

## Mobile Computing

1. History of mobile devices and mobile operating systems.
  - a. Mobile Computing.
  - b. Mobile computing vs. wireless Networking.
  - c. Mobile Computing Applications.
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In the traditional computing environment it was necessary to come to the computer to do some work on it. All computers were connected to each other, to networks, servers, etc. via wires.

Mobile is not just a communication source, we can also access a lot of activities like notepad work, Microsoft power point etc. So Now categorizing the types of mobile phones according to research, it is of three types:-

1. The first one is "**Smartphone**" which is generally using by people. It is a class of multi-purpose mobile computing device which include the capabilities of a mobile phone, but are distinguished from feature phones by their stronger hardware capabilities and extensive mobile operating systems.
2. Second part is "**Featured Phone**" which typically provides voice calling, simple text messaging, and basic multimedia and internet capabilities.
3. Third one is "**Kosher Phone**". It's a phone with restricted features. Featured with text message capability.

- Hardware part of phone is important.
  - We should know that what hardware technologies are used in mobile phones.
    - CPU (Processor of the phone).
    - Battery (providing power source to the phone)
    - Display (which echoes the user's typing, and displays text messages, contacts, and more).
    - Speaker (for sound).
    - SIM Cards.

### **Generation of wireless phone technology (Mobile Generation Technologies)**

- The aim of wireless communication is to provide high quality, reliable communication just like wired communication(optical fiber) and each new generation of services represents a big step(a leap rather) in that direction. This evolution journey was started in 1979 from 1G and it is still continuing to 5G. Each of the Generations has standards that must be met to officially use the G terminology.
- 1G was not used to identify wireless technology until 2G, or the second generation, was released. That was a major jump in the technology when the wireless networks went from analog to digital.

#### **1. 0<sup>th</sup> Generation**

- Pre-cell phone mobile telephony technology, such as radio telephones that some had in cars before the arrival of cell phones.
- Communication was possible through voice only.
- These mobile telephones were usually mounted in cars or trucks.
- Technologies:
  - PTT (Push to Talk).
  - MTS (Mobile Telephone System).
  - IMTS (Improved MTS).



First Mobile Radio Telephone-1924

## 1st GENERATION

- Analog cell phones.
- A voice call gets modulated to a higher frequency of about 150MHz and it is transmitted between radio towers. This is done using a technique called Frequency-Division Multiple Access (FDMA).
  - Technologies:
    - FDMA (Frequency Division Multiple Access).
    - NMT (Nordic Mobile Telephone).
    - AMPS (Advanced Mobile Phone System).
  - Problems:
    - No security.
    - Prone to distortions.
    - Bad voice quality
    - Poor battery, cellphones
    - Big cellphones
    - Better than nothing, at least its wireless and mobile



## 2<sup>nd</sup> GENERATION

- Digital cell phones
- **Speed:** 10kbits/sec
- **Time to download a 3min MP3 song:** 31-41 min
- **Different Services:**
  - Digital voice calling.
  - Short message service (SMS).
- **Standards:**
  - GSM.
  - CDMA.
  - TDMA.
- **Benefits:**
  - Consume less battery power.
  - Improves the voice clarity.
  - Reduces noise in the line.
  - Secrecy and safety to the data and voice calls.
  - Allows txt msg service.
  - Signal must be strong or else weak digital signal.

## 3<sup>rd</sup> GENERATION

- 3G networks provide the ability to transfer voice data and non-voice data over the same network simultaneously.

- Applications:
  - Internet, e-mail, fax, e-commerce, music, video clips, and videoconferencing
- The aim of the 3G is to allow for more coverage and growth with minimum investment.
  
- **Combines a mobile phone, laptop PC and TV**
- Features include:
  - Phone calls
  - Global roaming
  - Send/receive large email messages
  - High-speed Web
  - Navigation/maps
  - Videoconferencing
  - TV streaming
  - Electronic agenda meeting reminder
  - GPS
- 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.

## **4<sup>th</sup> GENERATION**

- 4G development focuses around achieving ultra-broadband speeds, competing with the speeds provided by your home internet connection.
- 4G average speeds are targeted to be in the 100Mbps to 1Gbps range, roughly 10 to 100 times (dependent on location) faster than 3G networks.
- A 4G phone can run on a 3G network just fine, and it'll be ready for the 4G revolution when the time comes.

- The word “**MAGIC**” also refers to 4G wireless technology which stands for **M**obile **m**ultimedia, **A**ny-where, **G**lobal mobility solutions over, **I**ntegrated wireless and **C**ustomized services.
- **Features include:**
  - A spectrally efficient system.
  - High network capacity.
  - Huge data rate.
  - Perfect connectivity & global roaming.
  - High quality of service.
  - Security & Privacy.
- **Speed:**
  - The data transfer is 100 Mbps for outdoor and 1Gbps for indoor.
- The design is that 4G will be based on OFDM (Orthogonal Frequency Division Multiplexing), which is the key enabler of 4G technology. Other technological aspects of 4G are **adaptive processing** and **smart antennas**, both of which will be used in 3G networks and enhance rates when used in with OFDM.
- **Applications:**
  - Games.
  - Electronic Agents.
  - Broadband Access in Remote Locations.
  - E-commerce
  - Business/Work
  - Private Life
  - Vehicular
  - Entertainment
  - Education

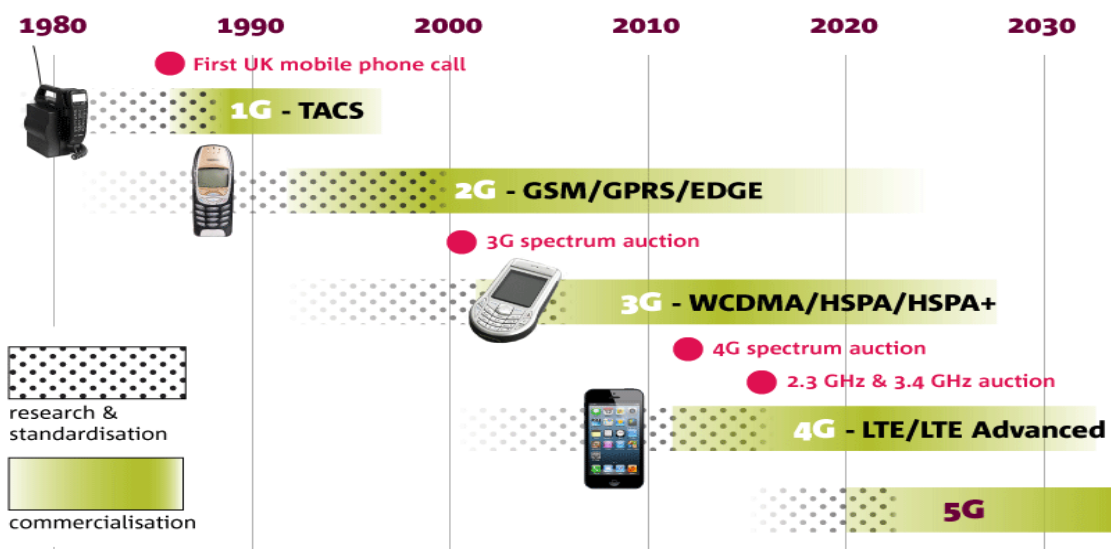
## **5<sup>th</sup> GENERATION**

- 5G is a technology used in research papers and projects to denote the next major phase of mobile telecommunication standards. It is a Real wireless world that is a complete WWW: World Wide Wireless Web. 5G technology has changed the means to use cell

phones within very high bandwidth. A user would never have experienced such a high value technology.

- 5G technology is going to be a new mobile revolution in mobile market. 5G technology has extraordinary data capabilities and has ability to tie together unrestricted call volumes and infinite data broadcast within latest mobile operating system.
- High speed and capacity
- Faster data transmission than 4G.
- More efficient.
- **Supports**
  - Interactive multimedia.
  - Voice streaming.
  - Internet.

## Evolution of mobile phone communications

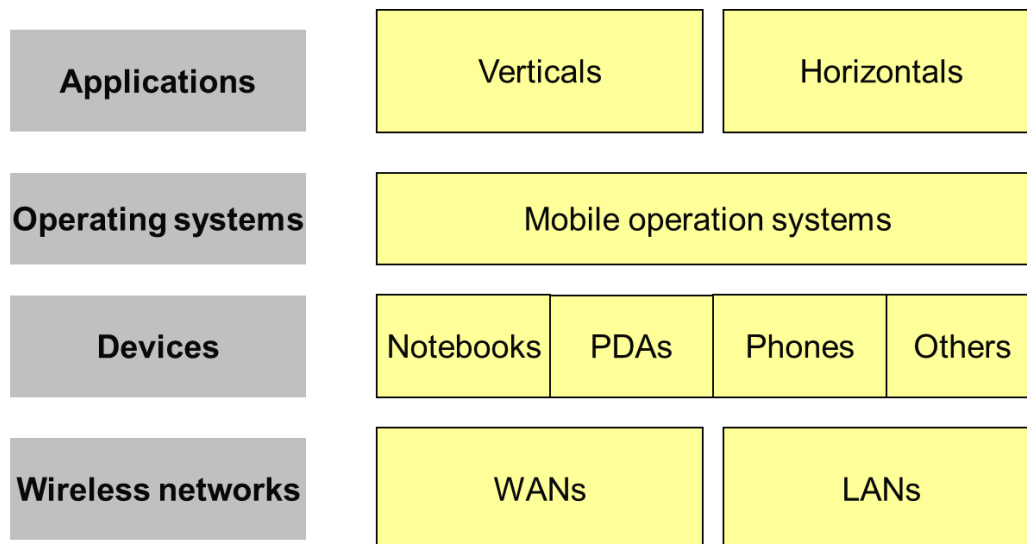


## Mobile Computing

- Mobile Computing is also known as “Ubiquitous Computing” (anywhere, anytime, any device).
- The scope covered by Mobile Computing roughly includes: Mobile Data, Wireless LANs and Ad Hoc Networks.
  - The first phase was to make computers small enough so they can be easily carried - Mobile devices

- The second solution to the need for mobile computing was to replace wires with wireless communication media.
- The third phase was a combination of the first two, namely to use mobile devices in a wireless environment. Referred to as wireless mobile computing, this combination enables real-time connections between mobile devices and other computing environments.
- **Wireless users** are free to be relatively mobile.
  - Wireless service basically allows anywhere, anytime computing and communications, which is a very attractive feature to some.
- **Wireless users** are able to join and leave wireless networks relatively easily.
  - There is **no physical point** of connection or cabling required, which makes this attractive for public network access.
- Wireless service can be deployed almost anywhere in the world.
  - Wired service can be quite difficult to roll out in some parts of the world, if not impossible.
  - Wireless service depends on less physical infrastructure, and can target remote areas.
- Wireless service can be deployed more quickly and cheaply than wired service in most cases.
  - No cabling or other physical infrastructure required with wireless.
  - All you need is a wireless interface, and you can be on the network in no time.





**Mobile computing has two major characteristics** that differentiate it from other forms of computing: *mobility* and *broad reach*.

- **Mobility** implies portability based on the fact that users carry a mobile device everywhere they go. Therefore, users can initiate real-time contact with other systems from wherever they happen to be.
- **Broad reach** is the characteristic that describes the accessibility of people. They can be reached at any time.

**Mobile computing has the following attributes:**

- **Ubiquity**: refers to the attribute of being available at any location at any given time. A mobile terminal in the form of a smartphone or a PDA offers ubiquity.
- **Convenience**: It is very convenient for users to operate in the wireless environment. All they need is an Internet enabled mobile device such as a smartphone.
- **Instant connectivity**: Mobile devices enable users to connect easily and quickly to the Internet, intranets, other mobile devices and databases.
- **Personalization**: refers to customizing the information for individual consumers.

- **Localization of products and services:** Knowing the users physically location at any particular moment is key to offering relevant products and services.

### **Mobile Computing Basic Terminology**

- **Personal digital assistant (PDA):** A small portable computer, such as Palm handhelds and Pocket PC devices.
- **Short Message Service (SMS):** A technology, in existence since 1991 that allows sending short text messages.
- **Enhanced Messaging Service (EMS):** An extension of SMS that is capable of simple animation, tiny pictures, and short melodies.
- **Multimedia Messaging Service (MMS):** The next generation of wireless messaging, this technology will be able to deliver rich media
- **Wireless Application Protocol (WAP):** A technology that offers Internet browsing from wireless devices.
- **Smartphones:** Internet-enabled cell phones that can support mobile applications.
- **Wi-Fi (*Wireless Fidelity*):** Refers to a standard 802.11b which most of the wireless local area networks are based on.