Data Consistency for Cooperative Caching in Mobile Environments

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Abstract: ***In mobile ad hoc networks (MANETs) have autonomous nodes that can change location itself on the fly. Nodes move spontaneously and node failures are common, which pointers to common network partitions. When a network is partitioned one part of mobile nodes can't access data hosted by nodes in another part of partition, so the performance of data access is reduced. To manage this kind of problem, we propose data replication technique. Existing data replication technique can deal with any one of following: reducing the query delay, improving the data accessibility and data collision. We propose a mechanism called data replication technique to deal smooth trade-offs between data availability, data collision and query delay. Simulation result shows that proposed replication technique can achieve both query delay and data accessibility with higher performance.***

Keywords: Data replication, data availability, mobile ad hoc network (MANET), Query delay.

1. Introduction

In mobile ad hoc networks (MANETs) is a kind of ad hoc network that can change its positions autonomously on-the-fly. Because MANETS are mobile nodes, they could use wireless networks to connect to various kind of networks topology. In MANET nodes are move spontaneously and dynamically. When a network is partitioned one part of mobile nodes can't access data hosted by nodes in another part of partition. Compared to wired network the data availability is lower in wireless network. This is referred as number of success full accessed data into overall data accessed. Data replication is widely used technique to make availability of data's in wireless distributed system.

Data replication is a technique that can be used to duplicate data into more number of remote locations. So replicating data at mobile nodes which are not the holders of the unique data and the data availability can be increased, because there are multiple data replicas in the remote network. Data replication can decrease the query delay because mobile nodes can find the data from some nearest replicas. However, MANET is a kind of ad hoc network so the mobile nodes are having limited transmission range, limited memory space, and bandwidth. Hence it is incredible for one node to gather and grip all the data considering these constraints.

When a node only repeats a portion of the data, there will be a smooth trade-off between query delay and data availability. Replicating information from a fundamental making environment to a glass subset used for logical or query processes. Hence replication of data reduce the total number of query delay, nonetheless it decreases the data availability since many nodes might close up duplicating the same data locally, whereas other data items are not replicated by someone. To raise the data availability, mobile nodes should not duplicate the same data that nearest nodes previously have. However, this result might raise the query delay since certain nodes can't be duplicate the most frequently retrieved data. Although the delay of retrieving the data from neighbors is lower than the data holder, it is much longer than retrieving it locally.

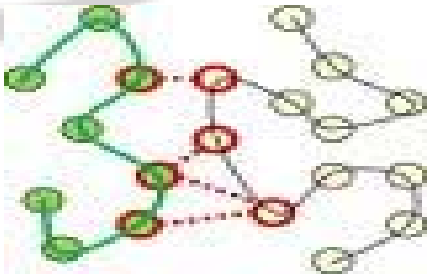

Figure 1 : Data Replication Technique

Figure 1 shows the data replication that uses local server and remote server, where replication is copy of data from local server to remote server.

In this paper, we propose distributed data replication techniques to find query delay, data availability and data collision problems. We propose distributed data replication techniques to balance the smooth tradeoffs between data availability and query delay. Simulation results show that the proposed method can achieve a balance among these metrics. The rest of the paper is organized as follows: The section 2, preliminaries of data replication. In Section 3, we describe the proposed data replication schemes in detail. Section 4 evaluates the Performance analyzes and simulation result and Section 5, we concludes the paper.

2. Preliminaries

Greedy method use minor data item which needs less memory size; by replicating them we can save memory size for other data items. This method uses the following function $AFi\ (k) = (aik/sk)$. Every node assign the data item in increasing order of *AFi,* no other data can be replicated by memory. In this method data are replicated more frequently that are accessed locally. It did not consider the collaboration between other neighboring nodes.

One-To-One Optimization (OTOO) method uses every mobile node which only collaborates with neighbor node to choose what data to be hosted. Every node *Ni* computes the Combined Access Frequency value of *Ni* and *Nj* to data item *Dk* at *Ni*, denoted as *CAF*1*ij* (*k*). *CAF*1*ij* (*k*) = (*aik* + *ajk* × (1 − *fij*)) / *si,* it assigns the data item in increasing order of *CAF1* no other data item can be replicated. This method progress the data accessibility, it might occur that node *Ni* should crowd *Dj* the node that crowd *Dj* is not available to *Ni* because of network separation.

Reliable (R) method used for mobile node, if the accessing links between nodes are equal more collaboration with the node can progress the data accessibility. In others, every mobile node supply the division of its memory to grasp data items for other dependable nodes, i.e. the link failure possibility is less than given threshold value.

3. Proposed Work

In wireless ad hoc both proactive and reactive routing networks will support multimedia application. The essential for mobility prediction is of excessive consequence. Node mobility partitions the network. In generally, mobile networks having limited transmission range. If a mobile node move out of range, it can't be provide any services afterward. If the node flexibility is calculated into higher order value, then data can be replicated in a suitable or proper node to improve data accessibility. If the nodes are connected symmetrically, but the network is not partitioned, then every mobile node often sends sync message to their neighbor and the distance is valued. Boundary value defines which is greater than the least transmission range and less than the extreme transmission range between two nodes U and V. if node V move away from the transmission region R, then it can't able to communicate with one another.

The second major issue is power consumption. Mobile nodes require more power to access data items to other nodes. The node must know about their context information. I.e. source, neighboring node and destination require sending and receiving the data. In the future every node must contain information about its neighboring node, data item, location and distance etc. This information must provide effective way to increases data availability.

Algorithm - DDR (Distributed Data Replication)
Begin
Initialize web hosting server
If *a node* ***U*** *is not symmetric*
Then
Remove the data item from the queue
Return
End if
If *(Reliability ratio< Boundary Value)*
Pointing the node to replicate the data item
Search: *Nodes higher order value*
Then
Replicate the data
End if
Else
Node ***V*** *is out of boundary*
Then
Discard
End if
End

4. Performance Analysis and Simulation Result

The major contribution of this paper is to reduce the total number of query delay and increase the data availability. Our proposed work, Distributed Data Replication (DDR) method achieve both delay and data availability. To compute this result we uniformly distribute nodes in a square size 1000 x 500 meter square. Figure 2 shows the performance evaluation for data query and figure 3 shows the analysis for data availability.

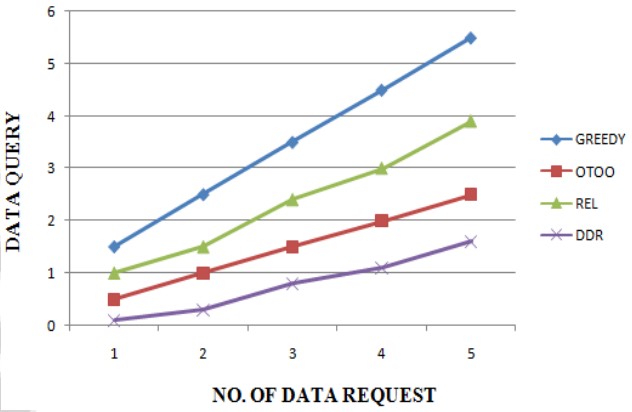

Figure 2: Data Query Vs No. of Data Request

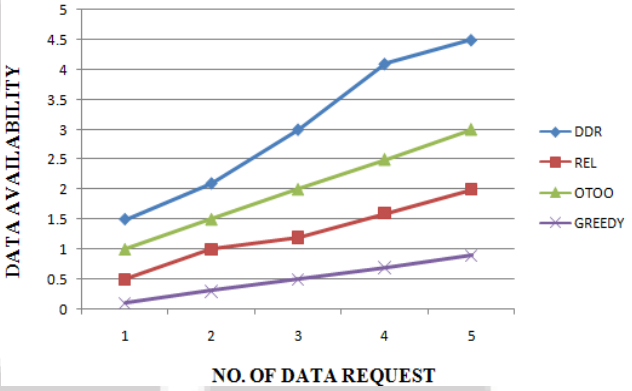

Figure 3: Data Availability Vs No. of Data Request

5. Conclusion

MANETs have autonomous node that can change location itself on the fly. The Replication technique compose the replicated data item on the access frequency of data items. It increase the response time and uphold the consistency. In this paper, we proposed the Distributed Data Replication (DDR) with disseminated model which achieve minimum query delay and maximum data availability to the distributed mobile node. Our scheme determine the data replication which compose smooth trade off between the query delay and data availability. By simulating the result, DDR method achieves low delay , high data availability to all node request.

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