Egotistic Approach to Reduce the Average Query Delay in MANET

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***Abstract* - A MANET (Mobile Adhoc NETwork) is a multi hop mobile wireless network that has neither a fixed infrastructure nor a central server. However this is not the case, a egotistic node is one that tries to utilize the network using its limited resource only for its own benefit, since each node in a MANET has resource constraints, such as battery and storage limitations, it would like to enjoy the benefits provided by the resources of other nodes, but it may not make its own resource available to help others. Such egotistic behavior can potentially lead to a wide range of problems for a MANET. If such behavior prevails among large number of the nodes in the network, it may eventually lead to disruption of network, Replica allocation in such a dynamic environment is a significant challenge. There are several data replication techniques are involved to minimize the performance degradation. Due to egotistic and mobility of the node, they decide to cooperate partially or not at all, along with other nodes for resource sharing. In turn it increases the data accessibility and reduces average query delay.**

***Keywords*—egotistic node, routing, data accessibility, query delay**

I. INTRODUCTION

A "mobile ad hoc network" (MANET) is an autonomous system of mobile routers (and associated hosts) connected by wireless links - the union of which forms an arbitrary graph. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably [5]. Such a network may operate in a standalone fashion, or may be connected to the larger Internet. These networks are fully distributed, and can work at any place without the help of any infrastructure. This property makes these networks highly exible and robost .Due to mobility some of the nodes become egotistic. The egotistic nodes are not malicious but are reluctant to spend their resources such as CPU time, memory and battery power for others. The problem is especially critical when with the passage of time the nodes have little residual power and want to conserve it for their own purpose. Thus in MANET environment there is a strong motivation for a node to become egotistic.

The characteristics of egotistic nodes as follows:

i. Do not participate in routing process: A egotistic node drops routing messages or it may modify the Route Request and Reply packets by changing TTL value to smallest possible value.
ii. Do not reply or send hello messages: A egotistic node may not respond to hello messages, hence other nodes may not be able to detect its presence when they need it.
iii. Intentionally delay the RREQ packet: A egotistic node may delay the RREQ packet up to the maximum upper limit time. It will certainly avoid itself from routing paths.
iv. Dropping of data packet: A egotistic nodes may participate in routing messages but may not relay data packets.

The major reason for such behavior is low residual battery power. It may here be clarified that a egotistic node is not malicious and doesn't intend to involve itself in the network damaging activities such as content alteration, spoofing etc. It normally restrains itself from the activities of the other nodes which do not bring any benefit to it. The partially egotistic node should be taken into account, in addition to the fully egotistic nodes to properly handle the egotistic replica allocation problem [7][8]. The credit risk is calculated from the nodes of each cluster to measure the degree of egotistic and chose the leader.

The leader is elected based on the credit risk to avoid the false alarm in identifying the partial egotistic node. Then it is constructed based on the concept of a self-centered friendship tree (SCF-tree) to achieve high data accessibility with low communication cost and also reduce the falseness in identifying egotistic node.

II.BACKGROUND WORK

In ad hoc networks, since mobile hosts move freely, disconnections occur frequently, and this causes frequent network division [1]. Consequently, data accessibility in ad hoc networks is lower than that in the conventional fixed networks.

It is overcome by considering the periodic updates and integrating user's profile that contains the mobile user's schedule, access behavior and read/write patterns. The replica allocation algorithms in these methods are modified for message exchanges among all connected mobile hosts and relocate replicas [6].

In MANET, the data replication improves the data availability. The mobility of mobile nodes causes frequent network partitioning and consistency management of data on replicas becomes a challenging task and thus global partitioning of data on replicas is not desirable for many applications [8].

A mobile ad hoc network (MANET) is a network that allows mobile servers and clients to communicate in the absence of a fixed infrastructure. MANET is a fast growing area of research as it finds use in a variety of applications [9]. 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. Since data availability in MANETs is affected by the mobility and power constraints of the servers and clients, data in MANETs are replicated. A number of data replication techniques have been proposed for MANET databases, identifies issues involved in MANET data replication and attempts to classify existing MANET data replication techniques based on the issues they address.

In wireless ad hoc networks, nodes communicate with far off destinations using intermediate nodes as relays. Since wireless nodes are energy constrained, it may not be in the best interest of a node to always accept relay requests. On the other hand, if all nodes decide not to expend energy in relaying, then network throughput will drop dramatically. Both these extreme scenarios (complete cooperation and complete noncooperation) are inimical to the interests of a user [3].

The issue of user cooperation in ad hoc networks is addressed. Assume that nodes are rational, i.e., their actions are strictly determined by self interest, and that each node is associated with a minimum lifetime constraint. The lifetime constraints and the assumption of rational behavior, are able to determine the optimal throughput that each node should receive, define this to be the rational Pareto optimal operating point, then propose a distributed and scalable acceptance algorithm called Generous TIT-FOR-TAT (GTFT). The acceptance algorithm is used by the nodes to decide whether to accept or reject a relay request. The GTFT results in Nash equilibrium and the system converges to the rational and optimal operating point [2].

Thus, the overall data accessibility would be decreased. Hence, to maximize data accessibility, a node should not hold the same replica that is also held by many other nodes. However, this will increase its own query delay. A node may act egotistically, i.e., using its limited resource only for its own benefit, since each node in a MANET has resource constraints, such as battery and storage limitations. A node would like to enjoy the benefits provided by the resources of other nodes, but it may not make its own resource available to help others. Such egotistic behavior can potentially lead to a wide range of problems for a MANET. Existing research on egotistic behaviors in a MANET mostly focus on network issues. For example, egotistic nodes may not transmit data to others to conserve their own batteries [6].

III. SYSTEM DESIGN

We have proposed an egotistic node detection method and novel replica allocation techniques to handle the egotistic 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 at one's own discretion. We applied the notion of credit risk from economics to detect egotistic nodes. Every node in a MANET calculates credit risk information on other connected nodes individually to measure the degree of egotistic. Since traditional replica allocation techniques failed to consider egotistic nodes, we also proposed novel replica allocation techniques. The technical description of this paper can be summarized as follows.

A. Node creation

The number of mobile nodes is set to 40.The movement pattern nodes follows the random waypoint model, where each node remains stationary for a pause time and then it selects a random destination and moves to the destination. After reaching the destination, it again stops for a pause time and repeats this behavior in Fig 1. The radio communication range of each node is a circle with a radius of 1~19 (m). Suppose that there are 40 individual pieces of data, each of the same size. In the network, node Ni (1<=i<= 40) holds data Di as the original. The data access frequency is assumed to follow Zip distribution.

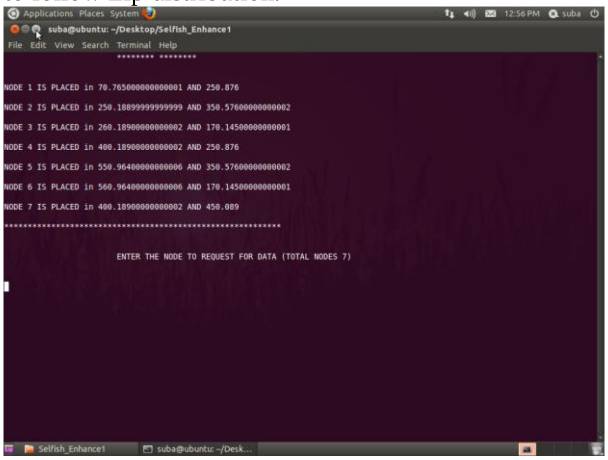

Figure 1 Node creation

B. Default setting of egotistic node in node creation

The default number of egotistic nodes is set to be 70 percent of the entire nodes in simulation, based on the observation of a real application. Set 75 percent of egotistic nodes to be type-3 (i.e., partially egotistic) and the remaining to be type-2 (i.e., fully egotistic). Type-3 nodes consist of three groups of equal size. Each group uses 25, 50 and 75 percent of its memory space for the egotistic area Type-2 nodes will not accept replica allocation requests from other nodes in the replica allocation phase, thus being expected to create significant egotistic alarm in query processing. Type-3 nodes will accept or reject replica allocation requests according to their local status, thereby causing some egotistic alarms in subsequent query processing.

C. Setting up energy level

The radio communication range of each node is a circle with a radius of 1~19(m). Suppose that there are 40 individual pieces of data, each of the same size. In the network, node Ni (1<=i<= 40) holds data Di as the original. The data access frequency is assumed to follow Zip distribution. Based upon the Energy level the cluster is formed and the leader is elected on each.

D. Credit risk evaluation

Credit risk evaluated based on Credit risk scores for each node by node specific and query processing-specific. Node Specific is based upon their resources available on each. Query processing Specific is based upon their node request and response to the query.

E. Leader election

Based upon credit risk leader node is elected initially to monitor all the other node to identify the reason for egotisticness. Due to dynamic nature the leader may move out and new node come in the region if so again the energy level will set up for new region and new leader will be chosen.

F. The Egotistic node detection

The Egotistic node will be detected based upon the data access frequency and query response among the nodes. The node with less data access frequency and response will be identified as egotistic node. If the node response is less due to traffic or network failure they are treated as non-egotistic nodes by the leader then by excluding that the new SCF (Self-Centered Friendship) tree will be constructed.Due to dynamic nature the egotistic and leader will be changed accordingly.

G. (Self-Centred Friendship) Tree Construction

Based upon the Degree of egotisticness the SCF tree will be constructed the lower level will have high degree of egotisticness in Figure 2.

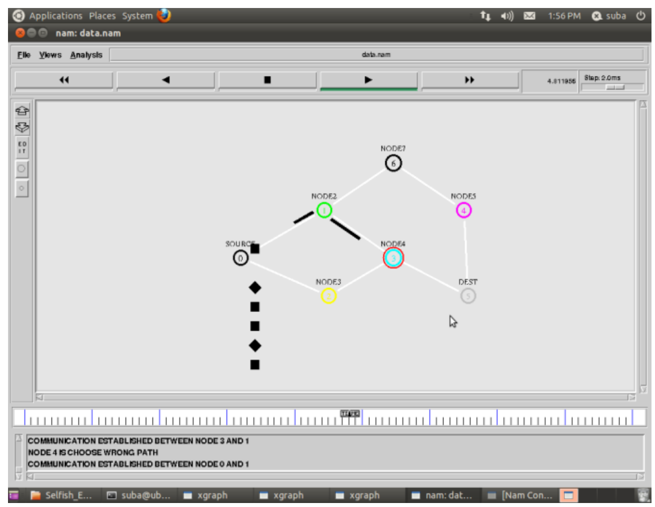

Figure 2 Tree model node constructions

H. Replica allocation

The Replicas will be allocated to nodes by handling egotistic replica allocation by identifying the sefish nodes without falseness.

IV. PERFORMANCE EVALUATION

We modeled its performance using Continuous Time Markov Chain with two parameters to indicate the degree of collaboration and detection of the watchdog. Numerical results show that a collaborative watchdog can reduce the overall detection time with a reduced cost in term of message overhead. This reduction is very significant when the watchdog detection effectiveness is low. Furthermore, this reduction can be obtained even with a moderate degree of collaboration. We evaluate our strategy using the following four performance metrics:

A.Average Query Delay

This is the number of hops from a requester node to the nearest node with the requested data item in figure 3. If the requested data item is in the local memory of a requester, the query delay is 0.We only consider successful queries, i.e., it is the total delay of successful requests divided by the total number of successful requests.

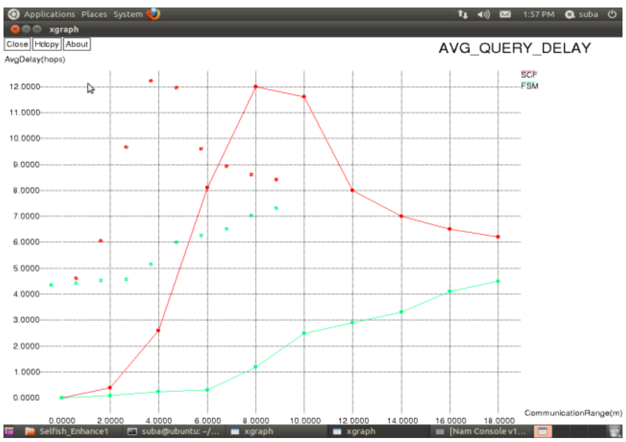

Figure 3 Average Query Delay

B.Data Accessibility

This is the ratio of the number of successful data requests to the total number of data requests.

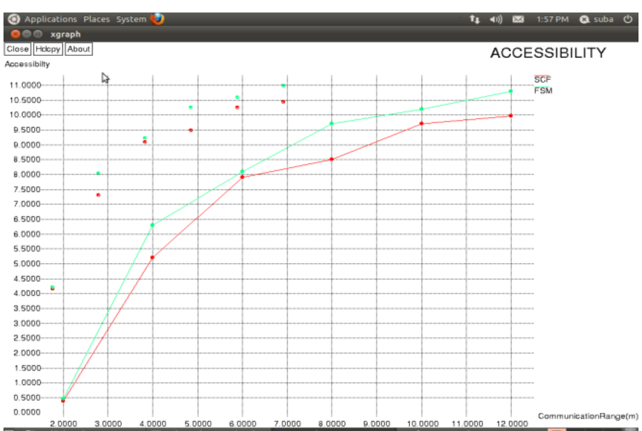

Figure 3 Data Accessibility

V.CONCLUSION

The proposed egotistic node detection method and novel replica allocation techniques are used to handle the egotistic replica allocation appropriately. The notion of credit risk from economics are applied to detect egotistic nodes, Based upon that SCF (Self - centred friendship) tree constructed and replica is allocated without false alarm on identifying egotistic node, for that the Dynamic number of nodes are created. The default number of egotistic nodes is set to be 70 percent of the entire nodes in simulation, based on the observation of a real application. Based upon the Credit risk the leader node is elected initially to monitor the other entire node to identify the reason for egotistic to find it without falseness. On average about 60 and 55 percent of the overall egotistic alarm are reduced by node egotistic, not disconnections and in parallel it increases the data accessibility and reduces average query delay.The proposed strategies show that it outperforms existing representative cooperative replica allocation techniques in terms of data accessibility, communication cost, and query delay. In future, Plan to identify and handle replica allocation, on different mobility pattern without egotistic by providing the

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