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Improved location services with cost and delay of Manet's

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Abstract

A mobile ad hoc network (MANET) is a self configuring infrastructureless network of mobile devices connected by wireless links. In order to facilitate communication within the network, a routing protocol is used to discover routes between nodes. The Primary goal of ad hoc network routing protocol is correct and efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. The Lodis(Location dissemination service)is one of the service is used to traces the locations of mobile nodes. but it does not concentrate about the optimal cost and delay. This paper proposes an optimal cost for Lodis by using BRR rule (Balanced ratio rule) and packet delivery delay by using CR rule(Composite rule).A BRR and CR rule can be done using the performance metrics like packet delivery ratio, throughput , packet drop, and packet delay to show that the former outperforms the later and confirms the better performing rules. Simulation results also shows that optimal Lodis has greatly improved network performance over Lodis.

KeyWords*: *LODIS, BRR, CR, Routing protocols ,MANET.

1. Introduction

Recently technologies have gained more importance. MANET is also a kind of wireless network but it has different feature of other wireless network such as the nodes in MANET moves in a random way. So locations are change according to movement of nodes. Due to this, routing is one of the challenging task which overcomes by developing many routing protocols.[1]

Due to the disconnected nature of IC-MANETs the dissemination takes time, which means that the location state maintained by the LoDiS could be stale. To overcome this problem, The incremental approach is to be used. Which is used to update the incremental location of the knowledge as a packet travels through the forwarding chain. The intermediate routers update the location information in a packet if their local LoDiS service has more recent information about the destination location. It is based on the simple idea that the node closer to the destination have better information on the correct location of the destination. The knowledge about the destination position will incrementally improved as the packet is routed toward the destination.[2]

In this paper we introduced an enhanced version of optimal cost of LoDiS and delay By using Balanced Ratio Rule (BRR),Composite Rule(CR) respectively. The balanced ratio rule is used to find the optimal cost of LoDiS, and the composite rule is used to find the delay.

In section 2 we review the AOMDV and LoDiS routing protocols. Section 3 gives the details about the cost and delay by using AOMDV routing protocol. while the Section 4 gives the performance analysis of the proposed protocol. Simulation Results are shown in Section 5. Finally Section 5 summarizes this paper.

Related Work

2. Review of AOMDV and LoDiS

In this section, we review the details of the two predecessor protocols AODV [3], and LoDiS [4] which are useful to our further discussion in this paper.

2.1 AODV

An ad-hoc network is the cooperative engagement of a collection of mobile nodes without the required intervention of any centralized access point or existing infrastructure. The Ad-hoc On Demand Distance Vector Routing (AODV), a novel algorithm for the operation of such ad-hoc networks. Each mobile host operates as a specialized router, and routes are obtained as needed (i.e., on-demand) with little or no reliance on periodic advertisements The new routing algorithm is quite suitable for a dynamic self starting network, as required by users wishing to utilize ad-hoc networks. AODV provides loop-free routes even while repairing broken links. Because the protocol does not require global periodic routing advertisements. The Ad hoc On-Demand Distance Vector (AODV) routing protocol is intended for use by mobile nodes in an ad hoc network. It offers quick adaptation to dynamic link conditions, low processing and memory overhead, low network utilization, and determines unicast routes to destinations within the ad hoc network. It uses destination sequence numbers to ensure loop freedom at all times (even in the face of anomalous delivery of routing control messages), avoiding problems (such as "counting to infinity") associated with classical distance vector protocols.

2.2. LoDis

In Lodis every node is a location server, and location and location data are updated by data exchanges as nodes encounter each other.
When the routing protocol requests a location from LoDiS,one thing that it can relatively be sure of is the location will be wrong, but if provided the location points the packet in the approximate right direction. It should be possible to use it as an initial estimate.To reduce the location error, the geographical routing protocol should update the location data in a packet for each node that the packet traverses. This approach is done by inquiring that nodes local lodis server whether it has more accurate information about the destination.[5]
In this paper we use the mobile object,that mobile object traces all locations in mobile nodes,and send the locations to the end user by using routing table. The following is the LODIS pseudocode[6]

<At a set interval broadcast location dataselect location data :

vector with elements(node,location, timestamp)Broadcast the data

When a Lodis broadcast is received For each received location data that is more recent upadate the entry in the LoDiS server When the location data is received from the routing protocol If the supplied information is morerecent update the entry in the LoDiS server>

3. Optimal Lodis

The LoDiS focused only on finding the node locations. They didn't consider the optimal cost and delay of the nodes. Apart from this, the following are common problems in Routing Protocols. Distribution of location information is that it can consume large amounts of system resources if not properly designed. Full network connectivity is not available for a mapping-based service, the node that requests location information needs to access one node in the subset of nodes that act as location servers for the destination node. Delay can be traded off with actual monetary cost in the context of bulk data transfers over the network .To overcome this problem we are going to use Composite Rule(CR) and Balanced Radio Rule(BR)to calculate the optimal cost and delay because these rules can be applicable to increase throughput, decrease delay,
increased packet delivery ratio and to decrease packet drop.[10]

To design this protocol the following four steps are important.

- LoDis Protocol Design
- Framework of IcMANET
- Forwarding Area Selection
- Delay and Cost Analysis Based Routing for Mobile Nodes

3.1 LoDis Protocol Design

The Protocol design consists of the following three phases: route discovery, data forwarding, and route maintenance.
LoDiS maintains a local database of node locations which is updated using broadcast gossip combined with routing overhearing. And beaconless strategy combined with a position-based resolution of bids when forwarding packets

Every node is a location server, and location data are updated by data exchanges as nodes encounter each other. The reason that all nodes are location servers is to avoid delaying the packet at the source node. If only a limited set of nodes were location servers, then the transmission of a data packet will be delayed by the time it takes for a location server to respond to the location request. In dense networks, multiple nodes share similar transmission coverage. Thus, randomly having, some nodes not rebroadcast and network resources without harming delivery effectiveness. In mobile networks, there is much less shared coverage. Thus, nodes won't receive all the broadcast packets with the probabilistic scheme unless the probability parameter is high.

3.2 Framework of IcMANET

A group of mobile, wireless nodes which cooperatively and spontaneously form a network independent of any fixed infrastructure or centralized administration. partitions are considered a normal phenomenon store–carry–forward technique is used to overcome communication interruptions. A node communicates directly with nodes within wireless range and indirectly with all other destinations using a dynamically determined multi-hop route though other nodes in the MANET. Self-creating is not rely on a preexisting fixed infrastructure. Self- organizing is not predetermined topology. Self-administering is not central control creating a network "on the fly".

3.3 Forwarding Area Selection

The forwarding area can have many shapes but it should be designed in such a way that progress toward the destination is guaranteed. One attractive property is the potential for all nodes within the forwarding area to hear each other's transmissions. This case will reduce the risk of tentative custodians failing to receive the packet transmitted by the new custodian.

3.4 Delay and Cost Analysis Routing Based Mobile Nodes

By applying the **Balanced Ratio Rule(BRR)** optimal cost of Lodis can be calculated.Min-cost-per-progress rule can be calculated .

$$MCPRP = \frac{C_{A \to B}}{|AD| - |BD|}$$

Node A selects as target that candidate moving towards D with the smallest TTI.If no candidates moves towards D, A keeps the packet. For each candidate B closer to D than A , let the cost/progress ratio. Where CA B is the cost of sending packets from A to B. All other candidates have a cost/progress ratio equal to infinity.

$$BRR = \frac{C_{A \to B} + a d_{B \to Z}}{|AD| - |DZ|}$$

For each candidate B moving towards D and for which AD - D>0 , Where Z is the point Where B will be closest to D according to its current velocity vector .Where d Z is the delay for B to arrive at Z and a is a positive real coefficient termed the conversion coefficient.

3.5 Composite Rule

By applying the Composite Rule (CR) ,

delay of nodes can calculated.

CR=min{MCPRP,BRR}

The rational behind the use of the composite metric is that the node holding a packet to be ready to take any opportunity arising, and be ready to employ either low cost hops with immediate gains in the progress made to the destination , or hops that eventually lead to a significant reduction to the distance to the destination with an attractive combination of cost and delay.

Performance Analysis

4.1. Performance Metrics

Ad hoc networks are designed to be scalable. As the network grows, various routing protocols perform differently. Some important measures of the scalability of the protocols are,

- Packet delivery ratio
- Network Throughput
- End-to-End Delay
- Packet drop

4.1.1 Packet drop

The packet drop is defined as the total number of routing packets transmitted over the network, expressed in bits per second or packets per second. Some sources of routing overhead in a network are cited in [7] as the number of neighbors to the node and number of hops from the source to the destination. The routing packet drop in on-demand protocols is typically lower than the shortest path protocols, as only the actively used routes are maintained [8]. However, some recent performance evaluation work has shown in [9], the packet drop still approaches to that of the shortest path protocols, if a moderate to large number of routes needs to be actively maintained.

4.1.2 Packet Delivery Ratio

Packet delivery ratio is defined as the ratio of total number of packets that have reached the destination node to the total number of packets originated at the source node.

4.1.3 Network throughput

Network Throughput is the ratio of total amount of data which reaches the destination from the sender to the time it takes for the destination to receive the last packet. It is represented in bits per second. In MANETs throughput is affected by various changes in topology, limited bandwidth and limited power. Unreliable communication is also one of the factors which adversely affect the throughput parameter.

4.1.4 End-to-End Delay

The packet end-to-end delay is the average time in order to traverse the packet inside the network. This includes the time from generating the packet from the sender up till the reception of the packet by receiver or destination and expressed in seconds. This includes over all delay of networks including buffer queues, transmission time and induced delay due to routing activities. Different application needs different packet delay level.

Simulation Results

5.1. Simulation Environment

For simulation we used network Simulator 2 [10] widely known as NS2, is an event-driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulations of wired as well as wireless network functions and protocols can be done using NS2.

Table 1: Simulator Setup

Interface queue type	Priqueue
Area	2500 x2500
Network interface type	Phy /WirelessPhy
MAC type	Mac 802.11
Number of mobile nodes	100
Routing protocol	AODV
Simulation end time	100 sec
Node movement speed	4[m/s]
Communication Range	250m
Node pause time	10s
CBR packet size	512(bytes)

The table.1 gives the simulation setup for simulation of results. The area used for 100 nodes is 2500m X 2500m.The antenna used for connection is Omni directional antenna which transmits in all directions. The radio propagation model used is two way ground model and the network interface used is wireless physical layer. The transmission range used is 250m.
By varying the node mobility and the packet rates the throughput, routing control overhead, packet delivery ratio and end to end delay are measured and graphs are plotted. The following section gives the graph which deals with above said metrics and hence performance is measured.

5.2. Comparison Results

The various analysis of performance parameters are given in this section. We now compare **LoDiS,optimal LODIS** with respect to node mobility. A dense wireless network of 100 nodes is simulated in a field with 2500m X 2500m area which has the duration of 100s. During each simulation 12 Constant Bit Rates (CBR) connections are generated, producing 4 packets per second with packet size of 512 bytes.

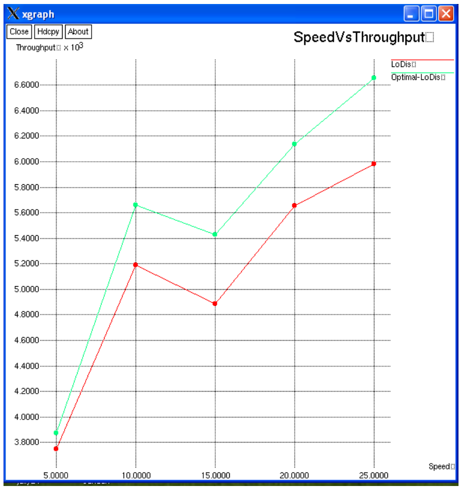

Fig.1 Network Throughput comparison between LODIS, and optimal LODIS with the increasing node mobility.

Simulation results for network throughput are shown in the Fig.1.

$$\text{Throughput} = \frac{\text{No. Of packets in bits}}{\text{Time}} \times 100$$

Throughput increases with the increased node mobility shown that LODIS-OPTIMAL LODIS

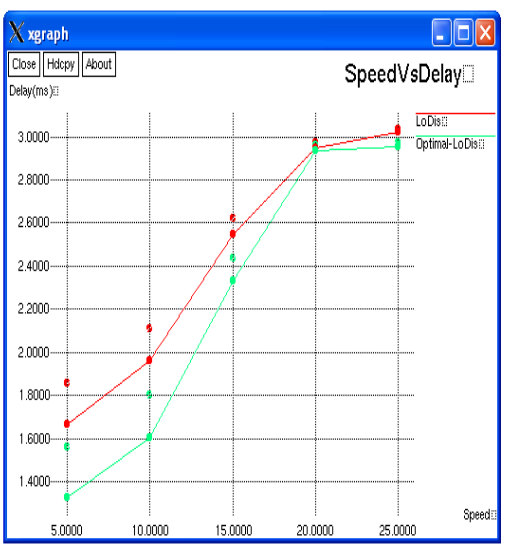

Fig.2. shows End-to-End delay results. Packet delay is decreased with the increasing node mobility which realizes the significant performance of LODIS and OPTIMAL-LODIS

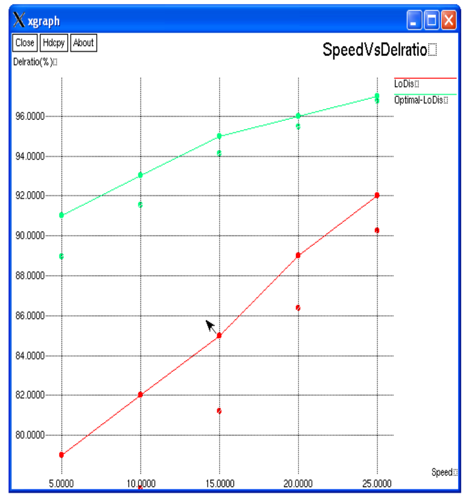

Fig.3 Packet delivery ratio comparison between LODIS and OPTIMAL-LODIS with the increasing node mobility.

$$\text{PDR} = \frac{\text{No.Of Received packets}}{\text{No.Of Sent packets}} \times 100$$

It is clearly shows that from the fig.3 the outperforms the LODIS and OPTIMAL-LODIS protocols.

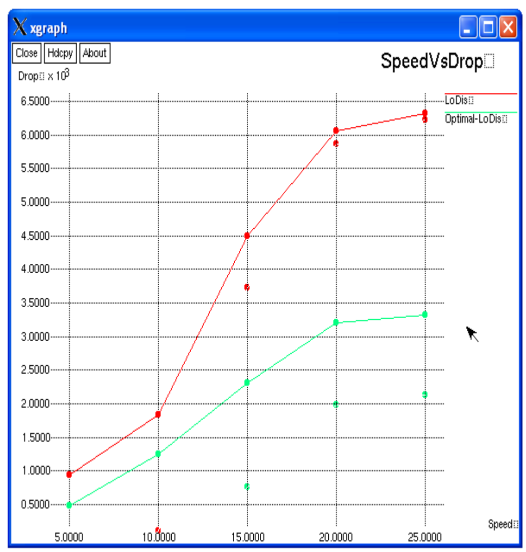

Fig:4 packet drop comparison between LODIS and optimal-LODIS

Conclusion

In this paper makes two important contributions: firstly we present a formulation in terms of cost and delay for studying fundamental tradeoff between the maximum permitted packet delivery delay and minimum possible aggregate transposition cost. Secondly we propose CR exhibits a cost/delay tradeoff Closest to the optimal for a variety of scenarios, While BRR achieves the lowest costs for large delays and a fixed model.

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