

Chapter 1

Introduction to Mobile Computing, WiFi, Bluetooth

Mobile Computing :- Mobile Computing is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link.

Mobile Hardware :- Mobile hardware includes mobile devices or device components that receive or access the service of mobility. Examples are portable laptops, smartphones, tablet PC, Personal Digital Assistants (PDA).

Mobile software :- Mobile software is the actual program that runs on the mobile hardware. It deals with the characteristics and requirements of mobile applications. This is the engine of the mobile device. In other terms, it is the operating system of the appliance. It's the essential component that operates the mobile device.

Mobile Computing Devices :- A mobile computing device is any device that is created using mobile components, such as mobile hardware and software. Mobile computing devices are portable devices capable of operating, executing and providing services and applications like a typical computing device.

Features in mobile computer devices include batteries, video camera, camera, voice recorder and music player. Laptop computers, tablets, smartphones, e-readers and handheld gaming devices are five types of mobile technology used to connect to the Internet and communicate with others.

History of Mobile Computing :- The Idea of mobile computing has only been around since the 1990s. Mobile computing has evolved from two-way radios that used large antennas to communicate simple messages to the personal computers. As long as a person has one of the devices capable of wirelessly accessing the internet, they are participating in mobile computing.

Advantages of Mobile Computing :-

1. Location Flexibility:- This has enabled users to work from anywhere as long as there is a connection established.
2. Saves Time :- The time consumed or wasted while travelling from different locations or to the office and back has been decreased.
3. Enhanced Productivity :- Users can work efficiently and effectively. It enhanced the productivity level.
4. Ease of Research :- Research has been made easier. It has also made it easier for field officers and researchers to collect and feed data from anywhere.
5. Business Processes :- Some business functions can be run over secure links and sharing of information between business partners can also take place.

Mobile Computing Functions :- The user of the mobile computing environment will be able to access data, information or logical objects from any device in any network while on move.

1. User mobility: User should be able to move from one physical location to another location and use same service
2. Network mobility: User should be able to move from one network to another network and use same service
3. Device mobility: User should be able to move from one device to another and use same service

4. Session mobility: A user session should be able to move from one user-agent environment to another.
5. Service mobility: User should be able to move from one service to another.
6. Host mobility: The user should be either a client or server.

Wired Network :- A wired network is a common type of wired configuration. Most wired networks use Ethernet cables to transfer data between connected PCs. In a small wired network, a single router may be used to connect all the computers. Larger networks often involve multiple routers or switches that connect to each other.

Wireless Network :- Computer networks that are not connected by cables are called wireless networks. They generally use radio waves for communication between the network nodes.

Examples of wireless networks :-

1. Mobile phone networks
2. Wireless sensor networks
3. Satellite communication networks
4. Terrestrial microwave networks

Wireless communication based projects mainly include different technologies like Bluetooth, GPS, GSM, RFID.

Bluetooth Technology :- The main function of the Bluetooth technology is that permits you to connect a various electronic devices wirelessly to a system for the transferring of data. Cell phones are connected to hands free earphones, mouse, and wireless keyboard.

Mobile Communication Systems :- The advancement of mobile networks is enumerated by generations. Many users communicate across a single frequency band through mobile phones. Cellular and cordless phones are two examples of devices which make use of wireless signals. Typically, cell phones have a larger range of networks to provide coverage. But, Cordless phones have a limited range. Similar to GPS devices, some phones make use of signals from satellites to communicate.

Adhoc Network :- Adhoc networks are created between two or more wireless PCs together, without the use of a wireless router or an access point. The computers communicate directly with each other. Ad hoc networks can be very helpful during meetings or in any location where a network doesn't exist.

Base Station :- A base station is a fixed point of communication for cellular phones on a carrier network. The base station is connected to an antenna (or multiple antennas) that receives and transmits the signals in the cellular network to phones and cellular devices.

Mobile Station :- The Mobile Station consists of the physical equipment, such as the radio transceiver, display and digital signal processors, and the SIM card. It provides the air interface to the user in GSM networks.

Architecture of Mobile Computing :- A 3-tier architecture is an application program that is organized into three major parts, comprising of:

The data access layer tier at the bottom,

The application tier (business logic) in the middle and

The client tier (presentation) at the top.

Each tier is distributed to a different place or places in a network.

- 1. Presentation Layer (UI):** This layer presents data to the user and optionally permits data manipulation and data entry. Also this layer requests the data from Business Layer.
- 2. Business Logic Layer:** The business logic layer acts as the server for client requests from workstations.
- 3. Data Access Layer:** The third tier of the 3-tier system is made up of the DBMS that provides all the data for the Presentation Layer as well as Business Logic Layer. This is the actual DBMS access layer.

Wireless LAN :- Wireless LAN stands for Wireless Local Area Network. It is also called LAN (Local Area Wireless Network). WLAN is one in which a mobile user can connect to a Local Area Network (LAN) through a wireless connection.

Advantages of WLANs :-

Flexibility: Within radio coverage, nodes can communicate without further restriction.

Robustness: Wireless networks can handle disasters, e.g., earthquakes, flood etc.

Cost: The cost of installing and maintaining a wireless LAN is on average lower than the cost of installing and maintaining a traditional wired LAN.

Ease of Use: Wireless LAN is easy to use.

Difference between Wi-Fi And WiMAX :-

WiFi: WiFi stands for Wireless Fidelity. WiFi uses Radio waves to provide wireless high-speed internet and network connections. A WiFi connection is established using a wireless adapter to create hotspots. WiFi can be used to connect with printer, computers, gaming consoles and many more.

WiMax: WiMax stands for Wireless Inter-operability for Microwave Access. WiMax uses licensed or unlicensed spectrum to deliver connection to network. WiMax handle a larger inter-operable network. WiMax can be used to provide internet services such as mobile data and WiFi spots.

WIFI	WIMAX
Wifi is defined under IEEE 802.11x standards where x stands for various WiFi versions.	WiMax is defined under IEEE 802.16y standards where y stands for various WiMax versions.
WiFi is for LAN (Local Area Network) applications.	WiMax is for MAN (Metropolitan Area Network) applications.
WiFi does not guarantee any Quality of Service (Qos).	WiMax guarantee Quality of Service (Qos).
WiFi network range is around 100 meters.	WiMax network can reach about 50-90 km.
WiFi MAC layer uses CSMA/CA protocol which is not connection oriented.	WiMax is connection oriented in nature.
WiFi is short range technology.	WiMax is long range technology.
WiFi connection can transmit upto 54 mbps.	WiMax connection can transmit upto 70 mbps.

Bluetooth :- Bluetooth is a new technology that comes as an alternative to cables for connecting portable and fixed electronic devices and uses short range (10 meters) frequency hopping radio links for communication. It operates within the unlicensed ISM (Industrial scientific and medical) band at 2.4 GHz.

Bluetooth Features :-

- * Robustness - It uses a fast acknowledgement and frequency hopping scheme to make a radio link robust.
- * Low complexity- The necessary transceiver components present in the devices are simple.
- * Low cost- A wireless device with this technology is available at an affordable price.

Applications of Bluetooth

There are a variety of applications of Bluetooth such as

- * Allows a transfer of images or word documents or applications or audio and video files between devices without the help of cables.
- * Can be used for remote sales technology allowing wireless access to vending machines and other commercial enterprises.
- * Provides inter accessibility of PDAs, palmtops and desktops for file and data exchanges.
- * It can be used to setup a personal area network (PAN) or a wireless personal area network (WPAN).

Infrared Transmission :- Infrared technology uses diffuse light reflected at walls, furniture etc. or a directed light if a line of sight (LOS) exists between sender and receiver.

Infrared light is the part of the electromagnetic spectrum, and is an electromagnetic form of radiation. Infrared is used in wireless technology devices or systems that convey data through infrared radiation.

Infrared wireless is used for medium and short range communications and control.

Infrared radiation is used in scientific, industrial, and medical application.

Advantages of infrared :-

- (i) The main advantage of infrared technology is that it is simple and extremely cheap
- (ii) No licenses are required for infrared.
- (iii) PDAs, laptops, notebooks, mobile phones etc. have an infrared data association interface.
- (iv) Electrical devices cannot interfere with infrared transmission.

Radio Transmission :- Almost all networks use radio waves for data transmission. Radio transmission technologies can be used to set up ad-hoc connections.

The two main types of radio transmission are AM (Amplitude Modulation) and (FM) Frequency Modulation.

FM minimizes noise and provides greater reliability.

In an AM transmission, the carrier wave has a constant frequency, but the strength of the wave varies.

Usually the radio transmission is used in the transmission of sounds and pictures-such as, voice, music and television.

The images and sounds are converted into electrical signals by a microphone or video camera.

The antenna converts the electrical signals into electromagnetic waves and sends them out or they can be received.

Advantages of Radio Transmission

- (i) Radio transmission can cover larger areas and can penetrate walls, plants, furniture etc.
- (ii) Additional coverage is gained by reflection.
- (iii) Radio typically does not need a LOS (Line of Site) if the frequencies are not too high.
- (iv) Higher transmission rates than infrared.

Chapter 2 Introduction to GSM, SMS, GPRS, Mobile OS

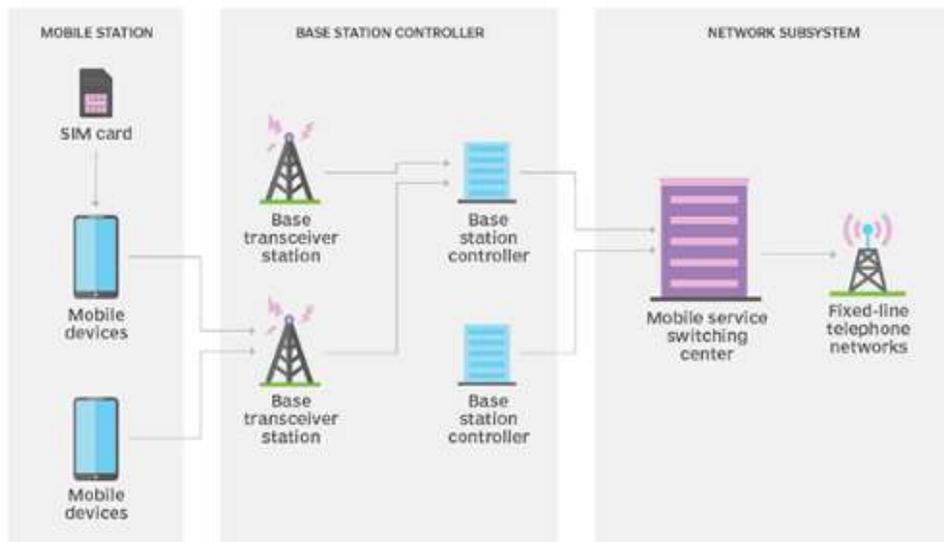
GSM (Global System for Mobile communication):- GSM (Global System for Mobile Communication) is a digital mobile network that is widely used by mobile phone users in the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and Code Division Multiple Access (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 megahertz (MHz) or 1,800 MHz frequency band.

GSM, together with other technologies, is part of the evolution of wireless mobile telecommunications that includes High-Speed Circuit-Switched Data (HSCSD), General Packet Radio Service (GPRS), Enhanced Data GSM Environment (EDGE) and Universal Mobile Telecommunications Service (UMTS).

Architecture of the GSM network: - The GSM network has four separate parts that work together to function as a whole: the mobile device itself, the Base Station Subsystem (BSS), the Network Switching Subsystem (NSS) and the Operation and Support Subsystem (OSS).

The mobile device connects to the network via hardware. The Subscriber Identity Module (SIM) card provides the network with identifying information about the mobile user.

Global system for mobile (GSM) network



The BSS handles traffic between the cell phone and the NSS. It consists of two main components: the base transceiver station (BTS) and the base station controller (BSC). The BTS contains the equipment that communicates with the mobile phones, largely the radio transmitter receivers and antennas, while the BSC, is the intelligence behind it. The BSC communicates with and controls a group of base transceiver stations.

The NSS portion of the GSM network architecture, often called the core network, tracks the location of callers to enable the delivery of cellular services. The NSS has a variety of parts, including Mobile Switching Center (MSC) and Home Location Register (HLN). These components perform different functions, such as routing calls and Short Message Service (SMS) and authenticating and storing caller account information via SIM cards.

Code Division Multiple Access (CDMA) :- Code Division Multiple Access (CDMA) is a digital cellular technology used for mobile communication. CDMA is the base on which access methods such as cdmaOne, CDMA2000, and WCDMA are built. CDMA cellular systems are

deemed superior to FDMA and TDMA, which is why CDMA plays a critical role in building efficient, robust, and secure radio communication systems.

Features of CDMA :-

- In CDMA, every channel uses the full available spectrum.
- Individual conversations are encoded with a pseudo-random digital sequence and then transmitted using a wide frequency range.
- CDMA consistently provides better capacity for voice and data communications, allowing more subscribers to connect at any given time.
- CDMA is the common platform on which 3G technologies are built.

Frequency Division Multiple Access (FDMA) :- FDMA (frequency division multiple access) is the division of the frequency band allocated for wireless cellular telephone communication into 30 channels, each of which can carry a voice conversation or digital data.

Features of FDMA (Frequency Division Multiple Access) :-

- (i) When the channel is not in use, it sits simply idle.
- (ii) Bandwidth of Channel is relatively narrow (30 KHz), known as narrowband system
- (iii) Analog links are suitable for FDMA
- (iv) Tight filtering is needed to minimize interference

(Interleave Division Multiple Access (IDMA) :- IDMA (Interleave-Division Multiple-Access) is a new method of digital communication that is very powerful. Interleaving is a technique commonly used in communication systems to overcome channel noise such as burst error or fading. The interleaver rearranges input data such that consecutive data are spaced apart.

Short Message Service (SMS) :- Short Message Service (SMS) is a text messaging service component of phone, web, or mobile communication systems. It uses standardized Communications protocols to allow fixed line or mobile phone devices to exchange short text messages.

- Strengths of SMS :-**
- (i) SMS uses SS7 signaling channel which is available throughout the world.
 - (ii) SMS is session-less and stateless.
 - (iii) SMS message is unidirectional and independent of any context.
 - (iv) SMS is completely asynchronous.
 - (v) It is more discreet than a phone conversation.
 - (vi) SMS is a store-and-forward service.
 - (vii) SMS can be used to send a message to a large number of people at a time.

Value added services (VAS) :- Value added services (VAS) in mobiles means those services that are offered by telecom service providers to customers beyond the core services like SMS, voice and data. The services may either be free or chargeable. The major areas where VAS are provided include entertainment, e-commerce, sports, etc.

Examples :-In the telecommunication examples of modern VAS services include:

Voice mail.

SMS voting.

Top up.

Ring back tone.

SMS lotteries.

SMS voting.

Balance checks.

M-commerce and mobile money based services.

GPRS (General Packet Radio Service) :- General Packet Radio Services (GPRS) is a packet-based wireless communication service that promises data rates from 56 up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users. The higher data rates allow users to take part in video conferences and interact with multimedia Web sites and similar applications using mobile handheld devices as well as notebook computers. GPRS is based on Global System for Mobile (GSM) communication and complements existing services such as circuit-switched cellular phone connections and the Short Message Service (SMS).

Features or characteristics of GPRS :-

- (i) The ability to maintain constant voice and data communications while on the move.
- (ii) It allows subscribers to obtain connectivity when needed, regardless of location and without a lengthy login session.
- (iii) Allows subscribers to obtain information relevant to their current location.

GPRS Specific Applications:

Chat: people use chat services as a means to communicate.

Multimedia Service: Multimedia objects like photographs, pictures, postcards, greeting cards and presentations, static web pages can be sent and received over the mobile network.

Virtual Private Network: GPRS network can be used to offer VPN services.

Personal Information Management: Personal diary, address book, appointments, engagements etc. are very useful for a mobile individual.

Vehicle Positioning: This application integrates GPS (Global Positioning System) that tell people where they are. Vehicle Positioning system can be used to deliver several services including remote vehicle diagnostics, stolen vehicle tracking.

Limitations of GPRS:

There are some limitations with GPRS which can be summarized as:

- (i) Limited Cell Capacity for All Users: Only limited radio resources can be deployed for different uses. Both Voice and GPRS calls use the same network resources.
- (ii) Speed Lower in Reality

Differences between 3G and 4G Data Services :-

	3G	4G
Frequency Band	1.8 - 2.5 GHz	2 - 8 GHz
Bandwidth	5-20 MHz	5-20 MHz
Data rate	Up to 2Mbps (384 kbps WAN)	Up to 20 Mbps or more
Access	Wideband CDMA	Multi-carrier - CDMA or OFDM(TDMA)
FEC	Turbo-codes	Concatenated codes
Switching	Circuit/Packet	Packet
Mobile top speeds	200 kmph	200 kmph

Mobile Operating System :- A mobile operating system is an operating system for mobile phone, mobile device. Mobile operating systems combine features of a operating system with other features useful for mobile or handheld use.

List of Mobile Operating Systems :-

Android OS (Google Inc.)

2. Bada (Samsung Electronics)

BlackBerry OS (Research In Motion)

iPhone OS / iOS (Apple)

MeeGo OS (Nokia and Intel)

Palm OS (Garnet OS)

Symbian OS (Nokia)

webOS (Palm/HP)

Smart Phone :- Smartphone is a combination of both mobile phone and handheld computer, into a single device. Smartphone is a single device which allows users to store information (for example, e-mail) and install programs, along with the use as a mobile phone. A Smartphone is a mobile phone with some PDA functions integrated into the device or vice versa.

Features of a Mobile Operating System :-

- (i) Multi-Tasking :- Multi-tasking is mostly a new feature in terms of operation systems. Multi-Tasking allows for multiple apps to run at one time.
- (ii) Speed of Ease :- Menus and buttons are very easy to use for mobile users. So, modern operation systems are very user friendly.
- (iii) Apps :- Mobile Operating Systems support new mobile apps. These apps can be used for specific purpose.

Chapter 3

Introduction to Android :- Android is a Linux based operating system. It is designed primarily for touch screen mobile devices such as smart phones and tablet computers. One of the most widely used mobile OS is android these days.

The android is a powerful operating system and it supports large number of applications in Smartphones. The hardware that supports android software is based on ARM architecture platform. The android is an open source operating system means that it's free and any one can use it.

The first version 1.0 of android development kit (SDK) was released in 2008 and latest updated version is jelly bean.

Features of Android :-

- Head set layout
- Storage
- Connectivity: GSM/EDGE, CDMA, Bluetooth, WI-FI, EDGE, LTE, GPS.
- Messaging: SMS, MMS
- Multilanguage support
- Multi touch
- Video calling
- Screen capture
- External storage
- Streaming media support
- Optimized graphics

Advantages of Android :-

- Android is Linux based open source operating system , it can be developed by any one
- Easy access to the android apps
- You can replace the battery and mass storage, disk drive and USB option
- Its supports all Google services
- The operating system is able to inform you of a new SMS and Emails or latest updates.
- It supports Multitasking
- Android phone can also function as a router to share internet
- Its free to customize
- Can install a modified ROM
- Its supports 2D and 3D graphics

Architecture of Android :- Android operating system is a stack of software components which is roughly divided into five sections and four main layers.

(i) Linux kernel :- At the bottom of the layers is Linux - Linux 3.6 with approximately 115 patches. This provides a level of abstraction between the device hardware and it contains all the essential hardware drivers like camera, keypad, display etc.

(ii) Libraries :- On top of Linux kernel there is a set of libraries including open-source Web browser engine WebKit, well known library libc, SQLite database which is a useful repository for storage and sharing of application data, libraries to play and record audio and video, SSL libraries responsible for Internet security etc.

(iii) Android Runtime :- This is the third section of the architecture and available on the second layer from the bottom. This section provides a key component called Dalvik Virtual Machine which is a kind of Java Virtual Machine specially designed and optimized for Android.

The Dalvik VM makes use of Linux core features like memory management and multi-threading, which is intrinsic in the Java language. The Dalvik VM enables every Android application to run in its own process, with its own instance of the Dalvik virtual machine.

The Android runtime also provides a set of core libraries which enable Android application developers to write Android applications using standard Java programming language.

(iv) Application Framework :- The Application Framework layer provides many higher-level services to applications in the form of Java classes. Application developers are allowed to make use of these services in their applications.

(v) Applications :- You will find all the Android application at the top layer. You will write your application to be installed on this layer only. Examples of such applications are Contacts, Books, Browser, Games etc.

Android Runtime (Dalvik Virtual Machine) :- This is the third section of the architecture and available on the second layer from the bottom. This section provides a key component called Dalvik Virtual Machine which is a kind of Java Virtual Machine specially designed and optimized for Android.

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Android SDK :- The Android SDK (software development kit) is a set of development tools used to develop applications for Android platform. The Android SDK includes the following:

- Required libraries
- Debugger
- An emulator
- Relevant documentation for the Android Application Program Interfaces (APIs)
- Sample source code
- Tutorials for the Android OS

Android Development Tool (ADT) :- ADT (Android Developer Tools) is a plugin for Eclipse that provides a suite of tools that are integrated with the Eclipse IDE. It offers you access to many features that help you develop Android applications quickly. ADT provides GUI access to many of the command line SDK tools as well as a UI design tool for rapid prototyping, designing, and building of your application's user interface.

Installation and Configuration

Follow steps below for complete installation and configuration of Android Studio.

Step 1) Download Android Studio

You can download Android Studio from this link or go to developer.android.com homepage and search for downloads. Choose appropriate platform either for windows, mac or linux.

Step 2) Run .exe file

Now the next step is to launch .exe file you just downloaded.

Click next and select Android SDK checked if you don't have it already.

Make sure Android virtual device is also checked.

Next step is to accept license and agreement. Click on I Agree.

Next step is to set location of installation. Please make sure your disk has minimum required space before clicking on Next.

Next step is to choose the start menu folder, where you want to create shortcut. If you don't want to create a shortcut just mark Do not create shortcut.

And hit Install button.

It will start installation.

Click Finish. Make sure Start Android Studio is checked.

Step 3) Configure Android Studio

When you run it for the first time it will ask for Android Studio settings.

If you don't have any previous settings click on the second option.

Select a theme and click next.

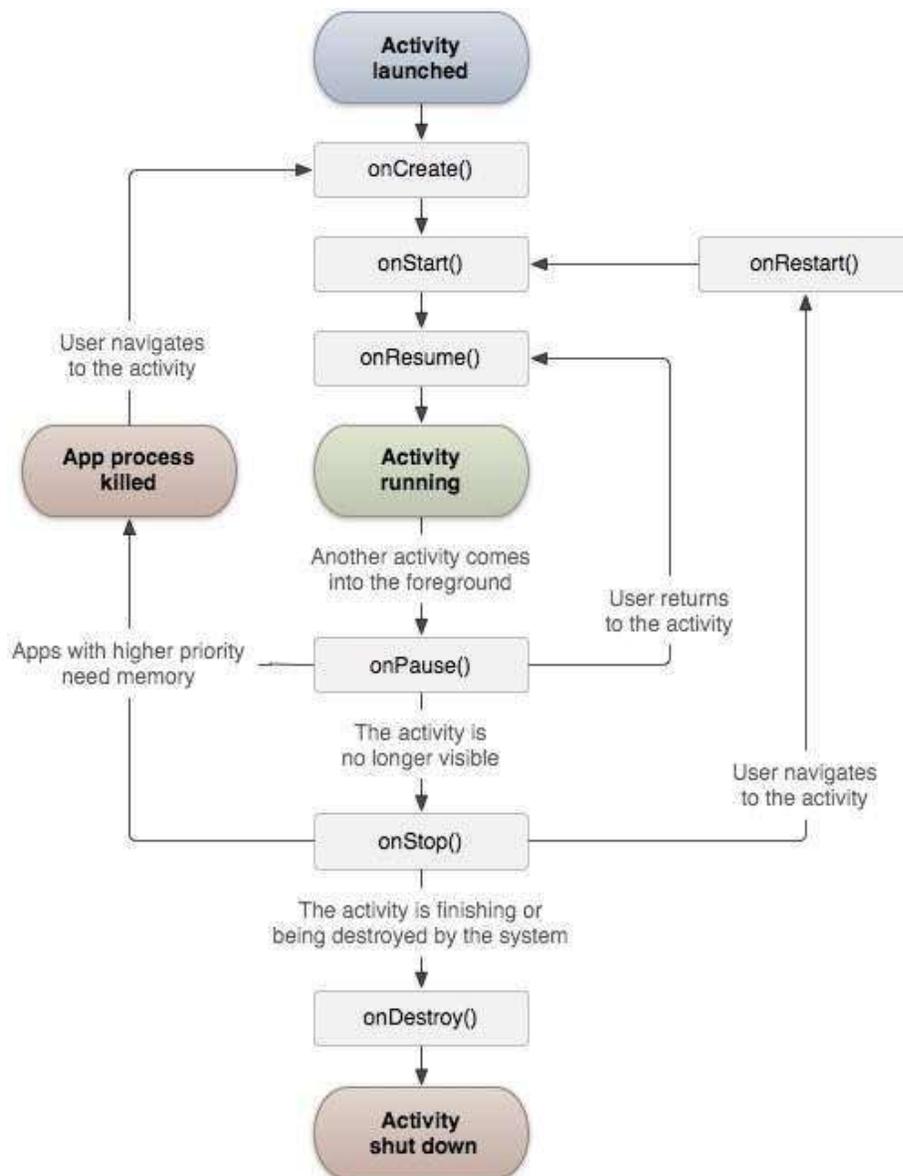
At the very first run it needs to download some necessary components, wait till it completes.

And it's all done.

Click on Finish and start building your Android apps.

Android Virtual Devices :- An Android Virtual Device (AVD) is a configuration that defines the characteristics of an Android phone, tablet, Wear OS, Android TV, or Automotive OS device that you want to simulate in the Android Emulator. The AVD Manager is an interface you can launch from Android Studio that helps you create and manage AVDs.

Activities :- Android system initiates its program with in an Activity starting with a call on *onCreate()* callback method. There is a sequence of callback methods that start up an activity and a sequence of callback methods that tear down an activity as shown in the below Activity life cycle diagram:



The Activity class defines the following call backs i.e. events.

Sr.No	Callback & Description
1	onCreate() This is the first callback and called when the activity is first created.
2	onStart() This callback is called when the activity becomes visible to the user.
3	onResume() This is called when the user starts interacting with the application.
4	onPause() The paused activity does not receive user input and cannot execute any code and called when the current activity is being paused and the previous activity is being resumed.
5	onStop() This callback is called when the activity is no longer visible.

6	onDestroy() This callback is called before the activity is destroyed by the system.
7	onRestart() This callback is called when the activity restarts after stopping it.

Linking Activities using Intents :- An Android application can contain zero or more activities. When your application has more than one activity, you may need to navigate from one activity to another. In Android, you navigate between activities through what is known as an intent.

Android View class and ViewGroup class :- The Android View class and ViewGroup class are two very central classes in Android apps. An Android app contains one or more activities. An Android activity is a screen, similar to windows in a desktop application. Inside an activity you can have GUI components. The GUI components are instances of View or ViewGroup subclasses.

View :- The View class is a superclass for all GUI components in Android. For instance, the TextView class which is used to display text labels in Android apps is a subclass of View. Android contains the following commonly used View subclasses:

- TextView
- EditText
- ImageView
- ProgressBar
- Button
- ImageButton
- CheckBox
- DatePicker

ViewGroup :- The ViewGroup class is a subclass of the View class. ViewGroup instances work as containers for View instances to group View instances together. Android contains the following commonly used ViewGroup subclasses:

- LinearLayout
- RelativeLayout
- ListView
- GridView

Android Layout Types :- There are number of Layouts provided by Android which you will use in almost all the Android applications to provide different view, look and feel.

Sr.No	Layout & Description
1	Linear Layout :- LinearLayout is a view group that aligns all children in a single direction, vertically or horizontally.
2	Relative Layout :- RelativeLayout is a view group that displays child views in relative positions.
3	Table Layout :- TableLayout is a view that groups views into rows and columns.
4	Absolute Layout :- AbsoluteLayout enables you to specify the exact location of its children.

5	Frame Layout :- The FrameLayout is a placeholder on screen that you can use to display a single view.
6	List View :- ListView is a view group that displays a list of scrollable items.
7	Grid View :- GridView is a ViewGroup that displays items in a two-dimensional, scrollable grid.

Android Display Orientation :- As with almost all smartphones, **Android** supports two **screen orientations**: portrait and landscape. When the **screen orientation** of an **Android** device is changed, the current activity being **displayed** is destroyed and re-created automatically to redraw its content in the new **orientation**.

Action Bar :- The **action bar** is an important design element, usually at the top of each screen in an app, that provides a consistent familiar look between **Android** apps. It is used to provide better user interaction and experience by supporting easy navigation through tabs and drop-down lists.

Listening to UI Notifications in Android :- There are two levels of Android user interface with which users interact and they are as follows:

1. Activity level
2. View level

Activity Level

At activity level, there are certain methods in Activity class which we can override. Some of the genuine methods are as follow:

- onKeyUp(): This is called when a key was released. This is not handled by any of the views inside the activity
- onKeyDown(): This is called when a key was pressed. This is not handled by any of the views inside the activity.
- onOptionsItemSelected(): This is called when any item of the menu panel is pressed by user.
- onMenuOpened(): This method is called when user opens the panel's menu.

View Level

When any user interacts with a view, the corresponding view fires event. When a user touches a button or an image button or any such view we have to service the related service so that appropriate action can be performed.

Chapter 4

Views

User Interface Controls :- In android UI or input controls are the interactive or View components that are used to design the user interface of an application.

In android we have a wide variety of UI or input controls available, those are TextView, EditText, Buttons, Checkbox, Progressbar etc.

Generally, in android the user interface of an app is made with a collection of View and ViewGroup objects.

The View is a base class for all UI components in android and it is used to create interactive UI components such as TextView, EditText, Checkbox, Radio Button, etc. and it is responsible for event handling and drawing.

The ViewGroup is a subclass of View and it will act as a base class for layouts and layout parameters. The ViewGroup will provide invisible containers to hold other Views or ViewGroups and to define the layout properties.

In android, we can define a UI or input controls in two ways, those are

- Declare UI elements in XML
- Create UI elements at runtime

Declare UI Elements in XML :- In android, we can create layouts same as web pages in HTML by using default Views and ViewGroups in the XML file. The layout file must contain only one root element, which must be a View or ViewGroup object. Once we define the root element, then we can add additional layout objects or widgets as a child elements to build View hierarchy that defines our layout.

Create UI Element at Runtime :- If we want to create UI elements at runtime, we need to create our own custom View and ViewGroup objects programmatically with required layouts.

Android Different Types of UI Controls :-

Android TextView :- In android, TextView is a user interface control that is used to display the text to the user.

Android EditText :- In android, EditText is a user interface control which is used to allow the user to enter or modify the text.

Android AutoCompleteTextView :- In android, AutoCompleteTextView is an editable text view which is used to show the list of suggestions based on the user typing text.

Android Button :- In android, Button is a user interface control that is used to perform an action when the user clicks or tap on it.

Android Image Button :- In android, Image Button is a user interface control that is used to display a button with an image to perform an action when the user clicks or tap on it.

Android Toggle Button :- In android, Toggle Button is a user interface control that is used to display ON (Checked) or OFF (Unchecked) states.

Android CheckBox :- In android, Checkbox is a two-states button that can be either checked or unchecked.

Android Radio Button :- In android, Radio Button is a two-states button that can be either checked or unchecked and it cannot be unchecked once it is checked.

Android Radio Group :- In android, Radio Group is used to group one or more radio buttons into separate groups based on our requirements.

Android ProgressBar :- In android, ProgressBar is a user interface control which is used to indicate the progress of an operation.

Android TimePicker :- In android, TimePicker is a widget for selecting the time of day, either in 24-hour or AM/PM mode.

Android DatePicker :- In android, DatePicker is a widget for selecting a date.

Android ListView :- Android ListView is a view which groups several items and display them in vertical scrollable list.

Android ImageView :- In Android, ImageView class is used to display an image file in application.

Android Menu :- Android Studio provides a standard XML format for type of menus to define menu items.

Analog and digital clocks :- Analog and digital clocks are used for display the time in android application.

1. Analog clock: Analog clock is a subclass of View class. It represents a circular clock.
2. Digital clock: Digital clock is subclass of TextView Class and uses numbers to display the time in "HH:MM" format.

Android Dialog Boxes :- A Dialog is small window that prompts the user to a decision or enter additional information.

Android Gallery view :- The Gallery is a view that shows items (such as images) in a center-locked, horizontal scrolling list.

Android ImageSwitcher :- ImageSwitcher is used with Gallery view to apply some animation to the image when it transitions from one image to another.

Android GridView :- The GridView shows items in a two-dimensional scrolling grid. You can use the GridView together with an ImageView to display a series of images.

Helper Methods with Option Menu and Context Menu

Helper Methods :- Before you go ahead and create your options and context menus, you need to create two helper methods. One creates a list of items to show inside a menu, while the other handles the event that is fired when the user selects an item inside the menu.

Options Menu :- You are now ready to modify the application to display the options menu when the user presses the MENU key on the Android device.

Context Menu :- Besides the options menu, you can also display a context menu. A context menu is usually associated with a view on an activity, and it is displayed when the user taps and holds an item

Sending and Receiving SMS

Android smartphones can send and receive messages to or from any other phone that supports Short Message Service (SMS). You have two choices for sending SMS messages:

- Use an implicit Intent to launch a messaging app with the ACTION_SENDTO intent action.

This is the simplest choice for sending messages. The user can add a picture or other attachment in the messaging app, if the messaging app supports adding attachments. The user can change the message in the messaging app before sending it. Send the SMS message using the `sendTextMessage()` method.

- To receive SMS messages, use the `onReceive()` method of the BroadcastReceiver class.

Making Phone Call

Android provides Built-in applications for phone calls. In some occasions we may need to make a phone call through our application. This could easily be done by using implicit Intent with

appropriate actions. Also, we can use `PhoneStateListener` and `TelephonyManager` classes, in order to monitor the changes in some telephony states on the device.

You will use `ACTION_CALL` action to trigger built-in phone call functionality available in Android device.

You can use `ACTION_DIAL` action instead of `ACTION_CALL`, in that case you will have option to modify hardcoded phone number before making a call instead of making a direct call.

To make a phone call at a given number, you need to specify `tel:` as URI using `setData()` method.

Chapter 5

Location-Based Services

(1) DISPLAYING MAPS :-

- Google Maps is one of the many applications bundled with the Android platform. In addition to simply using the Maps application, you can also embed it into your own applications and make it do some very cool things.
- We can change the views of Google Maps.
- We can obtain the latitude and longitude of locations in Google Maps.
- We can Perform geocoding and reverse geocoding (translating an address to latitude and longitude and vice versa).
- We can add markers to Google Maps.

(2) Obtaining the Maps API Key :-

- Beginning with the Android SDK, you need to apply for a free Google Maps API key before you can integrate Google Maps into your Android application.
- When you apply for the key, you must also agree to Google's terms of use, so be sure to read them carefully.

(3) Getting Location Data :-

- Nowadays, mobile devices are commonly equipped with GPS receivers. Because of the many satellites orbiting the earth, you can use a GPS receiver to find your location easily.
- However, GPS requires a clear sky to work and hence does not always work indoors or where satellites can't penetrate (such as a tunnel through a mountain).

(4) Monitoring a Location :-

- Main feature of the LocationManager class is its ability to monitor a specific location.
- This is achieved using the addProximityAlert() method.

Consuming Web Services using HTTP

- One common way to communicate with the outside world is through HTTP.
- HTTP is no stranger to most people; it is the protocol that drives much of the web's success.
- Using the HTTP protocol, you can perform a wide variety of tasks, such as downloading web pages from a web server, downloading binary data, and more.

Downloading Binary Data

- A common task you need to perform is downloading binary data from the web.
- For example, you may want to download an image from a server so that you can display it in your application.

Downloading Text Content

- Besides downloading binary data, you can also download plain-text content.
- For example, you might want to access a web service that returns a string of random quotes.

Accessing Web Services

- We can connect to a web service using the HTTP GET method.
- Once the web service returns a result in XML, you extract the relevant parts and display its content using the Toast class.

Sharing Data in Android

- In Android, using a content provider is the recommended way to share data across packages.
- Content provider acts as a data store. The packages can access the data stored in it using a consistent programming interface. A content provider behaves very much like a database — you can query it, edit its content, as well as add or delete content.
- However, unlike a database, a content provider can use different ways to store its data. The data can be stored in a database, in files, or even over a network.
- Android ships with many useful content providers, including the following:
 - ➤ Browser — Stores data such as browser bookmarks, browser history,
 - ➤ CallLog — Stores data such as missed calls, call details, and so on
 - ➤ Contacts — Stores contact details
 - ➤ MediaStore — Stores media files such as audio, video, and images
 - ➤ Settings — Stores the device's settings and preference

What is SQLite ?

- SQLite is a C-language library that implements a small, fast, self-contained, high-reliability, full-featured, SQL database engine.
- SQLite is the most used database engine in the world.
- SQLite is built into all mobile phones and most computers and comes bundled inside countless other applications that people use every day.
- SQLite database files are commonly used as containers to transfer rich content between systems.
- It is free to everyone to use for any purpose.