Reducing Query Delay In Mobile Ad Hoc Network Using Data Replication

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Abstract- *Mobile ad hoc networks (MANETs), is a self-configuring network of mobile routers connected by wireless links with no access point. Every mobile device in a network is autonomous. The mobile devices are free to move haphazardly and organize themselves arbitrarily; due to this MANETs link/node failures are common, which leads to frequent network partitions. Due to this network partition, mobile nodes in one partition are not able to access data hosted by nodes in other partitions, and hence significantly degrade the performance of data access. So, to deal with this problem, we apply data replication techniques. Most of the mobiles have limited amount of storage and bandwidth. So, it is impossible for them to hold all the data needed for replica.*

Keywords- MANETs, Data Replication, Reliable Grouping Scheme., Reliable Neighbor Scheme.

I. INTRODUCTION

In one-to-one optimization scheme each node will replicate the data of the most neighbor data item. In RN scheme each node will replicate the data item of one neighbor to other. In RG scheme node will replicate the data item in large group so that each and every node can use the shared data. In MANET's, two or more mobile nodes can form a temporary network without need of any existing network infrastructure or centralized administration [1]. In mobile computing environments, by utilizing wireless networks, users equipped with portable computers, called mobile hosts, can change their locations while retaining network connections. As one of the research fields in mobile computing environments, there has been an increasing interest in ad hoc networks which are constructed by only mobile hosts [16]. Recent advancements in wireless communication and the miniaturization of computers have led to a new concept called the mobile ad hoc network (MANET), where two or more mobile nodes can form a temporary network without need of any existing network infrastructure or centralized administration [1]. In these cellular networks, communications between two mobile nodes completely rely on the wired backbone and the fixed base stations. In a MANET, no such infrastructure exists and the network topology may dynamically change in an unpredictable manner since nodes are free to move. Opposed to the infrastructure wireless networks where each user directly communicates with an access point or base station, a mobile ad hoc network, or MANET is a kind of wireless ad hoc network [2]. It is a self-configuring network of mobile routers connected by wireless links with no access point. Every mobile device in a network is autonomous. The mobile devices are free to move haphazardly and organize themselves arbitrarily. In other words, ad hoc network does not rely on any fixed infrastructure (i.e. the mobile ad hoc network is infrastructure less wireless network). The Communication in MANET takes place by using multi-hop paths. Nodes in the MANET share the wireless medium and the topology of the network changes erratically and dynamically. In MANET, breaking of communication link is very frequent, as nodes are free to move to anywhere. As the nodes move, the resulting change in network topology must be made known to the other nodes so that outdated topology information can be updated or removed.

In ad hoc networks, it is a very important issue to prevent deterioration of data accessibility at the point of network division. A possible solution is by replicating data items at mobile hosts which are not the owners of the original data. User has great flexibility to design such a network at cheapest cost and minimum time. A mobile ad-hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. MANETS can be used for facilitating the collection of sensor data for data mining for a variety of applications such as air pollution monitoring and different types of architectures can be used for such applications. More specifically, as mobile nodes move freely in Manets, disconnections often occur, and this causes data in two separated networks to become inaccessible to each other. To deal with this problem, we apply data replication techniques. Existing data replication solutions in either wired or wireless networks aim at either reducing the query delay or improving the data availability, but not both. As both metrics are important for mobile nodes, we propose schemes to

balance the tradeoffs between data availability and query delay under different system settings and requirements.

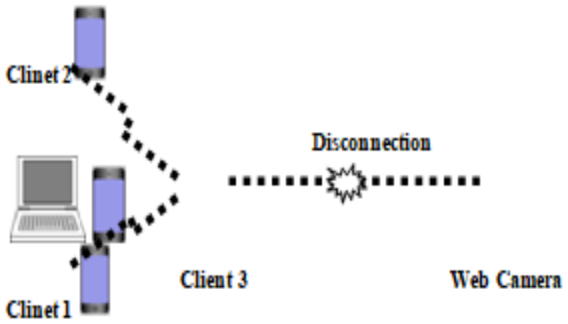
The rest of paper is organized as follows: Section II gives an explanation on data availability or Replication in MANETs. Section III presents the problem definition. Section IV discusses the methodologies used in this paper. Our conclusion is based on data replication and problem defined in this paper in section V.

II. DATA REPLICATION

Data replication is used to avoid data losses in case of unpredictable disconnections of mobile nodes by increasing system wide data availability. Data replication increases the efficiency by decreasing the number of hops that a data item is transmitted from source to destination. A MANET data replication scheme is shown in figure 1and it deals with the following limitations: The data replication scheme should be able to working the absence of a global node positioning. This is because the use of such systems increases the power consumption of the mobile hosts in the network. The absence of motion parameters of mobile hosts like speed and direction should not cause the data replication scheme to fail. It is not realistic to assume that information about the movement of users is always known ahead of time, especially in MANET applications like rescue operations. Mobile hosts in typical MANET applications belong in groups based on the functions they perform in the applications. Since all mobile hosts in a group perform the same set of operations, they access the same set of data items. Members of every group are spread across the network, and perform their functions in their locations. This will reduce the execution time of transactions, and hence, will result in an increased percentage of successful transactions [17].

Data replica means sharing information so as to ensure consistency between redundant resources. Data replication has been widely used to improve data availability in distributed systems, and we will apply this technique to MANETs. By replicating data at mobile nodes which are not the owners of the original data, data availability can be improved because there are multiple replicas in the network and the probability of finding one copy of the data is higher. By replicating data into a number of nodes in different squads, a data request can be served by the closest node that has the data replica [3]. Then, even if there is a network partition between the requesting node and the original data source, the data request can still be served as long as it can reach a node with a data replica. Moreover, data access delay is reduced since the data request can be served with fewer hops. Data replication increases data availability and reduces data access delay at the cost of data storage. It is important for nodes to cooperate with each other to decide which node should hold which data replica. To increase data availability, a node may not hold the data which has already been replicated by neighbors so that its local storage can be used to hold additional data. However, this may increase the hop count for some data and increase data access delay. The problem becomes more complex when mobility is considered, since mobility can change the location of the data replica, and then affect data availability and data access delay.

Network link failure in a MANET.



In above diagram there are four nodes in network. Web camera which continuously records video clips of its surroundings. Two clients' periodically access these video clips by using relay. However, when a disconnection occurs between client3 and web camera due to a link failure, becomes un-accessible to the other three nodes. To improve data availability, a copy of data can be replicated at *client3* before the disconnection. Then both clients can access data even if they are not able to connect with web camera. Further, by replicating a copy of all client can access within one hop, reducing the query delay.

III. PROBLEM DEFINITION

3.1 Existing System:

Wireless networks aim at either reducing the query delay or improving the data availability, several research issues in data replication in MANET and attempted to classify existing data replication techniques. proposed data replication schemes for ad hoc networks. These schemes are based on the intuition that replicating the same data near neighboring nodes should be avoided in order to improve data availability. However, this intuition may not be valid when the link failure probability is taken into consideration. Also, it only considers the availability, without considering the query delay. We will address these issues in this paper to provide better data replication. Some other researchers address data access issues

in Manets considering network partitions. Huang and Chen [10] addressed the problem of replica allocation in a MANET by exploring group mobility. proposed schemes to deal with network partitions due to node movement by replicating services in the network. Their schemes can provide guaranteed service with minimum number of replicated services. Hara proposed several metrics to evaluate the impact of mobility on data availability. Some of previous papers have discussed replica allocation in ad hoc networks to improve data accessibility. Firstly, they have proposed three replication methods in an environment where each data item is not updated. Then, they extended these three methods by considering a-periodic data updates since, in a real environment, updates do occur a-periodically. The simulation results showed that the three extended methods work well in an environment where each data items randomly updated and mobile users behave based on their schedules. Due to this there is a trade-off relationship between the improvement of data accessibility and the reduction of traffic. The simulation results also showed that the three extended methods give poor performance when some data items have very low write frequencies and not high access frequencies. However, many mobile nodes only have limited storage space, bandwidth and power, and hence itis impossible for one node to collect and hold all the data considering these constraints.

Drawback of existing system:

There is no effective cooperation between the neighboring nodes hence its performance may be limited.

3.2 Proposed System:

Data replication mobile ad hoc network techniques to address query delay. Here we solve the problem by replicating data items on mobile hosts. Data replication has been extensively studied in the web environment [13] and distributed database systems. However, most of them either do not consider the storage constraint or ignore the link failure issue. Before addressing these issues by proposing new data replication schemes, we first introduce our system model. In a MANET, mobile nodes collaboratively share data. Multiple nodes exist in the network and they send query requests to other nodes for some specified data items. Each node creates replicas of the data items and maintains the replicas in its memory (or disk) space. During data replication, there is no central server that determines the allocation of replicas, and mobile nodes determine the data allocation in a distributed manner. On an Ad hoc mobile network, the frequent partition of the network and the lack of fixed infrastructures complicate the data access and the sharing task.

Advantages of proposed system:

Data replication is suitable to improve the response time, the global traffic, and the sharing of data since even in the case of disconnection of a server. The nodes can continue to have access to replicas of data. Most of the replication schemes have link failure issue

Related Work:

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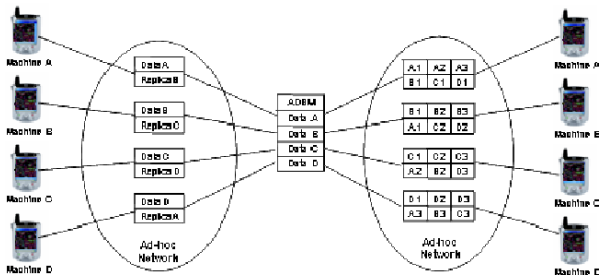

Fig. 3. Data Replication Ad hoc network (MANET)

Data replication has been extensively studied in the Web environment, where the goal is to place some replicas of the web servers among a number of possible locations so that the query delay is minimized. In the Web environment, links and nodes are stable. Thus, the performance is mainly measured by the query delay. Moreover, these schemes replicate at the whole database level; that is, the whole databases replicated as a unit to one or more locations. It is more complex when replication is done at the data item level, i.e., how to replicate data items to various nodes with limited memory space. Data replication has been studied in distributed database systems. In such systems, nodes that host the database are more reliable and less likely to fail/disconnect compared to those in Manets. Therefore, a small number of replicas can be used to provide high availability. However, in Manets, node/link failure occurs frequently, and data availability becomes an important issue. In Second technique one-to-one optimization access frequency from a neighboring

node to improve data availability. It considers the data size. If other criteria are the same, the data item with smaller size is given higher priority for replicating because this can improve the performance while reducing memory space. It gives high priority to local data access, and hence the interested data should be replicated locally to improve data availability and reduce query delay. It considers the impact of data availability from the neighboring node and link quality. Thus, if the links between two neighboring nodes are stable, they can have more cooperation's in data replication. Considers neighboring nodes when making data replication choices. However, it still considers its own access frequency as the most important factor because the access frequency from a neighboring node is reduced by a factor of the link failure probability. To further increase the degree of cooperation, we propose the Reliable Neighbor (RN) scheme which contributes more memory to replicate data for neighboring nodes. In this scheme, part of the node's memory is used to hold data for its *Reliable Neighbors*. If links are not stable, data on neighboring nodes have low availability and may incur high query delay. Thus, cooperation in this case cannot improve data availability and nodes should be more "selfish" in order to achieve better performance.

IV. CONCLUSION

As Mobile ad hoc networks (MANETs), is a self-configuring network of mobile routers connected by wireless links with no access point. Every mobile device in a network is autonomous. The mobile devices are free to move haphazardly and organize themselves arbitrarily; due to this MANETs link/node failures are common, which leads to frequent network partitions. As a result, data saved at other nodes may not be accessible. One way to improve data availability is through data replication. Most of the mobiles have limited amount of storage and bandwidth. So it is impossible for them to hold all the data needed for replica. In this paper, we proposed several data replication schemes to replicate the most frequently accessed data locally and only rely on neighbor's memory when the communication link to them is reliable. Here by using three different techniques we are balancing the trade-off between data availability and query delay in MANET's.

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