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Implementation and Analysis of QoS Aware Routing Protocol for the MANET

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Abstract: Nowadays, the growth in the field of information processing and wireless data transmission for any wireless system is in its peak.For designing the quality oriented system, evaluation of the two routing protocols under IEEE 802.11 standards has been done. The performance is evaluated in terms of the end-to-end delay and throughput The AODV and MAODV routing protocols are implemented for both the standards. It is concluded that the MAODV is best suited for designing a enhanced quality oriented protocol for better throughput and larger coverage area with lower delay.

Keywords: MANET, QoS, AODV and MAODV.

I. INTRODUCTION

MANETs [1] are popular in civil and militaryapplications. Because of the reason that the cellular network is very costly andinappropriate as well as at the same time unreliable, the MANET has proven its ability to provide sustainable network to deploy.Withoutthe need of any fix infrastructure MANET can be deployed like BTS units. In adhoc network all the nodes are self configured to establish the network randomly. They act as a source, destination as wellas router same time. As a node or client or host they discover the packet and as a router forward the packet.Discovered Packets are from source to destination are transmitted in multi-hop environment. The applications of MANET are unexplainable applications both incivil (medical, mobile computing, disaster recovery) and military (for battlefield security). Applications of MANETis largely dependent of theQuality of Service of routing protocol as well as its effectiveness.Host in MANET gets power by electro-chemical batteries which have limited capacity to operate. Power aware mechanism is a big issue in MANET because of batteries. The Main source ofpower consumption in MANET is communication and messaging. Most of the energy consumption in MANET is due to communicationactivities. Therefore, there must be proper management for power awareness during communication will enhance the network lifetime. The more power transmission means more communication is taking place. QoS[2]aware routing protocolsi.e MAODV have been pro-posed to enhance overall QoSof a node as well as network.

Mobile Ad-hoc Network

A network without any fixed access point and also does not depend on pre-existing infrastructure that's why such network is called Ad-hoc. Wireless Ad-hoc network is made up of few to hundred numbers of nodes or device that are connected through a Radio Frequency (RF) of infrared interface and have a capability of communicating with each other by making connected in a decentralized manner .

All mobile nodes of the network have equal importance means any node of the network can be work as a host or router and can communicate by transmitting the data directly to any node or device on the network. The control of the network is also distributed to every node of the network. As in wireless system all nodes or devices on the network are connected through the radio transmission path and because of that they are easily affected by noise, fading and interference.

Architectural solution

To tackle these issues we propose an architectural solution for Mobile Radio Networks which uses network coding techniques for reliable control information exchange and enables Mobile Radios to maintain up-to-date information regarding the network status and promptly react to wireless environmental changes. Its main features are: 1) a robust neighbor discovery algorithm able to guarantee fast and reliable network deployment; 2) a robust control channel for prompt control information exchange; 3) efficient cooperative detection of Primary Users' activity; 4) distributed allocation of the spectrum resources to Mobile Radios for both single hop and multi hop Mobile Radio Networks; 5) a spectrum aware cluster formation protocol that allows spectrum reuse and network scalability.

II. MOTIVATION

The basic objective of the research is to develop a wireless network or MANET system where more flexibility is added by considering mobility of nodes as well as different mobilities in different direction. The designed mobile are suggested to optimize throughput and end-to-end delay. To realize the objective, the following analysis and investigation are undertaken:

The mobile network model and a Quality oriented protocol MAODV has been designed using IEEE 802.11 WLAN standard and its performance has been analysed with AODV and MAODV routing protocols. Where the facility of variable speed and different trajectory is provided by considering the node movement inside the network. Study and analyses AODV and MAODV routing protocol under IEEE 802.11 WLAN and IEEE 802.11 Wireless Personal

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Area Network (WPAN).Implement AODV and MAODV routing protocols for the Network under 802.11 WLAN..

III. SOLUTION DOMAIN

The proposed routing technique is based on a modification of the widely adopted Ad-hoc On-demand Distance Vector (AODV) protocol. Unlike most of the previous works, our proposal avoids regions of PU activity during both route formation and packet discovery without requiring any dedicated control channel. Moreover, it assesses the qualities of any available channel, minimizing the route cost by performing a joint path and channel selection at each forwarder. Finally, it exploits the presence of multiple available channels to improve the overall performances. To perform different tasks when any node has data and it wants to send the data to the destination node. These tasks are route discovery, route maintenance and other management tasks. Algorithm for these tasks are given below.

A multi-metric route selection algorithm, which considers the availability of frequency band in addition to traditional metric like switching delay and queuing delay.

A Combined opportunistic routing (OR) with transmit power control (TPC) schemes, which simplifies the selection of CFNs, improving the delivery ratios of CFNs and achieving service differentiation to traffic flows with different priorities.

Initiate route discovery:

Begin

if (no valid route found on cache) then

1. Create RREQ packet;
2. Initialize route record in RREQ packet to empty, initialize delay to 0, initialize MEATT to 0;
3. Broadcast RREQ packet on common control channel.

Else Perform Route Decision.

endif

End

Propagate RREQ and route reply:

Begin

if (receive RREQ packet) then

4. Determine if its address is on the list of route record;

2.if (it is on the list of route record) then

Discard RREQ packet.

else

5. Append own address and frequency channel to route record in RREQ packet;
6. Set switching delay dswitch = td ms if the receiving frequency is fixed to the same channel as the previous hop node's transmitting frequency. Otherwise, theswitching delay is set to dswitch = 0 ms;
7. Add dswitch to the delay field;
8. Add average queuing delay to the delay field where dqueue ¼ n t nsend À t nreceiv e =n, where tnsend and tnreceive are the send and receive time of the previous n packets;

Rebroadcasts the RREQ packet on the common control channel.

endif

endif

endif

End

IV. REIVEW OF LITERATURE

Ze Li and Haiying Shen, "A QOS –Oriented Distributed Routing Protocol for Hybrid Wireless Networks", IEEE Transaction on Mobile Computing, Vol 13 No. 3, March 2014.[7]

Authors proposed QOD protocol for Hybrid Network. In this paper they analysed and simulate results based on the random way point model. Result shows that QOD can provide high QoS performance in terms of overhead, transmission delay, mobility-resilience. They also mentioned that QOD incorporates five algorithms which enhances network performance. Coding is done in AODV and NS-2 is used as Network Simulator.

Saravanasevlam, Nevatha, Nivetha, " A Survey on Quality of Service (QoS) for Ad Hoc Networks", International Journal of Advanced Research in Computer and Communication Engineering,Vol 3, Issue 10,October 2014.[8]

They measures the QoS considering various parameters. They defined QoS as the performance evaluation of the computer network particularly the performance seen by the users of the network. This paper tells about the comparison of various metrics like bandwidth, throughput, transmission delay, availability etc, which are evolved in giving the quality of services for higher performance in the network.

Himansha Sharma, Yogendra Kumar Jain, Geetika Pandey, " QoS Oriented Reservation based Routing Mechanism for Wireless Ad Hoc Networks", Journal of Global Research in Computer Science, Vol 2, No. 12, December 2011.[9]

Authors mentioned that, due to bandwidth constraint and dynamic topology of the MANETs, supporting QoS is challenging task. This Paper proposes simple yet effective method for nodes in MANETs to compute their available bandwidth in a distributed way. The paper analyses the applicability of the proposed mechanism over both proactive and reactive routing protocols. They used Reservation Based Mechanism which first reserve the network path that has sufficient resources to satisfy the QoS requirement and then achieving global efficiency in resource utilization.

R.Sumanthi and M.G. Srinivas, " A Survey of QOS based Routing Protocols for Wireless Sensor Networks", J Inf Process System, Vol 8, No. 4, December 2012[10]

Paper is focused on developing robust energy efficient QoS based routing protocols. The performance comparison of QoS based routing protocol such as SAR,MMSPEED, MCMP, MCBR has been analysed using ns-2 for various parameters such as energy efficiency, reliability, End to End delay. Advantages and Disadvantages of above mentioned protocols are discussed and compared.

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Dr.S.S.Tyagi, Aarti, " Study of MANET : Characteristics, Challenges, Application and Security Attacks", International journal of Advanced Research in Computer Science and Software Engineering, Vol 3, Issue 5, May 2013.[11]

V. SIMULATION ENVIRONMENT

Parameter	value	Description
Simulation Time	100 sec	Maximum Execution Time
Terrain dimension	1000 x 1000 Mt	Physical area
No. of Nodes	10 - 50	
Traffic Model	TCP	Transmission control Protocol
Node Placement	Uniform Dynamic	
Mobility	0,10,20,30,40 m/s	Speed of node
Routing Protocol	AODV	

VI. EVALUATION OF RESULTS

End To End Delay with 1Hope(0Speed)

Figure below shows that AODV has more delay as compare to MAODV because whenever any link to intended node breaks, AODV tries to find any alternative path to the destination that results in extra delay in the total time require to reach the destination whereas MAODV will not search for alternate path and packet drop, and it has to reinitiate route discovery process.

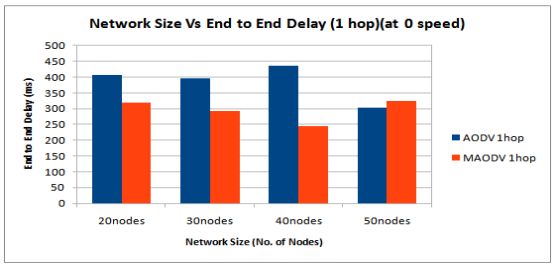
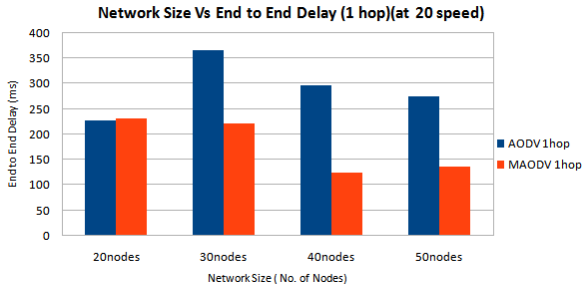


FIGURE: END TO END DELAY vs Network Size (0 Speed)

End To End Delay with 1Hope(20Speed)



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THROUGHPUT with 1Hope(0Speed)

From figure 5.6 throughput in case of AODV decreases with increasing number of nodes because AODV require more control overhead to maintain the entire route to every other node. Here MAODV routing protocol showing best throughput with increasing number of node because in MAODV routing protocol, routing table is established at every node, so there is no need to carry entire route information along th data packet that will decrease the control overhead.

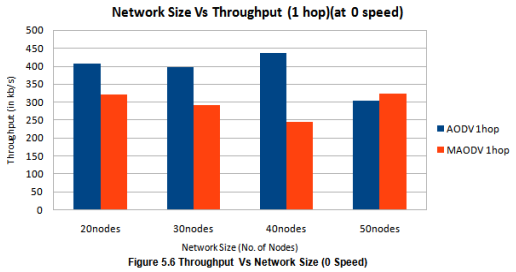

Figure 5.6 Throughput Vs Network Size (0 Speed)

FIGURE: Throughput vs Network Size (0 Speed)

THROUGHPUT with 1Hope(0Speed)

From figure 5.5 throughput in case of AODV decreases with increasing number of nodes because AODV require more control overhead to maintain the entire route to every other node. Here MAODV routing protocol showing best throughput with increasing number of node because in MAODV routing protocol, routing table is established at every node, so there is no need to carry entire route information along with data packet that will decrease the control overhead.

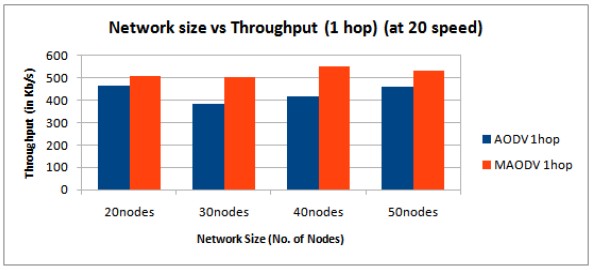

FIGURE: Throughput Vs Network size (20 Speed)

VII. CONCLUSION

A mobile adhoc network model using WLAN environment, where all the nodes are moving with changing speed and trajectory. The node's movement makes unpredictable topology and results link instability. In order to overcome such problem, the AODV and MAODV routing protocol has been implemented and their link performance has been analysed. It is found that under MAODV routing protocol the throughput achieved is

higher and the end-to-end delay is lesser as compared to AODV. It indicates that the MAODV performs better for the proposed mobile adhoc network model.

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