

Research on Issues in Mobile Computing

Ms.Sushma Lalgi Patel

MCA (IMCOST), Mumbai University

C-4,Wagle Industrial Estate, Near Mulund (W)

Check Naka, Thane (w) - 400604

Abstract— This Research is all about Mobile Computation. In this we go through its defination, evolution, where it is being used. Also describes the networking and security related to it. Networking includes its evolution and generations such as 1G, 2G, 2.5G, 3G, 4G. Here we deeply go through the mobile networking and the security related to it and analyzes it. In analysis we will come to its advantages and issues related to it. Also go through the areas where the mobile networks are still not available and is to work on that.

Keywords— Generations of mobile network, GSM, GPRS, mobile adhoc networking, security issues etc.

I. INTRODUCTION

This Paper is all about mobile Computing. It describes the evolution and generations of wireless network. Various technology that has been used or being used and their advantages and disadvantages and how to overcome certain issues. Also described the Security issues with Mobile Computing and ideas that are used to overcome with the security problems.

A technology from which transmission of data, voice and video is possible via a computer or any other wireless enabled device that need not to be connected to a fixed physical link is called as Mobile Computing.

Mobile computing involves wireless communication, wireless hardware, and wireless software. Communication issues deals with ad hoc and infrastructure networks as well as communication properties, agreements, data formats and concrete technologies. Hardware includes wireless devices or device components. Wireless software deals with the characteristics and requirements of mobile applications.

II. GENERATIONS OF MOBILE NETWORK

▪ 1G: FIRST GENERATION CELLULAR PHONES

The Introduction of First Generation, or 1G, mobile networks was held in 1970s. These systems were initially referred to as cellular, and later shortened to "cell", because of the procedures by which the signals were handed off between towers. This is the original cellular telephone networks which has provided analog traffic channels and now it is known as first-generation systems.

As compared to prior devices, Cell phone signals using analog system transmissions, and 1G devices were less heavy and expensive. Standards such as Advanced Mobile Phone System (AMPS), Total Access Communication System and Nordic Mobile Telephone (NMT) are the most popular standards deployed for 1G systems. Due to the appearance of the 1G

network, there was increase in global mobile phone market from 30 to 50 percent annually, and the number of subscribers of 1G worldwide reached approximately 20 million by 1990.

▪ 2G: GSM AND GPRS NETWORKS

In the early 1990s, the introduction of 2G phones deploying GSM technology were held. To improve voice quality digital modulation is used by Global System for Mobile communications, or GSM but the network offers limited data service.

Improvement in transmission quality and coverage were continuing by 2G carriers as demand drove uptake of cell phones. 2G carriers additionally started to supply extra services like paging, faxes, text messages and voicemail. The ldata services that are restricted beneath 2G enclosed WAP, HSCSD and MLS.

In the late 1990s, 2.5G was introduced which is an intermediary phase. GPRS standard, which delivers packet-switched data capabilities to existing GSM networks is used by 2.5G network. It allows users to send graphics-rich data as packets. As the Internet and the Internet Protocol, or IP rises, the importance for packet-switching also increased. The EDGE network is an example of 2.5G mobile technology.

○ GSM(Global System for Mobile communication)

GSM is a digital mobile data transmission system that is widely used in Europe and other parts of the world. GSM uses a distinct form of time division multiple access (TDMA) and mostly using of the three digital wireless telephony technologies like TDMA, GSM, and CDMA. GSM sends data down a channel with two other streams of user data after digitizing and compressing it, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

In 1991, Based on GSM technology mobile services were first launched in Finland. Today, more than 690 mobile networks supply GSM services across 213 countries and GSM represents 82.4% of all global mobile connections. GSM World specify that there are now more than 2 billion GSM mobile phone users worldwide. GSM World declares China as "the largest single GSM market, with more than 370 million users, proceeded by Russia with 145 million, India with 83 million, the USA with 78 million users."

Now users can often continue to use their cell phones while they travel to other countries since many GSM network operators have roaming acceptance with foreign operators. SIM cards that is Subscriber Identity Module holding home network access configurations may be shifted to those will metered local access, significantly

decreasing roaming costs while experiencing no reductions in service.

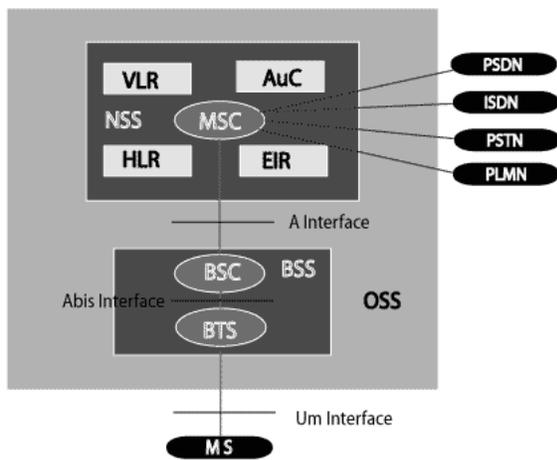
Together with different technologies, GSM is part of the evolution of wireless mobile telecommunications that options High-Speed Circuit-Switched information (HSCSD), General Packet Radio System (GPRS), and Universal Mobile Telecommunications Service (UMTS).

Architecture of GSM:-

The GSM network may be generally divided into:

- 1) The Mobile Station (MS)
- 2) The Base Station Subsystem (BSS)
- 3) The Network Switching Subsystem (NSS)
- 4) The Operation Support Subsystem (OSS)

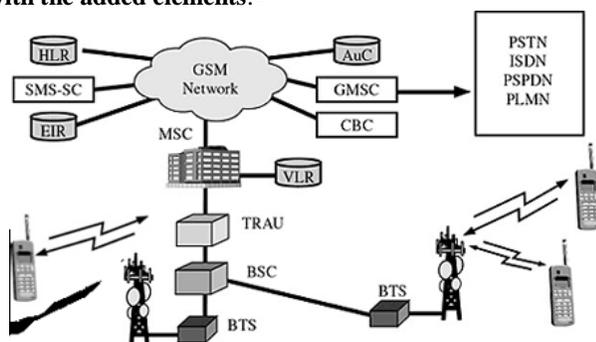
Below could be a straightforward pictorial read of the GSM design.



The additional components of the GSM architecture comprise of databases and messaging systems functions:

- 1) Home Location Register (HLR)
- 2) Visitor Location Register (VLR)
- 3) Equipment Identity Register (EIR)
- 4) Authentication Center (AuC)
- 5) SMS Serving Center (SMS SC)
- 6) Gateway MSC (GMSC)
- 7) Chargeback Center (CBC)
- 8) Transcoder and Adaptation Unit (TRAU)

The following diagram shows the GSM network along with the added elements:-



There is an Um interface between the MS and the BSS through which they can communicate. It is also known as the *air interface* or the *radio link*.

The A interface makes BSS to communicate with the Network Service Switching (NSS) center.

GSM network carries following areas :

- 1) **Cell** : Cell is the basic service area; and in this one cell is covered by one BTS. Cell Global Identity (CGI), is a number given to each cell which uniquely identifies that cell.
- 2) **Location Area** : Location Area (LA) consist of more than one cells that forms group. As a subscriber gets an incoming call, LA is paged. Location Area Identity (LAI) is assigned to every LA. There can be more than one BSCs to serves each location area.
- 3) **MSC/VLR Service Area** : The area that is covered by one MSC is MSC/VLR service area.
- 4) **PLMN** : One network operator covers area of Public Land Mobile Network (PLMN). A PLMN can contain one or more MSCs.

ADVANTAGES OF GSM

- 1) More than 450 million users are using GSM all over the world.
- 2) International roaming facility provides the permission that the user can use one phone throughout the world unlike CDMA which will work in Asia, but not European nations.
- 3) Since GSM is established long back started in the mid-80s, it has a more stable network with healthy features are available.
- 4) The accessibility of smart cards such as Subscriber Identity Modules (SIM cards), provide secure data encryption to give GSM mobile commerce that is m-commerce advantages.
- 5) More than 200 different countries using GSM service, hence it is quite easy for you to simply use your GSM phone when you are in one of these countries.

DISADVANTAGES OF GSM

- 1) The authentication center stores every users SIM cards, individual keys information in GSM. Hence any person who have rights and qualifications to access authentication center can manipulate these to impersonate that mobile user.
- 2) A3, A5, and A8 are all the examples of undisclosed algorithms that are used in GSM for security purpose . But use of these algorithms cannot guarantee 100% security which is proved by researchers.
- 3) Call privacy and Subscriber mystery are only guaranteed on the air interface among the mobile station and the base station subsystem leading to likelihood of intrude of voice data.

GPRS(General Packet Radio Services)

GPRS is a mobile telephony service. In this mobile phone users are permitted to connect to the Internet using their phones. Before mobile phones started becoming Wi-Fi enabled, it was used at a large scale. It is very much in the

backseat as of now, although it presents a viable alternative in emergencies, when other means of connecting to the Internet are not ready for use.

To transmit and receive data packets, the GPRS uses the unused portions of the GSM bandwidth. A certain level of quality is guaranteed in conventional connection however there is no such guarantee in GPRS, it operates within a best possible attempt scenario. This is the difference between a conventional connection and GPRS that describes quality.

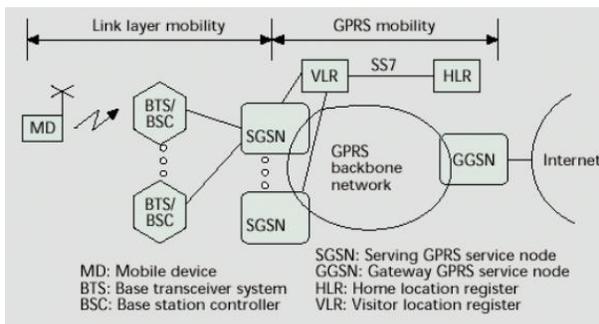


Figure :- Simple Architecture of GPRS

○ ADVANTAGES OF GPRS

- 1) GPRS makes Internet available on mobiles, due to which many mobile phone users comes out from the world of WAP. This in itself was a monumental feat, and hence GPRS took off with quite a bang. GPRS makes it possible that huge large amounts of data can be transferred to and from the mobile device over the Internet.
- 2) As portable Internet connections are available for laptops, GPRS-enabled mobile phones also double up. GPRS can be a lifesaver where Internet access is not easily available but a mobile network available. Most phones can be used as a modem once connected to a laptop.
- 3) The GPRS has a great backup option and this is one of the most important advantage of its in todays technological environment. The portability factor has diminished somewhat, with the advent of much faster data cards, which plug directly into the laptop.

○ DISADVANTAGES OF GPRS

Calls and other network-related functions are disabled when a GPRS connection is active since it uses the cellular network's GSM band to transmit data. The data session will go on standby. This is a typical characteristic of the Class B GPRS device. There are Class A devices also exists. In this, there are two radios accompanied into the device, allowing both features to run at the same time. But the class A devices are more expensive, and by extension, less in demand. Most mobile phones fall in the Class B category.

■ RECENT 3G NETWORKS

Mobile telephone customers can use audio, graphics and video applications in their mobile with the help of 3G revolution. Now anyone who has 3G is able to watch streaming video and engage in video telephony, although such activities are severely constrained by network congestion and over-usage.

To standardize on a single global network protocol instead of the different standards previously accepted in Europe, the U.S. and other regions was one of the main objectives behind 3G. Upto 2Mbps 3G phone speeds deliver, but only under the best conditions and in stationary mode. 3G bandwidth drop to a mere 145 Kbps if moving at a high speed.

3G cellular services, also known as UMTS, sustain higher data rates and open the way to Internet style applications. Both packet and circuit switched data transmission are supported by 3G technology, and a single set of standards can be used worldwide with compatibility over a variety of mobile devices. With potential access to the Internet from any place, UMTS delivers the first chance of global roaming.

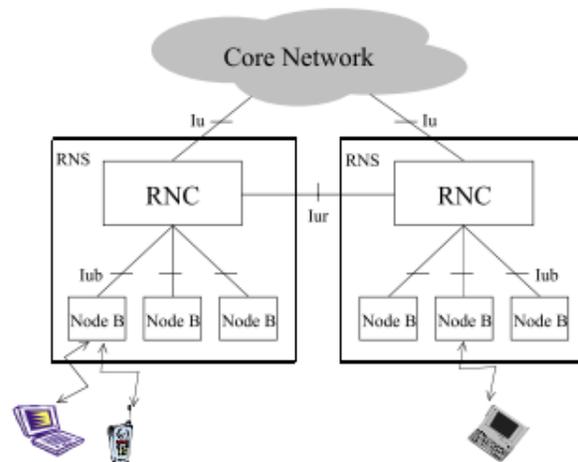


Figure:- UMTS General Architecture.

○ ADVANTAGES OF 3G NETWORKS

- 1) Data transmissions are faster as 3G Networks allow a wider radio spectrum.
- 2) It is used by advanced technology, multimedia services and larger network capacity.
- 3) As compared to 2G, carriers can deliver 3G at a minimized cost.
- 4) There are a wider variety of cell phones which 3G network allows to operate on the network.
- 5) The Business men who have 3G cell phones can travel to and from Japan without renting or buying new phones due to the 3G network.
- 6) It also provides location based services like weather reports on the mobile.
- 7) However 3G is cheaper for providers, but its plans are more expensive due to the high cost of implementation of 3G network.
- 8) 3G provides video calls, and hence there are many business conferencing between cities, states, and even countries

- 9) With the help of Picture messaging feature, it allows products, progress or problems to be shown visually.
- 10) Applications can be developed and used that are more data intensive.
- 11) Everyday 3G networks allow people to access music, pictures, and videos with no difficulty creating a bigger and open market for those industries in advertising.
- 12) It is extremely faster as compared to previous networks.
- 13) Increase in handset internet usage lead to businesses using social networking applications to advertise.

○ DISADVANTAGES OF 3G NETWORKS

- 1) 3G network implementation may be costly and also its plans are also expensive.
- 2) 3G plan prices for cell phones are much higher than 2G.

▪ HIGH-SPEED 4G MOBILE NETWORKS

4G, the current generation of mobile data transmission has been developed with the aim of providing transmission rates up to 20 Mbps but at the same time accommodating Quality of Service (QoS) features. QoS will allow you and your telephone carrier to find out which traffic are more important and how much according to the type of application using your bandwidth and balance between your different telephone requirements at a moment's notice.

Only now are we starting to see the potential of 4G applications. They are expected to include high-performance streaming of multimedia content. The functionality of video conferencing will also be improved with the deployment of 4G networks. It is also forecasted that 4G networks will deliver wider bandwidth to vehicles and devices moving at high speeds within the network area.

○ ADVANTAGES OF 4G MOBILE NETWORKS

- 1) The 4G mobile network has amazing speed which is the most obvious advantage of it. Data transfer speed becomes faster as bandwidth increases, which is advantageous especially for mobile devices. The Advantages of superior, uninterrupted connectivity, especially for advanced tasks such as video chats and conferences are used by the 4G network user. Taking into consideration the younger generation of mobile device users, they can transmit and receive music, videos and movies at a much rapidly speed than ever before and can also easily share information internet.
- 2) As compared any other systems such as WiFi which forces users to depend upon hotspots in each area you visit, 4G networks offers greater coverage area. Users would be assured of complete connectivity at all times, because 4G offers a coverage of 30 miles and more, as also partly coincides network ranges.
- 3) Online security is one of the biggest problems with WiFi networks. This is especially true for mobile devices. 4G networks provides complete privacy, security and safety. This is beneficial especially for corporate establishments and business persons, who hold information which

responds to slight changes on their respective mobile devices.

- 4) These days 4G networks are quite affordable, with what pricing schemes being considerably good enough for users' budgets. Of course, this type of connectivity is more costly than traditional WiFi networks, but there are many benefits also that can be offered to users.
- 5) 4G network also provides several options for users to choose from, as considered plans and equipment to connect to the 4G network. Special opening offers for new customers, which works out to be very reasonable for them are also offered by many mobile carriers.

○ DISADVANTAGES OF 4G MOBILE NETWORKS

- 1) Connectivity is still restricted to certain specified carriers and regions though an abstract idea of 4G mobile networks liked by people is growing day by day. Of course, there is growth in the number of cities by the day that have 4G coverage. But it will take much time for this 4G network to be available in all the cities of the world.
- 2) As we know that we can get the hardware compatible with 4G networks at very low prices today than earlier, but it becomes necessary for us to installed this new equipment in order to supply these services. And it may results a cumbersome process for most mobile carriers who are planning to launch these services.
- 3) There can be initial glitches and bugs in 4G as this mobile technology is still fairly new, which could be quite irritating for the user. There is no need to say that, with the time these teething troubles would be sorted out, as well as with increase in network coverage.
- 4) Users of 4G network has much poorer battery life on their mobile devices since 4G uses so many antennae and transmitters. Therefore to use internet for longer periods of time, 4G users would have to use larger mobile devices which has more battery power.
- 5) In area where 4G mobile network coverage are still not available, 4G users have to use 3G or WiFi connectivity. But then also they have to pay the same amount as specified by 4G network plan which will become worse issue. This loophole has already resulted in many disgruntled customers. If mobile carriers expand their 4G network coverage which include more regions then only this situation can be resolved.

Since we can see that there are many advantages but also there are disadvantages too. So there is a need to create the technology that contains all the features of 4G as well as features to come over its disadvantages such as battery problems by that uses less antennae and transmitters without any performance decrease, Also increase the 4G network coverage by a methodology that contains less cost so that each and every users can use that, and also cannot contain any initial glitches and bugs, Solving Connectivity Problem etc.

III. MOBILE ADHOC NETWORKING

An distinguished type of wireless networking, within which nodes of mobile come with an extemporaneous or ad hoc basis are known as as Mobile Ad Hoc Networks (MANETs).

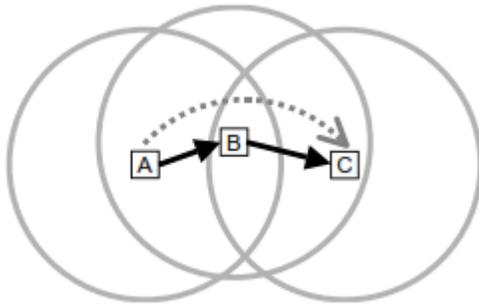


Figure :- Example of mobile ad-hoc network where A communicates with C via B.

These are self-forming as well as self-healing, which enables peer-level communications between mobile nodes that do not depends on centralized resources or fixed infrastructure.

These attributes makes able MANETs to provide important advantages in virtually any scenario which consist a cadre of highly mobile users or platforms, a strong requirements to share IP-based data, and an environment in which fixed network infrastructure is not practical, not paired, or not possible. Recovery with disaster, transportation, defense, constructions that are heavy, mining, and special event management are the Key applications.

IV. SECURITY ISSUES

In the fixed computing, by enabling physical isolation in the computer and database system, physical protection can be easily achieved from the other components in the environment. But in mobile computing, as there is a relatively limited resources available to a mobile unit, therefore it is difficult to achieve this form of isolation and self-sufficiency.

Like any other technology, mobile computing also has its fair share of security concerns. It is hard to monitor the proper usage due to its nomadic nature. Intentions of the users may not be same, on how to utilize this privilege. Hacking, industrial espionage, pirating, internet fraud and malicious destruction are some of the practices that are not proper and unethical but some of the problems experienced by mobile computing.

Another big problem distress to mobile computing is credential verification. Due to sharing of other users username and passwords, there may be chance of a major threat to security. As it is a very sensitive problem, most companies are very hesitant to implement mobile computing to the dangers of offense of giving a false information.

It is very hard to contain or eradicate the problem of identity theft. Issues with access to data and information by hackers which are not authorized, is also an enormous problem. Vital

data can be steal from companies because outsiders gain access, which provides major obstruction in rolling out mobile computing services.

Any company does not wants to lay open their secrets to hackers and other intruders, who will in turn sell their information to their competitors for which they did great worth. It's also significant to take the necessary precautions to reduce these threats from taking place. Some of those measures include –

- 1) Hiring qualified personnel.
- 2) Installing security hardware and software.
- 3) Educating the users on proper mobile computing ethics.
- 4) Auditing and developing sound, effective policies to govern mobile computing.
- 5) Enforcing proper access rights and permissions.

To stop possible damages to any company planning to offer mobile computing, these are just but a few ways. All possible measures should be assess and implemented for safeguard purposes because information is vital.

There may be chances for exploits and other unknown damages to infiltrate and cause irrefutable harm , in the absence of such measures. These may be either reputation or financial penalties. In such cases, it's not difficult to be misused in different unethical practices.

There may be an avenue for constant threat, if these factors aren't worked on properly. Implementing this kind of technology there are various threats still exist.

V. CONCLUSION

After going through this research we come to conclusion that, In Today's life Mobile Computing technology is very important for us. And it is necessary that wireless network availability must be there in each and every part of the world and it also available in most of areas but there are still some areas where network is not available and work is going on. And Mobile Computing Security issue still arises at a large scale and work is going on to introduce new methods to avoid these security issues.

VI. ACKNOWLEDGEMENT

We thank our college IMCOST who provided insight and expertise that greatly assisted the research, however they may not agree with all of the explanations/conclusions of this paper. We thank Prof. Mrs. Reeta Singh for assistance with methodology of this research.

VII. REFERENCES

- [1] www.google.com
- [2] Dr. Sumi Helal. Mobile Networking Concepts and Protocols
- [3] en.wikipedia.org/wiki/Mobile_computing
- [4] searchmobilecomputing.techtarget.com/definition/GSM

- [5] Thomas Harjono and Jennifer Seberry. Information Security Issues in Mobile Computing.
- [6] tutorialspoint.com/mobile_computing/mobile_computing_security_issues.htm
- [7] mobiledevices.about.com/od/carrierfaq/a/4g-Mobile-Networks-The-Pros-And-The-Cons.htm
- [8] William Stallings. Wireless Communications and Networks.
- [9] Ivan Marsic. Wireless Networks, Local and Ad Hoc Network.
- [10] tutorialspoint.com/gsm/gsm_architecture.htm
- [11] brighthub.com/mobile/symbian-platform/articles/16995.aspx
- [12] Ivan Stojmenovic. Handbook of Wireless Networks and Mobile Computing
- [13] ukessays.com/essays/information-technology/advantages-and-disadvantages-of-gsm-information-technology-essay.php

Ms. Sushma Patel – Currently Pursuing Masters in Computer Application at ASM’s institute of Management & computer Studies(IMCOST), Thane(W).