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A Survey on Mobile Ad-hoc Social Networks for Efficient Data Query in Intermittently Connected System

Gowdiperu Sucharitha[1], Srinivas Aluvala[2], Deepika Vodnala[3], Nagendar Yamsani[4]

[1]Masters Student [CSE], Dept. of CSE, SR Engineering College, Warangal, India

[2,3,4]Assistant Professor, Dept. of Computer Science and Engineering, SR Engineering College, Warangal, India

ABSTRACT: To enable data query in Mobile Ad Hoc Networks (MASONs) formed by mobile users who share their common interests by connecting with each other using Bluetooth or Wi-Fi connections we introduce an efficient method. Our main aim is to determine optimization in transmission within a delay budget and minimizes total communication cost.

KEYWORDS: Data Query, Mobile Ad Hoc Social Networks, Centralized Optimization Model, Distributed Protocol, Testbed Experiment, Simulations

I. INTRODUCTION

A Mobile Ad-hoc (Latin means "For This Purpose") Network (MANET) is a continuously self-arranging infrastructure-less mobile devices network which is connected without wires.

Each device in a MANET moves freely in any direction, and changes its links to other devices frequently. Each device forwards traffic which is unrelated to its own use, and be a router. The main challenge in building MANET is to supply necessary items to each device continuously to maintain the information required to route traffic in a proper manner, these networks can be operated by themselves or connect to larger internet. They may contain one or more varied transceivers between the nodes and this result in a highly dynamic and autonomous topology.

MANETs are "Wireless Ad Hoc Network" that has a networking environment which is routable on top of the "Link Layer Ad Hoc Network". MANETs consists of a peer-to-peer, self forming and self-healing network.

Social networks like Facebook, Twitter, LinkedIn and Google+ has become popular in online.

Social communities have an explosive growth in recent years. Unlike to the popular web based online social networks that depend on the Internet infrastructure for communication, We focus on Mobile Ad-hoc Social Network (MASON), an autonomous social network which is formed by mobile users who share their common interests by connecting with each other through Bluetooth and/or Wi-Fi connections of their portable devices.

A MASON is frequently created for a local community where the participants have regular interactions, e.g., people living in an urban area, students studying in a college. Its size varies from a large group (for instance, all the students in a university) to a small cluster (such as members of a school band).

II. EXISTING SYSTEM

MASON (Mobile Ad Hoc Social Network) is an autonomous social network which is formed by mobile users who share their common interests by connecting with each other by using Bluetooth or Wi-Fi connections of their mobile.

An individual MASON is totally different with online social networks in terms of number of participants, social connections and the amount of social media used.

MASON serves as an extra element which enhances and augments to online social networks, local ad hoc social networks. It helps to find and update social links that are not identified by online social networks and allows a user to query localized data such as local knowledge, contacts, and news etc. that people do not bother to report online websites. But keeps on their portable devices and send upon a request.

- A query issuer creates a query.

- Query is delivered to the nodes that can provide an answer called as "Data Provider" by the network.
- It sends the reply to the query issuer, if the data provider receives the query.

III. PROBLEMS IN EXISTING SYSTEM

A. *Opportunistic link connectivity*:

The connectivity in MASONs is very low and intermittent which forms a thinly scattered network where a node is connected to other nodes only occasionally unlike online social networks, where users always have reliable Internet connections. Due to the loose connectivity among nodes the data delivery delay in MASONs is low.

B. *Autonomous computing and storage:*

Unlike Online social networks MASONs do not have central servers to store and process user data, where individual portable devices must perform distributed data storage and computation.

A portable device has limited computing, storage and energy capacity. It is a disadvantage to MASONs, as a node must process data in a distributed manner and store them locally for much longer time before sending them to another node due to intermittent connectivity.

C. *Unknown or inaccurate expertise:*

When a node issues a query, it is unaware of the nodes that have sufficient expertise to answer the query. A mobile node hardly knows its probability to answer queries in each category precisely. It may claim its expertise based on user's social roles and available resources. But claimed expertise is often inaccurate.

IV. OUR CONTRIBUTION

We propose a centralized optimization model which develops a distributed data query protocol. Distributed data query protocol is based on two techniques in MASONs.

A. *Reachable Expertise:*

The delivery of query depends on a "routing metric", which is updated regularly and maintained separately itself. We introduce a metric i.e., "Reachable Expertise" which guides transmission. Each node has certain expertise to answer a query.

We assume E_i^c in our analysis. Let E_i^c denotes the expertise of Node i to answer a query in Category c. It is important to define the expertise properly, because a mobile node hardly knows whether it has the probability to answer the queries in each category. Initially it may state its expertise based on the mobile user's professions, interests and resources available. But the expertise which is stated initially is often inaccurate. Therefore, after initialization, the expertise should be updated according to the feedbacks from other nodes, especially the query issuers.

B. *Redundancy Control*:

The delivery of a query is directed by the group of reachable expertise, where the query is forwarded from the node with a lower group of reachable expertise to the node with a higher one. When compared to the store and forward data transmission method where a single copy of data is transmitted across the network, redundancy is regularly employed in opportunistic networks. Redundancy is important to achieve the desired query delivery rate and should be properly controlled as high amount of redundancy may exhaust network capacity and degrades the performance.

V. ADVANTAGES

A. *The practicality and efficiency of the data query protocol is increased:*

To explain the practicality and efficiency of the proposed data query protocol we have done a testbed experiment using Dell Streak tablets and developed a prototype system by using Dell Streak 5 and 7 tablets that are of the Smartphone/tablets PC hybrid operating on Android 2.2. The communication between the tablets is activated by using Bluetooth and standard Android APIs.

We compare several variations using 0-hop, 1-hop and 2- hop scheme .The 2-hop scheme achieves the highest query rate whereas 1-hop scheme has lower query rate as the node only tries to answer the query upto one relay .The 0-hop scheme has the lowest query rate as a query can be answered only when the query issuer meets the data provider directly.

B. Minimized total communication cost:

We use a concept redundancy in routing following reachable expertise to direct the query transmission .Even if multiple copies of query request exists in the network, a node receives and forwards the same request only once. Using

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redundancy if a node crashes in middle there is no need of going back to the root node for the information, it can retrieve it from the previous node, minimizing the total communication cost.

VI. SYSTEM ARCHITECTURE

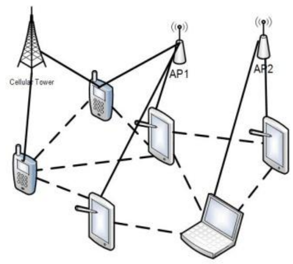

Fig. 1 . Example of Communication in MASON

VII. SYSTEM IMPLEMENTATION

MODULES:

A. *System Module:*

The communication in MASONs depends upon meeting events of nodes. The time interval between two consecutive meeting events between two nodes, we assume the communication delay dominate meeting intervals of nodes. The channel bandwidth is sufficient for two nodes meeting each other to exchange data packets with negligible delay.

B. *Protocol Design:*

Data query in MASONs is based on two key techniques.

a. First, it uses “reachable expertise” as the routing metric to direct the transmission of query requests.
b. Second, it uses the redundancy in query transmission. Redundancy should be controlled properly, as high amount of redundancy may degrade the performance.

C. *Routing with Dynamic Redundancy Control:*

Based on the routing metric, i.e., reachable expertise, we now introduce the routing algorithm. The delivery of a query is guided by the aggregated reachable expertise, where the query is generally forwarded from the node with a lower aggregated reachable expertise to the node with a higher one.

In contrast to the conventional store-and-forward data transmission where a single copy of data is transmitted across the network, redundancy is often employed in opportunistic networks.

Redundancy, it is important in practice to achieve the desired query delivery rate. Higher the redundancy, the higher probability the query is answered successfully.

However, redundancy must be properly controlled as excessive redundancy may exhaust network capacity and thus degrade the performance.

D. *Data query:*

Even though multiple copies of a query request exists in the network, but a node receives and forwards the same request only once. A naïve approach is to create a fixed amount of redundancy for each query. For example a predetermined number of copies of the query can be created and distributed to other nodes in the network.

This approach is often inefficient, because the fact, the effectiveness of redundancy highly depends on the reachable expertise of the nodes that carry the redundant copies. To this end, we introduce a parameter to dynamically reflect the “effective redundancy”.

VIII. CONCLUSION

To enable data query in Mobile Ad Hoc Networks (MASONs) formed by mobile users who share their common interests by connecting with each other using Bluetooth or Wi-Fi connections we introduce an efficient method and

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also proposed a centralized optimization model and developed a distributed data query protocol for practical which minimizes total communication cost and increases overall efficiency.

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BIOGRAPHY

Gowdiperu Sucharitha pursuing her Masters degree in Computer Science and Engineering (M.Tech) from SR Engineering College (Autonomous), affiliated to Jawaharlal Nehru Technological University, Hyderabad, Telangana, India. Her research interests are Computer Networks and Network Security.

Srinivas Aluvala received his Masters degree in Computer Science and Engineering (M.Tech) form Jawaharlal Nehru Technological University, Hyderabad, Telangana, India in 2010. He is Pursuing Ph.D. in the area of Mobile ad-hoc networks in KL University, Guntur, Andhra Pradesh, India. From 2007 to till date he is working as Assistant professor in the department of Computer Science and Engineering, SR Engineering College, Warangal, Telangana, India. His research interests are Computer Networks, Network Security and Mobile Ad-hoc Networks.

Deepika Vodnala received her Master of Technology degree in the stream of Software Engineering from Jawaharlal Nehru Technological University, Hyderabad, Telangana, India in 2011. She is pursuing Ph.D. in the area of Mobile ad-hoc networks in GITAM University, Hyderabad, Telangana, India. From 2012 to till date he is working as Assistant professor in the department of Computer Science and Engineering, SR Engineering College, Warangal, Telangana, India. Her research interests are Computer Networks, Network Security and Mobile Ad-hoc Networks.

Nagendar Yamsani received his Masters degree in Computer Science and Engineering (M.Tech) form Jawaharlal Nehru Technological University, Hyderabad, Telangana, India in 2009. From 2009 to till date he is working as Assistant professor in the department of Computer Science and Engineering, SR Engineering College, Warangal, Telangana, India. His research interests are Computer Networks, Network Security, Algorithms and Automata.