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A Review on Comparison of the Geographic Routing Protocols in MANET

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Abstract: In Mobile ad-hoc networks (MANET) with high number of nodes and high mobility the routing of packets is a difficult task. In this paper, we are reviewing different geographic routing protocols as geographic routing are efficient for highly mobile nodes and made the communication scalable. Different protocols compared are The Distance Routing Effect Algorithm (DREAM), Location Aided Routing (LAR) Calculation, Greedy Perimeter Stateless Routing(GPSR) as of late new convention comes which is exceedingly proficient is the Adaptive position update (APU) strategy and further the improved APU strategy and on the basis of performance metrics the protocols are compared and reveals that the Improved APU strategy gives the high packet delivery ratio, lower delay and low energy consumption.

Keywords: DREAM, LAR, GPSR, APU, Improved APU

1. INTRODUCTION

MANET is a type of mobile ad hoc network that can change locations and configure itself on the fly. Because Mobile Ad hoc networks are mobile, they use wireless connections to connect to various networks. Some MANETs are restricted to local area of wireless devices, while others may be connected to the Internet. Numerous Directing conventions have been considered for geographic routing in MANET furthermore progressions are done over. Some of these conventions are The Distance Routing Effect Algorithm (DREAM), Location Aided Routing (LAR) Calculation, Greedy Perimeter Stateless Routing (GPSR) as of late new convention comes which is exceedingly proficient is the Adaptive position update (APU) system for geographic steering furthermore improved APU technique which more refines the consequence of APU methodology.

2. THE DISTANCE ROUTING EFFECT ALGORITHM (DREAM)

DREAM is location- based routing protocol, however not an absolutely geological one due to its proactive methodology. DREAM can be delegated as proactive routing strategy by using a new mechanism of dissemination and update of location information also routing tables for every one of the nodes in the network [3]. Every node proactively redesigns every other node about its location with the help of DREAM's location service. The overhead of such location updates is reduced in two ways. To start with, the effect of distance (nodes move slowly with respect to each other as their distance of separation increases). Next, every node generates updates about its location relying on its mobility rate fast moving nodes update more frequently whereas slow moving nodes generate updates less routinely. DREAM geographically forwards data packets in the form of a directional flood. In DREAM the sender S of a packet with destination D will forward the packet to every one of the one-hop neighbors that lie "towards D." In order to determine this direction, anode calculates the region that is liable to contain D, called the *expected region*. As portrayed in Fig.1. The expected region is a circle around the position of D as it is known to S. since this position data may be out of date, the radius *r* of the expected region is set to ($t1$-$t0$) $v$max, where $t1$ is the current time, $t0$ is the timestamp of the position information S has a session D, and $v$max is the maximum speed that a node may travel in the ad hoc network. Given the expected region, the "bearing towards D" for the delineation given in Fig. 1 is defined by the line in the middle of S and D and the angle α. The neighboring hops repeat this strategy utilizing their information on D's position. If a node does not have a one-hop neighbor in the oblidged direction, a recovery procedure must be started. This system is not some piece of the DREAM specific [1].

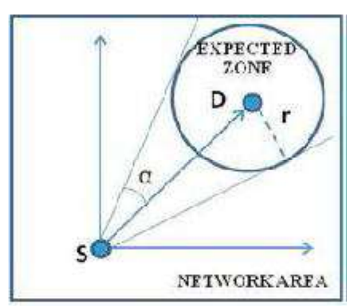

Figure1: Illustration of progress with DREAM [1].

3. LOCATION AIDED ROUTING (LAR) ALGORITHM

It makes presumptions of a 2-D plane, of GPS prepared nodes or the accessibility of another location service, of equal node range, of location error, of no congestion, no transmission error and no delays. Additionally, it is assumed only one sender and one destination. The aim is to reduce the number of nodes to which the route request is propagated. It is a routing protocol with two proposed methods: LAR1 and LAR2, both illustrated in Fig.2 [3].

In LAR1, the sending node advances the message only within the request zone and neighbors outside the region are not tended to. Within the limited sector, flooding is utilized.

In LAR2, the sending node always advances the message to all nodes closer to the destination than itself [1].

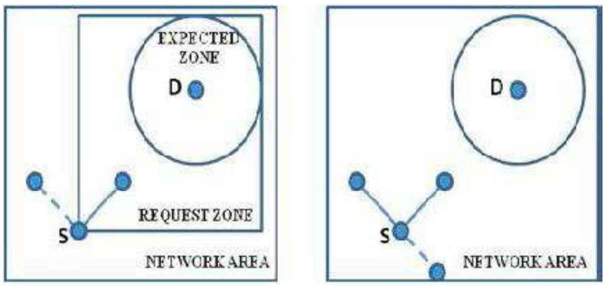

Figure2a.Progress with LAR1 b. Progress with LAR2 (forwarding option further away than source) [1].

4. GREEDY PERIMETER STATELESS ROUTING PROTOCOL (GPSR)

GPSR is a protocol that works in 2-dimensional plane. It is a Routing protocol which gives scalability with increasing nodes in the network. GPSR beacon telecasts MAC address with nodes IP and position [5]. It advances the information assuming the location service and keeps up a neighbor table, periodically updated through beacon messages. It results in a lots of data traffic; source's location is piggybacked on all data packets; it is validated in flat (2-D) topologies; it uses two methods for forwarding data: greedy forwarding and perimeter forwarding (right hand rule) [3].

In greedy forwarding, the forwarding is carried out on a greedy basis by selecting the node closest to the destination. This procedure proceeds until the destination is come to.

In perimeter forwarding, whenever the greedy forwarding method is not applicable or when this method fails, then the algorithm uses perimeter routing strategy to route around the communication voids and achieves the destination. Once the other node comes in transmission range, the algorithm changes back to the Greedy forwarding, reducing the delay and increment in the performance [8].

5. ADAPTIVE POSITION UPDATE (APU) STRATEGY

After GPSR protocol, new method APU strategy comes which incredibly simplifies the data transfer in MANET. There are some assumptions before as: all nodes are aware of their own position and velocity, all links are bidirectional, the beacon updates include the current location and velocity of the nodes, and data packets can piggyback position and velocity upgrades and all one-hop neighbors operate in the promiscuous mode and hence can overhear the data packets [6].APU employs two mutually exclusive beacon triggering rules, which are discussed in the following:

5.1 Mobility Prediction Rule:

This rule adapts the beacon generation rate to the mobility of the nodes. Nodes that are highly mobile need to frequently update their neighbors since their locations are changing dynamically. Despite what might be expected, nodes which move slowly do not need to send frequent updates. In contrast periodic beacon update policy cannot satisfy both these requirement at the same time. In this scheme, upon receiving a beacon update from a node i, each of its neighbor's records node i's current position and velocity and periodically track node i's location using a simple prediction scheme based on linear kinematics (discussed below). Based on this position estimate, the neighbors can check whether node i is still inside of their transmission range and update their neighbor list accordingly. The objective of the MP rule is to send the next beacon update from node i when the error between the anticipated location in the neighbors of i and node i's actual location is greater than an acceptable threshold. We use simple location prediction scheme to estimate a node's current location. Note that, we assume that the nodes are located in a 2D coordinate system with the location indicated by the x and y coordinates. TABLE 1 illustrates the notations used.

Table 1
Notations for Mobility Prediction

Variables	Definition
(X_l^i, Y_l^i)	The coordinate of node i at time T_l (included in the previous beacon)
(V_x^i, V_y^i)	The velocity of node i along the direction of the x and y axes at time T_l (included in the previous beacon)
T_l	The time of the last beacon broadcast.
T_c	The current time
(X_p^i, Y_p^i)	The predicted position of node i at the current time

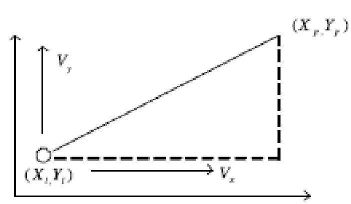

Figure3. An example of mobility prediction

As shown in Fig. 1, the position of node i and its velocity along the x axis and y axis at time T_l, its neighbors can appraise the present position of i, using the following equations:

$$X_p^i = X_l^i + (T_c - T_l) * V_x^i$$

$$Y_p^i = Y_l^i + (T_c - T_l) * V_y^i$$

Note that, in this equation (X^i_l,Y^i_l) and (V^i_x,V^i_y) refers to the location and velocity information that was broadcast in the previous beacon from node i. Node i uses the same prediction criteria to keep record of its predicted location among its neighbors. Let (X_a, Y_a), denote the actual location of node i, acquired via GPS or other localization techniques. Node i then computes the deviation D^i_{devi} as follows:

$$D^i_{devi} = \sqrt{(X^i_a - X^i_p)^2 + (Y^i_a - Y^i_p)^2}$$

If the deviation calculated is greater than a certain threshold, known as the *Acceptable Error Range (AER)*, it acts as a trigger for node i to broadcast its present location and velocity as a new beacon. The MP rule then tries to maximize the effective duration of each beacon, by broadcasting a beacon only when the position information in the previous beacon becomes inaccurate. This extends the effective duration of the beacon for nodes with low mobility, thus reducing the number of beacons. Further, highly mobile nodes can broadcast frequent beacons to guarantee that their neighbors are mindful of the quickly changing topology.

5.2 On Demand Learning (ODL) Rule:

The MP rule solely may not be adequate for keeping up an exact local topology. Hence, it is important to devise a mechanism which will maintain a more exact local topology in those regions of the network where significant data forwarding activities are on-going. This is exactly what the *On-Demand Learning (ODL)* rule aims to accomplish. As the name recommends, a node broadcasts beacons *on-demand*, i.e. with respect to data forwarding activities that occur in the vicinity of that node. As indicated by this rule, whenever a node overhears a data transmission from a *new* neighbor, it broadcasts a beacon as a response. In actuality, a node waits for a small random time interval before responding with the beacon to prevent collisions with other beacons. Review that, it is assumed that the location updates are piggybacked on the data packets and that all nodes operate in the promiscuous mode, which permits them to overhear all data packets transmitted in their vicinity. Likewise, since the data packet contains the location of the final destination, any node that overhears a data packet also checks its current location and figures out if the destination is within its transmission range. Provided that this is true, the destination node is added to the list of neighboring nodes, if it is not already present. Note that, this specific check incurs zero expense, i.e. no beacons need to be transmitted. We allude to the neighbor list developed at a node by virtue of the initialization phase and the MP rule as the *basic* list. This list is mainly updated in response to the mobility of the node and its neighbors. The ODL rule permits active nodes that are included in data forwarding to enhance their local topology beyond this basic set. As it were, a *rich* neighbor list is maintained at the nodes located in the regions of high traffic load. Thus the rich list is maintained only at the active nodes and is built reactively in response to the network traffic. Every inactive node simply maintains the basic neighbor list. By making a rich neighbor list along the forwarding path, ODL guarantees that in situations where the nodes involved in data forwarding are highly mobile, alternate routes can be easily established without causing extra postpones.

Fig. 4(a) delineates the network topology before node A starts sending data to node P. The solid lines in the figure denote that both ends of the link are mindful of one another. The initial possible routing path from A to P is A-B-P. Presently, when source A sends data packets to B, both C and D receive the data packet from A. As A is a new neighbor of C and D, according to the ODL rule, both C and D will send back beacons to A. As a result, the links AC and AD will be discovered. Further, on the basis of location of the destination and their current locations, C and D discover that the destination P is within their one-hop neighborhood. Essentially when B advances the data packet to P, the links BC and BD are discovered. Fig. 4(b) reflects the enhanced topology along the routing path from A to P.

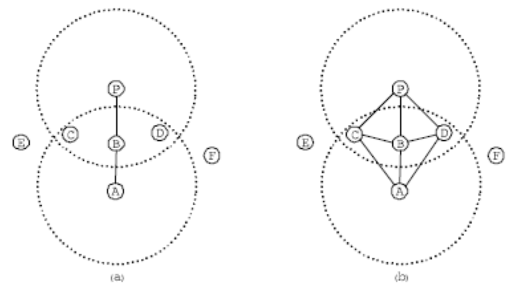

Figure4.An example illustrating the ODL rule [4].

Note that, however E and F receive the beacons from C and D, respectively, neither of them responds back with a beacon. Since E and F do not lie on the forwarding path, it is futile for them to send beacon updates in response to the broadcasts from C and D. Basically, ODL aims at improving the accuracy of topology along the routing path from the source to the destination, for each traffic flow within the network [4].

6. IMPROVED APU STRATEGY

The proposed Improved Adaptive Position Update (IAPU) strategy for geographical routing which progressively adjusts the regularity of position updates based on the mobility dynamics of the nodes and the forwarding patterns in the network. Improved APU is considering two essential standards such as Nodes whose movements are harder to predict update their positions more frequently, and Nodes closer to forwarding paths update their positions more frequently. The following are the systematic process of the Improved APU in which it bit by bit increases the performance of the existing Adaptive Position Update for Geographic routing with low mobility based forwarding node selection. This thusly further overcomes the link failure of the whole network in high mobility routing.

6.1 Beacon Updation

In this process, the nodes position changes either long or short each node should update their position more frequently through beacon packet. Updating each and every either low or high movement updating, it will consume more energy, and received by someone in general or increasing amounts over time.

6.2 Mobility Prediction

Mobility Prediction (MP) employs a basic mobility prediction scheme to estimate when the location information broadcast in the previous beacon becomes incorrect. The next beacon is send out only if the predicted error in the location estimate is greater than a exact threshold, thus alter the update frequency to the dynamism inherent in the node's movement. A periodic beacon update policy cannot fulfill both these requirements at the same time, since a small update interval will be inefficient, whereas a larger update interval will lead to inaccurate position information for the highly mobile nodes. In our procedure, upon receiving a beacon update from a node i, each of its neighbor's records node is current position and velocity and periodically track node is location using a simple prediction scheme based on linear kinematics. Based on this position approximate the neighbors can check whether node i is still within their transmission range and update their neighbor list accordingly. The aim of the MP rule is to send the next beacon upgrade from node i when the error between the predicted location in the neighbors of i and node i's actual location is greater than an acceptable threshold.

6.3 On Demand Learning

Update forwarding path's closest neighbor position for effective routing performance improving the accuracy of the topology along the routing paths between the communicating nodes. ODL utilizes an on-demand learning approach, whereby a node broadcast beacons when it overhears the transmission of a data packet from a new neighbor in its neighborhood. This guarantees that nodes involved in forwarding data packets maintain a more up to date view of the local topology. Referred as On-Demand Learning (ODL), in which it aims at improving the exactness of the topology along the routing paths between the communicating nodes. On the opposing, nodes that are not in the vicinity of the forwarding path are unaffected by this rule and do not broadcast beacons very frequently.

6.4 Improved APU

In Mobile Ad-hoc Networks if forwarding nodes have high mobility, may have lot of chances to make local topology inaccuracy. To upgrade with low mobility based forwarding node selection we improve routing performance more than APU. If we take high mobility routing, link failure will affect the Whole Network. Through this way, we can able to send data without link failure. The Improved APU is that beacons generated in APU are more concentrated along the routing paths, while the beacons in all additional schemes are more scattered in the whole network. As a result, in modified APU, the nodes located in the hotspots are responsible for forwarding most of the data traffic in the network have an up-to-date view of their local topology [2].

7. PERFORMANCE METRICS

Diverse Performance metrics are compared for all the protocols. Some of the metrics are: packet delivery ratio, end to end delay, energy consumption.

7.1 Packet delivery ratio

Measures the percentage of data packets generated by nodes that are successfully delivered.

7.2 End to End Delay

This metric measure the average time it takes to route a data packet from the source node to the destination node.

7.3 Energy Consumption

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

8. SIMULATION RESULT

Comparison of geographic routing protocols in tabular form on the premise of qualitative parameters when the node density is high [7][5] [2]. The comparison depicts that as the protocols are derived for routing performance of routing increased.

Table 2
Comparison of geographic routing protocols

Parameter	Packet delivery ratio	End to end delay	Energy consumption
DREAM	Low	Long delay	High
LAR	Low	Long delay	High
GPSR	High	Lower delay	Low
APU	High	Lower than GPSR	Low
Improved APU	High	Lower delay than APU	Lower than APU

9. CONCLUSION AND FUTURE SCOPE

In this paper, we have clarified different geographic routing protocols and compared the performance of all and presumed that new procedure is superior to the previous one and more work can be done in this respect. In Future, further improvements in the current strategy and new techniques can be proposed and APU strategy can be further improved to give more reliable communication.

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11. REFERENCES

[1] Divya Wadhwa, Deepika, Vimm Kochher, Rajesh Kumar Tyagi (2014), "A Review of Comparison of Geographic Routing Protocols in Mobile Adhoc Network", Advance in Electronic and Electric Engineering, Vol. 4, No.1, pp. 51-58.

[2] Mr.C.Nallusamy, Dr.A.Sabari, Mr.N.Suresh (2014), "Improved Adaptive Position Update for Geographic Routing in Mobile Ad Hoc Networks", International Journal of Engineering Sciences & Research Technology, pp. 46-51.

[3] Ana Maria Popescu, Ion Gabriel Tudorache, Bo Peng, A.H. Kemp(2012),"Surveying Position Based Routing Protocols for Wireless Sensor and Ad-hoc Networks", International Journal of Communication Networks and Information Security *(IJCNIS)*, Vol. 4, No. 1**.**

[4] Quan jun Chen, Salil S. Kanhere, Mahbub Hassan(2013), "Adaptive Position Update for Geographic Routing in Mobile Ad Hoc Networks", IEEE TRANSACTIONS ON MOBILE COMPUTING, Vol. 12.

[5] Ms. Pranoti A. Bedekar, Dr. Y. M. Patil, Dr. A. S. Vaingankar (2014), "Review paper on Adaptive Position Update for efficient routing in mobile ad hoc networks", Journal of Emerging Technologies and Innovative Research, Vol.1 , Issue 6.

[6] Quan Jun Chen, Salil S. Kanhere, Mahbub Hassan, Kun-Chan Lan (2005), "Adaptive Position Update in Geographic Routing, School of Computer Science and Engineering", The University of New South Wales, Sydney, Australia.

[7] Gang Wang, Guodong Wang(2010), "An Energy Aware Geographic Routing Protocol for Mobile Ad Hoc Networks", Int J Software informatics, Vol. 4, No. 2, pp.183-196.

[8] Varun G Menon, Joe Prathap p m(2013), "Performance Analysis of geographic Routing Protocols in highly Mobile ad hoc Network", Journal of Theoretical and Applied Information Technology, Vol. 54, No. 1.

[9] Michele Zorzi, Senior Member, IEEE, and Ramesh R. Rao(2003), "Geographic Random Forwarding (GeRaF) for Ad Hoc and Sensor Networks: Energy and Latency Performance", IEEE TRANSACTIONS ON MOBILE COMPUTING, Vol. 2, No. 4.

[10] Y. Kim, R. Govindan, B. Karp and S. Shenker(2005), "Geographic Routing Made Practical", in Proceedings of the 2nd Conference on Symposium on Networked Systems Design and Implementation, Berkeley, CA, USA, pp. 217-230.

[11] B. Blum, T. He, S. Son, and J. Stankovic(2003), "IGF: A State-free Robust Communication Protocol for Wireless Sensor Networks", Tech. Rep., Department of Computer Science, University of Virginia, USA.

[12] B. Karp and H. T. Kung(2000), "GPSR: Greedy Perimeter Stateless Routing for Wireless Networks", in Proceedings of ACM Mobicom 2000, Boston, MA, USA, pp. 243-254.

[13] Ravi Kumar Poluru, T. Sunil Kumar Reddy, D.Nagaraju, "Updating the Routing Position in Ad hoc Networks by using Adaptive Position", International Journal of Computer Trends and Technology (IJCTT), Vol. 10, No. 3.