

STUDY OF MOBILE COMMUNICATION

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ABSTRACT

The journey of development in mobile wireless communication is spread over few decades. This advancement in mobile communication consists of few generations and is still going on. In this paper we will present the study of several generations which are being used 1G, 2G, 3G, and 4G, and try to find some future generations

Keywords: 1G,2G,3G,4G,5G,6

INTRODUCTION TO MOBILE COMMUNICATION

Mobile Communication is the use of technology that allows us to communicate with others in different locations without the use of any physical connection (wires or cables). Mobile communication makes our life easier, and it saves time and effort.

A mobile phone (also called mobile cellular network, cell phone or hand phone) is an example of mobile communication (wireless communication). It is an electric device used for full duplex two way radio telecommunication over a cellular network of base stations known as cell site.

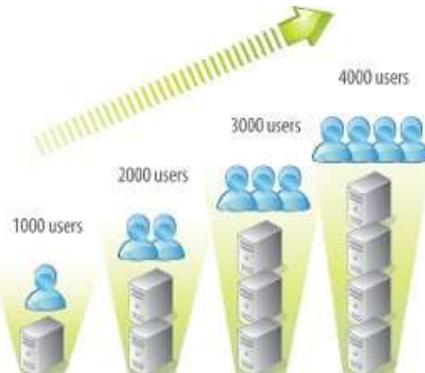
Features of Mobile Communication

The following are the features of mobile communication:

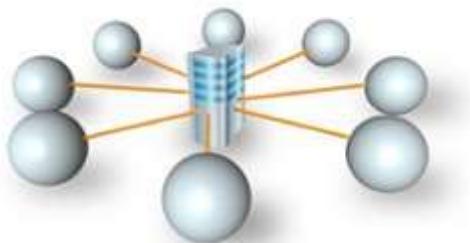
- **High capacity load balancing:** Each wired or wireless infrastructure must incorporate high capacity load balancing. High capacity load balancing means, when one access point is overloaded, the system will actively shift users from one access point to another depending on the capacity which is available.



- **Scalability:** The growth in popularity of new wireless devices continuously increasing day by day. The wireless networks have the ability to start small if necessary, but expand in terms of coverage and capacity as needed - without having to overhaul or build an entirely.v



- **Network management system:** Now a day, wireless networks are much more complex and may consist of hundreds or even thousands of access points, firewalls, switches, managed power and various other components. The wireless networks have a smarter way of managing the entire network from a centralized point.



Role based access control: Role based access control (RBAC) allows you to assign roles based on what, who, where, when and how a user or device is trying to access your network. Once the end user or role of the devices is defined, access control policies or rules can be enforced.

- **Indoor as well as outdoor coverage options:** It is important that your wireless system has the capability of adding indoor coverage as well as outdoor coverage.
- **Network access control:** Network access control can also be called as mobile device registration. It is essential to have a secure registration. Network access control (NAC) controls the role of the user and enforces policies. NAC can allow your users to register themselves to the network. It is a helpful feature that enhances the user experience.
- **Mobile device management:** Suppose, many mobile devices are accessing your wireless network; now think about the thousands of applications are running on those mobile devices. How do you plan on managing all of these devices and their applications, especially as devices come and go from your business?

Mobile device management can provide control of how you will manage access to programs and applications. Even you can remotely wipe the device if it is lost or stolen.



- **Roaming:** You don't need to worry about dropped connections, slower speeds or any disruption in service as you move throughout your office or even from building to building wireless needs to be mobile first. Roaming allows your end-users to successfully move from one access point to another without ever noticing a dip in a performance. For example, allowing a student to check their mail as they walk from one class to the next.
- **Redundancy:** The level or amount of redundancy your wireless system requires depends on your specific environment and needs.
- **For example:** A hospital environment will need a higher level of redundancy than a coffee shop. However, at the end of the day, they both need to have a backup plan in place.
- **Proper Security means using the right firewall:** The backbone of the system is your network firewall. With the right firewall in place you will be able to:
 - See and control both your applications and end users.
 - Create the right balance between security and performance.
 - Reduce the complexity with:
 - Antivirus protection.
 - Deep Packet Inspection (DPI)
 - Application filtering
 - Protect your network and end users against known and unknown threats including:
 - Zero-day.
 - Encrypted malware.
 - Ransomware.
 - Malicious botnets.
- **Switching:** Basically, a network switch is the traffic cop of your wireless network which making sure that everyone and every device gets to where they need to go. Switching is an essential part of every fast, secure wireless network for several reasons:
 - It helps the traffic on your network flow more efficiently.
 - It minimizes unnecessary traffic.
 - It creates a better user experience by ensuring your traffic is going to the right places.

Advantages of Mobile Communication

There are following advantages of mobile communication: Handling in Java - Ja

- **Flexibility:** Wireless communication enables the people to communicate with each other regardless of location. There is no need to be in an office or some telephone booth in order to pass and receive messages.
- **Cost effectiveness:** In wireless communication, there is no need of any physical infrastructure (Wires or cables) or maintenance practice. Hence, the cost is reduced.
- **Speed:** Improvements can also be seen in speed. The network connectivity or the accessibility was much improved in accuracy and speed.
- **Accessibility:** With the help of wireless technology easy accessibility to the remote areas is possible. For example, in rural areas, online education is now possible. Educators or students no longer need to travel to far-flung areas to teach their lessons.
- **Constant connectivity:** Constant connectivity ensures that people can respond to emergencies relatively quickly. For example, a wireless device like mobile can ensure you a constant connectivity though you move from place to place or while you travel, whereas a wired landline can't.

History of Wireless Communication

The history of the wireless communications started with the understanding of magnetic and electric properties observed during the early days by the Chinese, Roman and Greek cultures and experiments carried out in the 17th and 18th centuries. A short history of wireless communication is presented in the tabular form:

Year	Description
1880	Hertz-Radio Communication
1897	Marconi- Radio Transmission
1933	FCC (Federal Communication Commission)
1938	FCC rules for regular services
1946	Bell telephone laboratories 52 MHz
1956	FCC - 450MHz (Simplex)
1964	Bell telephone active research 800 MHz
1964	FCC - 450 MHz (Full Duplex)
1969	FCC - 40 MHz bandwidth
1981	FCC ? release of cellular land phone in the 40 MHz
1982	At & T divested and Server RBOC (Regional Bell Operation Companies) formed to manage the cellular operation.
1984	Most RBOC market in operations
1986	FCC allocates 5MHz extended band.
1988	TDMA voted as digital cellular standard in North America.
1992	GSM (Group Special Mobile) operable Germany D2 system.
1993	CDMA (Code Division Multiple Access)
1994	PDCC (Personal Digital Cellular Operable) in Tokyo, Japan
1995	CDMA operable in Hong Kong
1996	Six Broad Band PCS (Personal Communication Services) licensed bands (120 MHz) almost reader 20 billion US dollar
1997	Broad band CDMA constructed and of the 3rd generation mobile.
1999	Powerful WLAN systems were evolved, such as Bluetooth. This uses 2.4 MHz spectrum.

Generations of Wireless Communication

1G

- This is the first generation of wireless telephone technology, mobile telecommunications, which was launched in Japan by NTT in 1979.
- The main technological development in this generation that distinguished the First Generation mobile phones from the previous generation was the use of multiple cell sites, and the ability to transfer calls from one site to the next site as the user travelled between cells during a conversation.
- It uses analog signals.
- It allows the voice calls in one country.

DISADVANTAGES

- Poor quality of voice
- Poor life of Battery
- Size of phone was very large
- No security
- Capacity was limited
- Poor handoff reliability

1G WIRELESS SYSTEMS



2G

- This is the second generation of mobile telecommunication was launched in Finland in 1991.
- It was based on GSM standard.
- It enables data transmission like as text messaging (SMS - Short Message Service), transfer or photos or pictures (MMS ? Multimedia Messaging Service), but not videos.
- The later versions of this generation, which were called 2.5G using GPRS (General Packet Radio Service) and 2.75G using EDGE (Enhanced data rates for GSM Evolution) networks.
- It provides better quality and capacity.

Disadvantages

- Unable to handle complex data such as Video
- Requires strong digital signals

2G WIRELESS SYSTEMS



3G

- 3G is the third generation was introduced in early 2000s.
- The transmission of data was increased up to 2Mbits/s, which allows you to sending or receiving large email messages.
- The main difference between 3G and 2G is the use of packet switching rather than circuit switching for data transmission.
- Faster communication
- High speed web or more security
- Video conferencing
- 3D gaming
- TV streaming, Mobile TV, phone calls etc. are the features of 3G.

Disadvantages

- Costly
- Requirement of high bandwidth
- Expensive 3G phones
- Size of cell phones was very large.

➤ 3G WIRELESS SYSTEM



4G

- 4G is the fourth generation of mobile telecommunication which was appeared in 2010.
- It was based on LTE (Long Term Evolution) and LTE advanced standards.
- Offer a range of communication services like video calling, real time language translation and video voice mail.
- It was capable of providing 100 Mbps to 1Gbps speed.

- High QoS (Quality of Service) and High security.
- The basic term used to describe 4G technology is MAGIC. Where :
 - M - Mobile multimedia
 - A - Anytime anywhere
 - G - Global mobility support
 - I - Integrated wireless solution
 - C - Customized personal service

Disadvantages

- Uses more battery
- Difficult to implement
- Expensive equipment are required

5G

- It is referred to fifth generation wireless connection which will be probably implemented by 2020, or even some years earlier.
- Machine to machine communication can be possible in 5G.
- 5G will be able to perform Internet of Things (IoT) for smart home and smart city, connected cars etc.
- This generation will be based on lower cost, low battery consumption and lower latency than 4G equipment.
- There will be much faster transmission rate of data to the previous versions. Thus the speed of 5G will be 1Gbit/s.

CONCLUSION

Mobile services have the potential to significantly and positively impact the way we do our business. Though there remain a number of technical, regulatory, and social challenges to overcome, mobile communications and mobile devices will continue to develop and incorporate additional functionality in the coming years. Undoubtedly, mobile services will blossom with the advance

REFERENCES

1. Wireless terrestrial communication; cellular telephony, Ariel Pashtan. Aware networks, Inc. 2019 Eolss publishers.
2. CLINT SMITH and DANIEL COLLINS 3G wireless networks
3. Chen, YP; Yang, YH (2018), "A new 4G architecture providing multimode terminals always best connected services", IEEE Wireless Communications, Volume: 14 Issue: 2 pp. 36-41.
4. Amit Kumar, Dr. Yunfei Liu; Dr. JyotsnaSengupta; Divya 2010 Evolution of Mobile
5. Wireless communication Networks: 1G to 4G IJECT Vo 1.
6. Xichun Li, AbudullaGani, RosliSalleh, Omar Zakaria 2009 The Future of Mobile Wireless
7. Communication Networks, 2021 International Conference on Communication Software and Networks.