Original Article

Qos Parameters Estimation in MANET Using Position Based Opportunistic Routing Protocol

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ABSTRACT

Mobile Ad-hoc Network is an infra-structure less and decentralized network which need a robust dynamic routing protocol. Most existing ad hoc routing protocols are and the broadcast nature of susceptible to node mobility, especially for large-scale networks. Such an efficient routing protocol is introduced called Position based Opportunistic Routing protocol. It uses geographic routing for finding the location of all the nodes to transmit the data packets in hop by hop manner and opportunistic forwarding finding the next suitable node to forward the packets. In order to improve the efficiency of POR protocol the quality parameters are considered. For improving the quality bandwidth of the node is estimated from the MAC protocol for finding the availability of the bandwidth to transmit packet. Also the link quality is assured by finding the signal to noise ratio of each node. On considering both the parameters the data packet is forwarded through the best nodes. On comparing the results of data transmission using POR protocol with the quality assured POR (EPOR) protocol the efficiency is improved in EPOR protocol.

Keywords: Mobile Ad-hoc network (MANET), Position based opportunistic routing protocol (POR), Geographic routing, Opportunistic forwarding, Bandwidth estimation, Link quality.

INTRODUCTION

MANET is a self configuring infrastructureless network which needs an efficient routing protocol. Such a Protocol is introduced called Position based opportunistic routing protocol which uses geographic routing and opportunistic forwarding techniques. The QoS parameters are calculated for efficient transn=mission of packets.[1]

Position-based opportunistic routing (POR) protocol

There are some disadvantages in other MANET routing protocols, those problems can be solved by using new routing protocol namely, Position based Opportunistic Routing Protocol (POR). The design of POR is based on geographic routing and opportunistic forwarding. The nodes are assumed to be aware of its own location and the positions of its direct neighbors. Geographic Routing (GR) uses location information to forward data packets, in a hop-by-hop routing fashion.

The concept of opportunistic forwarding is to select and prioritize the forwarding candidates. The forwarding candidates cache the packet that has been received using MAC interception. If the best forwarder does not forward the packet in certain time slots, suboptimal candidates will take turn to forward the packet according to a locally formed order.[1]

Limitation on possible duplicate relaying

Due to collision and nodes movement, some forwarding candidates may fail to receive the packet forwarded by the next hop node or higher-priority candidate, so that a certain amount of duplicate relaying would occur. To limit such duplicate relaying, only the packet that has been forwarded by the source and the next hop node is transmitted in an opportunistic fashion and is allowed to be cached by multiple candidates.[1]

Virtual destination based void handling mechanism (VDVH)

In the case of communication hole, a Virtual Destination based Void Handling scheme in which the advantages of greedy forwarding and opportunistic routing can still be achieved while handling communication voids.[1]

Proposed work

In our proposed work, we calculate the QoS parameters Signal-to-Noise ratio (SNR) and Bandwidth as the link quality metric in POR protocol which takes into consideration the SNR value and the bandwidth value of a wireless link to discover new routes.

Qos in mobile Ad hoc networks

It set of service requirements that are met by the network while transferring a packet stream from a source to a destination. QoS metrics could be defined in terms of one or a set of parameters. Some of the parameters are delay, bandwidth, packet loss, delay-jitter, throughput, Energy, overhead, etc.

Bandwidth estimation

The capacity of the channel is estimated to check whether the link to be used for packet forwarding is free or not. The bandwidth availability is accessed from the MAC protocol. A Bandwidth timer is initialized and it accesses the bandwidth information about each node from the MAC protocol. Based upon the Bandwidth information of each node, it is decided that whether the node should be added in the group or not. It checks each node for the higher bandwidth. The higher bandwidth nodes are allowed to join the group of multicast and the nodes with low bandwidth are not allowed to join the group.

Link quality estimation

The link quality of each node is estimated by calculating the Signal-to-Noise ratio (SNR). The transmitter power and the receiver power is calculated for each node. The calculation of power between the transmitter power and the receiver power is estimated. The estimated value is the link quality metric. The node with high link quality metric is considered for quality routing purpose. The nodes with low link quality are not considered for routing.

Estimation of maximum quality node

The following are the steps performed in the estimation of maximum quality node by calculating the bandwidth and the link quality:

1. Initially a group join announcement is made from a node to all other neighboring nodes based upon the position details of each node.
2. The source node receives a group message as a reply.
3. The source node then classifies the packet base on the bandwidth and the link quality of each node.
4. The bandwidth of every node is accessed from MAC and the link quality is estimated from the power calculation of transmitter and receiver.
5. Maximum quality node is calculated from, Source < Bandwidth + link quality.
6. The calculation should be made for every node and the sum of bandwidth and link quality is compared with the source.
7. The nodes which have maximum quality can join the group.
8. The multicasting of packets is then carried out through the maximum quality nodes.
9. Multicasting is done until the destination receives the packet.

Simulation parameters

See table 1.

Performance analysis

The important terms used in the analysis are:

Throughput

It is defined as the total amount of data a receiver receives from the sender divided by the time it takes for the receiver to get the last packet.[12]

Jitter

The term jitter is often used as a measure of the variability over time of the packet latency across a network.[12]

Overhead

Number of Routing Packets Sent Per Second.[12]

SIMULATION RESULTS

It is observed that the Enhanced POR have high throughput when compared to POR. (See figure 1.)

The EPOR have reduced jitter when compared to POR. (See figure 2.)

EPOR have reduced normalized overhead when compared to POR. (See figure 3.)

EPOR have high average energy when compared to POR. (See figure 4.)

The EPOR have reduced overhead when compared to POR. (See figure 5 and table 2.)

CONCLUSION

On estimating the QoS parameters of POR protocol such as bandwidth and link quality an efficient ad hoc routing protocol for throughput, average energy, jitter and overhead is achieved. On comparing the protocols we have studied the efficiency of delivering the packets in Mobile ad hoc networks.

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Table 1. Table for simulation parameters

Parameters	Value
MAC Protocol	IEEE 802.11
Propagation Model	Two-way Ground
Transmission Range	250 m
Antenna Type	Omnidirectional antenna
Mobility Model	Random Way Point (RWP)
Traffic Type	Constant Bit Rate (CBR)
Packet Size	256 Bytes
Number of Nodes	80
Simulation Time	900 sec

Table 2. Comparison table for Nodes vs Overhead

Number of nodes	POR	EPOR
50	1289	1289
75	1932	1925
100	2565	2558
125	3219	3182
150	3843	3819

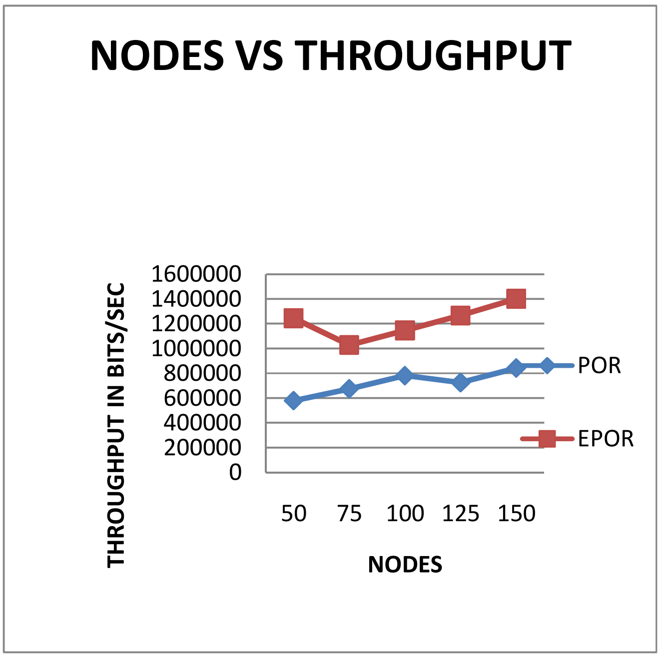

Figure 1. Comparison of Nodes vs Throughput

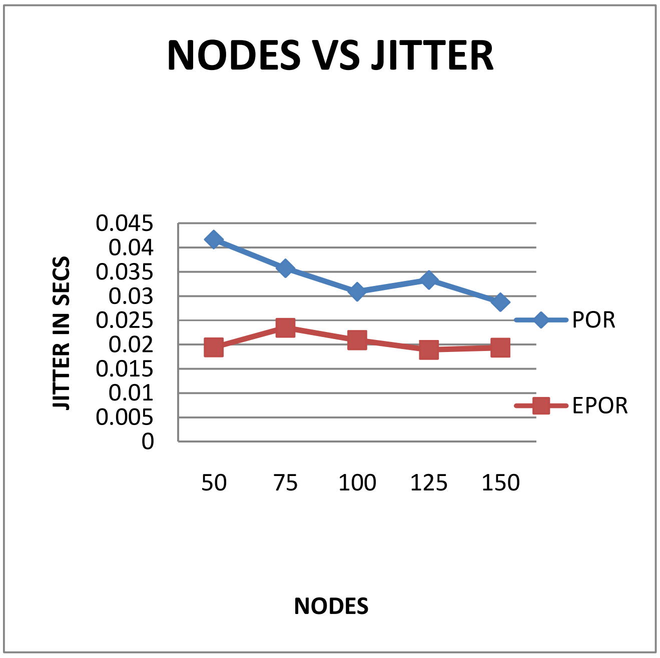

Figure 2. Comparison of Nodes vs Jitter

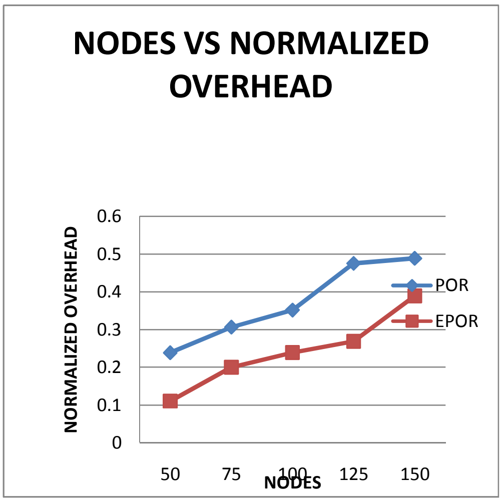

Figure 3. Comparison of Nodes vs Normalized overhead

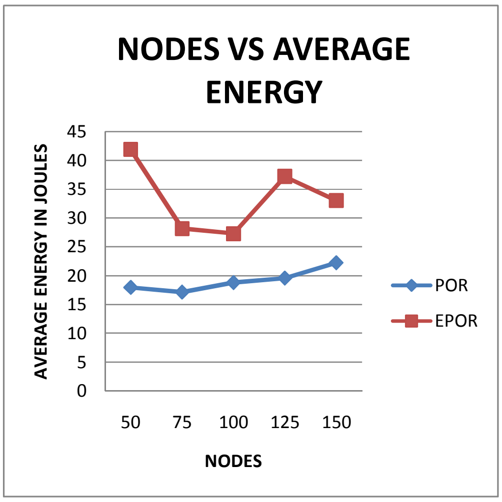

Figure 4. Comparison of Nodes vs Average energy

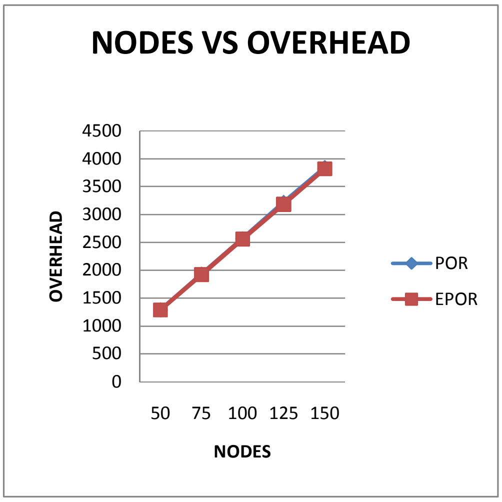

Figure 5. Comparison of Nodes vs Overhead