ISSN 2320-9984
Volume 3 Issue 2 | June 2015
ISSN: 2320-9984 (Online)
International Journal of Modern Engineering & Management Research
Website: www.ijmemr.org

A Cost Effective Novel Approach to Minimize Mobile Data Utilization Using Distributed Mobile Networking

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Abstract**—***Nowadays mobile devices have become data extensive. They need to be constantly connected to the internet and download lots of data. But most of the time, that data might be present at neighboring devices. This paper proposes a technique to minimize the need of using mobile data by fetching available data from devices around us. Our work presents a new approach in which mobile devices in an area connect to each other wirelessly and share available data whenever possible. The technique can greatly reduce the need to download remote content and thus reduce mobile data utilization.*

Keywords:—*Ad-hoc network; Indexed data; Distributed data sharing;*

1. INTRODUCTION

With the growing trend of smart phones and other mobile devices, the consumption of mobile data has increased tremendously. These devices continuously use internet accessibility provided by mobile network providers to download various contents from the internet, for example, music, videos, books etc. Most of the time, there is a high probability that the same data may be present on another mobile device around us. So, it would be convenient to get data that from the device rather than from the internet, thus saving internet charges. Furthermore, as the location of that particular file is in our network, the accessibility will be faster.

In this paper we propose the implementation of above idea by creation of mobile ad-hoc networks and data indexing. Mobile ad-hoc network or MANET is an infrastructure-less network in which all devices have the same status and act as routers to forward data. Their links with the neighboring devices change continuously as all devices are free to move in any direction. It is thus, a self-forming, self-healing network.

We shall use the concept of indexing of data of all neighboring devices. Indexing makes the data retrieval faster as it facilitates random access of data as opposed to the sequential one. Thus data accessing becomes efficient at the cost of some storage space.

This is an innovative approach because we are reducing the need of internet

accessibility and are promoting data sharing. With greater number of devices, this will be a very efficient method as a lot of network traffic can be avoided.

2. THE METHOD

Our algorithm to implement this approach considers a radius of about 5m from a particular mobile device. As soon as another device enters this radius, the two automatically form an ad-hoc network.

We categorize the data on every device into two parts: private data, that cannot be shared with other nodes of the network; and accessible data which shall be available for sharing. Our approach is concerned only with the latter.

We propose that as soon as a device enters the range of the other and a network is formed, the two devices index the accessible data present at the other one. Thus, each device now has knowledge of what the data is present at the other one. This data shall be referred to as indexed data of that device.

Whenever a query is made, the device will search at three levels: First, it will search if the data is present locally (cached from earlier searches or already existing). If not found, the query shall be searched for in the indexed information of the network. Upon a hit, the required data can be fetched from the particular node in the network. If in case the search fails, i.e., worst case, the search shall be made on the internet through mobile data.

Figure 1.1 depicts the idea of the network. It clearly explains the network structure and shows the idea of indexed data storage locally.

Figure 1.2 is a flowchart that explains the searching structure which we propose.

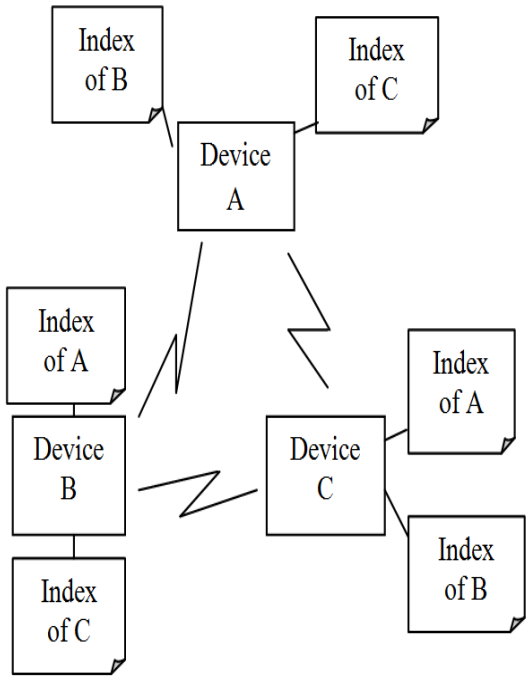

Figure 1.1: Network design

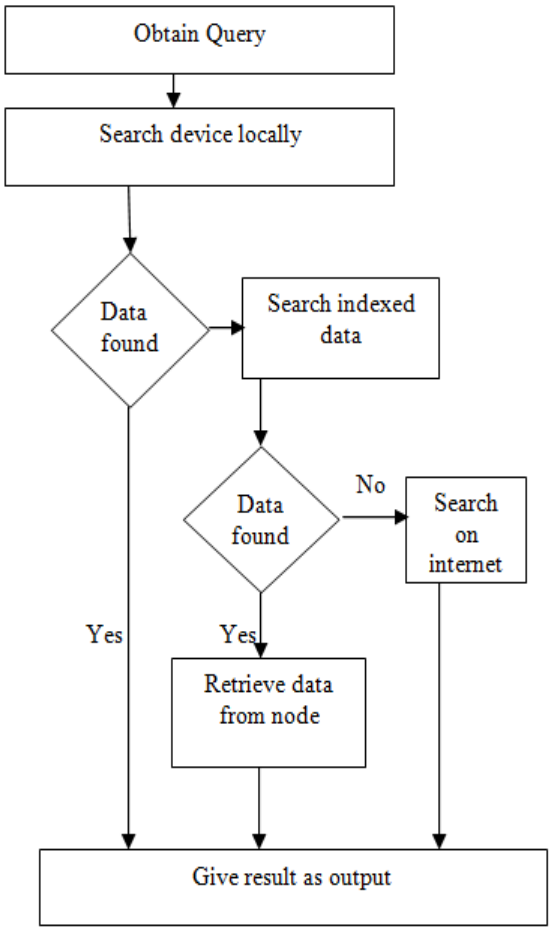

Figure 1.2: Flowchart representing searching structure

3. ALGORITHM

Let P = {P_1, P_2, P_3 ……. P_n} be the set of indexed data at neighborhood devices t_1, t_2, t_3….t_n respectively. Each of these contains information about data present at the surrounding devices which is accessible to others.

We use the following variables in the algorithm:

X: query to be searched for.

P_0: index of the data locally present at the device.

P_n: the indexed data of nth node of network.

n: number of devices in the network.

found: flag to indicate if data is found. Initially zero.

The algorithm can be as follows:

```
X = get_query();
if ((X = present_in(P0)) is true)
    {
        result = fetch(X from P0);
        output(result);
    }
    else
    {
        while (i < n)
    {
    if ((X = present_in(Pi)) is true)
    {
        result = fetch(X from Pi);
        output(result);
        found = 1;
        break;
    }
    }
    if (found == 0)
    {
        result = fetch(X from internet);
        output(result);
    }
    }
```

4. CONCLUSION

This paper presents a peer-to-peer distributed method for efficient data retrieval. We first create an ad-hoc network of the mobile devices present locally. Then we create an index of accessible data present on them.

If in case the required data is present on these local devices, it can be retrieved efficiently. Finally, we give the algorithm to implement this approach.

Though some space is required for storing the indexed data, but the efficiency of the searching greatly increases. Furthermore, utilization of mobile data is reduced.

Future work includes the implementation of security related features and reducing the size of indexed data on the basis of availability.

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