Adaptive and Secure Strategy for Multicast Addressing in Mobile Ad Hoc Network

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ABSTRACT
Location based Multicast Addressing (LMA) is a technique used to distribute information to the multiple nodes surrounded by a particular geographical area. It mainly applied for context aware applications in mobile ad hoc networks (MANETs). In this Location matching process done between middleware of publish/subscribing environment. In this paper introduce, one new feature is implemented for creating context awareness among mobile network to analyze how many users are currently located in the mobile network, and how many of them discarded from the network because of low energy level. The Bandwidth of each node is calculated to know the energy level status. Some of nodes in mobile network utilize more bandwidth. Allocate bandwidth equally to all nodes to avoid packet dropping and also identify the nodes information using keys provided by AES algorithm it is also helpful to improve security in mobile network.

General Terms: Publish/Subscribe, Middleware

Keywords: LMA, MANETs, Publish/Subscribe, Context-Aware, AES.

1. INTRODUCTION
A mobile ad hoc network (MANET), also call a mobile mesh network, have ability to organize network of mobile devices coupled with wireless links. Every node in a MANET is open to move independently in any direction, and will consequently change its links to other devices frequently. In MANET environments, the multicast problem is complex because topology change of the network is active and quite unstable. [8] Context Aware Group (CGC) communication model is one of application in MANETs is to manage communication on the origin of the uniqueness of the communicating nodes, such as their locality and their profiling information. The model provides message patterns with different semantics to address both point-to-point and point-to-multipoint communication needs. The idea of context awareness captures the reality that nodes normally depend on the geographical and temporal context to facilitate do their tasks.

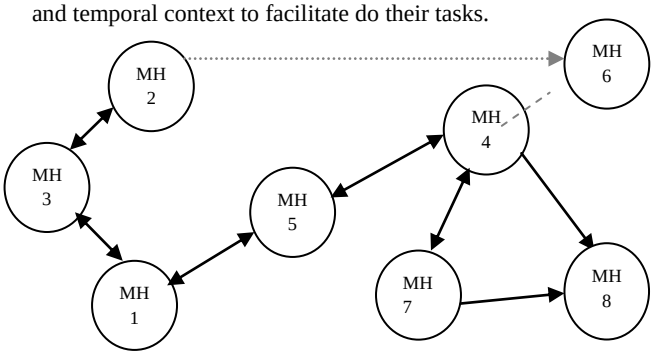


Fig. 1 Model of MANET Structure

In geographic dependency include a notion of location context capture closeness of senders and receivers. Temporal dependency concentrates on life time through messages multicast. The Location Based Multicast Addressing (LMA) is a specific abstraction in context aware group communication. Message-centric strategy employ geographically scoped rumor to spread messages inside a distinct geographical range around the sender (message space). [7] Query centric, strategy perform message matching and restricted to a geographical range around the receiver (query space). Hybrid strategy partition the range of the particular spaces between message distribution and query transmission, by half of the range for each. To facilitate deliver messages to receivers in the message space but exterior of the distribution range, intermediate nodes are responsible of matching and routing. [1] The context aware strategy is used to get information about users currently located in the network location and identify how many users discard from that range. After receiving user updates and then confirm no of users interested to receive message in particular location. So it is easy to reduce interference among network.

2. RELATED WORK
In location-based multicast addressing, the delivery of a message through a receiver is trained by three matches, namely in logical space, physical space, and time. If a host be located in the multicast region at known time, it will routinely become a member of the consequent multicast group at that time.

A location-based multicast group may be used for sending a message that is likely to be of interest to everyone in a specified area. In wired settings the publishers and subscribers are connected by network of brokers which compute and sum up of subscriptions. [13] The publish/subscribe systems in wired settings with mobile wireless clients. Above system still assume a broker sub network located on a static backbone and/or consisting of a predefined set of mobile nodes. [12] Propose a query-centric approach include on the ODMRP [10] multicast algorithm for MANETs. [2] Proposed a strategy in between message and query centricity to deal with the event query problem in sensor networks. In this scheme, messages are disseminate by agents for a certain number of hops. Queries are disseminating in an arbitrary fashion through the network until their time-to-live expires. The authors offer a shortest path context forwarding (SPCF) algorithm, which they contrast to two content-based query-centric schemes. [4] SPCF construct a shortest path tree routed at all publisher and then routes messages along the tree using content and context tables. Location information is used by the broker to discard the number of subscribers to which a message is routed.

3. CONTEXT AWARE STRATEGY

Context-aware systems propose entirely new prospect for user by assembling context data and adjusting systems performance consequently. [6] Especially in arrangement with mobile devices these methods are used to increase necessity extremely. Highly dynamic computing setting like ubiquitous and pervasive computing, involve regular adaptation of applications. [9] This system depends on particular requirements and conditions such as the locality of sensors, the number of probable users (one user or many), the obtainable resources of the used plans or the ability of an additional extension of the system.

3.1 Context Aware Approach

The context aware approach is used to get information about users currently located in the network location and identify users discard from that range. [11] The bandwidth of each node was traced for identifying the energy level of nodes. In the time of multicasting, there is a possibility for packet dropping as the energy level of nodes dismount. After dismounting the user nodes get discarded from the network. The Source node multicasts messages to destinations based on receiver's request (also called queries). Logical space matching in terms of logical space means matching on message content. Physical space matching in terms of physical space depends on location match based on the sender space and the receiver space. Matching in terms of time means matching based on communication determination, which is defined as the duration determined by the application inside which a message is applicable for an interested receiver.

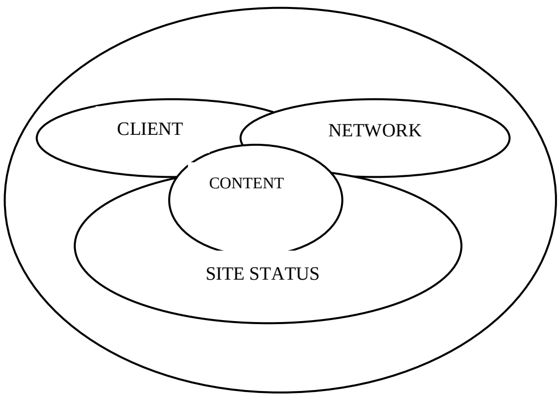


Fig. 2 Context Aware Group Model

3.2 Protocol Implementation

The Ad hoc On Demand Distance Vector (AODV) is a routing protocol deliberated for ad hoc mobile networks. It builds routes between nodes only as preferred by source nodes. [5][14] It preserved these routes as long as they are wanted by the sources. Furthermore, AODV outline trees which attach multicast group members. The trees are collected of the group members and the nodes desired to unite the members. AODV uses series numbers to make sure the originality of routes. It is loop-free, self-starting, and scales to huge numbers of mobile nodes. AODV construct routes by a route request / route reply query progression. Nodes remain method of the RREQ's source IP address and broadcast ID.

3.3 Input Configuration

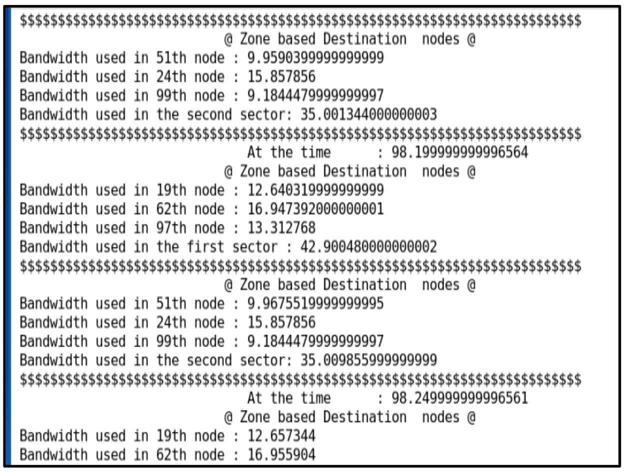
The general parameters are thus defined and set as follows: For this system 1000 meter-wide geographical field is used on which nodes developed. The field is occupied by 100 nodes which contain receivers, senders, and passive nodes that are executing the application. Each node contains Wi-Fi capability with a communication range of 100 meters. In this simulations are ran for duration of 1000 seconds.

4. ADVANCED ENCRYPTION STANDARD (AES)

Advanced Encryption Standard (AES) is one of the famous algorithms which encrypts and decrypts different length of data blocks. The sender and receiver in AES use the same key to encrypt and decrypt data that called symmetric encryption so the key must be kept secured. [16] The Advanced Encryption Standard (AES) is receiving deployed in more and more solutions. The future work attempts to adapt the 256 bit block and key for Mobile Ad-Hoc Network Environment, encoding the text data to reduce input bits keeping the amount of computation less conforming to limitations of power of the devices consumed.

4.1 AES in Context Aware Strategy

In context aware approach bandwidth was not equally shared by each node so there is dismounting occurs in network environment. In the time of communication, some of nodes utilize more energy unnecessarily identify that nodes by using keys and allocate their energy to dismount nodes.[18] Key will assign for each node with source id, destination id at the time of bandwidth tracing so packet dropping also monitored and reduced. [3] AES offers more benefits to network competitions like security, computational efficiency, memory requirements, hardware and software suitability, flexibility. It should be more comfortable to avoid delay and also improve packet delivery ratio and performance comparing other system Create 100 nodes and set the communication range 1000meter in a geographical field. The Source node multicasts messages to destinations based on receiver's request (also called queries). In the time of multicasting, there is a possibility for packet dropping as the energy level (Usual energy level of nodes set =1000 joules) of nodes dismount. After dismounting the user nodes get discarded at 1.0 ms from the network.



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$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
                              @ Zone based Destination  nodes @
Bandwidth used in 51th node : 9.9590399999999999
Bandwidth used in 24th node : 15.857856
Bandwidth used in 99th node : 9.1844479999999997
Bandwidth used in the second sector: 35.001344000000003
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
                                 At the time      : 98.199999999996564
                              @ Zone based Destination  nodes @
Bandwidth used in 19th node : 12.640319999999999
Bandwidth used in 62th node : 16.947392000000001
Bandwidth used in 97th node : 13.312768
Bandwidth used in the first sector : 42.900480000000002
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
                              @ Zone based Destination  nodes @
Bandwidth used in 51th node : 9.9675519999999995
Bandwidth used in 24th node : 15.857856
Bandwidth used in 99th node : 9.1844479999999997
Bandwidth used in the second sector: 35.009855999999999
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
                                 At the time      : 98.249999999996561
                              @ Zone based Destination  nodes @
Bandwidth used in 19th node : 12.657344
Bandwidth used in 62th node : 16.955904
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Fig. 3 Bandwidth Tracing

5. PERFORMANCE EVALUATION

Location based Multicast Addressing model was compared with three different strategies and three strategies were analyzed in order to choose the best one among these strategies for context aware group communication. The performance evaluation metrics, the comparison of the Strategies and results have been described through the NS2 Simulator. NS2 is constantly maintained and updated by its large user base and a small group of developers at ISI. NS2 is a discrete event simulator targeted at networking research. It provides substantial support for simulation of TCP, routing, and multicast protocols over wired and wireless (local and satellite) networks. It includes an optional network animator.

5.1 Simulation Parameters

Below Fig. 3 shows the bandwidth of each node was traced to know about the energy level up to limit or not. If it exceeds user node get discarded from the network. Two metrics, Message load and Delivery ratio, to evaluate the performance of the proposed protocol have been given. Message load is nothing but packet size used for transmission and also capability of a single user node. The Delivery ratio is defined as delivery of message by sender per second. These two metrics have been checked in the mobility and interference situation of a mobile network. This proposed system reduced the impact of mobility and interference. The bandwidth of each node was traced for identifying the energy level of nodes. It calculated using condition.

[expr $bw0/$time*8/10000000]

TABLE 1

Network Parameters	Value
Simulation Time	1000 seconds
No of nodes	100
Bandwidth	3Mbps
Data Packet Size	512 Bytes
Transmission Range	1000m
Node speed	Max speed=12m/s
Location Match Range	600m
Initial Energy of Nodes	1000 Joules
Number of Multicast	600

Below Fig. 4 shows packet dropping occurs due to low energy level of nodes and it get discard from mobile network. At the time of multicasting user nodes discard was identified and also some keys assigned to packets to identify the information loused in each different Zones

If the energy level of nodes get down means new node will be generated. Simulation results indicate that proposed algorithms result in lower message delivery overhead, using AODV protocol to improve the packet delivery ratio compared to existing schemes security mechanism will help this system to choose adaptive and also secure strategy for context aware multicast addressing in mobile ad hoc network.

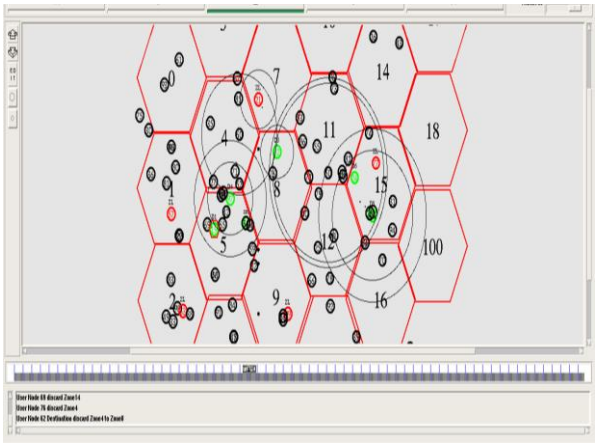
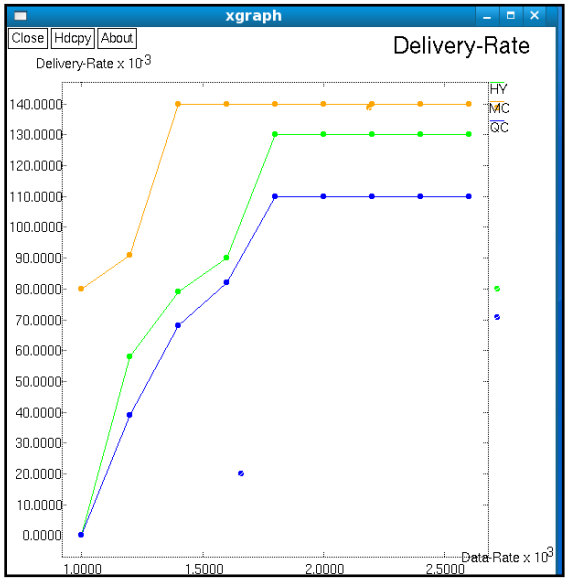


Fig. 4 Context Aware Multicasting



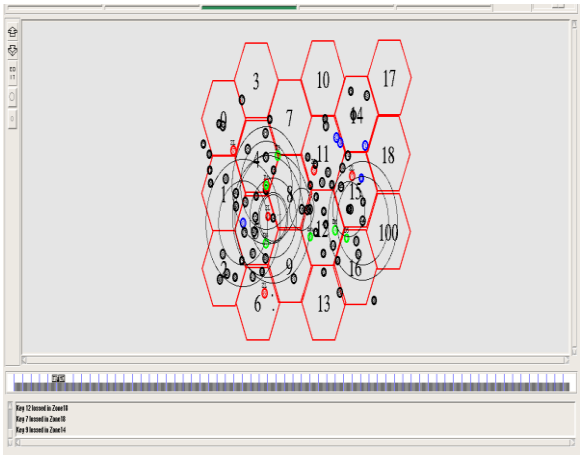


Fig. 5 Delivery Rate

Above Fig. 5 shows Delivery Rate compared with previous strategy and Context aware strategy it was mentioned as hybrid strategy delivery rate was increased.

Fig. 6 Key loss information

Fig. 7 Packet Delivery Ratio

Above Fig. 6 shows Key loss happen at time of Multicasting. One key file was maintained with 15 keys and it allocate for each packet so it is easy to identify information loss in network by using AES.

Above Fig. 7 shows result of packet delivery improved from existing by after applying Aodv protocol and aes. The existing ratio only reaches 0.9 but proposed system with Aodv reach up to 1.14.

6. CONCLUSION

Analyzed and compared the performance of three different implementation strategies for location-based multicast addressing under varying application workloads. The results show break even points that allow selecting the optimal implementation strategy for an expected ratio of query versus messages. Over three times as many queries as messages, the message-centric strategy is the best choice. Conversely, three times as many messages as queries, the query centric strategy are the winning strategy. For scenarios in between, the hybrid strategy is preferable. The context aware approach is used to get information about users currently located in the network location and identify users discard from that range. After receiving user updates and then confirm number of users interested to receive message in particular location. So it is easy to reduce interference among network. It mainly used to reduce impact of mobility and interference in mobile network than existing approaches.

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