ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

QOS AWARE MULTIPATH PROTOCOL FOR MANETS

Shimja.K.J*, Joish George
* MTech Student, Department of CSE, KMEA Engg College, India
Asst.Professor, Department of IT, KMEA Engg College, India

/ABSTRACT

The recent advancements in wireless technology have led to tremendous progresses in Mobile Ad hoc Networks. A MANET is a dynamic wireless network formed by a set of mobile nodes which communicate with each other those who are within the transmission range of each node without any pre-existing infrastructure. The energy consumed by the mobile nodes is a critical issue in MANETs. The discharge of the battery causes many problems such as the damage of the packets and the re-initialization of route discovery which leads to bandwidth consumption, increase in delay and decrease in throughput. A new routing protocol should be designed based on power and QoS aware multipath routing (PQMR) for MANETs. The goal of such routing protocol is to find multiple paths which are more stable from a source to a destination node in terms of remaining life time of battery ,that satisfy Quality of Service (QoS) requirements, given in terms of delay and bandwidth. By using PQMR protocol multiple paths will be chosen between single source and destination using QoS constraints and energy levels to send packets reliably . NS2.34 will be considered for simulation. The proposed PQMR protocol is expected to show better throughput and packet delivery ratio as compared to other multipath protocols of MANETs.

KEYWORDS: MANETs,Quality of Service(QoS),Multipath Routing,AODV.

INTRODUCTION

Mobile ad hoc networks (MANETs) are advanced wireless communication networks.MANET is a collection of mobile nodes sharing a wireless channel without any centralized control or established communication backbone. Mobile ad hoc network is a collection of independent mobile nodes that can communicate to each other by means of radio waves. Each terminal which may be mobile act as host and terminal .MANET has dynamic topology and each node has limited resources. The mobile nodes can directly communicate to those nodes that are in radio range or transmission range of each other, whereas others nodes need the help of intermediate nodes to route their packets and thus such networks are also called as multi-hop networks.

MANETS are very useful in battlefields, natural disasters etc. To setup MANET is simple, fast and cheap and the transmission power can be reduced as compared to wireless infrastructure networks. Creating ad hoc network from the scratch requires a few settings and no additional hardware or software. To connect multiple computers quickly and easily, an ad hoc network is an ideal solution. The level of flexibility for setting up MANET is high, because they do not require any previous installation and, thus, they can be created or removed easily in a very short time. MANET could be more economical in some cases as they eliminate fixed infrastructure costs and reduced power consumptions at mobile nodes.

The capacity of the wireless links is less than wired links in wired networks. As the resources are limited energy should not be wasted and some energy conserving algorithms should be used. The nodes will be sleeping or idle when they do not have to transmit any data. Attenuation and interferences are other effects of the wireless link that increase the error rate .The addressing is the another problem for the network layer in MANET, since the information about the location the IP addressing used in the fixed networks offers some facilities for routing that cannot be applied in MANET. MANET is yet far from being deployed on large- scale commercial basis.
Quality of Service (QoS) is an important concept in networking, and also a major challenge. Providing QoS guarantees becomes more challenging when you

add the complexities of wireless and mobile networks. QoS refers to a broad collection of networking technologies and techniques. The goal of QoS is to provide guarantees on the capability of a network to deliver expected results. Elements of network performance within the scope of QoS often include availability bandwidth (throughput), latency (delay), and error rate. Quality of service guarantees are typically made for one or more of the four characteristics which are described below. A guarantee of minimum delay to send packet, low loss rate of packets during transmission. A guarantee of jitter and finally, a better throughput .

To enhance the QoS support and energy utilization capability of MANETS [1] a protocol named Power and QoS aware Multipath Routing (PQMR) protocol is proposed. It is a reactive routing protocol which is based on an on-demand routing scheme. The reactive routing protocols are intended to maintain routing information about active routes only. Routes are created when desired by the source node. Route discovery procedure is needed before data transmission, giving rise to high latency. Rapidly changing wireless network topology may disrupt active troue and cause sub-sequent route search. Nodes learn about the network topology on an as-needed basis. Reactive routing is preferable over proactive in situations where the number of active routes per node is low and mobility is high.PQMR protocol uses multiple paths from single source to the destination using QoS constraints and switches the paths whenever necessary to send data reliabily.In the case of link failure only it re-initiates route discovery process.

RELATED WORKS

In MANETs the nodes or devices are working based on the battery power which provides only limited working capacity to the mobile nodes in the network.So energy efficient routing is necessary for MANETs.One such power aware routing with path selection based on minimum traffic [2] the battery status will be estimated from the information contained in RREQ control messages.Traffic level information also will be included in RREQ.It is also a multipath approach,where the link failure causes reconstruction of the route or local maintenance process to select the next path to continue the data transmission.

In multipath MAX energy based routing scheme[3] there will be a threshold value forenergy of nodes in the possible paths.The nodes will be filtered out using this threshold value.Then average energy of each path will be calculated and best path will be selected based on the maximum average energy and maximum min energy. Thus the protocol is said to be increase the life time of MANETs.

There are so many QoS aware multipath approaches[4] also in MANETs.But most of them will satisfy one or two QoS constraints only.In such a QoS based multipath approach for MANETs[5],the protocol adopts ticket based probing.Multiple path will be selected if they satisfy certain bandwidth requirements.

THE PROPOSED PQMR PROTOCOL

The related works of several multipath protocols [6], [7]for MANETs are available . But the proposed PQMR protocol is a combination of several several QoS measures. Multi-path routing in ad hoc networks permits the establishment of more than one path between source and destination to assure the QoS requirements. Because of dynamic nature of ad hoc networks due to mobility and nodes joining and leaving the network, limited transmission range and limited source power of the nodes, multi-path routing is needed to increase network resilience and load balancing, which decreases congestion and bottlenecks, increases aggregate bandwidth, reduces end to end delay, delay variation and packet loss ratio.

The Power and QoS aware Multipath Routing protocol combines some features of AODV and Stable Path Routing (SPR) protocols[5] .The PQMR protocol is a modified version of AODV[6] protocol. Energy classes are also added to AODV to make it energy efficient. It uses all the basic features of AODV protocol and additional features are added to make it an efficient multipath protocol with QoS constraints to provide better performance. The goal of the PQMR protocol is to select multi-paths with the longest lifetime in the network without performance degradation in terms of delay .As the nodes are mobile in MANETS there will not be a fixed path from the start and end of packet transmission. So the paths selected according to the criteria of the PQMR protocol will be dynamic in nature. The cost, energy, bandwidth and delay are selected as the parameters to choose multiple path in PQMR protocol. Cost will be a random value .For each node the cost will be different. The energy level of each node in the network will also be different because the nodes are mobile.

The PQMR protocol will select multiple paths based on the four QoS constraints from the given source

and destination. Thus the paths selected will be stable in nature. The most optimal path will be considered as primary path. That path will be taken as the active route to transmit data from source to the destination.The next optimal path (secondary) will be considered as the secondary route, like wise all the path information will be saved. As the nodes are mobile, the routing table should be updated frequently. If the source node detects a new optimal route than the active route then the source switches the path and send data though the new optimal path. The process will be repeated throughout the data transmission process from the specified source to the destination.If the source node detects any link failure in the active route with the help of RERR messages then the source node switches the packets to the secondary path and if the secondary path and all other paths are affected by the link failure then the route discovery process will be started to send packets.So only in the unavoidable situation only PQMR protocol triggers the time consuming route re-initialization process.This feature makes the PQMR protocol more efficient than the other protocols.

The Route discovery and route maintenance process are similar to AODV with some changes.In route discovery process PQMR protocol finds non disjoint paths.The algorithm for what happens when an intermediate node receives RREQ message from the source node is described below.

Algorithm

Step 1: When a node receives RREQ message from the source,it checks whether thatRREQ is already received or not.
Step 2: If it is a fresh request go to step step 4.
Step 3: If it is an already received request then again checks whether the route entry contains unique neighbor hops or not.
Step 4: If the neighbor hops are unique then check the QoS constraints(highest available bandwidth,lowest cost, minimum highest residual energy of the node in the path,minimum end to end delay).
Step 5: If the conditions are met add the route to the table,otherwise discard the RREQ.
Step 6: The node the check whether it is the destination node or not.
Step 7: If not it broadcasts the RREQ messages to all other nodes.
Step 8: If yes it will send RREP message to the source node.

Rest of the process are same as that of AODV phases.

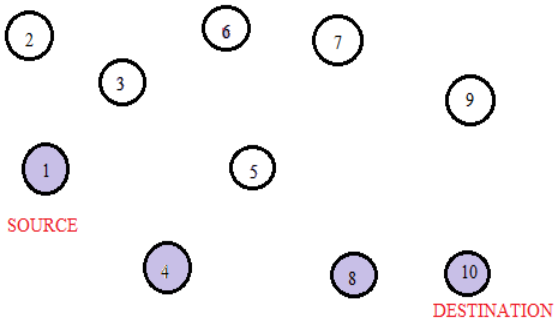

Fig1.The packets send through active(optimal) path

Figure 1. shows the primary path or active path which will be selected based on the QoS constraints, after the route discovery process .Then source node starts sending packets through the optimal path.After some time a link failure occurred and source detect it with the presence of RERR message .The source node then switches the route to the secondary path which is independent from that particular link failure which is depicted in Figure 2.

PQMR protocol is effective for MANETs with rate of mobility is high.In such networks the topology may change anytime.The PQMR protocol adjust with the changes in the topology provided the QoS criteria is not violated.This scenario is depicted in Figure 3. If the QoS criteria is violated ,then only the source node triggers the route discovery process again . Thus by reducing the additional cost and delay .

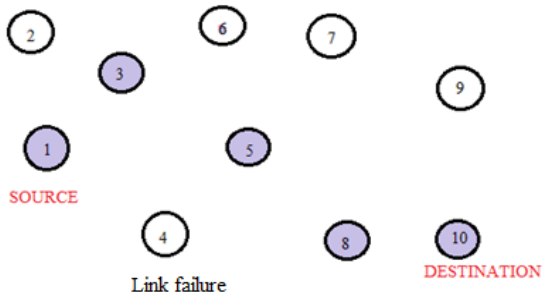

Fig2.The packets send through secondary path after the lik failure

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

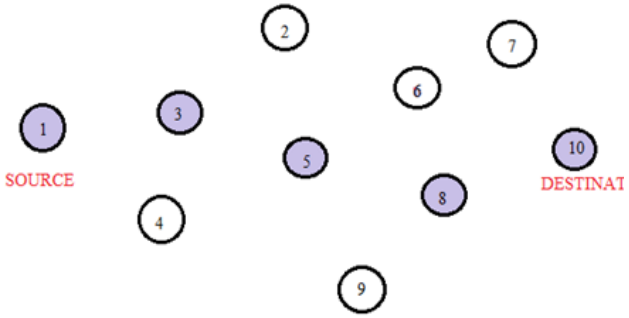

Fig3.The packets send through the secondary path even after change in topology iff QoS constraints remain unvoilated

Thus the PQMR protocol finds multiple path by using the network resources efficiently without increasing the network overhead.The primary path selected will be the optimal one which satisfies the QoS constraints with minimum hop count.

CONCLUSION

The power is a major constraint in ad hoc networks since the nodes operate with limited battery life. Hence, the routing protocols in this type of networks must be developed to consider power aware as a primary objective. Also, the support of QoS requirements in terms of delay and bandwidth becomes a challenge due to the dynamic nature of ad hoc networks. NS2.34[10] is the simulation tool that can be used for this work. The new routing protocol for MANETs, PQMR protocol does not consider only the battery power as a major challenge, but it also aims to satisfy QoS requirements (delay and bandwidth,cost). The proposed PQMR protocol will be expected to significantly outperforms other multipath protocols in terms of throughput, end-to-end delay and loss rate and delay and loss rate and energy consumption.

REFERENCES

[1] Z.Li and H.Shen "Power and Delay-aware Multipath Routing Protocol for Ad Hoc Networks,"IEEE CONFERENCE ON COMPUTER INFORMATION AND TELECOM SYSTEMS, 2014 Vol.13, NO. 3,pp.1-6

[2] Sathya.E,Rajpriya.G," Power aware routing for path selection with minimum traffic in Mobile Ad hoc Network", International Journal of Engineering Research and General Science Volume2, Issue 6, October-November, 2014.

[3] Varun Mishra,Gajendra Sonker,"Energy aware and multipath base reliable communication in MANET", International Journal of Innovative Research in Computer and Communication Engineering , Volume 1, Issue 5,July 2013.

[4] Fujian Qin, Youyuan Liu," Multipath Based QoS Routing in MANET" JOURNAL OF NETWORKS, VOL. 4, NO. 8, OCTOBER 2009.

[5] W. H. Liao *et al.*, "A Multi-Path QoS Routing Protocol in a Wireless Mobile Ad Hoc Network," *IEEE ICN*, 2001.

[6] Marina, M.K., Das, S.R.:"On-demand Multipath Distance Vector Routing in AdHoc Networks". Proceedings of the International Conference for Network Procotols(2001).

[7] Mohammed Tarique, Kemal E. Tepe, Sasan Adibi and Shervin Erfani,"Survey of multipath routing protocols for mobile ad hoc networks,"Journal of Network and Computer Applications, pp. 1125–1143, 2009.

[8] P. K. Suri, M.K. Soni, P. Tomar, " Stable Path Routing Protocol basedon Power Awareness", International Journal of Scientific & EngineeringResearch Volume 2, Issue 8, Auguest 2011

[9] Charles E. P, E. M. Belding-Royer and I. Chakeres, "Ad hoc On-Demand Distance Vector Routing", IETF Internet draft, 2003.

[10] "The Network Simulator - ns-2," http://www.isi.edu/nsnam/ns, 2013.