Efficient Replica Allocation in Ad Hoc Networks for developed Data Accessibility

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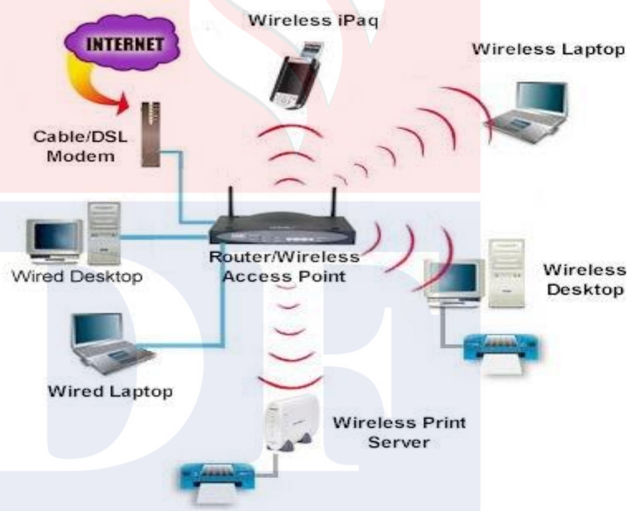
Abstract— Recent advances in computer and wireless communication technologies have led to an increasing interest in ad hoc networks which are temporarily constructed by only mobile hosts. In ad hoc networks, since mobile hosts move freely, disconnections occur frequently, and this causes frequent network division. Consequently, data accessibility in ad hoc networks is lower than that in the conventional fixed networks. In this paper, we propose three replica allocation methods to improve data accessibility by replicating data items on mobile hosts. In these three methods, we take into account the access frequency from mobile hosts to each data item and the status of the network connection. We also show the results of simulation experiments regarding the performance evaluation of our proposed methods.
Keywords—ad hoc networks, replica allocation, data accessibility, mobile computing environment.

I. INTRODUCTION

MANETS has drawn the attention of the people because of its unique feature and application. MANET is a peer-to-peer multi hop mobile wireless network which is not a central server or any other fixed machine. Each node in a MANET acts as a router, and communicates with each other. Data are usually replicated at nodes, other than the original owners, to increase data accessibility to cope with frequent network partitions. In general, replication can simultaneously improve data accessibility and reduce query delay.

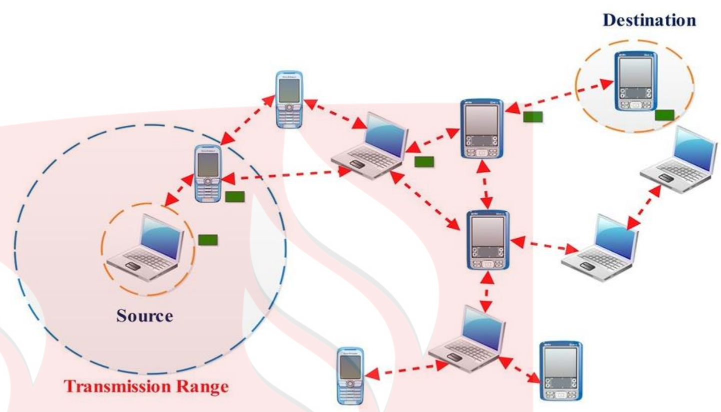


II MANET research in past.

Mobile ad hoc networks (*MANET*) has its origin in *Packet Radio Network,* which was studied in the early 1970's. Afterward, MANET has been a hot research topic since the 1990's, in the computer science and IT research communities. While there are different definitions of a MANET, the most typical and well-known definition is a wireless network which is temporally constructed solely by mobile nodes with wireless communication capabilities. In a MANET, mobile nodes have a limited range of wireless communication, basically restricted to the reachable area (coverage) of radio signals. Therefore, two mobile nodes located beyond their own communication range communicate with each other via other intermediate nodes located between them, who relay their communication messages. Thus, in a MANET, communication between nodes is achieved in a multi-hop manner. Compared with other existing network infrastructures, such as the Internet and WiFi, MANETs have a significant advantage, in that they can be constructed without centralized network controls (*i.e.,* fixed infrastructure). Thus, MANETs are expected to be useful in situations where a fixed network infrastructure is not available, such as in excavation work or military affairs, and also in rescue operations where network infrastructures are compromised. A MANET is also useful for car-to-car communication, for safe driving and other services, because it can provide real-time communication, and is more energy and cost efficient than infrastructure communication.

In a MANET, the movement of mobile nodes often causes nodal disconnection (*i.e.*, two nodes that were within the communication range of each other move beyond this range and lose the ability to communicate directly with each other). Thus, a number of techniques have been developed to support communication between arbitrary pairs of nodes in a MANET, where the network topology is dynamically and continuously changing. Since mobile nodes are typically small battery-driven devices such as laptop computers, mobile phones, or sensor nodes, they are limited by resource constraints in terms of battery-life and communication channel. Therefore, almost all the studies in the early stage of MANET research (in the 1990's) sought networking techniques for achieving efficient communication between nodes. In particular, designing routing protocols to find efficient communication paths between source and destination nodes, and relay message packets along such paths, has been a central focus of research for many years.

Figure shows an example in which the source node *S* tries to find an efficient communication path to the destination node *D* (for example, to access a data item held by *D*), where a line between a pair of nodes indicates that there is a radio communication link between them (*i.e.*, they are within the communication range of each other). In this example, the routing protocol basically finds the shortest path to the destination node, indicated here by the solid arrow, rather than, for example, that indicated by the dashed arrow.

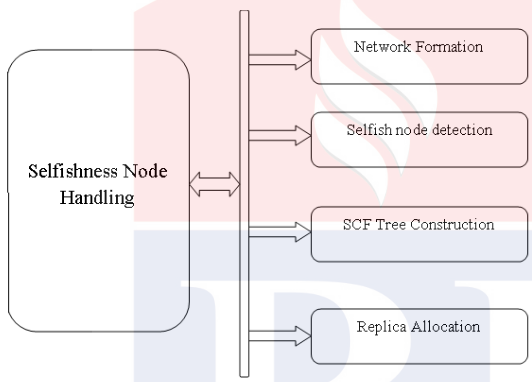


III Selfish replica allocation

In MANETs, network partitions occurs frequently, as the mobile nodes moves freely in the network, which causes the decrease in the data accessibility. To handle this situation data are usually replicated at nodes, other than original owners. This replicated data commonly known as a replica. Replica can improve data accessibility and also reduces the query delay i.e. query response time. If the mobile nodes in a MANET together have sufficient memory space to hold both all the replicas and the original data. The response time of a query can be gradually reduced, if the query accesses a data item that is locally stored replica.

A node may hold a part of the frequently accessed data items locally to reduce its own query delay. However, if there is only limited memory space and many of the nodes holds the same replica locally, then some data items would be replaced and missing. Then the overall data accessibility would be decreased. To minimize the data accessibility, a node should not hold the same replica that is also held by many other nodes. Hence this will increase its own query delay. A node may act selfishly, i.e., using its limited resource only for its own benefit. A selfish node would like to enjoy the benefits provided by the resources of other nodes such as battery and storage limitations, but it may not make its own resource available to help others. This selfish behavior can leave to wide range of problems for MANET. In this paper we address the problem of selfishness of a node in the context of replica allocation in a MANET. A selfish node may not share its own memory space to store replica for the benefit of other nodes. Such problem is referred as selfish replica allocation. It exhibits nodes non cooperative action, such that the node refuses to cooperate fully in sharing its memory space with other nodes.

System architecture:



Behavior of selfish nodes in MANET

Selfishness for nodes are categorized into two types based on their behavior.

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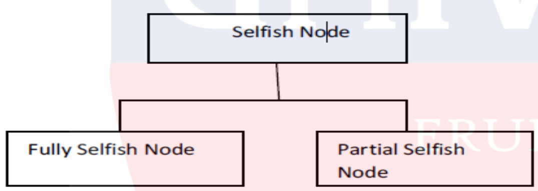

1. Fully selfish nodes-The nodes do not hold replicas allocated byother nodes, but allocate replicas to other nodes for their accessibility.
2. Partial selfish nodes-The nodes use their memory space partially for allocated replicas by other nodes.

These nodes allocate replicas to other nodes for their accessibility. Each node in a MANET has limited memory locally and each node acts as a data provider, it provides several data items and as well as a data consumer. Each node holds data item replicas and maintains the replicas in local memory space. The replicas are relocated in a specific period. There are 'm' nodes, N1,N2,…Nm. Any node can freely joins in a MANET.A mobile adhoc network is an undirected graph G=(IN,IL).Where 'IN' is a finite set of nodes and 'IL' is a finite set of communication links.

 Each node in a MANET has a unique identifier and they are denoted by

N={N1,N2,…Nm}, where 'm' is the total number of nodes.

 Each node holds data items of equal size, and first data item in a memory is considered as its original data. Every data item has a unique identifier, denoted by

D={D1,D2,…Dn},

where 'n' is the total number of data items. The remaining data items in a memory are treated as replicas for its particular node.

 Each node Ni has its own access frequency for data item and it does not change always.

When a node Ni sends a request (query) for accessing of data item, first, the search has takes place in its own memory. The request is successful, when the node Ni holds the data item as its original data item (or) replica, otherwise the request is broadcasted. The request is also successful, when the node Ni gets reply from its adjacent nodes connected to Ni with one hop or multi hops. Otherwise, the request fails.

IV **EXISTING SYSTEM**

Handling selfish nodes can be classified into three categories: reputation-based, credit payment, and game theory-based techniques.

1. ***Reputation-based Technique:*** Each node observes the behaviors of others and uses the acquired information for routing.
2. ***Credit-payment techniques:*** Each node gives a credit to others, as a reward for data forwarding**.** The acquired credit is then used to send data to others.
3. ***The game theory-based techniques:*** It assumes that all rational nodes can determine their own optimal strategies to maximize their profit. The game theory-based

techniques want to find the Nash Equilibrium point to maximize system performance.

Limitations:

1. Low accuracy.
2. High traffic.

V Proposed System

In a proposed system at a specific period, or relocation period, each node executes the following procedures:- -Each node detects the selfish nodes based on credit risk scores. -Each node makes its own (partial) topology graph and builds its own SCF-tree by excluding selfish nodes. -Based on SCF-tree, each node allocates replica in a fully distributed manner.

Conclusion

MANETS are used in various contexts like mobile social networks, emergency deployment; intelligent transportation systems etc. According to the viewpoint of network, problem of selfish nodes from the replica allocation has been addressed. This term is stated as selfish replica allocation. The fact that a selfish replica allocation could lead to overall poor data accessibility in a MANET, so the proposed solution describes a selfish node detection method and replica allocation techniques to handle the selfish replica allocation appropriately. The proposed strategies are inspired by the real-world observations in economics in terms of credit risk and in human friendship management in terms of choosing one's friends completely one's own discretion. We applied the notion of credit risk from economics to detect selfish nodes. Every node in a MANET calculates credit risk information on other connected nodes individually to measure the degree of selfishness.

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