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Survey of Electronic Communication System of Pakistan

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Abstract: Mobile communication is continuously one of the hottest areas that are developing at a booming speed, with cutting edge strategies developing in all the fields of mobile, fixed and wireless communications. This research paper deals with the comparative study of wireless cellular technologies to be specific First Generation, Second Generation, Third Generation, and Fourth Generation and about the future trends. As the number of users are expanding the demand for higher data rates and higher quality of service turns into the most influential requirement and changes are required in the framework. These changes in architecture of generations are being discussed as we move from one network to another, also the architecture of cellular operator (WARID) has been demonstrated.

Key Words: GSM, WCDMA, LTE, WLL, CELLULAR

I. INTRODUCTION

This research paper will renderthe evolution of cellular standards multiplied over years starting from 1G cellular network generation to the future 5G connectivity. Also it constitutes of quality comparison and detailed architecture of second, third and fourth generation. The telecommunication sector has been exposed to reforms witnessing a significant expansion of both fixed and mobile networks and striking improvement in quality. The rapid speed of emerging technology has changed our lives in short span of time, not only the cellular operators but also the wireless local loop operators. This paper portrays the fixed and wireless local loop operator's bandwidth.It delineates the conjunction of various systems while being in the same environment furthermore decipher the future need and request, as the populace is expanding, the quantity of clients are likewise wide spreading per system.

The wireless industry has flourished a great somewhere around 2010 and 2015. Wireless correspondence has been overhauled from simple voice calls to current cutting edge advances, which are encouraging the general public by portable broadband administrations of high caliber with information rates of a few megabits for each second over wide ranges. There are four generations of mobile communication which are currently in use and the fifth generation is on staircase of flourishment and will soon breakthrough all evolved technologies.The 1st generation was developed with a data rate up to 2.4kbps in early 1980's. It was not secured. First generation was the first analog cell phone system and uses analog transmission for speech services. 2nd generation was developed towards end of 1990. The primary distinction between 1G and 2G is analog/digital split. Global Systems for Mobile Communication (GSM) was the principal framework utilized, having an information rate up to 64kbps and advanced encryption gave security and wellbeing to the voice calls and information exchanging [1].Further 2.5G came into existence. It was a system which generally uses 2G system frameworks. It was a circuit switched network, applying packet switching in parallel with a data rate up to 144kbps. While2.75Gwas upgrade of 2G and 2.5G. A while later the third era was set up in late 2000 with a transmission rate up to 2Mbps. 3G innovation offers more extensive scope of administrations [2]. 4G was an incredible unrest and is a successor to 3G and 2G.4G uses Long Term Evolution (LTE). It gives fantastic video/sound gushing and furnishes adaptable backing with OFDMA [3].It is an all IP network with flattened architecture resulting in less equipment per transmission but as the number of users are increasing, network traffic has increased, because of which a requirement for more propelled innovation is required.5G networks must provide user with higher capacity and higher data rates.5G is assume to have increased signal strength against unintended man made obstruction and proposed sticking because of vast movement or colossal number of clients membership. The evolution of 1Gto 4G in terms of technology and techniques used is summarized in table 1.

II. NETWORK ARCHITECTURE (GSM, UMTS, LTE)

A. Architecture of GSM

For the communication purpose, mobile network uses mobile station (MS) for mobile subscription.(Mobile Station) connects to the nearby BTS (Base Transceiver Station) through Um interface. Um interface is the radio or air interface. BSS (Base Station System) consists ofBSCs (Base Station Controller) and BTS (Base Transceiver Station).The BTS (Base Transceiver Station) consists of radio base equipment such asantennas and transceivers which provide service to each cell.All the radio related functions of GSM (Global System for Mobile Communication) network manages by BSC (Base Station Controller). BTS (Base Transceiver Station) is connectedthrough Abis interface with BSC (Base Station Controller). Abis interface is the interface which allows the control of thefrequency allocation andradio equipment inBTS

(Base Transceiver Station). Circuit Switch Media Gateway (CS-MGW) enablesan MSC (Mobile Switching Centre) to interrogate a network's HLR to route a call to the MS (Mobile Station).MSC (Mobile Station Controller) performs the telephony switching function for the mobile network.CS-MGW (Circuit Switched Media Gateway) is connected with MSC (Mobile Switching Centre) server through Mc interface.

Table 1: Evolution from 1G TO 5G

Generation	***Start/Deployment***	***Data Rates***	***Service***	***Technology***	***Multiplexing/Switching***	***Web Standards***	***Core Network***
1G	1970/1984	2kbps	Mobile telephon-y (voice)	Analog cellular	FDMA/Circuit		PSTN
2G	1980/1999	14.4-64kbps	Digital voice, short messagin g	Digital cellular	TDMA,CDMA/Circuit, Packet	www	PSTN
3G	1990/2002	2Mbps	High quality audio, video streamin g	Broad bandwidth /CDMA/IP technology	CDMA/ Packet except circuit for only air interface	www (IPv4)	Packet networ k
4G	2000/2010	200Mbp s-1Gbps	Dynamic informati on access, Wearable devices	Unified IP and seamless combination of broadband LAN/WAN/P AN and WLAN	CDMA/All packet	www (IPv4)	Interne t

The interface A is used to provide communication between the BSS (Base Station System) and the CS-MGW (Circuit Switched Media Gateway). A interface carries information to enable channels, timeslots. The EIR (Equipment Identity Register) is the data base containing mobile equipment identity information which helps to block calls from the stolen unauthorized sources. EIR (Equipment Identity Register) is connected with MSC (Mobile Switching Centre) through F interface.

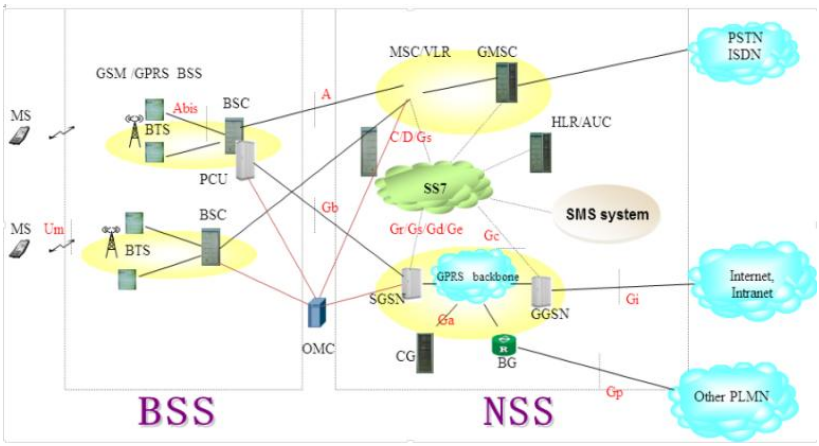

Figure 1: GSM Architecture

The communication along this interface is used to confirm the status of SIM (Subscriber Identity Module) of the MS (Mobile Station) gaining access to the network. The HLR (Home Location Register) is the centralized network data base that stores and manages all mobile subscriptions belonging to the specific operator.The interface C is located between HLR (Home Location Register) and media gateway MSC (Mobile Switching Centre). The AUC (Authentication Centre) is the data base connected with HLR (Home Location Register). The main function of the AUC (Authentication Centre) is to authenticate the subscribers attempting to use a network. The D interface is situated between AUC (Authentication Centre) and the MSC (Mobile Switching Centre). The Serving GPRS Support Node (SGSN) is a main component of the GPRS network, which handles all packet switched data within the network, e.g. the mobility management and authentication of the users. The SGSN performs the same functions as the MSC (Mobile Switching Centre) for voice

traffic. There must be at least one SGSN in a GPRS system. Gb interface is between SGSN (Serving GPRS Support Node) and BSS (Base Station System). The Gb interface carries the GPRS traffic and signaling between the GSM radio network (BSS) and the GPRS network.Gr interface is being used between an SGSN (Serving GPRS Support Node) and HLR (Home Location Register). The Gr gives the SGSN access to the subscriber information in the HLR.The Gateway GPRS Support Node (GGSN)is responsible for the interworking between the GPRS network and external packet switched networks, like the Internet.Gi interface is located between GGSN and SGSN. The GPRS network is connected to an external data network via this interface [3]-[4].

B. Architecture of UMTS

The objective of UMTS is to provide wireless services, which require higher data rates than can be offered in GSM/GPRS/EDGE radio networks. UMTS (Universal Mobile Telecommunications Service) /WCDMA is a third-generation (3G) broadband, packet-based transmission of text, digitized voice, video, and multimedia. WCDMA was selected as the radio interface technology of the UMTS system. It is totally different from the technology used in GSM. The UMTS network architecture can be divided into three main elements: User equipment (UE), Radio network subsystem (RNS), Core network (CR). The User Equipment (UE) is the name given to what was past termed the portable, mobile, or cell phone. Radio Access Network, UTRAN, is what might as well be called the past Base Station Subsystem or BSS in GSM. It gives and deals with the air interface for the system.

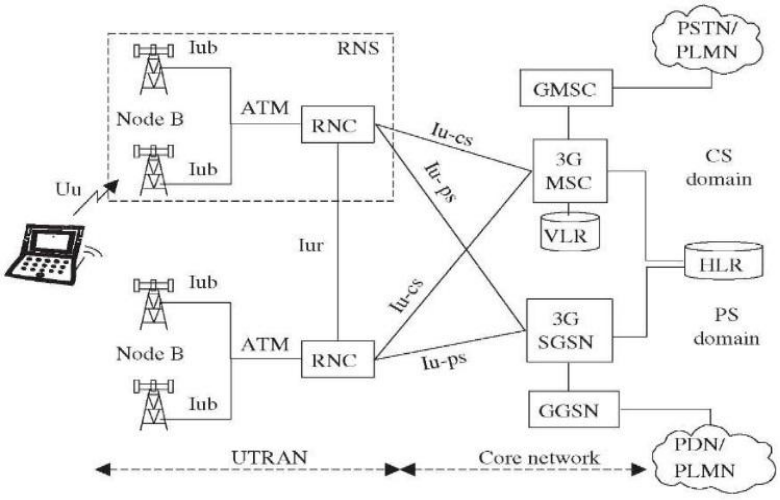

Figure 2: UMTS Architecture

The UMTS Radio Access Network includes two fundamental parts radio network controller and Node B. Radio network controller (RNC) controls the Node Bs that are associated with it. It is the part dealing with the information encryption/decoding and shields the client information from listening stealthily. Node B contains the transmitter and recipient to speak with the client hardware's (UEs) inside the cell. So as to encourage viable handover between Node Bs under the control of various RNCs. The RNC speaks with the Core Network, as well as with neighboring RNCs

The core network provides all the central processing and management for the system. It is the equivalent of the GSM Network Switching Subsystem. The central or core system is the general element that interfaces to outer systems including people in general telephone system and other cell information transfers systems. There are several interfaces that are defined for the UTRAN elements: Iub, Iur, Iu. The Iub connects the NodeB and the RNC within the UTRAN. The Iur interface allows communication between different RNCs within the UTRAN.The Iu interface connects the UTRAN to the core network having standardized interfaces within various areas of the network including the UTRAN allows network operators to select different network entities from different suppliers.The UMTS core network is part into two unique territories that are Circuit Switched Elements and Packet Switched Elements. These components are principally taking into account the GSM system components and convey information in a circuit exchanged way, i.e. a perpetual channel for the length of the call. The circuit exchanged components of the UMTS core network design incorporates Mobile Switching Center and Gateway MSC.

Whereas packet exchanged system elements are intended to convey information in form of packets. This empowers much higher system utilization as the limit can be shared and information is conveyed as packets which are directed by destination. The packet switched elements of the 3G UMTS core network architecture includes Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN).

The SGSN provides a number of functions within the UMTS network architecture like mobility management, Billing and Interaction with other areas of the network. Whereas GGSN handles working between the UMTS bundle exchanged system and outside packet exchanged systems, and can be considered as an exceptionally complex switch.

C. Architecture of LTE

Mobile Equipment (ME) is connected with eNB through Uu interface. The E-UTRAN handles the radio correspondences between the mobile and the evolved packetcore and contains only one element, the evolved base stations (eNB). It is a base station that sends and gets radio transmissions to each portable device (mobile).The architecture of the network is shown in the figure 3.

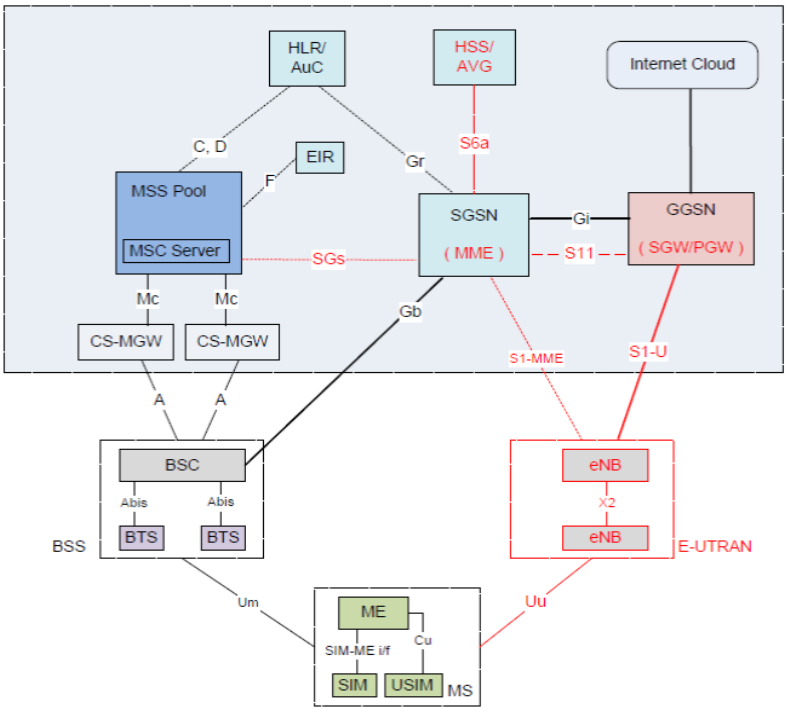

Figure 3: LTE Architecture

X-2 interface is located between two eNBs. The main purpose of this interface is to minimize packet loss due to user mobility.E-UTRAN is connected with Serving Gateway (S-GW) through S1-U interface. The Serving Gateway (S-GW) acts as a router and is a medium of data exchange between the base station and the Packet Data Network (PDN) gateway.

The Packet Data Network (PDN) Gateway (P-GW) communicates with the outside world i.e. internet cloud. The P-GW performs same function as performed by the GPRS Support Node (GGSN) and the Serving GPRS Support Node (SGSN) with GSM.

S5/S8 is the interface between the serving and PDN gateways. S11 interface is situated between S-GW and MME. MME (Mobility Management Entity) is the key control hub for LTE access system. It is in charge of following and paging method including retransmissions. The MME additionally gives the control plane capacity to versatility amongst LTE and 2G/3G access systems with the S3 interface ending at the MME from the SGSN.

MME connects to the eNB (evolved node b) through the S1-MME interface. The HSS consists of pre Home Location Register (HLR) and Authentication Center (AuC). MME (Mobility Management Entity) is connected with MSC (Mobile Switching Centre) through SGs interface. Voice call in LTE is transferred to MSC through MME via SGs interface.

III. SURVEY OF MOBILE OPERATOR (WARID) IN PAKISTAN

Warid is a GSM, LTE based mobile administrator in Pakistan. It initiated business operations in May 23, 2005. Warid is the seventh mobile bearer to enter the Pakistani business sector, it is Pakistan's fourth biggest GSM portable administration supplier and fifth biggest mobile administration as far as endorser base of more than 12.9 million. Warid dispatched 4G LTE administrations in Pakistan before the end of 2014. At first it secured 28 noteworthy urban communities of the nation, which is so far the biggest scope in the principal eliminate of move by the main speculation of US $150 million. Inside 80 days, Warid secured 1 million clients with 7% piece of the pie. In the first place commemoration of Warid stamped 9.7 million supporters.

Warid works at 900, 1800 MHz for GSM/GPRS/EDGE conventions for class 2G and at 1800 MHz recurrence Warid LTE convention works for class 4G. Warid has contributed more than US $2.5 billion to develop system framework in Pakistan. It has set-up more than 5000 base stations. It is the sole administrator in Pakistan conveying Ericsson as seller for its system base stations, microwave joins, IT backing and transmission towers. In GSM arrange all sending is of Copper wire while in LTE optical filaments are utilized. Waird 2G BSCs are either IP base (SGSN) or FR based (edge hand-off) and LTE is completely in view of IP system. Signal taking care of is done in MSC. Media entryway handles genuine information. In Lahore there are two SGSN and one GGSN, 2G SGSN is associated with BTS with radio interface and handles information part while GGSN is associated with web cloud. Home area register confirms the clients and contain membership data. In the event that client is substantial then it make an association with web. In LTE system, voice call is moved towards 2G.

In GSM system, Warid have partitioned Pakistan into four primary districts on the premise of its center circuit exchanging network. Lahore, Jehlum and Gujranwala are in one locale. Second locale have urban communities like Islamabad, Abbottabad, Peshawar and third fourth districts contain other primary urban areas of Pakistan like Karachi, Faisalabad, Multan, Hyderabad, Quetta and so on. For Warid GSM Network, there are all out four Mobile Switching Stations (MSS) in Lahore, these MSS are associated further with different urban areas MSS like Faisalabad, Gujranwala.

Lahore district four MSS associated with eight Media Gateway MSCs (MGW). There are absolute ten Base Station Controllers (BSC) and every Media Gateway (MGW) is associate with three to four Base Station Controllers (BSC). Inside the locale, these MGWs are further associated with different urban areas MGWs like Gujranwala, Jehlum.

Warid works 12 business focuses, more than 350 establishments, 1,000 Warid Super shops, and 200,000 retail client focuses across the nation. On January 1, 2014 Warid in a joint effort with Bank Alfalah dispatched versatile managing an account benefit in particular 'portable paisa'. On November 26, 2015 VimpelCom and Dhabi Group consented to combineMobilink and Warid into a solitary organization. The case was under audit at Pakistan telecom power. After examination PTA at long last endorsed the merger on 24 May 2016.

IV. COMPARISON OF QOS

In 2014, Pakistan Telecommunication Authority presented Next Generation Mobile Services (NGMS) in Pakistan through four prevalent Cellular Mobile Operators (CMOs). The Authority started an overview in Islamabad and Rawalpindi alongside Peshawar to evaluate the nature of administration gave by these NGMS and CMOs. The motivation behind the study was to monitor the Key Performance Indicators (KPIs) set up in their permit and control.User Data Throughput defines user internet speed to be provided by NGMS operators in terms of data rate. The throughput for all NGMS operators has exceeded the benchmark set for in their licenses. The internet speed of Zong has turned out to be the highest, whereas Ufone is providing the lowest speed.This KPI represents open air signal quality. All the NGMS administrators have given great scope in their zones and therefore, surpassing their benchmark.Ufone and Telenor have preferable signal strength over Zong and Mobilink, however their nature of administration is better due to their frequency spectrum range.Network Accessibility defines the probability of the service being available to the user throughout the duration and according to the report it is satisfactory for all users.Grade of Service defines network blocking as the probability of service that is inaccessible to the user as indicated by their device.The survey reveals that all operators are meeting the criteria set in their agreements.Call Connection Time defines the time taken between dialing the call and hearing the first tone.

Sadly, all operators have unsatisfactory results for this KPI which greatly effects their overall quality service as a CMO.Call Completion Ratio addresses the amount of call drops. As compared to other operators, Mobilink and Ufone has the highest percentage of call drops recorded, thus their KPI is below the threshold. Though, Zong has a near perfect ratio.End-to-End Speech Quality refers to the voice clarity during phone calls. With Telenor providing the best speech quality, the other operators have also exceeded the benchmark by providing quality service for this KPI. SMS Success Rate refers to the successful delivery of an SMS. Mobilink and Warid have failed to meet the standard for this KPI as compared to other operators. It is an achievement for Zong to have 100% success rate for this KPI. End-to-End SMS Delivery Time refers to the time taken by an SMS to reach from its sender to recipient.

All operators are successfully meeting this standard with satisfactory results. While Ufone takes the longest to deliver a message, Zong has the lowest delivery time.Therefore survey results have established that all operators providing mobile internet are maintaining signal strength in their respective coverage areas. However, Zong has emerged as the fastest internet for the three cities under consideration. For SMS services, Mobilink and Warid have the lowest success rate. Moreover, the call connection time for every operator has turned out to be unsatisfactory, which goes on to establish how the basic service provision needs extensive improvement. Boosting to be the largest service providers of the country, Mobilink and Ufone has the highest number of call drops. While Mobilink has failed to emerge as a successful service provider for SMS and Voice Services, it is safe to say that Zong is conquering this avenue as well.

V. FIXED LINE AND WIRELESS LOCAL LOOP OPERATORS

Wireless local loop utilizes a remote connection to interface endorsers of their neighborhood trade set up of ordinary copper wire. By utilizing the remote connection, the development time frame is abbreviated and the expense of establishment and working expense is decreased. In customary phone systems, phone would be associated with the closest trade through a couple of copper wires.While in Wireless local loop (WLL) the subscriber is connected to the nearest exchange through a radio link instead of through these copper wires. In Pakistan the wireless local loop operators are: Worldcall, Telecard, PTCL, WiTribe, Wateen WiMAX, Cyber Internet, Metrotel, LINKdotNET, Mytel, DVCom Data, Great Bear International,Super Dialogue and Sharp.WLL operators operate at a frequency of 450 MHz, 479 MHz, 1900MHz and 3.5 GHz. Telecard, worldcall, PTCL and Great Bear International operates in 450 MHz frequency band. In 479 MHz frequency band only worldcall operates. Telecard, worldcall, PTCL and DV Com Data operators operates in 1900 MHz frequency band. Whereas 3.5 GHz frequency band includes Worldcall, PTCL, WiTribe, Wateen, WiMAX, Cyber Internet,Metrotel,LINKdotNET, Mytel, Super Dialogue&Sharp. 1900 MHz band operators are telecard, worldcall,ptcl and Dv com data.For 450 MHz it include four operators which are telecard, worldcall, ptcl and great bear international Operators.For 479 MHz band, it include only one operator for many cities.It exists only in two ranges of the frequency which is in Mhz. The range is from 493.48 – 489 MHz and the other range is from 483.48 – 479 MHz and for 3.5 GHz it include ten operators for many cities. These operators are worldcall , ptcl , WiTribe , Wateen WIMAX , cyber internet , sharp , Metrotel , LINKdotNET , Mytel , Super Dialogue and great bear international Operators.

VI. FREQUENCY ALLOCATION OF CELLULAR OPERATORS IN PAKISTAN

There are five cellular service providers in Pakistan. These cellular service providers are Mobilink, Warid, Zong, Telenor, U-fone. All these cellular service providers are operated in 900, 1800 and 2100 MHz spectrum range.In GSM 900 MHz band 880 to 915 MHz is uplink range and from 925 to 960 is downlink range. Uplink is the link from user to

the service provider while downlink is the link from service providers to user.The spectrum range of various cellular service providers are depicted in figure shown below for 900 MHz band.

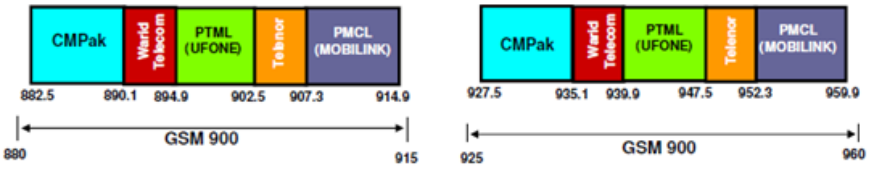

Figure 4: GSM 900 MHz Band

In GSM 1800 MHz band 1710 to 1785 MHz is uplink range and from 1805 to 1880 is downlink range. The spectrum range of various cellular service providers are depicted in figure shown below.

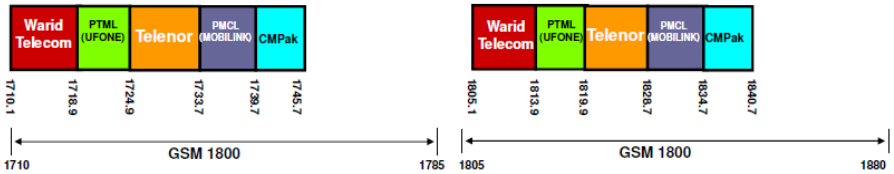

Figure 5: GSM 1800 MHz Band

On April 23, 2014 Frequency Allocation Board (FAB) Pakistan finished up cutting edge portable range closeout and Zong paid $516 million for 10 MHz range in 2100 MHz recurrence for 3G and 10 MHz range in 1800 MHz recurrence for 4G making it Pakistan's initial 3G and 4G administrator. The range assignments for NGMS 1800MHz as shown in figure below.

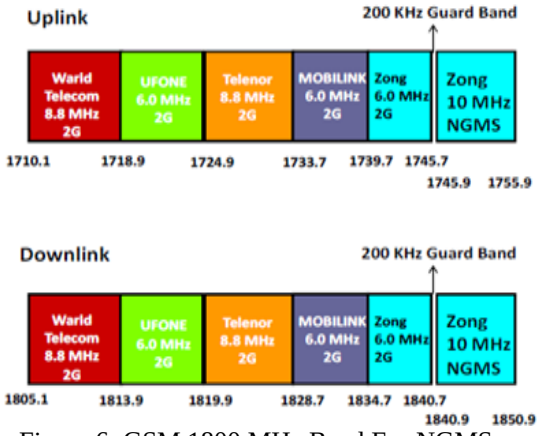

Figure 6: GSM 1800 MHz Band For NGMS

VII. PAKISTAN SATELLITE AND MARINE CABLES

Pakistan uses its PAKSAT-1R satellite for communication purposes. High power PAKSAT-1R was launched in august 2011and it was the replacement of PAKSAT-1 satellite. PAKSAT-1R is at 38° East orbit position. It covers four continents and seventy five countries and has a strong customer core across South Asia,Europe, Africa andMiddle East. It provide services like TV-Broadcasting, Cellular Operation, Internet and Data Services across four continents.

PAKSAT-1R has an operational existence of 15 years and there payloads are Ku and C. Ku band payload has an uplinked frequency of 13755 MHz to 14245 MHz, downlink frequency of 10955 MHz to 12745 MHz's and C band payload uplink frequency is 5925 MHz to 6425 MHz, download frequency is 3700 MHz to 4200 MHz's. Ku and C band payload gives a few administrations including Video Broadcast/HD TV, Video Contribution/Distribution, Satellite News Gathering, Data Connectivity and Broadband Internet. Unmatched capable Ku-band scope over, rest of South Asia and parts of Central Asia, enabling use of small reception apparatuses up to 60 cm.

Numerous TV channels, for example, PTV Home, Dawn News, Dunya Entertainment, 92 News, City 42, and NEO TV etc. are connected with PAKSAT-1R for TV television and all these TV stations are working at various recurrence. PAKSAT-1R has an immediate one bounce access into premium UK and territory Europe links and Perfect for IP trunking from UK and Mainland Europe into S. Asia, Middle East, Africa and parts of Central Asia. In the field of Telecom, with the extension extending from South Asia to Southern Europe, PAKSAT-1R is transforming into the favored choice for Cellular, Fixed and WLL system administrators. GSM executives are benefitting from immense cost speculation reserves by using PAKSAT-1R for backhaul accessibility to extend their administrations to natural and remote ranges in this way enhancing their forceful edge while keeping their framework costs low.

A submarine cables is a link laid on the ocean bed between area based stations to convey telecom signals crosswise over extends of sea. Submarine cables links Pakistan to different nations around the globe for correspondence. As of now Pakistan's universal submarine link connections and transfer speed potential are: I-ME-WE with Design Capacity of 3.86Tbps, TW1 with outline limit of 1.28Tbps, Sea-Me-We-3 with 480 Gbps with two fiber sets and Sea-Me-We-4 with configuration limit of 1.28Tbps

The India-Middle East-Western Europe (IMEWE) submarine connection is a ultra-high cutoff fiber optic connection which joins India and Europe by method for Middle East. Their three fiber pair system with total length of around 12,091 kilometers has nine terminal stations of nine telecom bearers from eight countries, including Pakistan. Pakistan Telecommunication Limited (PTCL) was influenced by the significant glitch in IMEWE submarine links on June 2014, which has affected the entire area of South Asia. The link shortcoming has happened some place amongst UAE and Karachi and Pakistan has 3.79 million broadband clients out of which 80% are the PTCL, clients influenced by this submarine link deficiency [13]. The South East Asia – Middle East – Western Europe 4 (SEA-ME-WE 4) Cable System is one of four submarine links that interface Pakistan. It is a ultra-high-limit fiber optic submarine link framework connecting South East Asia to Western Europe by means of the Middle East. Ocean ME-WE 4 connecting 16 landing stations, link system is around 20,000 kilometers and it is claimed by a partnership of 16 driving telecom bearers in 14 nations. South-East Asia - Middle East - Western Europe 3 (SEA-ME-WE-3) can trade more than 960 Gbps, almost 1 Tbps. Sea ME-WE-3 has 39 landing demonstrates from Korea Germany spreading more than 24,000 miles. Optical Branching Units license SEA-ME-ME-3 to drop off relationship into countries along its course, for instance, India, Pakistan, Turkey, and Greece. Trans World that claims TW1 has joined an association of driving telecom organizations to fabricate and work the SEA-ME-WE 5 submarine link system. The 20,000 km long submarine link, a 100 Gbps innovation and a configuration limit of no less than 24 Tbps on 3-fiber sets will interface nations from Singapore to Europe including Italy and France, KSA, Djibouti, Yemen, Oman, UAE, Pakistan, Sri Lanka, Thailand, Indonesia and Malaysia. Ocean ME-WE 5 associates a great many clients and organizations with whatever is left of the world. It is required to be prepared for administration by the second 50% of 2016.

The new connection system, Asia Africa Europe (AAE-1), will add terabits of transmission ability to PTCL's general breaking point. AAE-1 is one of the greatest connection structures dispatched and will use 100Gbps advancement with traversing about 25,000 kilometers and a framework cutoff of more than 40 terabits. The AAE-1 submarine connection will be one of the principle join systems interfacing Hong Kong, Singapore, Middle East, Africa and Europe and give a choice low lethargy course amongst Pakistan and rest of the world. The seventeen vital bearers including China Unicom, Chuan Wei, Djibouti Telecom,Omantel, OTEGLOBE, Ooredoo, PCCW Global, Pakistan Telecommunication Company Limited (PTCL), Telecom Egypt, TOT, Viettel and some diverse transporters, have denoted the Construction and Maintenance Agreement (C&MA) in Hong Kong on January 27, 2014 to definitively check the start of the AAE-1 Project. The target finish date for AAE-1 join improvement is the year 2016.

VIII. FUTURE TRENDS IN COMMUNICATION

The remarkable achievement of wireless communication is reflected by quick innovation. The 4G remote frameworks were intended to satisfy the prerequisites of International Mobile Telecommunications-Advanced (IMT-A). It has been anticipated by the Wireless World Research Forum (WWRF) that 7 trillion remote devices will serve 7 billion individuals by 2017; that is, the quantity of system associated remote devices will achieve 1000 times the world's populace [9]. It is broadly concurred that contrasted with the 4G system, the 5G system ought to accomplish 1000 times the framework limit, 10 times the otherworldly effectiveness, vitality proficiency and information rate (i.e., crest information rate of 10 Gb/s for low portability and crest information rate of 1 Gb/s for high versatility), and 25 times the normal cell throughput.

With the passage of time,number of users per network is increasing which cause an increase in mobile data traffic. There are many ways to overcome this ever increasing demand by creating more sites which means by building more number of base stations or by simply upgrading the system to next generation. But more convenient solution to this problem is WiFi offloading because it is cheaper in comparison to the cost required for building new sites and deploying new equipment for working in an advanced environment. Two types of offloading occurs. In on the spot concept of offloading the user is instantaneously connected to WiFi and data is transmitted and when user is out of the range of WiFi the transfer occurs via cellular interface where as in delayed offloading a specific time is defined and data is transmitted whenever WiFi is connected again after being disconnected. But if the delayed time has been completed then the data is sent through cellular network. Connection managers can be used in mobile phones to provide intelligent Wi-Fi offload experience where policies decide where and when offloading from 3G/4G to Wi-Fi and vice versa should occur.The strategies to control this instrument are taken care of by the Access Network Discovery and Selection Function (ANDSF) which conveys approach choices to the connection manager. The ANDSF can recover arrangement choices from the Policy Charging and Rules Function (PCRF). Offloading lessens the amount of information being carried on the cell groups, especially data transfer capacity for different users.

Additionally expanded indoor or hotspot movement, as of now, 60 percent voice activity and 70 percent information movement happens inside; later on, indoor/hotspot movement may approach 90 percent. One of the key thoughts of outlining the 5G technology is to particular open air and indoor situations so that entrance misfortune through building dividers can be some way or another dodged. This will be helped by Distributed Antenna System (DAS) and massive MIMO innovation. MIMO innovation is a standout amongst the most essential advancements to altogether enhance framework execution in scope and user information rates. Multi-user MIMO (MU-MIMO) is an impeccable arrangement of the test in downlink and uplink. It can enhance framework limit. Neighborhood IMT small cells will be composed in view of the inside and/or hotspot situation small cell can bolster more reception apparatuses (e.g., 8 or even 16 radio wires) in light of its small size. It is trusted that small cells will assume an essential part in 5G to meet the 5G prerequisites in activity volume, recurrence effectiveness, and vitality and cost diminishment. The force utilization of a nearby IMT small cell can be lessened by a few requests of greatness from that in a present base station [14]. The future

5G system will be a heterogonous layer system comprising of macrocells, conventional smaller scale/ Pico cells, new Local IMT small cells and other low-control hubs. More propelled IC and inactive part innovations might be utilized as a part of 5G.

IX. CONCLUSION

In this paper, we have first discussed the evolution of technologies and after studying the architecture of 2G, 3G & 4G, we have presented their architecture in the paper. Further we have discussed about the Warid cellular operator after having discussion on it by visiting Warid office and have talked about its 2G & LTE.After that performance of wireless local loop and cellular operators in Pakistan, in terms of their capacity, data rate, spectral efficiency, latency and Quality of service have been presented and we conclude that Zong has been leading all the operators of cellular network afterreading the PTA report of 2016.PTA set up their Key Performance Indicators (KPIs) to monitor these operators. Further in future, a new revolution of 5G technology is about to begin and we have described the future trends.

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