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Community Based Routing in Delay Tolerant Mobile Social Networks

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Abstract-**Mobile social networks (MSNs) are a special kind of delay tolerant network (DTN), in which mobile users move around and communicate with each other via their carried short-distance wireless communication devices. Typical MSNs include pocket switch networks, mobile vehicular networks, mobile sensor networks, etc. As more users exploit portable short-distance wireless communication devices (such as smart phones, iPads, mobile PCs, and sensors in vehicles) to contact and share data between each other in a cheap way, MSNs attract more attention. Since MSNs experience intermittent connectivity incurred by the mobility of users, routing is a mainly concerning and challenging problem.Recently, some social-aware routing algorithms that are based on social network analysis have been proposed, such as Bubble Rap, SimBet, and algorithms, etc. Two key concepts in social network analysis are: (i) community, which is a group of people with social relations; (ii) centrality, which indicates the social relations between a node and other nodes in a community. Based on the two concepts, these algorithms detect the communities and compute the centrality value for each node. Messages are delivered via the nodes with good centralities. Since social relations of mobile users generally have long-term characteristics and are less volatile than node mobility, social-aware algorithms outperform traditional DTN algorithms, such as flooding-based algorithms and probability-based algorithms. Despite this, these algorithms tend to forward messages to the nodes with locally best centralities.**

Keywords—MSN.DTN, Bubble Rap, SimBet

I. INTRODUCTION

Delay Tolerant Networks (DTN), also referred to as Intermittently Connected Mobile Networks, are wireless networks in which at any given time instance, the probability that there is an end-to-end path from a source to destination is low. Since most of the nodes in a DTN are mobile, the connectivity of the network is maintained by nodes only when they come into the transmission ranges of each other. If a node has a message copy but it is not connected to another node, it stores the message until an appropriate communication opportunity arises.

There are many examples of such networks in real life. For example, in north part of the Sweden [1], the communication between villages and the summer camps of the Saami population is provided when the nodes get connected. The same situation is also seen in rural villages of India and some other poor regions [2]. Other fields where this kind of communication scenarios may occur also include satellite communication [3], wildlife tracking [4], military networks [5] and vehicular ad hoc networks [6]. Moreover, such environments can exist even when a stable infrastructure is destroyed by natural disaster or other effects. A more interesting example of DTNs is the applications where sensors are attached to seals [7] and whales [8] to collect large number of sensor readings from the oceans. In these applications, the data collected by sensors on seals and whales is transferred to a sink node using the transitive connectivity between the sensor nodes.

Routing Problem in DTNs

Although the connectivity of nodes is not constantly maintained, it is still desirable to allow communication between nodes. Therefore, it is necessary to provide a routing protocol which tries to route packets throughout the times the link is available among the nodes. But this cannot be done by standard routing algorithms which assume that the network is connected most of the time.

In a standard network, since the nodes are connected most of the time, the routing protocol forwards the packets in a simple way. The cost of links between nodes are mostly known or easily estimated so that the routing protocol computes the best path to the destination in terms of cost and tries to send the packets over this path. Furthermore, the packet is only sent to a single node because the reliability of paths is assumed relatively high and mostly the packets are successfully delivered. However, in DTN like networks, routing becomes challenging because the nodes are mobile and connectivity is rarely maintained.

The transient network connectivity needs to be of primary concern in the design of routing algorithms for DTNs. Therefore, routing of the packets is based on store-carry-and-forward paradigm. That is, when a node receives a message but if there is no path to the destination or even a connection to any other node, the message should be buffered in this current node and the upcoming opportunities to meet other nodes should be waited. Moreover, even a node meets with another node, it should carefully decide on whether to forward its message to that node. It is obvious that to forward a message to multiple nodes increases the delivery probability of a message. However, this may not be the right choice because it can cause a huge messaging overhead in the network which then causes redundant energy and resource consumption. On the other hand, sending a copy of the message to a few number of nodes uses the network resources efficiently but the message delivery probability becomes lower and the delivery delay gets longer. Consequently, it is clearly seen that there is a tradeoff between the message delivery ratio and the energy consumption and delivery delay in the network. Hence, while designing a routing protocol for delay tolerant networks, the important considerations must be (i) the number of copies that are distributed to the network for each message, and (ii) the selection of nodes to which the message is replicated or forwarded.

Consider the sample delay tolerant network illustrated in Figure 1.1. It presents four different snapshots of the network showing connectivity between nodes at four different times. Assume node A has a message destined to node G. Looking at the snapshots, we can easily observe that delivery of the message could be achieved by node B at T4 if node A forwards the message to node B at time T1. However, the key point here is how node A will know that node B will meet the destination node before it meets the destination. What makes routing challenging in a DTN is to be able to make better decisions at contact times of nodes using only local information available at nodes.

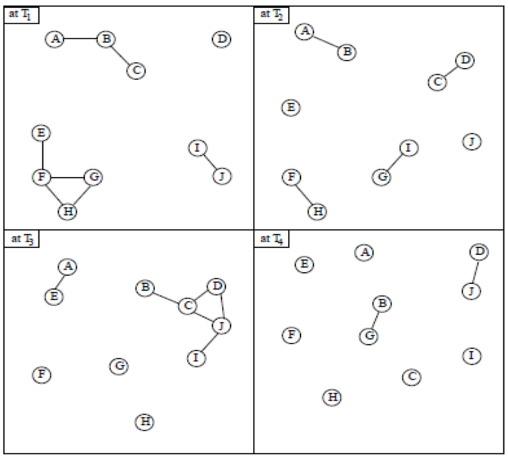

Figure 1.1: Snapshots of a delay tolerant network at four different times.

In this paper,the routing problem in delay tolerant networks and provide different solutions. In each, we use different routing techniques and work on different DTN scenarios, however our common main objective is to minimize the routing cost1 while achieving high delivery rate by the delivery deadline.

II. RELATED WORK

It has been almost a decade since the initiating talk [9] of Kevin Fall about delay tolerant networks. The primary focus of researchers studying on DTNs has been routing problem. Many studies have been performed on how to handle the sporadic connectivity between the nodes of a DTN and provide a successful and efficient delivery of messages to the destination. Different classifications of these algorithms can be made. In Figure 2.1, we show two different classifications of routing algorithms proposed for delay tolerant networks.

In the paper [1] The pioneering algorithm in the category of multi-copy based routing algorithms is Epidemic Routing. Basically, at each contact between any two nodes, the nodes exchange their messages so that they both have the same list of message copies. As the result, the fastest spread of copies is achieved yielding the shortest delivery time and minimum delay. Clearly, the major drawback of this approach is excessive usage of bandwidth, buffer space and energy due to the uncontrolled and greedy spreading of copies.

One of the first studies in the category of single-copy based algorithms is Prophet Algorithm. De-pending on the observation that the movement of nodes in a typical mobile ad hoc network might be predictable based on repeating behavioral patterns (i.e. if a node has visited a location several times before, it is likely that it will visit that location again.), Lindgren et al. propose a probabilistic routing model where the forwarding decisions are made comparing the predicted future delivery probabilities (that are computed from previous node encounters and updated with aging and transitivity mechanisms) of meeting nodes.

In the paper[2] erasure-coding based routing, source node converts its message into a large set of blocks such that the original message can be constructed from a subset of these blocks. Then, the source node distributes these blocks to different nodes in the network and delivery of at least some minimum number of them is expected for the delivery of entire message. The most important advantage of erasure coding based message routing over replication based routing1 is that erasure coding strengthens the robustness of the routing against network failures. That is, the more messages are spread to the network, the higher is the probability of message delivery to the destination, regardless of the rate of communication failures.

In erasure coding based routing, spraying of all messages takes more time than it takes in replication based routing algorithms because more encoded messages (which are k times smaller) are transferred to delay nodes. Therefore, the way the messages are distributed to other nodes in the network is a significant factor affecting the performance of the algorithm. The faster they are sprayed to other nodes, the higher is the delivery rate. On the other hand, the spraying stage contributes significantly to the cost of the algorithm.

In the paper [3] Existing routing algorithms for Delay Tolerant Networks (DTNs) assume that nodes are willing to forward packets for others. In the real world, however, most people are socially selfish; i.e., they are willing to forward packets for nodes with which they have social ties but not others, and such willingness varies with the strength of the social tie. Following the philosophy of design for user, we propose a Social Selfishness Aware Routing (SSAR) algorithm to allow user selfishness and provide better routing performance in an efficient way

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III. PROPOSED WORK

In existing Social-aware algorithms assume that each node has some social characteristics (such as community, centrality, and similarity, etc.) and then exploits the knowledge to direct the routing decision, so as to improve the delivery ratio. Unlike existing community models, each community home in our model is assumed to have a throwbox to store and transmit messages. Compared with the CAOR algorithm, these algorithms just exploit the social characteristics of nodes to improve the probability of meeting the destination for each message. However, this is still unpredictable, and thus cannot achieve the optimal result.

Disadvantages

- In the existing system there should be only limited community are to be routing in mobile social network.
- The Delay tolerant are should be occurred in network.
- Higher end to end delay routing.
- Delivery ratio must be low in the existing system.

MSN

In this work we focus on the single-copy routing problem in MSNs. In many real MSNs, mobile users that have a common interest generally will visit some (real or virtual) location that is related to this interest. For instance students with a common study interest will visit the same classrooms to take part in the same courses; customers with the same shopping interests often visit the same shops; friends generally share some resources through Facebook, and so on. Based on this basic social characteristic, we propose a home-aware community model. Mobile users with the common interest autonomously form a community, in which the frequently visited location is their common "home".

We first turn the routing between lots of nodes to the routing between a few community homes. Then, we adopt the optimal opportunistic routing scheme by maintaining an optimal relay set for each home. Each home only forwards its message to the node in its optimal relay set and ignores other relays. Since this scheme solves the problem of whether a home should select a visited node as the relay of message delivery or ignore this visited node to wait for those better relays, it can achieve the optimal performance.

Advantages :

- Efficient packet delivery for the entire dynamic nodes and each communities in mobile social network.
- Reliable for every nodes which are dynamically connected with the mobile adhoc networks.
- This algorithm is used to achieve optimal dynamic routing in mobile social networks.
- We can create more communities in proposed system even the multiple community are also created.

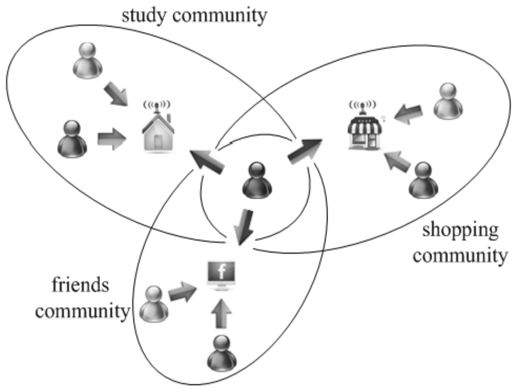

Figure 3.1 Architectural Design

Based on this basic social characteristic, we propose a home-aware community model. Mobile users with the common interest autonomously form a community, in which the frequently visited location is their common "home". Moreover, like we assume that each home supports a real or virtual throw box a local device that can temporarily store and transmit messages.After careful analysis the system has been identified to have the following process:

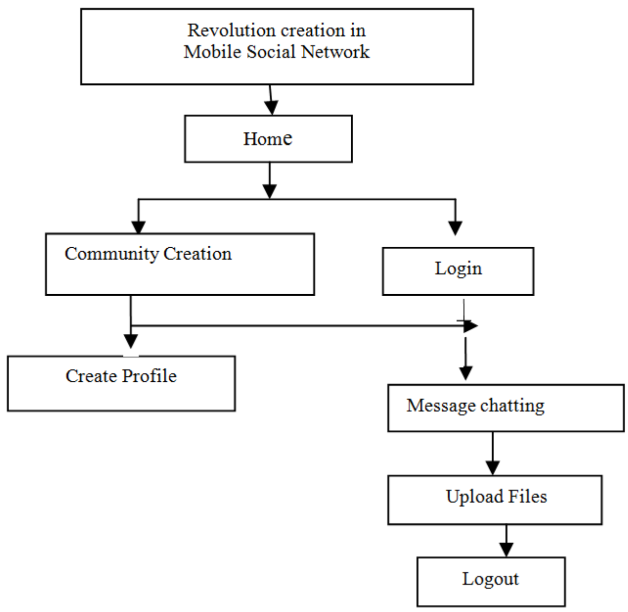

Figure 3.2 overall flow chart

Registration

In this module, the new users can register their names and previously registered users can enter into the work. The admin only can enter in admin login and do the registration of the user.

Password Manager

In this module, if the password is known to all, then the password will be changed by the administrator in respective of the user. Also this is used for security purpose.

Mobile Social Network Module

Mobile social networks (MSNs) are a special kind of delay tolerant network (DTN), in which mobile users move around and communicate with each other via their carried short-distance wireless communication devices. Recently, some social-aware routing algorithms that are based on social network analysis have been proposed. Two key concepts in social network analysis are: (i) community, which is a group of people with social relations; (ii) centrality, which indicates the social relations between a node and other nodes in a community. Based on the two concepts, these algorithms detect the communities and compute the centrality value for each node. Messages are delivered via the nodes with good centralities.

Building Home Aware Community Module

A home-aware community is a community of nodes that frequently visit a given home. The frequently visited home is the common home of the community members, i.e., the community home. Moreover, if a node visits several homes frequently, it can belong to multiple communities and have multiple homes. The whole network is composed of some overlapped star-topology communities, as community can easily be detected. Each community exactly contains a group of nodes that have the common interest to the community home.

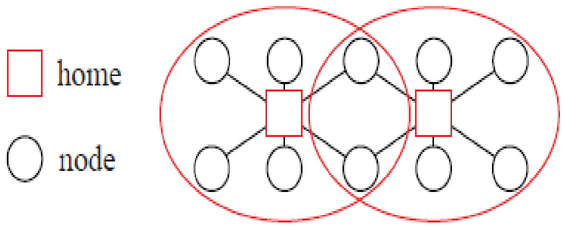

Figure 3.1 : Home-aware Communities

Delay Tolerant Network Module

A Delay-Tolerant Network (DTN) is a general-purpose over- lay network that operates on top of varying regional networks, including the Internet. DTNs allow regional net- works with varying delay characteristics to interoperate by providing mechanisms to translate between their respective network parameters. Therefore, the underlying protocols and technologies for these regional networks may differ considerably, but the flexibility of the DTN architecture allow s them to be connected to each other.

Opportunistic Routing Module

We adopt the optimal opportunistic routing scheme by maintaining an optimal relay set for each home. Each home only forwards its message to the node in its optimal relay set and ignores other relays. Since this scheme solves the problem of whether a home should select a visited node as the relay of message delivery or ignore this visited node to wait for those better relays, it can achieve the optimal performance. The optimal opportunistic routing scheme means that each message sender delivers messages via its optimal relay set (i.e., delivers messages via the first encountered relay in this set). The key problem is to determine whether a relay belongs to the optimal relay set for each message sender.

User Log Status

Today's enterprises use multiple domain controllers in their Active Directory based network. The data synchronization between multiple domain controllers happens at regular intervals, mostly once a week. In this case, the user logon details retrieved from a domain controller may not reflect the current data. Moreover, it is limited as it only provides the user name and their last logon time.

User Logon Reports provides the detailed information about the users' login details along with their history. This agent-based report are more accurate and also provides the details of the user, their logon time, logoff time, the computer from which they logged on, the domain controller they reported, etc., along with their logon history.

IV. CONCLUSION

In this thesis, we model an MSN into some overlapping home-aware communities, simplify the routing problem among many mobile nodes into the problem among some static communities, and propose the CAOR algorithm to achieve optimal opportunistic routing. Through theoretical analysis, we find out that optimal opportunistic routing only depends on a few nodes in the network. A change in behavior of most nodes would not affect the routing performance. We can thus achieve the optimal routing performance at a very low maintenance cost. Compared with previous social-aware algorithms, the optimal and predictable routing performance is the biggest advantage of the CAOR algorithm.

REFERENCES

[1] A. Doria, M. Uden, and D. P. Pandey, Providing connectivity to the saami nomadic community, in Proceedings of the 2nd International Conference on Open Collaborative Design for Sustainable Innovation (dyd 02), Bangalore, India, Dec 2002.

[2] A. Pentland, R. Fletcher, and A. A. Hasson, A road to universal broadband connectivity, in Proceedings of the 2nd International Conference on Open Collaborative Design for Sustainable Innovation (dyd 02), Bangalore, India, Dec 2002.

[3] G. E. Prescott, S. A. Smith, and K. Moe, Real-time information system technology challenges for NASAs earth science enterprise, in

Proceedings of The 20th IEEE Real-Time Systems Symposium, Phoenix, Arizona, Dec 1999.

[4] P. Juang, H. Oki, Y. Wang, M. Martonosi, L. S. Peh, and D. Rubenstein, Energy-efficient computing for wildlife tracking: design tradeoffs and early experiences with zebranet, in Proceedings of ACM ASPLOS, 2002.

[5] Disruption tolerant networking, http://www.darpa.mil/ato/solicit/DTN/.

[6] J. Ott and D. Kutscher, A disconnection-tolerant transport for drive-thru internet environments, in Proceedings of IEEE INFOCOM, 2005.

[7] G. W. Boehlert, D. P. Costa, D. E. Crocker, P. Green, T. OBrien, S. Levitus, and B. J. Le Boeuf, Autonomous pinniped environmental samplers; using instrumented animals as oceanographic data collectors, Journal of Atmospheric and Oceanic Technology, vol. 18, no. 11, pp. 18821893, 2001, 18 (11).

[8] T. Small and Z. Haas, The shared wireless infostation model - a new ad hoc networking paradigm (or where there is a whale, there is a way), in Proceedings of The Fourth ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc 2003), June 2003, pp. 233244.

[9] K. Fall, A Delay-Tolerant Network Architecture for Challenged Internets, SIGCOMM, August 2003.

[10] A. Beaufour, M. Leopold, and P. Bonnet, Smart-tag based data dissemination, in First ACM International Workshop on Wireless Sensor Networks and Applications (WSNA02), June 2002.

[11] W. Vogels, R. V. Renesse, and K. Birman, The power of epidemics: Robust communication for large-scale distributed systems, In Proceedings of HotNets-I’02: First Workshop on Hot Topics in Networks, special issue of the ACM SIGCOMM Computer Communication Review, Princeton, NJ. October 2002.

[12] P. Zhang, C. M. Sadler, S. A. Lyon, and M. Martonosi, Hardware design experiences in zebranet, In Proc. ACM SenSys, pages 227238, 2004.

[13] M. Motani, V. Srinivasan, and P. Nuggehalli, PeopleNet: Engineering a Wireless Virtual Social Network, In Proc. ACM Mobicom, pages 243257, Aug. 2005.

[14] J. Partan, J. Kurose, and B. N. Levine, A Survey of Practical Issues in Underwater Networks, In Proc. ACM WUWNet, pages 1724, Sept. 2006.

[15] Z. Zhang, Routing in intermittently connected mobile ad hoc networks and delay tolerant networks: overview and challenges, Communications Surveys & Tutorials, IEEE, vol.8, pp. 24-37, 2006.