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# Efficient Forwarding Protocol to Tolerate Selfish Behavior in Social Mobile Network

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***Abstract*— Nodes should accept to use their own energy and bandwidth just to carry other people's messages. One fundamental and natural question, especially in this setting, is why nodes should do the above function. Present two forwarding protocols for mobile wireless networks of selfish individuals. Assume that all the nodes are selfish and show formally that both protocols are strategy proof, that is, no individual has an interest to deviate. Improve performance by reducing the number of replicas and the storage requirements. Extensive simulations with real traces show that these protocols introduce an extremely small overhead in terms of delay, while the techniques introduce to force faithful behavior have the positive and quite a surprising side effect to improve performance by reducing the number of replicas and the storage requirements for the node. Test this protocol also in the presence of a natural variation of the notion of selfishness nodes that are selfish with outsiders and faithful with people from the same community. Even in this case, these protocols are shown to be very efficient in detecting possible misbehavior.***

***Index Terms*—Dijikstra Algorithm, Epidemic Forwarding, Delegation Forwarding.**

## I. INTRODUCTION

### *A. OVERVIEW OF PROJECT*

Mobile social networking is social networking where individuals with similar interests to converse and connect with one another through their mobile phone and/or tablet. Andreas Kaplan defines mobile social media as "a group of mobile marketing applications that allow the creation and exchange of user generated content". Much like web-based social networking, mobile social networking occurs in virtual communities. A current trend for social networking websites, such as Facebook, is to create mobile apps to give their users instant and real-time access from their device. In turn, native mobile social networks have been created like Foursquare and Gowalla, communities which are built around mobile functionality. This was a precursor to 802.11i defined by an industry group as an interim measure while waiting for 802.11i to be ratified. [2] WPA specifies a subset of the requirements found in 802.11i and is designed for implementation on legacy hardware. Specifically WPA requires only the TKIP cipher that is derived from the original WEP cipher. 802.11i permits use of TKIP but also requires support for a stronger cipher, AES-CCM, for encrypting data. As a result, G2G Epidemic Forwarding and G2G Delegation Forwarding, besides providing robustness in a network where every node is selfish, have nearly the same delay and success rate of their original alter egos, and have a considerably lower cost in terms of the number of replicas (around 20 percent less). Moreover, perform a detailed study of the memory load required by all these protocols. [1] To the best of this knowledge, this is the first time such a detailed study is performed. Measure the cost generated by each protocol by computing the average storage requirements to forward one message. These experimental results show that this G2G protocol, aside providing tolerance to selfish behavior, require considerably less storage than their vanilla alter-egos in almost all cases, even including the overhead due to signatures and other information used by the G2G mechanisms.

## II. RELATED WORK

### *A. Controlled Epidemic Routing for Multicasting in Delay Tolerant Networks*

Delay tolerant networks (DTNs) are a class of networks that experience frequent and long-duration partitions due to the sparse distribution of nodes. DTN multicasting is a desirable feature for applications where some form of group communication is needed. The topological impairments experienced within a DTN pose unique challenges for designing effective DTN multicasting protocols. [3] In this paper, examine multicasting in DTNs using controlled flooding schemes. Specifically, analyze basic multicast routing schemes for fundamental performance metrics such as a message delivery ratio, message delay, and buffer occupancy. Further, study the effects of different controlled Epidemic routing schemes using TTL and message expiration times. Provide analytical results for performance metrics and perform extensive evaluations of these proposed methods. [3] This experiment show that this analytical results are accurate and that with careful protocol parameter selection it is possible to achieve high delivery rates for various system scenarios. Although multicasting, or routing in general, has been studied extensively in the Internet and mobile ad hoc networks (MANETs), routing in DTNs remains to be challenging problem due to long delays and frequent partitions. Since there may not exist an end-to-end path in DTNs, both proactive and reactive routing schemes fail to work. Proactive routing schemes, where nodes try to keep up to date routing information for other nodes, may fail to converge while producing a lot of periodic update packets. In reactive routing schemes, where routing information is obtained on demand, nodes mail fails to find a path to the destination.

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### *B. Multicasting in Delay Tolerant Networks: Delegation Forwarding*

Delay tolerant networks (DTNs) are a kind of wireless mobile network, which may lack continuous network connectivity. [4] Multicast supports the distribution of data to a group of users, a service needed for many potential DTNs applications. While multicasting in the Internet and mobile ad hoc networks has been studied extensively, due to the unique characteristic of frequent partitioning in DTNs, multicasting in DTNs is a considerably different and challenging problem. It not only requires new destinations of multicast semantics, but also brings new issues to the design of routing algorithms. In this paper, propose new forwarding models for DTNs multicast and develop several multicast forwarding algorithms. Use delegation forwarding (DF) in DTNs multicast and compare it with single and multiple copy multicast models, which are also designed by us. The effectiveness of this approach is verified through extensive simulation.

### *C.TWOACK: preventing selfishness in mobile ad hoc networks*

Mobile Ad hoc Networks (MANETs) operates on the basic underlying assumption that all participating nodes fully collaborate in self-organizing functions. However, performing network functions consumes energy and other resources. Therefore, [5] some network nodes may decide against cooperating with others. Providing these selfish nodes, also termed misbehaving nodes, with an incentive to cooperate has been an active research area recently. In this paper, propose two networks-layer acknowledgment-based schemes, termed the TWOACK and the S-TWOACK schemes, which can be simply added-on to any source routing protocol. The TWOACK scheme detects such misbehaving nodes, and then seeks to alleviate the problem by notifying the routing protocol to avoid them in future routes. Details of the two schemes and this evaluation results based on simulations are presented in this paper have found that, in a network where up to 40% of the nodes may be misbehaving, the TWOACK scheme results in a 20 % improvement in packet delivery ratio, with a reasonable additional routing overhead. Mobile Ad Hoc Network (MANET) can be described as an autonomous collection of mobile nodes (users) that communicate over relatively low capacity wireless links, without a centralized infrastructure. In these networks, nodal mobility and the wireless communication links may lead to dynamically changing and highly unpredictable topologies. All network functions such as routing, multi-hop packet delivery and mobility management have to be performed by the member nodes themselves, either individually or collectively. So, network performance becomes highly dependent on the collaboration of all member nodes.

## III. EXISTING SYSTEM

The problem of building mechanism and protocols that can tolerate selfish behavior is an important and modern issue in the design of networking protocols and distributed systems. Earlier work has been done to mitigate the impact of selfish behavior in mobile ad hoc networks as well. The solutions can be classified into two main approaches. Reputation-based schemes and credit based schemes. In the former schemes, nodes collectively detect misbehaving members and propagate declarations of misbehavior throughout the network. Eventually, the other nodes will avoid routes through selfish members. [1] In a credit-based approaches, nodes pay and get paid for providing service to others. The digital cash system is implemented in order to encourage correct behavior among nodes. In a combination of the two schemes are presented. All these solutions assume the use of public key cryptography for authentication of messages. Regardless of the performance of these schemes for ad hoc networks, none of them is designed for social mobile networks. Indeed, no previous work is neither designed with a social mobile scenario in mind, nor exploits the social nature of the network or the properties of the movement that such social nature generates. Recently, Buttya´n et al introduced a barter-based cooperation system to increase the message delivery rate in opportunistic networks. [4] The authors assume that altruistic static nodes scattered in the network area generate messages downloadable by interested network members in physical proximity. When two nodes meet, they exchange the list of the messages in their buffers and each node decides to download from the other node only the messages of its interest. Then, the nodes start downloading messages till they move out, each other's communication range. A game theoretical model helps the authors prove that the approach foster cooperation. They support their findings with extensive simulations done with the restricted random waypoint model and the Simulation of Urban Mobility SUMO. [6] Though it introduces a novel technique of stimulation of cooperation, their work is oriented to a gossip like service, where messages are created from special nodes and many other nodes are interested in downloading them, which is a natural incentive for the distribution. COFFEE is an interesting mechanism to enforce cooperation among nodes in wireless networks. However, the solution relies on fixed and known-in-advance routes among nodes. Indeed, it uses the DSR routing protocol, which is shown to be inapplicable in a dynamic, delay tolerant setting such as pocket switched networks. In the authors study the impact of different degrees of cooperation among the nodes on the performance of Epidemic Forwarding, Binary Spray Wait, and the Two-Hop relaying algorithm. A recent work presents a routing mechanism built upon the willingness (declared by each individual) to forward other individuals' messages. In the authors' study for the first time the impact of different distributions of altruism on the throughput and the delay of mobile social communication systems. They show that, when forwarding algorithms that use multiple paths are considered, social mobile networks are robust to different distributions of altruism of nodes. To the best of this knowledge their work is

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the first study aimed to explore altruistic/selfish behavior in these types of networks and encourages for further work in this direction. Pocket Switched Networks are usually disconnected, are characterized by social-based mobility and heterogeneous contact rate. [5] Examples of such networks include people at work places, students on university campuses, and citizens in metropolitan areas. Possible application scenarios of PSNs include bringing connectivity to rural areas and enabling services such as e-governance, citizen journalism, etc. The problem of designing efficient forwarding protocols for PSNs has attracted the attention of many researchers. In forwarding protocols, messages are routed from source to destination thanks to intermediate relays.

### *A. Limitations of Existing System*

- Storage requirements are more.
- Unable to minimize the replica nodes.
- Nodes deviate the messages.

## IV. PROPOSED SYSTEM

Propose two efficient protocols for mobile wireless networks of selfish individuals. The protocol improves the performance by reducing the number of replica nodes and storage requirements. The central authority is introduced to handle new nodes joining and signs new nodes certificate, in this way can identify the replica nodes in the network introduce Give2Get (G2G) Epidemic Forwarding and Give2Get Delegation Forwarding, which are, to the best of this knowledge, the first protocols for packet forwarding in a social mobile setting that leverage on the social aspects of the network to tolerate the selfish behavior: friend nodes meet with high frequency. This helps us showing formally that no rational node has any incentive to deviate. In other words, these two protocols are strategy proof, i.e., the strategies of following the protocols are Nash Equilibrium. However, for simplicity will use the words protocol and strategy (to follow that protocol) interchangeably. In the paper, describe this methodology and the main steps, the mechanisms, and the ideas that have used to build the complete proof.

- Replica nodes are identified by the central nodes.
- Epidemic forwarding protocols make the selfish nodes to transfer messages.
- Pure trust nodes are identified by ingress and egress filter.
- Performance is reduced due to less storage requirements.

### *New node joining to CA*

In this system nodes that join and leave are handled by a central authority. The authority handles new nodes joining the network in a standard way: It identifies the new node an it signs the new node's certificate (or the master public key is handed out to the node in case of an identity-based public key system). Central authority updates the information about each node. The shared key is generated for each node in order to access the information.

### *Selfish node creation*

In this system model, every node is selfish. This is a realistic scenario, if people can get the same level of service without using part of their battery or part of their wireless uptime or memory without any consequence, they will. As the first user finds a way to get more (or the same) while paying less, and publishes the patch of the system software, everybody will download the patch and use it. So, it is reasonable to assume that, if some of the nodes deviate selfishly, after a while everybody will. Also assume that selfish node do not collude All the nodes in the system are interested in receiving and sending messages, in other words, all the nodes are interested in staying in the system. Nodes are loosely time synchronized. Loose time synchronization is very easy to get, if a precision on the order of the second is enough, like in this protocol. Assume that every control message of these protocols is labeled with a time stamp, though it does not appear in the protocols to keep the presentation clean. Lastly, nodes are capable of making use of public key cryptography this capability will be used to sign messages and to make sender to destination encryption. Therefore, assume that every node has a public key and the corresponding private key.

### *Data sharing between selfish nodes*

The nodes in the social mobile network want to share information from the neighbor node, but all the nodes are selfish nodes. Even though the nodes are selfish the two forwarding protocols deliver messages to the respective nodes. The source node selects the destination node to access the information from that node. It encrypts the message along with the destination and sends to the neighbor node.

### *G2G epidemic forwarding*

Once the message is generated, the sender S tries to relay it to the first two nodes it meets. When node S meets node B, node S starts a session with the possible relay by negotiating a cryptographic session key with node B. This is easily and locally done by using the certificates of the two nodes, signed by the trusted authority. In this way, both identities are authenticated. Only when two proofs are collected the message can be discarded from B's memory. After a time-out, B can stop looking for relays and can discard every information regarding the message. In turn, node A can discard the token TAB, in case a test phase between the two nodes is executed. Time-out plays the role of the message time to live (TTL) in Epidemic Forwarding. Therefore, it should be chosen in such a way that the success rate is high enough. This experiment shows that the delay of G2G Epidemic Forwarding is very close to the delay of Epidemic Forwarding, and so can be chosen as in its original alter ago without affecting the success rate.

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***Delegation forwarding***

Delegation Forwarding is a class of protocols that have been shown to perform very well. In Delegation Forwarding, every node is associated with a forwarding quality, that may depend on the destination of the message at stake. When a message is generated, it is associated with the forwarding quality of the sender. Then, the message is forwarded from node to node, creating a new replica of the message at each step, according to the following protocol. When a relay node A gets in contact with a possible further relay B, node A checks whether the forwarding quality of B is higher than the forwarding quality of the message. If this is the case, node A creates a replica of the message, labels both messages with the forwarding quality of node B, and forwards one of the two replicas to B. Delegation Forwarding, in many of its flavors, has been shown to reduce considerably the cost of forwarding (that is, the number of replicas), without reducing considerably success rate and delay. However, just like Epidemic Forwarding, it is far from being a Nash equilibrium. A selfish node can easily send messages and receive messages without taking care of relaying any other message. It is also easy to see that it is not enough to translate all the techniques used in G2G Epidemic Forwarding in order to get a version of Delegation Forwarding that is a Nash equilibrium.

***Validation of deviated nodes***

If the source node wants to know whether the message has been reached to the destination in between the selfish node's network environment. Source node can ask the central authority, this authority maintains information for each node . By validating the information the source node will able to know whether the information has been reached to the destination node.

## V. CONCLUSION & FUTURE WORK

Smart phones are used by people not only technology geeks to communicate, to use applications once, run only by desktops, and to organize their life. Typically, these devices can communicate with each other over short distances by using wireless technologies. But a question arises that why nodes should waste their own energy for people needs, considering in that mind presented epidemic forwarding and delegation forwarding protocols under the assumption that all the nodes in the network are selfish. Again we ensure the the trust of every nodes by ingress and egress filter. It minimizes the replica nodes and storage requirements by improving its performance in terms of success rate and delay. Refine the approach by presenting a Dijikstra algorithm to find the shortest path for neighbor nodes so that reduce delays in the node for data transfer.

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