

Assaignment

On

“5G Technology in Telecommunication”

Course Name: Introduction to Telecommunication
Course No: ICT 5104

Submitted to:

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Introduction:

The fifth generation wireless mobile multimedia internet networks can be completely wireless communication without limitation, which makes perfect wireless real world – World Wide Wireless Web (WWWW). Fifth generation is based on 4G technologies. This generation is expected to be released around 2020. The world of universal, uninterrupted access to information, entertainment and communication will open new dimension to our lives and change our life style significantly.

Evaluation and Comparison:

First Generation (1G):

1G emerged in 1980s. It uses analog radio signal which have frequency 150 MHz, voice call modulation is done using a technique called Frequency-Division Multiple Access (FDMA). It has low capacity, unreliable handoff, poor voice links, and no security at all.[1]

Second Generation (2G):

2G emerged in late 1980s. It uses digital signals for voice transmission and has speed of 64 kbps. It provides facility of SMS (Short Message Service) picture messages and MMS (multimedia messages). 2G use the bandwidth of 30 to 200 KHz. Next to 2G, 2.5G system uses packet switched and circuit switched domain and provide data rate up to 144 kbps. [1]

Third Generation (3G):

It uses Wide Band Wireless Network with which clarity is increased. The data are sent through the technology called Packet Switching. It operates at a range of 2100MHz and has a bandwidth of 15-20MHz used for High-speed internet service, video chatting. [1]

Fourth Generation (4G):

4G offers a downloading speed of 100Mbps. 4G provides same feature as 3G and additional services like Multi-Media Newspapers, to watch T.V programs with more clarity and send Data much faster than previous generations. LTE (Long Term Evolution) is considered as 4G technology. [1]

Fifth Generation (5G):

Currently, 5G is not a term officially used for any particular specification or in any official document yet made public by telecommunication companies or standardization bodies such as 3GPP, WiMAX Forum or ITU-R. New 3GPP standard releases beyond 4G and LTE Advanced are in progress, but not considered as new mobile generations. [2]

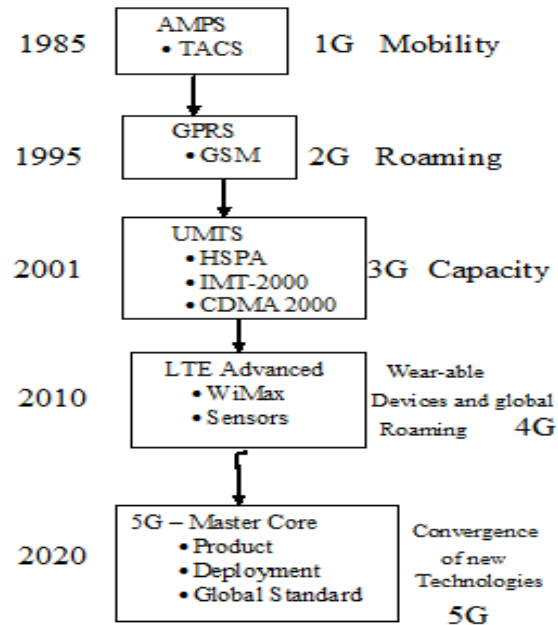


Fig 1: Evolution of Wireless Mobile Technologies [2]

Comparison of all Generations of Mobile Technologies:

Technology→ Feature↓	1G	2G	2.5G	3G	3.5G	4G	5G
Start/Deployment	1970-1980	1990-2000	2001-2004	2004-2005	2006-2010	2011-Now	Soon(2020)
Data Bandwidth	2 Kbps	64 Kbps	144 Kbps	2 Mbps	More than 2 Mbps	1 Gbps	More than 1 Gbps
Technolog	Analog Cellular	Digital Cellular	GPRS, EDGE, CDMA	CDMA 2000 (1xRT, EVDO) UMTS, EDGE	EDGE, Wi-Fi	WiMax, LTE, Wi-Fi	Wwww (coming soon)
Service	Voice	Digital voice, SMS, Higher capacity packetize d data	SMS, MMS	Integrated high quality audio, video and data	Integrated high quality audio, video and data	Dynamic Information access, Wearable devices	Dynamic Information access, Wearable devices with AI capabilities
Multiplexing	FDMA	TDMA, CDMA	CDMA	CDMA	CDMA	CDMA	CDMA
Switching	Circuit	Circuit, Packet	Packet	Packet	All Packet	All Packet	All Packet
Core Network	PSTN	PSTN	PSTN	Packet N/W	Internet	Internet	Internet
Handoff	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal and Vertical	Horizontal and Vertical

Table 1: Comparison of all Generations of Mobile Technologies [3]

Concept and Requirement of 5G Technology:

Application Layer	Application (Service)
Presentation Layer	
Session Layer	Open Transport Protocol (OTP)
Transport Layer	
Network Layer	Upper Network Layer
	Lower Network Layer
Data Link Layer (MAC)	Open Wireless Architecture (OWA)
Physical Layer	

Table 2: Protocol stack for 5G [4]

1. Physical/MAC Layer:

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. [4]

2. Network Layer:

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). [4]

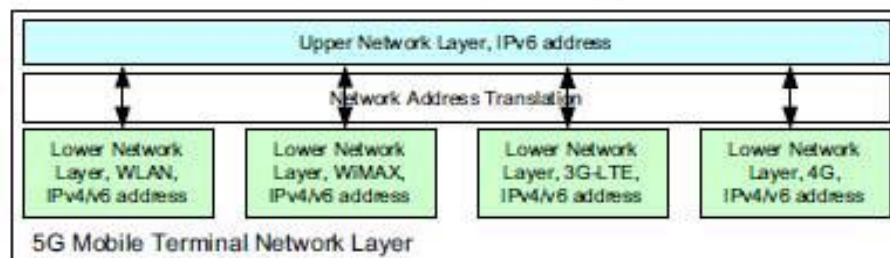


Fig 2: 5G mobile terminal network layer. [5]

3. Open Transport Protocol (OTP) Layer:

For 5G mobile terminals will be 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. [4]

4. Application Layer:

Regarding the applications, the ultimate request from the 5G mobile terminal is to provide intelligent QoS management over a variety of networks. The process of IPv4 address exhaustion is expected to be in its final stages by the time that 4G is deployed. [4]

Architecture of 5G:

In 5G Network Architecture, all IP based mobile applications and services are offered via Cloud Computing Resources (CCR). CCR links the Reconfigurable Multi Technology Core (RMTc) with remote reconfiguration data. RMTc is connected to different radio access technologies ranging from 2G/GERAN to 3G/UTRAN and 4G/EUTRAN in addition to 802.11x WLAN and 802.16x WMAN. [1].

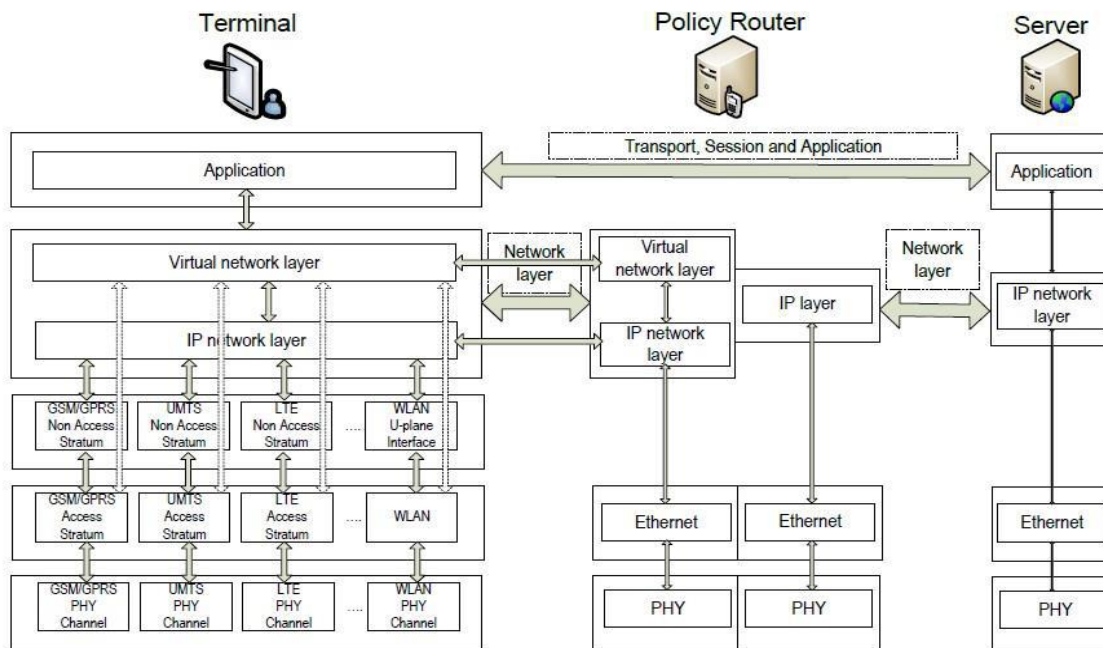


Fig 3: Architecture of 5G [6].

Advantage of 5G:

1. High speed, high capacity, and low cost per bit.
2. Global access, service portability, and scalable mobile services.
3. The high quality services of 5G technology based on Policy to avoid error.
4. 5G technology is providing large broadcasting of data in Gigabit.

Disadvantage of 5G:

1. 5G will cost more to implement and while the newest mobile phones will probably have it integrated, other handsets could be deemed out of date.
2. With the addition of 5G to the wireless spectrum, this could put us at risk of overcrowding the frequency range.

Application of 5G:

Some fields are given below where can be applied 5G:

1. High-speed mobile network
2. Entertainment and multimedia
3. Smart home
4. Smart cities
5. Smart farming
6. Industrial Internet of Things (IoT)
7. Healthcare and mission critical application
8. Autonomous Driving
9. Drone Operation
10. Security and surveillance

Conclusion:

The development of the mobile and wireless networks is going towards higher data rates and all-IP principle. Mobile terminals are obtaining each year more processing power, more memory on board, and longer battery life for the same applications. 5G include latest technologies such as cognitive radio, SDR, nanotechnology, cloud computing and based on All IP Platform. 5G is a promising Generation of wireless communication that will change people's lives.

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