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Evolution of Mobile Wireless Technology from 0G to 5G.

Mohammad Meraj ud in Mir , Dr. Sumit Kumar

Abstract -The ability to communicate with people on move has evolved remarkably, since Guglielmo Marconi, first demonstrated radio ability to provide continuous contact with ships. The mobile wireless evolved in a very short span of time. In this paper I will through light on evolution of mobile Wireless Communication Networks along with their significance and advantage of one over the other. In few past decades , the mobile wireless evolution progressed from Zero Generation (0G) to First Generation (1G), Second Generation (2G), Third Generation (3G), and now Fourth Generation (4G) systems are being deployed with the aim Quality of Service (QoS), efficiency and performance. Mobile wireless technology have reached to 4G or 5G of Technology. 1G technology made large scale mobile wireless communication possible. Digital communication has replaced analog technology in 2G which significantly improved wireless communication. Voice communication was main focus in 3G technology, and converged networks for both voice and data communication was main focus in 3G technology, and converged networks for both voice and data communication is emerging. Currently 5G term is not officially used. In 5G researches are being made on development of WWWW, Dynamic Adhoc Wireless networks(DAWN) etc.

Key words:- Mobile Wireless Communication, Networks, 0G, 1G, 2G, 3G, 4G, 5G, Mobile Broadband, Wi-Fi, GSM.

INTRODUCTION

Mobile wireless industry has started its technology creation, revolution and evolution since early 1970. From Mid 1990's the cellular communication industry has witnessed explosive growth. Wireless communication networks have become much more pervasive than anyone could have imagined when the cellular concept was first deployed in 1960's and 1970's. Mobile cellular subscribers are increasing 40% per year, and by the end of 2010 there will be 4 times more mobile cellular subscription than fixed telephone lines.

The rapid world wide growth in cellular telephone subscribers has demonstrated conclusively that wireless communications is a robust, viable voice and data transport mechanism. The wide spread success of cellular has led to the development of newer wireless system and standards for many other types of telecommunication traffic besides mobile voice telephone calls.

Why we use wireless communication

Wireless technology are differentiated on the basis of their range. Some offer connectivity within few feet's viz. Bluetooth and other cover medium sized office space. The mobile phone covers whole continents.

Wireless technology offer e-commerce more flexible and in-expensive ways to send and receive data.

The four key benefits of wireless technology are as under:-

1. **Increased efficiency:-** High technology communication systems lead to faster transfer of information within business and between customers.
2. **Rarely out of touch:-** No need to carry cables or adapters in order to access office Networks.
3. **Greater flexibility for users:-** Wireless workers in the office can be networked without sitting at dedicated PC's.
4. **Reduced Cost:-** Wireless networks are mostly cheaper to install and maintain than wired networks.

HISTORY/BACKGROUND:-

After going through the era of 1G & 2G from the early 1900s to 2000, 3G first came into the scene in the year 2001. The first pre-commercial trial network with 3G was launched by NTT DoCoMo in Japan in the Tokyo region in May 2001. NTT DoCoMo launched the first commercial 3G network on October 1, 2001, using the WCDMA technology. In 2002 the first 3G networks on the rival CDMA2000 1xEV-DO technology were launched by SK Telecom and KTF in South Korea, and Monet in the USA. Monet has since gone bankrupt. By the end of 2002, the second WCDMA network was launched in Japan by Vodafone KK (now Softbank). In March the first European launches of 3G were in Italy and the UK by the Three/Hutchison group, on WCDMA. 2003 saw a further 8 commercial launches of 3G, six more on WCDMA and two more on the EV-DO standard. By the end of 2007 there were 295 Million subscribers on 3G networks worldwide, which reflected 9% of the total worldwide subscriber base. About two thirds of these are on the WCDMA standard and one third on the EV-DO standard. The 3G telecoms services generated over 120 Billion dollars of revenues during 2007 and at many markets the majority of new phones activated were 3G phones. In Japan and South Korea the market no longer supplies phones of the second generation. Earlier in the decade there were doubts about whether 3G might happen, and also whether 3G might become a commercial success. By the end of 2007 it had become clear that 3G was a reality and was clearly on the path to become a profitable venture.

On the other hand, 4G has a very short history thus far. It started from the year 2008 and has not been implemented fully yet. Sprint made history in September 2008 when it became the first major US carrier to launch a 4G network in Baltimore. This week it expanded its coverage to three more cities and announced plans to launch 17 additional new markets in 2009.

Evolution of Mobile cellular Networks

Cellular Mobile communication has generations as shown in the figure. The brief description of every generation is given as under:-

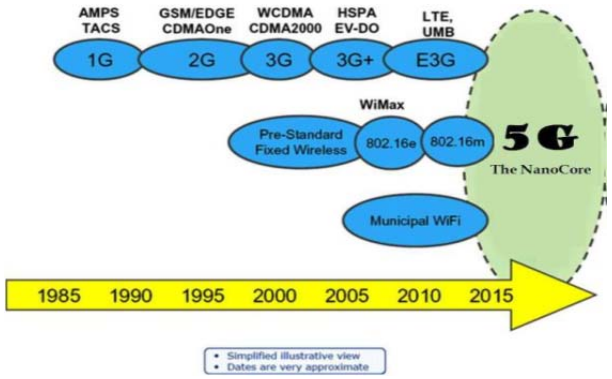

Figure:- Block diagram of evolution of wireless network.

0G

Wireless telephone started with 0G, which became available after World War-II. In those pre-cell days, mobile operator sets up the calls and there were only a handful of channels available. These mobiles does not support the handover feature i.e. Change of channel frequency.

0G refers to pre cellular mobile telephony technology in 1970's., such as Radio telephones that some had in cars before the advent of cell phones. Mobile radio telephonic system produced modern cellular mobile-telephony technology. Since they were predecessors of first generation of cellular telephones, these systems, are called 0G (Zero Generation) Systems.

Technologies used in 0G systems included PTT (Push to Talk), MTS (Mobile Telephone System) , IMTS (Improved Mobile Telephone Service),AMTS (Advanced Mobile Telephone System), OLT (Norwegian for Offentlig Landmobil Telefoni ,Public Land Mobile Telephony) and MTD (Swedish abbreviation for Mobile Telephony system D). The primary users were loggers, construction foremen, realtors and celebrities. They were used for them for basic voice communication.

0.5 G

0.5 G is a group of technologies with improved feature than the basic 0G technologies.

These early mobile telephone systems can be distinguished from earlier closed radiotelephone systems in that they were available as a commercial service that was part of the public switched telephone network, with their own telephone numbers, rather than part of a closed network such as a police radio or taxi dispatch system.

These mobile telephones were usually mounted in cars or trucks, though briefcase models were also made. Typically, the transceiver (transmitter receiver)

was mounted in the vehicle trunk and attached to the "head" (dial, display, and handset) mounted near the driver seat.

They were sold through WCCs (Wireline Common Carriers, AKA telephone companies), RCCs (Radio Common Carriers), and two-way radio dealers. The primary users were loggers, construction foremen, realtors, and celebrities. They used them for basic voice communication.

Early examples for this technology are:

1. The Autoradiopuhelin (ARP) launched in 1971 in Finland as the country's first public commercial mobile phone network.
2. The B-Netz launched 1972 in Germany as the countries second public commercial mobile phone network (but the first one that did not require human operators anymore to connect

FIRST GENERATION (1G)

1G is the first generation wireless telephone technology, Cell phones. They were analog cell phones and were introduced in 1980. In 1979, the first cellular system in the world became operational by Nippon Telephone and Telegraph (NTT) in Tokyo, Japan. In Europe two most popular analog systems were Nordic Mobile Telephone (NMT) and (TACS) other analog systems were also introduced in 1980's across the Europe. All the systems offered handover and roaming capability but the cellular networks were unable to interoperate between countries. This was the main drawback of First Generation mobile networks. 1G has low capacity unreliable handoff, poor voice links and no security since voice calls were played back in radio towers making these calls susceptible to unwanted. In USA AMPS was first 1G standard launched in 1982. AMPS system was allocated a 40 MHZ bandwidth within the 800-900 MHZ frequency range by the federal Communication Commission (FCC). In 1988 additional 10 MHZ bandwidth, called expanded spectrum (ES) was allocated to AMPS.

Italy used a telecommunication system called RTMI. IN UK, YACS was used. France used RadioComm 2000. In West Germany , Portugal and South Africa a telecom standard known as C-450 was used.

1G technology replaced 0G technology, which featured mobile radio telephones and such technologies as Mobile Telephone System (MTS), Advanced Mobile Telephone System (AMTS), Improved Mobile Telephone Service (IMTS), and Push to Talk (PTT).

1. Developed in 1980s and completed in early 1990's
2. 1G was old analog system and supported the 1st. generation of analog cell phones speed up to 2.4kbps
3. Advance mobile phone system (AMPS) was first launched by the US and is a 1G mobile system
4. Allows users to make voice calls in 1 country

SECOND GENERATION TECHNOLOGY (2G TO 2.7 G)

2G is the Second-Generation wireless cellphones, based on digital technologies and in early 1990's. In 1991 2G was launched in Finland. 2G provided services such as text message, picture messages and MMS. 2G has greater security for both sender and receiver. All text messages are digitally encrypted, which allows for the transfer of data in such a way that only intended receiver can receive and read it. 2G system uses digital mobile access technology such as TDMA and CDMA. TDMA divides signal in time slots while as CDMA allocates each user a special code to communicate over a multiplex physical channel. Different TDMA technologies are GSM, PDC, iDEN , iS-136. GSM was first 2G System. CDMA technology is IS-95. GSM (Group Special Mobile) has origin from Europe. GSM is

most admired standard of all the mobile technologies used in more than 212 countries, in the world. GSM standard makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM uses TDMA to multiplex upto 8 calls per channel in the 900 and 1800 MHZ bands. GSM can't only deliver voice but also circuit switched data at sped upto 14.4kbps. In US FCC also auctioned a new block of spectrum in the 1900MHZ band. During 20 years , GSM technology has been continuously improved to offer better services in the market. New technologies has been developed based on the original GSM system, leading to some advanced system , known as 2.5 generation (2.5 G) Systems.

2.5G – GPRS (General Packet Radio Service)

GPRS is extension of existing 2G network to have the capacity of launching packet based services while enhancing the data rates supported by these networks. The term " Second and a half generation" is used to describe 2G-Systems that have implemented a packet switched domain in addition to circuit switched domain.

"2.5 G" is an informal term. GPRS provided data rates from 56 Kbps upto 384 Kbps, using database HLR, VLR, EIR, and AuC with HSCSD, GPRS and EDGE technologies. It provides services such as Wireless Application Protocol (WAP) access, Multimedia Messaging Service (MMS) and for internet communication services such as e-mail and World Wide Wireless Web (WWW) access. GPRS data transfer is typically charged per megabyte of traffic transferred, while data communication via traditional circuit switching is billed per minute of connection time, independent of whether the user actually is utilizing the capacity or is in an idle state.

2.5G networks may support services such as WAP, MMS, SMS mobile games, and search directory and well internet access.

2.75 – EDGE (Enhanced Data rates for GSM Evolution)

GPRS network s evolved to EDGE networks with the introduction of 8PSK encoding. Enhanced Data rates for GSM Evolution, Enhanced GPRS (EGPRS) , or IMT Single Carrier (IMT-SC) is a backward-compatible digital mobile phone technology that allows improved data transmission rates, as an extension on top of standard GSM. EDGE was deployed on GSM networks beginning in 2003 initially by Cingular (now AT & T) in the United States. EDGE is standardized by 3GPP as part of the GSM family, and it is an upgrade that provides a potential three-fold increase in capacity of GSM/GPRS networks. The specification achieves higher data –rates (up to 236.8 Kbits/s) by switching to more sophisticated methods of coding (8PSK), within existing GSM timeslots.

EDGE technology is an extended version of GSM. It allows the clear and fast transmission of data and information. It is also termed as IMT-SC or single carrier. EDGE technology was invented and introduced by Cingular, which is now known as AT& T. EDGE is radio technology and is a part of third generation technologies. EDGE technology is preferred over GSM due to its flexibility to carry packet switch data and circuit switch data.

EDGE transfers data in fewer seconds if we compare it with GPRS Technology. For example a typical text file of 40KB is transferred in only 2 seconds as compared to the transfer from GPRS technology, which is 6 seconds. The biggest advantage of using EDGE technology is one does not need to install any additional hardware and software in order to make use of EDGE Technology. There are no additional charges for exploiting this technology. If a person is an ex GPRS Technology user he can utilize this technology without paying any additional charges.

Keys:-

1. In between 2G and 3G there is another generation called 2.5G.
2. 2.5G represents handsets with data capabilities over GPRS.
3. But this has not brought out any revolution.

Migration path towards 3G Wireless System

Soon, a greater demand to remove the distinction between fixed and mobile networks will become apparent . Access to the Internet and Intranets, Teleworking and the advent of the Virtual office are concepts which will become more commonplace in the near future. For the third generation communication system, the challenge will be the globalization and convergence of office and home applications and services with the help of new communication tools.

However, the situation is not the simple. The variety of communication systems in the market today, as discussed above, across different geographical locations, with their own economic, political, regulatory and social issues, make it difficult to bring all the players together to one single convergence point. There are large investments involved already and it is extremely difficult if not possible to develop standards right from scratch. Keeping this in mind, it has been recognized that a standard should be developed that accommodates the backward-compatibility of existing networks, while at the same time defining a common framework under which these networks can evolve. This will be an evolution from each of the regional second generation systems – wireless and wireline- and will satisfy market demands for global roaming, service portability and multimedia, allowing for differentiation of services and products.

3G

3G is the third generation of mobile phone standards and technology, superseding 2G, and preceding 4G. It is based on the International Telecommunication Union (ITU) who formulated a plan to implement global frequency band in the 2000 MHZ range, which will support a single, ubiquitous wireless communication standard for all countries throughout the world. This paln is called International Mobile Telephone 2000 (IMT-2000), Standard.

3G evolution for CDMA systems lead to Cdma 2000. Several variants of CDMA 2000 are based on IS-95 and IS-95B technologies. 3G evolution for GSM is IS-136 and PDC System lead to wideband CDMA (WCDMA), also called Universal Mobile Telecommunication Service (UMTS) , W-CDMA is based on GSM network. Cdma

2000 and W-CDMA, will remain main 3G technology popular. 3rd. Generation Partnership Project (3GPP) has continued that work by defining a mobile system that fulfills the IMT-2000 standard.

3G technologies enable network operators to offer users a wider range of more advanced services while achieving greater network capacity through improved spectral efficiency. Services include wide area wireless voice telephony, video calls, and broadband wireless data, mobile television, GPS (global positioning system) and video conferencing. all in a mobile environment.

3G has the following enhancements over 2.5G and previous networks:

- Enhanced audio and video streaming.
- Several Times higher data speed.
- Video-conferencing support.
- Web and WAP browsing at higher speeds.
- IPTV (TV through the Internet) support.

3.5 G – HSDPA (High-Speed Downlink Packet Access)

High-Speed Downlink Packet Access(HSDPA) is a mobile telephony protocol, also called 3.5G (or "3½ G"), which provides a smooth evolutionary path for UMTS-based 3G networks allowing for higher data transfer speeds. HSDPA is a packet-based data service in W-CDMA downlink with data transmission up to 8-10 Mbit/s (and 20 Mbit/s for MIMO systems) over a 5MHz bandwidth in WCDMA downlink. HSDPA implementations includes Adaptive Modulation and Coding (AMC), Multiple-Input Multiple-Output (MIMO), Hybrid Automatic Request (HARQ), fast cell search, and advanced receiver design.

3.75G – HSUPA (High-Speed Uplink Packet Access)

The 3.75G refer to the technologies beyond the well defined 3G wireless/mobile technologies. High Speed Uplink Packet Access (HSUPA) is a UMTS / WCDMA uplink evolution technology.

The HSUPA mobile telecommunications technology is directly related to HSDPA and the two are complimentary to one another.

HSUPA will enhance advanced person-to-person data applications with higher and symmetric data rates, like mobile e-mail and real-time person-toperson gaming. Traditional business applications along with many consumer applications will benefit

from enhanced uplink speed. HSUPA will initially boost the UMTS / WCDMA uplink up to 1.4Mbps and in later releases up to 5.8Mbps.

Future Trends

Future 3G technologies such as EDGE, UMTS, IVRS, and Broadband will enable a larger amount of data that can be exchanged while on the move and will determine the path the wired and wireless computing field will take. These will create the need for convergence of digital appliances, assimilation of the technologies, fading of content distribution boundaries and therefore, the need to provide a common framework for organizations to meet these challenges. It isn't tough anymore to imagine the near future where the small machine in the pocket will replace a variety of appliances that a person needs to carry — mobile phones, personal computer, driver license, credit card, remote control, security device, smart cash, etc. — all combined in a single device.

4G

4G is a concept of inter-operability between different sorts of networks, which is all about high speed data transfer such as 0-100MBPS of either the server or the data receiver set is moving at a speed of 60 Kmph. If the server and the receiver are stationary, the data transfer would be a minimum of 1GBPS.

4G is the next generation wireless networks that will replace 3G networks sometimes in future. In other context, 4G is simply an initiative by academic, R & D labs to move beyond the limitations and problems of 3G which is having trouble getting deployed and meeting its promised performance and throughput.

These days in 3G we can access the internet through our mobile phone with the help of various technologies, like Wi-Fi, Wi-Max, GPRS, EDGE, WAP and Wi-Bro.

But the problem is that if you are accessing the internet through your mobile phone within the help of any of these technologies and you move to place where inter-operability between different networks obtains, you are stuck. If you are using 4G, you can access the net through any of the aforesaid technologies even while moving from one place to another.

Expected issues considered to be resolved in this 4G mobile technology which are as under:-

- It is considered to embed IP feature in the set for more security purpose as high data rates are send and receive through the phone using 4G mobile technology.
- 4G mobile technology is going to be able to download at a rate of 100Mbps like mobile access and less mobility of 1GBps for local access of wireless
- Instead of hybrid technology used in 3G with the combination of CDMA and IS-95 a new technology OFDMA is introduced 4G. In OFDMA, the concept is again of division multiple accesses but this is neither time like TDMA nor code divided CDMA rather frequency domain equalization process symbolizes as OFDMA.
- CDMA sends data through one channel but with the division of time in three slots. While CDMA also sends data through one channel identifying the receiver with the help of code. Whereas in 4G mobile technology OFDMA is going to introduce in which data packets sends by dividing the channel into a narrow band for the greater efficiency comprises a prominent feature of 4G mobile technology.
- IEEE 802.16m is processing for the IEE802.16e comprising the 4G brand will define it as WMBA (Wireless Mobile Broadband Access). This is a plain indicator for the internet availability. The implementation is in progress to avoid the call interference in case of data download from a website. It will propose 128 Mbps downlink data rate and 56Mbps uplink data rate which is an extra ordinary step in 4G mobile technology. The service will limit as the availability of hotspot is condition for the internet connectivity.

- Parallel with WiMAX, LTE is intended to incorporate in 4G mobiles. It is also a wireless technology for the broadband access. The difference between WiMAX and LTE is that LTE goes for the IP Address. It follows the same TCP / IP concept inherited from networking technology. Restricted for the IP addresses it will provide great security as well as high data transferability, avoid latency, having the ability to adjust the bandwidth. LTE is compatible with CDMA so able to back n forth the data in between both networks.
- 3GPP Organization is going to introduce two major wireless standards; LTE and IEEE802.16m. Former is granted permission for the further process while second is under consideration and that will become a part of 4G mobile technology.
- IPv6 is approved by Version as a 4G standard on June 2009.

FIFTH GENERATION (5G)

5G (5th generation mobile networks or 5th generation wireless systems) is a name used in some research papers and projects to denote the next major phase of mobile telecommunications standards beyond the upcoming 4G standards, which are expected to be finalized between approximately 2011 and 2013. 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.

5G network is assumed as the perfection level of wireless communication in mobile technology. Cable network is now become the memory of past. Mobiles are not only a communication tool but also serve many other purposes. All the previous wireless technologies are entertaining the ease of telephone and data sharing but 5G is bringing a new touch and making the life real mobile life. The new 5G network is expected to improve the services and applications offered by it.

This paper concludes by looking back at existing wireless technologies and summarizing the next generation wireless communication media in the following table. These technologies, indeed, have a long way to go and exciting and amazing products are bound to emerge in the years to come.

FUTURE SCOPE:-

5G network technology will open a new era in mobile communication technology. The 5G mobile 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 offers 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 phone will be tablet PC Many mobile embedded technologies will evolve.

Generation	Speed	Technology	Time period	Features
1G	14.4 Kbps	AMPS,NMT, TACS	1970 – 1980	During 1G Wireless phones are used for voice only.
2G	9.6/ 14.4 Kbps	TDMA,CDMA	1990 to 2000	2G capabilities are achieved by allowing multiple users on a single channel via multiplexing. During 2G Cellular phones are used for data also along with voice.
2.5G	171.2 Kbps 20-40 Kbps	GPRS	2001-2004	2.5G the internet becomes popular and data becomes more relevant.2.5G Multimedia services and streaming starts to show growth. Phones start supporting web browsing though limited and very few phones have that.
3G	3.1 Mbps 500-700 Kbps	CDMA 200 (1xRTT, EVDO) UMTS, EDGE	2004-2005	3G has Multimedia services support along with streaming are more popular. In 3G, Universal access and portability across different device types are made possible. (Telephones, PDA's, etc.)
3.5G	14.4 Mbps 1-3 Mbps	HSPA	2006 – 2010	3.5G supports higher throughput and speeds to support higher data needs of the consumers
4G	100-300 Mbps. 3-5 Mbps 100 Mbps (Wi-Fi)	WiMax LTE Wi-Fi	Now (Read more on Transitioning to 4G)	Speeds for 4G are further increased to keep up with data access demand used by various services. High definition streaming is now supported in 4G. New phones with HD capabilities surface. It gets pretty cool. In 4G, Portability is increased further. World-wide roaming is not a distant dream.
5G	Probably gigabits	Not Yet	Soon (probably 2020)	Currently there is no 5G technology deployed. When this becomes available it will provide very high speeds to the consumers. It would also provide efficient use of available bandwidth

KEY CHALLENGES

Integration of various standards: Each engineering practice has their own standard (F.eks Telecom has 3GPP, 3GPP2, ITU, IETF, etc). To integrate these various standards, requires systematic and time consuming approach.

Common Platform: There is no common architecture for interconnecting various engineering practices. One common governing body is required, which creates a common platform for all engineering practices to regularize the interconnectivity issues as well as knowledge sharing.

Super core concept

Existing telecom networks are fashioned in hierarchical way, where subscriber traffic is aggregated at aggregation point(BSC/RNC) and then routed to gateways. Flat IP architecture will lessen burden on aggregation point and traffic will directly move from Base station to Media gateways. When transition from legacy (TDM, ATM) platforms to IP will be concluded (Flat Network concept, described in previous section) a common ALL IP platform will be emerged. Vision of Super Core is based on IP platform. All network operators (GSM,CDMA, Wimax, Wireline) can be connected to one Super core with massive capacity. This is realization of single network infrastructure. The concept of super core will eliminate all interconnecting charges and complexities, which is right now network operator is facing. It will also reduce number of network entities in end to end connection, thus reducing latency considerably.

High redundancy requirement:

Under Super core concept, all network operators will be moving to single core infrastructure, high redundancy and security among core network entities is required. A failure of single node will impact huge number of subscribers across various network operators.

Transparency among network operators, regarding Subscriber data, churn management, etc. Government **regulatory** framework for Super core.

Flatter IP concept

At regular interval, semiconductor manufacturers advance to a new generation with smaller feature sizes. This allows them to incorporate more functions into a given area of silicon and, hence, more features or new capabilities into electronic devices like cell phones. As advancement semi-conductor industry, 22nM CMOS will be reality and this will increase the processing capacity of digital devices significantly. Increased processing capacity will be allow Mobile devices (cellphones, PDAs, etc) to do more tasks (instructions per minute) then before. This will lead to even the Flatter IP network. As Flat IP has shifted some of the BSC/RNC's radio resource functions to Base station, Flatter IP will shift some of the RR functions, to Mobile devices from Base station. Finally your cell phone will not be just access device but, it will also perform some of the Radio Resource Management functions.

Evolution of network infra sharing

Network operators, worldwide are opting for infrastructure sharing. Currently trend is for passive infra sharing as Active infra sharing has certain limitation. But at invention and deployment of Cognitive Radios (Software based radios) and multi-port Base station, will promote active infra sharing at Antenna, Base station and spectrum level at access Ran. So, network operators, offering different access technologies such LTE & Wimax, can have single high capacity base station and antenna.

Currently service provider is spending 60% of total expenditure on Capex This arrangement will have significant amount of Capex saving as currently service provider is spending 60% of total expenditure on Capex.

Evolution of managed services

Network operators are shifting network related activities to managed service vendor. Concept of Super Core complements this trend as all network operators will end up having one massive super core, which will be managed by one or many vendors under managed service contract, bound by SLA (Service level agreements). Thus, during 5G, may be Today's mobile network operators could become service retailers and due to single infrastructure, today's MNO (Mobile network operators) s will effectively be MVNOs (Mobile Virtual network operators).

Future Enhancement:-

1. The future enhancement of Nanocore will be incredible as it combines with artificial intelligent (AI).
2. One can able to control his intelligent Robot using his mobile phone. Human life will be surrounded by artificial sensors which could be communicating with your mobile phones.
3. Your Mobile can automatically type the message what your brain thinks.
4. Your TV will display the programmes of a channel u thinks.
5. Recently a research company of Sweeden has claimed that they have made a mouse which will display the S/W you are intending only looking towards the screen without clicking by using Nanotechnology .
6. We might get a circumstance where we don't require any spectrum for communication.
7. We might be communicating with people on other planets using mobile phone December 1, 2010es.
8. We might have a single NanoCore common for all the nations. This might improve mobility of user as well as a smaller amount of billing to end user.
9. Who knows some times we may communicate with the supernatural things with our mobile phones.
10. Everything depends on how human being is going to utilize these echnologies in an innovative manner.

Conclusion:

As data traffic has tremendous growth potential, under 4G existing voice centric telecom hierarchies will be moving flat IP architecture where, base stations will be directly connected to media gateways. 5G will offer even more flatter architecture by using advanced semi conductor technologies as 22mN CMOS. 5G will promote concept of Super Core, where all the network operators will be connected one single core and have one single infrastructure, regardless of their access technologies. 5G will bring evaluation of active infra sharing and managed services and eventually all existing network operators will be MVNOs (Mobile virtual network operators).

Future is becoming more difficult to predict with each passing year. We conclude that nanotechnology, Cloud computing, All IP are the next great technology wave and the next phase of Moore's Law. NanoCore innovations enable Myriad disruptive businesses those were not possible before, driven by entrepreneurship. People working in different fields creating future concepts of mobile communication, Internet services, Cloud computing, All IP network, and Nanotechnologies.

CONCLUSION

Mobile communications are clearly going to show major enhancements in terms of capabilities of mobile networks. The next generation of wireless services, besides improving the overall capacity, will create its own unique demands in terms of localization, personalization, etc., which will in turn, drive the development and continuous evolution of services and infrastructure. While development of 3G networks will continue and pick up pace in the near future, the 2nd generation networks will keep evolving in terms of continuous enhancements and towards convergence of existing 2G standards. The initial 3G solutions should coexist with the 2G networks while slowly evolving to all 3G networks. While 3G networks expect transparent roaming across all networks throughout the world, given the current investments and implementation of the 2nd generation systems, true roaming consistent service availability, across networks, independent of networks will take some time to implement. A lot will depend on the commercial proposition of each of the technologies and on how good an organization's business models are to recover investments.

While technologies continue to establish themselves in the business world, research is already progressing towards the next generation of communication services. The future mobile communications systems are expected to provide a wide variety of services, from high-quality voice to high-definition video, through high-data-rate wireless channels anywhere in the world. High data rates require broad frequency bands, and sufficient broadband can be achieved in higher frequency bands such as microwave and millimeter-wave. These broadband wireless channels have to be connected to broadband fixed networks such as the Internet and local area networks. Future generations of systems will include not only cellular phones, but also many new types of communications systems. Future generations of mobile communications will talk about multimedia communications, wireless access to broadband fixed networks, and seamless roaming among different systems.

In conclusion, this research paper reveals that there are following major area of research:

- Real wireless world with no more limitation with access and zone issues.
- Wearable devices with AI capabilities.
- Internet protocol version 6 (IPv6), where a visiting care-of mobile IP address is assigned according to location and connected network.
- Pervasive Networks providing ubiquitous computing: The user can simultaneously be connected to several wireless access technologies and seamlessly move between them.

Finally nowadays, wireless technology is getting popular and important in the network and the Internet field. In this paper, I briefly introduced the history background of 1G to 5G, compared the differences of 3G and 4G, and illustrated how 4G may work for more convenient and powerful in the future. 4G just right started from 2002 and there are many standards and technologies, which are still in developing process. Therefore, no one can really sure what the future 4G will look like and what services it will offer to people. However, we can get the general idea about 4G from academic research; 4G is the evolution based on 3G's limitation and it will fulfill the idea of WWWW, World Wide Wireless Web, offering more services and smooth global roaming with inexpensive cost.

REFERENCES

1 ITU (2009). "Measuring the Information Society; The ICT Development Index", [Online] Available: http://www.itu.Int/ITUD/ict/publications/idi/2009/material/IDI2009_w5.pdf

2 Mishra, Ajay K. "Fundamentals of Cellular Network Planning and Optimization, 2G/2.5G/3G…Evolution of 4G", John Wiley and Sons, 2004.

3 Chen, Yue (2003). "Soft Handover Issues in Radio Resource Management for 3G WCDMA Networks", Queen Mary, University of London, [Online] Available: www.elec.qmul.ac.uk/research/thesis/YueChen2003.pdf

4 ITU-R PDNR WP8F. "Vision, Framework and Overall Objectives of the Future Development of IMT-2000 and Systems beyond IMT-2000", 2002.

5 Toh, C. K. "Ad Hoc Mobile Wireless Networks: Protocols and Systems", Prentice Hall, New Jersey, USA, 2002.

6 Pereira, Vasco & Sousa, Tiago. "Evolution of Mobile Communications: from 1G to 4G", Department of Informatics Engineering of the University of Coimbra, Portugal 2004.

7 ITU (2010). "Measuring the Information Society, 2010".[Online] Available: http://www.itu.int/ITU-D/ict/statistics/material/graphs/2010/Global_ICT_Dev_00-10.jpg

8 UMTS World (2009). "UMTS / 3G History and Future Milestones", [Online] Available: http://www.umtsworld.com/umts/history.htm

9 Kamarularifin Abd Jalil, Mohd Hanafi Abd. Latif, Mohamad Noorman Masrek, "Looking Into The 4G Features", MASAUM Journal of Basic and Applied Sciences Vol.1,No. 2 September 2009

10 3gamericas (2010). "Transition to 4G: 3GPP Broadband Evolution to IMT-Advanced", Rysavy Research/3G Americas. [Online] Available: ww.rysavy.com/PR/3GA_PR_2010_09.pdf

11 Fumiyuki Adachi, "Wireless past and Future: Evolving Mobile Communication Systems". IEICE Trans. Findamental, Vol.E84-A, No.1, January 2001.

12 ITU (2010). "ITU Paves the Way for Next-Generation 4G Mobile Broadband Technologies". [Online].Available:http://www.itu.int/net/pressoffice/press_releases/2010/40.

13 Andrea Goldsmith, Wireless Communications, Standford University

14 Arogayaswami Paulraj, Rohit Nabar, Dhananjay Gore, Introduction To Space Time Wireless Communications, Prentice Hall of India

15 A. V. Geramita and J. Seberry, Orthogonal Designs, Quadratic Forms and Hadamard Matrices, Lecture Notes in Pure and Applied Mathematics, vol. 43. New York and Basel: Marcel Dekker, 1979.

16 A. Wittneben, "Base station modulation diversity for digital SIMULCAST," in Proc. IEEE VTC, May 1991.

16 B. Hassibi and B. Hochwald, "high-rate codes that are linear in space and time", IEEE Trans. Inform. Theory, April 2001.

17 J. Winters, J. Salz, and R. D. Gitlin, "*The impact of antenna diversity on the capacity of wireless communication systems,*" IEEE Trans. Communication.

18 L. Stuber, *Principles of Mobile Communication*. Boston, M.A:Kluwer