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A survey of various geographic routing protocols on the basis of performance parameters in Mobile Ad-hoc Network (MANETs)

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Abstract
Mobile ad hoc networks are described by multi-hop wireless cell nodes that transfer data with each other without unified control or set up. There are many challenges in MANET like bandwidth optimization, routing, scalability and dynamic topology. But the main challenge immanent is connection fail due to high mobility. Topology-Based routing protocols end up unsatisfactory for MANET when the nodes are exceptionally mobile and topology changes dynamically geographic routing protocols are viewed as capable and adaptable when mobility is high. Hence, this protocols have involved a lot of attention in the area of routing protocols for MANET. In This paper our focus is on, various geographic routing protocols like Distance Routing Effect Algorithm for Mobility, Energy Aware Geographic Routing, Location-aided Routing and Greedy Perimeter Stateless Routing, based on the performance metrics like energy consumption, Path Strategy, delivery ratio, Path Selection, lifetime of network, Scalability and end to end delay. The outcomes display that Energy Aware Geographic Routing displays lifetime of network and high delivery ratio as compare to the other geographic protocols.

Keywords: mobile Ad-hoc network, GPSR, DREAM, EGR, LAR geographic routing protocols

1. Introduction
A Mobile Ad-hoc network (MANETs) is consists of stationary nodes or mobile routers that are connected automatically to each other without any stable infrastructure. In MANETs nodes can self-organize dynamically connected arbitrarily for some temporary time that is why all node in MANET is freely to move. MANET include in some zone such as business colleague sharing data, military relaying information, disaster recovery, rescue operations, monitoring animal habitats, earthquake, VANET. In such network might seem to easily flood the whole network and no pre-existing infrastructure for communication. A MANETs routing protocol is required whenever a data packet should be transfer to an end point (destination) from source through the number of hubs. In past several routing protocols for mobile Ad-hoc network have been proposed. In MANET each node is able to forward packets of data to other nodes. A Routing protocols is always needed a path for data packet delivery and carry the data packet to the correct destination [1]. All node in MANET acts as router and each node is responsible for transmitting the data packets [2]. There are main issues in MANET like high mobility, scalability, routing, and dynamic topology. The network system can be broken because of the high mobility. In the MANET topology there is a dynamic change in Topology based routing that can be fail in MANET. In proactive routing path is already known, each node maintains its routing table continuously. The routing table consists of source and destination address. In this routing unused route involves the accessible transfer speed of the network if the topology changes. In reactive routing, the route is only settled when a node needs to send the information, both reactive and proactive routing is less overhead and minimum power consumptions and less transfer speed necessity [3]. To maintain a strategic distance from these issues, Geographic routing is used. This routing methodologies has become one of the most suitable in wireless MANET, mainly when there is a dynamic change in the network topology and when the mobility is high. Geographic routing is utilized to remove the confinements of topology based routing. The geographic routing protocol is also called as position based routing protocol, because the data are sanded to its receiver point regarding its position [4]. The standard approach in geographic routing is greedy forwarding in this paper gives survey of geographic routing protocol and comparison between different geographic routing protocols premise of performance metrics such as network lifetime, Path Strategy, end to end delay, Path Selection, delivery ratio, Scalability and energy consumption.

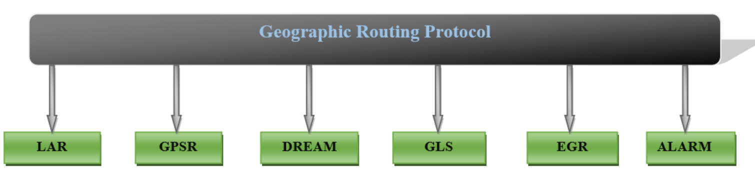

Fig 1: Types of Geographic (position based) Routing Protocol

2. Protocols Studied

This section gives the overview of the working of these routing protocols. The protocols of these categories are as under:

2.1 Distance Routing Effect Algorithm (DREAM)

DREAM is an early case of a routing protocol which is totally location (area)-based. The area service is also part of the similar protocol. With DREAM's location service, each hub proactively refreshes each other hub about its (area) location. The overhead of such (area) location updates is removed in 2 ways. Starting with, distance effect (hubs travel gradually with respect to each new as their space of separation rises). Second, every hub creates updates about its area upon its mobility rate quick moving nodes update more often whereas slow moving nodes create updates less often. (DREAM) geographically sanded information's as a directional flood. In DREAM the source node of an information's with destination (receiving) Node M will sanded the information's to all one-hop neighbors that lie "in the direction of M." In order to measure this direction, anode computes the region that is likely to have M, known as expected region. As depicted in Fig. 2, the expected region is a circle around the position of M as it is known to E. Since this position information may be outdated, the radius r of the expected region is set to (k2-k1) vmax, where k2 is the current time, k1 is the timestamp of the position information E has a bout M, and vmax is the highest speed that a node may travel in the MANET. Given the expected region, the "direction toward M" for the example shown in Fig. 2is defined by the line between E and M and the angle α. The neighboring hops repeat this procedure using their information on M's position. If a hub does not have a one-hop neighbor in the necessary route, a recovery process has to be started. This process is not part of the DREAM specification [9].

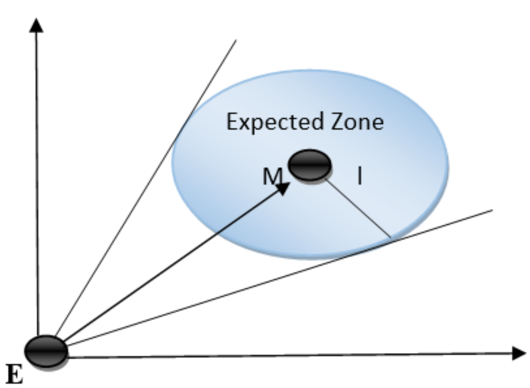

Fig 2: Illustration of progress with DREAM [11]

2.2 Location-aided Routing Protocol (LAR)

This protocol is based on the use of location information about the nodes of mobile by using location services like GPS and many more to remove the flooding route discovery overhead. The two regions are defined i.e. Request zone and Expected zone. In Request zone LAR uses an estimate of destination's location to restrict the flood to a minor region relative to the entire network region. Expected zone is the location in which there is the maximum probability of finding the destination nodes. Since the destination (receiving) node is mobile, we can calculate its probabilistic position by assuming its average velocity multiplied by difference in time interval. LAR calculate that every hub know sits own route, but does not work any special route service to get route of different nodes. Destination location information obtained from a prior path searching issued as an estimate of destination's location for limiting the flooding region in subsequent path searching. LAR have 2 different schemes with different heuristics to select the request zone have been projected [5]. In LAR1, the Source (sending) node sends the packets of data only outside the Expected Zone. Within the limited sector, flooding issued. In LAR2, the sending node always sanded the packets of data within the Expected Zone to all nodes that is nearer to the (receiving) destination than itself [6].

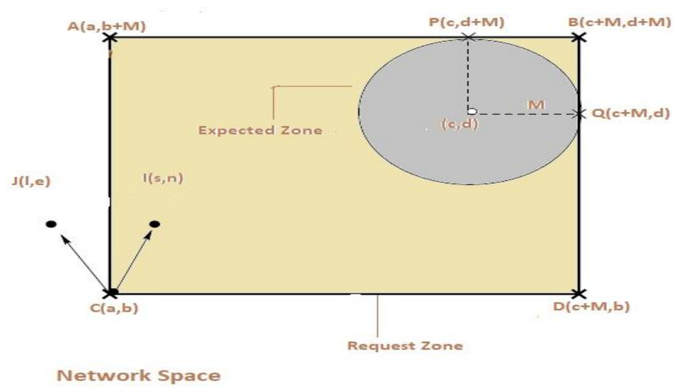

Fig 3: Source node outside the Expected Zone

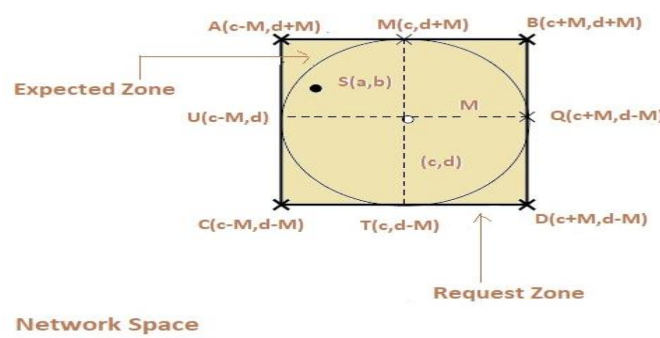

Fig 4: Source node within the Expected Zone

2.3 Adaptive Location-aided Mobile ad hoc Network Routing Protocol (ALARM)

This protocol uses feedback for adaption and route information for progress the performance. It is a hybrid, adaptive to protocol mobility 'which uses LAR and directed flooding. It presents the total number of hubs to be flooded past the mobility hot spot by the flood horizon. It uses the link the duration of the feedback at each node to determine the appropriate forwarding method and it adapts the operation on the current network mobility conditions and it will increases the mobility of the packet overhead [7].

2.4 Greedy Perimeter Stateless Routing Protocol (GPSR)

This protocol utilizes the route of the node to selectively a sent the messages based on the distance. GPSR is a protocol that indicates only the geographic forwarding methodology, not at all like DREAM, and expect the presence of an area service. GPSR's data forwarding algorithm comprises of 2 modules: perimeter routing and greedy forwarding. The hub nearest to the destination by sending is completed on the basis by choosing the greedy approach. This procedure proceed until the destination is reached. This protocol utilizes 2 methods for information sending: greedy forwarding and perimeter forwarding. A node sent the message to its neighbor hubs closed to its region of perimeter. In the path searching the states are gathered and cached in the nodes after the region of perimeter forwarding. For the investigation of mobility, we utilized a random way point model [8].

2.5 Grid or Geographic Location Service Protocol (GLS)

It is based a location service for the geographic locations. We can be simulated with the simple geographic routing and the GPSR. It hold up the network path into a hierarchical forming of the system of squares a quad-tree, where every (p-0) order squares consist four (p-1) order squares. It will make use of the location information and it can be a unique, permanent and random allocated node IPs, the local first order square that each node stores a table of all nodes. It use of the periodic broadcasts as the location which updates increase with the network size [10].

2.6 Energy Aware Geographic Routing (EGR)

In EGR, each hub broadcasts a HELLO message to its neighbor hub regarding its residual energy value, location and identity periodically over a short period, m. In the EGR protocol, only the neighbors have residual energy message about each other. The following defines the structure for EGR protocol. Firstly update the latest location information of D to its location server at t0. At t1 (t1- t0¡<T) a source node Swans to transmit a data packet P to D, and it acquires the location of D from Dislocation server (in simulation, S have the path from its own LET). Then S adds the path of D and itself as well as time difference t1- ¡t0 to P's header as is present inFig.5 (a), we adopt the scheme of Ref [11] for predicting the destination node's expected zone. The center of the zone is the coordinate of D at t0, and the radius of the zone is the upper boundary of the predicted distance of D's movement. The destination of data packet should be an area. However, we attempt to make some optimization. FromFig.5, we see that the restricted region for the relay is in the grey areas of the three models. We employ flooding in the area of the EGR, whose borderline is defined by a circle in Fig.5. Therefore, EGR markedly reduces the cost of flooding, compared with the LAR and DREAM. In the DREAM, if S is quite far away from D, the angle Ө will be too small for S to find the next hop. Consequently, we modify the former tangents to the outer tangent lines between the two circles. One circle is centered on S whose radius is the transmission distance of S. The other is the scope of D's expected zone.

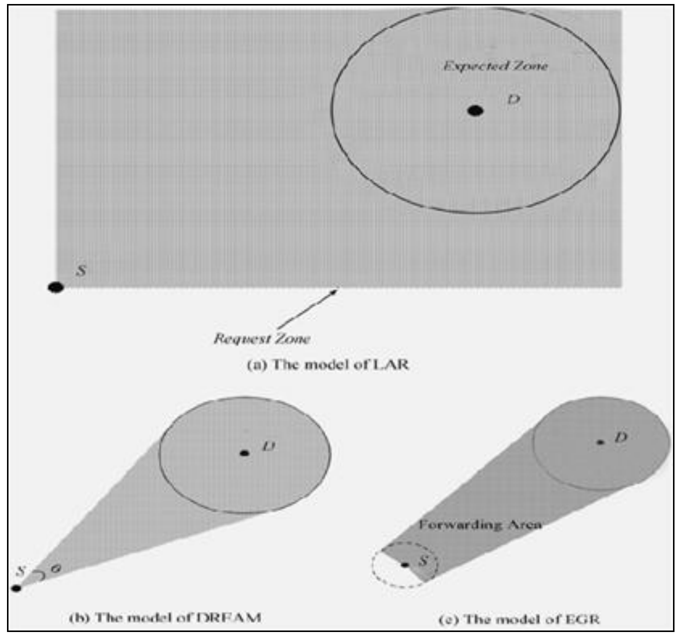

Fig 5: The models of three location-based routing [12].

Performance Metrics

The evaluation of performance of routing protocols can be considered under the below matrices:

Path Strategy

This metric measure what is the route strategy of neighbor node to sending the data packets to the destination node.

Delivery Ratio

Calculate the data packets percentage that is created by nodes that are successfully delivered.

Path Selection

This metric measure how to choose the route to send the data.

End to End Delay

This metric calculate the average time it takes to location a information from the sending node to the receiving node.

Scalability

This is shows Scalability of all geographic routing protocol that can be low, medium or high.

Energy Consumption

The energy metric is taken as the average energy consumption per node calculated through simulation time.

Network Lifetime

First node timing failure because of the exhaustion of battery power charge during the simulation with an individual routing protocol.

Simulation Result

Survey and Compare of different kind of geographic routing protocols on the basis of qualitative parameters when the node density is high [12].

Table 1: geographic routing protocols on the basis of performance parameters

Parameters	End to End Delay	Delivery Ratio	Path Strategy	Network Lifetime	Path Selection	Scalability	Energy Consumption
DREAM	Long delay	Low	Multipath	Short	Hop Count	Medium	High
LAR	Long delay	Low	Multipath	Short	Hop Count	Medium	High
ALARM	Long delay	Low	Multipath	Short	Link duration	High	high
GPSR	Lower delay	High	Single Path	Longest lifetime	Hop Count	Medium	Low
GLS	Lower delay	High	Single Path	Longest lifetime	Hop Count	Medium	Low
EGR	Low delay but little longer than GPSR	Higher than GPSR	Single Path	Longest lifetime than GPSR	Hop Count	High	Average

Conclusion

This paper Survey the various geographic routing protocols such as GPSR, GLS, LAR, ALARM, DREAM and EGR on the basis of performance parameters like end to end delay, path strategy, path selection, delivery ratio, Scalability, energy consumption and network lifetime. Through comparison it concludes that EGR performs better in terms of delivery ratio, lifetime and energy consumption. But GPSR outperforms EGR in terms of energy consumption or end to end delay. The common objective to remove the control packet overhead, minimize the end-to-end delay and maximize throughput. The main factoring differentiating between the routing protocols is the way of finding and maintaining the paths between the source and the destination pairs. We hope that the taken taxonomy of the protocol presented in this paper will be helpful for making the best decision protocol.

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