Partition based Mobility Management Technique (PMMT) in MANET for better QoS

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ABSTRACT

The mobility in mobile ad hoc networks is an application that uses location information of nodes in a network to identify present location of a node. Since we need to get better QOS, mobility management is considered scalable and dynamic compared to other QoS parameters in mobile ad hoc networks. Mobility management in mobile ad hoc networks are mainly motivated by the adoption of dynamic mobility of nodes due to scalability issues. However, mobility management is difficult when there is highly dynamic and frequent changes in the topology may be hard to predict and nodes are mobile or frequently disconnected to save battery power. Therefore, In this paper, we present a novel mobility management mechanism called PMMT: *Partition based mobility management technique*. In PMMT, the entire network is partitioned into a regions of smaller and smaller regions. For each node, at each level, once node belongs to particular region-level of the hierarchy and is chosen as its location for location information server and and periodically updates them with its location. The main contributions of the paper are: First, we present a node mobility mechanism based on partition. Second, we present a mechanism for location server mobility.

Keywords-**Location Management, MANET, Mobility Management, QOS**

1. INTRODUCTION

Due to the dynamic nature of MANETs[2,3], designing communications and networking protocols for these networks is a challenging process. One of the most important aspects of the communications process is the design of the mobility management mechanism used to identify the exact location of mobile nodes such that nodes may allow the communication of data between mobile nodes.The QoS in MANETs, and have proposed numerous QoS parameters for mobility management. Most of these parameters provide QoS support for the available bandwidth requirement for a given path. This is because bandwidth is the most critical parameter in most MANET applications due to the scarcity of this resource in the wireless environment.

With the increase in quality of service (QoS)[9,10] needs in evolving applications, it is also desirable to support these services in MANETs. QoS is usually defined as the set of service requirements that need to be met by the network while mobility of a mobile node in different network. The mobile ad hoc network is expected to guarantee a set of measurable pre-defined service attributes to the users in terms of end-to-end performance, such as delay, bandwidth, probability of packet loss, delay variance (jitter), etc. Power consumption and service coverage area are two other QoS attributes that are more specific to MANETs.

The management of mobility by introducing the concept of domain, in order to achieve the requirements on performance and flexibility especially for frequently moving mobile node. With this in mind, two kinds of mobility can be defined as follows, according to the movement span. Micro mobility i.e. mobile node’s movements inside a domain, to which intra-domain mobility management solutions are suitable, focusing mainly on a fast, efficient, seamless mobility support within a restricted coverage. Macro mobility i.e. mobile node’s movements between different domains, to which inter-domain mobility management schemes can be employed, acting as a global mobility solution with the advantages of flexibility, robustness, and scalability.

Mobility management plays a significant role in the current and the future wireless mobile adhoc networks in effectively delivering services to the mobile node on the move.mobility management contains two distinct but related components: location management and handoff management[22,25]. The former concerns how to locate a mobile node, track its movement, and update the location information, while the later focuses mostly on the control of the change of a mobile node's access point during active data transmission.

This work both extends and is compared to the Grid Location Service (GLS) [5], the Simple Location Service (SLS) [9], and the Legend Exchange and Augmentation Protocol (LEAP) [7,6]. In all of these location services, each of the mobile nodes maintains a physical location table that contains information about other nodes in the network. In some cases, information in these tables is either not available or has expired and an update mechanism is engaged to obtain the most current information.

This dynamic mobility management includes functions to passively keep track of the location of the user/terminals and to maintain connections to the terminals belonging to the system. To make intelligent mobile-aware applications, it is important that a mobile terminal/system be more intelligent and can anticipate the change of the location of its user.A mobile node can dynamically participate in mobility management. Only mobiles keep a record of their own movement history, by saving their location identity numbers (IDS), dwell time and other related information after they have first registered with their location servers.

To get better QOS, mobility management is considered scalable and dynamic compared to other QoS parameters in mobile ad hoc networks. Mobility management in mobile ad hoc networks are mainly motivated by the adoption of dynamic mobility of nodes due to scalability issues. However, mobility management is difficult when there is highly dynamic and frequent changes in the topology may be hard to predict and nodes are mobile or frequently disconnected to save battery power. Therefore, In this paper, we present a novel mobility management mechanism called PMMT: *Partition based mobility management technique*.

This paper is organized in sections. section – 1 presents the conceptual facts under heads of Introduction. The literature survey details included in section – 2 under heads of backgrounds. Consecutively the proposed architecture and mechanism is mention in section – 3. The conclusion of this paper is in section – 4. Finally, The future scope is mention in section-5.

2. BACKGROUNDS:

Recent research shows that location-based routing[2,3] can significantly reduce communication overhead compared with topology-based methods. Location-based routing protocols are likely to be more scalable, since each node only needs to know the location of the destination and its neighbor's locations to make a forwarding decision. An important issue of geographic ad hoc routing protocols is the existence of scalable location services, which manage the location information of any mobile node at any time throughout the entire network. Examples of location-based routing include DREAM [10], LAR [11], GPSR [4], and DLM [5]. The current position of a specific node can be learned in a deterministic manner with the help of a location service. Each mobile node registers its current location with the service.

When a node does not have the location of its communication partner, it requires such information from location services. In fact, to design a scalable location management[5] scheme is inherently difficult, because it would represent a functional deadlock problem[17]; it is impossible to obtain the position information of a specific node without a position server, on the other hand, without position information, how to reach the position server.

Adaptive Demand-driven Location Service (ADLS) [15] in an effort to scale the class of home region location services to large (metropolitan) area networks. In this algorithm, the overhead involved in creating and maintaining multiple home regions to address geographical (or logical) separation is off-set by allowing home regions to be created on-demand in order to service local requests for a particular node or set of nodes.

Prediction Location Service (PLS).The objective is to use predictive methods to improve the location accuracy of other mobile nodes in the network. This work both extends and is compared to the Grid Location Service (GLS) [21], the Simple Location Service (SLS) [19], and the Legend Exchange and Augmentation Protocol (LEAP) [20]. In all of these location services, each of the mobile nodes maintains a physical location table that contains information about other nodes in the network. In some cases, information in these tables is either not available or has expired and an update mechanism is engaged to obtain the most current information. In other cases, information is available and has not expired, yet it may be "stale" (in that it may not perfectly locate the requested node). In PLS, predictive methods are used to augment valid location information to produce a better estimate of a nodes actual location. Like SLS, PLS incorporates a mechanism.

The Kalman-filter Based Location Prediction [23]Kalman filter and extended Kalman filter are well-known tools used to estimate asystem's past, present or future state by using a time sequence of measurements of the system state and a statistical model that characterizes the system and measurement errors, along with initial conditions [27], [2]. In cellular networks, Kalman filter and extended Kalman filter have been widely used for user locating and tracking [10], [30], [23]. In PLM,[27] with node *B's* historical location information stored in node A's LT, node A is able to predict node *B's* current location information by implementing Kalman filter or extended Kalman filter.

3. PROPOSED ARCHITECTURE AND MECHANISM:

The detailed architecture and mechanism is discussed in section- 3.1 and section- 3.2.

3.1 Architecture for Partition based Mobility Management Technique (PMMT) in MANET:

The proposed architecture is illustrated in Fig-1 for Partition based Mobility Management Technique in MANET based on different module such as network partitioning, addressing of nodes, location management scheme, location server selection, location information update, location information query and mobility of location server.

The network partitioning module is meant for the entire network, the specific location of a node can be identified by pointing out which region it resides. In order to address nodes with this approach, we first need to label the regions according to their orders and locations. If an n-order region is partitioned into a*b k-order regions(n < k), then the Relative Address of the k-order region with respect to this n-order region is a string(i,j) .

This location management service that provides the location of any host at any time throughout the network. Under this location management scheme , a specific node in the network could query the location of another node with no prior knowledge beyond destination's ID. This scheme is decentralized and runs on the mobile nodes themselves, requiring no fixed infrastructure and underlying routing support other than geographical forwarding.

The basic ideas of this location management scheme are the following

- Node A maintains its current location at a small subset of the network's nodes, which are referred to as A's location server.
- The location of location servers of A are determined by A's ID so that any other node B could know where to query A's location only with the knowledge of A's ID.
- Host addresses of different accuracy levels are maintained at different location servers of the same node, depending on the location of the location server so that only a small number of location servers need to be updated when the node moves.

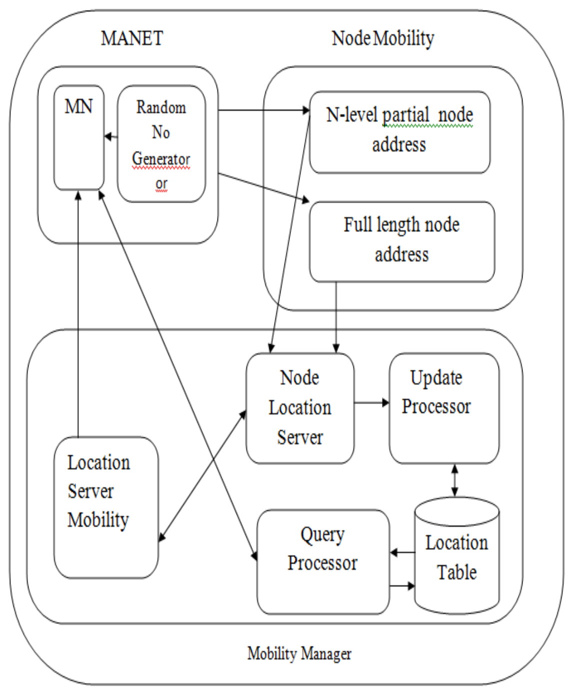

Figure -1: Architecture for Partition based Mobility Management Technique (PMMT) in MANET

3.2 Mechanism for Partition based Mobility Management Technique (PMMT) in MANET:

The proposed mechanism for Partition based Mobility Management Technique is divided into three phases:

Phase –I: Node Mobility

Step-1

Assign Node ID for each node of MANET

```
 No of Nodes = n;
    for(i=0; i<n; i++)
        {
        NodeID[i] = RandomNoGenerator( );
        }
```

/*Random No Generator generate different random Node ID for each mobile node in MANET*/

Step- 2 Network Partitioning

- Partitioning scheme. the deployment region, which is also referred to as the 0 - order region, is partitioned into 2*3 square regions.
- Each of them is an 1-order region.1-order regions are further partitioned into 2*2
  2-order regions.
- while these 2-order regions are partitioned into 2*2 3-order regions.

Step-3 Addressing of Nodes

CASE – I: An n-level Partial Node Address of a node is defined as a string that is identical to the region address of the order region in which it resides.

Region Address of an n-order region is a string defined as the following:

RegionAddress( )

```
        {
        If( n = =0)
        {
        Region Address is an empty string ∈;
        }
        If(n ==1)
        {
        Region Address is  string t0
        /*Relative address of 1-order region
        w.r.t 0-order   region*/
        }
        If( n >1)
          {
        Region addaress is a string t0.t1…….tn-1.tn ;
          }
```

/* where region address of (n-1) order region where it resides , and tn is relative address of n-order region w.r.t (n-1) order region */

CASE – II: Full Length Node Address of a node is a string identical to the region address of the minimum partition in which it resides.

With such a partitioning scheme for the entire network,

- The specific location of a node can be identified by pointing out which region it resides.
- In order to address nodes with this approach, we first need to label the regions according to their orders and locations.

- If an n-order region is partitioned into a*b k-order regions(n < k), then the Relative Address of the k-order region with respect to this n-order region is a string(i,j)

  /* n, k represents specific order level of a region i.e an n –order region usually n<k.

  where i ∈ {0,1,2…..,a-1}, j ∈ {0.1.2……,b-1}, (i , j)represents the relative position of this k-order region in the n -order region with the upper left corner as the origin point i identifies the row; j identifies the column. */

Phase- 2: Location Management Scheme

Step –1 Location Server Selection

/*Here id(A) is the identifier of node A and m is density of location server there is one location server in each of the m-order regions*/

SelectionLocationServer(a, b, m, id(A))

```
{
For each m-order region R
{
        i=[id(A)%(a×b)]/a;
/*Hash Function  is used to resolve relative address(i, j) from id(A) */
        j=[id(A)%(a×b)]%a;
/*a,b represent n-order region is partitioned into
        a × b k-order regions*/
        /*consider the minimum partition P
        whose relative address is (i , j) w. r .t
        R*/

while (P is marked as void)
/*void indicates that there is no node within this region*/
{
If there is at least one node in P
   {
P is selected as a partition for the location server;
              break;
```

```
        }
else
 {
        Mark region P as there is no node
within this region;
if(j>o)
        i=i;
        j=j-1;
else
if(i>0 && j=0)
{
        i=i-1;
        j=b-1;
else
if(i=0 && j=0)
{
        i= a-1;
        j=b-1;
    }

        }}
        }}
```

Step-2 Location Information Update for Node movement

Each of mobile nodes needs to update its location servers with its new location when its moves around and keep the information at each location server up to date.

- The location information required by any geographical ad-hoc routing protocol is completely represented without loss of information by the use of full length node addresses. The node only needs to update its location servers when its full length node address is changed i.e. when it moves away from its current minimum partition.
- In order to explain how location information is updated, we first need to understand how location information is represented at each of the servers. Two alternative policies are discussed as follows
- **Full Length Address Policy**

Under this policy, the mobile node updates all its location servers with its full length node address when it moves away from its current minimum partition.

- **Partial Address Policy**

Under this policy, the mobile node only updates a subset of its location servers with its partial node address, whenever it moves away from its residing minimum partition.

We need to address three key issues with respect to location update:

Step-3 Location Information Query

- When a source node needs to find the location of a destination node, it queries the destination node's server region using a query packet.
- The query phase is terminated by the response phase, in which the first node to receive the query will respond with the latest known location of the destination node. Data is then routed to the destination node by the source node using this location and a geometric routing protocol.
- **Query under the full length address policy**

Under this policy, the source node will first locate destination's location server (L) in its own m-order region using the location selection algorithm. Location sever will then reply source node with destination's full length address, source node will use this address to contact destination node, if it succeeds, destination will reply to source node with its location information.

- **Query under the partial address policy**

Under this policy source node will first locate destination's location server in its own m-order region using location selection algorithm, location server will then reply source node with destination's compressed partial address with their levels.

Phase-III Mobility of Location Servers

The mobility of Location server of source node in an m-order region R, It moves away from its original minimum partition, where the location server should reside. In this case, location server is no longer eligible to be source node's location server.

There are two solutions for this problem.

- Location server is responsible to find a new location server for source node in R-region according to given location selection algorithm and move the location information of source node to the new server. This approach is necessary when the location information carries is updated infrequently.
- Location server just discards the location information of source node, when it moves away from R-region .Each time when source node updates its location, it may check whether the original location server is still in region R. If it is, source node update this server with its new location. Otherwise source node will choose a new server using location selection algorithm.

4. CONCLUSION

This paper present a novel mobility management mechanism called PMMT: *Partition based mobility management technique*. In PMMT, the entire network is partitioned into a regions of smaller and smaller regions. For each node, at each level, once node belongs to particular region-level of the hierarchy and is chosen as its location for location information server and and periodically updates them with its location. The main contributions of the paper are: First, we present a node mobility mechanism based on partition. Second, we present a mechanism for location server mobility.

5. FUTURE SCOPE

The proposed novel mobility management mechanism called PMMT: *Partition based mobility management technique* will provide efficient and effective mobility to nodes in MANET but as number of mobile nodes over network is scale up and scale down beyond certain limit them performance might be affected. The heterogeneity and portability feature changes then it's performance may affect the processing of location information server.

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