoS) means that the network should provide some kind of guarantee or assurance about the level or grade of service provided to an application. The actual form of QoS and the QoS parameter to be considered depends upon specific requirements of an application. For example, an application that is delay sensitive may require the QoS in terms of delay guarantees. Some applications may require that the packets should flow at certain minimum bandwidth. In that case, the bandwidth will be a QoS parameter. Certain application may require a guarantee that the packets are delivered from a given source to destination reliably, then, reliability will be a parameter for QoS. Service guarantees are typically made for one or more of the following four characteristics. A guarantee of delay assures the sender and receiver that it will take no more than a specified amount of time for a packet of data to travel from sender to receiver. A guarantee of loss assures the sender and receiver that no more than a specified fraction of packets will be lost during transmission. A guarantee of jitter assures the sender and receiver that the delay will not vary by more than a specified amount. Finally, a guarantee of throughput assures the sender and receiver that in some specified unit of time, no less than some specified amount of data can be sent from sender to receiver. The rapid development of wireless networks has stimulated numerous wireless applications that have been used in wide areas such as commerce, emergency services, military, education, and entertainment. The number of Wi-Fi capable mobile devices including laptops and handheld devices (e.g., smartphone and tablet PC) has been increasing rapidly. For example, the number of wireless Internet users has tripled world-wide in the last three years, and the number of smartphone users in US has increased from 92.8 million in 2011 to 121.4 million in 2012, and will reach around 207 million by 2017[1]. The widespread use of wireless and mobile devices and the increasing demand for mobile multimedia streaming services are leading to a promising near future where wireless multimedia services are widely deployed. The emergence and the envisioned future of real time and multimedia applications have stimulated the need of high Quality of Service (QoS) support in wireless and mobile networking environments. The QoS support reduces end to-end transmission delay and enhances throughput to guarantee the seamless communication between mobile devices and wireless infrastructures. Quality of Service (QoS) means that the network should provide some kind of guarantee or assurance about the level or grade of service provided to an application. The actual form of QoS and the QoS parameter to be considered depends upon specific requirements of an application. For example, an application that is delay sensitive may require the QoS in terms of delay guarantees. Some applications may require that the packets should flow at certain minimum bandwidth. In that case, the bandwidth will be a QoS parameter. Certain application may require a guarantee that the packets are delivered from a given source to destination reliably, then, reliability will be a parameter for QoS. The functionalities that are to be incorporated for QoS provisioning are as follows:

- Traffic classifier
- Resource reservation
- scheduling
- Admission control.

2 CATEGORIES OF QOS CONSTRAINTS

A constraint makes the job of a protocol more stressful as compared to the scenario when there is no constraint specified. For example, in case of routing, a route will be considered if it satisfies the specified constraints. The overall value of a constraint from a source to a destination may be expressed in terms of the values of its constituents. Let there be a multihop path between nodes u and v consisting of nodes $u1, u2, \ldots, uk$. Let $c(i, j)$ denotes the value of constraint c between nodes i and j or link (i, j). Alternatively, the value of a constraint along a path depends upon the individual values of the constraint along the links that form the path. Based on how the values of path constraints are related to the values of their corresponding link constraints, QoS constraints are classified into the following three broad categories.

• *Additive*: A constraint whose overall value is summation of the values of its constituents. In other words,
$c(u, v) = c(u, u1) + c(u1, u2) + \cdots + c(uk, v)$.
For example delay, jitter, hop count are additive constraints.
• *Multiplicative*: A constraint whose resulting value is a product of the values of its constituents. In other words,
$c(u, v) = c(u, u1).c(u1, u2). \ldots .c(uk, v)$.
For example, reliability, and the probability of packet loss are multiplicative constraints.
• *Concave*: A constraint is concave if
$c(u, v) = \min\{c(u, u1) + c(u1, u2) + \cdots + c(uk, v)\}$.
For example, bandwidth along a path is minimum among the bandwidths of the links that constitute the path. Therefore, bandwidth is a concave QoS constraint.

3 CLASSIFICATIONS OF METHODOLOGIES

The issues involved in QoS provisioning are different depending upon the type of and the requirements of an application, the methodology of QoS provisioning, and the layer of protocol stack at which the QoS is to be provided. In this section, we wish to classify the methodologies of QoS provisioning in mobile ad hoc networks and then we discuss different methods reported in the literature in each class. Figure 1 shows a classification of methods of QoS provisioning in mobile ad hoc networks that we call *layered classification*. In general, depending upon at which layer of TCP/IP protocol suite the QoS provisioning is implemented, one can classify methods of QoS provisioning into the following categories:

- MAC layer
- Network layer
- Cross layer.

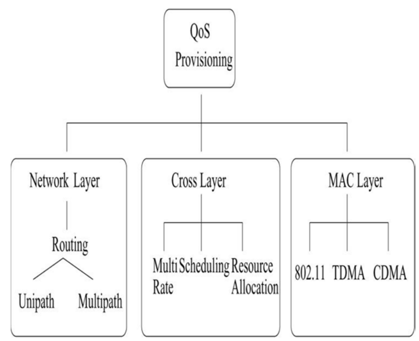

Figure 1 A layered classification of method of QoS provisioning in ad hoc networks

4 QOS ROUTING PROTOCOLS

4.1 Interference aware routing

A QoS routing protocol that guarantees the bandwidth for ad hoc networks with interference considerations is proposed in paper [2]. The protocol addresses the problem of Ad hoc Shortest Widest Paths (ASWP) routing. A routing protocol that is aware of the interference called as Interference Aware QoS Routing (IQRouting) is proposed in paper [3]. In IQRouting, several paths are probed using flow packets in a distributed fashion for satisfying QoS. The paths that satisfy the QoS are known as candidate paths. The path that is the best in terms of the QoS amongst all candidate paths is chosen by the destination node.

4.2 Multicast QoS routing

The issues involved in multicast routing with a provision of QoS are focused in this paper [4]. Therein, authors use a concept of „node bandwidth‟. Node bandwidth is related to the transmission rate by a node. As the bandwidths at the nodes of an ad hoc network are limited, a multicast call can be blocked despite the fact that enough bandwidth is available in the system so as to support the call. This is because a single multicast tree does not exist at the node to support the call. This paper proposed a multicast routing scheme by using either multiple paths or multiple multicast trees so that the bandwidth requirement of a call is met. Therein, three multicast routing schemes are proposed named as Shortest Path Tree Based Multiple Paths (SPTM), Least Cost Tree Based Multiple Paths (LCTM), and Multiple Least Cost Trees (MLCT). The routing trees obtained using these strategies can meet the User"s requirements in terms of delays and bandwidth.

4.3 Multipath QoS routing

A single route from a given source to a destination may not be able to provide enough resources required by an application. Therefore, a protocol should be capable of identifying multiple paths from a given source to a destination. A QoS routing protocol called Ticket Based Probing (TBP) is proposed in this paper [5]. A ticket is permission for an intermediate node to search exactly one path. The source sends probes towards the destination to search for a low cost path that satisfy the QoS constraint. Each probe is required to carry at least one ticket and a probe with more than one ticket is allowed to split at an intermediate node each searching a different downstream sub path. As a result, there can be multiple paths from a given source to the destination. However, multiple paths searched may not satisfy any kind of disjointness. The protocol avoids flooding by the ticket mechanism and is able to handle sessions with either delay or bandwidth constraints. There are multiple levels of path redundancies so as to direct traffic through an alternate path in case of failure of a link along an existing path. However, the protocol needs a beacon mechanism to know the neighbors and beacon packets are transmitted periodically; therefore, the overhead may be significant.

4.4 QoS routing with resource allocation

A framework for generalized QoS routing with resource allocation is proposed in this paper [6]. The framework combines routing with the allocation of resources along the routes. It employs a dynamic programming algorithm that tries to find an optimal path between a given source and a destination and computes the amount of resources required at each intermediate node so as to satisfy the end-to-end QoS requirements along the path. The QoS parameters considered are end-to-end delay, jitter, reliability, and bandwidth. These QoS parameters are represented as functions of resources rather than a fixed value metrics.

4.5 Reliable and efficient forwarding in ad hoc networks

The paper [7] packet forwarding in ad hoc networks are focused and proposes a new approach to improve performance of nodes communication. A mechanism for REliable and Efficient Forwarding (REEF) is given which alleviate the effects of undesirable situations caused by cooperation misbehavior or network fault conditions. It makes use of nodes local knowledge to estimate route reliability, and multi-path routing to forward packets on the most reliable route. This REEF mechanism, which addresses performance problems of the forwarding function, caused by several factors such as nodes selfishness, malice, and fault conditions. This paper explains REEF as TCP traffic based mechanism.

In case of UDP packets, no acknowledgment is given for packets that are sending. Therefore, to estimate the reliability of routing a mechanism is introduced to determine if packets reach the destination. A solution in this direction is given in [8], where overlapping sub-packets are dispersed on different routes, and are assembled at destination, which ultimately sends back an acknowledgment to confirm that the packets are reached. Packet acknowledgments regard pieces of packets that have been successfully received, and are dispersed as well. The introduction of an acknowledgment for every UDP packet makes the mechanism look like a TCP service. Thus, an alternative solution can be the introduction of a increasing acknowledgment on UDP traffic. In particular, the destination may at times send an acknowledgment to inform a set of received packets. The acknowledgment can be used for updating the reliability of routes through which packets were sent. The simplest way to estimate the nodes reliability involves each node to keep a probability index for each neighbor, representing the reliability level of the link between the node and the specified neighbor. If there are multiple routes available for packet forwarding to a destination node, the source node can choose one of them according to a certain criteria. Some of the ad hoc policies consider the shorter or fresher paths than others. Selfishness is a new problem evolved with the ad hoc network, and set apart a class of self-interested behavior. A selfishness model for routing and forwarding functions has been defined in [9]. In this model, behavior of nodes depends on their energy level. When the energy level of the nodes goes below a predefined threshold then the nodes can stop forwarding others packets, but still participating to the routing protocol. When the energy level goes down and falls below a lower threshold, the routing function can be disabled so that it does not to appear in other routing tables, and thus need not to forward packets. Thus, nodes energy is used only for its own communications. To motivate nodes cooperation a simple forwarding mechanism based on priority treatment is used. The main goal is to differentiate the quality of service toward different nodes, providing preferential or unfavorable service, according to the way they behave with others. In this way, packets coming from reliable neighbors are forwarded with higher priority than packets coming from neighbors with a lower reliability value. The main goal of REEF is to improve network throughput and balance network utilization at the same time. The results show the performance problems are addressed with selfish nodes with the retrieving the nodes local information. The network throughput and balance network utilization is improved with the reliability, but the misbehaving nodes estimation can be further refined and the global evolution of this can be done and the effectives must be improved for the better qos.

4.6 Bandwidth reservation protocol for qos routing

This paper [10] describes the comparison and analysis of the bandwidth reservation problem in a mobile ad hoc network to support QoS (quality-of-service) routing. The problem is approached by assuming a common channel that is shared by all hosts under a TDMA (Time Division Multiple Access) channel model. A protocol that can reserve routes by addressing both the hidden-terminal and exposed-terminal problems is implemented here. The protocol can give accurate bandwidth calculation while performing route discovery. Providing QoS is more difficult for MANET due to two reasons. First, unlike wired networks, radios have broadcast nature.

Thus, each link‟s bandwidth will be affected by the transmission/receiving activities of its neighboring links. Second, unlike cellular networks, where only one-hop wireless communication is involved, a MANET needs to guarantee QoS on a multi-hop wireless path. Now, a simpler TDMA model on a single common channel shared by all hosts is assumed. So it is inevitable to take the radio interference problems into consideration. The bandwidth reservation problem in such environment is measured. A route discovery protocol is proposed, which is able to find a route with a given bandwidth (represented by number of slots). When making reservation, both the hidden-terminal and exposed-terminal problems will be taken into consideration. Issues related to QoS transmission in MANET have received attention recently. A ticket-based protocol is proposed to support QoS routing. A CDMA-over-TDMA channel model is assumed. The code used by a host should be different from that used by any of its two-hop neighbors. So a code assignment protocol should be supported this can be regarded as an independent problem. The bandwidth requirement is realized by reserving timeslots on links. Based on such assumption, this paper shows how to allocate time slots on each link of a path such that no two adjacent links share a common time slot. This paper is concerned with QoS routing in a MANET.

4.7 A QoD protocol

The paper [11] focus on hybrid wireless networks, a wireless hybrid network integrates mobile wireless ad hoc network (MANET) and a wireless infrastructure network has been proven to be a better alternative for the next generation wireless networks. By directly adopting resource reservation-based QoS routing for MANETs, hybrids networks inherit invalid reservation and race condition problems in MANETs. Direct adoption of the reservation-based QoS routing protocols of MANETs into hybrid networks inherits the invalid reservation and race condition problems. In order to enhance the QoS support capability of hybrid networks, in this paper, we propose a QoS-Oriented Distributed routing protocol (QOD). Usually, a hybrid network has widespread base stations. The data transmission in hybrid networks has two features. First, an AP can be a source or a destination to any mobile node. Second, the number of transmission hops between a mobile node and an AP is small. The first feature allows a stream to have any cast transmission along multiple transmission paths to its destination through base stations, and the second feature enables a source node to connect to an AP through an intermediate node. Taking full advantage of the two features, QOD transforms the packet routing problem into

a dynamic resource scheduling problem. Specifically, in QOD, if a source node is not within the transmission range of the AP, a source node selects nearby neighbors that can provide QoS services to forward its packets to base stations in a distributed manner. The source node schedules the packet streams to neighbors based on their queuing condition, channel condition, and mobility, aiming to reduce transmission time and increase network capacity. The neighbors then forward packets to base stations, which further forward packets to the destination. In this paper, we focus on the neighbor node selection for QoS-guaranteed transmission. QOD is the first work for QoS routing in hybrid networks. This paper makes five contributions.

- QoS-guaranteed neighbor selection algorithm. The algorithm selects qualified neighbors and employs deadline-driven scheduling mechanism to guarantee QoS routing.
- Distributed packet scheduling algorithm. After qualified neighbors are identified, this algorithm schedules packet routing. It assigns earlier generated packets to forwarders with higher queuing delays, while assigns more recently generated packets to forwarders with lower queuing delays to reduce total transmission delay.
- Mobility-based segment resizing algorithm. The source node adaptively resizes each packet in its packet stream for each neighbor node according to the neighbor‟s mobility in order to increase the scheduling feasibility of the packets from the

source node.

- Soft-deadline based forwarding scheduling algorithm. In this algorithm, an intermediate node first forwards the packet with the least time allowed to wait before being forwarded out to achieve fairness in packet forwarding.
- Data redundancy elimination based transmission. Due to the broadcasting feature of the wireless networks, the APs and mobile nodes can overhear and cache packets. This algorithm eliminates the redundant data to improve the QoS of the packet transmission. A comparison of QoS routing protocols is shown in Table

Table 1 A comparison of QoS routing protocols

Protocol	Features	QoS parameter	comments
TBP	Ticket Based Probing	Delay/Bandwidth	Multipath QoS routing
ASWP	Interference considerations	Bandwidth	Consider the shortest path
IQ Routing	Interference aware	Bandwidth	Use of candidate paths
SPTM, LCTM, MLCT	Multicast routing	Delay/Bandwidth	Meet user requirements in terms of delay and bandwidth
REEF	Reliable and Efficient forwarding in adhoc network	Reliability	Estimate routing reliability of network
QOD	QoS-Oriented Distributed routing protocol	Scalability	Enhance QoS support of hybrid networks

5 CONCLUSION

This paper describes about the analysis of quality of service in the wireless networks and the performance measurement. In Interference Aware QoS Routing (IQRouting) several paths are probed using flow packets in a distributed fashion for satisfying QoS. In Multicast QoS routing the concept of node bandwidth is consider in multicast routing with a provision of QoS. In Multipath QoS routing the Ticket Based Probing algorithm is proposed is proposed to enhance the quality of service in wireless network. In QoS routing with resource allocation approach, a framework for generalized QoS routing with resource allocation is proposed. Bandwidth reservation protocol for qos routing compare and analysis the bandwidth reservation problem in a mobile ad hoc network to support QoS (quality-of-service) routing. Reliable and efficient forwarding in ad hoc networks consider the reliability and efficiency metrics for the higher performance. In the qos oriented distributed routing protocol the scalability, time resilience, overhead is considered for better qos achievement.

REFERENCE

[1] “A Majority of U.S. Mobile Users Are Now Smartphone Users,”http://adage.com/article/digital/a-majority-u-s mobile-userssmartphone- users/241717, 2013.

[3] [2] Gupta, R., Jia, Z., Tung, T. and Walrand, J. (2005) “Interference-aware QoS routing (IQRouting) for adhoc networks”, *Proc. IEEE Global Telecommunications Conference (Globecom)*, IEEE Press, St. Louis, Missouri, pp.2599–2604. Jia, Z., Gupta, R., Walrand, J. and Varaiya, P. “Bandwidth guaranteed routing for ad hoc networks

[4] Wu, H. and Jia, X. (2007) “QoS multicast routing by using multiple paths/trees in wireless ad hoc networks”, *Elsevier Journal on Ad hoc Networks*, Vol. 5, No. 5, July, pp.600–612.

[5] Chen, S. and Nahrstedt, L. (1999) “Distributed quality of service routing ad hoc networks”, *IEEE Journal on Selected Areas in Communications*, Vol. 17, No. 8, August, pp.1488–1505.

[6] Bashandy, A.R., Chong, E.K.P. and Ghafoor, A. (2005) “Generalized quality-of-service routing with resource allocation”, *IEEE Journal on Selected Areas in Communications*, Vol. 23, No. 2, February, pp.450–463.

[7] M. Conti, E. Gregori, and G. Maselli, “Reliable and Efficient Forwarding in Ad Hoc Networks,” Ad Hoc Networks, vol. 4,pp. 398-415, 2006.

[8] P. Michiardi, R. Molva, Simulation-*based analysis of security exposures in mobile ad hoc networks*, in: Proceedings of European Wireless 2002 Conference, 2002.

[9] P. Papadimitratos, Z.J. Haas, *Secure message transmission in mobile ad hoc networks*, Ad Hoc Networks 193–209.

[10] Ze Li, Student Member, IEEE, and Haiying Shen, Member, IEEE „A QoS-Oriented Distributed Routing Protocol for Hybrid Wireless Networks‟, IEEE TRANSACTIONS ON MOBILE COMPUTING, VOL. 13, NO. 3, MARCH 2014.

[11] I. Jawhar and J. Wu, “*Quality of Service Routing in Mobile Ad Hoc Networks*,” Network Theory and Applications, Springer