Mobile Data Offloading Using Opportunistic Communication and AP Deployment: A Case Study

Sanjit Kumar Dash, College of Engineering and Technology, Bhubaneswar, India
Sasmita Mishra, Indira Gandhi Institute of Technology, Saranga, India
Jibitesh Mishra, College of Engineering and Technology, Bhubaneswar, India

ABSTRACT

There is an exponential surge in the number of Wi-Fi enabled devices which has caused an unprecedented overload on cellular and Wi-Fi networks. The two emergent techniques that have made significant difference in the reduction of network traffic surge are opportunistic communication and effective access point deployment. Since these techniques take user mobility into account, the authors propose to implement them at places where mobility pattern of users can be predicted intuitively, such as a college campus. The aim is to find strategic points across a college campus for deployment of Wi-Fi routers and explore the possibility of opportunistic communication. Then, the focus is on finding the target set which ensures high rate of information dissemination using proposed random and greedy algorithms. The mobility traces are captured using an android app WeCamp, which subsequently helps to find the locations with maximum number of users and to redeploy access points in such places using proposed algorithms to ensure uniform network speeds and efficient Wi-Fi connectivity.

KEYWORDS

Access Point (AP), Cellular Network, Contact Graph, Mobile Data Offloading, Opportunistic Communication, Target Set, WeCamp, Wi-Fi

1. INTRODUCTION

Demographics indicate that internet population is skyrocketing exponentially. Simultaneously the global interest of staying connected has seen an enormous surge in the recent years. India ranks third in the number of internet users after China and US. The smartphone penetration in India stands at approximately 349 million which accounts for 28.5% of the entire population (RapidValue Solutions, 2014). This calls for certain infrastructural changes and optimizations which would facilitate better internet connectivity, steady network traffic and superior quality of service. Also, unplanned deployment of hotspots may lead to both under-utilized and over-utilized access points in a network. Thus, to ensure greater reliability and throughput we need to deploy certain Access Point in places where demand for high speed internet is very high (Sui et al., 2016). Such places can be Special Economic Zones (SEZ’s), corporate offices, educational institutions etc. The popularity of social media, YouTube videos, internet gaming over smart phones and tablets has created a rush of network and data traffic. In this context Opportunistic Communication provides a sub-optimal solution for mobile data traffic offloading (Han et al., 2012).

DOI: 10.4018/IJMCMC.2017100104
To reduce the traffic load on network we have applied access point deployment and opportunistic communication strategies in an academic institution having Wi-Fi connectivity. Section 3 describes our problem statement based on Access Point deployment and Opportunistic Communication.

2. LITERATURE SURVEY

2.1. Mobile Data Offloading

Mobile data offloading also called as Wi-Fi offloading is the use of complementary network communication technologies to deliver mobile data traffic originally planned for transmission over Wi-Fi networks (“Mobile data offloading”, Wiki). Complementary network communication technologies include integrated mobile broadcast, Wi-Fi and femto cell. The amount of data which should be carried out on the cellular bands can be reduced by offloading scheme and also freeing bandwidth for other users. The primary source of mobile data traffic includes different internet applications, from browsers to video and audio streaming applications processing in smartphone devices, feature phones, tablets and laptops with 3G access capabilities. The popularity of social media, video and demand of internet gaming across a wide variety of new devices like smartphones and tablets has created a rush of network data traffic. Quick growth of smartphones, laptops and tablets, data traffic on the networks is increasing and mobile connections are predicted to reach 7.4 billion marks by 2015 striking the global population. According to Cisco’s survey, monthly global mobile data traffic will exceed 24.3 Exabyte by 2019 (“Cisco Visual Networking Index”, 2016). There are several solutions for mobile traffic offloading as discussed below:

Wifler can be used to augment 3G capabilities in cellular environments. Fast switching mechanism and leveraging delay tolerance concepts are used to overcome the performance and the poor availability of Wi-Fi (Balasubramanian et al., 2010). Line2 is an app which is used to utilize Wi-Fi, 3G and 4G data connections in mobile network (“Line2 iPhone application”). At first Line2 attempts to connect via a Wi-Fi network. iPass system gives access to the iPass cellular network which is the world’s vast trading Wi-Fi network (“iPassConnect”). MOTO Project is used to carry out the boundaries of 4G/LTE technologies in congested conditions (“MOTO: Mobile Opportunistic Traffic Offloading”, 2013). It also determines how opportunistic communication and networking can be used as a trustworthy way to offload some segment of the traffic from the 4G/LTE network.

2.2. MoSoNet (Mobile Social Networks)

MoSoNets can be viewed as an amalgamation of traditional social networks with emerging opportunistic networks (Vukadinovic & Karlsson, 2010). People in the same network can actively forward (push) information whenever they want. On the other hand, mobile users that are in contact can also pull information from each other locally.

MoSoNets such as PeopleNet are usually good resources for location, community, and time-specific information (Motani et al., 2005). WhozThat is another MoSoNet that brings together social networks and mobile smartphones to build a local wireless networking infrastructure (Beach et al., 2008). It utilizes wireless connections to online social networks to bind social networking IDs with location. Micro-Blog is a social participatory sensing application that can enable the sharing and querying of content through mobile phones (Gaonkar et al., 2008). CenceMe is a people-centric sensing application that infers individual’s sensing presence through off-the-shelf sensor-enabled mobile phones and then shares this information using social network portals such as Facebook and MySpace (Miluzzo et al., 2008).
Modulation Recognition of Digital Multimedia Signal Based on Data Feature Selection


Integrating Mobile-Based Systems with Healthcare Databases


[www.igi-global.com/chapter/integrating-mobile-based-systems-healthcare/26600?camid=4v1a](www.igi-global.com/chapter/integrating-mobile-based-systems-healthcare/26600?camid=4v1a)