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Dynamic Geographical broadcast over Mobile ad Hoc networks

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Abstract

Geographic addressing of packets with in mobile adhoc network which enables this as a hard real time engagement, In emergency places when we seek immediate help from in and around the area where the help is to be seeked. It can also involve hard real time situations in the geographic command and control functions, emergency communications and commercial applications as well. In order to establish reliable communication and also to provide a better scalability among group of nodes, we can use the scalable implementation of geocast by using Geoaddressing ID via the Geocast protocol. The nodes must be located at the forwarding zone where the nodes retransmit the packets based on the local decision rules. The previous Geocast implementations uses the flooding algorithm for sending the data to the Geocast region, which is involves a guaranteed routing delivery, but there is high waste of bandwidth, energy, and also duplicate data will be used due to high load. In order to overcome the deficiency, we propose the Central Distance point with Priority (C-D) P heuristic rule for sending the data to the geocast region. When the nodes are static, the forwarding node is frequently not available and also not reliable. Hence the packet transmissions to the geocast region are highly dynamic, for improvement of reliable communication and to provide the better scalability. And also we compare both static and dynamic packet transmission by using the network simulator.

Index terms – *Geocast, CD-P heuristics, reliability, flooding.*

1. Introduction

Geocast expansion is geographical broadcast for sending the data to the Geocast region using the Geocast routing protocol. Geocast is the network routing protocol for sending the packet to all nodes with in a defined Geocast region. The MANET enables the interesting new applications. These includes the hard and real –time situations simulation in military training and testing system, geographical command and control in the areas lacking of network infrastructure, emergency

Communications for the disaster response and commercial geographic messaging applications such as gaming, advertising and traffic services [2].

MANETs for military training must operate at an unprecedented network scaled up to 10,000 mobile nodes without any installed infrastructure. Disaster situations

may lead to the need for Scalable communications in densely populated areas with Missing or malfunctioning network infrastructure. Commercial applications operated in grouping situations, such as shopping malls, sporting events, school campus, and city streets. This will be results in a geo-addressing applications and stressing the scale limits of traditional MANET technologies. In geographic command and control applications, a mobile node is used to discover and initiate communications with all nods in a defined geographic area at a time, even when the sender has no knowledge of which nodes currently occupy the area. The most scalable, responsive and reliable implementation of geoaddressing in MANETs is via a Geocast protocol, uses a location aware nodes which broadcast and selectively rebroadcast the packets based on local decision rules. Approaches based upon simple flooding [5], [6], where every node must be located within a forwarding zone in order to retransmits packet based on the local decision rule, are well known not to scale beyond a few tens of MANET nodes [4]. By differentiate, Geocast derived from well-designed retransmission heuristics yield a limited and scalable geographic flooding.

Here we worked on three primary novel contributions:

(i) For transmit the data to the geocast region, in the previous approaches we can use the simple flooding algorithm.
(ii) The novel Geocast, based on a new heuristic, the Center Distance with Priority (C-D)P Heuristic when the nodes are static
(iii) A flexible framework for integrating Geocast heuristics, including the (C-D)P when the nodes are highly dynamic

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(iv) With (CD)-P when the modes are static and considering the (C-D) p when the node are highly dynamics and compare the both performance.

The rest of the paper is organized as follows. The works related to the paper are discussed in section II. The detailed view of system model is described in section III. Section IV describes our proposed system and implementation. The experimental results are analyzed in section V.

2. RELATED WORKS

In this section we first examine some of the existing algorithms and then we propose our highly dynamic packet transmission to the geocast region.

In the conventional system [2] packet transmission sender to the geocast region they use the flooding algorithm its efficient algorithm for transmit the packet to the geocast region. But it also while sending the geocast region which is generates the duplicate data so it consumes the more energy. The flooding algorithm are unscalable due to the high load generate.

In the paper [3] they use the geocast routing protocol, which is used in military training places and emergency places where we can seek immediate help where the messages can be passed through packets in the secure way they also use the geocast routing protocol [5] if the nodes are located in the obstacle places the sender doesn't communicate the geocast region where the obstacle places considered as the geocast region in this work significantly improves on reliability of existing scalable geo-casts and yet also the complexity increases.

The geoTORA protocol is used for providing the geocast service to the mobile adhoc networks and presents a novel Geocasting algorithm combining unicasting and flooding. The Flooding also incorporated in GeoTORA, but it is limited to nodes with in a small region. [10] This integration of TORA and flooding can significantly reduce the overhead of geocast delivery and maintaining reasonably high accuracy.

In addition to the above work on unicast routing in adhoc networks, there has been significant work on multicasting as well, and several approaches have been proposed [4, 5, 21]. The schemes for multicasting can be broadly divided into two types: flooding-based schemes and tree based schemes. Both approaches have their advantages and disadvantages.

Flooding-based schemes do not need to maintain as much network state as the tree-based protocols. On the other hand, flooding-based schemes can potentially deliver the multicast packets to a large number of nodes who do not wish to receive them (i.e., nodes which do not belong to the multicast group). Tree-based schemes we will use the terms node and host interchangeably.

This work we can use the path discovery algorithm. Which is the novel aspects the most statistically reliable path towards the geocast region. The novel aspects of our protocol are the attribution of network layer reliability to space, that enables reliability aware geocast and provides the soft delay guarantees. The end-to-end reliability estimates along the path from the source to destination.in this approaches it doesn't have the better scalability performance.

3. PROPOSED SYSTEM

In the mobile ad hoc networks we assume that each mobile node is location aware, meaning it knows its locations at all time, such as via an onboard GPS unit. Geocast is a protocol for sending a packet to all nodes with defined Geocast region. The System model of Geocast consists of Geocast framework, Geographic Routing protocol and (C-D) P heuristics.

3.1Geocast Framework:

In the Geocast framework, the packet p contains the Geocast information such as packet id, source host ID, destination cellular ID, upper cellular ID, type, Geocast region, and message. It contains information needed for transmitting the packet, including an application type, a Geocast ID location of sender in the forwarding zones each and every node has the Geocast id. The Location of sender and the center of the targeted Geocast region, the application type are used as an index to determine the values of Geocast parameters to use with the packet including forwarding zone definitions and parameter values governing the heuristics. The Geocast ID is a unique identifier assigned by the originator of the Geocast and is carried in each transmission associated with that particular Geocast.

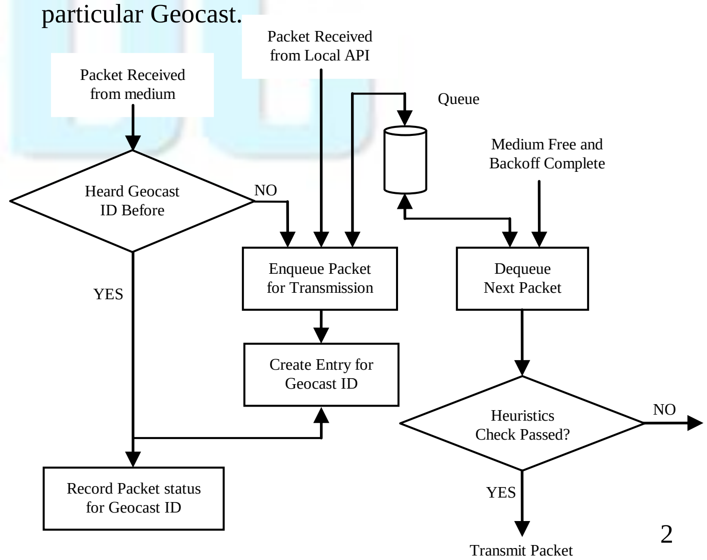

Fig 1 geocast framework

The Classic Geocast framework operating at each node is shown in Fig. 1. When a node receives a packet from the medium, it checks to see if it has heard Geocast packets one previously having the same Geocast ID. If not so, it creates a new record for that ID and Enqueues the packet for later retransmission. However, in other case, it updates its statistics on the packet in the record for the Geocast ID. A packet received from the local application software via the network API is allocated a new Geocast ID and treated accordingly by the framework. If a packet reaches the head of the queue, it is ready to be transmitted. It means any back off interval has expired and the medium is free, we perform heuristics check. If passed heuristics are passed, the packet is transmitted; otherwise the packet will be discarded.

This late cancelation (i.e., checking heuristics after back off and medium free) allows the node to suppress extraneous copies of a packet by reacting to information in the most recent transmissions. This is critical to scalability.

In the scenario the node must be located physically in the forwarding zone defined by packet application type and other header information. There are many ways for defining forwarding zones suitable to different assumptions about environment, emergency scenario and obstacle places, etc. these on what application the particular message type is designed to support, such as long rang weapons simulation versus short-range command and control. And then it must pass at least one of the heuristics predicates.

3.2Geographic Routing Protocol:

The geographic routing protocol is classified in to two categories topology free approaches and topology based approaches.

3.2.1The topology-free approaches*:*

The topology free approaches suffer from three drawbacks in the high-scale scenarios. First, we seek scaling to high geographic density; since topology-packet traffic grows in proportion to density, then overhead can become prohibitive. Second, we perform scaling to medium and high levels of node mobility.

This leads to topology information rapidly becoming stale, will tends to mislead of algorithms relying on it. Finally, the topology based approaches will depend on link symmetry. If a node hears a packet from its neighbor, it assumes that it can be heard by the Neighbor as well. But this assumption is often not satisfied due to differences in equipment characteristics (e.g., antenna), differing battery levels and radio propagation phenomena like multipath effects.

3.2.2The topology –based approaches*:*

The topology based approaches used in Greedy Perimeter Stateless Routing (GPSR), greedy relay selection is done by first computing a planar graph from gathered topology information. If we found there is no relay closer to the destination then forwarding the packet instead to the first node counterclockwise from the sender around the planar-graph face intersecting the destination direction.

While this heuristic can improve Success% over pure greedy approaches, it can also select overly long paths, resulting in high latency or packet drops due to reaching time-to-live limits.

3.3 CD-P heuristic:

The central distance point heuristics was broadly classified in to two types these are MinTrans (M) and threshold (T). The M heuristics, hM, counts the number of transmissions heard for the Geocast ID. hM is TRUE if and only if this count is less than the M parameter. Thus, a node will retransmit the packet if it has not already heard M copies is valuable in adding pure redundancy to the propagation to help combat problems like collisions and as well as to help the propagation get out of local minima, otherwise, be stuck in by hill climbing directly toward the destination.

The T Heuristic, hT is based on the location of each transmission heard. hT(p) is TRUE if the among all transmitters of packets x with gID(x) = gID(p) are at least a distance T away from this node. T is used for spreading the Geocast propagation outward to cover distant areas that may not have been covered.

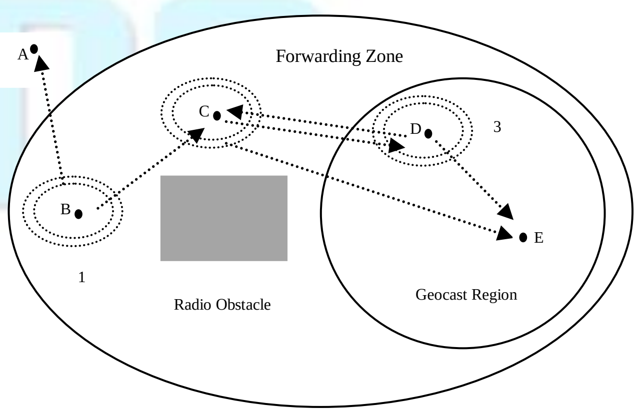

Fig. 2 Geocast Packet Transmission Sequence

The node must be located in the forwarding zone. If the nodes are doesn't located in the forwarding the packet will not re-transmit. From the fig 2 node B is the sender, node "A" located out of the forwarding zone, so the packet will transmit only one time. The sender doesn't re-transmit.

The CD-P heuristic is described in two steps:

Step 1: The Center-Distance (CD) Heuristic:

Each time a node hears a transmission of a Geocast packet p for Geocast ID i, it calculates the distance from the transmitter of p (whose position is in the Geocast header) to the center of the Geocast region CGR (p). If this distance is the least of all such distances for all transmissions it has heard with GeocastID i, only then it is recorded. Denote this recorded minimum value CDist(i). Next, add a new heuristic predicate hCD into the outgoing heuristics check logic. hCD (p) is rue if and only if the node's own distance to CGR(p) is less than CDist(i).

Scalability Problem:

Once the originator transmits, all other nodes in line of sight will judge themselves closer to the CGR than the originator. All the nodes decide to transmit, so there will be many transmissions as simple flooding, which will be impractical for more than a few nodes as the number of transmissions scales up. There is another problem which arises when there is more than one Geocast originated concurrently. Suppose that all nodes originate distinct Geocast to the Geocast region shown. All such Geocast will result in node N transmitting, because it is closest to CGR among all nodes in line of sight of origin. N will have to transmit all Geocast, which results in a long queue wait at N.

Step 2: Adding Priority Queuing:

To eventually solve this scalability problem, the CD-P Heuristic includes an additional condition that each node prioritizes it's transmit queue (of, Fig. 1) by center distance improvement. For each packet in a node's transmitting queue, assign it a priority Prio as follows. First, any non Geocast packet (unicast traffic) and any Geocast packet, that has not been transmitted at all, have Prio=0. The formula for adding the priority queuing is

$$\text{Prio}(p) = \max(0, \text{cDist}(\text{gID}(p)) - d(p))$$

For Geocast packets p, let d (p) be the distance from the node to CGR (p).Thus, the greater the improvement, that is reduction of distance to CGR. Higher the priority, the sooner the packet will be transmitted. Intuitively, the wish is to transmit sooner those packets that can most quickly move toward the centers of their Geocast regions. This is because the greater the progress toward the center, the many other nodes will be suppressed due to being farther from center.

4. PERFORMANCE OF PROPOSED SYSTEM

In this section we explained central distance point heuristic(C-D) P consideration when the nodes are static and also explain about dynamic.

Normally For the packet transmission among the group of nodes to the Geocast region, we can use the simple flooding algorithm. Which is guaranteed routing delivery but high waste of bandwidth, energy, and also duplicate data will be accrue due to high load. In order to overcome the deficiency, we propose the Central Distance point with Priority (C-D) P heuristic rule is used for sending the data to the geocast region., for finding the optimal path and also calculate the central distance between the sender and center of the Geocast region

From the **fig 3,** we assume that the Nodes are located in streets and avenues of Manhattan-style geometry; the dark squares represent buildings that completely block radio signals from penetrating through them.

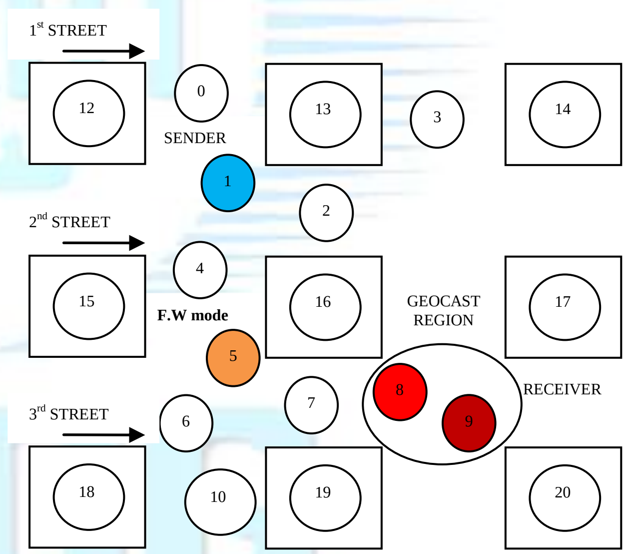

Fig. 3 Geocast Packet Transmission when nodes are static

Thus, connectivity is purely line of sight and also nodes are placed in hidden places such as 8 and9. The nodes are placed with in a transmission range. The each square block, block the radio signal will be assumed to be three streets. For example, node 1 can hear node 10 and vice versa. When we attempt to send a packet from the sender to the geocast region, from fig 3; the node at 8 and 9 is located at geocast region. In order to communicate from the source to destination the radio signal get blocked by the block16 that is located at located to the street 2. A

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typical Static Geocast transmission sequence is shown in **fig.3.**

From the **fig 3**; the heuristics rule defined by the three stages that is, the node it is heard by everyone located on line-of-sight the packet will be transmitted with no C-D. Second stage, Due to the Minimum transmission (hM) heuristic, without priority check transmission 2 is sent from the sender between first and Second Street is shown. Finally, since the node is in the geocast region with priority when the nodes are highly dynamic that is the T Heuristic distance that is considered as the geocast region, threshold heuristics (hT) causes transmission 3. All these three transmissions are heard only by sender nodes located at 1st street Avenue. In spite, the sender nodes of 1 street Avenue did not hear them; the Geocast fails to reach the Geocast region. One can compensate for this within Classic by either Increasing M or decreasing T. But, while increasing success rates these also increase transmissions. The main contribution of this paper is the (C-D) P Heuristics, solves the problem more cost effectively, resulting in a more reliable. In the emergency communication in the tactical operation when the nodes are dynamically varying their position, in that time starts communicate with the receiver in the Geocast region, the sender sends the hello packet to the each and every node in the physically located in the forwarding zone.

For Calculating the central distance

For calculating the central distance point between the sender and center of the Geocast region I can use the formula that is

d=sqrt (((x2-x1) ^2) + ((y2-y1) ^2))

Here d is the distance and x1, x2 and y1, y2 is the node's location the formula represents the node's direction and their direction. By using this formula I can calculate the central distance point and also for set the priority based on the distance calculation by using use the (C-D) P heuristics algorithm.

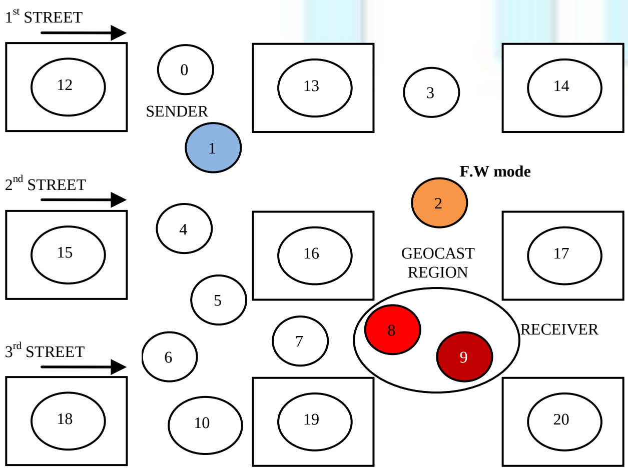

Fig. 4 Geocast Packet Transmission when nodes are highly dynamic

As I assumed the all nodes are location aware from the **fig 4**; initially all the nodes are send and receive the hello packet in order to checks the nodes condition. If the sender 5 wants to communicate with node 10, the node 10 located at the line-of-sight so it will sends directly by using the multi-hop method without helping any forwarding node. But the sender wants to communicate the node 8, the Radio signal get blocked by square block 16, so the node 8 and 9 considered as the geocast region. The sender sends the packet through the obstacle places, the 90% of packet get dropped the geocast region nodes receives only the 10% of packet. In order to advertise their location the geocast node will broadcast the geocast packet to all the nodes. The geocast packet contains the packet id, source host id, destination cellular id, upper cellular id, type, geocast region, and message.so the sender will know the geocast region and it's calculate the central distance from the source to center of the geocast region from the fig 4 node 2(orange) is the forwarding node. When the node are highly dynamic, the sender will select the corresponding forwarding node based on the near to the geocast region.

For the central distance calculation (C-D) P heuristics rules are used. By using this rule calculate the central distance from the source to the center of the geocast region. The very closer to the geocast region the node set the priority is 0 and also calculates the corresponding nodes and it will set the priority.

The sender by using transmits the packet with the lowest priority node that is called as the forwarding node. For setting the priority=0 is considered as the forwarding node. By using this node the sender will sends the packet to the Geocast region. In the infrastructure less network, for transmitting the packet with high reliable is major challenge. In order to overcome this problem central distance point (C-D) P are used. The nodes are dynamically varying in their position. In that situation the sender will change their forwarding node based on the priority check If the nodes are located in the line of sight the packet will transmitted directly, while nodes are dynamically varying in their position the packet get transmitted based on the CD-P calculation.

In that scenario for the routing purpose we used the routing protocol DSDV used for calculating the central distance point when the nodes are dynamically varying using the heuristics algorithm CD-P are used.

5. Experimental Results

In order to evaluate the algorithm, network simulator (NS-2) is used. The network was setup 20 nodes deployed in an area of 250 meter ellipse circle. We granted CBR packet size 512; at every 5 seconds to generate the packet transmission. The simulation carried out for a 50 seconds. After 35 seconds the nodes get dynamically varied. Further the network parameters were varied such increase the area, transmission range and simulation is carried and comparison is made.

5.1 Throughput

For the dynamic network packet transmission Throughput can be calculated and compared with the static network from the figure 5.

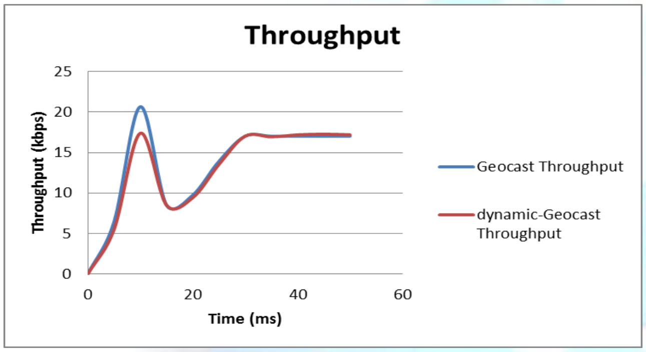

Fig 5.1 throughput

5.2 Energy

From the Fig. 5.2we conclude that the Efficient Geocast consumes more energy than the existing Geocast, and produce better peformance.

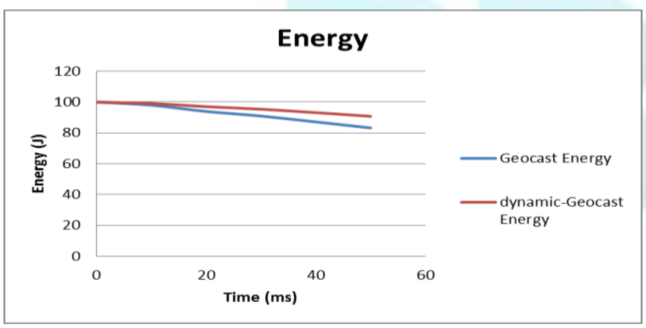

Fig. 5.2 Energy

5.3 Packet Drop Ratio

Packet drop ratio is the failure of one or more transmitted packets to arrive at their Geocast region when compared to the static network shown in graph .

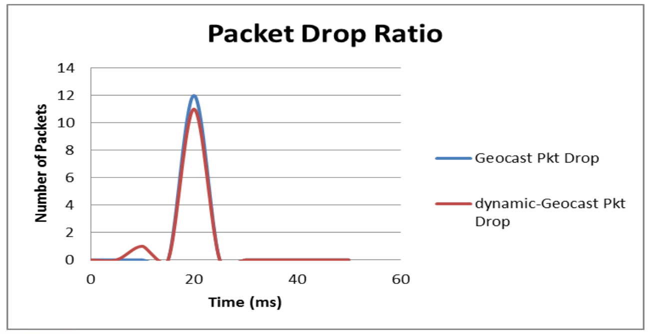

Fig. 5.3 Packet Drop Ratio

5.4Packet Delivery Ratio

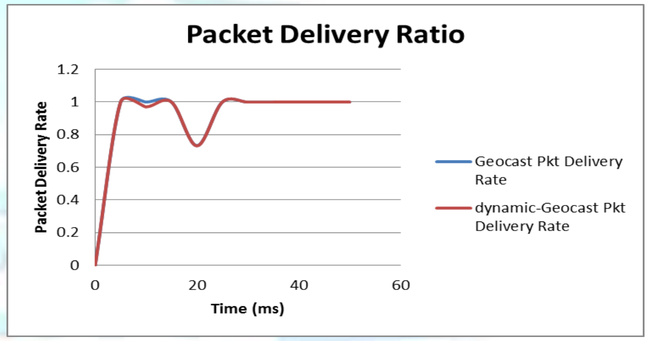

Fig. 5.4 Packet Delivery Ratio

For the dynamic network packet transmission packet delivery ratio can be calculated and compared with the static network from the figure 5.4

6. CONCLUSION AND FUTURE WORK

In this work we propose the packet transmission when the nodes are highly dynamic by using the central distance point heuristics(C-D) P. It is designed to support the Geocast in the high-scale MANET applications and integrated into the classic Geocast framework. It is based upon three key ideas. First, the sender sends the data when the nodes are located at the line-of sight and if it is closer to the center of the Geocast region than all other copies it has heard and transmitted. Second, the sender will sends the data among the group of Geocast region to calculate the (C-D) P when the nodes are static network, and it will sends the data to the Geocast region. Eventually in order to improving the scalability and also reliability, we can use the (C-D)P rules when the nodes are highly dynamic that is the nodes are moving at high speed at the same time it will calculate the central distance between the sender and center of the Geocast region with priority. Based on the lower priority it will send the packet to the Geocast region.

In future, the Geocast is highly scalable.it can handle high traffic between ten thousands of devices, even in urban settings. And also geocast can use fixed communication tiers, like cellular network, for efficient transport of message over long distance.so in this technique will apply in cellular network like infrastructure networks.

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