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Analysis of Location Management Schemes in Mobile Ad Hoc Network

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Abstract: ***Mobile Adhoc networks use two approaches: topology-based and position-based routing. Topology based routing protocols can be further divided proactive, reactive, and hybrid approaches. CQRS (Circular Quadrant Routing Scheme) is a location management scheme, in which the whole area network is assumed as a circular in nature. Each node is capable of determining its own position using digital compass, which provides the angle of motion of the mobile device hosting it. Thus mobile nodes are capable of knowing the distance traveled by them. Each mobile node is equipped with radios having their transmission range as Rt. Circular area having radius R. This scheme divides the entire area into four equal quadrants. Each quadrant has been assigned a unique number from 1 to 4. In this paper, a position based routing scheme "Quadrant Routing Scheme (QRS)" have been discussed. We believe that network quality parameters are directly related to the real world for commercial purpose. With the implementation of the CQRS, we have determined some parameters related to particular node such as x-coordinate, y-coordinate, distance and angle.***

Keywords: CQRS. QRS, Adhoc networks, location management, topology, routing.

I. INTRODUCTION

Ad hoc networks can be subdivided into two classes: static and mobile. In static ad hoc networks the position of a node may not change once it has become part of the network. Typical examples are rooftop networks [1]. In mobile ad hoc networks, systems may move arbitrarily. Since mobile ad hoc networks change their topology frequently and without prior notice, routing in such networks is a challenging task. We distinguish two different approaches: topology-based and position-based routing. Topology-based routing protocols use the information about the links that exist in the network to perform packet forwarding. They can be further divided into proactive, reactive, and hybrid approaches. Proactive algorithms employ classical routing strategies such as distance-vector routing (e.g., DSDV [2]) or link-state routing (e.g., OLSR [3] and TBRPF [4]). They maintain routing information about the available paths in the network even if these paths are not currently used.

The main drawback of these approaches is that the maintenance of unused paths may occupy a significant part of the available bandwidth if the topology of the network changes frequently [5].In response to this observation, reactive routing protocols were developed (e.g., DSR [6], TORA [7], and AODV [8]). Reactive routing protocols maintain only the routes that are currently in use, thereby reducing the burden on the network when only a small subset of all available routes is in use at any time. However, they still have some inherent limitations First since routes are only maintained while in use, it is typically required to perform a route discovery before packets can be exchanged between communication peers. This leads to a delay for the first packet to be transmitted. Second, even though route maintenance for reactive algorithms is restricted to the routes currently in use, it may still generate a significant amount of network traffic when the topology of the network changes frequently. Finally, packets en route to the destination are likely to be lost if the route to the destination changes. Hybrid ad hoc routing protocols such as ZRP [9] combine local proactive routing and global reactive routing in order to achieve a higher level of efficiency and scalability. However, even a combination of both strategies still needs to maintain at least those network paths that are currently in use, limiting the amount of topological changes that can be tolerated within a given amount of time. A survey and comparison of topology- based approaches can be found in [10, 11].

Position-based routing algorithms eliminate some of the limitations of topology-based routing by using additional information. They require that information about the physical position of the participating nodes be available. Commonly, each node determines its own position through the use of GPS or some other type of positioning service [12, 13], a survey of these methods can be found in [14]. A location service is used by the sender of a packet to determine the position of the destination and to include it in the packet's destination address. The routing decision at each node is then based on the destination's position contained in the packet and the position of the forwarding node's neighbors. Position-based routing thus does not require the establishment or maintenance of routes. The nodes have neither to store routing tables nor to transmit messages to keep routing tables up to date. As a further advantage, position-based routing supports the delivery of packets to all nodes in a given geographic region in a natural way. This type of service is called geocasting [15].

II. EXISTING SYSTEM

CQRS (Circular Quadrant Routing Scheme) is a location management scheme, in which the whole area network is assumed as a circular in nature. Each node is capable of determining its own position using digital compass, which provides the angle of motion of the mobile device hosting it. Thus mobile nodes are capable of knowing the distance traveled by them. Each mobile node is equipped with radios having their transmission range as Rt. Circular area having radius R. This scheme divides the entire area into four equal quadrants. Each quadrant has been assigned a unique number from 1 to 4 as shown in figure 1.

At the startup, each node is aware of the network being partitioned into 4 equal Quadrants. Each Quadrant contains a small circular area acting as a home region (Ri, $1 \leq i \leq 4$) whose center is the intersection of lines emerging from the centers of two radius lines creating that Quadrant. In this scheme, due to the circular nature of the network architecture, we keep track of the location information using (r, θ) coordinate system. The advantage of this scheme is that, when a node moves in the same direction, only one parameter changes, i.e., r. There is no need to change θ. Thus instead of processing two parameters we need to process only one parameter. In mobile adhoc networks, where there is a scarcity of resources, such reduction is very significant. This protocol uses some-for-all location service, i.e. some nodes (nodes in home regions) are acting as location servers for all the nodes in the network. Instead of storing the exact location at every home region, it uses two level location information strategies. CQRP defines "home region near a node" as the home region which is in the quadrant in which the node is currently present and the location servers in that home region will be storing the complete location information about that node. The remaining three home regions are acting as "far by home regions" and the location servers in these home regions will be storing the relative location information about that node. Complete location information consists of node ID, Quadrant number, and exact location. Relative location information consists of only node ID and Quadrant number. Using this approach, as a node moves within the same Quadrant, only closer servers need to be updated frequently, whereas remote servers (nodes in far by home region) require only infrequent updates, i.e. they need to be updated only when a node changes its Quadrant.

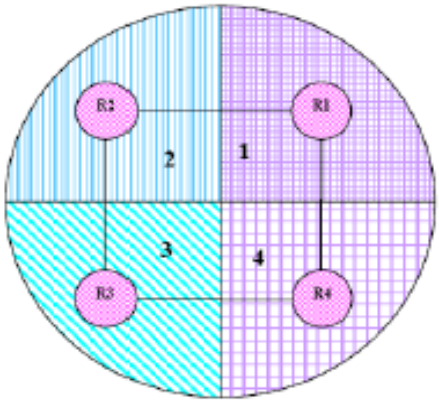

Figure 1: Existing Circular Quadrant Architecture

A. CQRS applied to Intra quadrant Location update:

Whenever node 'U' moves from one location to other location within the same quadrant. In this situation, after movement node 'U' informs to location server region. Location server region updates the existing location information related to node U as shown fig.

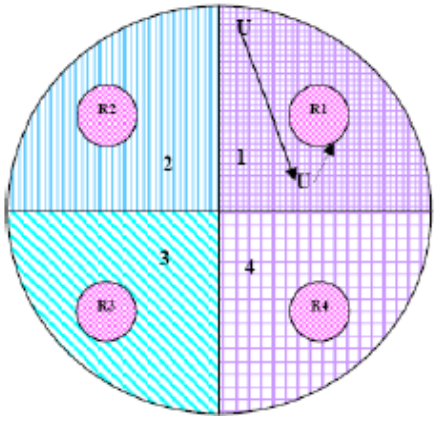

Figure 2: Intra quadrant Location update

B. CQRS applied to Inter quadrant Location update:

Whenever node 'U' moves from one location to other location between the quadrants (i.e. different quadrant). In this situation, after movement node 'U' informs to location server which exist in other quadrant. Location server updates the existing location information related to node U as shown in fig.

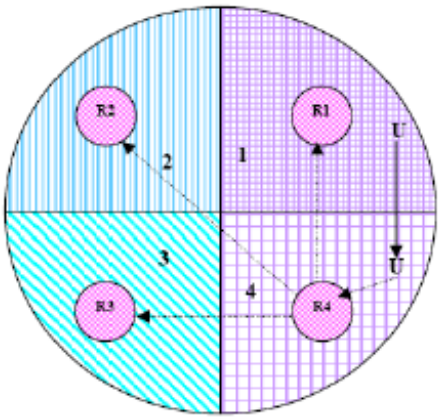

Figure 3: Inter quadrant Location update

III. PROBLEM WITH EXISTING SYSTEM

There are many location management schemes have been proposed in mobile ad hoc network, which also have been discussed in literature survey. I am solving some problems of existing location management scheme. In existing scheme, there are four location server regions. Each server region has nodes act as a location servers. Existing system maintains four server regions. The management of four regions is difficult and complicated and in existing system uses few parameters of nodes (radius and angle) for location management. In my proposed solution, I am using a proxy node rather than four location servers. I am using and also calculating parameters like **quadrant no., value of x-coordinate, value of y-coordinate, distance and angle**. I am also including simulation results for distance and angle.

A position based routing scheme "Quadrant Routing Scheme (QRS)" is used for location update. In this scheme it has been assumed that whole network area as a circular. In this scheme a proxy node is used, which is the reference point for the determination of complete location information of each nodes in the network. This complete location information will be changed due to mobility of mobile nodes. The mobile nodes will be changed their location with respect to simulation. The circular area is divided into four quadrants. Each mobile node in four quadrants uses proxy node for location update. Updated location information will be stored into the log files. This scheme uses "**one for all location service**", i.e. one proxy node act as a reference point is used for all location update in each quadrant.

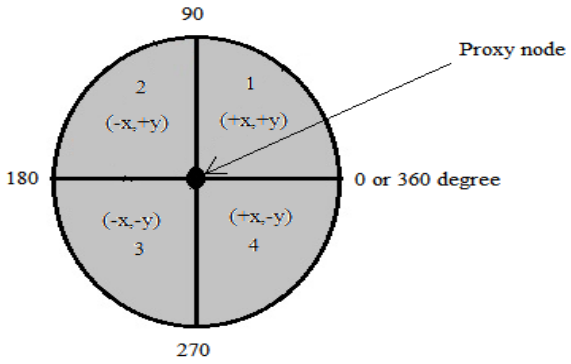

Figure 4 : Proposed Design Architecture for location management

Complete location information of a node will be determined with the reference of proxy node. Complete location information consists of quadrant number, x-coordinate, y-coordinate, distance and angle from location server node.

CONSTRAINTS AND ASSUMPTION

- Proxy Node is placed at the central position of whole network area.
- Inbuilt AODV protocol is used for communication.
- For TCP and UDP transformation we make TCP and UDP connection between some of the mobile nodes.

IV. CONCLUSION

Proposed system has focused finely on the network performance in terms of throughput and fairness. This system involves the implementation of a new location management scheme. We believe that network quality parameters are directly related to the real world for commercial purpose. With the implementation of the CQRS, we have determined some parameters related to particular node such as x-coordinate, y-coordinate, distance and angle. As an additional work, with the help of simulator it has been shown practically that the proposed scheme is fine for location management and also we have analyzed TCP and UDP packets transformation. An algorithm is also designed for location management. With the help of algorithm, it is easy to design proposed system.

In project efforts has been made to overcome the difficulties of existing system and to design software that tries to achieve all the goals and objectives sets in the project. Inferences are as follows:

1. We have analyzed the working of NS2 simulator with the help of the user and the developer manual provided with it. This analysis also consists of practically implementing the topologies by reading the instructions on the user manual.
2. We have analyzed the code of proposed Location management scheme used in the NS2 simulator. The code consists of implementation of the new location management scheme for mobile ad hoc network,
3. The analysis of the proposed location management scheme is performed by considering the existing schemes for location management and searching the reasons for their improvement. The analysis consists of the comparative study of the existing location management schemes.
4. The appropriate code of the proposed location management scheme is developed in tcl script and awk script.
5. The results generated in the form of graph.
6. The graph generated from proposed location management scheme is much better to understand in terms of throughput and fairness.

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