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An Overview of One To One Optimization (OTOO)

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ABSTRACT
A Mobile Ad Hoc Network, also called MANET, is a collection of mobile interconnected nodes. In a MANET, the network topology can change unpredictably during data transmissions. Due to this the network partitions occurs. When a network partition occurs, 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. To deal with this problem, we apply data replication techniques. Existing data replication techniques in wired or wireless networks aim at either reducing the query delay or improving the data availability, but not both. Since both metrics are important for reliable data transmission we are applying One to One Optimization (OTOO) data replication scheme to overcome this problem.
Keywords:- MANET's, Query Delay, Data Availability.

I. INTRODUCTION

A. *Overview*

A Mobile Ad hoc Network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Ad hoc is Latin and means "for this purpose". 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. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet.[2]

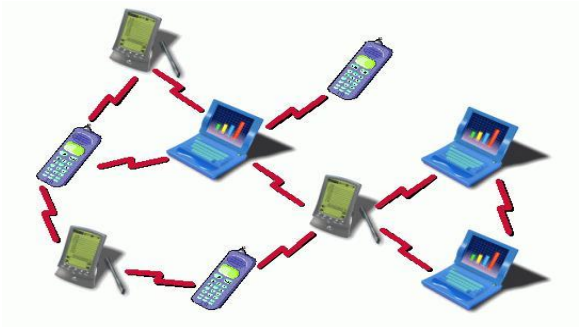

Fig 1: Mobile Ad-Hoc Network [5]

In mobile ad hoc networks (MANETs), since mobile nodes move freely, network partition may occur, where nodes in one partition cannot access data held by nodes in other partitions. Thus, data availability (i.e., the number of successful data accesses over the total number of data accesses) in MANETs is lower than that in the conventional wired networks. 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. Also, data replication can reduce the query delay since mobile nodes can obtain the data from some nearby replicas. However, most mobile nodes only have limited storage space, bandwidth and power, and hence it is impossible for one node to collect and hold all the data considering these constraints. By taking these issues into consideration, we expect that mobile nodes should not be able (or willing) to replicate all data items in the network. One solution to improve the data access performance considering the resource constraints of mobile nodes is to let them cooperate with each other; i.e., contribute part of their storage space to hold data of others. When a node only replicates part of the data, there will be a tradeoff between query delay and data availability. For example, replicating most data locally can reduce the query delay, but it reduces the data availability since many nodes may end up replicating the same data locally, while other data items are not replicated by anyone. To increase the data availability, nodes should not replicate the same data that neighboring nodes already have. However, this solution may increase the query delay since some nodes may not be able to replicate the most frequently accessed data, and have to access it from neighbors. Although the delay of accessing the data from neighbors is shorter than that from the data owner, it is much longer than accessing it locally.[1]

B. ***Issues of Mobile Ad hoc Networks (MANETS)***

1. Transmission errors: The unreliability of the wireless medium and the unpredictability of the environment may lead to transmitted packets being garbled and thus received in error.
2. Node failures: Nodes may fail at any time due to different types of hazardous conditions in the environment. They may also drop out of the network either voluntarily or when their energy supply is depleted.
3. Link failures: Node failures as well as changing environmental conditions (e.g., increased levels of EMI) may cause links between nodes to break. Mobility/context aware applications
4. Route breakages: When the network topology changes due to node/link failures and/or node/link additions to the network, routes become out-of date and thus incorrect. Depending upon the network transport protocol, packets forwarded through stale routes may either eventually be dropped or be delayed; packets may take a circuitous route before eventually arriving at the destination node.
5. Congested nodes or links: Due to the topology of the network and the nature of the routing protocol, certain nodes or links may become over utilized, i.e., congested. This will lead to either larger delays or packet loss.[3]

B. MANETs characteristics

1. Distributed operation: There is no background network for the central control of the network operations, the control of the network is distributed among the nodes. The nodes involved in a MANET should cooperate with each other and communicate among themselves and each node acts as a relay as needed, to implement specific functions such as routing and security.
2. Multi hop routing: When a node tries to send information to other nodes which is out of its communication range, the packet should be forwarded via one or more intermediate nodes.
3. Autonomous terminal: In MANET, each mobile node is an independent node, which could function as both a host and a router.
4. Dynamic topology: Nodes are free to move arbitrarily with different speeds; thus, the network topology may change randomly and at unpredictable time. The nodes in the MANET dynamically establish routing among themselves as they travel around, establishing their own network.
5. Light-weight terminals: In maximum cases, the nodes at MANET are mobile with less CPU capability, low power storage and small memory size.
6. Shared Physical Medium: The wireless communication medium is accessible to any entity with the appropriate equipment and adequate resources. Accordingly, access to the channel cannot be restricted. [4]

II. EXISTING SYSTEM

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. However most mobile nodes only have limited storage space, bandwidth and power, and hence it is impossible for one node to collect and hold all the data.one of the data replication technique used in the existing system is Greedy Data Replication Scheme.

One naive greedy data replication scheme is to allocate the most frequently accessed data items until the memory is full. However, this naive scheme, referred to as Greedy, does not consider the data size difference between different data items. The data size are considered in this scheme. Smaller data require less memory space, and hence replicating them can save some memory space for other data items. The major drawback of the greedy scheme is that it does not consider the cooperation between the neighbouring nodes and hence its performance may be limited. [1]

III. PROPOSED SYSTEM

A new data replication technique to address query delay and data availability issues is proposed. As both metrics are important for mobile nodes, proposed technique balances the trade-offs between data availability and query delay under different system settings and requirements. The implemented OTOO scheme, can achieve a balance between these two metrics and provides efficient system performance.

A. ***Steps involved in OTOO***

1) It considers the access frequency from a neighbouring node to improve data availability.
2) 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.

3) 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.
4) It considers the impact of data availability from the neighbouring node and link quality. Thus, if the links between two neighbouring nodes are stable, they can have more cooperation's in data replication.[1]

IV. ONE TO ONE OPTIMIZATION (OTOO) SCHEME

As we have discussed above this scheme is used to replicate data in Manet's. Consider some set of nodes in Manet's; each node will be having a cache memory to store data locally and the data being saved on cache will be recognized through two properties. First is the Access Count (AC), which gives the number of time the data being accessed. Second one is the Access Time (AT), which gives the latest time data being accessed.

Another aspect we are going to consider is cache size. Whenever a data is being served from server it is cached in node memory using one to one optimization scheme. The procedure involved is as follows:

- Initially all caches are empty
- If Cooperative Node Cache is empty select that node for sharing of data .here cooperative node is the neighbour node with least distance.
- Divide data (served from server) into 2 parts.
- Client will cache one part of data.
- Other part is cached in the cooperative node.
- Every time when file is accessed, the Access Time and Access Count will be updated
- If Cache Memory exceeds the limit (depend on user) the file with least Access Count will be deleted.
- If many files have same Access Count, check for the Access Time and delete the file which is accessed earlier
- The node which deletes the part of cached file will ask its cooperative node to delete the other part of the same file. Make the remaining cache memory available for data storage
- In case if Cooperative Node is not available for sharing data. The client tries to cache the entire data.

In this way data will be cached and maintained. Hence we are increasing Data Availability by sharing data with neighbour node and at the same time we are reducing query delay by making data availability in cache. In case if a network partition occur then we will be having a part of data in one of cache, so that by the time we access this data we can request another part from server.

V. CONCLUSION

In MANETs, due to link failure, network partitions are common. As a result, data saved at other nodes may not be accessible. One way to improve data availability is through data replication. A data replication scheme to improve the data availability and reduce the query delay has being implemented. The basic idea is to replicate the most frequently accessed data locally and only rely on neighbour's memory when the communication link to them is reliable. Extensive performance evaluations can demonstrate that the proposed schemes outperform the existing solutions in terms of data availability and query delay.

VI. FUTURE WORK

In future work can done towards improving cooperation between nodes and increasing cache size without effecting the network and also on the parameters which improve the overall system performance. Group Optimization can be used in future instead of One To One to Optimization. In Group Optimization instead of sharing data with one neighbour, sharing of data takes place with group of neighbour nodes.

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