CAPACITY CRUNCH: CAN MoSoNets OFFLOAD DATA SOLVE THIS

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Abstract:

Due to the increasing popularity of various applications for smart phones, 3G cellular networks are currently overloaded by mobile data traffic. Offloading mobile cellular network traffic through opportunistic communications is a promising solution to partially solve mobile data traffic, because there is no monetary cost for it. To solve this problem we propose target-set selection problem for information delivery in the emerging Mobile Social Networks (MoSoNets). We propose to exploit opportunistic communications to facilitate the information dissemination and thus reduce the amount of cellular traffic. Here, with only k mobile users we study how to select the target set, such that we can minimize the cellular mobile data traffic. In this scenario, initially the content service providers deliver information over cellular networks to only users in the target set. Then with the help of opportunistic communications, target-users will further disseminate the information among all the registered users. At last, service providers will send the information to users who fail to receive it before the delivery deadline (i.e., delay-tolerance threshold). Here we intend three algorithms, called Greedy, Heuristic, and Random, to solve data traffic over cellular mobile data traffic and then evaluate their performance through an extensive trace-driven simulation study. The simulation results check the efficiency of these three algorithms for both synthetic and real-world mobility traces. Moreover, to investigate the feasibility of opportunistic communications for mobile phones, we execute a proof-of-concept prototype, called Opp-Off, which utilizes their Bluetooth interface for device/service discovery and content transfer. Through this work we can improve performance, security, and cost of existing data traffic over network.

General terms: *Algorithm, design, implementation, performance, security, cost.*

Keywords: *Mobile communication, Cellular traffic offloading, 3G, target-set selection, opportunistic communications, mobile social networks, trace driven simulation.*

1. INTRODUCTION:

There is no doubt that the volumes of mobile communication is exploding beyond anyone's imagination and this is compounded by the widespread use of smart phones using novel platforms of Google's android, apple's ios and windows mobile platform virtually allowing them to take over almost all the functions of a computer for the average user.

The service providers are being overwhelmed by the sheer volumes of data that these phones generate and in a populous country like India where the bandwidth are auctioned service providers are forced to extract the maximum out of the existing frequencies. Therefore in this scenario we speak about cellular network, data offloading approaches, various kinds of algorithm to offload a data, both real time and non real time analysis of mobile data offload

Since mobile communication is the fastest growing field in the telecommunications industry, the cellular network is the most successful mobile communication system, cellular network's used to transmit both voice and data. Data diffusion over a cellular network is a novel service, which makes data networks accessible from mobile terminals via cellular phones. The cellular network system is one among many communication systems which facilitate mobility in communication. Systems accomplish mobility by making use of wireless network technology. Wireless networks make use of radio waves to transmit data.

1.1 Mobile communication systems currently in use as follows:

- ***Paging:***
  Paging is a simple and inexpensive form of mobile communication. An antenna/transmitter or satellite broadcasts short messages to subscribers. Receivers are more often devices

such as beepers which display messages on a small screen. Here transmission of data is one-way. Therefore paging systems are intended to provide reliable communication to subscribers wherever they are.

- ***Communication Satellites:***
  Satellites consist of large transponders out of which it listen to a particular radio frequency, intensify the signal, and then rebroadcast it at another frequency. Therefore they are inherently broadcast devices. A negative aspect of satellites is that they have quite a large propagation delay due to the distances traveled by radio waves.

- ***Cellular Radio Networks:***
  Cellular networks are called such because of the fact that a geographical area is divided into cells, each cell being serviced by one or more radio transceivers (transmitter/receiver). Communication over cellular network is full duplex. Full duplex communication is achieved by sending and receiving messages on two different frequencies called frequency division duplexing (FDD). The motive for the cellular topology of the network is to allow frequency reuse. Here Cells at certain distance apart can reuse the same frequencies; therefore the aim is to ensure the efficient usage of limited radio resources.
- ***Personal Handyphone:***
  Personal Handyphone stands for PHS; following System is used in Japan. It is similar to cellular networks; on other hand phones can also communicate directly with one another when it is in range, it is an advantage over cellular phones that can merely communicate with one another via base station transceivers. Therefore this system is very popular within heavily populated metropolitan areas.
- ***Mobile Radio:***
  Mobile radio is in many ways the predecessor of the cellular radio network. It is mostly analogue in nature, and makes use of single frequencies for sending and receiving signals. Here communication is half-duplex, and a key has to be pressed to switch between modes. Mobile radio is mostly used by applications for emergency services, such as the transport sector and security industry.

Since mobile communications systems are cellular in nature, where the cellular network is divided into a number of cells or geographical coverage; where within each cell or geographical coverage there is a base station called (BTS), which contains the radio transmission and reception equipment. Within the cell, the BTS provides the radio communication interface for mobile phones, therefore the coverage area of a known cell depends on a number of factors, like the BTS transmission power, the mobile communication power, the height of the BTS antennas or transmitter, and the topology of the landscape. The coverage of a cell is capable of ranging from 100 meters to tens of kilometers..

1.2 Mobile cellular network architecture

A number of BTS are connected to a Base Station Controller called (BSC), among other things the BSC handles the handoff of calls from one BTS to another as the mobile moves from cell to cell. The Mobile Switch Center (MSC) is connected to the BSC, also referred as Mobile Telephone Switch Office (MTSO). The MSC manages the setup and tear down of calls to and from mobiles. The MSC in addition interface with one or more Home Location Registers (HLR) where mobile subscriber's data is held and plays a critical role in mobility management including the tracking of mobiles as they move in the network; as mobiles move from MSC to MSC the HLR is notified in order for the call to be routed correctly[10].

1.2.1 Three Techniques Used In Cellular Mobile Network:

- **Frequency Division Multiple Access (FDMA)** FDMA is the simplest technique used in mobile communications for multiple-access. FDMA is a bidirectional system in which the bandwidth is divided into different channels and used for communication in each direction within each cell, channel of specified bandwidth is called as spectrum and a selection of these channels is used within a given cell. These channels can be reused in different cells which are apart; i.e channels are used in each direction, from BTS to mobile (downlink) and from mobile to BTS (uplink). Normally a fixed separation exists between the uplink and downlink frequencies, which is known as duplex distance; another technique used for the uplink and downlink management is the time division duplex (TDD) where only one channel is used for both uplink and downlink transmissions [10].
- **Time Division Multiple Access (TDMA)** TDMA differs from FDMA in the sense that it not only divides the bandwidth into smaller radio channels but also the channels into time slots allocating each mobile device in the cell a different time slot. The device will use the particular bandwidth only for the period of time slot after which it changes.

The difference between TDMA and FDMA is that in the TDMA system a given mobile does not have exclusive access to the radio channel [10].

- **Code Division Multiple Access (CDMA)** CDMA can cater to a large number of users for the same bandwidth by a novel technique called spread spectrum. In this each device is allotted a code specific to the device, the data transmitted by the device is much smaller than the bit rate sequence allotted to the device and the code allotted to the device identifies the device at the switching station. The disadvantage of CDMA is that it can accommodate only a set number of devices in that addition of each device creates noise in the system and when it reaches a critical level the system will not be able to filter out and identify each device.

The CDMA 2000, WCDMA, and TD-CDMA are version of CDMA systems, where CDMA 2000 and W CDMA being FDD-based systems. A major advantage of CDMA system's that eliminates frequency, hence CDMA is designed to deal with interference and also it allows a given RF carrier to be reused in every cell [10].

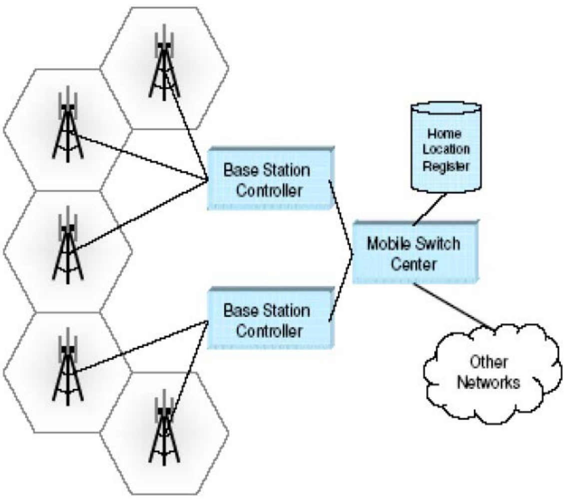

Figure 1: Mobile cellular Network [10]

Due to the ever-increasing demand for new applications i.e from last two decades, from first generation analog systems to present day third generation digital system which has lead to tremendous advances in cellular networks.

Here we are speaking about 3G cellular Networks, 3G networks are designed to deliver next-generation services with transmission rates beyond 2.5G systems that can support multimedia, data & video along with voice. UMTS, cdma2000, and EDGE support 3G services.

- The standard 3G communication technique called Universal Mobile Telecommunications System or UMTS offers high speed indoor data of 2 Mbps and is adopted as the standard by the European service providers.
- American service provider use CDMA 2000 as standard. This is similar to WCDMA but the devices are incompatible to each other.
- EDGE (Enhanced Data rates for GSM Evolution) provides data rates 3 times faster than GPRS using the same frequencies. It enhances the voice and data network as an evolution of GSM GPRS.

Mobile data traffic over 3G cellular network is growing exponentially, due to the rapid growth of smart phones and tablets, the data traffic on the networks is on the rise and also the popularity of data guzzling applications, social networking, video and online gaming will further drive data consumption creating tremendous strain on the networks so service providers or operators must manage their networks efficiently to meet consumer demand.

In order to optimize the usage of the network elements and the traffic flow, mobile data offload solutions enable the optimum utilization of network resources required. Data traffic offload can help operators reduce the traffic on their radio spectrum lowering the operating load on base stations.

Since, data offloading can help operators avoid signal choking and revenue loss, it is emerging as one of the best options to manage network capacity and load. A robust data offload solution can provide telecom operators with the flexibility to control data flow across the network based on traffic patterns, class of service and type of customers – enabling a better quality of service.

In addition, users can also have the flexibility to control the data traffic that they wish to offload based on the type of applications, their location or service type, helping them to handle their data allowances in a much better way.

There are six different options to offload data from the mobile network at either the access or the core network level. Each of these options can co-exist and the operator will have to determine the best option based on multiple factors such as current infrastructure, customer usage patterns, associated costs, deployment, maintenance complexities and user density in a particular location.

1.2.2 The six different mobile data offload options are:

1. Wi-Fi Hotspot

2. LTE Small Cells / Relay nodes

3. Integrated Femto / Wi-Fi

4. Direct Tunnel

5. Internet offloads Gateway (IOGW)

6. M2M Gateway

Service providers can select any option or a combination of options to offload data and reduce the strain on access networks depending upon the specific challenges in radio access, backhaul and core network. Availability of channels of a specified bandwidth, capacity and coverage area are the typical challenges faced by the operators that offloading solutions can help address. However, appropriate offloading strategies would depend upon operator's priorities, expansion plans and many other factors. Some solutions that operators can evaluate include:

- **Short Term Solution:** Deployment of Wi-Fi hotspots are commercially available, which is cost effective and easy to manage. However, as it is not a carrier grade solution and has limited coverage, it can only be utilized as a supplementary solution.
- **Medium Term solution:** Deployment of LTE small cells (Femto cells) as a carrier grade option in the licensed spectrum. A well-planned small cell deployment can prove effective in managing data growth, providing a long-term data offloading solution.
- **Potential Long-Term Solution:** Deployment of an integrated solution, such as hybrid Femto/Wi-Fi will utilize both licensed and unlicensed spectrum to address the capacity issues. However, since it is still in the development stage, operators will be able to explore this as a potential solution for the future.

As it has been mentioned before various data offloading options, their advantages challenges and operators benefits are shown in following references [1].(Figure 8 gives an overview of data offloading options).

The concept of data offloading is not new. Generic Access Network (GAN), better known by its commercial name Unlicensed Mobile Access (UMA), is a 3GPP standard released in 2005 and designed to enable access to GSM and GPRS mobile services over unlicensed spectrum, including Bluetooth and Wi-Fi. Mobile data offloading solution is a comprehensive solution that addresses the scalability, reliability, security and feasibility.

Here in this study for offloading data traffic, we are proposing opportunistic communications. Opportunistic communications is a promising solution to partially solve this problem (data traffic over cellular network), because there is no monetary cost for it. Intentionally we propose to delay the delivery of information over cellular networks and offload it through the free opportunistic communications, with the aim of reducing mobile data traffic over network. Here, we study the target-set selection problem as the first step toward bootstrapping mobile data offloading for information delivery in MoSoNets. The information that need to be delivered over mobile networks may include multimedia newspapers, weather forecasts, movie trailers, video, images etc., generated by content service providers.

Benefiting from the delay-tolerant nature of non-real-time applications, service providers may broadcast the information i.e. they disseminate data to only a small fraction of selected users i.e., target-users, to minimize mobile data traffic and also their operation cost.

With the help of target selection problem, target user then help to further propagate the information among all the subscribed users through their social participation, when users mobile phones are within the transmission range i.e coverage area of each other, therefore they can communicate opportunistically. Not only the target user, the Non-target-users can also disseminate the information further after they get it from target-users or others. The major advantage of mobile data offloading over cellular network is a promising approach, such that there is almost no monetary cost associated with opportunistic communications, which are recognized through either WiFi or Bluetooth technology.

❖ We investigate how to choose the initial target set with only k users, such that we can reduce the amount of mobile data traffic. We can translate this objective to make best use of the expected number of users that can receive the delivered information through opportunistic communications.

2. SYSTEM MODEL AND PROBLEM STATEMENT:

Here in this section, we are concentrating on, how to describe the system model of mobile social networks (MoSoNets) and target selection problem we propose to solve a mobile data offloading.[11]

2.1 Model of MoSoNets:

There are two types of connection in mobile social network

- Local connection
- Remote connection

Local connection: Local connection is nothing but short range communication, communicated through Bluetooth or WiFi. When two mobile phones are within the transmission range of each other, then their vendors may start to exchange information, even though they

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aren't familiar with each other. For Local connection, a contact graph can be created for disseminated data. [11]

Remote connections: Remote connection is nothing but long-range communications, communicated through EDGE, EVDO, or HSPA. This communication happens only between friends in real life. It may be used periodically, compared to the short-range communication. Here we can construct social graph for remote connection [11]

Since MoSoNets can be viewed as a "The Marriage of traditional social networks over novel approach called opportunistic communication method", we can make use of both types of connection to facilitate information dissemination in MoSoNets.

- Firstly, friends can actively forward (push) information whenever they want.
- Secondly, mobile users that are in contact can also pull the information from each other locally.

2.2 Problem statement:

We aim to study how to choose the initial set with only k users (target users), such that we can maximize the expected number of client users. The following number will be translated to decrease the cellular data traffic. If there are totally n subscribed users and m users finally receive the information before the deadline, the amount of reduced cellular data traffic will be

$$n-(k+(n-m)) = m-k.$$

For a given mobile user, the delivery delay is defined to be the time between when the service provider delivers the information to the k users until a copy of it is received by that user. If he or she fails to receive the information before their delivery deadline, the service provider will send the information to a user directly through cellular networks. How the information is propagated is determined by the behavior of mobile users and we exploit a probabilistic dissemination model in this paper. Pull probability is defined in such a way that mobile users pull the information from their peers during each of their contacts. But the value of pull probability p may not be the same for different types of information and may change as time goes on, that reflects the dynamics of information popularity. Once mobile users receive the information from either the service provider or their peers, they may forward it, through cellular networks (e.g., MMS, Multimedia Messaging Service), to their target users with probability q. usually, p > q, because users generally prefer the free opportunistic communications. Moreover, short-range communications usually consume much less energy than long-range ones [2]. We do not consider the push-based approach for opportunistic communications in this paper and leave it as a future work. The modeling of information dissemination through opportunistic communications can be viewed as a combination of three sub-processes. Firstly, in order to protect their privacy, mobile users have a complete control of whether or not to share a piece of information with their geographical neighbors and share it with probability p1. Secondly, mobile users may want to explore the information in their proximity only when they are not busy and mobile phones may not always be able to discover each other during the short contact duration. Thus they can find the meta-data of a piece of information with probability p2. Lastly, based on these meta-data, mobile users will decide whether to fetch information or not from their geographical neighbors and then pull it with probability p3. Which result in?

$$p = p1 \cdot p2 \cdot p3.$$

The information dissemination process in MoSoNets is similar to the information diffusion under the independent cascade model [5] of influence maximization [6] in social networks. In the independent cascade model, when a node u becomes active, it has a single chance to activate any currently inactive neighbor v with probability pu, v. In comparison, mobile users have the chance to pull/exchange information for every contact.

3. PROPOSED SYSTEM:

The System architecture consist of 2 parts

1. Proof of concept part
2. Simulation Part

3.1 Proof of concept

The software architecture of the proof of concept part is given below.

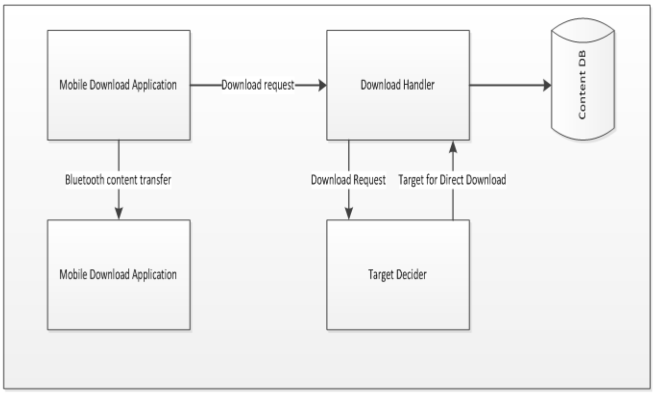

Figure 2: proof of concept

- Mobile download application is installed on an android handset. User raises their content request through this application. Also this application can share content via Bluetooth with peer application in other handsets located in Bluetooth coverage range.

- All users request comes to download handler module.
- Download handler module will send the requests to target decider to decide on the subset of mobile users to which content must be directly delivered. To those target users, the content will be directly delivered.
- Target decider will run the proposed 3 algorithms to decide the subset of mobile users.

For performance evaluation, we use mobility traces and the results is then analyzed with the help of trace-driven simulator. The simulator first loads contact events from real-world traces or based on the movement history (synthetic traces) it then generates contact events. It then replays the contact events for the given information dissemination. At the start of each contact, the simulator determines randomly whether a mobile user can get the information or not with the help of peer i.e pre -configured pull probability.

3.2 Simulation part

The software architecture of simulation part is shown below

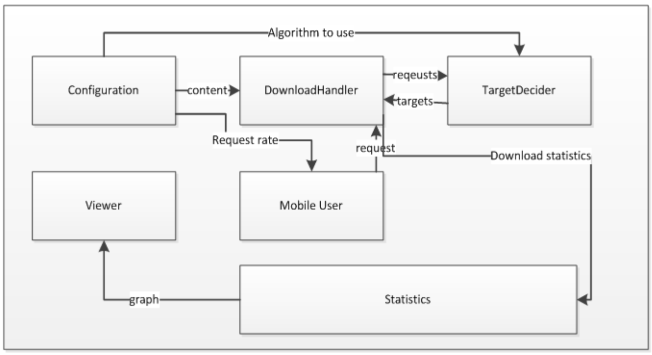

Figure 3: Simulation Part

- Configuration: This module will configure all the other modules. User will use it configure number of mobile user , request generation rate from the user, total contents at download handler , the algorithm to use at the target decider.
- Mobile user: will trigger request at the rate configured to the Download handler.
- Download Handler module along with Target decider module will decide the target mobile users to which content should be directly delivered.
- Statistics module: will collect details of number of direct download, number of offline downloads, average waiting time and use it to draw a performance graph.

4. DESIGN:

4.1 Data flow diagram:

The data flow diagram details the process and data flow in the system:

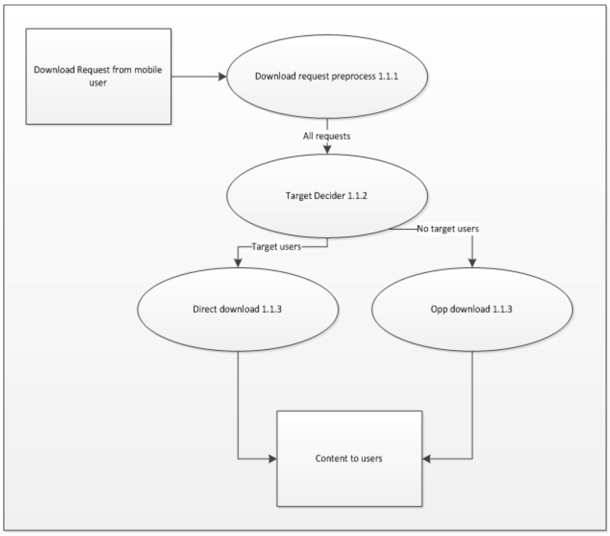

Figure 4: Data flow

4.2 Process View /sequence diagram

The goal of process view is the dynamic aspects of the system that explains the system processes and how they communicate, and focus on the runtime behavior of the system.

A) Direct download.
B) Opportunistic communication.

Direct download:

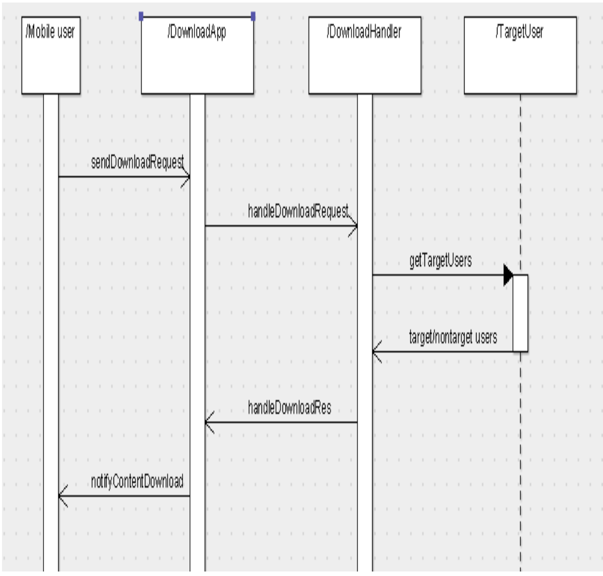

Figure 4: Direct download

Opportunistic download:

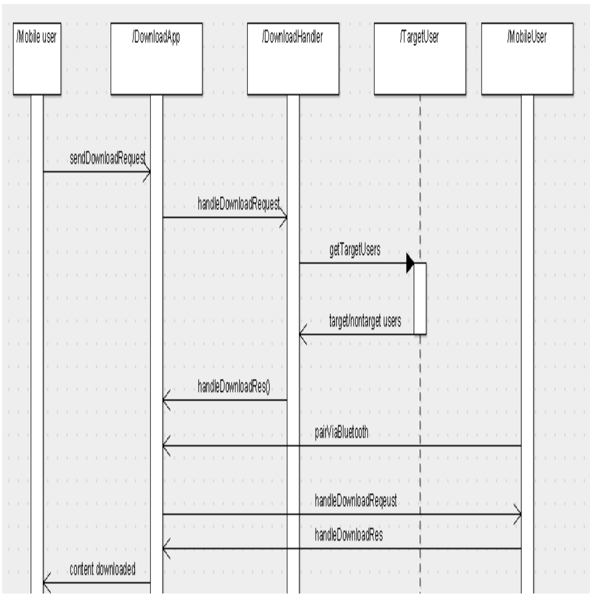

Figure 5: opportunistic download

5. IMPLEMENTATION

In this section, we evaluate the feasibility of opportunistic communications for moving mobile phones through a proof-of-concept prototype implementation that we built for the proposed information dissemination framework, called Opp-Off. In a latest work, Zahn et al. [9] investigate the content dissemination for devices mounted on moving vehicles. However, a very little work is done to examine, whether it is feasible to support opportunistic communications on mobile phones. Since it is hard to set up a proposed offloading solution on a large user base (e.g., more than 100 users), we focus on the feasibility of opportunistic communications between two mobile phones and evaluate the performance of proposed target-set selection algorithms through trace driven simulation for large data sets in later section.[11]

5.1 Bluetooth or WiFi

The two common local wireless communication technologies available on most smart phones are Bluetooth and WiFi (a.k.a., IEEE 802.11).

There are three major phases during opportunistic communications: **device discovery, content discovery, and data transfer.** Here we discuss how to support opportunistic communications using Bluetooth and WiFi separately.

The Bluetooth specification (Version 2.1) [3] defines all layers of a network protocol stack, from the base-band radio layer to top most application layer. It operates with 2.5 GHz frequency band, shared with other devices [7]. Thus, for channel access control Bluetooth uses Frequency-Hopping Spread Spectrum (FHSS) to avoid interference with coexisting devices. For two Bluetooth devices to discover each other, one of them (inquiring device) sends out inquiry messages periodically and waits for responses; another one (scanning device) listens to the wireless channels and sends back responses after receiving inquiries [5].

The duration of a Bluetooth time slot is 625μs. During the device discovery process, an inquiring device uses two channels of 16 frequency bands each; the 32 bands are selected based on a pseudo random scheme and the device switches channel at every 2.56 seconds. The inquiring device sends out two inquiry messages on two different frequency bands during each time slot and waits for responses on the same frequency bands during the next time slot. Two other parameters called scan window and scan interval, helps to control the duration and frequency of scanning devices. After receiving an inquiry message device will wait for 625μs (i.e., the duration of a time slot) before sending out a response on the same frequency band, which completes the device discovery process. To increase the device discovery probability and reduce the discovery time, an inquiry scan mode was proposed in Bluetooth Version 1.2.

Bluetooth defines a Service Discovery Protocol (SDP) to allow devices to discover services provided by others. Therefore SDP determines the Bluetooth profiles (e.g., Headset Profile and Advanced Audio Distribution Profile) that are supported by the devices. In order to identify each service, Bluetooth make use of 128-bit Universally Unique Identifier (UUID). Once a new service is installed by device, it will start registering its service with the local SDP server.

In order to discover services that are supported by other devices, a device can connect to their SDP servers and search through their service records. There are two types of commonly used Bluetooth transport protocols called 1**)** Logical Link Control & Adaptation Protocol (L2CAP). 2) Radio Frequency Communications (RFCOMM).

L2CAP is built upon Asynchronous and Connection-less Link (ACL) and multiplexes data transmissions from higher-level protocols and applications. Radio Frequency Communications (RFCOMM) is on top of L2CAP in the protocol stack. It is designed to emulate RS-232 serial ports and supports services similar to TCP. The data rate of Bluetooth Version 2.0 + EDR (extended data rate) is 3 Mbps and can be up to 24 Mbps for Version 3.0 + HS (high speed). Since the Bluetooth specification has more, we refer interested readers to Smith et al. [8] and Drula et al. [5] for detailed introduction of the Bluetooth protocol stack.

The key concepts of WiFi-based device discovery are well understood. IEEE 802.11 standard describe some operation modes along with infrastructure and ad hoc modes. Stations in these kinds of modes will periodically send out Beacon messages in order to announce the presence of a network. A Beacon message contains time stamp (for synchronization), interval, capacity information, service set identifier, etc. The default value of Beacon interval for WiFi device drivers is 100 ms. It need to be operated in ad hoc mode to support opportunistic communications over mobile interface, since they cannot form a network if they both operate in infrastructure mode. In addition sending out Beacon messages, they will also look into the wireless channels to discover peers. In order to allow two mobile phones to communicate with each other, they need to form an Independent Basic Service Set (IBSS). Compared to Bluetooth, there is no other service discovery protocol defined in IEEE 802.11 standard. Once connection is setup, mobile phones can exchange data using either UDP or TCP. The maximum data rate of WiFi is 54 Mbps for 802.11g IEEE standard and can be up to 600 Mbps (theoretically) for 802.11n IEEE standard.

Comparison of WiFi & Bluetooth:

- WiFi search will reduce battery life of a phone. Device tracing time interval is more compared to Bluetooth.
- Bluetooth inquiry will not drain battery life very quickly for discovering devices. It takes less Time to search device.
- Although WiFi can provide longer communication range and higher bandwidth, but it consumes high energy because of which it is not suitable for device discovery.
- Even though the Bluetooth suitable for device discovery, due to short range communication it's not adopted in most of the novel technologies.

Thus, the following comparison results indicate that Bluetooth may be a better candidate for Opp-Off than WiFi.

5.2 Opp-off

We implement a simplified version of Opp-Off using Bluetooth for two reasons.

- Firstly, as we have demonstrated that the energy consumption of WiFi scanning is much higher than that of Bluetooth inquiry.
- Secondly, Bluetooth is available on almost all the modern mobile phones. However, only relatively few smart phones have WiFi interface.

When mobile phones run Opp-Off, the program first starts a content server as a primary thread, and then the main part is a loop that performs device discovery using Bluetooth inquiry. Once two phones discover each other, the secondary thread called client will be started to connect to the content servers on the remote phones. Once connection is established, data transmission will take place until the content transfer is finished or the connection is broken (e.g., because they are not within the Bluetooth communication range of each other due to movement).In our current implementation, the inquiry duration is x seconds. For other Bluetooth parameters we make use of default values, such as scan window and scan interval.

In order to guarantee that the data transfer is not affected by inquiry procedure, the device discovery process will be skipped once the connection is established. That is, simultaneously the mobile phone cannot connect to multiple peers simultaneously. Note that the connection is of bi-directional type, for instance assume x's as a client and y's as a server. After x's client connects to y's server, x's server can still accept connections from y's client.

6. ADVANTAGES:

6.1 Solution Highlights:

- ***Network Optimization*** is achieved by offloading bandwidth-intensive data traffic onto lower cost, available Wi-Fi/Bluetooth networks wherever possible. Mobile operators can better allocate 3G network resources, by alleviating smart phone network congestion.
- ***Increase Customer Satisfaction*** by offering high-speed Wi-Fi/Bluetooth connection automatically at popular hotspot locations or open places without intervention or interruption of service. Because the following solution makes use of common technology that is available in mobile devices, so that customers need not upgrade devices.

- ***Centralized Access Point Management*** The access points can be managed remotely over the air from a central location by a server thus making manual and on site updating of access points obsolete.

6.2 For operators:

- Increases network capacity and coverage in high traffic areas through carrier Wi-Fi or Bluetooth.
- New revenue sources, supporting visitors, roaming, and future location based-services.
- It improves customer satisfaction and reduced churn.

6.3 For end-users

- It provides high service quality and high speed data rates.
- Mobile handset makes use of SIM credentials in order to connect automatically to the network.
- Provides secured access to data.

7. CONCLUSION:

Due to ever-growing popularity of smart phones, usage of mobile data is rapidly increasing; therefore 3G network is overwhelmed. The present challenge for service provider is to provide a reliable mobile data services by speeding the limited network resources that are available.

Mobile data offload is a robust solution ,which alleviates i.e. lessens 3G network congestion by leveraging existing technologies and infrastructures, we propose to offload mobile data traffic through opportunistic communications and investigate the target set selection problem for information delivery in MoSoNets. We propose three algorithms to solve mobile data traffic over cellular network, they are Random, Heuristic, and Greedy, and also with the help of three algorithm we evaluate their performance through trace-driven simulation, using both in real and non real world, (i.e. large-scale synthetic and real-world mobility traces).

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