

# A STUDY ON DATA REPLICATION TECHNIQUE IN MANET

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## ABSTRACT:

A mobile ad-hoc network MANET is a self-configuring network of mobile nodes connected by wireless links. In MANET nodes move randomly and organize themselves. It allows mobile nodes to communicate directly without any centralized controller. Mobile nodes are move freely; therefore link and node failures are common. This leads to frequent network partition. While a network partition occurs, mobile nodes in one partition are not capable to access data hosted by nodes in other partitions. Hence it degrades the performance of data access. To address this issue, we apply data replication techniques. Our aim is to improve data availability and reduces query delay in MANET. There are number of data replication techniques have been proposed to increase data availability and reduce query delay in MANET. This paper is an effort to survey on existing data replication techniques.

*Index Terms-* Replication; query delay; data availability; mobile ad hoc network (MANET).

## 1. INTRODUCTION

MANET mobile nodes are move freely, while network partition occurs. Nodes in one partition cannot access data held by nodes in other partitions. Hence it degrades performance of the data access. Data replication has been widely used to improve data availability in distribute systems, and we will apply this technique to MANETs [19]. By replicating data at mobile nodes which are not the owners of the original data. Data availability knows how to be improved because there are multiple replicas in the network. Also, data replication can reduce the query delay since mobile nodes can attain the data from some nearby replicas. However, the majority of mobile nodes have limited storage space, bandwidth and power, and hence it is not possible for one node to collect and hold all the data. By taking these issues into consideration, the mobile nodes should not replicate all data items in the network. The aim of this paper is to provided that a complete review and classification of data replication techniques for MANET.

The rest of this will be structured as follows section-2 describes about the data replication techniques. Section-3 follows with the performance of data replication technique, section-4 presents a literature survey, finally conclusion shown in section-5

## 2. DATA REPLICATION

Data replication (it stores the same data on multiple storage devices) is used in the Web environment and distributed database systems [19]. Either do not consider the storage constraint or ignore the link failure issue. For addressing these issues a new data replication schemes was introduced. In a MANET, mobile nodes collaboratively

share the data. Multiple nodes exist in the network and they send query requests to other nodes for some specified data items. Each node creates replicas (it is an exact copy of real data (the same but fake)) of the data items and maintains the replicas in its memory or disk space. During the data replication there is no central controller that determines the allocation of replicas and nodes determine the data allocation in a distributed manner.

### **2.1. ISSUES IN DATA REPLICATION TECHNIQUES**

Data replication technique [11], for MANET must also deal with the following additional issues.

#### *2.1.1. Server Power consumption*

Servers in MANET run on battery power. Power consumption of servers to make available services to potentially many clients should be minimized to the extent that possible. Servers among higher power availability are expected to perform more work than those that contain lower power.

#### *2.1.2. Server mobility*

Servers in MANET are mobile and the speed at which the network topology changes is higher. Due to their mobility, servers might sometimes move to a place where they cannot be reached by other servers or clients. Data replication technique is supposed to avoid replicating frequently accessed data items.

#### *2.1.3. Network Partitioning*

Due to frequent disconnection of mobile hosts, network partitioning occurs. It reduces data accessibility.

#### *2.1.4. Client mobility*

Clients query sometimes sends to the nearest servers to get a faster response. The choice to replicate a data item in a particular server may be based on the access frequency of that data item on that server. Clients, after issue their requests for data access to a server might move to new positions after a certain interval of time, and they force to send their query and update requests to the nearby servers from their new locations. Therefore, the access frequencies must be dynamic in nature and the decision to replicate data items.

#### *2.1.5. Client Power*

Client machines also run using their battery power. Some client's like servers. They are limited by the amount of energy they can use before their batteries need to survive recharged. A client force loses its power rapidly if it waits for its transactions results for a time-consuming. The replication technique should be capable to replicate data items in appropriate servers in such a way that client power consumption is reduced.

#### *2.1.6. Time critical applications*

MANET applications like rescue and military operations are time critical and may contain both in firm and soft real-time transactions. Therefore, the replication technique should be able to deliver correct information before the expiry of transaction deadlines.

### **3. DATA REPLICATION TECHNIQUE TO IMPROVE DATA ACCESS PERFORMANCE IN MANETS**

Data availability means where the availability ensures that the data can be successfully transmitted from the source to the destination in a timely manner [10]. Data Replication is technique which enhances data availability by making copies of data items. Data Replication allows improved data sharing. It is a key move toward for achieving high availability. It is suitable to develop the response time of the access requests.

### 3.1. EXAMPLE FOR DATA REPLICATION TECHNIQUE

Figure 1 is an example of how data replication can be used to improve the performance of data access when network partition occurs. There are four mobile nodes in the network [1].  $N4$  is a web camera, which continuously records video clips in  $d1$  surroundings. Two client's  $N1$  and  $N2$  sporadically access these video clips by using  $N3$  as relay. However, when a disconnection occurs between  $N3$  and  $N4$  due to a link failure,  $d1$  becomes inaccessible to the other three mobile nodes. To improve the performance of data availability, a copy of  $d1$  can be replicated at  $N3$  before the disconnection. Then both  $N1$  and  $N2$  can access  $d1$  still if they are not able to connect with  $N4$ . As a result of replicating a copy of  $d1$  at  $N3$ ,  $N1$  and  $N2$  can access  $d$  contained by one hop, reducing the query delay.

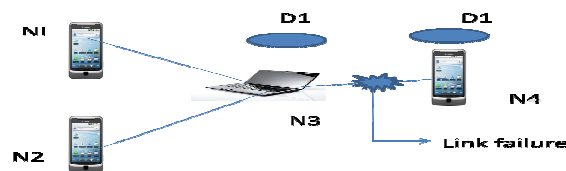


FIG.1. NETWORK PARTITION DUE TO LINK FAILURE IN A MANET

## 4. STUDY OF RELATED WORKS

Christopher Paul et al. [1] proposed to replicate the most frequently accessed data locally and only rely on neighbor's memory when the communication link to them is reliable. In this approach, the selfish caching issue in MANET is formulated as a non-cooperative problem. The solution is to solve the problem, an efficient storage space allocation approach is proposed for data replication problem while nodes are in selfish behaviors.

Hauspie et al. [2] developed an evaluating link robustness that is used to detect network partitions without using the services of a Global Positioning System. It is used to take decision for replicating data items, it not only at the time of detecting a network partition and also when the conditions of the wireless connections.

Effective Replica Allocation in Ad Hoc Networks for Improving Data Accessibility Hara [3] proposed three replication techniques. These techniques is for data items are to be replicated on which mobile hosts is based on data items access frequencies and such a decision is taken during a certain period of time, known as relocation period.

Kuppusamy et al. [4] proposed caching is a significant process to store the frequently accessed data item in the MANET. The accessed data is stored in the mobile node's cache for its own and neighbor's future use. Data availability and accessibility is a challenging task. Cooperative caching addresses these challenges to improve the data availability and efficiency of data access by sharing and coordination among the mobile nodes. These attempts to give the review and hypothetical analysis of various cooperative caching strategies in the mobile ad hoc networks based on their performance metrics such as cache hit ratio and average query delay with respect to cache size and number of mobile nodes. Global Cluster Cooperative caching provides better performance than others in terms of cache hit and average query delay.

Luo et al. [5] have introduced a set of protocols (probabilistic quorum system for mobile ad hoc networks PAN) with the aim of applying a gossip-based multicast protocol to probabilistically disseminate updates in a quorum system to attain high reliability even when there are large simultaneous update and query transactions.

Mohammed et al. [6] proposed to solve the mobile database issues. Replication of data in a MANET environment focuses on, to improve reliability and availability of data to the mobile node. There are many issues revolving around replication of data in such a scenario like power, server and node mobility, networking partition and frequent disconnection. So that it is intended to propose an approach for replication of data and to overcome the issues related to node mobility or disconnection problem in MANET environment.

Morteza Maleki et al. [7] proposed to design constraints in mobile ad hoc networks is that they are power constrained. Therefore it is used to reduce power. Every node has to perform the functions of a router, if some nodes expire early due to lack of energy, it will be impossible for other nodes to communicate with each other. Therefore, the network will get disconnected and the network lifetime will be adversely affected. This paper presents a life time prediction. The routing protocol for MANETs that maximizes the network lifetime by finding routing solutions that minimize the variance of the remaining energies of the nodes in the network.

Moon et al. [8] introduced an energy efficient eager replication scheme, named E-DRM (eager replication extended database state machine), that contains energy restrictions and achieves data consistency across the network reducing the number of broadcast messages.

P. Muklian and A. Wahi [9] proposed consistency based data replication algorithm with minimum energy consumption and provide high data availability to the multiple mobile nodes whenever required. In the proposed method is focus on improving data accessibility, energy constraint and network strength.

Nishant Gupta [10] proposed an efficient data replication technique for Mobile Ad-hoc networks is proposed that improve data availability by considering all the issues related with MANET such as power consumption, resource accessibility, and response time and consistency management. Hence this replication technique makes data replication effective as it replicates data items on the basis of access frequency of data items, recent network topology and stability of wireless links. Its improved response time and maintained consistency.

Pushpalatha et al. [12] proposed that the mobile nodes to communicate directly without centralized controller. MANET is used in various applications like military applications, rescue operations, gaming, etc. These applications play a very important role in data or file sharing. It involves many users. To make possible data sharing effectively in MANET. The Data Replication technique has several challenges in MANETs that create problems replicating data. The aim of this paper is to discuss the various issues related to data replication in MANET and the possible solutions to solve this issue.

Ratner et al. [13] proposed a Roam scheme is a replication technique model and designing a replication system to maintain real mobile users. It provides an efficient scalability for communication. The capability of selecting replication protocols.

Rajeev Kumar and Prashant Kumar [14] proposed the replica allocation technique based on cluster for MANETs. In this algorithm consider that each mobile node is associated with a cluster and each cluster has its cluster head (CH). Each CH will maintain an ART. Whenever a node requires a new data item then node has to send the request

to the CH. currently CH will check the id of required data item in its ART, if found the data id, then the request is redirected to the node with node-id pertaining to that item-id in ART. As soon as a node receives a data item then, it will create a replica of it for future a use. And an update message is send to the CH. A node may need to remove some data items in order to replicate the new ones. For this we will use a replacement policy based upon TTL value of the data items. Additional this TTL will be used in maintaining the consistency of the data items.

HARA[15] proposed an assuming an environment where each data item is periodically updated, Three replica allocation methods are proposed to improve data accessibility by replicating data items on mobile hosts. In these three methods, the access frequency from mobile hosts to all data item, the status of the network connection, and the time remaining pending each item is updated next.

Takahiro Hara [16] proposed in MANET there are many applications in which mobile users share information, for e.g., collaborative rescue operations at a disaster site and exchange of word-of-mouth information in a shopping mall. In support of such applications, improving data availability is a considerable issue and various studies have been conducted with this aim. On the other hand, each of these conventional works assumed a particular mobility model and did not fully investigate the influence of the mobility. In this paper consider of several factors that affect the data availability.

Tang et al. [17] proposed a data caching can significantly to the efficiency of information access in a wireless ad hoc network by reducing the access latency and bandwidth usage. But designing efficient distributed caching algorithms is non-trivial when network nodes have limited memory. In this paper we consider the cache placement problem of minimizing total data access cost in ad hoc networks with multiple data items and nodes with limited memory capacity. The optimization difficulty is known to be NP-hard.

Toh, [18] proposed an ad hoc mobile devices at present operate on batteries. Therefore, power consumption becomes an important issue. To maximize the life time of ad hoc mobile networks, the power consumption time of each node must be evenly distributed, and the taken as a whole transmission power for each connection request must be minimize. These two objectives cannot be satisfied simultaneously by employing routing algorithms proposed in previous work. In this paper they present a new power-aware routing protocol to satisfy these two constraints simultaneously

Yang Zhang et al. [20] proposed that during tactical networks, mobile nodes move according to tactical maneuvers and network partitions occur frequently. To moderate this problem, data replication is commonly used to increase data availability and reduce data access delay. In this paper, they presents data replication problem in mobile tactical networks, propose a new intra-group data replication scheme and extensively quantify the effects of mobility on different inter-group data replication schemes from various perspectives. The study is based on a number of metrics, which contain the average access delay and data availability, as well as the temporal and spatial analysis of these values.

Yin and Cao [21] proposed that in mobile ad hoc networks, mobile nodes move freely and link/node failures are frequent. This leads to network partitions. Therefore it degrades the performance of data access in ad hoc networks. Whereas the partition occurs, nodes in one network are not able to access data hosted by nodes in other networks. To deal with this problem by apply data replication techniques. Reducing the query delay or improving the data accessibility.

Yu Du et al. [22] has introduced a novel cooperative caching scheme for on-demand data access applications in MANET. The objective is to improve data availability and access efficiency by collaborating local resources of mobile nodes. COOP addresses two fundamental problems of cooperative caching cache resolution and cache management. To improve data availability along with access efficiency in MANET. For cache management, COOP increases the effective capacity of cooperative caches by minimizing caching duplications within the cooperation zone and accommodating more data varieties.

## 5. CONCLUSION

This survey is presented and classified on data replication techniques for mobile ad hoc network (MANET). The issues to be considered when developing a replication technique. Existing replication techniques be discussed based on how they addressed the identified issues. From this survey, that the research in MANET data replication is still in its infancy. A number of open research problems are described above. A survey of different data replication and their performance is impending, which would to help choose the most suitable technique for a particular application.

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