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Enhancement of 5G Architecture and Framework Using Green and Emerging Technology

A.S. Khan, A. Qahar, A.H. Fauzi and Y. Javed
Faculty of Computer Science and Information Technology,
Universiti Malaysia Sarawak, Sarwak, Malaysia

Abstract: Due to ever increasing demand for mobile broadband communication, the existing 4G broadband technologies like Long Term Evolution-Advanced (LTE-A) and mobile multihop relay WiMAX networks are facing a fundamental challenges in terms of higher data rates efficient end to end performance, user coverage, low latency, energy consumptions and cost per information transfer. Evolving 5th Generation (5G) cellular networks are envisioned to overcome these challenges. However, 5G is still in its infancy stages and a lot of investigations and debates are ongoing on 5G network architecture that must be proficient enough to accommodate above mentioned challenges. Thus, there is a great demand of in-depth reviews on 5G network architecture for the researchers for their better analysis and designs. This review study revealed about the 5G network architecture based on a few general architecture design which are iNet, Wireless Backhaul WiBACK, MyNet and SONAC and cognitive and Cloud Optimized Network Evolution (CONE) network architecture. In order to make 5G perform every function needed by users without any drop in speed or connection, there are several emerging technologies which can improve the general architecture of 5G network and are comprises of massive MIMO, interference management, spectrum sharing, D2D communication system, ultra dense networks, Multi-Radio Access Technologies (Multi-RAT), Full Duplex radio, milimetre wave spectrum and cloud technologies. Besides, this study also give an overlook on the 5G framework discussing on nomadic node, Wireless/Mobile Broadband (WMB), Distributed Mobility Management (DMM) which is further categories into 3 separated solutions namely PMIPv6, SDN and routing-based DMM solution. To advance this high level vision, green technology in 5G network is introduced which encompasses of edge caching, cognitive radio technologies and energy and spectrum harvesting. Other technologies involvement related to 5G network architecture such as Radio Access Technology (RAT) is also discussed in this study.

Key words: 5G architecture, green technology, framework, D2D, massive MIMO, MM-wave, SDN, small cell

INTRODUCTION

As existing broadband technologies like Long Term Evolution-Advanced (LTE-A) and mobile multihop relay WiMAX networks technology are reaching maturity and have been deployed (Qiao *et al*., 2015; Shen, 2015; Li *et al*., 2012; Khan, 2014; Khan *et al*., 2014 a-c, 2010). However, due to dramatically increasing data traffic among mobile devices with the emergence of various high-speed multi-media applications the existing 4G broadband technologies are facing a fundamental challenges in terms of higher data rates, efficient end to end performance user coverage, low latency, energy consumptions and cost per information transfer. Evolving 5th Generation (5G) cellular networks are envisioned to overcome these challenges. The future 5th Generation (5G) cellular networks have drawn great attention from researchers and engineers around the world. 5G cellular networks are envisioned to attain 1,000 times higher mobile data volume per unit area, 10-100 times higher number of connecting devices and user data rate, 10 times longer battery life and five times reduced latency. Although, it is still too early to give an exact definition of 5G, current research trends have shown that the above ambitious goals can potentially be achieved by a multi-tier and heterogeneous network architecture along with the aggregation of several key technologies.

With the rapidly emerging and evolving of the 5G network technologies, the network architecture acts as a crucial role to ensure the effectiveness of the performance of networking in 5G. There are different types of network architecture that are well-known such as the HetNet, Cone, i-Net, MyNet, SONAC and METIS network architecture which are used to implement in the 5G network. The HetNet or heterogeneous network architecture is a combination of a the macro and Small

Corresponding Author: A.S. Khan, Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak, Sarwak, Malaysia