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Load Balancing In Multistage Packet Switches

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***Abstract*— In Computer networks (CNs), link/node failures are common, which leads to frequent network partitions. When a network partition occurs, computer 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 solutions in both wired and wireless networks aim at either reducing the query delay or improving the data availability, but not both. As both metrics are important for computer nodes, we propose schemes to balance the trade-offs between data availability and query delay under different system settings and requirements. Extensive simulation results show that the proposed schemes can achieve a balance between these two metrics and provide satisfying system performance.**

***Keywords*— Data Availability, Data Replication, Query Delay.**

I . INTRODUCTION

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. Wired solutions have been around for a long time but there is increasing demand on working wireless solutions for connecting to the Internet, reading and sending E-mail messages, changing information in a meeting and so on. Ad hoc networks are networks are not (necessarily) connected to any static (i.e. wired) infrastructure. In an ad-hoc network it is mostly a LAN or other small network, especially one with wireless connections, in which some of the network devices are part of the network only for the duration of a communications session or, in the case of mobile or portable devices, while in some close proximity to the rest of the network.

A mobile ad hoc network (MANET) is a network that allows mobile servers and clients to communicate in the absence of a fixed infrastructure. In order to facilitate efficient data access and update, databases are deployed on MANETs. These databases that operate on MANETs are referred to as MANET databases. MANET is a fast growing area of research as it finds use in a variety of applications. 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 MANET's, each node not only plays the role of an end system, but also acts as a router that forwards packets to desired destination nodes. These nodes are capable of both single and multi-hop communication. In other words, ad hoc network do 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. The density of nodes and the number of nodes depends on the applications in which we are using MANET.

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. For example, as MH2 in Figure 1 changes its point of attachment from MH3 to MH4 other nodes part of the network should use this new route to forward packets to MH2 [8]. User has great flexibility to design such a network at cheapest cost and minimum time. Wireless system operates with the aid of a centralized supporting structure such as an access point.

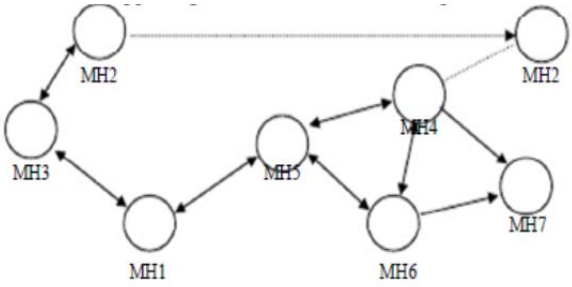


Fig 1.1 communications in MANET

Access points assist the wireless users to keep connected with the wireless system, when they roam from one place to other. Wireless system allows the devices to communicate via radio channel to share resource and information. Due to presence of a fixed supporting structure, limits the adaptability wireless system is required easy and quick deployment of wireless network. Recent advancement of wireless technologies like Bluetooth, IEEE 802.11 introduced a new type of wireless system known as Mobile ad-hoc network (MANETs), which operate in the absence of central access point. It provides high mobility and device portability's that enable to node connect network and communicate to each other and also allows the devices to maintain connections to the network as well as easily adding and removing devices in the network. 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.

Portable computers and wireless networks are becoming widely available, which enables users to remain connected to the Internet while moving around. For example, with cellular network techniques such as General Packet Radio Service (GPRS), mobile users can connect to the Internet while moving. However, mobile users may want to communicate with each other in situations where such kind of fixed infrastructure is not available. For example, a group of emergency rescue workers may need to form a network after an earthquake, or a group of soldiers may need to communicate during a military operation. In such circumstances, a collection of mobile nodes with wireless network interfaces may form a temporary network without the aid of any established infrastructure or centralized administration. This type of network is known as wireless ad hoc networks.

In ad hoc networks, direct communication between any two nodes is possible when they are within the communication range of each other, in which case we say that these two nodes are neighbors. Otherwise, the nodes communicate through multi-hop routing. In ad hoc networks, since mobile nodes move freely, disconnections may occur frequently. If a network is divided into two partitions due to the movement of mobile nodes, mobile nodes in one of the partitions cannot access the data held by the mobile nodes in the other partition. Thus, data accessibility in ad hoc networks is lower than that in the conventional fixed networks. Data replication has been widely used to improve data accessibility in distributed.

II . DATA AVAILABILITY (REPLICA)

Data availability or 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. Also, data replication can reduce the query delay since mobile nodes can obtain the data from some nearby replicas. For data replication protocols, significant factors that affect the performance are how many data items can be replicated on connected mobile nodes and how often and how much the groups of connected mobile nodes change. 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. One solution to improve the data access performance considering the resource constraints of mobile nodes is to let them cooperate with each other; That is, contribute part of their storage space to hold data of others.

When a node only replicates part of the data, there will be a trade-off 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 neighbouring 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 neighbours. Although the delay of accessing the data from neighbours is shorter than that from the data owner, it is much longer than accessing it locally. In this paper, we propose different data replication techniques to address query delay and data availability issues. As both metrics are important for mobile nodes, we propose techniques to balance the trade-offs between data availability and query delay under different system settings and requirements.

III. PROBLEM DEFINITION

A. 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. Padmanabhan [4] *et al* Identified several research issues in data replication in MANET and attempted to classify existing data replication techniques. Hara [5], [2] proposed data replication schemes for ad hoc networks. These schemes are based on the intuition that replicating the same data near neighbouring 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 [6] addressed the problem of replica allocation in a MANET by exploring group mobility. Wang and Li [7] 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 [1] 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 aperiodic 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 item is 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 it is impossible for one node to collect and hold all the data considering these constraints.

B. Proposed System:

In this paper, we propose new data replication techniques to address query delay and data availability issues. As both metrics are important for mobile nodes, we propose techniques to balance the trade-offs between data availability and query delay under different system settings and requirements. Here we solve the problem by replicating data items on mobile hosts. Data replication has been extensively studied in the web environment [8] 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. 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. 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.

IV. TECHNIQUES

A. Data Replication:

Data replication has been extensively studied in the Web environment 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.

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 database is 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 issues.

The following notations are used in this paper.

S={ {I} , {o} {Function}}

Where,

Input = I= {file}

- File – Our project input is file . file containing text , image , video etc. this file is browse from user machine and select destination address to send selective file .

Output=o={File deliver to destination }

- File received successfully.
- Function Description :-
  1. Send File():- In which function we can send the selected file.
  2. Divide file():- By using this function the file is divided into number of packets.
  3. Conquer() :- By using this function the divided packets are merged into single file .
  4. Received File():- By using this function the merged file received successfully.
- Failure Case :- When connection is break at the time of sending file then the file is stored in the queue. In that case the file does not reach to the destination.

Mathematical Representation

Our paper can be represented as an undirected graph G(V,E).

Where,

V – be the set of vertices represent the nodes in the network.

E – be the set of edges in the graph. It represent the physical \ logical link between the nodes.

Let,

N- be the set of nodes in the network.

m-be the total number of nodes .

D-be the set available data items in the network.

n-be the total number of data items.

S_i-be the size of d_i.

C-be the memory size of each node for hosting data replicas.[c<n]

t_{ij}-be the delay of transmitting data items of unit size between node N_i & N_j.

f_{ij}-be the link failure probability between node N_i & N_j.

a_{ij} – be the data access frequency of node N_i to d_j.

Suppose , node Ni & Nj are neighbouring nodes .

Ni – Calculate the combined access frequency (CAF) value of Ni & Nj to data items dk and Ni , denoted as CAF^k_{ij} by using the following function.

$$CAF^k_{ij} = (a_{ik} + a_{jk} * (1 - F_{ij}))/S_i$$

Similarly,

Nj – Calculate its combined access frequency to dk with the following function

$$CAF^k_{ji} = (a_{jk} + a_{ik} * (1 - F_{ij}))/S_i$$

If the neighbouring nodes Nj of Ni has already replicated the data & the link failure probability between Ni & Nj is

low . Ni is less likely to replicate this data because it can always get the data from Nj.

However , if the link failure probability is high Ni may like to replicate the data locally .

Therefore , we define priority value for node Ni to replicate data dk given its neighbouring node Nj , denoted as P^k_{ij} by using the following function

$$P^k_{ij} = CAF^k_{ji} * w^k_{ij}$$

Where ,

Wkij- indicate the impact on data availability by the neighbouring node & the link failure probability w^k_{ij} is calculated as follows

w^k_{ij} = fij - if data dk is replicated at Nj.

1 - if data dk is not replicated at Nj.

Each node sorts the data according to the priority value P & picks data item with the highest P to replicate in its memory until no more data items can replicated .

V. RSA ALGORITHM

For Security purpose there are many ways of classifying data cryptographic algorithms but for the purpose of this paper, they will be classified based on the number of keys that are employed for encryption and decryption. The three common types of algorithms are:

A. Secret Key Cryptography (SKC):

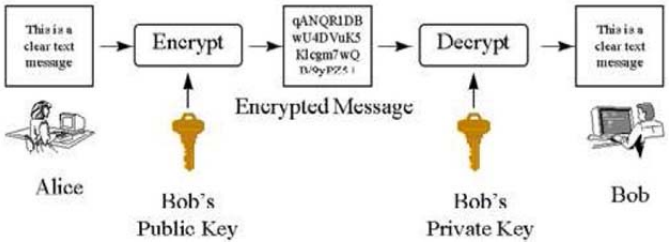
The SKC method uses only a single key for both encryption and decryption. The schemes are generally categorized as being either stream ciphers or block ciphers. Stream ciphers operate on a single bit (byte or computer word) at a time and implement some form of feedback mechanism so that the key is constantly changing while block cipher scheme encrypts one block of data at a time using the same key on each block.

The main drawback of this method is propagation error because a distorted bit in transmission will result in n distorted bits at the receiving side. Though stream ciphers do not propagate transmission errors, they are periodic therefore the key-stream will eventually repeat. This normally results in the use of digital signature mechanisms with either large keys for the public verification function or the use of a TTP.

B. Public Key Cryptography (PKC):

PKC scheme uses one key for encryption and a different key for decryption. Modern PKC was first described using a two-key crypto system in which two parties could engage in a secure communication over a non-secure communications channel without having to share a secret key [3]. In PKC, one of the keys is designated the public key and may be advertised as widely as the owner wants. The other key is designated the private key and is never revealed to another party. RSA is one of the first and still most common PKC implementation that is in use today for key exchange or digital signatures.

The cardinal advantage of this method is that administration of keys on a network requires the presence of only a functionally trusted TTP, as opposed to an unconditionally trusted TTP. Depending on the mode of usage, the TTP might only be required in an "off-line" manner, as opposed to in real time. Many public-key schemes yield relatively efficient signature mechanisms. The key used to describe the public verification function is typically much smaller than for the symmetric-key counterpart [6-9].



VI. CONCLUSION

Main goal of this paper is to increase the data availability by dividing the message into different packet and transfer it them to the switches having different sizes and after that it transfer it to the appropriate receiver. This paper helps you to calculate the delay of received packet and the transfer rate and it could be used as an network analyzer for analyzing the network traffic and how the packets are flowing and how much time they are taking to reach destination. Also this paper has presented data encryption and decryption in a network environment that was successfully implemented. Data can be transferred from one computer terminal to another via an unsecured network environment. Intruders that break into the message will return a meaningless message. Obviously encryption and decryption is one of the best ways of hiding the meanings of a message from intruders in a network environment.

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