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Design and Evaluation of Wi-Fi Offloading Mechanism in Heterogeneous Networks

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ABSTRACT

In recent years, WiFi offloading provides a potential solution for improving ad hoc network performance along with cellular network. This paper reviews the different offloading techniques that are implemented in various applications. In disaster management applications, the cellular network is not optimal for existing case studies because the lack of infrastructure. MANET Wi-Fi offloading (MWO) is one of the potential solutions for offloading cellular traffic. This word combines the cellular network with mobile ad hoc network by implementing the technique of Wi-Fi offloading. Based on the applications requirements the offloading techniques implemented into mobile-to-mobile (M-M), mobile-to-cellular (M-C), mobile-to-AP (M-AP). It serves more reliability, congestion eliminated, increasing data rate, and high network performance. The authors also identified the issue while implementing the offloading techniques in network. Finally, this paper achieved the better performance results compared to existing approaches implemented in disaster management.

KEYWORDS

Generic Algorithm, Heterogeneous Network, Wi-Fi, Wi-Fi Offloading

1. INTRODUCTION

Due to the rapid development of wireless technology, especially Mobile Adhoc Networks performing vital role in disaster management. The data exchange in mobile nodes supported by cellular networks, WIFI, WiMax, Blutooth etc. Due to the damage of base stations in disaster environment the cellular network is not adopted for making communication of mobile nodes.But the current cellular networks don't effectively support to M-C communication because it addresses the serious challenge of destroyed base stations in disaster environment (Kumar & Ramamoorthy 2018). The existing technologies like WiFI/ WiMax implemented in heterogeneous networks for different applications cannot produce optimal solutions due to the challenges of network like congestion, data rate, energy consumption and throughput (Maithili et al., 2018). To address the explosion of MANET we need to upgrade the existing

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technology standards for future generation networks. WiFi offloading seems the viable solution for Mobile Adhoc Network as well as future generation networks (Kumar et al., 2018). Nowadays WiFi hotspots are very cheaper and users deploying their homes and working places. Most of the smart devices give priority to WiFi rather than cellular network (Jayasuruthi et al., 2018).

2. RELATED WORK

The study of analyzing Wi-Fi offloading and mobile data transfer results show that 55% of battery power saved due to offloading the mobile data and 65% throughput improved in terms of data rate (Lee et al., 2012). To improve the performance of remotely connected networks with different infrastructure. They designed framework for calculating data delivery in terms of time and data size. The proposed algorithm solves the N-P hard problem in network and improved efficiency (Kouser et al., 2018). The proposed offloading scheme in Mobile networks to improve energy and network capacity. They developed offloading algorithm using dynamic programming and it is proved by N-P complete problem. The results solved computational problems and obtain better network performance (Lu et al., 2016). The SDN based framework to offload mobile network to heterogeneous networks. He proposed partial algorithm for Wi-Fi offloading with the parameters of threshold probability and offloading data (Cao et al., 2016). After the simulation result the proposed method achieves 20%-40% improvement compared to without offloading scheme (Duan et al., 2014). The collaborative method of Wi-Fi offloading scheme in MADNet for enhancing energy efficiency in smart phones and achieves 80% energy consumption. It can tolerate minor prediction in mobility, localization and offloading (Ding et al., 2013). In Ad hoc Network, Ad hoc On-Demand Distance Vector (AODV) protocol category of re-active routing protocoland it gives better performance through the on-demand connection establishment. The improvement of this type of routing protocol is that it maintains routing information and updates every route establishment. It provides more flexibility on network deployment and supports both unicast and multicast routing. Security in MANET is a more important need and many researches are going on to solve the attacks and provide trust. Generally, the Public key cryptography and private key cryptography methods are using to provide the security and avoid the vulnerabilities (Shalini et al., 2018). These two crypto system approaches use different algorithms and protocols to enhance security. For internet based applications the security aspects implemented by the way of layered mechanism like Transport Layer Security (TLS), PGP, and GPG (Kumar et al., 2019).

The survey states that, mobile data offloading challenges and identified spatial data analysis during data offloading. The proactive scheme uses caching mechanism for obtaining better results and improving caching schemes (Bastug et al., 2014). The proposed a method of Wi-Fi offloading to avoid severe congestion in networks and improve network capacity. It has been one of the most promising techniques for identifying the challenges in Wi-Fi networks. This method suited for opportunistic communication in mobile networks and adapted to cellular networks (Zhou et al., 2017). It describes the strategies of both delayed and non-delayed and also distinguished node-node techniques from AP-based offloading. Moreover, the decision taken for offloading scheme based on the metrics like cost reduction, energy savings and vehicular offloading (Rebecchi et al., 2014).

WiFi offloading generally automatically occur when the mobile nodes move from one WiFi access to another. However, the current applications using smart phone platforms delaying data transmission with high cost, energy and bandwidth. Hence, the delayed offloading quite similar to all current devices especially heterogeneous network devices. Thus, the proposed spot offloading with smart-phone platforms achieve better performance compared with other offloading schemes (Laoutaris et al., 2009). WiFi offloading is a alternative technology for data delivery which is different from targeted cellular or mobile networks. The aim of this is to keep quality of service (QoS) for users, which also minimize the cost and network capacity on the mobile network. However, the current industries are focusing on mobile offloading with less congestion to improve QoS (Yu et al., 2017).