Volume 2, Issue 9, September 2012 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Classification of QoS Routing for MANET - A Summary

K. Prabu[1], Asst Prof, Dept of Computer Applications, SRASC, Chidambaram, Tamilnadu, India.
Dr. A. Subramani[2], Prof & Head, Dept of MCA, KSRCE, Thiruchengode, Tamilnadu, India.

Abstract – MANETs is a special kind of wireless networks. It is a collection of mobile node without having aid of established infrastructure [1]. A Manet is an autonomous system of mobile nodes. The system may operate in isolation, or may have gateways to and interface with a fixed network. Manet includes easy installation and upgrade, low cost and maintenance, more flexibility. Quality-of-service (QoS) is the performance level of a service offered by the network to the user, the major goal of QoS provisioning is to achieve a more deterministic network behavior, so that information carried by the network can be better delivered and network resource can be better utilized. In this paper we present major classification of Quality-of-Service, discuss their advantages and disadvantages.
Keywords - QoS, MANETs, Adhoc Networks, QoS Routing Algorithms, Routing Protocols.

I. INTRODUCTION

QoS routing in Adhoc networks has been studied only recently [3][4][5][6][7]. QoS routing requires not only finding a route from a source to a destination but a route that satisfies the end-to-end QoS requirement often given in terms of bandwidth (or) delay. A network or a service provider can offer different kinds of services to the used. Here a service can be characterized by a set of measurable prespecified service requirements such as minimum bandwidth, maximum delay, maximum delay variance (jitter), and maximum packet loss rate. After accepting a service request from the user the network has to ensure that the service requirements of the user's flow are met, as per the agreement, thought the duration of the flow (a packet from the source to the destination). after receiving a service request form the user, the first task is to find a suitable loop free path from source to the destination that will have the necessary resources available to meet the QoS requirements of the desired service. This process is known as QoS routing. After finding a suitable path, a resource reservation protocol is employed to reserve necessary resources along that path.

II. CHARACHTERISTICS OF QoS

The major challenges in providing QoS in Adhoc wireless networks have certain unique characteristics that pose several difficulties in provisioning QoS. Some of the characteristics are given below.

- **Dynamically varying network topology.**

Adhoc wireless networks do not have any restriction on mobility, the networks topology changes dynamically. Hence the admitted QoS sessions may suffer due to frequent path breaks, thereby requesting such session to be reestablished over new path.

- **Imprecise state information.**

Adhoc wireless networks maintain both the link-specific state information and flow specific state information. The link-specific state in formation includes bandwidth, delay, delay jitter, loss rate, error rate, stability, cost, and distance value for each link. The flow specific information include session ID, source address, destination address, and QoS requirements of the flow (such as maximum bandwidth requirements, minimum bandwidth requirements, maximum delay, and maximum delay jitter).

- **Lack of central coordination.**

Unlike wireless LAN and cellular networks, Adhoc wireless networks do not have central controller to coordinate the activity of nodes.

- **Error-prone shared radio channel.**

The radio channel is a broadcast medium by nature. During propagation through the wireless medium, the radio waves suffer from several impairments such as attenuation, multipath propagation, and interference.

- **Hidden terminal problem.**

The hidden terminal problem is inherent in Adhoc wireless networks. This problem occurs when packets originating from two or more sender node, which are not within the direct transmission range of each other, collide at a common receiver node. It necessitates the retransmission of the packet, which may not be acceptable for flow that has stringent QoS requirements. The RTS/CTS control packet exchange mechanisms, proposed [3] and adopted later in the IEEE 802.11 standard [4] reduces the hidden terminal problem only to a certain extent.

- **Limited resource availability.**

Resources such as bandwidth, battery life, storage space and processing capabilities are limited in Adhoc wireless networks. Out of these range band width and battery life are critical resource, the availability of which significantly affect the performance of the QoS provisioning mechanism. Hence efficient resource management mechanisms are required for optimal utilization of these scarce resources.

- **Insecure medium.**

Due to the broadcast nature of the wireless medium, communication through a wireless channel is highly insecure. Therefore security is an important issue in Adhoc wireless networks, especially for military and tactical applications.

III. CLASSIFICATION OF QoS

The QoS solutions can be classified in two ways,

I-Based on the QoS approach employed.

II-Based on the layer.

I-Based on the QoS approach employed.

The QoS approach can be classified into

1) **Based on the interaction between the routing protocol and the QoS provisioning mechanism.**
2) **Based on the interaction between the network and MAC layer.**
3) **Based on the routing update mechanism.**

1. Based on the interaction between the routing Protocol and the QoS Provisioning mechanism.

The QoS approach can be classified into two categories.

(a) Coupled QoS Approach.

(b) Decoupled QoS Approach.

(a). Coupled QoS Approach.

The routing protocol and the QoS provisioning mechanism closely interact with each other for delivering QoS guarantees. If the routing protocol changes, it may fail to ensure QoS guarantees.

TBP - Ticket-Based QoS Routing Protocol.
PLBQR – Predicate Location-Based QoS Routing Protocol.
TDR- Trigger-Based Distributed QoS Routing Protocol.
QoSAODV-QoS Enabled Adhoc On-Demand Distance Vector Routing Protocol.
BR- Bandwidth Routing Protocol.
OQR- On-Demand QoS Routing Protocols.
OLMQR-On-Demand Link-State Multipath QoS Routing Protocol.
AQR-Asynchronous Slot Allocation Strategies.
CEDAR- Core Extraction Distributed Adhoc Routing Protocol.
INORA [18].

(b). Decoupled QoS Approach.

The decoupled approach, the QoS provisioning mechanism dose not depend on any specific routing protocol to ensure QoS guarantees.

INSIGNIA [17]
SWAN-Stateless Wireless Adhoc Networks.
PRTMAC- Proactive Real Time MAC.

2. Based on the interaction between the Routing Protocol and the MAC Protocol.

This QoS approaches can be classified into two categories.

(a) Independent QoS Approaches.

(b) Dependent QoS Approaches.

(a) Independent QoS Approaches.

In the independent QoS Approaches, the network layer is not dependent on the MAC layer for QoS Provisioning.

TBP- Ticket-Based QoS Routing Protocol.
PLBQR- Predicate Location-Based QoS Routing Protocol.
QoSAODV- QoS Enabled Adhoc On-Demand Distance Vector Routing Protocol.
INORA [18].
INSIGNIA [17].
SWAN- Stateless Wireless Adhoc Networks.

(b) Dependent QoS Approaches.

The dependent QoS approach requires the MAC layer to assist the routing for QoS provisioning.

TDR-Trigger-Based distributed Routing Protocol.
BR- Bandwidth Routing Protocol.
OQR- On-Demand QoS Routing Protocols.
OLMQR- On-Demand Link-State Multipath QoS Routing Protocol.
AQR- Asynchronous Slot Allocation Strategies.
CEDAR- Core Extraction Distributed Adhoc Routing Protocol.
PRTMAC- Proactive Real Time MAC.

3. Based on the routing information update mechanism employed.

The routing information update mechanism employed QoS approaches can be classified into three categories namely,

(a) Table-Driven QoS Approach.
(b) On-Demand QoS Approach.
(c) Hybrid QoS Approach.

(a) Table-Driven QoS Approach.

In table-driven approach each node in the network maintains a routing table which aids in forwarding packets.

PLBQR- Predicate Location-Based QoS Routing Protocol.

(b) On-Demand QoS Approach.

In the On-Demand approaches, no such tables are maintained at the nodes, and hence the source node has to discover the route on the fly.

TBP- Ticket-Based QoS Routing Protocol.
TDR- Trigger-Based Distributed Routing Protocol.
QoSAODV- QoS Enabled Adhoc On-Demand Distance Vector Routing Protocol.
OQR- On-Demand QoS Routing Protocols.
OLMQR- On-Demand Link-State Multipath QoS Routing Protocol.
AQR- Asynchronous Slot Allocation Strategies.
PRTMAC- Proactive Real Time MAC.
INORA [18].

(c) Hybrid QoS Approach.

The hybrid approaches incorporates features of both the table-driven and the on-demand approaches.

BR- Bandwidth Routing Protocol.
CEDAR- Core Extraction Distributed Adhoc Routing Protocol.

II-Based on the layer.

In the layer wise classification of existing QoS solutions can be classified into three categories.

1) **MAC layer solutions.**
2) **Network layer solutions.**
3) **QoS frame works (cross-layer solutions).**

1) MAC layer solutions.

The MAC protocol determines which node should transmit net on the broadcast channel when several nodes are competing for transmission on that, channel. The existing MAC protocol for Adhoc wireless networks use channel sensing and random back-off schemes, making them suitable for best-effort data traffic, real time traffic (voice and video) requires bandwidth guarantees. Some of the existing MAC protocols are belong to this categories are given below,

Cluster TDMA-Time Division multiple access.
802.11e- IEEE802.11 task group e (TGe)
DBASE-distributed bandwidth allocation sharing extension.
MACA/PR-multiple access collision avoidance With piggy-backed reservation.
RTMAC-real time MAC.

2) Network layer solutions.

The bandwidth reservation and real-time traffic support capability of MAC protocol can ensure reservation at the link level only hence the network layer support for ensuring end-to-end resource negotiation, reservation and reconfiguration is very essential. This category can be further classified into three types.

(i) Table-Driven (ii) On-demand (iii) Hybrid

In this classification were already discussed in the before categories.

3) **QoS frame works** (cross layer solutions).

A frame work for QoS is a completed system that attempts to provide required/promised services to each user or application. All components within this system cooperate in providing the required services. The existing cross layer solutions are given below.

INSIGNIA [17].
INORA [18].
SWAN- Stateless Wireless Adhoc Networks.
PRTMAC- Proactive Real Time MAC.

TABLE – I. Comparison of QoS Routing Protocol.

	Coupled	Decoupled	Independent	Dependent	Table-Driven (Proactive)	On-Demand (Reactive)	Hybrid	MAC layer	Cross layer
TBP	√		√			√			
PLBQR	√		√		√				
TDR	√			√		√			
QoS-AODV	√		√			√			
BR	√			√			√		
OQR	√			√		√			
OLMQR	√			√		√			
AQR	√			√		√			
CEDAR	√			√			√		
INORA	√		√			√			√
INSIGNIA		√	√						√
SWAN		√	√						√
PRTMAC		√		√		√			√
RTMAC								√	
802.11e								√	
DBASE								√	
MACA/PR								√	
Cluster TDMA								√	

IV.

CONCLUSION

In this paper, the major issues involved in the design of a QoS routing protocol and the different classification of QoS routing protocol for Adhoc wireless networks were described. The comparison of QoS routing for Adhoc wireless routing protocol is given in Table -I. The major challenges in providing QoS in Adhoc wireless networks must dynamic varying network topology, lack of precise state information, lack of a channel controller, error-prone shared radio channel, limited resource availability, hidden terminal problem, and insecure medium.

REFERENCES

[1] C. Siva Ram Murthy and B.S. Manoj "Adhoc Wireless Networks Architectures and Protocols" Prentice Hall 2004.

[2] S. Murthy and J.J. Garcia-Luna-Aceves "An efficient Routing Protocol for Wireless Networks", *ACM* Mobile Networks and Applications Journal. SPECIAL Issue on Routing in Mobile communication Networks. Vol 1. No 2. pp 183-197. October-1996.

[3] P. Karn "MACA: A New Channel Access Method for Packet Radio", Proceedings of *ARRL/CRRL* Amateur Radio 9th Computer Networking Conference 1990, pp. 134-140, September 1990.

[4] IEEE Standard Broad, "Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification", the Institute of Electrical and Electronics Engineers, Inc., 1997.

[5] M. Gerla and J.T.C. Tsai "Multicasting Mobile Multimedia Radio Network". *ACM/Baltzer* Wireless Networking Journals, Vol 1. No. 3. pp. 255-265, October-1995.

[6] S. Mangold, S. Choi, P. May, O. Klein, G. Hiertz and L.Stibor, "*IEEE* 802.11e Wireless LAN for Quality of Service", Proceedings of the European Wireless 2002, vol. 1, pp. 32-39, February 2002.

[7] M.A. Visser and M.E. Zakir, "Voice and Data Transmission Over an 802.11 Wireless Network", Proceeding of *IEEE PIMRC* 1995, vol.2, pp. 648-652, September 1995.

[8] IEEE 802.11 TGe, "EDCF Proposed Draft Text", TR-01/131r1, March 2001.

[9] S. Sheu and T. Sheu "DBASE A Distributed Bandwidth Allocation/Sharing/Extension Protocol for Multimedia over IEEE 802.11 Ad Hoc Wireless LAN", Proceddings of *IEEE INFOCOM* 2001, vol.3, pp.1558-1567, April 2001.

[10] S. Chen and K. Nahrstedt, "Distributed Quality-of-Service Routing in Ad Hoc Networks", *IEEE* Journal on Selected Areas in Communication, vol.17, no. 8, pp.1488-1504, August 1999.

[11] S.H. Shah and K.Nahrstedt, "Predictive Location-Based QoS Routing in Mobile Ad Hoc Networks", Proceddings of *IEEE ICC* 2002, vol.2, pp.1022-1027, May 2002.

[12] S. De, S.K. Das, H. Wu, and C. Qiao, "Trigger-Based Distributed QoS Routing in Mobile Ad Hoc Networks", *ACM SIGMOBILE* Mobile Computing and Communication Review, vol.6, no.3, pp.22-35, July 2002.

[13] C.E.Perkins, E.M.Royer, and S.R.Das, "Quality-of- Service for Ad Hoc On-Demand Distance Vector Routing", *IETF* Internet Draft, draft-ietf-manet-aodvqos-00.txt, July 2000.

[14] C.R. Lin and J.Liu, "QoS Routing in Ad Hoc Wireless Networks", *IEEE* Journal on Selected Areas in Communications, vol.17, no.8, pp.1426-1438, August 1999.
[15] C.R.Lin, "On-Demand QoS Routing in Multi-Hop Mobile Networks", Proceedings of *IEEE* INFOCOM 2001, vol.3, pp.1735-1744, April 2001.
[16] H.Xiao, K.G. Seah, A.Lo, and K.C.Chua, "A Flexible Quality-of –Service Model for Mobile Ad Hoc Networks", Proceedings of *IEEE* Vehicular Technology Conference, vol.1, pp.445-449, May 2000.
[17] S.B. Lee, A.Gahng-seop, X.Zhan, and A.T.Campbell, "INSIGNIA: An IP-Based Quality-of-Service Framework for Mobile Ad Hoc Networks", Journal of Parallel and Distributed Computing, vol. 60, no.4, pp.374-406, April 2000.
[18] D.Dharmaraju, A.R.Chowdury, P.Hovareshti, and J.S.Baras, "INORA- A Unified Signalling and Routing Mechanism for QoS Support in Mobile Ad Hoc Network" Proceedings of ICPPW 2002, pp.86-93, Agust-2002.

BIOGRAPHY.

Prof. K. Prabu has received his MCA, M.Phil from Annamalai University, Chidambaram, Tamilnadu, India in the year of 2006 and 2008. He is currently pursing his Ph.D in Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India. At Present working as an Assistant Professor in Department of Computer Applications, Shree Ragavendra Arts & Science, Chidambaram, Tamilnadu, India. His Research interested includes Ad hoc Networks. He is a life member of ISTE.

Dr. A.Subramani received his Ph.D Degree in Computer Applications from Anna University, Chennai. He is now working as a Professor & Head, Department of Computer Applications, K.S.R. College of Engineering, Thiruchengode, Tamilnadu, India. His research interested includes ATM Networks, Ad Hoc Networks, High Speed Networks. He has published more that 28 technical papers at various National / International Conference and Journals. He is a life member of ISTE, CSI.

