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RESEARCH ARTICLE

A HETEROGENEOUS WIRELESS NETWORK FOR 5G MOBILE

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Abstract— ***We have introduced a design for future 5G mobile in heterogeneous wireless network. As compared to the situation of today, in 2020, mobile access networks will experience significant challenges. The paper throws light on the evolution and development of various generations of mobile wireless technology along with their significance and advantages of one over the other. This paper takes as starting point the situation of today, and tries to pinpoint important focus areas and potential solutions when designing an energy efficient 5G mobile network architecture. These include system architecture, where a logical separation of data and control planes is seen as a promising solution; network deployment, where (heterogeneous) ultra dense layouts will have a positive effect, radio transmission, In the near future, it is expected that mobile cloud computing (MCC) will benefit enterprises by improving network manageability and maintenance.***

Keywords— ***heterogeneous network; generation of mobile; network architecture; cloud computing; mobile cloud computing***

I. INTRODUCTION

Mobile phones have been undergoing a breathtaking evolution over the last decade starting from simple mobile phones with only voice services towards the transition of smart phones offering Internet access, localization information and even more. It seems that there are simply no limitations for mobile devices getting smaller, offering higher data rates, brighter displays. Unfortunately this assumption is not correct. The limiting factor is known, namely the energy and power consumption of mobile devices being battery driven. As the complexity within the mobile device is increasing dramatically due to new services such as GPS modules, digital photo cameras, mp3 players and others, the improvement of battery capacity is quite moderate. The increase in complexity of the mobile device is related to the fact that mobile hand-set vendors need new services to market their products and therefore exploit all the computational power of the given hardware, which is following Moore's law. Even the wireless air interfaces are getting more and more complex starting from simple DMA systems towards the planned OFDMA/MIMO systems for the 4G wireless communication systems.

II. HETEROGENEOUS NETWORK

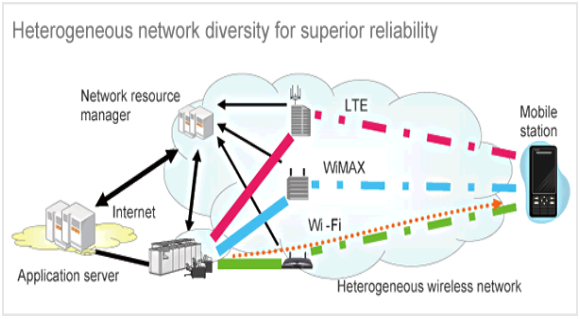

Fig. 1 Heterogeneous wireless network in 5G mobile

A heterogeneous network is a network connecting computers and mobile devices with different operating systems and/or protocols. For example, local area networks (LANs) that connect Microsoft Windows and Linux based personal computers with Apple Macintosh computers are heterogeneous. The word heterogeneous network is also used in wireless networks using different access technologies. For example, a wireless network which provides a service through a wireless LAN and is able to maintain the service when switching to a cellular network is called a wireless heterogeneous network. Heterogeneous Networks (a.k.a. HetNets) are essentially made up of existing disparate Radio Access Network (RAN) technologies (e.g. WiMAX, Wi-Fi, E-UTRAN, etc.). They usually consist of multiple architectures, transmission solutions, and base stations of varying power capacity. The constituent networks are used for the purposes of improving user experience, reducing bottlenecks in RAN and core network (CN). HetNets are also helpful in introducing intelligent IP traffic routing and management, as well as efficient load balancing and resource allocation, by ways not limited to aggregating disparate network radio resources, as well as in offloading and loading selected or bulk packet-switched/circuit-switched traffic between the HetNets. 3G-WLAN has been investigated beyond other inter-technology options. This is probably due to the attendant complementary offerings, e.g. for WLAN: high data rates, short range, low mobility, while for UMTS: relatively low data rates, long range, high mobility. These disparate radio interfaces are merged both at the UE and RAN; as a result, multi-radio frameworks (both client-based and host based) enabling mobility and handover managements are necessary. Moreover, none of the existing second and third generation technologies or services has been able to provide the ubiquity required in network coverage with accompanying Quality of Service (QoS) levels.

III. GENERATION OF MOBILE

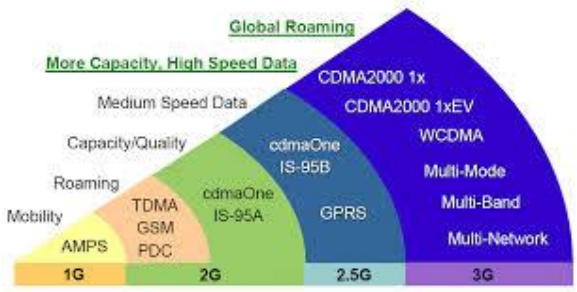

Fig. 2 Evolution of Mobile technology

A. First generation

1G refers to the first generation of wireless telephone technology, mobile telecommunications which was first introduced in 1980s and completed in early 1990s. Its Speed was up to 2.4kbps. It allows the voice calls in 1 country. 1G network use Analog Signal. AMPS was first launched in USA in mobile systems.

B. Second generation

2G technology refers to the second generation which is based on GSM. It was launched in Finland in the year 1991. Compared to first-generation systems, second-generation (2G) systems use digital multiple access technology, such as TDMA (time division multiple access) and CDMA (code division multiple access) 2G network use digital signals, its data speed was

upto 64kbps. It enables services such as text messages, picture message and MMS (multimedia message), it provides better quality and capacity. 2.5G is a technology between the second (2G) and third generation (3G) of mobile telephony.2.5G is sometimes described as 2G cellular Technology combined with *GPRS.* It is used to describe 2G-systems that have implemented a packet switched domain in addition to the circuit switched domain. 2.5 G can provide data rate, up to 144 kbps. Features such as phone calls, send and receive e-mail message, web browsing, its speed is up to 64-144kpbs.

C. Third generation

3G technology refer to third generation which was introduced in year 2001.Data transmission speed increased from 144kbps - 2 mbps.Typically called smart phones and features increased its bandwidth and data transfer rates to accommodate web-based applications and audio and video files. It provides faster communication video conferencing and Mobile TV. It has large capacity and broadband capabilities. The main components includes BS (Base Station) or nod B, RNC (Radio Network Controller), apart from WMSC (Wideband CDMA Mobile Switching Centre) and SGSN/GGSN. 3G networks enable network operators to offer users a wider range of more advanced services while achieving greater network capacity.

Mobile communication systems revolutionized the way people communicate. Evolution of wireless access technologies is about to reach its fourth generation (4G) and the 5G mobile networks will focus on the development of the user terminals where the terminals will have access to different wireless technologies at the same time and will combine different flows from different technologies. Looking past, wireless access technologies have followed different evolutionary paths aimed at unified target related to performance and efficiency in high mobile environment. The first generation (1G) has fulfilled the basic mobile voice, while the second generation (2G) has introduced capacity and coverage. This is followed by the third generation(3G), which has quest for data at higher speeds to open the gates for truly "mobile broadband" experience, which was further realized by the fourth generation (4G).The Fourth generation (4G) provides access to wide range of telecommunication services, including advanced mobile services, supported by mobile and fixed networks, which are increasingly packet based, along with a support for low to high mobility applications and wide range of data rates, in accordance with service demands in multiuser environment. Fifth generation should be more intelligent technology that interconnects the entire world.

TABLE I
COMPARISION BETWEEN 4G AND 5G

Technology	**4G(2000-10)**	**5G(2010-20)**
Switching	Circuit/Packet	Circuit/Packet
Date Rate	Upto 1 Gbps	Higher than 1 Gbps
Technology	Wi-Max LTE Wi-Fi	WWWW(Coming soon)

D. Fourth generation

4G wireless technology that promises higher data rates and expanded multimedia services ,It is capable to provide speed of 100Mbps-1 Gbps, with high QOS and High Security, it also provide any kind of service at any time as per user requirements anywhere. To provide wireless services at anytime and anywhere, terminal mobility is a must in 4G infrastructure. Terminal mobility allows mobile clients to roam across geographic boundaries of wireless networks.

E. Fifth generation

The 5G (Fifth Generation Mobile and Wireless Networks) can be a complete wireless communication without limitation, which bring us perfect real world wireless – World Wide Wireless Web (WWWW). 5G denotes the next major phase of mobile telecommunications standards beyond the 4G/IMT-Advanced standards. 5G technology includes camera, MP3 recording, video player, large phone memory, dialing speed, audio player and much more one can never imagine. In fifth generation, Network Architecture consists of a user terminal (which has a crucial role in the new architecture)and a number of independent, autonomous radio access technologies (RAT) [14]. 5G mobile system is all-IP based model for wireless and mobile networks interoperability. Within each of the terminals, each of the radio access technologies is seen as the I Plink to the outside Internet world.

IV. ANALYSIS OF CURRENT AND FUTURE CELLULAR NETWORK ARCHITECTURE

Starting from GPRS (General Packet Radio Service) and including LTE (Long-Term Evolution) cellular data network architecture has employed the same basic approach to transporting user data traffic, tunneling over diverse lower layer transport protocols to and from a centralized gateway. Details vary depending on the technology generation, but the basic operation remains the same. In the downstream direction from the Internet to a user device, user IP packets are fragmented as needed and encapsulated in GTP (GPRS Tunneling Protocol) tunnels over UDP/IP from a gateway. (In the case of the U.S., usually placed at a handful of data centers (DC) around the country.)In LTE encapsulated packets travel between a gateway (PDN-GW: Packet Data Network-GateWay) and a base station (NodeB, a collection of which is called UTRAN, The Serving GW may be combined with the PDN-GW under non-roaming scenarios. Otherwise it acts as forwarder to home networks for roaming UE's(User Equipment: 3GPP terminology for devices used by subscribers). In WCDMA/HSPA, in addition to a gateway (GGSN: Gateway GPRS Support Node) and a base station (NodeB), the encapsulation is translated into lower layer fragmentation packet formats at GSN (Serving GPRS Support Node) and RNC (Radio Network Controller) that relay between GGSN and NodeB. (In this case, UTRAN is a collection of SGSN's, RNC's,and NodeB's.)The extensive use of tunneling was perhaps necessary in the early designs of cellular data networks, due to lack of extensive wide area packet transport at the time. Also, the designers were familiar with the circuit protocols used for cellular voice, and built the data network as an overlay. Cellular data, after all, was an unproven add-on to highly successful voice services at very low rates of less than 20 kbps. The wired Internet was still not widely popular at the time. Thus, user level tunnels became the foundation of cellular data networks, being used for mobility, policy control, routing, QoS, service redirection, and numerous other functions. Tunneling, in itself, is not inherently a bad design choice, given the capabilities of modern router/switch systems, and is often employed in other networking services, e.g., VPN, MPLS, provider Ethernet, etc. The issues with tunneling in 3GPP networks arise from the very fine tunnel granularity potentially very long transit distances, massive concentration of tunnels to a small number of gateways, overloading the protocol with multiple functions such as QoS, policy, charging, and roaming. Particularly, the high number of states that must be maintained throughout the cellular network, as we will see later, becomes a barrier to scaling and innovation. Normally, tunneling protocols concern only the two end-points, and other network elements in the path are supposed to be stateless with respect to tunnels. However, this is not the case for cellular networks due to the overloading of user-level tunnels with many extra functions that are state fully processed by most intermediate nodes.

V. MOBILE CLOUD COMPUTING

Fig. 3. Mobile Cloud Computing

Cloud Computing is one of the emerging technologies in Computer Science. Cloud provides various types of services to us. Database Outsourcing is a recent data management paradigm in which the data owner stores the confidential data at the third party service provider's site. The service provider is responsible for managing and administering the database and allows the data owner and clients to create, update, delete and access the database. There are chances of hampering the security of the data due to untrustworthiness of service provider. So, to secure the data which is outsourced to third party is a great challenge. The

major requirements for achieving security in outsourced databases are confidentiality, privacy, integrity, availability. To achieve these requirements various data confidentiality mechanisms like fragmentation approach, High-Performance Anonymization Engine approach are available. Various mechanisms for implementing Data Confidentiality in cloud computing are analyzed along with their usefulness in a great detail.

Mobile cloud computing (MCC) is an appealing paradigm enabling users to enjoy the vast computation power and abundant network services ubiquitously with the support of remote cloud. However, the wireless networks and mobile devices have to face many challenges due to the limited radio resources, battery power and communications capabilities, which may significantly impede the improvement of service qualities. Heterogeneous Network (HetNet), which has multiple types of low power radio access nodes in addition to the traditional macrocell nodes in a wireless network, is widely accepted as a promising way to satisfy the unrelenting traffic demand. we first introduce the framework of HetNet for MCC, identifying the main functional blocks. Then, the current state of the art techniques for each functional block are briefly surveyed, and the challenges for supporting MCC applications in HetNet under our proposed framework.

Today's fast advance of mobile computing and cloud computing is bring a new paradigm shift from conventional mobile computing and wireless communications services to mobile cloud computing and services over wireless internet in the real world. Many people believe that mobile cloud computing will not only completely change the current way of delivering mobile computing and communication services to global mobile users, but also alter their working and life styles with seamless global mobile resource sharing and accesses.

In current mobile computing and wireless services, mobile users commonly use mobile devices with limited computing power and resources to receive regional wireless communication services and limited data services, plus some access to selected mobile applications. Unlike mobile computing, mobile cloud computing leverages emergent cloud infrastructures and resources to deliver innovative mobile cloud infrastructures, platforms, and software-as-as-services, as well as mobile enabled applications services to global mobile device users at any-time and anywhere. It allows mobile users to use low-end mobile devices to access diverse and scalable cloud computing resources (such as IaaS, PaaS, SaaS, and DaaS) and globally connected mobile enabled resources (such as, devices, tags/barcodes/sensors, and wireless networks) to receive unlimited mobile application services.

Clearly mobile cloud computing will provide many exciting new opportunities and enable innovative applications to mobile users, mobile cloud vendors, and businesses. It definitely will bring new computing models and infrastructures to build and delivery mobile services on mobile devices, and change the current ways on how to delivery mobile enabled computing resources, applications, and services to mobile users. Meanwhile, it will impact the ways on how to deliver, store, retrieve, process, and share mobile data and resource on mobile devices for business and private settings. These changes and impacts put forward new research issues and topics for both academic and industry communities.

VI. CONCLUSION

All totally the best way to help all users is to use 5G as the new wireless system and in totally it is safety and secure for public, this the need that demands the solution. Today's wired society is going wireless and if it has problem, 5G is answer.5G technology is going to give tough competition to Computers and Laptops. It will be available in the market 2020 at affordable cost with more reliability than previous mobiles.

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