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LOCAL BROADCAST ALGORITHM WITH SELF-MOTIVATED MULTIPATH ROUTING IN MOBILE AD HOC NETWORKS BY QOS APPROACH

D. Jagadeesan[1], G. Asha[2], S. Narayanan[1] and R. Sundar[3]
[1]Department of Computer Science and Engineering, Adhiparasakthi College of Engineering, Kalavai, Vellore, Tamil Nadu, India
[2]Department of Electronics and Communication Engineering, SCSVMV University, Kanchipuram, Tamil Nadu, India
[3]Department of Computer Science and Engineering, Sathyabama University, Chennai, India
E-Mail: djagadeesanphd@gmail.com

ABSTRACT

In MANETs, the route discovery using AOMDV involves broadcast of request message to all neighbor however it lead to unnecessary overhead of route discovery. In our proposed scheme as an alternative of broadcast we use multicast request message forwarded to few neighbor nodes known as dominant set (DS). Selection of these nodes is based on node energy level analysis, channel state information and traffic analysis. Moreover minimum connecting dominant set (MCDS) is formed by selecting neighbor nodes in similar manner for all nodes present in dominant set. This process is repeated until the destination node is reached. Route discovery process involves only the nodes present in connecting dominant set (CD) and MCDS thereby less traffic. State information about the multiple route paths is also maintained based on the QoS parameter. In order to overcome the frequent link failure, the route path is switched prior to route breakage based on the QoS parameters.

Keywords: local broadcast, route breakage, QoS, link failure, dominant set, MCDS.

1. INTRODUCTION

A mobile ad hoc network (MANET) is an infrastructure-less unique wireless network of mobile devices where each device acts as a router. Ad hoc networks are instantaneously formed to perform a specific purpose and cease to exist after the network fulfills its purpose. MANET is a self-configuring network connected by wireless links. Most Ad hoc networks do not rely on any fixed infrastructure such as base stations or access points [1].

a) Routing

In mobile ad hoc network, the routing is nontrivial due to extremely formation of dynamic environment. An ad hoc network is a collection of wireless mobile nodes (such as mobile device, laptop) dynamically forming a temporary network without using any previous existing infrastructure network or centralized administration system [2]. Routing is the process of moving packets between source node and destination node in internetworking.

b) Routing protocols for MANETs

Routing protocols use a routing algorithm which is a mathematical formula to forward the packet to its destination. Many researchers have proposed different routing protocols such as DSDV, OLSR, GSR, AODV, DSR, AOMDV and ZRP for the purpose of transferring packet from source to destination in mobile ad hoc networks. Generally they are grouped into three types.

- Table driven (proactive) routing protocols,
- On-demand (reactive) routing protocols, and
- Hybrid routing protocols [3, 4, 5].

c) Quality of service

QoS is a complicated task for the designers, because the topology of an ad hoc network will continuously change. Reserving resources and sustaining a certain quality of service, while the network condition constantly changes, is very challenging [6].

QoS act as very important role in MANETs. For instance transferring live video, audio and image from source to destination is needed the good quality of service for best result. Qualities of Service aware solutions are being developed to meet the emerging requirements of these applications [7].

2. REVIEW OF RELATED WORKS

Fang Jing, Bhuvaneswaran. R.S., Katayama. Y. and Takahashi. N has proposed Dynamic Route Selection Policy Protocol in MANET. Multipath route selection policy has been studied in the context of mobile ad hoc networks. Many ad hoc routing protocols are based on best routing policy, such as the fastest or the shortest routing policy with local traffic optimization. However, the lack of global perspective might increase congestion resulting in damage of the local traffic and load balancing policy protocols lost many traffic chances and cause low traffic performance on special condition. In this paper new route selection policy is proposed with consideration of the dynamic network condition. This scheme offered a high packet delivery ratio and low packet overhead ratio than other protocols [8].

Iftikhar Ahmad and Mata ur Rehman have proposed efficient AODV routing based on traffic load and mobility of node in MANET. In this paper a protocol with an improved route discovery mechanism that avoids the congestion in the route. The protocol selects route on

the basis of traffic load. As a substitute of transmitting entire data through one route, new efficient paths are discovered from time to time during transmission. This is an efficient technique for transmissions that requires a link for longer period of time [9].

P. Rama Devi and Dr. D. Srinivasa Rao have proposed Congestion Adaptive Hybrid Multi-path Routing Protocol for Load Balancing in Mobile Ad Hoc Networks. In this paper proposed two multipath issues. They are route request storm and inefficient route discovery. A huge quantity of route request messages are created by the multipath reactive routing protocols. When the intermediate nodes requires to process the duplicate request messages, there is a chance of unnecessary overhead packets be set up in the networks. Certain multipath routing protocols avoid intermediate node from forwarding a reply from its route cache in order to determine node-disjoint or link disjoint paths. Hence the source has to wait till it gets a reply from destination. Thus the process of route discovery performed by the multipath routing protocol needs more time when compared with DSR or AODV protocols [10].

Majid Khabbazian, Ian F. Blake, and Vijay K. Bhargava have proposed Local Broadcast Algorithms in Wireless Ad hoc Networks: Reducing the Number of Transmissions. In this paper, we investigated capabilities of local broadcast algorithms in reducing the total number of transmissions that are required to achieve full delivery. The local broadcast algorithms based on the static approach cannot guarantee a small sized CDS if the position information is not available. In this paper, they showed that local broadcast algorithms based on the dynamic approach do not require position information to guarantee a constant approximation factor. In case where nodes have different transmission ranges or when the network is modeled using the quasi unit disk graph model is not considered [11].

Ragb O.M. Saleh, Md Yazid Mohd Saman and M. Nordin A. Rahman have proposed route selection method (RSRS) to DSR protocol. It developed to select the recent-short route from the source to the destination. The performance of RSRS method for DSR Protocol has been evaluated and compared with standard DSR. This route selection method is more delay in AOMDV [12].

S. Priyadsrini, T. M. Navamani, and Venkatesh Mahadevan have proposed route discovery process considers the lifetime of the route as the metric while selecting the route, the routing failure is minimized. This reduces the number of route discovery process and also the computation overhead of every node involved in route discovery process which affects the overall performance of routing protocol. In this paper security problems (malicious nodes which affect the performance) not considered. [13].

3. PROPOSED WORK

MANETs, we proposed to transfer data packet between source and destination through multipath. This proposed scheme has to detect best path based on QoS parameters. Hence, it reduces the packet loss, end to end delay and improves throughput.

In this paper, instead of broadcast we use the multicast route request message thereby reducing the traffic overhead. QoS parameters are analyzed to discover the best path between source and destination. In order to overcome the frequent link failure, the route path is switched prior to route breakage based on the QoS parameters. There are three phases for discover the selection of best path in the network. They are,

- Route discovery
- Multipath maintenance in multipath
- Dynamic path selection based on QoS parameters

a) Route discovery

In our proposed system, we use the local broadcast algorithm. Local broadcast algorithm involves the selection of dominating set and connecting dominant sets. Messages are forwarded only to the nodes present in dominating set and connecting dominant sets. All the nodes in MANET are either in dominant set or they are neighbor to nodes present in the dominant set. Selection of nodes is done based on node energy level, traffic and channel sensing for signal strength. Figure-1 shows the route discovery by route request and route reply packet.

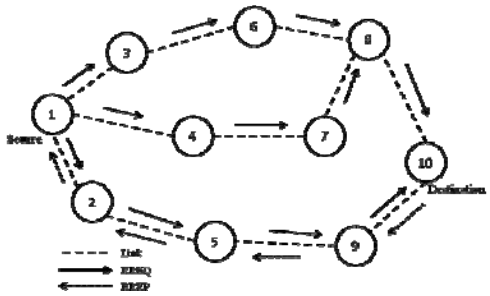

Figure-1. Route discovery.

b) Route maintenance in multipath

Final stage of route discovery involves existence of multiple paths between the source and destination nodes. This multipath state information is stored and maintained in their route cache. State information involves gathering information about node mobility, node energy level, signal strength and channel sensing.

c) Dynamic path selection based on QoS parameters

The multiple path analysis is done based on the traffic overhead, packet delivery ratio, throughput and node energy level and the best path is selected for transmission. Due to the mobility of node, there may be a chance of path breakage. In proposed system we may switch to alternate path prior to path breakage, thereby reducing the data loss and delay in path selection after failure. The signal strength of nodes is analyzed during the transmission of data and whenever the node signal strength is reduced below the threshold value, automatically alternate path is selected.

Figure-2 to 5 shows the selection of best path based on QoS parameters such as energy level, traffic and congestion in the network for transferring packet from source to destination.

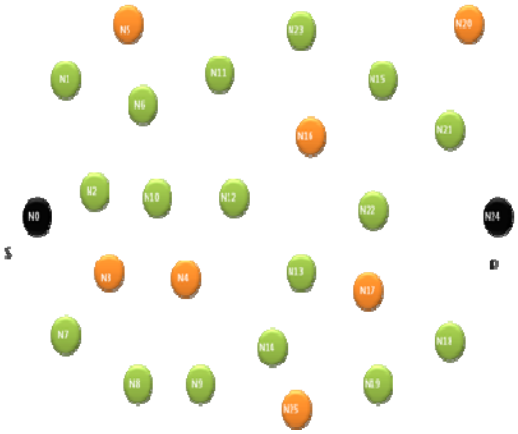

Figure-2. Dominant set is selected based on the energy level analysis.

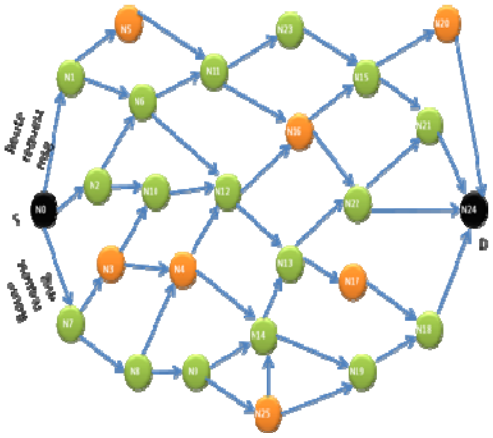

Figure-3. Source node sent route request message to neighbor nodes towards Destination node.

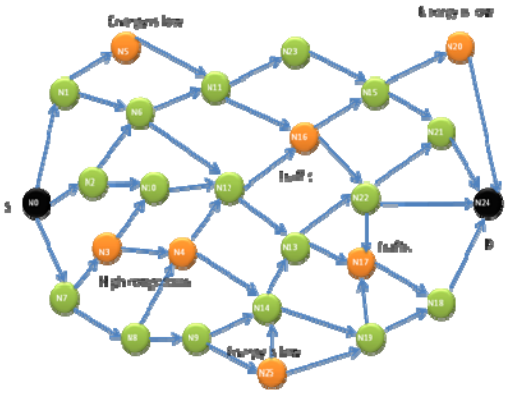

Figure-4. Analyze the QoS parameters.

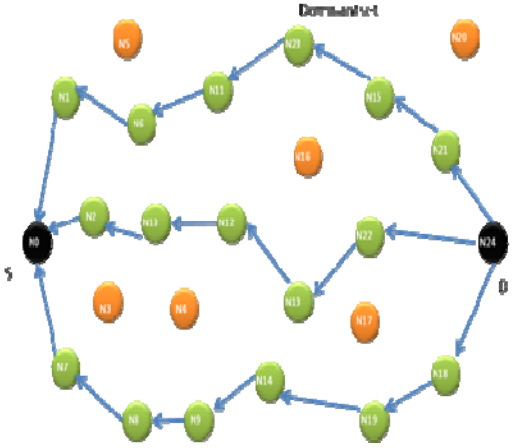

Figure-5. Select the best paths based on based QoS parameters.

d) Algorithm

Step 1 : Set threshold value based on size of the message to be transmitted.

Step 2 : Establish local broadcast route discovery process.

Step 3 : Select the list of next hop node from Source, If node energy level >= threshold value that forms Dominant Set.

Step 4 : Form the Connection Dominant Set for dominant set with the same step 3.

Step 5 : Repeat step 4 until reaches destination node D.

Step 6 : Multicast route reply message to next hop node that are in dominant set.

Step 7 : End

4. SIMULATION RESULTS

a) Simulation model and parameters

NS-2 [14] is used to simulate our proposed Local Broadcast Algorithm with Self-Motivated Multipath Routing in Mobile Ad hoc Networks by QoS Approach. In the simulation, the channel capacity of mobile hosts is set to the same value: 2 Mbps. The Distributed Coordination Function (DCF) of IEEE 802.11 for wireless LANs is used as the MAC layer protocol. It has the functionality to notify the network layer about link breakage. The simulation settings and parameters are summarized in Table-1.

Table-1. Simulation parameters.

Number of nodes	25
Area size	1000 x 1000 m
MAC protocol	802.11
Radio propagation model	Two ray ground
Radio range	250 m
Antenna	Omni directional antenna
Simulation time	50 sec
Traffic source	CBR
routing protocol	AOMDV
Packet size	512 bytes
Mobility model	Random Way Point
Rate	100 Kb
Maximum number of packets in queue	150
Speed (m/sec)	5,10,15,20 and 25

b) Performance metrics

We compare our Local Broadcast algorithm with QoS Approach (LBA-QoS) with the existing Local Broadcast algorithm (LBA). We evaluate mainly the performance according to the following metrics:

1. **Average end-to-end delay:** The end-to-end-delay is averaged over all surviving data packets from the sources to the destinations.
2. **Control overhead:** The control overhead is defined as the total number of routing control packets normalized by the total number of received data packets.

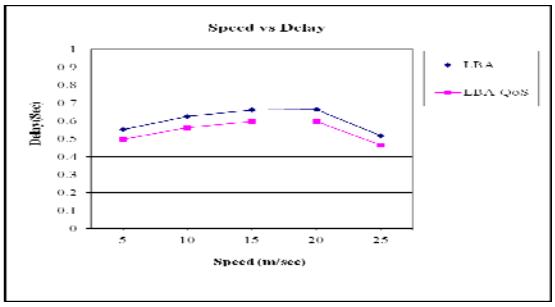

Figure-6. Speed vs Delay.

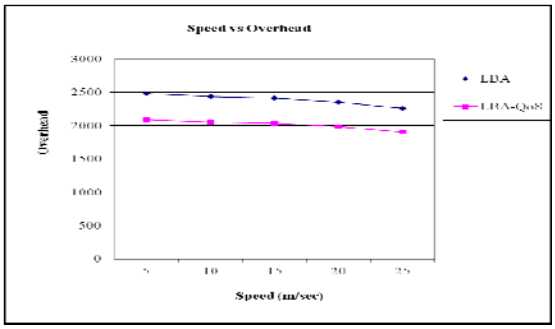

Figure-7. Speed vs Overhead.

Figure-5 shows the average end-to-end delay of the protocols, when the speed of node is increased. Since an increase in node speed incurs in frequent disconnections and link failures, the route maintenance time will be increased. Hence the delay is increasing shorply for LBA and slightly for LBA-QoS as seen in the Figure-5. It can be observed that delay of LBA-QoS is 21.6% less than that of LBA, since it quickly performs the route selection.

Figure-6 shows the total overhead involved in both the techniques, when the speed is increased. Clearly the overhead increases linearly, because of the frequent route updates. However we can see that the overhead is 12.5% less for LBA-QoS when compared to LBA, since it selects the most consistent route from the cache.

5. CONCLUSIONS

In this paper, we propose a efficient local broadcast algorithm with dynamic multipath routing using energy analysis, traffic analysis and channel state information for MANETs. We extend AOMDV routing protocol to improve channel state information maintenance by selecting dominant sets for multipath routing. We reduce congestion, traffic and frequent like failure by QoS parameters. In future further development can be made to detect the less energy level node rather than using the threshold value in QoS.

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