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Priority Queue Based Path Selection Using Pqmr Protocol in Manet

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ABSTRACT

MANET (Mobile Ad hoc Network) comprises of several mobile nodes connected by wireless links that creates this network as self-configuring and is also called as Mobile Mesh Networks. The Ad hoc networks are a novel wireless networking prototype for mobile nodes and compared with traditional networks it does not possess any existing or fixed network infrastructure. Rather the mobile nodes rely on each other to prevent the connection of the network. In mobile ad hoc networks, the mobile nodes communicate with the distant destinations by employing intermediate nodes. Sending multiple copies of packets to multiple destination nodes is known as Multicast routing which is a key concept in MANET in which efficient routing is a major problem. In order to overcome this we proposed Priority Queue based Multipath Routing (PQMR) protocol in which each path contains a priority queue and at first it allows to transmit the packet that has highest priority among other packets and by the way we can avoid or reduce the traffic and delay as well. When the packets are dropped due to channel noise or the condition of full queue or due to congestion it chooses the alternate path in a frequent manner. Hence, the efficiency and throughput are increased.

Key Terms: MANET, multi hop, multicast and PQMR,Congestion.

I. INTRODUCTION

In general, MANETs (Mobile Ad hoc Networks) are self-configuring network which contains various autonomous mobile nodes as communication point that can create a dynamic topology and are functioned on the multi hop wireless networks. It can frequently vary their topology and the nodes of MANETs can randomly moved anywhere in the network. Entire nodes cooperatively keep the network connectivity without any attention of the fixed infrastructures such as BS (Base Station) or AP (Access Points) in promote. Every single node in the network has a routing purpose in order to communicate the destination node by forwarding packets through the intermediate nodes. [1]. The network has several communication ranges in which the nods are in the same communication range can communicate or transmits their packets directly; otherwise they depends on their neighbors to forward the packets to destination. Mobile networks are distinguished by unlimited mobility and comfortable deployment that makes them very hopeful. There are various applications that necessitate data delivery to several destination nodes to keep and minimize the network traffic. [2, 3].

Such mobile networks are generally dynamic where the nodes are mobile and thus rendering robust multicast routing for such type of network is challenging task. In few of the multicast applications of wireless network the source and intermediate nodes are not stable and the multicast receivers and the destination nodes are constant. In other type of multicasting applications, entire nodes like source, intermediate nodes and destination are not stationary in which a source node must know the multicast

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destination in order to endure whatever type of multicasting applications. The MANETs are required by the networks which lost their infrastructure that can provide cost effective communication. However, ad hoc networks render the applications such as armed sectors and emergency services and the resources of MANETs are shared by the users. These networks have restricted transmission range because of the characteristics of wireless devices; so, in order to make communication from source to destination it utilizes their intermediate nodes that take over the province of routing and maintenance of the networks. [4].

In order to communicate the destination which does not have an arbitrate neighbor nodes which has the co-operation to forward the packets to destination; the source node should discover a path to respective destination. Then, intensive routing of packets occurred in a diffused manner. While talking about queue it is necessary to discuss about congestion and its control mechanisms. Congestion occurs in mobile networks with confined resources and the apportioned wireless channel and frequent topology changes contribute to interference and fading of the network during transmission of packets takes place. Duplicate packets and bandwidth decrepitude are induced because of congestion; so, time and energy of mobile nodes are wasted on its retrieval. These congestions are precluded by utilizing Congestion Aware Routing protocol via getting around the impacted paths. [6].

Serious throughput erosion and monumental fairness drawbacks are few of the described congestion concerned troubles which are created by Medium Access Control, transport layer and routing of protocols. Congestion control is one of the major troubles in mobile ad-hoc networks that are related to traffic control of entering into telecom networks. In order to avoid the congestive collapse/path capacities of the intermediate nodes, the rate of transmitting packets must be reduced. Congestion control and reliability mechanisms are merged by transmission control protocol in order to execute the congestion control without any denotative feedback regarding the position of congestion and if there is no intermediate node available; then the transmission occurs directly to the destination which has some principles like packet preservation, linear increase and accelerative decrease of transmitting rate and static network. [5].

The basic proficiency of congestion control includes flow control of terminate systems, congestion control and congestion avoidance of network and resource apportioning. Various congestion control mechanism needs more time congestion detection and the utilization of new links provides better results at some vital situations. When the congestion occurs at once the packets may be lost continuously. In order to provide the congestion control solution for a network, the transmission rate of sender or the dropping rate of intermediate nodes must be reduced which also decreases the traffic load and maximum packet loss leads minimum throughput of the network. [7].

In this paper, we are going to talk about the Priority Queue based Multipath Routing (PQMR) protocol that frequently chooses an alternate path when the current transmission path has more number of packet dropping i.e., it is said to be failure. Section 2, overviewed the existing methods. In Section 3, our proposed PQMR protocol is talked over in an elaborated manner Section 4 reviews the algorithm of PQMR protocol and the experimental results are shown in section 5. At last, Section 6 resolves the paper and states future works as well.

II. RELATED WORK

Multipath routing which is employed in wired networks to attain maximum throughput, high load balancing capacity and accurate fault tolerance and among all the routing protocols for mobile networks, TORA [8] affirms multipath routing merely deficiencies exact distance metrics for an optimum routing. The protocols such as ROAM [9] and MDVA [10] are planned to render multipath routing and its proactive fashion builds them more desirable for the networks which are static or contains low mobility. In recent years, completely reactive protocols like AODV [11] and DSR [9] that are stretched to affirm multipath routing [12–15] in ad hoc networks. In [13], a suggestion is provided to maintain two links- disarticulate routes to the destination

node at the sender and at each arbitrate node, one path acts as the main route and the other path behaves as the back off.

Simulation and investigation demonstrate that rendering arbitrate nodes with back off routes enhances the life time of the participating route. In [14], a diversity injection approach is presented for Dynamic Source Routing (DSR) to discover node- disarticulate routes and the process of route reply is altered so the arbitrate nodes may re-broadcast RREPs through multiple routes back to the sender. In [12] another approach is proposed to detect maximally disarticulate routes. Their SMR (Split Multipath Routing) is the prolongation to DSR protocol, arbitrate nodes may send on, not neglect, a repeated RREQ, if such RREQ assumes a path different from the former obtained RREQ.

In [15], both approaches were discussed and compared. In [12], AOMDV (On-demand Multipath Distance Vector routing) is proposed, an elongation to AODV protocol. On-demand Multipath Distance Vector routing enable arbitrate nodes to send on multiple RREPs on link- disarticulate routes as well. An additional first hop field is contributed to RREQs to recognize. Multipath routing in mobile ad hoc networks has a dissimilar set of targets from which in the wired networks. It is expressed in [14] that, owing to the interference of signal between multiple paths i.e., the coupling trouble occur, the throughput gain of multipath routing is little, still for wireless networks employing the approaches of multiple channels. Most of the annexes of on-demand protocol [12,13,16] concentrate on fault tolerance only.

III. PQMR PROTOCOL

In our paper, we proposed Priority Queue based Multipath Routing (PQMR) protocol which is a new stateless routing protocol that contains a queue at each path. In general, in a network information is splitted into number of packets which are sent through the network and priority is assigned to each packets. Here, priority based queues are used at each path that can allow only the highest priority packets at first and it continues the transmission by sequentially sending the priority wise packets. For instance, consider a source contains some packets which have priority number as well and if No. 7 is the highest priority number among other packets.

At first, such highest priority packet is allowed into the queue while in transmission and next priority wise packets are filled into the queue. Hence, the network traffic can be reduced. At the same time, the transmitted packets may dropped and that has two possibilities such as,

(i) when the queue is full the congestion may occur so next coming packets are dropped and

(ii) due to channel noise the packet dropping occurs.

Then, the network consider that path is a failure one and it chooses an alternate path in a frequent manner to continue transmission without any time delay by our protocol and the latency and the communication overhead is reduced. Our proposed PQBR protocol attains highest packet delivery ratio and reduced end to end delay. At last, the network throughput and efficiency is increased.

IV. ALGORITHM FOR PRIORITY QUEUE BASED MULTIPATH ROUTING (PQMR) PROTOCOL

1. Step 1:
2. Initialize the Source ΔS_{ax}
3. Attach Agent ΔA_{ax}
4. $\Delta S_{ax} <= \Delta A_{ax} + \Delta D_{ax}$
5. Packet & Packet ID => Q_{ix}
6. Step 2:

7. Initialize Queue *Qix*
8. For(Q_{ix} = 0; Q_{ix} <N; Q_{ix} ++)
9. If (Q_{ix} = 0);
10. Packet was Flow into the Queue
11. Else
12. (Q_{ix} = 1);
13. Queue was Full Packet was dropped
14. End if
15. Step 3:
16. Path Selection Process initiated
17. For (P_{th} = 0; P_{th} < N; P_{th} + 1;)
18. If
19. (P_{th} = 0)
20. Path is Free Packets Flow on the path
21. Else
22. (P_{th} =1)
23. Path is Full Choose Alternate path
24. End if ;
25. End Process;

(A) Description

Thousands of nodes are deployed in a network in which source and destination nodes are initialized and an information is splitted into packets by the source that are transmitted through the paths to destination by using intermediate nodes. Efficient routing is a vital problem in MANETs (Mobile Ad hoc Networks) in order to overcome this we proposed Priority Queue based Multipath Routing protocol (PQMR). Here, each path contains a priority queue and the packets contain a priority number that allows priority based routing and for example consider a source node which contains 1000 packets; each packet has a priority number. If a packet has highest priority among other packets then the priority queue allows that packet to transmit first and by the way we can avoid or reduce the traffic and delay in the network. Here, the packet dropping arises in two ways; if a queue becomes full the congestion may occur so the next coming packets are continuously dropped and if a channel noise is present while the queue is empty the coming packets are rejected. At that situation, an alternate path is selected frequently to continue transmission without any time delay by our protocol and the latency and the communication overhead is reduced. At last, the network throughput and efficiency is increased linearly by the network.

(B) Benefits

- Our proposed PQMR protocol uses priority based queue at each and every path in the network. So, high priority packets are transmitted first.
- By the utilization of queue we can reduce the traffic and delay.
- So, the communication overhead and scalability is also increased.
- When the queue is full, it frequently chooses another path without any delay to continue transmission. Thus, the time delay is reduced and packet delivery ratio is increased.

(C) Issues in Former Protocols

By compared with former protocols (like AODV, MDSR and AOMDV) of multipath routing our proposed provides better performance. Since, those protocols chose only an efficient path as an alternate path. So, it is necessary to sense all the paths in the network in order to detect which one is so efficient. So, the time to choose an alternate path is increased. Hence the network life-time is reduced and that network cannot provide better performance. But our PQMR protocol chooses any one the path as an alternate path. So the time delay is reduced and network life-time is increased.

V. COMPARISON OF NETWORK PARAMETERS

Table 1
Comparison of AODV, DSR and PQMR Protocol

S. No.	*Parameters*	*AODV*	*DSR*	*PQMR*
1	Total Number Packets	1000	1200	1500
2	Antenna Type and Coverage	Omni Direction al Antenna	Omni Direction al Antenna	Omni Direction al Antenna
3	Bandwidth	6db	8db	10db
4	Frequency	1000MHz	1200MHz	1500MHz
5	Packet Transmission Mode	Distance Based	Distance Based	Path Based
6	Transmissi on Medium	0.256e	0.296e	0.325e
7	Delay	0.258 ms	0.220 ms	0.195 ms

In Table 1, we compare the parameters of existing (AODV and DSR) and proposed (PQMR) Protocols. In AODV, we can send 1000 packets and in DSR we can transmit 1200 packets but in our proposed PQMR we can SEND 1500 packets. These three protocols employ Omni directional antenna for packet transmission. AODV, DSR and PQMR require the bandwidth of 6db, 8db and 10db respectively. Frequency range of existing (AODV and DSR) protocol and proposed PQMR protocol is 1000MHz, 1200MHz and 1500MHz respectively. Both AODV and DSR follows distance based packet transmission mode but PQMR follows path based packet transmission mode. Transmission medium of AODV, DSR and PQMR has 0.256e, 0.296e and 0.325e and the delay of 0.258ms, 0.220ms and 0.195ms respectively.

V. EXPERIMENTAL RESULTS

In Fig. 1, red line shows the performance of AODV and green line shows the performance of our proposed PQMR protocol. These plots are drawn between Mobility and Delay. While delay is increased the mobility of AODV gets increased and PQMR gets decreased compared with AODV. Generally, the network which has low mobility provides better performance.

In Fig. 2, red line shows the performance of AODV and green line shows the performance of our proposed PQMR protocol. These plots are drawn between PDR and Good put. While PDR is increased the good put of AODV gets increased slightly and PQMR gets suddenly increased compared with AODV. In general, the network which provides high Good put at increased PDR.

In Fig. 3, red line shows the performance of AODV and green line shows the performance of our proposed PQMR protocol. These plots are drawn between No. of nodes and PDR. While No. of nodes is increased the PDR of AODV gets slightly increased and PQMR gets frequently increased compared with AODV protocol. Generally, the network which has high PDR provides better performance.

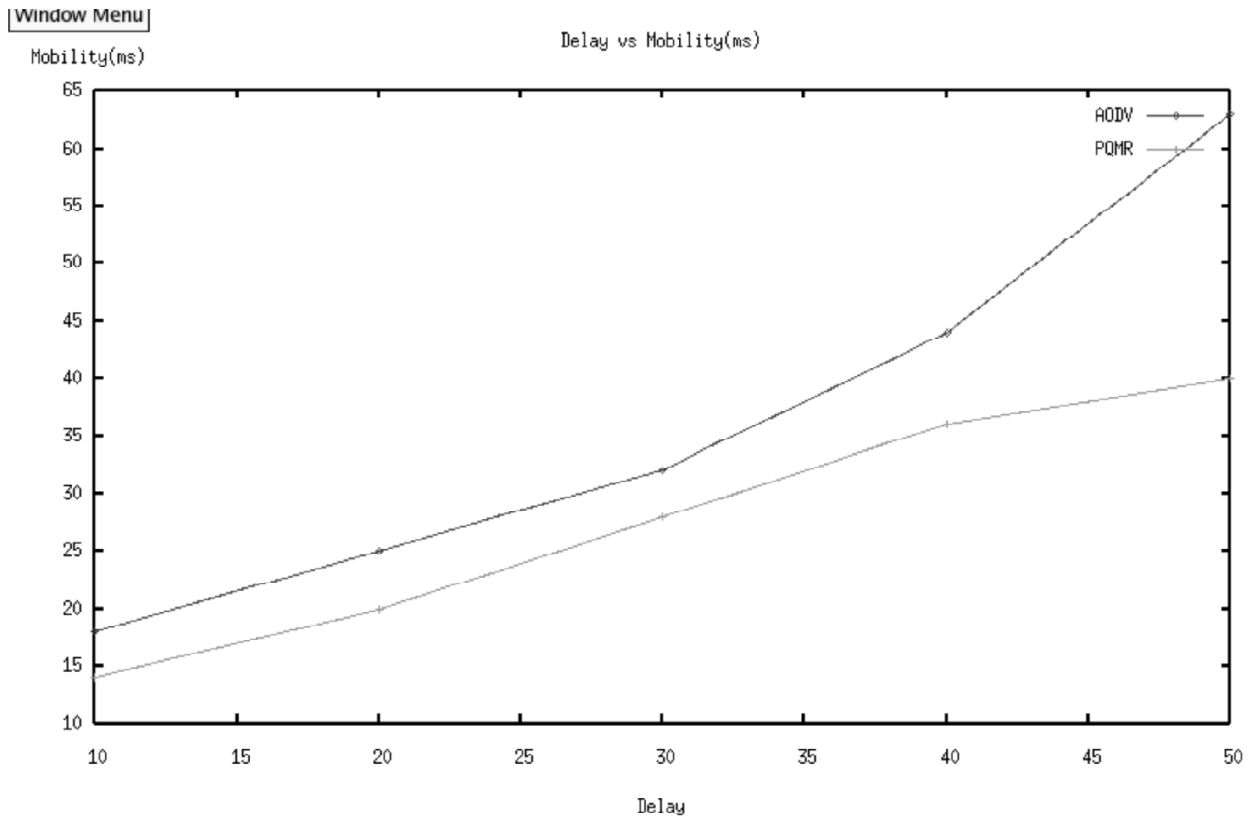

Figure 1: Performance between PQMR and AODV in Mobility and Delay

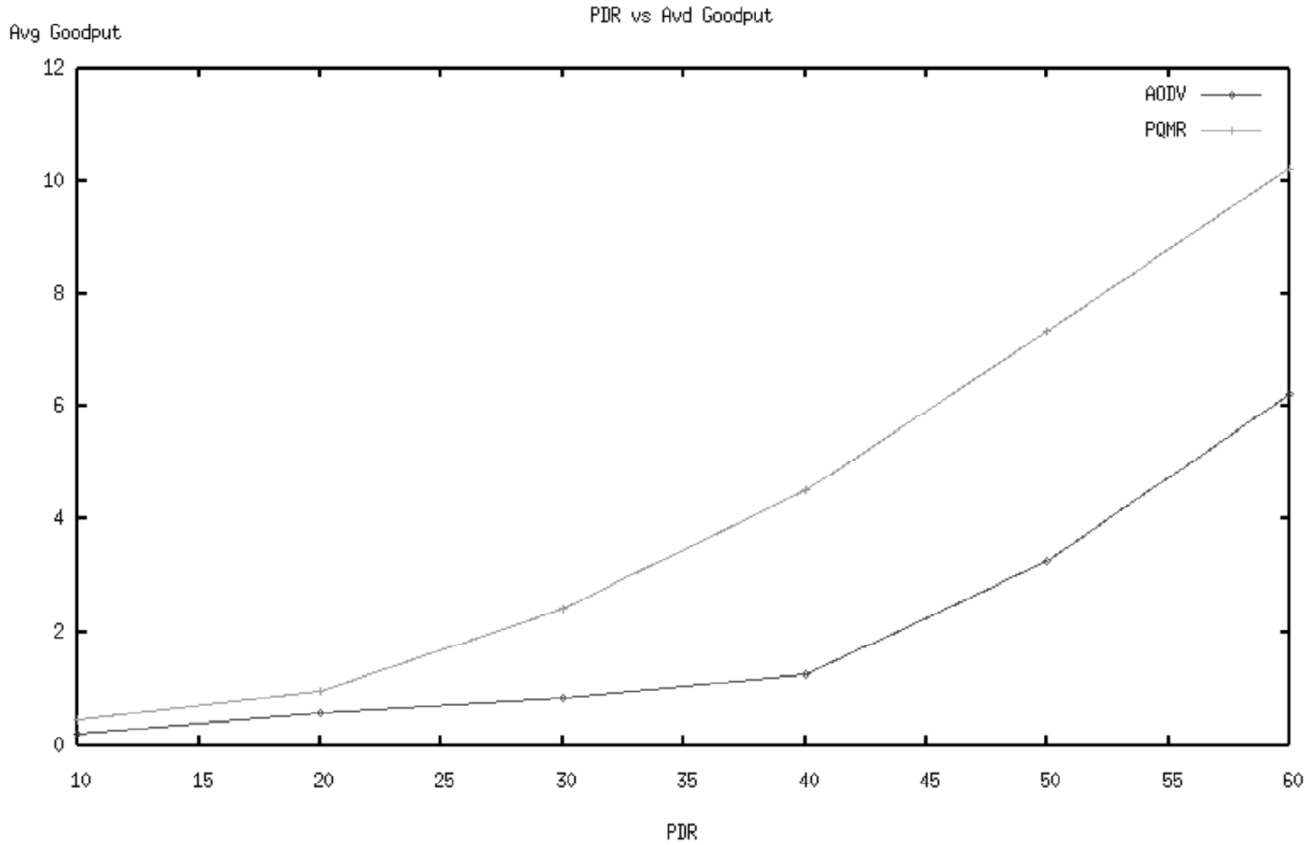

Figure 2: Performance between PQMR and AODV in PDR and Avg Good put

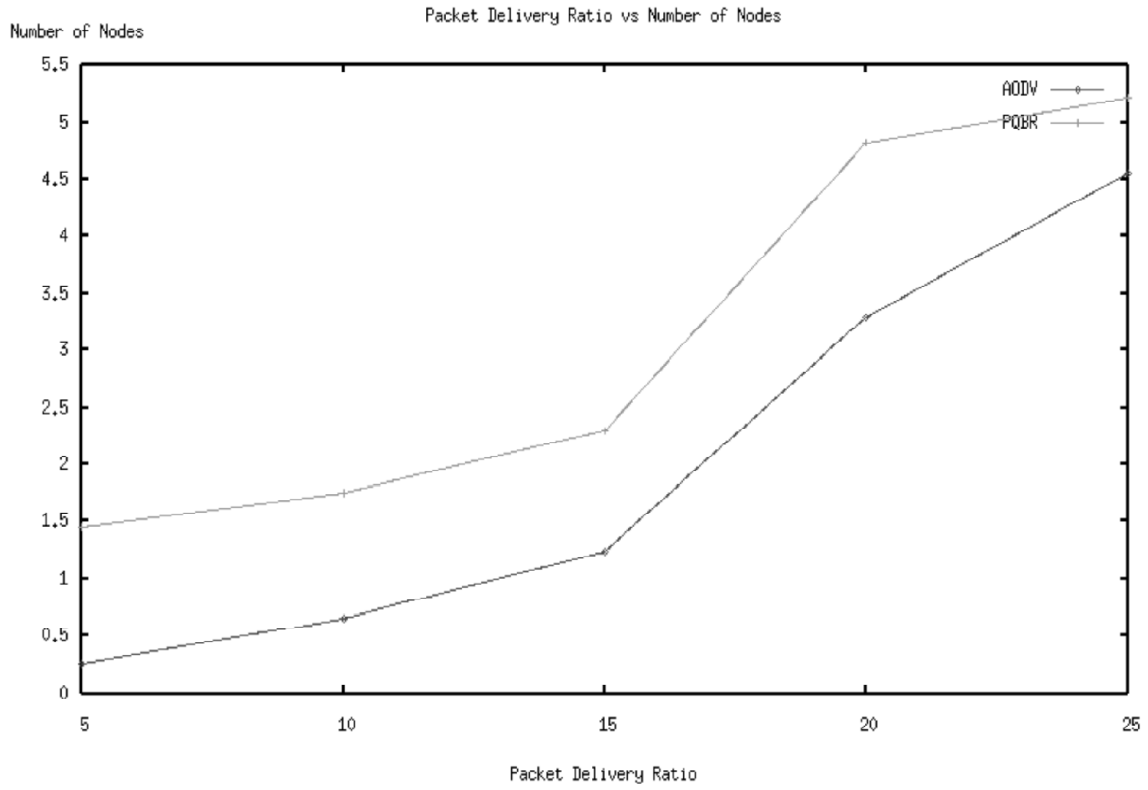

Figure 3: Performance between PQMR and AODV in Commubication Overhead

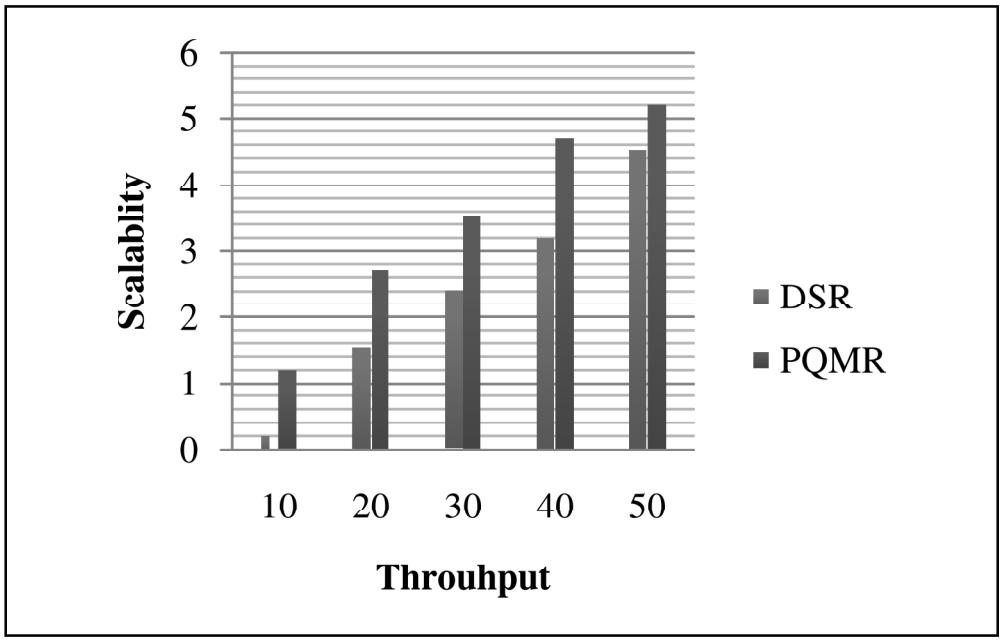

Figure 4: Performance between PQMR and AODV in Throughput and Scalability

In Fig. 4, blue line shows the performance of DSR and red line shows the performance of our proposed PQMR protocol. These plots are drawn between Scalability and Throughput. While throughput is increased Throughput of DSR gets slightly increased and PQMR gets frequently increased compared with DSR protocol. Generally, the network which has high Scalability and Throughput provides better performance.

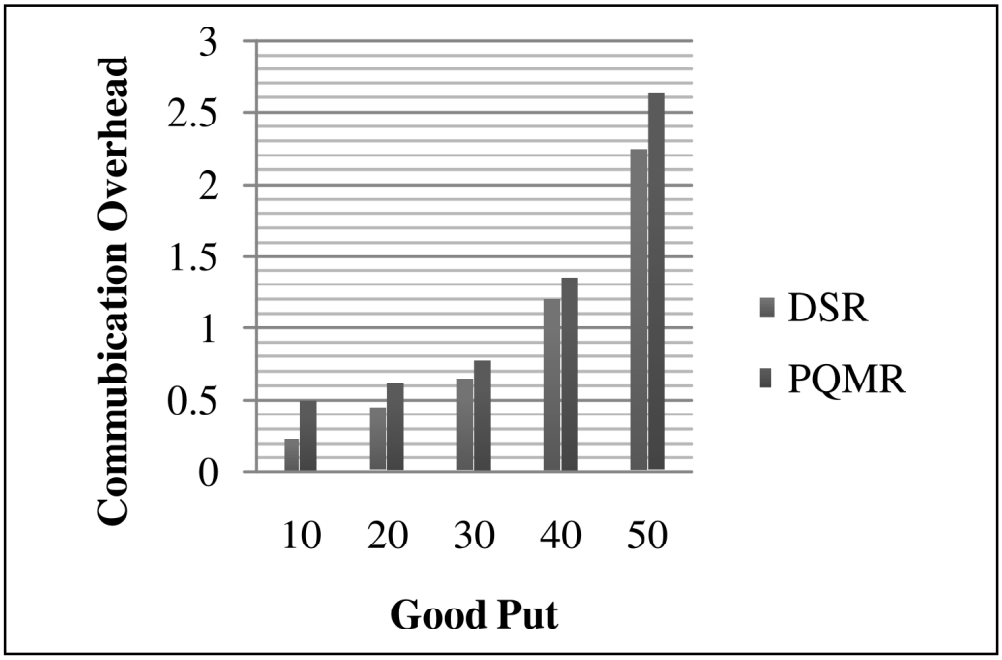

Figure 5: Performance between PQMR and AODV in Communication Overhead and Good Put

In Fig. 5, blue line shows the performance of DSR and red line shows the performance of our proposed PQMR protocol. These plots are drawn between Communication overhead and Goodput. While good put is increased communication overhead of DSR gets slightly increased and PQMR gets suddenly increased compared with DSR protocol. Generally, the network which has high Good put renders better performance.

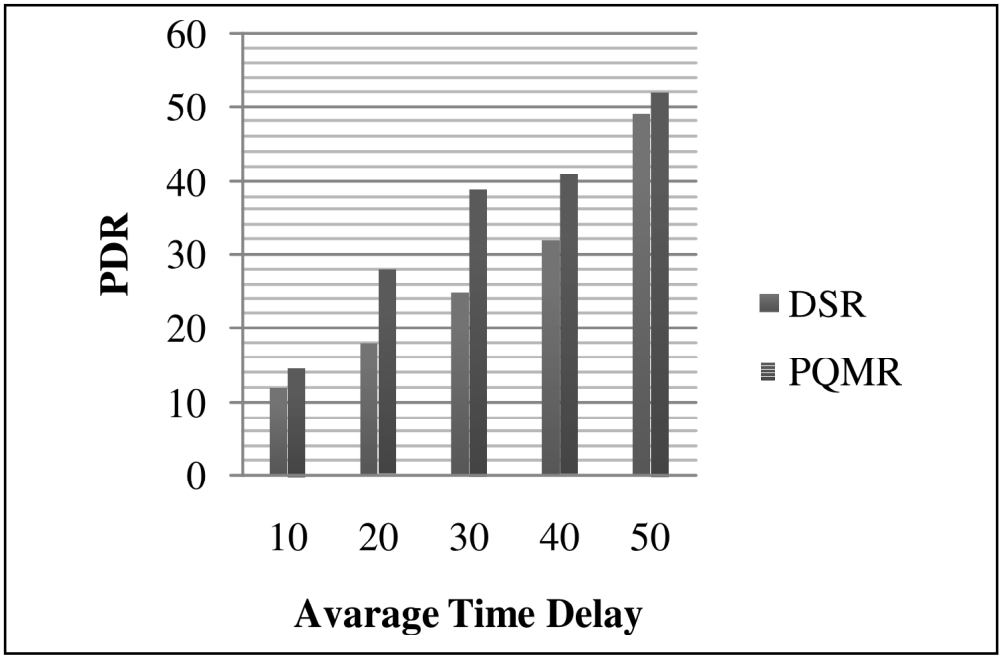

Figure 6: Performance between PQMR and AODV in Average Time Delay and PDR

In Fig. 6, blue line shows the performance of DSR and red line shows the performance of our proposed PQMR protocol. These plots are drawn between Average Time Delay and PDR. While Delay is increased Packet Delivery Ratio of DSR gets slightly increased and PQMR gets frequently increased compared with DSR protocol. Generally, the network which has high PDR provides better performance.

VI. CONCLUSION

Thus, Priority Queue based Multipath Routing protocol (PQMR) is proposed to increase the efficiency of the network by reducing network traffic and delay as well and our proposed protocol contains priority queue at each path which priority wise allows the packets i.e., the highest priority packets are transmitted first by the way the network traffic is minimized. When the queue is full, congestion is occurred so the approaching packets are dropped or if a channel noise is present in a path the packets may dropped and in such situations an alternate path is chosen by our protocol in a frequent and efficient manner. The proposed PQMR protocol provides highest throughput because the packet delivery ratio of such network is high and it has less number of probabilities of packet dropping. It offers improved performance even in high mobility conditions of nodes in dynamic environments and the protocol chooses the alternate path with no delay which makes this communication more robust and scalable. Finally, the overall network performance is increased and the required efficiency is achieved. Using our PQMR protocol, we can increase the efficiency only and these networks have lower security during packet transmission. So in future, our work will concentrate to provide security of our proposed protocol by proposing a new authentication protocol.

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