Course: 305-02: Mobile Application Development - 1

Unit-1: Concepts of Mobile computing.

1.1   Fundamentals of Mobile computing:

Introduction to Mobile Computing:

Mobile Computing refers a technology that allows transmission of **data, voice and video** via a computer or any other wireless enabled device. It is free from having a connection with a fixed physical link. It facilitates the users to move from one physical location to another during communication.

Mobile Computing is a technology that provides an environment that enables users to transmit data from one device to another device without the use of any physical link or cables.

In other words, you can say that mobile computing allows transmission of data, voice and video via a computer or any other wireless-enabled device without being connected to a fixed physical link. In this technology, data transmission is done wirelessly with the help of wireless devices such as mobiles, laptops etc.

This is only because of Mobile Computing technology that you can access and transmit data from any remote locations without being present there physically. Mobile computing technology provides a vast coverage diameter for communication. It is one of the fastest and most reliable sectors of the computing technology field.

The concept of Mobile Computing can be divided into three parts:
1. Mobile Communication
2. Mobile Hardware
3. Mobile Software

Mobile Communication:

Mobile Communication specifies a framework that is responsible for the working of mobile computing technology. In this case, mobile communication refers to an **infrastructure** that ensures seamless and reliable communication among wireless devices. This framework ensures the consistency and reliability of communication between wireless devices. The mobile communication framework consists of communication devices such as protocols, services, bandwidth, and portals necessary to facilitate and support the stated services. These devices are responsible for delivering a smooth communication process.

Mobile communication can be divided in the following four types:
1. Fixed and Wired
2. Fixed and Wireless
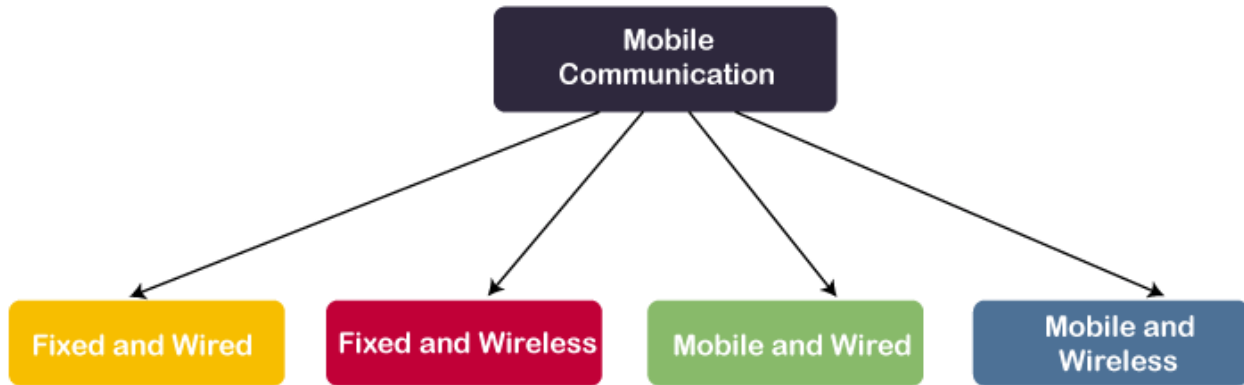
3. Mobile and Wired
4. Mobile and Wireless

Fixed and Wired: In Fixed and Wired configuration, the devices are fixed at a position, and they are connected through a physical link to communicate with other devices.
For Example, Desktop Computer.

Fixed and Wireless: *In Fixed and Wireless configuration, the devices are fixed at a position, and they are connected through a wireless link to make communication with other devices.*
For Example, Communication Towers, WiFi router

Mobile and Wired: *In Mobile and Wired configuration, some devices are wired, and some are mobile. They altogether make communication with other devices.*
For Example, Laptops.

Mobile and Wireless: *In Mobile and Wireless configuration, the devices can communicate with each other irrespective of their position. They can also connect to any network without the use of any wired device.*
For Example, WiFi Dongle.

Mobile Hardware

Mobile hardware consists of mobile devices or device components that can be used to receive or access the service of mobility. Examples of mobile hardware can be smartphones, laptops, portable PCs, tablet PCs, Personal Digital Assistants, etc.

These devices are inbuilt with a receptor medium that can send and receive signals. These devices are capable of operating in **full-duplex**. It means they can send and receive signals at the same time. They don't have to wait until one device has finished communicating for the other device to initiate communications.

Mobile Software

Mobile software is a program that runs on mobile hardware. This is designed to deal capably with the characteristics and requirements of mobile applications. This is the operating system for the appliance of mobile devices. In other words, you can say it the heart of the mobile systems. This is an essential component that operates the mobile device.

This provides portability to mobile devices, which ensures wireless communication.

Applications of Mobile Computing:

Following is a list of some significant fields in which mobile computing is generally applied:

- *Web or Internet access.*
- *Global Position System (GPS).*
- *Emergency services.*

- *Entertainment services.*
- *Educational services.*

1.1.1 Concepts of fixed and wireless network

Fixed vs. Wireless Networks in Mobile Computing

Fixed and Wireless Networks are both used in Mobile computing. Fixed networks commonly operate on radio transmission to connect established, wired communications systems. Let's see the differences between fixed and wireless networks in mobile computing.

Difference between Fixed and Wireless Networks

The differences between Fixed and Wireless networks can be distinguished as that the wireless networks do not require any cables to make a physical connection with the device. It is easily assessable because it is a shared medium. On the other hand, in the case of fixed networks, a physical configuration of devices is mandatory to perform data transmission. In this medium, you have to connect every new device separately and physically to the network. Let's consider and make a comparison between these two technologies used in mobile computing.

The following table specifies the main differences between the Fixed and Wireless Networks in mobile computing technology:

Sr. No	Wireless Networks	Fixed Networks
1	There is no requirement of any physical configuration in the wireless network.	In Fixed Networks, a physical configuration is required in any condition.
2	The data loss rate is high in Wireless Networks.	In Fixed Networks, a perfect link is established between the

		devices, so; the data loss rate is very low.
3	In Wireless Networks, the data transmission rate is comparatively low, so it provides less speed.	In Fixed Networks, the rate of data transmission is high, so it provides high speed.
4	Latency is high in Wireless Networks, which finally results in more delay.	There is no issue of latency in Fixed Networks because there is a perfect connection established between the devices that provide less delay.
5	The Wireless Networks may be hacked; that's why the security is always low in this type of network.	Fixed Networks connections are highly secured.

Issues occurred in Mobile Computing.

There is a lot of advantage of using Mobile computing technology. It provides vast features from mobility to portability and from cloud to productivity. But, along with these advantages, you can face specific eye-catching issues while using mobile computing technology. Following is a list of issues we find while using fixed and wireless networks in mobile computing.

1. **Costly due to Wireless Medium**

The Mobile computing technology mainly focuses on wireless infrastructure, so the cost of implementation is always high. It also faces issues like efficiency, delays and security, which we have to consider in project establishment.

2. **Issue due to Device Mobility**

The device mobility is one of the most significant advantages of mobile computing technology. But, it is one of its major issues too. To obtain the device mobility feature of mobile computing technology, we have to install the highest standards' types of equipment. So, whenever the mobile device changes its environment, we have to restructure its configuration environment.

We have to configure the device mobility feature according to the location, environment and surroundings of a mobile device regularly.

3. **Security Issues in Mobile Computing**

This is undoubtedly the biggest and one of the most discussed issues we face in mobile computing technology. It arises due to the shared medium ability of mobile computing.

The most significant security issues are:

- *Physical Security or Data Security*
- *System Security or Network Security*

These issues can be resolved by using some common tactics. These issues are:

- *Using VPN technology*
- *Using Cryptography & Network Security in your project*
- *Use of Firewall technology in the project*

Advantages and Disadvantages of Mobile Computing

Advantages of Mobile Computing Technology

Enhanced Productivity

We can use mobile devices in various companies, which can reduce the time and cost for clients and themselves and enhance the productivity of the company.

Location Flexibility

This technology facilitates users to work efficiently and effectively from whichever location they want to do their tasks. So, a user can work without being in a fixed position. This facility makes them able to carry out numerous tasks at the same time and also benefitted the company.

Saves Time

The location flexibility facility of mobile computing makes it time-saving. It cuts down the time consumed or wasted while traveling from different locations or to the office and back. It facilitates users to access all the essential documents and files over a secure channel and work on their computers. It has also reduced many unnecessary incurred expenses.

Support Cloud Computing

By using mobile Computing technology, you can save your documents on an online server and access them anytime and anywhere when you have an internet connection. You can access these files on several mobiles simultaneously.

Entertainment

Nowadays, mobile devices can be used as an entertainment source. They provide a lot of entertainment facilities to their users.

Besides the above advantages, it provides some other facilities such as Device Mobility, Simple Framework, easy and simple infrastructure etc.

Disadvantages of Mobile Computing Technology

Along with these advantages, there are some disadvantages also of mobile computing technology. Following is the list of biggest disadvantages:

Poor Quality of Connectivity

This is one of the biggest disadvantages because if you are not near any of these connection providers, your access to the internet may be minimal.

Security Issues

Mobile VPNs are not very safe to connect, and there is always a chance of security concerns.

High on Power Consumption

These devices run on batteries that do not tend to long-lasting. So, if in a situation where there is no source of power for charging, then that will be a failure.

Besides the above, there are also some disadvantages such as low data transmission rates, High data losses, Frequent network issues etc.

1.1.2 Introduction of Multiplexing, Modulation

Multiplexing in Mobile Computing

*Multiplexing is a technique used in the area of electronics and signal processing. In mobile computing, telecommunications and computer networks, Multiplexing is a method that can be used to combine multiple **analog** or **digital** signals into one signal over a shared medium. The main aim of using this method is to share a scarce resource.*

*Example: You can see a real-life example of Multiplexing in the telecommunication field where several telephone calls may be carried using one wire. Multiplexing is also called as **muxing**.*

History of Multiplexing

The concept of Multiplexing was originated in telegraphy in the 1870s. Nowadays, it is widely used in communications.

George Owen Squier is called the father of Multiplexing in telephony. He was credited for the development of telephone carrier multiplexing in 1910.

Modulation in Mobile Computing

Modulation is a process of mixing signals with a sinusoid to produce a new form of signals. The newly produced signal has certain benefits over an un-modulated signal. Mixing of low-frequency signal with a high-frequency carrier signal is called Modulation.

In other words, you can say that "Modulation is the process of converting one form of signals into another form of signals." For example, Analog signals to Digital signals or Digital signals to Analog signals.

Modulation is also called signal modulation.

Example: Let's understand the concept of signal modulation by a simple example. Suppose an Analog transmission medium is available to transmit signals, but you have a digital signal that needs to be transmitted through this Analog medium. So, to complete this task, you have to convert the digital signal into an analog signal. This process of conversion of signals from one form to another form is called Modulation.

Advantages of Modulation

Following is the list of some advantages of implementing Modulation in the communication systems:

- *By implementing Modulation, the antenna size gets reduced. Before modulation technology, the antenna used for transmission had to be very large. The range of communication gets limited as the wave cannot travel to a distance without getting modulated.*
- *The range of communication has increased.*
- *The reception quality is immensely improved.*
- *Receivers are allowed to adjust to the bandwidth.*
- *Multiplexing of signals occurs.*
- *No signal mixing occurs.*

1.1.3 Fundamentals of spectrum, Bluetooth technology

Spread Spectrum in Mobile Computing

Spread spectrum is a technique used for wireless communications in telecommunication and radio communication. In this technique, the frequency of the transmitted signal, i.e., an electrical signal, electromagnetic signal, or acoustic signal, is deliberately varied and

generates a much greater bandwidth than the signal would have if its frequency were not varied.

In other words, "Spread Spectrum is a technique in which the transmitted signals of specific frequencies are varied slightly to obtain greater bandwidth as compared to initial bandwidth."

Now, spread spectrum technology is widely used in radio signals transmission because it can easily reduce noise and other signal issues.

Example of Spread Spectrum

Let's see an example to understand the concept of spread spectrum in wireless communication:

*We know that a conventional wireless signal frequency is usually specified in **megahertz (MHz) or gigahertz (GHz).** It does not change with time (Sometimes it is exceptionally changed in the form of small, rapid fluctuations that generally occur due to modulation). Suppose you want to listen to FM stereo at frequency 104.8 MHz on your radio, and then once you set the frequency, the signal stays at 104.8 MHz. It does not go up to 105.1 MHz or down to 101.1 MHz. You see that your set digits on the radio's frequency dial stay the same at all times. The frequency of a conventional wireless signal is kept as constant to keep bandwidth within certain limits, and the signal can be easily located by someone who wants to retrieve the information.*

Usage of Spread Spectrum

There are many reasons to use this spread spectrum technique for wireless communications. The following are some reasons:

- It can successfully establish a secure medium of communication.
- It can increase the resistance to natural interference, such as noise and jamming, to prevent detection.
- It can limit the power flux density (e.g., in satellite down links).
- It can enable multiple-access communications.

Bluetooth Technology in Mobile Computing

Bluetooth technology is a high speed and low powered wireless technology designed to connect phones or other portable equipment for communication or file transmissions. This is based on mobile computing technology. Following is a list of some prominent features of Bluetooth technology:

- Bluetooth is also known as IEEE 802.15 standard or specification that uses low power radio communications to link phones, computers and other network devices over a short distance without using any type of connecting wires.
- As Bluetooth is an open wireless technology standard so, it is used to send or receive data to connected devices present across a certain distance using a band of 2.4 to 2.485 GHz.
- In Bluetooth technology, the wireless signals transmit data and files over a short distance, typically up to 30 feet or 10 meters.
- Bluetooth technology was developed by a group of 5 companies known as Special Interest Group formed in 1998. The companies are Ericsson, Intel, Nokia, IBM, and Toshiba.
- The range of Bluetooth technology for data exchange was up to 10 meters in older versions of devices, but the latest version of

*Bluetooth technology i.e.,
Bluetooth 5.0, can exchange data in
the range of about 40-400 meters.*

- *The average speed of data
transmission in Bluetooth
technology was around 1 Mbps in the
very first version. The second
version was 2.0+ EDR, which
provided the data rate speed of
3Mbps. The third was 3.0+HS, which provided the speed of 24 Mbps.
The latest version of this technology is 5.0.*
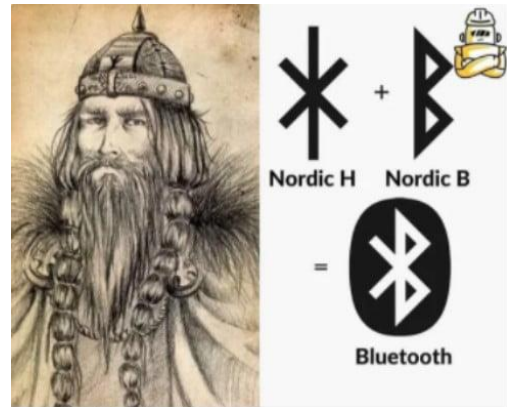
History of Bluetooth

*There is an amazing story behind the history of Bluetooth technology.
The Bluetooth wireless technology was named after a Danish King named
Harald Blatand. His last name means "Bluetooth" in English. The name
"Bluetooth" was awarded to this technology because the Danish King
named Harald Blatand was united the Denmark and Norway, same as
Bluetooth wireless technology is used to unite two disparate devices
for communication or data transmission.*

*Ericsson Mobile Communications started the development of
Bluetooth technology in 1994. The main motive behind the development
of this amazing technology was to find an alternative to the use of
cables for communication between mobile phones and other devices. In
1998, 4 big companies of that time named Ericsson, IBM, Nokia and
Toshiba formed the Bluetooth Special Interest Group (SIG), which
published the 1st version of Bluetooth technology in 1999. After that,
four versions have been released. The latest version of this
technology is Bluetooth 5.0.*

The Architecture of Bluetooth Technology

- *In Bluetooth technology, the network of Bluetooth consists of a
Personal Area Network or a*

- *Bluetooth's architecture is also called a **"Piconet"** because it is made of multiple networks.*

- *It contains a minimum of 2 to a maximum of 8 Bluetooth peer devices.*

- *It usually contains a single master and up to 7 slaves.*

- *Piconet provides the technology which facilitates data transmission based on its nodes, i.e., Master node and Slave Nodes.*

- *The master node is responsible for sending the data while the slave nodes are used to receive the data.*

- *In Bluetooth technology, data transmission occurs through Ultra-High frequency and short-wavelength radio waves.*

- *The Piconet uses the concept of multiplexing and spread spectrum. It is a combination of code division multiple access (CDMA) and frequency hopping spread spectrum (FHSS) technique.*

Advantages of Bluetooth Technology

Following is a list of some advantages of the Bluetooth technology:

- *Bluetooth Technology is based on Wireless technology. That's why it is cheap because it doesn't need any transmission wire that reduces the cost.*

- *It is very simple to form a Piconet in Bluetooth technology.*

- *It removes the problem of radio interference by using the Speed Frequency Hopping technique.*

- *The energy or power consumption is very low, about 0.3mW. It makes it possible for the least utilization of battery life.*

- *It is robust because it guarantees security at a bit level. The authentication is controlled using a 128bit key.*

- *You can use it for transferring the data, and verbal communication as Bluetooth can support data channels of up to 3 similar voice channels.*

- *It doesn't require line of sight and one to one communication as used in other modes of wireless communications such as infrared.*

Disadvantages of Bluetooth Technology

Following is a list of some disadvantages of the Bluetooth technology:

- *In Bluetooth technology, the bandwidth is low.*
- *The data transmission range may also be an issue because it is also less.*

Applications of Bluetooth Technology

Bluetooth technology is used in many communicational and entertainment devices. The following are some most used applications of the Bluetooth technology:

- *Bluetooth technology is used in cordless desktop. It means the peripheral devices such as a mouse, keyboard, printer, speakers, etc. are connected to the desktop without a wire.*

- *It is used in the multimedia transfer, such as exchanging multimedia data like songs, videos, pictures etc. that can be transferred among devices using Bluetooth.*
- *This technology is also used in the following devices: i.e.*
- *Bluetooth Speakers.*

- *Bluetooth Headphones.*

- *Bluetooth Headsets for calling purposes.*

- *Bluetooth gaming consoles etc.*

1.1.4 Concepts of Wireless Application Protocol (WAP)

Wireless Application Protocol (WAP) in Mobile Computing

Wireless Application Protocol or WAP is a programming model or an application environment and set of communication protocols based on the concept of the World Wide Web (WWW), and its hierarchical design is very much similar to TCP/IP protocol stack design. See the most prominent features of Wireless Application Protocol or WAP in Mobile Computing:

WAP is based upon the concept of the World Wide Web (WWW), and the backend functioning also remains similar to WWW, but it uses the markup language Wireless Markup Language (WML) to access the WAP services while WWW uses HTML as a markup language. WML is defined as XML 1.0 application.

In 1998, some giant IT companies such as Ericson, Motorola, Nokia and Unwired Planet founded the WAP Forum to standardize the various wireless technologies via protocols.

After developing the WAP model, it was accepted as a wireless protocol globally capable of working on multiple wireless technologies such as mobile, printers, pagers, etc.

In 2002, by the joint efforts of the various members of the WAP Forum, it was merged with various other forums of the industry and formed an alliance known as Open Mobile Alliance (OMA).

WAP was opted as a De-Facto standard because of its ability to create web applications for mobile devices.
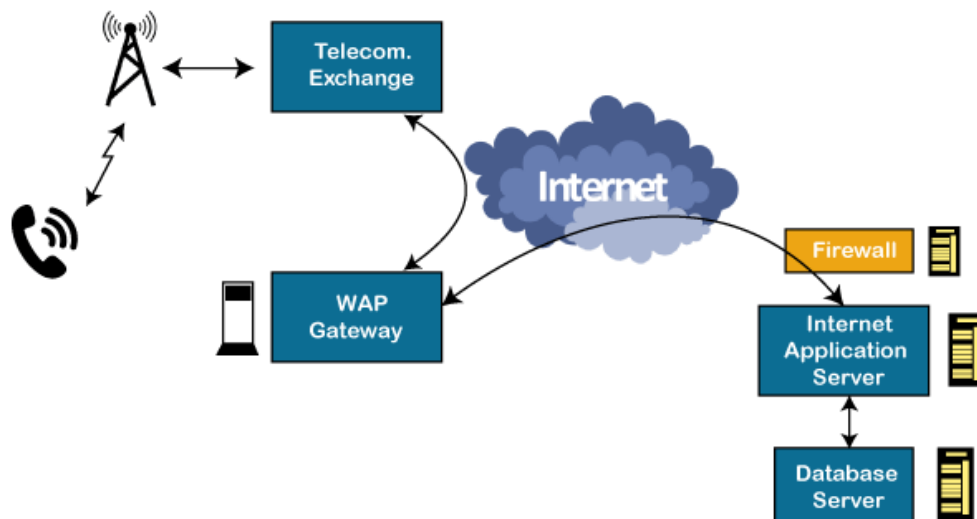
Working of Wireless Application Protocol or WAP Model

The following steps define the working of Wireless Application Protocol or WAP Model:

- The WAP model consists of 3 levels known as Client, Gateway and Origin Server.

- When a user opens the browser in his/her mobile device and selects a website that he/she wants to view, the mobile device sends the URL encoded request via a network to a WAP gateway using WAP protocol.

- The request he/she sends via mobile to WAP gateway is called as encoding request.

- The sent encoding request is translated through WAP gateway and then forwarded in the form of a conventional HTTP URL request over the Internet.

- When the request reaches a specified Web server, the server processes the request just as it would handle any other request and sends the response back to the mobile device through WAP gateway.

- Now, the WML file's final response can be seen in the browser of the mobile users.

Advantages of Wireless Application Protocol (WAP)

Following is a list of some advantages of Wireless Application Protocol or WAP:

- WAP is a very fast-paced technology.
- It is an open-source technology and completely free of cost.
- It can be implemented on multiple platforms.
- It is independent of network standards.
- It provides higher controlling options.
- It is implemented near to Internet model.
- By using WAP, you can send/receive real-time data.
- Nowadays, most modern mobile phones and devices support WAP.

Disadvantages of Wireless Application Protocol (WAP)

Following is a list of some disadvantages of Wireless Application Protocol or WAP:

- The connection speed in WAP is slow, and there is limited availability also.
- In some areas, the ability to connect to the Internet is very sparse, and in some other areas, Internet access is entirely unavailable.
- It is less secured.
- WAP provides a small User interface (UI).

Applications of Wireless Application Protocol (WAP)

The following are some most used applications of Wireless Application Protocol or WAP:

- WAP facilitates you to access the Internet from your mobile devices.

- *You can play games on mobile devices over wireless devices.*

- *It facilitates you to access E-mails over the mobile Internet.*

- *Online mobile banking is very popular nowadays.*

- *It can also be used in multiple Internet-based services such as geographical location, Weather forecasting, Flight information, Movie & cinema information, Traffic updates etc. All are possible due to WAP technology.*

1.2 Introduction of Android

1.2.1 History, concepts and Features of Android

Android tutorial or Android Studio tutorial covers basic and advanced concepts of android technology. Our Android development tutorial is developed for beginners and professionals.

Android is a complete set of software for mobile devices such as tablet computers, notebooks, smartphones, electronic book readers, set-top boxes etc.

It contains a linux-based Operating System, middleware and key mobile applications.

It can be thought of as a mobile operating system. But it is not limited to mobile only. It is currently used in various devices such as mobiles, tablets, televisions etc.

What is Android?

Before learning all topics of android, it is required to know what is android.

Android is a software package and linux based operating system for mobile devices such as tablet computers and smartphones.

It is developed by Google and later the OHA (Open Handset Alliance). Java language is mainly used to write the android code even though other languages can be used.

The goal of android project is to create a successful real-world product that improves the mobile experience for end users.

There are many code names of android such as Lollipop, Kitkat, Jelly Bean, Ice cream Sandwich, Froyo, Ecliar, Donut etc which is covered in next page.

What is Open Handset Alliance (OHA)

It's a consortium of 84 companies such as google, samsung, AKM, synaptics, KDDI, Garmin, Teleca, Ebay, Intel etc.

It was established on 5th November, 2007, led by Google. It is committed to advance open standards, provide services and deploy handsets using the Android Plateform.

Features of Android

After learning what is android, let's see the features of android. The important features of android are given below:

1) It is open-source.

2) Anyone can customize the Android Platform.

3) There are a lot of mobile applications that can be chosen by the consumer.

4) It provides many interesting features like weather details, opening screen, live RSS (Really Simple Syndication) feeds etc.

It provides support for messaging services(SMS and MMS), web browser, storage (SQLite), connectivity (GSM, CDMA, Blue Tooth, Wi-Fi etc.), media, handset layout etc.

Categories of Android applications

There are many android applications in the market. The top categories are:

- *Entertainment*
- *Tools*
- *Communication*
- *Productivity*

- *Personalization*
- *Music and Audio*
- *Social*
- *Media and Video*
- *Travel and Local etc.*

History of Android

The history and versions of android are interesting to know. The code names of android ranges from A to J currently, such as Aestro, Blender, Cupcake, Donut, Eclair, Froyo, Gingerbread, Honeycomb, Ice Cream Sandwitch, Jelly Bean, KitKat and Lollipop. Let's understand the android history in a sequence.

1) Initially, Andy Rubin founded Android Incorporation in Palo Alto, California, United States in October, 2003.

2) In 17th August 2005, Google acquired android Incorporation. Since then, it is in the subsidiary of Google Incorporation.

3) The key employees of Android Incorporation are Andy Rubin, Rich Miner, Chris White and Nick Sears.

4) Originally intended for camera but shifted to smart phones later because of low market for camera only.

5) Android is the nick name of Andy Rubin given by coworkers because of his love to robots.

6) In 2007, Google announces the development of android OS.

7) In 2008, HTC launched the first android mobile.

1.2.2 Concepts of API framework

Android Versions, Codename and API

Let's see the android versions, codenames and API Level provided by Google.

Code name	Version numbers	API level	Release date
No codename	1.0	1	September 23, 2008
No codename	1.1	2	February 9, 2009
Cupcake	1.5	3	April 27, 2009
Donut	1.6	4	September 15, 2009
Eclair	2.0 - 2.1	5 - 7	October 26, 2009
Froyo	2.2 - 2.2.3	8	May 20, 2010
Gingerbread	2.3 - 2.3.7	9 - 10	December 6, 2010
Honeycomb	3.0 - 3.2.6	11 - 13	February 22, 2011
Ice Cream Sandwich	4.0 - 4.0.4	14 - 15	October 18, 2011
Jelly Bean	4.1 - 4.3.1	16 - 18	July 9, 2012
KitKat	4.4 - 4.4.4	19 - 20	October 31, 2013
Lollipop	5.0 - 5.1.1	21- 22	November 12, 2014

Marshmallow	6.0 - 6.0.1	23	October 5, 2015
Nougat	7.0	24	August 22, 2016
Nougat	7.1.0 - 7.1.2	25	October 4, 2016
Oreo	8.0	26	August 21, 2017
Oreo	8.1	27	December 5, 2017
Pie	9.0	28	August 6, 2018
Android 10	10.0	29	September 3, 2019
Android 11	11	30	September 8, 2020
Android 12	12	31	February 18, 2021

1.3 Intro. of Android Architecture (Software Stack)

1.3.1 kernel Native Libraries

1.3.2 Concepts of Native Libraries and Android Runtime (Dalvik VM)

1.3.3 Application Framework
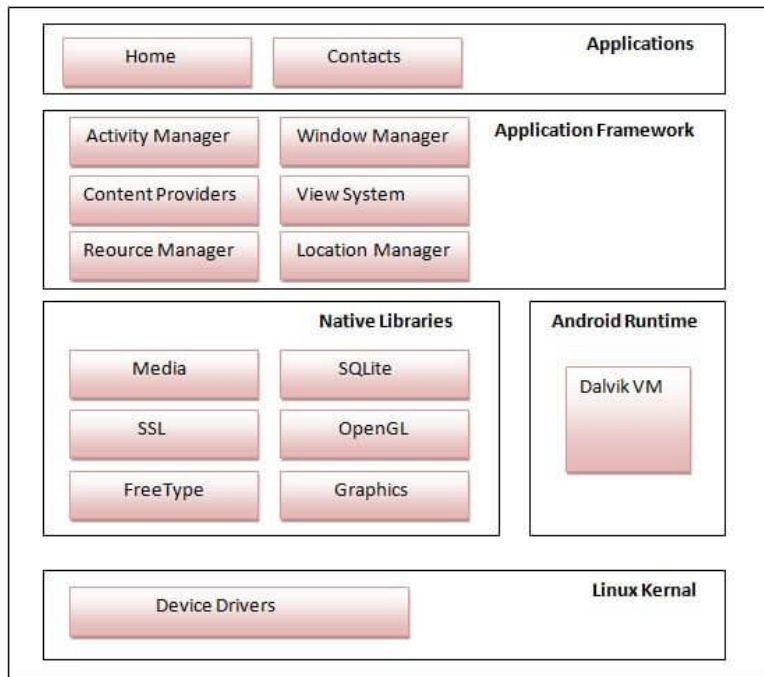
1.3.4 Application

Android Architecture

android architecture or Android software stack is categorized into five parts:

1. linux kernel
2. native libraries (middleware),
3. Android Runtime

4. *Application Framework*

5. *Applications*

Let's see the android architecture first.

1) Linux kernel

It is the heart of android architecture that exists at the root of android architecture. Linux kernel is responsible for device drivers, power management, memory management, device management and resource access.

2) Native Libraries

On the top of linux kernel, their are Native libraries such as WebKit, OpenGL, FreeType, SQLite, Media, C runtime library (libc) etc.

The WebKit library is responsible for browser support, SQLite is for database, FreeType for font support, Media for playing and recording audio and video formats.

3) Android Runtime

In android runtime, there are core libraries and DVM (Dalvik Virtual Machine) which is responsible to run android application. DVM is like JVM but it is optimized for mobile devices. It consumes less memory and provides fast performance.

4) Android Framework

On the top of Native libraries and android runtime, there is android framework. Android framework includes Android API's such as UI (User Interface), telephony, resources, locations, Content Providers (data) and package managers. It provides a lot of classes and interfaces for android application development.

5) Applications

On the top of android framework, there are applications. All applications such as home, contact, settings, games, browsers are using android framework that uses android runtime and libraries. Android runtime and native libraries are using linuxkernel

Android Core Building Blocks

Android Components

An android component is simply a piece of code that has a well defined life cycle e.g. Activity, Receiver, Service etc.

The core building blocks or fundamental components of android are activities, views, intents, services, content providers, fragments and AndroidManifest.xml.

Activity

An activity is a class that represents a single screen. It is like a Frame in <mark>AWT</mark>.

View

A view is the UI element such as button, label, text field etc. Anything that you see is a view.

Intent

Intent is used to invoke components. It is mainly used to:

- *Start the service*
- *Launch an activity*
- *Display a web page*
- *Display a list of contacts*
- *Broadcast a message*
- *Dial a phone call etc.*

For example, you may write the following code to view the webpage.

Intent intent=new Intent(Intent.ACTION_VIEW);

intent.setData(Uri.parse("http://www.nehalpatel.in"));

startActivity(intent);

Service

Service is a background process that can run for a long time.

There are two types of services local and remote. Local service is accessed from within the application whereas remote service is accessed remotely from other applications running on the same device.

Content Provider

Content Providers are used to share data between the applications.

Fragment

Fragments are like parts of activity. An activity can display one or more fragments on the screen at the same time.

AndroidManifest.xml

It contains informations about activities, content providers, permissions etc. It is like the web.xml file in Java EE.

Android Virtual Device (AVD)

It is used to test the android application without the need for mobile or tablet etc. It can be created in different configurations to emulate different types of real devices.