ARCHITECTURE OF 5G TECHNOLOGY IN MOBILE COMMUNICATION

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Abstract - The objective of this paper is comprehensive study related to 5G (fifth generation) technology of mobile communication. In 5G, researches are related to the development of World Wide Wireless Web (WWWW), Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless Communication. 4G technology will include several standards under a common umbrella, similar to 3G, but with IEEE 802.xx wireless mobile networks integrated from the commencement. The major contribution of this paper is the key provisions of 5G technology of mobile communication, which is seen as consumer oriented. In 5G technology, the mobile consumer has given utmost priority compared to others. 5G technology is to make use of mobile phones within very high bandwidth. The 5G terminals will have software defined radios and modulation scheme as well as new error-control schemes can be downloaded from the Internet on the run.. The 5G technologies include all types of advanced features which make 5G technology most dominant technology in near future.

Keywords- 5G, World Wide Wireless Web, Dynamic Adhoc Wireless Networks (DAWN), Real Wireless Communication.

I. INTRODUCTION

Mobile and wireless networks have made tremendous growth in the last fifteen years. Nowadays many mobile phones have also a WLAN adapter. One may suppose that near soon many mobile phones will have WiMAX adapter too, besides their 3G, 2G, WLAN, Bluetooth etc. adapters. Today 3G mobile systems are on the ground providing IP connectivity for real-time and non-real-time services. On the other side, there are many wireless technologies that have proven to be important, with the most important ones being 802.11Wireless Local Area Networks (WLAN) and 802.16 Wireless Metropolitan Area Networks (WMAN), as well as ad-hoc Wireless Personal Area Network (WPAN) and wireless networks for digital TV and radio broadcast. Using IP for both, 2.5G or 3G Public Land Mobile Networks(PLMN) on one side and WLAN on the other, raised research on their integration, which was mainly divided into loose and tight coupling.

Regarding the 4G, its focus is towards seamless integration of cellular networks such as GSM, 3G, WLAN and Bluetooth. Multimode user terminals are seen as must have for 4G, but different security mechanisms and different QoS support in different wireless technologies remain a challenge. However, AAA (Authentication, authorization, and accounting) integration among different wireless networks (e.g. PLMN and WLAN) is functioning in practice even today. But, different wireless networks from a single terminal are used exclusively, that is, there is no combining of different wireless access technologies for a same session.

The proposed Open Wireless Architecture (OWA) in is targeted to provide open baseband processing modules with open interface parameters to support different existing as well as future wireless communication standards. The OWA is targeted to MAC/PHY layers of future (4G) mobile terminals. The referenced work above provides a ground for definition of a concept for beyond 4G mobile networks, referred in this paper as 5G mobile networks.

II. 5G MOBILE NETWORKS

5G is being developed to accommodate the QoS and rate requirements set by forthcoming applications like wireless broadband access, Multimedia Messaging Service (MMS), HDTV content, Digital Video Broadcasting (DVB), minimal services like voice and data, and other services that utilize bandwidth. The definition of 5G is to provide adequate RF coverage, more bits/Hz and to interconnect all wireless heterogonous networks to provide seamless, consistent telecom experience to user. In 5G, each network will be responsible for handling user-mobility, while the terminal will make the final choice among different wireless/mobile access network providers for a given service. Such choice will be based on open intelligent middleware in the mobile phone. Now, we will go through all OSI layers (Table. 1) in the 5G mobile terminal design (Fig. 1).

Table. 1 OSI Layers in the 5G Mobile Terminal Design

Application Layer	Application (Services)
Presentation Layer	
Session layer	Open Transport Protocol
Transport Layer	
Network layer	Upper network layer
	Lower network Layer
Datalink Layer	Open Wireless Architecture
Physical Layer	

Fig. 1 5G Mobile Phone Concept

A. Physical/MAC layers

Physical and Medium Access Control layers i.e. OSI layer 1 and OSI layer 2, define the wireless technology. For these two layers the 5G mobile networks is likely to be based on Open Wireless Architecture.

B. Network layer

The network layer will be IP. The IPv4 (version 4) is worldwide spread and it has several problems such as limited address space and has no real possibility for QoS support per flow. These issues are solved in IPv6, but traded with significantly bigger packet header. Then, mobility still remains a problem. There is Mobile IP standard on one side as well as many micro-mobility solutions (e.g., Cellular IP, HAWAII etc.). All mobile networks will use Mobile IP in 5G, and each mobile terminal will be FA (Foreign Agent), keeping the CoA (Care of Address) mapping between its fixed IPv6 address and CoA address for the current wireless network. However, a mobile can be attached to several mobile or wireless networks at the same time. In such case, it will maintain different IP addresses for each of the radio interfaces, while each of these IP addresses will be CoA address for the FA placed in the mobile Phone. The fixed IPv6 will be implemented in the mobile phone by 5G phone manufactures.

The 5G mobile phone shall maintain virtual multi-wireless network environment. For this purpose there should be separation of network layer into two sub-layers in 5G mobiles i.e.: Lower network layer (for each interface) and Upper network layer (for the mobile terminal). This is due to the initial design of the Internet, where all the routing is based on IP addresses which should be different in each IP network world wide. The middleware between the Upper and Lower network layers shall maintain address translation from Upper network address (IPv6) to different Lower network IP addresses (IPv4 or IPv6), and vice versa.

C. Open Transport Protocol (OTA) layer

The mobile and wireless networks differ from wired networks regarding the transport layer. In all TCP versions the assumption is that lost segments are due to network congestion, while in wireless networks losses may occur due to higher bit error ratio in the radio interface. Therefore, TCP modifications and adaptation are proposed for the mobile and wireless networks, which retransmit the lost or damaged TCP segments over the wireless link only. For 5G mobile terminals, it is suitable to have transport layer that is possible to be downloaded and installed. Such mobiles shall have the possibility to download (e.g., TCP, RTP etc. or new transport protocol) version which is targeted to a specific wireless technology installed at the base stations. This is called here Open Transport Protocol - OTP.

D. Application layer

Regarding the applications, the ultimate request from the 5G mobile terminal is to provide intelligent QoS management over variety of networks. Today, in mobile phones the users manually select the wireless interface for particular Internet service without having the possibility to use QoS history to select the best wireless connection for a given service. The 5G phone shall provide possibility for service quality testing and storage of measurement information in information databases in the mobile terminal. The QoS parameters, such as delay, jitter, losses, bandwidth, reliability, will be stored in a database in the 5G mobile phone with aim to be used by intelligent algorithms running in the mobile terminal as system processes, which at the end shall provide the best wireless connection upon required QoS and personal cost constraints. With 4G, a range of new services and models will be available. These services and models need to be further examined for their interface with the design of 4G systems. The process of IPv4 address exhaustion is expected to be in its final stages by the time that 4G is deployed. Therefore, IPv6 support for 4G is essential in order to support a large no. of wireless- enabled devices. IPv6 removes the need for NAT (Network Address Translation) by increasing the no. of IP addresses. With the available address space and number of addressing bits in IPv6, many innovative coding schemes can be developed for 4g devices and applications that could help in the deployment of 4G network and services. The fourth generation promises to fulfill the goal of PCC (personal computing and

communication)—a vision that affordably provides high data rates everywhere over a wireless network. In the future wireless networks there must be a low complexity of implementation and an efficient means of negotiation between the end users and the wireless infrastructure.

III. FEATURES

- 5G technology offers high resolution for crazy cell phone user and bi- directional large bandwidth shaping.
- The advanced billing interfaces of 5G technology makes it more attractive and effective.
- 5G technology is providing large broadcasting of data in Gigabit which supporting almost 65,000 connections.
- 5G technology offers transporter class gateway with unparalleled consistency.
- The traffic statistics by 5G technology makes it more accurate.
- Through remote management offered by 5G technology a user can get better and fast solution.
- The remote diagnostics is also a great feature of 5G technology.
- The 5G technology is providing up to 25 Mbps connectivity speed.
- The 5G technology also support virtual private network.
- The uploading and downloading speed of 5G technology touching the peak.
- The 5G technology network offering enhanced and available connectivity just about the world

IV. CONCLUSION AND FUTURE ENHANCEMENT

A. CONCLUSION

In this paper we have proposed 5G mobile phone concept. The 5G mobile phone is designed as an open platform on different layers, from physical layer up to the application. Currently, the ongoing work is on the modules that shall provide the best QoS and lowest cost for a given service using one or more than one wireless technology at the same time from the 5G mobile phone. A new revolution of 5G technology is about to begin because 5G technology going to give tough completion to normal computer and laptops whose marketplace value will be effected. There are lots of improvements from 1G, 2G, 3G, and 4G to 5G in the world of telecommunications. The new coming 5G technology is available in the market in affordable rates, high peak future and much reliability than its preceding technologies.

B. FUTURE ENHANCEMENT

5G network technology will open a new era in mobile communication technology. The 5G moble phones will have access to different wireless technologies at the same time and the terminal should be able to combine different flows from different technologies. 5G technology offer high resolution for crazy cell phone user. We can watch TV channels at HD clarity in our mobile phones without any interruption. The 5G mobile phones will be a tablet PC. Many mobile embedded technologies will evolve.

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