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National
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Transforming the skill landscape

Telecom
Sector
Skill
Council

Participant Handbook

Sector
Telecom

Sub-Sector
Handset (Terminal Applications)

Occupation
Terminal Equipment Application Developer

Reference ID: **TEL/Q2300, Version 5.0**
NSQF - Level 4

Telecom Terminal Equipment Application Developer(Android)

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Estel House, 3rd Floor, Plot No:- 126, Sector 44 Gurugram,
Haryana 122003
Phone: 0124-2222222
Email: tssc@tsscindia.com
Web:www.tsscindia.com

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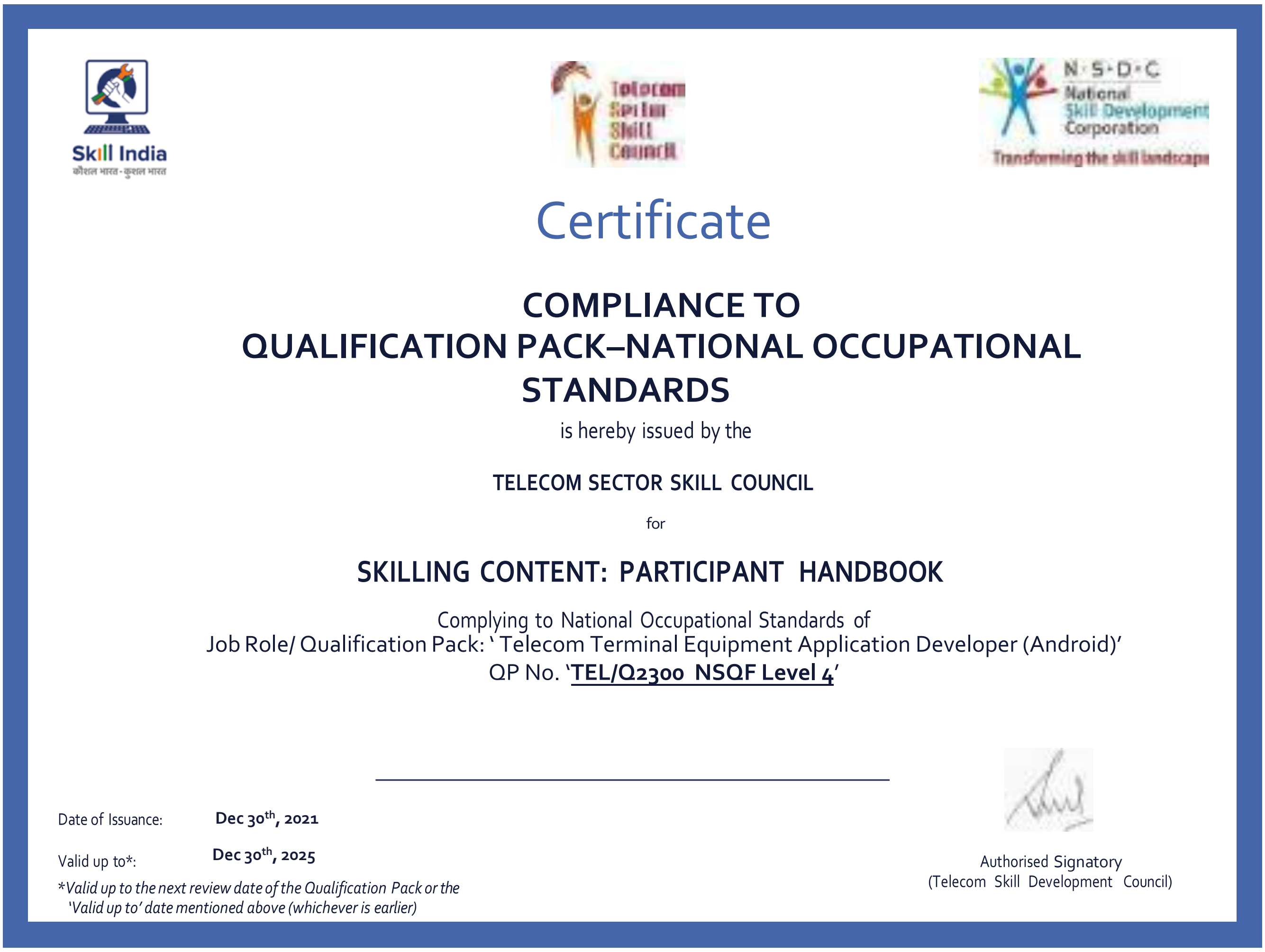
> If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India



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TELECOM SECTOR SKILL COUNCIL

for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: ' Telecom Terminal Equipment Application Developer (Android)'
QP No. '**TEL/Q2300 NSQF Level 4**'

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The preparation of this handbook would not have been possible without the Telecom industry’s support. Industry feedback has been extremely encouraging, from inception to conclusion, and it is with their input that we have tried to bridge the skill gaps existing today in the industry.

This Participant Handbook is dedicated to the aspiring youth who desire to achieve special skills which will be a lifelong asset for their future endeavours.

About this Book

In the last five years, the growth of the Indian telecommunications sector has outpaced the overall economic growth. This sector is poised for strong growth of about 15% in short term during 2013–17, driven by growth in organised retail, technological advancements, changing consumer preferences and government support. With over 1 billion subscribers, India is the second largest telecom market in the world. The sector currently employs over 2.08 million employees and is slated to employ more than 4.16 million employees by 2022. This implies additional creation of 2.1 million jobs in the nine-year period.

This Participant Handbook is designed to impart theoretical and practical skill training to students for becoming an Android Application Developer in the Telecom Sector.

A Telecom Terminal Equipment Application Developer (Android) is responsible for creating Applications for Android platform that can be used on Smartphone and Tablets running on Android Operating System. He also handles end-to-end activities for application development ranging from installing requisite frameworks, setting-up of development environment, developing apps, security frameworks, testing and deployment. He must also have good programming skills in Java, multithreading and operating system concepts; problem solving & analytical skills and their translation to specified outcome and additionally expected.

This Participant Handbook is based on Telecom Terminal Equipment Application Developer (Android) Qualification Pack (TEL/Q2300) & includes the following National Occupational Standards (NOS):

1. Set-up Android framework/development environment and creating user interface - TEL/N2300
2. Developing Android Value Added Services Application - TEL/N2301
3. Test and Publish Android Applications - TEL/N2302
4. Organise work and Resources as per Health and Safety Standards-TEL/N9101
5. Interact effectively with Team members and customers -TEL/N9102

The Key Learning Outcomes and the skills gained by the participant are defined in their respective units. Post this training, the participant will be able to set-up android frameworks; create user interfaces; develop android VAS applications; as well as test & publish android applications.

We hope that this Participant Handbook will provide a sound learning support to our young friends who want to build an attractive career in the telecom industry.

Symbols Used

Key Learning Outcomes

Steps

Notes

Unit Objectives

Practical

Exercise

Table of Contents

1. Roles and Responsibilities of Telecom Terminal Equipment Application Developer (Android)

Telecom
Sector
Skill
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Key Learning Outcomes

At the end of this module, you will be able to:

- Learn means and types of communication systems
- Discuss how communication systems are propagated from one place to another
- Understand the networking of communication systems and Internet
- List access methods which help the data to flow
- Describe the different generations of advanced communication systems
- Understand different Mobile Operating Systems and their versions
- Know about windows mobile
- Understand the different versions of android
- Know the basic hardware requirements of Android and how to instal it in a smart phone

UNIT 1.1: Introduction to the Program

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the basics of Telecommunication and its working
2. Explain Mobile Operating System
3. Understand different versions of Android
4. Explain the basic requirements for installing Android on the Device
5. Install Android Operating System in mobile

Click the QR code to view the video on tips how to become a mobile app developer

1.1.1 Introduction

Telecommunication is defined as the transmission of signals through physical media or through radiations. The signals can be text, images, sounds or information. The physical media used for transmitting the signals can be wires, optical fibres and the radiation media used can be electromagnetic systems.

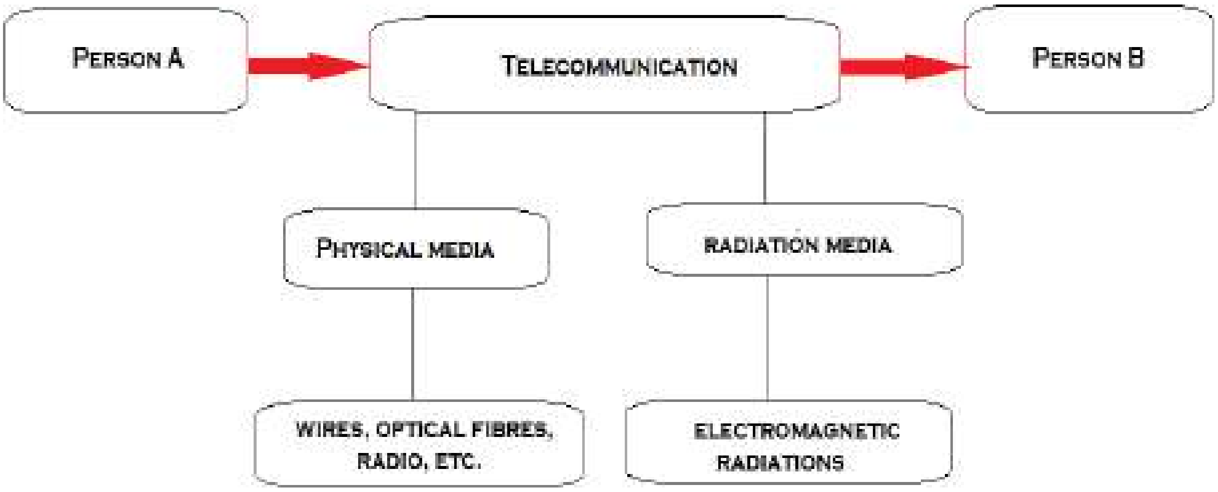

Fig. 1.1.1 Telecommunication process

The above diagram shows how a telecommunication system can be generated between two persons who may be living in two different places.

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UNIT 1.2: History of Communication

Unit Objectives

At the end of this unit, you will be able to:

1. Learn about various types of communication systems
2. Understand the working of the Internet

1.2.1 History of Communication

- Communication was thought to have started very early when civilizations were set up.
- Persians were said to have the most efficient means of postal services as early as 540 B.C.
- Around the 11th century, domesticated pigeons were used to deliver messages.

1.2.2 Telegraph and Telephone

- The electric telegraph was invented in 1816 by English inventor Francis Ronalds using static electricity.
- After the invention of telegraph many notable scientist made their version with some advancements.

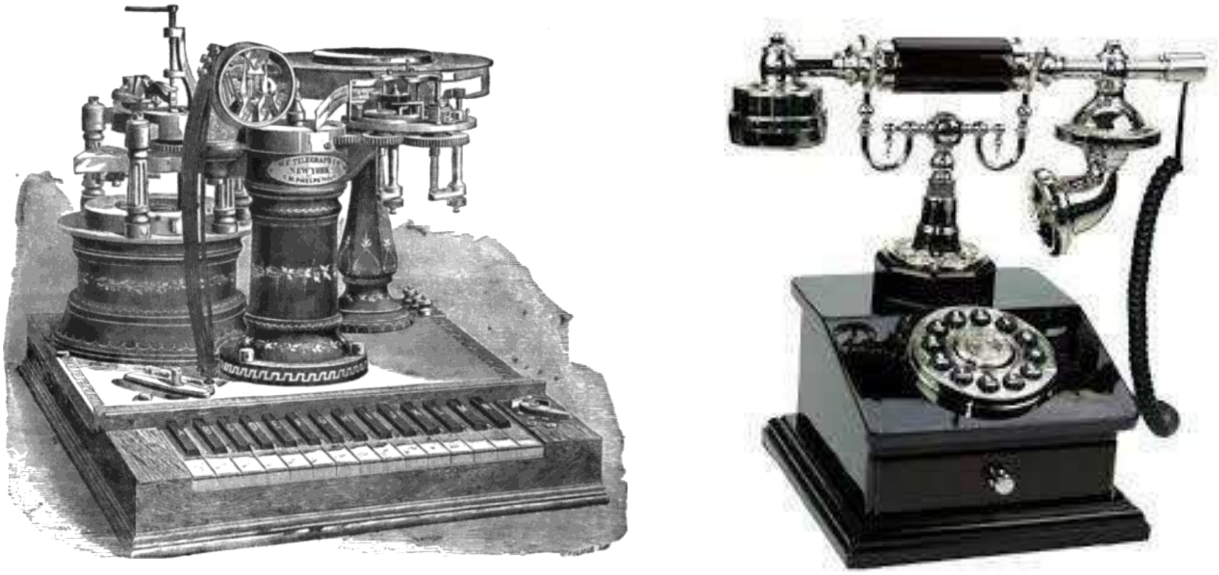

Fig. 1.2.2(i) A Telegraph and Telephone

- In 1876, telephone was invented by Alexander Bell and Alisha Gray.
- The invention of telephone gave birth to the invention of cell phones and mobile phones in the early 18th and 19th centuries.

Fig. 1.2.2(ii) Traditional telephone, (b) Evolution of cell phones over time

Fig. 1.2.2(iii) Evolution of cell phones over time

1.2.3 Computers and the Internet

- Computers are the devices that are used for doing random arithmetic calculations automatically.
- Computers were made to setup networks all across the world through data packet transfer wirelessly with the help of optical fibres that were buried underground.
- The configurations that were set with the help of computers were made to communicate using packet switching and the data would be sent to different computers using a centralized mainframe computer.
- Communication through internet has played a very important role.
- E-mails, documents, videos, songs, etc. can be easily transformed into signal with the help of a computer and then transferred through the internet to the other computer.

A telecommunication system comprises of three fundamental parts (Refer Fig 1.1.4):-

- Transmitter
- Transmission medium
- Receiver

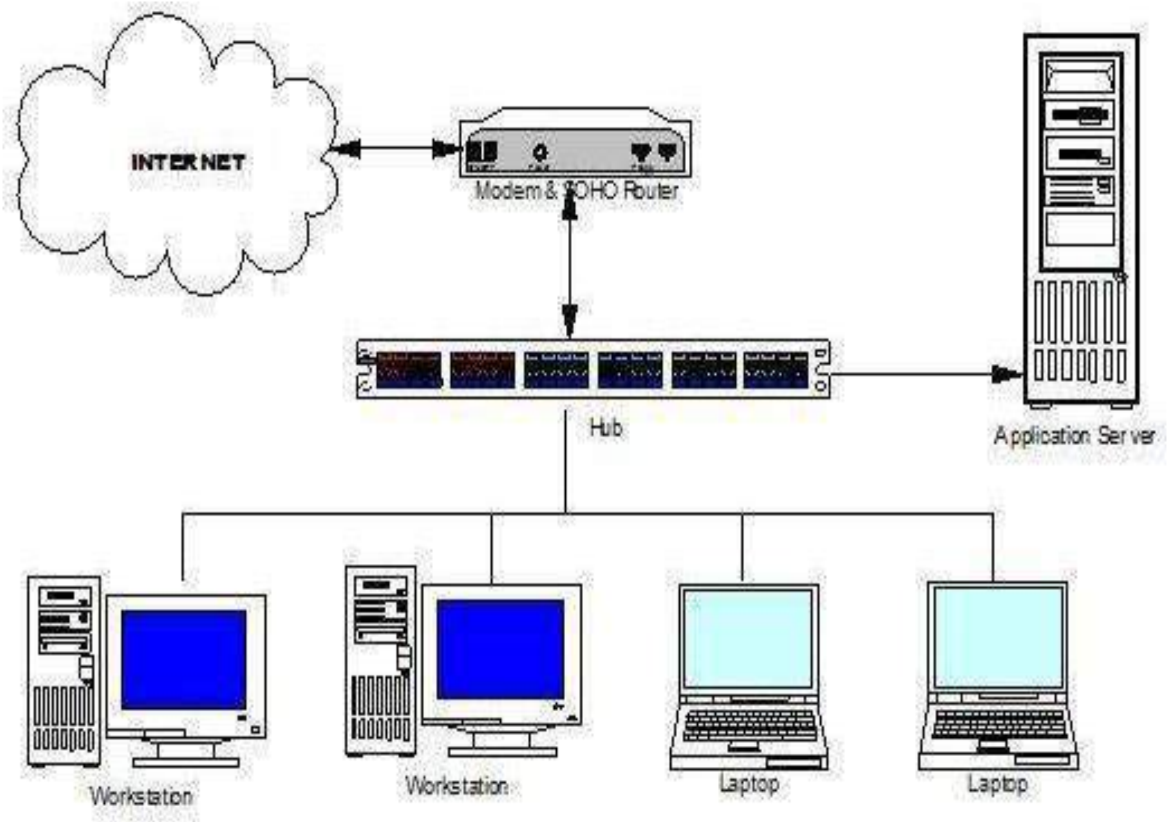

Fig. 1.2.2(iv) A typical diagrammatic representation showing the working process of internet with the help of the labeled devices

The work of a transmitter is to convert the information that has to be sent, into a signal.

The transmission medium can be a wire, optical fibre or electromagnetic radiation.

Receiver that is on the other end receives the signal and then converts it into useful information for the user on the other end.

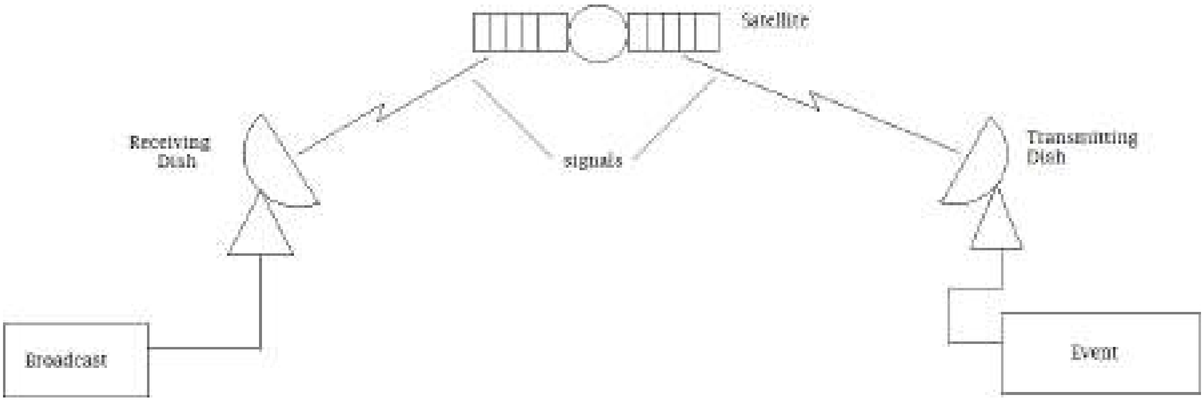

Fig. 1.2.2(v) Point-to-point communication since we have only one transmitter and one receiver. Now, if there are multiple transmitters and multiple receivers, we call those systems as multiplex systems

UNIT 1.3: Signals

Unit Objectives

At the end of this unit, you will be able to:

1. Understand signals or the data carriers

1.3.1 Signals

- Signals play a very important role in a telecommunication system since they carry the information.
- The signals are transformed into, either an analog signal or a digital signal (refer Fig 1.3.1).
- An analog signal can be defined as the signal which changes with respect to the information.
- A digital signal is that type of signal which carries information in binary form (in combinations of 0s and 1s).

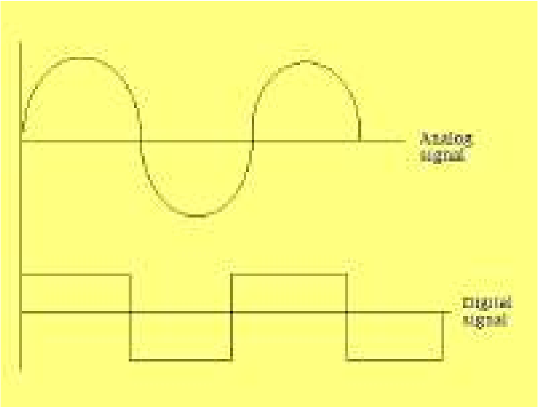

Fig. 1.3.1 Types of signals

- The transmitted signal does not have a 100% efficiency and energy because the signals are degraded by undesirable physical noise.
- Noise can be defined as adding or subtracting energy from the signal in a random manner.

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UNIT 1.4: Networks

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the basics of networking
2. Learn about generations of networks

1.4.1 Networks

- The mutual working of transmitters and receivers over large distances is termed as telecommunication networks.
- To transmit information from one place to another in a digital communication system, a controlling unit called a router is used.
- In analogue systems, switches are used between two or more users.
- The signal loses energy as it moves over large distances.
- To strengthen the signal, amplification is required.
- Amplification is achieved by use of physical systems called repeaters.

1.4.2 Mobile Telecommunication

- The mobile phone services started with the zero generation (0G) services which only supported few calls.
- Further advancements brought 1G, 2G, 3G and 4G services respectively.
- A mobile phone has some basic components which are stated as under:

1. **Battery**

   The battery is nothing but a power source in a mobile phone which helps the phone to function.

2. **Input**

   The input to the phone is the keypad and touch screens as used in smart phones. The input to the phone helps a user to interact with the function of the phone.

3. **SIM card**

   SIM stands for “Subscriber Identity Module”. The function of the SIM card is to provide network services like making phone calls and sending text messages.

4. **Memory Card**

   The latest mobile phone devices are equipped with slots for external memory called a memory card. The function of the memory card is to store data of the mobile phone like images, songs, videos etc. As the mobile phones were evolved, standards were set for the mobile communication. These standards are also called as generations. We will now discuss in detail, the different generations of mobile communication.

1.4.3 The 3rd Generation Partnership Project (3GPP)

The 3GPP is a collaboration between the organisational partners who belong to Asia, Europe and North America. Following are the generations of mobile communication that come under 3GPP:

1. **GSM (2nd Generation)**
   - It was developed by European Telecommunications Standards Institute in 1991 in Finland.
   - It is the default global standard as of now.
   - GSM at first used circuit-switched transport for packet data transfer.
   - Services called General Packet Radio Service or GPRS and Enhanced Data rates for GSM Evolution or EDGE were used for better data transfer.
2. **UMTS (3rd Generation)**
   - 3GPP introduced the 3rd generation (3G) services for better voice quality and enhanced data transferring speeds.
   - It was named as The Universal Mobile Telecommunication System or UMTS.
   - It uses wideband Code Division Multiple Access (W-CDMA) radio access technology for better efficiency of mobile operators.
   - UMTS supports maximum data transfer rates via High Speed Packet Access (HSPA).
3. **HSPA**
   - High Speed Packet Access or HSPA is a combination of High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access (HSUPA).
   - HSPA was introduced to improve the efficiency and performance of the 3rd Generation mobile Communication networks.
4. **LTE (4th Generation)**
   - Long-Term Evolution or LTE is a standard under 3GPP.
   - It was developed for high speed wireless mobile communication and data transfer.
   - LTE together with EDGE and UMTS/HSPA makes the 4th generation (4G) technology.

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UNIT 1.5: Networks

Unit Objectives

At the end of this unit, you will be able to:

1. Learn about multiplexing
2. Understand the basics of code division multiple access systems

1.5.1 Channel Access Methods

Multiplexing

- Multiplexing is a method by which multiple signals are converted into one signal over a shared medium.
- In a multiplexed signal the communication channel is divided into many logical channels.
- The data or messages that these logical channels carry is integrated into a single channel and then converted into the original signal at the receiver's end.
- The device which helps in the multiplexing is called a Multiplexer or MUX (Refer Fig 1.5.1).
- The device which helps in demultiplexing is called as a demultiplexer or a DEMUX (Refer Fig 1.5.1).

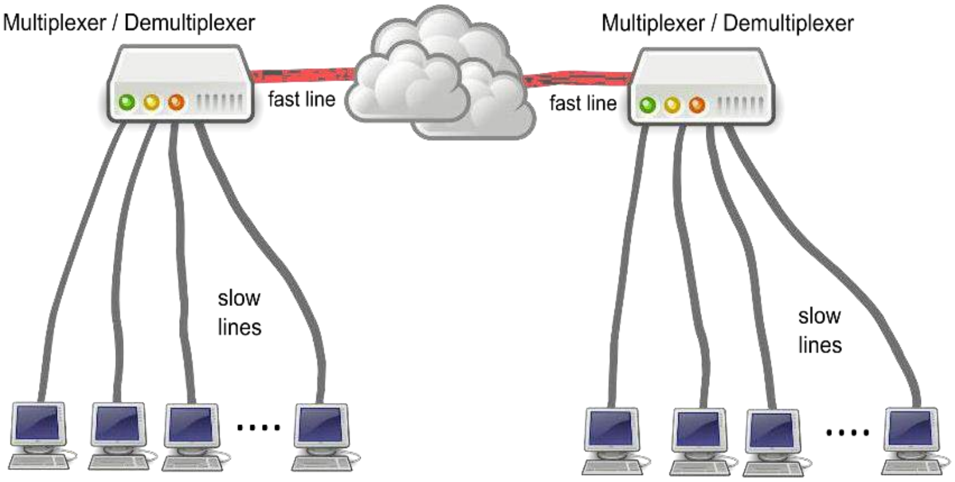

Fig. 1.5.1 Multiplexing/ De-multiplexing systems

- The channel access scheme is based on the multiplexing method.
- Multiplexing helps the data or signals to travel throughout the same physical medium which is a channel.
- One of the fundamental channel access schemes is called the Code Division Multiple Access or CDMA scheme.
- CDMA scheme has a wider radio spectrum which helps in transferring the data and signals simultaneously over the same carrier frequency.

DS-CDMA

Direct sequence-CDMA is used in 3rd generation (3G) mobile phone systems. For every symbol there is an information bit and it turns into long code sequences when there are several pulses, called chips.

FH-CDMA

Frequency Hopping-CDMA is a rapidly changing channel frequency. Bluetooth data transferring methods are based on frequency hopping. Frequency hopping is mainly used to avoid data collision between nodes in a virtual private network.

Exercise

Choose the correct option

1. Which component helps in transmitting the signal in a telecommunication system?
   a. Modem
   b. Transmitter
   c. GSM
   d. Receiver
2. Out of the following options which one describes the 2nd generation communication systems?
   a. HSPA
   b. W-CDMA
   c. LTE
   d. GSM
3. Who invented the telephone?
   a. Alexander Graham Bell
   b. Nikola Tesla
   c. Albert Einstein
   d. Erwin Schrödinger
4. Channel access scheme is based on which method?
   a. DEMUX
   b. Multiplexing
   c. MUX
   d. HSPA
5. A digital signal carries the information in which form?
   a. Sinusoidal form
   b. Binary (0 and 1)
   c. Cosine form
   d. Tangential form

6. A MUX has
    a. One input and one output
    b. Several inputs and one output
    c. Several inputs and several outputs
    d. One input and several outputs
7. In digital communication which device is used to transmit the information
    a. MUX
    b. DEMUX
    c. Router
    a. Printer
8. DS-CDMA is used in which mobile generation systems?
    a. 1st Generation
    b. 2nd Generation
    c. 3rd Generation
    d. 4th Generation
9. LTE along with GSM and UMTS/HSPA makes which mobile generation system?
    a. 1st Generation
    b. 2nd Generation
    c. 3rd Generation
    d. 4th Generation
10. Which device is used to convert the multiplexed signals into readable signals on the receiver's end?
    a. MUX
    b. Router
    c. DEMUX
    d. Monitor

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UNIT 1.6: Mobile Operating Systems

Unit Objectives

At the end of this unit, you will be able to:

1. Discuss about mobile operating systems
2. Learn about android development

1.6.1 Definition

An operating system is a set of different commands, called a program which is installed in the computer to manage the hardware and software resources. Operating system carries out the basic processes like understanding the input given by the user through the input devices such as the keyboard, mouse etc. and then processing the commands to give the required output which can be in the form of display on the monitor or a document printed on the paper. Every general purpose computer has an operating system or the computer cannot function (Refer Fig 2.1.1).

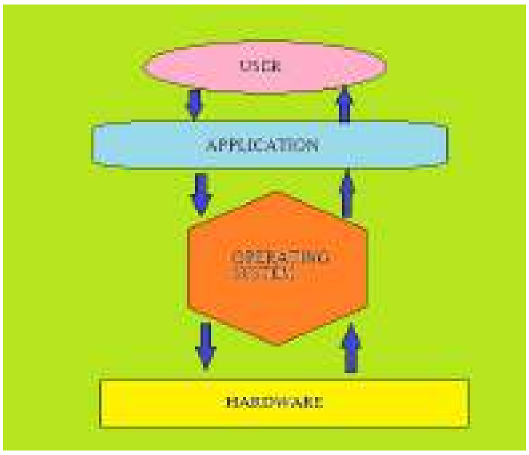


Fig. 1.6.1 Basic flowchart of a machine with an OS

Mobiles phones are also computers and hence they also possess an operating system. The mobile operating system, like a conventional computer operating system helps in running the applications and understanding the input in the form of key pressing and touch and then processing the information to give the output in the form of a display or sound depending upon the input given by the user. The mobile operating system has the basic features as that of common computer and it can also carry communication processes in the form of voice call or text messages.

Earlier, computers were installed with MSDOS which was replaced when Microsoft introduced Windows and Apple introduced iOS. These operating systems with further modification brought revolution in the field of computing. Similarly, in order to revolutionize the mobile phones from just a desk cell phone which weighed 2 kg to smart phones which weigh in grams, several operating systems were introduced each with some new features. We will study about some of these operating systems in detail.

1.6.2 Channel Access Methods

Symbian is a mobile operating system which is designed for smart phones. It is the product of Symbian Ltd. and has been used by several major brands like Nokia, Samsung, Motorola and Sony Ericsson worldwide. Symbian is not that widely used as it is surpassed by many fast and efficient operating systems but still some old devices use it as the basic operating system. The figures below show some of the versions of Symbian as installed in Nokia mobile phones.

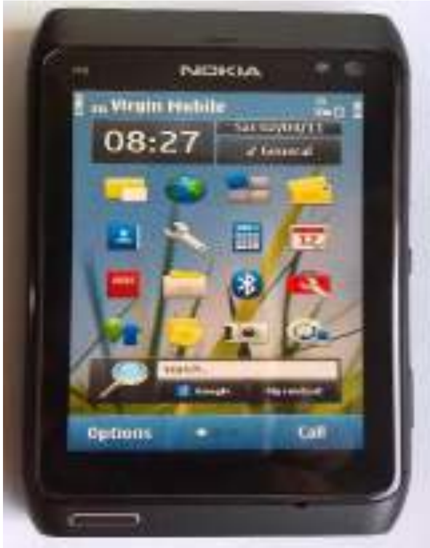


Fig. 1.6.2(i) Shows Nokia N8 which was launched in October 2010. The phone had GSM/HSPA network technology and the operating system installed in it was Symbian 3rd Edition. The phone supported a 16 MP rear camera

Fig. 1.6.2(ii) Shows Nokia 808 Pureview which was launched in June 2012. The phone has GSM/HSPA technology and the operating system installed in it is Nokia Belle. The phone has a 4.0" capacitive touchscreen and supports a 41 MP camera. This was Nokia's Last Symbian phone.

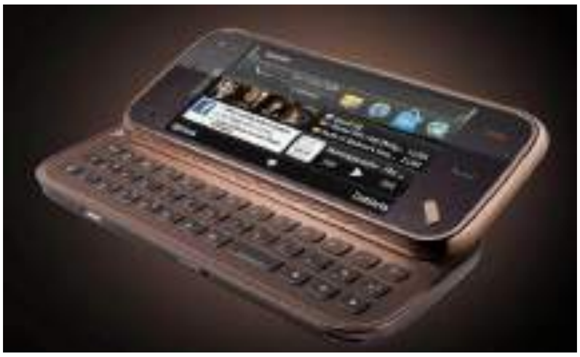


Fig. 1.6.2(iii) shows Nokia N97 Mini which was launched in November 2009. The phone had GSM/HSPA network technology and the operating system installed in it was Symbian V9.4, Series 60. The Phone had a TFT resistive touch screen and a QWERTY keypad which gave it excellent aesthetics and made typing on the phone very efficient.

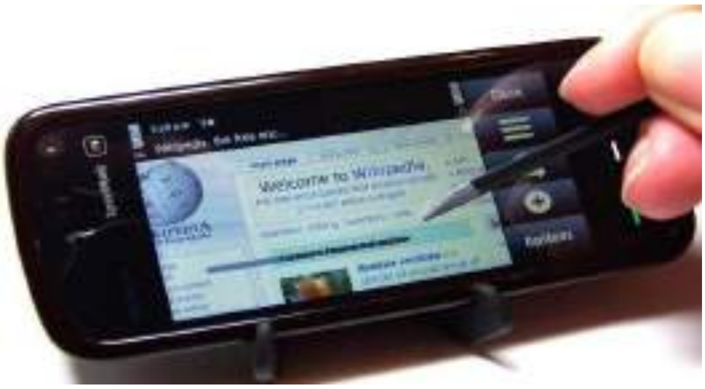


Fig. 1.6.2(iv) Shows Nokia 5800 Xpress Music which was launched in November 2008. The phone had GSM/HSPA network technology and had a Symbian V9.4, Series 60 Operating system. The phone had a TFT touchscreen and was equipped with handwriting recognition.

1.6.3 User Interface

What is User Interface?

User interface is a virtual space where interactions between a human and machine take place. This interaction helps the human users to operate the machine really effectively. When designing user interface we need to take consideration two important disciplines, ergonomics and psychology. Ergonomics (the study of people's efficiency in their working environment) have to be considered while engineering a human-machine interface.

Symbian was provided with a graphics toolkit called the Series 60. The Design of Series 60 was so done as to make the QWERTY keyboard compatible. It was compatible upto and including Symbian^3. Symbian^3 includes the Qt framework, which is mainly used for the development of the software with the help of graphical user interface or GUI. Qt framework helped in the fast development of the applications for the mobile phones. It is the recommended user interface toolkit since all the application that had to be run on and including symbian^3 operating system had to be developed using the Qt framework.

To create a visually rich touchscreen interfaces for further development, Nokia has recommended the developers to use Qt Quick with QML, the new high-level declarative user interface. This development will be delivered to the Nokia users using Symbian^3 and above as an update which can be downloaded to their phones for the application of the developed operating system.

1.6.4 Application Development

Qt

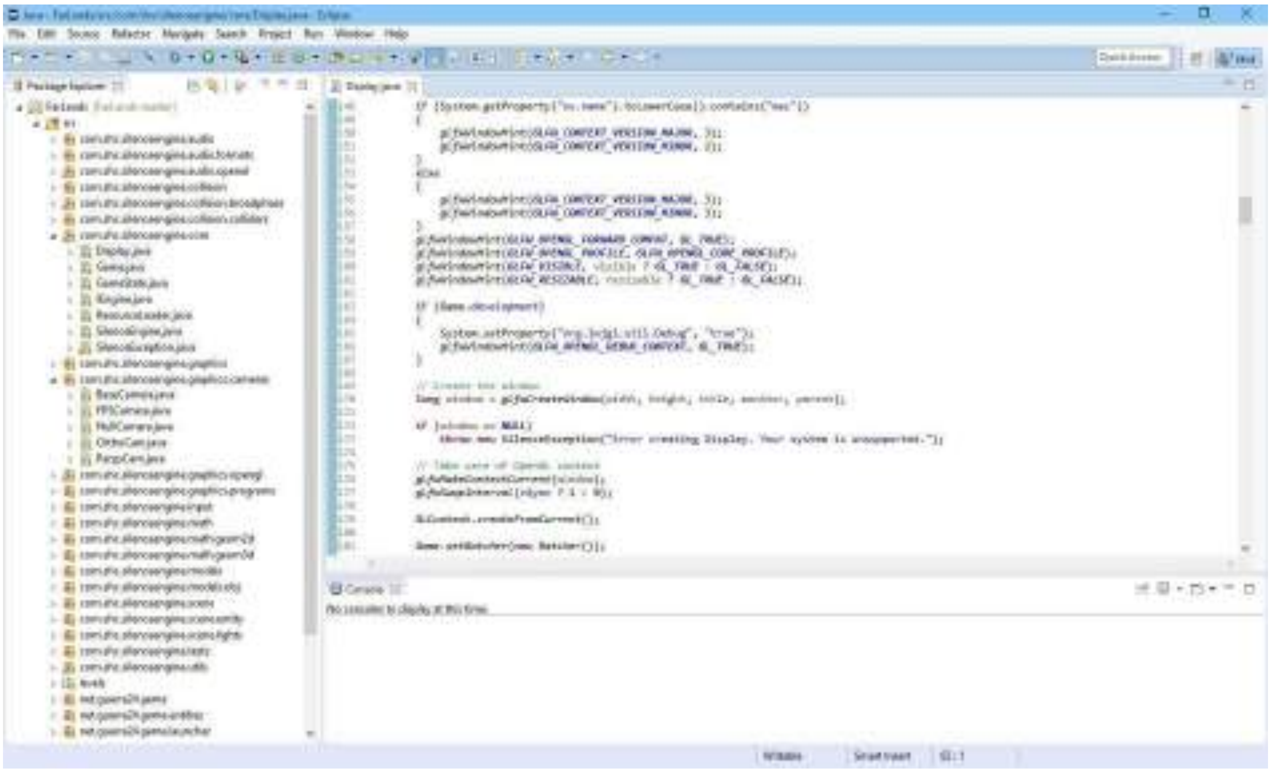
As we discussed earlier, Qt is a framework which is used for the development of applications of the operating system with the graphical user interface. The software development kit or SDK for Symbian is C++ with the help of Qt. In order to test if the developed application is running properly, a mobile phone simulator is installed in the computer and then the Qt apps are installed on the simulator and the testing is done. We will understand and learn the use of Software development kit or SDK in the coming lessons.

Symbian C++

The Symbian operating system is written in C++. Since C++ is also used in creating software in computers, therefore, C++ is used along with the Symbian standards to write the operating system. Now SDK is used for writing the operating system and the Symbian C++ was used until the introduction of Qt SDK. Development of Qt SDK was done because programming in C++ was very difficult and required special techniques which made it more difficult to run an application without experiencing an error. The programming of Symbian C++ is generally done in an integrated development environment or IDE. For versions of Symbian earlier than Symbian^3, the programming was done on commercial integrated development environment CodeWarrior platform. CodeWarrior tools were later replaced by Carbide. C++ which was an Eclipse based integrated development environment develop by Nokia Itself.

Eclipse

Eclipse is an integrated development environment which is used for programming computers. Mostly written in JAVA, Eclipse can also write programs in other computer languages which include C++, COBOL, D, C, Fortran etc. although it is mostly used to develop the application which are used in the JAVA platform (Refer Fig 2.1.6).


File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
Display.java
Console
Writable
Smart Insert

```
if (System.getProperty("os.name").toLowerCase().contains("mac"))
{
    glfwWindowHint(GLFW_CONTEXT_VERSION_MAJOR, 3);
    glfwWindowHint(GLFW_CONTEXT_VERSION_MINOR, 3);
}
else
{
    glfwWindowHint(GLFW_CONTEXT_VERSION_MAJOR, 3);
    glfwWindowHint(GLFW_CONTEXT_VERSION_MINOR, 3);
}
glfwWindowHint(GLFW_OPENGL_FORWARD_COMPAT, GL_TRUE);
glfwWindowHint(GLFW_OPENGL_PROFILE, GLFW_OPENGL_CORE_PROFILE);
glfwWindowHint(GLFW_VISIBLE, visible ? GL_TRUE : GL_FALSE);
glfwWindowHint(GLFW_RESIZABLE, resizable ? GL_TRUE : GL_FALSE);

if (Game.development)
{
    System.setProperty("org.lwjgl.util.Debug", "true");
    glfwWindowHint(GLFW_OPENGL_DEBUG_CONTEXT, GL_TRUE);
}

// Create the window
long window = glfwCreateWindow(width, height, title, monitor, parent);

if (window == NULL)
    throw new SilenceException("Error creating Display. Your system is unsupported.");

// Take care of OpenGL context
glfwMakeContextCurrent(window);
glfwSwapInterval(vSync ? 1 : 0);

GLContext.createFromCurrent();

Game.setBatcher(new Batcher());
```

```
No consoles to display at this time.
```

Fig.1.6.4 Eclipse IDE

Other softwares that can be used fir the programming of Symbian Operating Systems are Python, Java ME, Flash Lite, Ruby, .NET and Web Runtime.

1.6.5 Symbian Operating System

An Operating system is programmed in layers. The layers in which Symbian is written are:

1. User Interface Layer
2. Application Services Layer
    - Java ME
3. Operating System Services Layer
    - Generic operating system services
    - Communication services
    - Multimedia and Graphics Services
    - Connectivity Services
4. Base Services Layer
5. Kernel Services and Hardware Interface Layer

The lowest layer which a user can reach is the base service Layer. The base service layer includes the File server, User Library, a Plug-in Framework, Central Repository, Database Management System and cryptographic services. Symbian has microkernel architecture. A Kernel can be stated as a computer program that makes the main central core of the computer's operating system and whatever happens in the computer is controlled by the Kernel. Now, a microkernel in a computer is the small part of the software needed that can be used to provide the mechanisms needed to implement an operating system. The microkernel architecture contains a scheduler, memory management and device drivers and other services like networking, telephony and file system support are placed in the operating system service layer.

Symbian is designed in such a way that it is compatible with other devices, especially removable media systems. Earlier Symbian was Called EPOC which was derived from EPOCH or "Electronic Piece Of Cheese" and its development led to the use of File allocation table or FAT as internal file systems. There are three main servers that form the large networking and communication subsystem which are

- ETEL
- ESOCK
- C32 (responsible for serial communication)

These servers possess plug-in schemes. For instance, ESOCK allows .PRT protocol modules to implement various networking protocols. These subsystems also contain specific codes that support short range communication links like Bluetooth, Infrared Data Association (IrDA) and Universal Serial Bus (USB). All native Symbian C++ applications stand on three framework classes which create the fundamental application behaviour are as follows:

- Application class
- Document class
- User Interface class

Symbian also includes a reference UI known as Techview which provides environment and customization tools when testing the platform and running the codes before it is released for the user.

Symbian UI Variants/Platforms

- S60
- Series 80
- Series 90
- UIQ
- MOAP (Mobile Oriented Applications Platforms) Japan Only
- OPP (successor of MOAP)

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UNIT 1.7: Windows Mobile

Unit Objectives

At the end of this unit, you will be able to:

1. Understand about window mobile
2. Understand about blackberry OS
3. Understand about mobile information device profile

1.7.1 Windows Mobile

Windows mobile was the family of mobile operating systems which was developed by Microsoft for smart phones and pocket computers. Windows started producing phones in 1996 with their first ever operating system called the Windows CE. Then windows appeared in 2000 with PocketPC which was renamed as Windows Mobile in 2003. There are many standard features in the phone, multitasking and navigating the file systems being the respective examples. A windows mobile is shown in the figure below:

Fig. 1.7.1 Windows phone

Windows mobile comes with some basic installed applications:

- Internet Explorer Mobile (Default Browser)
- Windows Media Player
- Microsoft Office

Another feature that windows mobile introduced is the internet connection sharing which is only supported on compatible devices, allows the phone to share its internet connection with computers via universal serial bus (USB) or via Bluetooth. Another networking feature that windows mobiles are equipped with is called as Virtual private networking (VPN) over Point-to-Point Tunnelling Protocol (PPTP). Let us get the brief idea of what these two terms are.

Virtual Private Networking (VPN)

It is a private network which is made by a computer itself so that other computers can be connected to it via internet. VPN allows the user to send and receive the data that are connected to each other over the internet. Virtual Private Network is created by establishing a virtual point-to-point connection, virtual tunneling protocols. VPN systems may be classified by:

- Protocols that help in tunneling the data traffic through the network.
- Location of the point where the tunnel ends i.e. on the user end or on the network end.
- If site to site connectivity is offered or network to network connectivity is offered.
- The levels of security.
- Number of simultaneous connections between the networks.

Point-to-Point Tunneling Protocol (PPTP)

The Point-to-Point Tunneling Protocol is a method by which virtual private networks (VPNs) are implemented. Windows has changed its user interface over time with different versions, which are as following:

1. Windows CE
2. Pocket PC 2000
3. Pocket PC 2002
4. Windows mobile 2003
5. Windows mobile 2003 SE
6. Windows mobile 5
7. Windows mobile 6
8. Windows mobile 6.1
9. Windows mobile 6.5

1.7.2 Hardware

Windows mobile supports three main versions of the operating systems for different hardware; For phones like smart phones and touch screen phones, windows developed the windows mobile professional operating system. They also developed an operating system called the windows mobile standard which was made to run on the hardware devices that were not touchscreens whereas, for the old versions of the hardware devices like the personal digital assistant or the pocket PC, windows developed the Windows mobile classic.

1.7.3 BlackBerry OS

BlackBerry operating system is a mobile operating system which was developed by BlackBerry Ltd for the smartphones. Since it is supported in the smartphones, it was developed for multitasking and it was installed with special input devices like track wheel, track ball and track pad which was one of the best aesthetics that BlackBerry devices had. BlackBerry supported corporate email through MIDP 1.0 and then upgraded to a new version MIDP 2.0 which was developed to allow proper wireless activation. Besides, there was a function of synchronizing data with applications like Microsoft Exchange, tasks, calendar, contacts etc.

1.7.4 MIDP

MIDP stands for Mobile Information Device Profile. It is a mobile specification which is published for using Java on mobile phones and personal digital assistants (handheld personal computer). It is the part of the Java Micro Edition Framework and leads the lower level programming interfaces.

Fig. 1.7.4(i) Palm TX, personal digital assistant (PDA)

The mobile operating system can also be updated automatically from the wireless carriers that support Over The Air Software Loading (OTASL) service.

Fig. 1.7.4(ii) BlackBerry mobile phone with track pad

Notes

UNIT 1.8: Versions of Android

Unit Objectives

At the end of this unit, you will be able to:

1. Understand about various operating systems of mobile phones

1.8.1 Android OS

Android is a Linux based operating system which is developed by Google. This operating system is designed for touchscreen smartphones and tablets. Android operating system has also been developed for television, cars, watches and other electronic devices. The source code of Android comes under open source license and is released by Google.

Source Code

Source code can be defined as that programming language which is written in a readable computer language in the form of text. The source code is first transformed into low level machine language by a complier program of specific software and then it is read by the computer and the desired output is generated.

For instance,

The source code for displaying "hello, world" is written in simple C language which prints the "hello, world" on the screen. The source code is as follows:

```
main ( )
{
Printf("hello, world") ;
}
```

1.8.2 Features

User Interface

The user interface of Android based system is based on direct manipulation which means that the input given to the device is solely based on touch inputs which corresponds to the action like tapping on the screen, swiping and pinching. In order to type on the device, the input system is a virtual keyboard.

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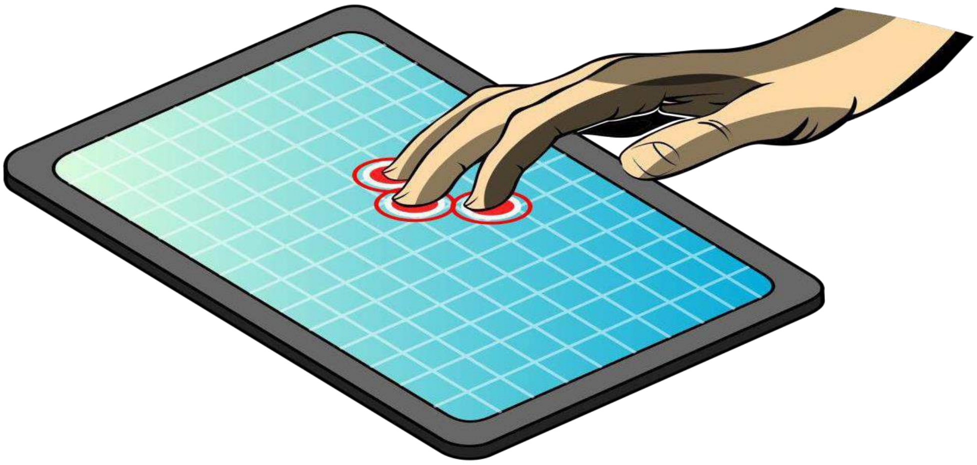


Fig.1.8.2(ii) A touch Interface

Another development that Android has is that physical keyboards and consoles can be connected to the device via Bluetooth or USB (Universal serial bus controller). Apart from the direct manipulation input, the devices that support Android OS are installed with proximity sensor, Gyroscope sensor, gravity sensor as well as accelerometer sensor for better working of applications. For example Temple run is a game (application) developed for android which is played with the help of gravity sensor. The actions performed during the gameplay sliding, tilting and swiping being done with the help of gravity sensors.

Fig. 1.8.2(iii) Temple Run 2, works on gravity sensor

Android home screen have applications like weather application, maps, email etc. which are auto-updated over the internet. The home screen is developed in pages with each page containing the icon of the installed application.

Fig. 1.8.2(iv) A Weather Widget

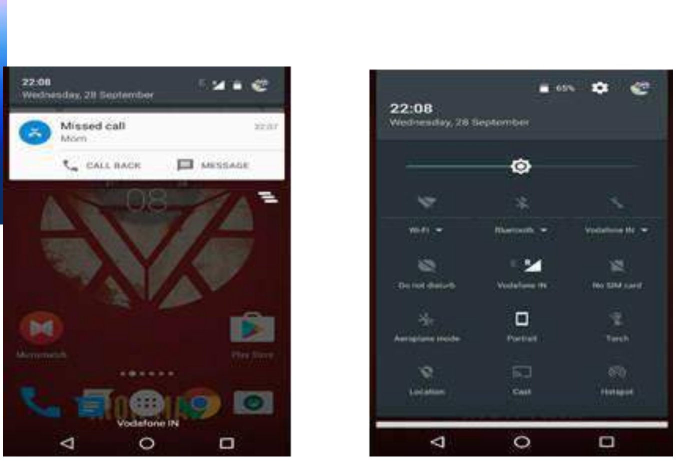


Fig. 1.8.4(v) Status bar - Android Marshmallow

At the top of the screen is the status bar which needs to be pulled down to view the notifications, like message received, missed calls, application installation notification, etc. The status bar is also developed to possess short cut virtual switches for Bluetooth, Wi-fi, Location as well as mobile data connection (internet). The notifications that appear on the status bar keep showing until they are read or checked. Extra control is given to wipe off too many notifications in one go.

1.8.3 Applications

The applications or apps for android are developed using the Android Software Development Kit (SDK) and the programming is done in Java programming language which we will learn in the following chapters. The software development kit includes development tools like the debugger, software libraries and a handset emulator. The Integrated development environment (IDE) used by Google was Eclipse IDE at first but then it was replaced by Android Studio for android development. The apps that can be installed on the android device can either be downloaded from Google Play Store or from third party developer sites in the form of Android Application Package (APK) files.

The Apps store allows the user to install the apps, update and remove the app right from the store window. The apps can also be removed through the default application removal feature of the Android although updation can only be done from the developer’s page either on the appstore or from the third party website. It is recommended to use the official appstore or Google play store for installing and updation apps because the third party sites have bugged software and it is not certain if they will release an update for certain software. Apart from the free applications on the play store which are distributed under open source licenses, there are apps which have to be purchased before installation.

1.8.4 Virtual Reality

Google has announced a virtual reality platform called Daydream that is developed for smartphones the input and output of which will be received on a virtual reality headset and controller which are also designed by Google.

1.8.5 Hardware

ARM

ARM stands for Acorn RISC (Reduced instruction set computing) Machine. It is a family of RISC architectures which have been developed for computer processors (Refer Fig 2.3.4). The design done through RISC helps us to install very few transistors in the processors as compared to the one [CISC {complex instruction set computing}] which are installed in the personal computers. This helps in reducing overall cost, heating issues and power consumptions. Since the size of the processor gets smaller, it is feasible for the use in smartphones, laptops and tablet PCs.

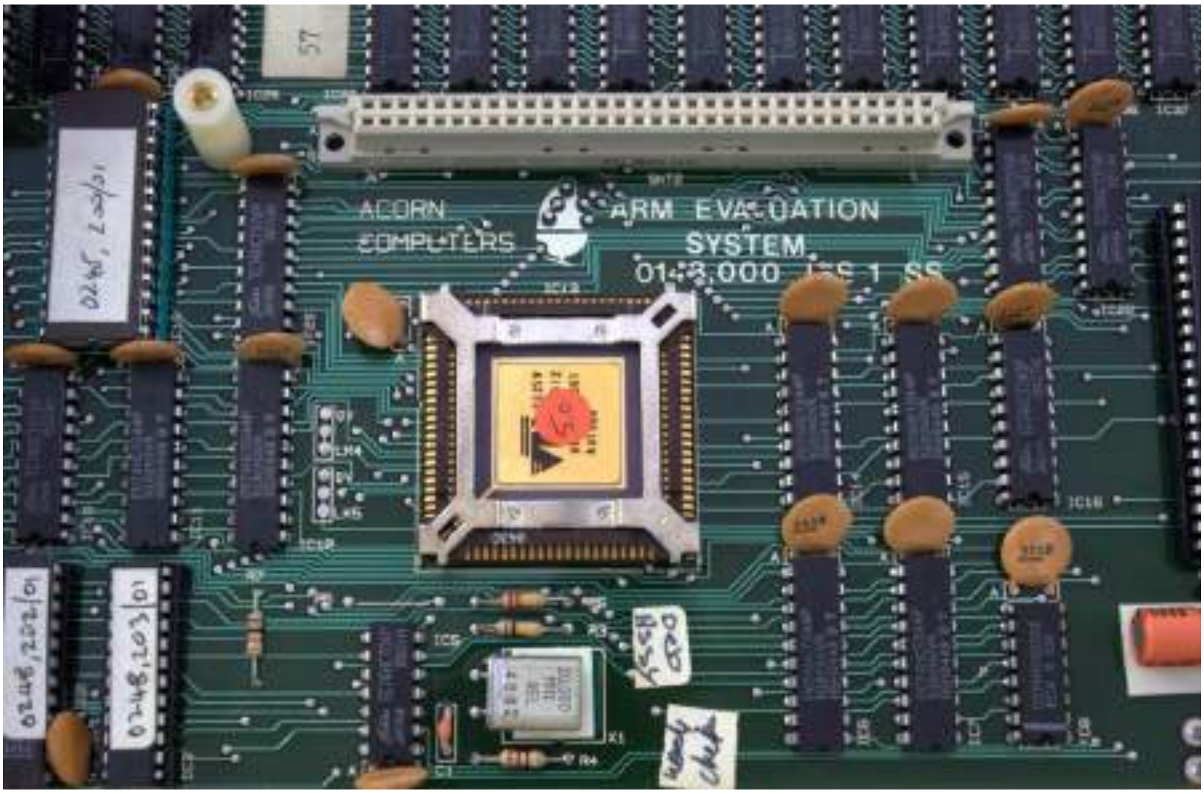


Fig. 1.8.5(i) ARM1 RISC processor

Every core which is from ARM supports a 32 bit address space and 32-bit arithmetic. 32 bit means that the arithmetic data or the memory addresses are 32 bit wide. Same holds true for a 64 bit core. The versions of ARM of which the core bit width is 32 bit are as follows:

1. ARMv1
2. ARMv2
3. ARMv3
4. ARMv4
5. ARMv4T

6. ARMv5TE
7. ARMv6
8. ARMv6-M
9. ARMv7-M
10. ARMv7E-M
11. ARMv7-R
12. ARMv7-A
13. ARMv8-A
14. ARMv8.1-A
15. ARMv8.2-A
16. ARMv8-R
17. ARMv8-M

The versions of ARM of which core bit width is 64 bit are as follows:

1. ARMv8-A
2. ARMv8.1-A
3. ARMv8.2-A

To develop the hardware that can support Android, the platform is ARM (ARMv7 and ARMv8-A architectures) with x86 and MIPS architectures. The 64 bit variants are also supported in addition to 32-bit variants on all the Android versions over and including v5.0 or commonly known as “Lollipop”. The new Android hardware is supported with Intel processors to gain support on 64 bit platforms. The minimum amount of RAM (Random Access Memory) required to run an Android based operating system is 512 MB for normal density screens and 1.8 GB for high density screens. The RAM recommended for Android 4.4 or “KitKat” is 512 MB. KitKat also requires a 32-bit ARMv7, MIPS or x86 architecture processor together with an OpenGL ES 2.0 compatible graphics processing unit (GPU).

Apart from running on the smartphones and tablet PCs, the android also runs computers with the help of Android Emulators or by using bluestacks. The Android version available for the computers is customized for the hardware of the computer and is closely related to the versions of mobile operating system.

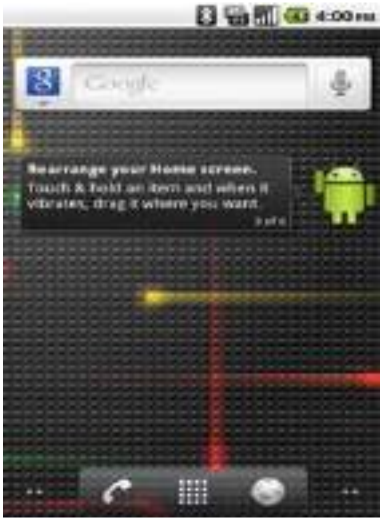
Fig. 1.8.5(ii) Bluestacks android emulator

1.8.6 Versions

Froyo, Android (2.2 - 2.2.3)

Developed by Google with versions 2.2 and 2.2.3., It introduced USB tethering and Wi-Fi hotspot functionality. Changes include:

- Android Cloud to Device Messaging
- Enabling Push notifications
- Speed , memory and performance optimization
- Improved application launcher with shortcuts to phone and browser applications.
- Option to disable data access over mobile internet
- Support for file upload fields in browser
- Support for installing applications to expandable memory
- Adobe Flash support
- Support for high pixels per inch such as 720p screens.



Rearrange your Home screen.
Touch & hold an item and when it vibrates, drag it where you want.
3 of 4

Fig. 1.8.6(i) Froyo UI

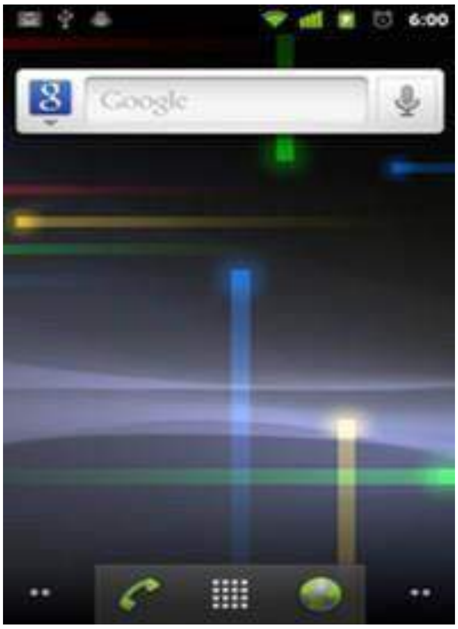


Fig. 1.8.6(ii) Gingerbread UI

Gingerbread, Android (2.3 - 2.3.7)

Developed by Google from versions 2.3 – 2.3.7, it introduced support for near field communication which is used in mobile payment solutions and session initiation protocol (SIP). The changes with this version of the operating system are as follows:

- Updated user interface design
- Support for extra-large screen sizes and resolutions
- Improved text input using virtual keyboard
- Enhanced copy/paste functionality
- Enhanced support for native code development
- Improved power management
- Support for multiple cameras on the device
- Concurrent garbage collection for increased performance.

Ice Cream Sandwich, Android (4.0 – 4.0.4)

Developed by Google from versions 4.0 to 4.0.4, it introduced a new visual appearance codenamed "Holo" and a new default typeface (a set of one or more fonts in a text document) named Roboto. The changes in the operating system include

- Refreshed home screen
- Near field communication support and ability to beam content to another user
- Updated web browser

- New contacts manager
- Access to camera and music via lock screen
- Visual voicemail support
- Face recognition
- Monitor and limit mobile data usage
- Ambient temperature and humidity sensors
- Wi-Fi direct
- Social networking

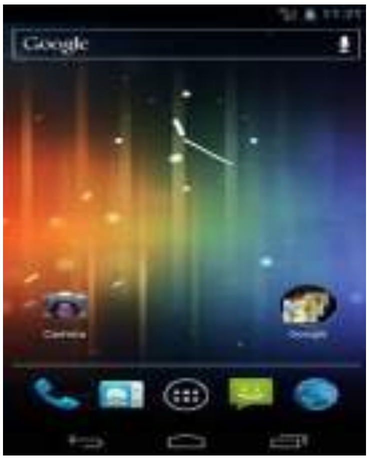


Fig. 1.8.6(iii) Ice Cream Sandwich UI

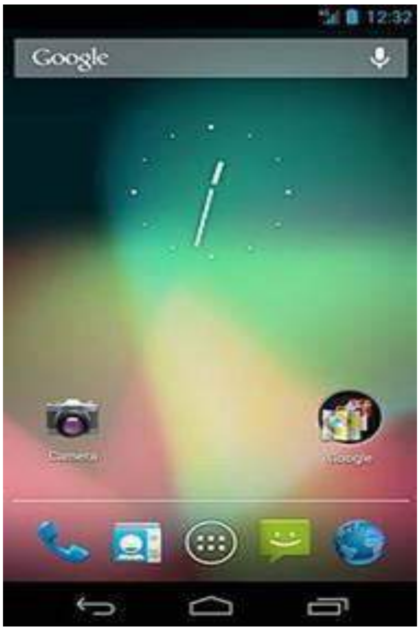


Fig. 1.8.6(iv) Jelly Bean UI

Jelly Bean, Android (4.1 – 4.3.1)

Developed by Google and spanning between versions 4.1 and 4.3.1, it introduced thee refinement of the “Holo” appearance. The other features that Jelly Bean gained are:

- Shortcuts and widgets on home screen
- Improvement of notification system with addition of expandable and actionable notifications.
- Options such as call back or message on a missed call through notification screen
- Improvement in lock screen
- Addition of Google Chrome as default browser
- Introduction of new screen saver system known as Daydream
- Supports multiple users

KitKat, Android (4.4 – 4.4.4)

Developed by Google from version 4.4 to 4.4.4, it was created with prime focus on optimizing the operating system for improved performance on entry level devices with limited resources. The changes that were made in this version of the operating system are:

- Refreshed appearance of the launcher
- Implementation of the translucent navigation bars
- In the settings menu, users can now specify a default home (launcher) and text messaging app
- Introduction of Google Hangouts
- Default gallery removed with Google+ photos
- Document file picker for some applications.

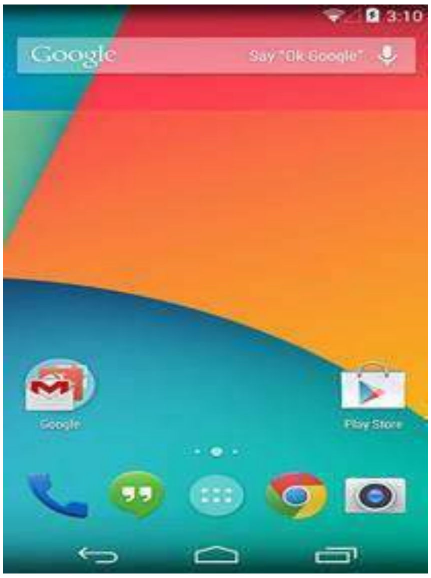


Fig. 1.8.6(v) KitKat UI

Lollipop, Android (5.0 – 5.1.1)

Developed by Google from versions 5.0 to 5.1.1, it was made available from Over the air update for selected devices. The changes with which Lollipop was launched was the redesigned user interface developed with a design language known as material design which was made to give a paper like feel to the interface. Other changes made were:

- Refreshed notification system
- Individual notifications are displayed on cards
- Notifications are displayed on lock screens
- Do-not disturb feature added

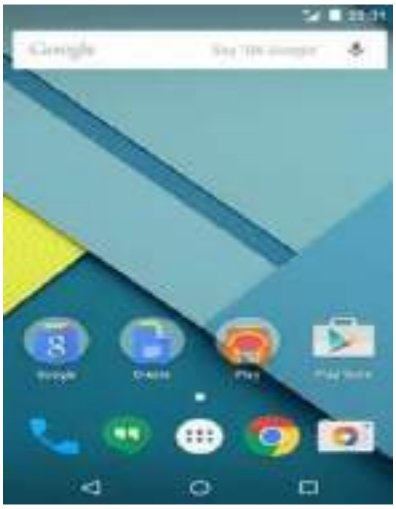


Fig. 1.8.6(vi) Lollipop UI

Exercise

Tick the correct answer:

1. Microsoft Windows is
   a. An operating system
   b. A object oriented language
   c. A game
   d. A hardware
2. Symbian is an operating system designed by
   a. Samsung
   b. Nokia
   c. Motorola
   d. Sony
3. Eclipse is a
   a. Language
   b. Integrated development environment
   c. Networking platform
   d. Operating system
4. Google Play Store is a platform for downloading applications for which mobile operating system
   a. Android
   b. Symbian
   c. Windows
   d. iOS

5. Android version 4.4 is known as
   a. Kitkat
   b. Jellybean
   c. Froyo
   d. Lollipop
6. The minimum amount of RAM required to run an android system is
   a. 512 MB
   b. 256 MB
   c. 120 MB
   d. 20 MB
7. RISC stands for
   a. Reduced instruction system computing
   b. Reversed information set computing
   c. Reduced instruction set computing
   d. Reduced instruction set communication
8. The private network made by the computer so that other computers can get connected to it via internet is known as
   a. Virtual private network
   b. Point-to-point tunneling protocol
   c. ARM architecture
   d. MIDP
9. Windows media player is the application for which mobile operating system
   a. Symbian
   b. HTC
   c. Android
   d. Windows Mobile
10. What is used to run java on mobile phones
   a. MIDP
   b. VPN
   c. PPTP
   d. RISC

Notes

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UNIT 1.9: Basic Requirements for Installing Android on the Device

Unit Objectives

At the end of this unit, you will be able to:

1. Learn about the android system
2. Learn about the basics of android handset configuration

1.9.1 Android

Android is a Linux based operating system that is developed by Google and is designed to support a wide variety of hardware platforms and configurations.

1. Chipset

- A chipset is defined as the type of hardware which holds a collection of circuits which are required to work as one unit in order to perform a task with the system.
- The minimum chipset required for supporting Android Operating system should be ARM based.
- ARM stands for Advanced RISC Machine where RISC stands for Reduced Instruction Set Computing architectures for computer processors.

Advantage

The RISC based design allows the processors to use fewer transistors thereby reducing the cost heat, power consumption and size of the device.

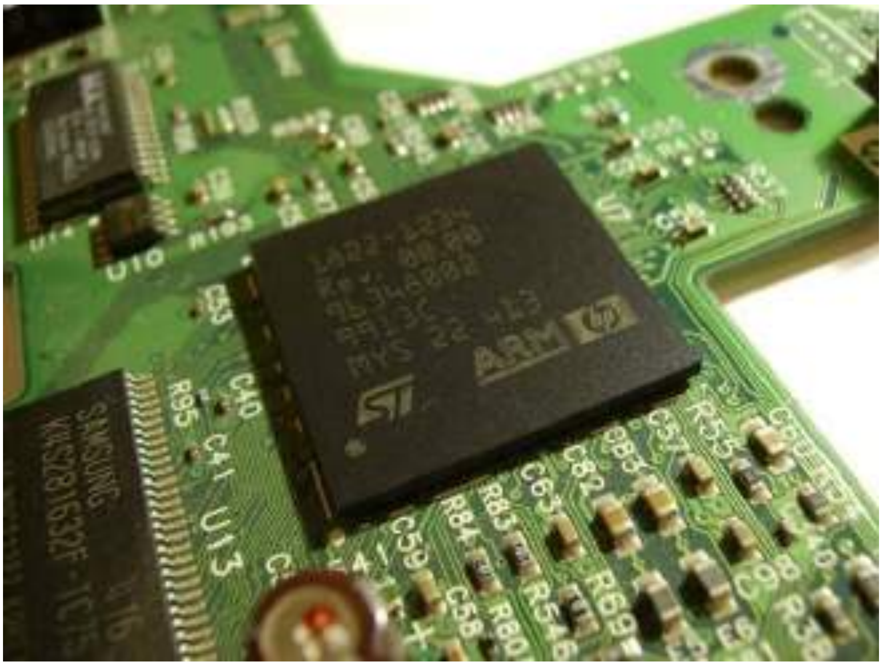


Fig. 1.9.1(i) Chipset

2. Memory

- The minimum memory requirements for installing Android on the device should be 128 MB RAM (Random Access Memory) and 256 MB external flash memory or the storage memory.

3. Storage

- It is recommended to uses external storage.
- For that purpose a Mini SD or a Micro SD card can be used.
- The basic device models compatible with Android OS have very less internal storage and thus it is required to use an external storage so as to download and store the updates of the operating system.

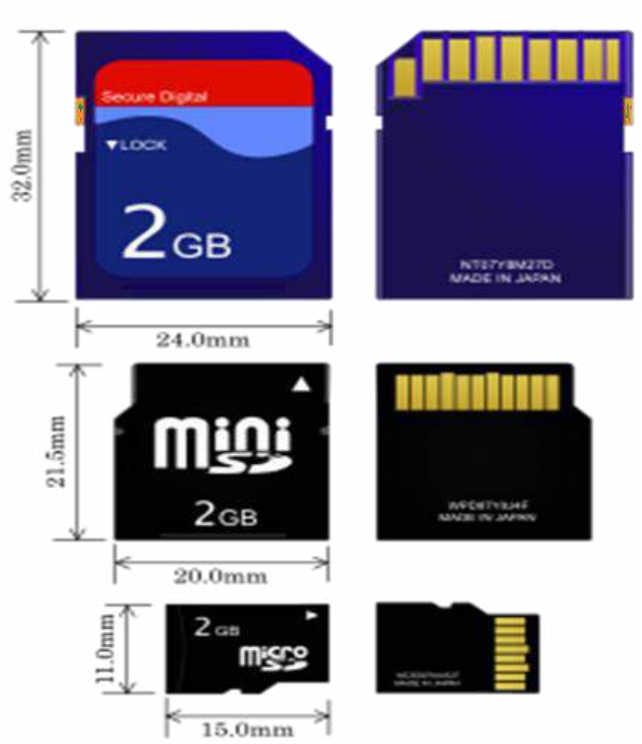


Fig. 1.9.1(ii) Various types of memory cards

4. Primary Display

- The current android interface targets a touch based half-size visual graphic array or HVGA resolution display with a touch interface.
- The size of the touch interface should not be smaller than 2.8 inches.
- For better visual experience the minimum requirement is a Quarter Video Graphics Array or QVGA with Thin Film Transfer Liquid Crystal Display (TFT LCD) or larger configuration with 16 bit colour or better.

Fig. 1.9.1(iii) Primary display

5. **Navigation Keys**

- The navigation keys are used for some of the basic application in a phone like:
  - » Powering ON/OFF the device.
  - » Increasing or decreasing the volume of media and calls
  - » Camera applications, etc.
- Basic requirement of the navigational keys for the device on which Android is going to be installed should be installed with 3 application keys i.e. Power, camera and volume control.

6. **Camera**

- Camera is an optional feature which may or may not be added as a basic requirement.
- The basic camera that can be used should be a 2 MP camera.

7. **Bluetooth**

- Bluetooth is wireless technology developed for data transfer under personal area networks from one device to another.
- The data can be transferred from either mobile to mobile or mobile to computer or computer to computer.
- A Bluetooth device with version 1.2 or 2.0 should be installed.

8. **Universal Serial Bus (USB)**

- USB is a way of data transfer from a personal computer to an android device and vice-versa.
- The USB can also be used for debugging the android device.
- The USB interface that should be used in a basic android device should be a Standard mini-B USB interface.

1.9.2 System Requirements For Android Studio Version 1.x

For Windows OS

OS Version	Microsoft Windows 10/8.1/8/7/Vista/2003/XP (32 bit or 64 bit)
RAM	2 GB RAM minimum, 4GB RAM recommended
Disk Space	500 MB
Space for Android SDK	At least 1GB for Android SDK, emulator system images, and caches
JDK Version	Java Development Kit (JDK) 7 or higher
Screen Resolution	1280x800 minimum screen resolution

For OS X

OS Version	Mac OS X 10.8.5 or higher, up to 10.10, 10.10.2, 10.10.3 or 10.10.5
RAM	2 GB RAM minimum, 4GB RAM recommended
Disk Space	500 MB
Space for Android SDK	Atleast 1GB for Android SDK, emulator system images, and caches
JDK Version	Java Development Kit (JDK) 7 or higher
Screen Resolution	1280x800 minimum screen resolution

For Linux

OS Version	GNOME or KDE or Unity desktop on Ubuntu or Fedora or GNU/Linux Debian
RAM	2 GB RAM minimum, 4GB RAM recommended
Disk Space	500 MB
Space for Android SDK	At least 1GB for Android SDK, emulator system images, and caches
JDK Version	Java Development Kit (JDK) 7 or higher
Screen Resolution	1280x800 minimum screen resolution

1.9.3 System Requirements for Android Studio Version 2.x

For Windows OS

OS Version	Microsoft Windows 10/8/7 (32 bit or 64 bit)
RAM	2 GB RAM minimum, 8GB RAM recommended
Disk Space	500 MB
Space for Android SDK	Atleast 1.5GB for Android SDK, emulator system images, and caches
JDK Version	Java Development Kit (JDK) 8
Screen Resolution	1280x800 minimum screen resolution

For OS X

OS Version	Mac OS X 10.9.5 or higher, up to 10.11.6 (El Capitan) or 10.12 (Sierra)
RAM	2 GB RAM minimum, 8GB RAM recommended
Disk Space	500 MB
Space for Android SDK	Atleast 1.5GB for Android SDK, emulator system images, and caches
JDK Version	Java Development Kit (JDK) 8
Screen Resolution	1280x800 minimum screen resolution

For Linux

OS Version	GNOME or KDE desktop
RAM	2 GB RAM minimum, 8GB RAM recommended
Disk Space	500 MB
Space for Android SDK	Atleast 1.5GB for Android SDK, emulator system images, and caches
JDK Version	Java Development Kit (JDK) 8
Screen Resolution	1280x800 minimum screen resolution

Notes

UNIT 1.10: Android Installation

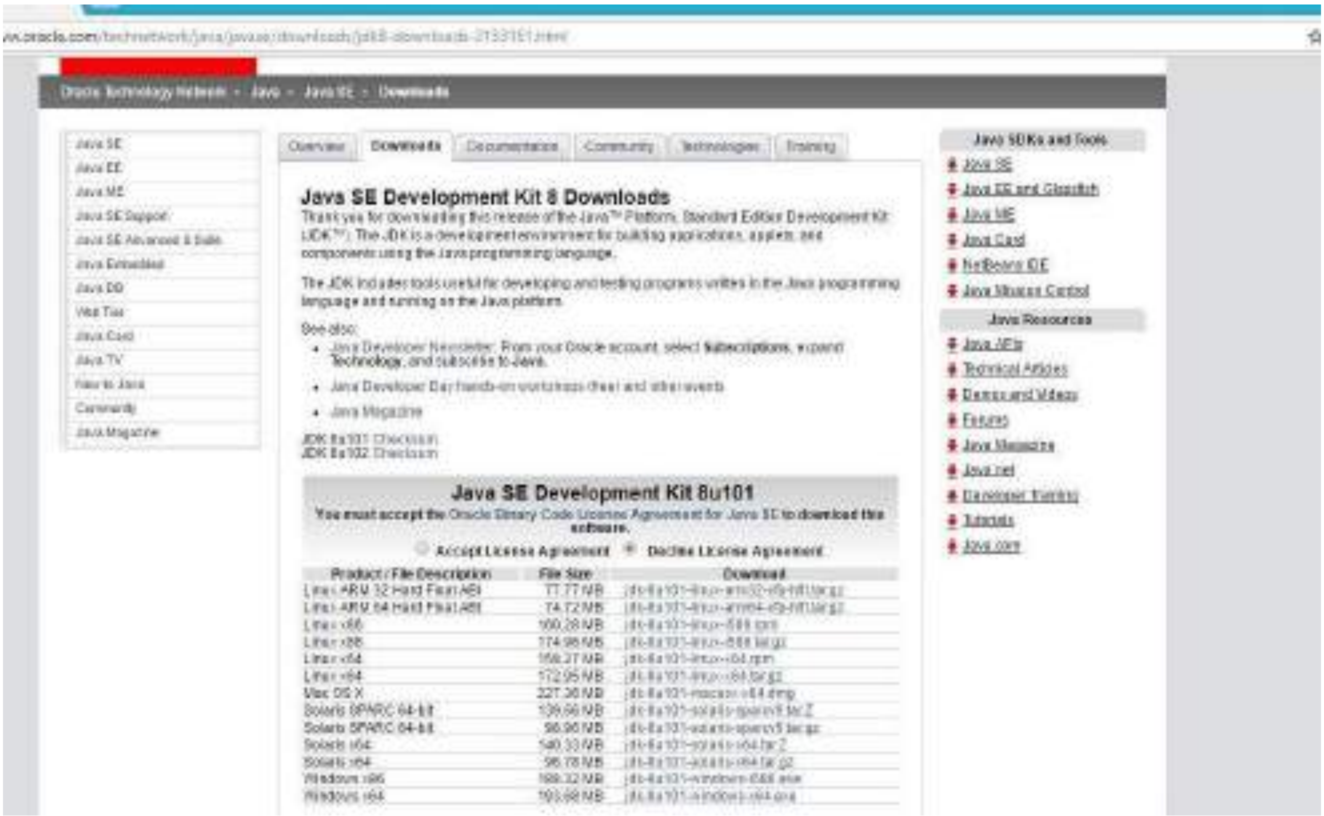
Unit Objectives

At the end of this unit, you will be able to:

1. Understanding the installation of Android OS on Windows, Linux and Mac

1.10.1 Installation

- We will start with installing Java Development Kit (JDK) on the computer.
- To install JDK, go to http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
- Download the latest Java version depending upon which operating system you are using.
- Accept the License Agreement and click on the file to download.



ww.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html

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Java SE Development Kit 8 Downloads

Thank you for downloading this release of the Java™ Platform, Standard Edition Development Kit (JDK™). The JDK is a development environment for building applications, applets, and components using the Java programming language.

The JDK includes tools useful for developing and testing programs written in the Java programming language and running on the Java platform.

See also:

- Java Developer Newsletter: From your Oracle account, select **Subscriptions**, expand **Technology**, and subscribe to Java.
- Java Developer Day hands-on workshops (free) and other events
- Java Magazine

JDK 8u101 Checksum
JDK 8u102 Checksum

Java SE Development Kit 8u101

You must accept the Oracle Binary Code License Agreement for Java SE to download this software.

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Product / File Description	File Size	Download
Linux ARM 32 Hard Float ABI	77.77 MB	jdk-8u101-linux-arm32-vfp-hflt.tar.gz
Linux ARM 64 Hard Float ABI	74.72 MB	jdk-8u101-linux-arm64-vfp-hflt.tar.gz
Linux x86	160.28 MB	jdk-8u101-linux-i586.rpm
Linux x86	174.96 MB	jdk-8u101-linux-i586.tar.gz
Linux x64	158.27 MB	jdk-8u101-linux-x64.rpm
Linux x64	172.95 MB	jdk-8u101-linux-x64.tar.gz
Mac OS X	227.36 MB	jdk-8u101-macosx-x64.dmg
Solaris SPARC 64-bit	139.66 MB	jdk-8u101-solaris-sparcv9.tar.Z
Solaris SPARC 64-bit	98.96 MB	jdk-8u101-solaris-sparcv9.tar.gz
Solaris x64	140.33 MB	jdk-8u101-solaris-x64.tar.Z
Solaris x64	96.78 MB	jdk-8u101-solaris-x64.tar.gz
Windows x86	188.32 MB	jdk-8u101-windows-i586.exe
Windows x64	193.68 MB	jdk-8u101-windows-x64.exe

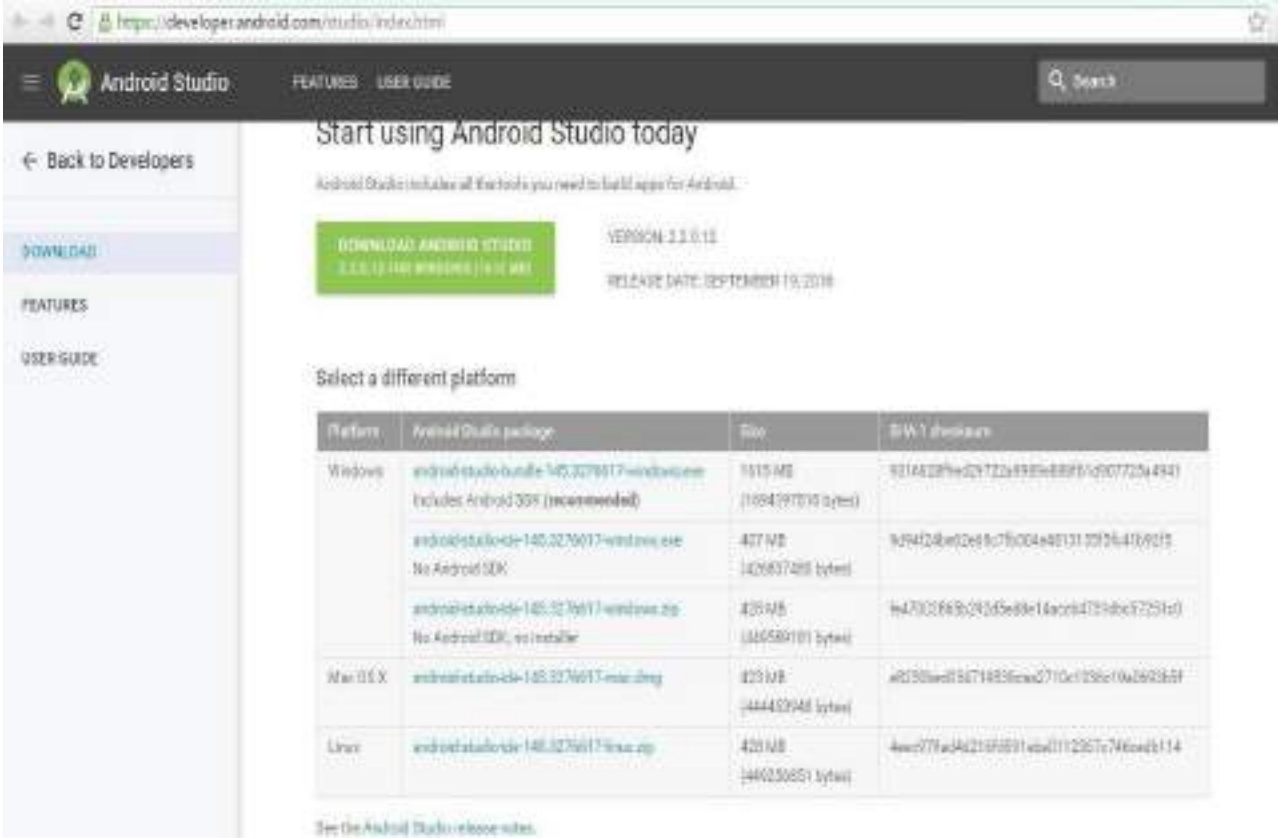
Fig. 1.10.1 Snapshot of the web to know about how to install java development kit

Note: The students must be aware of the Java programming. Those who don't know or have a little understanding of the language should refer to the link below: https://www.udacity.com/learn/java

1.10.2 Installing Android Studio on Windows

Download Android studio for Windows from the following link

https://developer.android.com/studio/index.html



Start using Android Studio today

Android Studio includes all the tools you need to build apps for Android.

DOWNLOAD ANDROID STUDIO 2.2.0.12 FOR WINDOWS (1615 MB)

VERSION: 2.2.0.12

RELEASE DATE: SEPTEMBER 19, 2016

Select a different platform

Platform	Android Studio package	Size	SHA-1 checksum
Windows	android-studio-bundle-145.3276617-windows.exe Includes Android SDK **(recommended)**	1615 MB (1694397816 bytes)	[illegible]
	android-studio-ide-145.3276617-windows.exe No Android SDK	407 MB (426837488 bytes)	[illegible]
	android-studio-ide-145.3276617-windows.zip No Android SDK, no installer	428 MB (449589101 bytes)	[illegible]
Mac OS X	android-studio-ide-145.3276617-mac.dmg	423 MB (444433948 bytes)	[illegible]
Linux	android-studio-ide-145.3276617-linux.zip	420 MB (440250851 bytes)	[illegible]

See the Android Studio release notes.

Fig. 1.10.2(i) Snapshot of the web to know about how to install android studio

- Run the .exe file to initiate installation

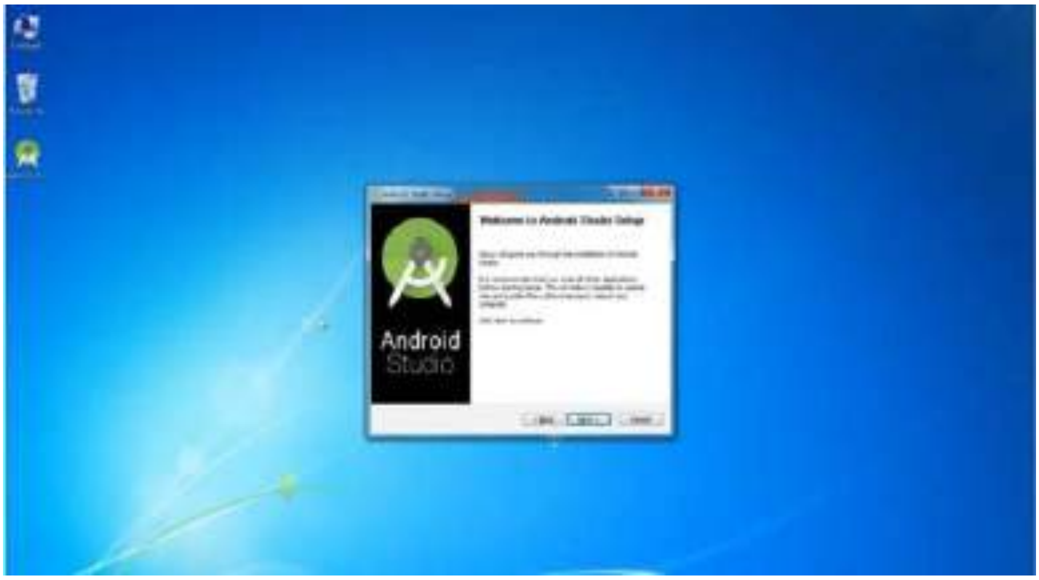
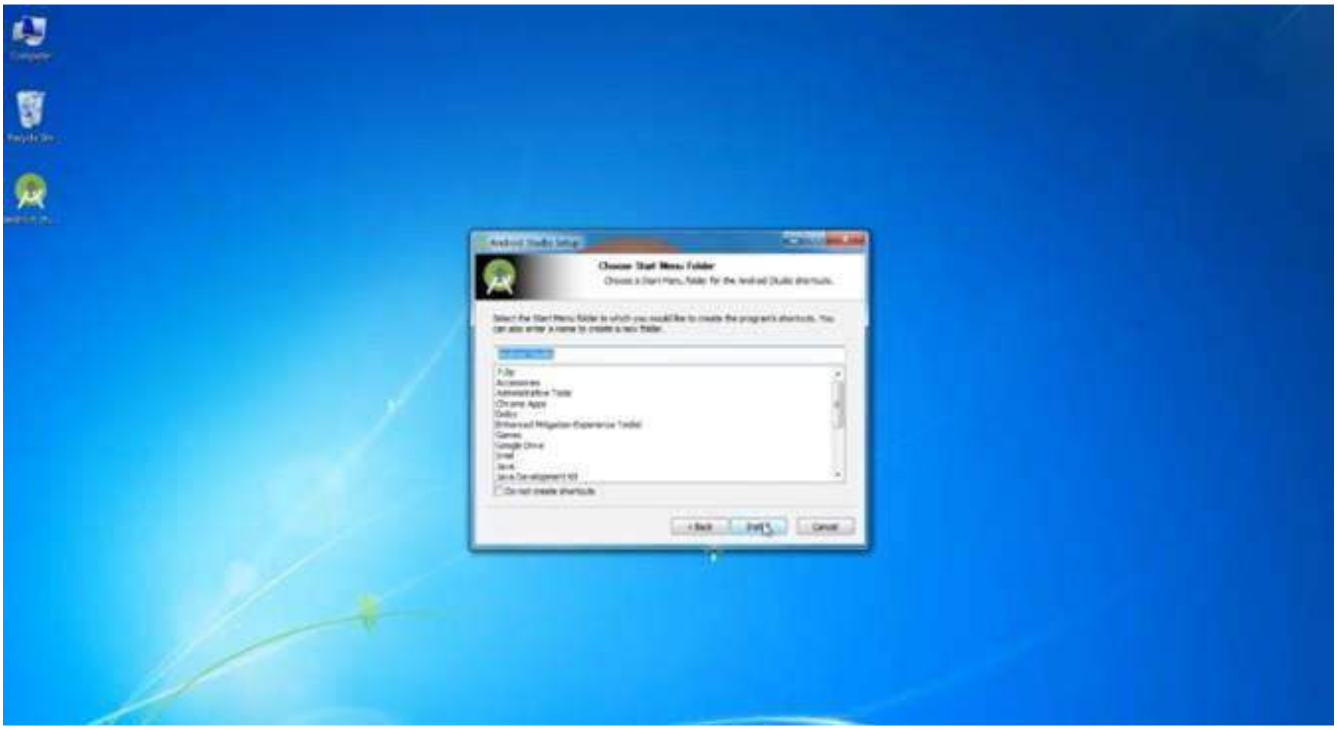


Fig. 1.10.2(ii) Snapshot of the web to know about how to install android studio

- Now click “Next” till you get the window that says “install”.



Android Studio Setup

Choose Start Menu Folder

Choose a Start Menu folder for the Android Studio shortcuts.

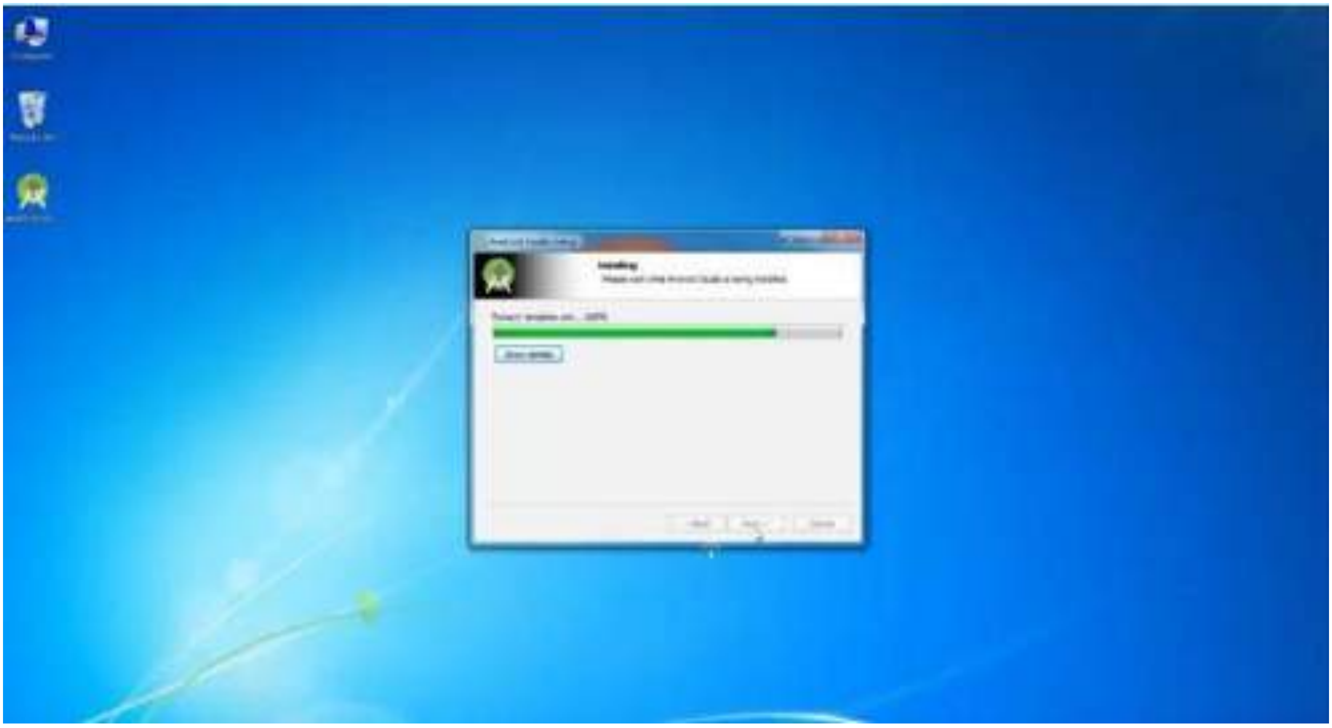
Select the Start Menu folder in which you would like to create the program's shortcuts. You can also enter a name to create a new folder.

7-Zip
Accessories
Administrative Tools
Chrome Apps
Dolby
Enhanced Mitigation Experience Toolkit
Games
Google Drive
Intel
Java
Java Development Kit

□ Do not create shortcuts

Fig. 1.10.2(iii) Snapshot of the web to know about how to install android studio

- Click “Install”. This will start extracting files to the computer.



Android Studio Setup

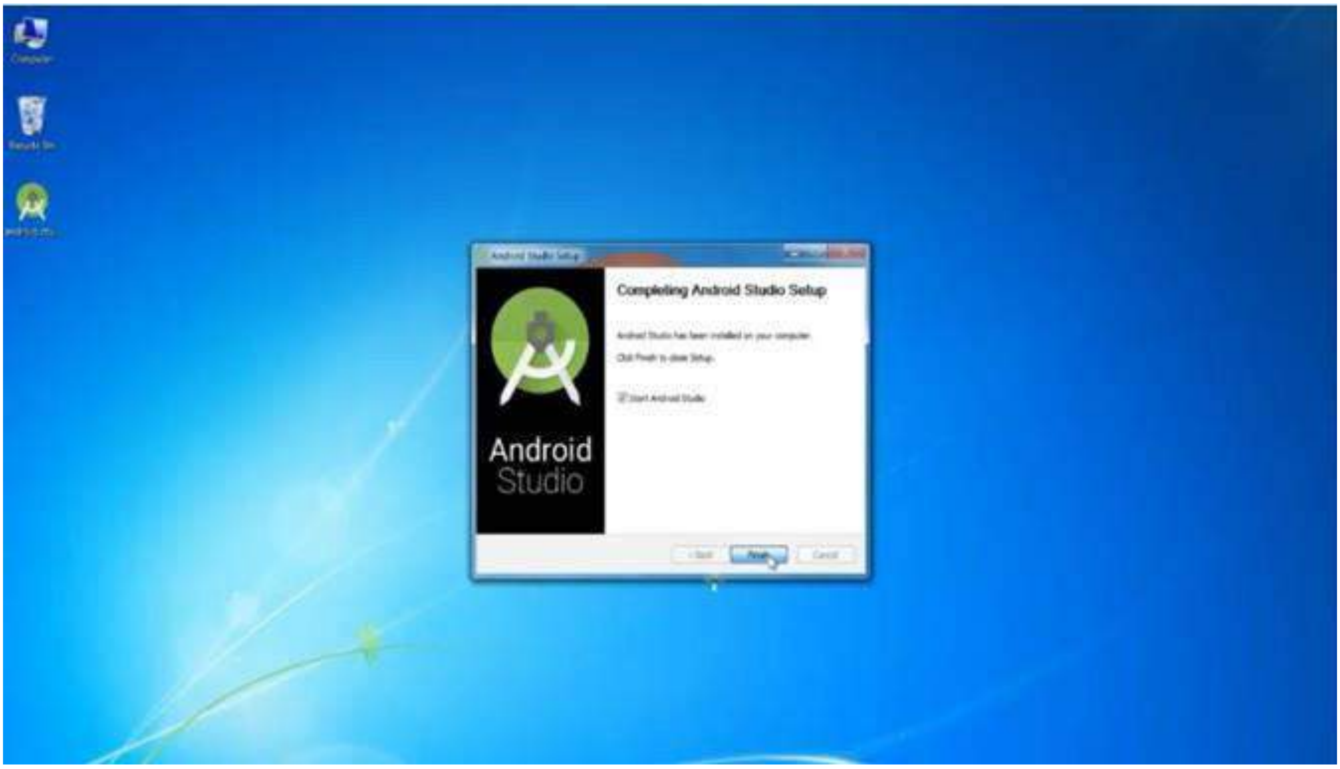
Installing

Please wait while Android Studio is being installed.

[illegible] 100%

Fig. 1.10.2(iv) Snapshot of the web to know about how to install android studio

- After the extraction is completed, the setup will prompt you to finish the extraction and start the Android Studio.



Android Studio Setup

Completing Android Studio Setup

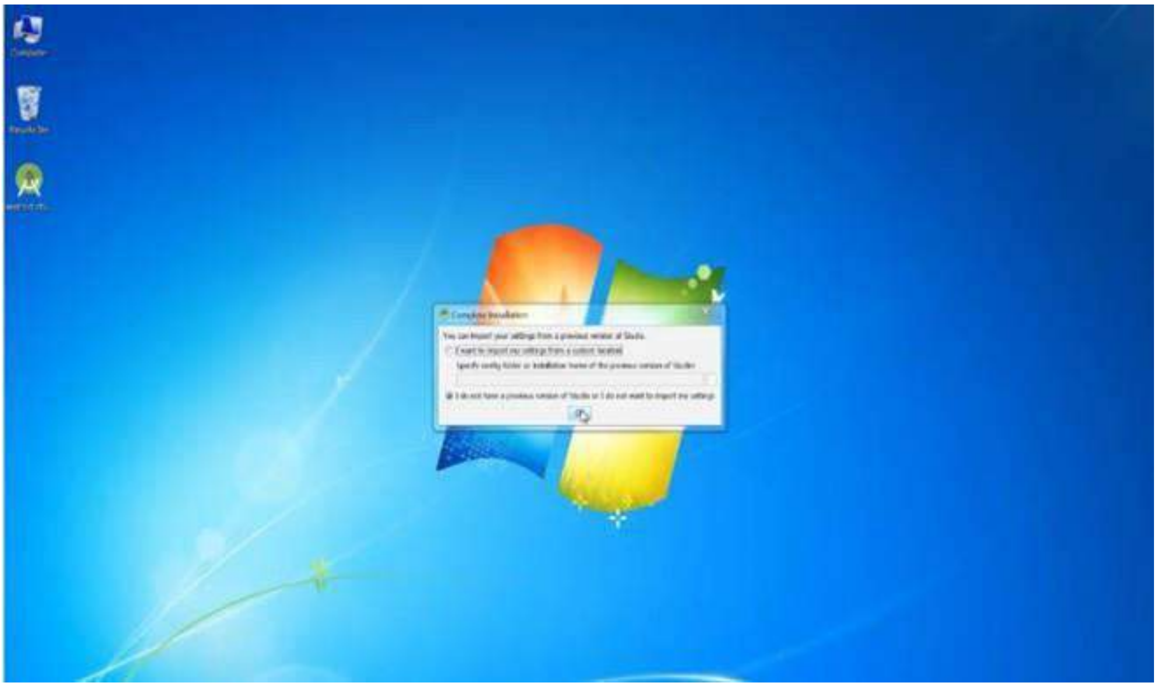
Android Studio has been installed on your computer.

Click Finish to close Setup.

☑ Start Android Studio

Fig. 1.10.2(v) Snapshot of the web to know about how to install android studio

- Now if there are any previous versions of the Android Studio installed on the computer then click on import settings from the previous version.
- Otherwise, click I don’t have any previous version and I don’t want to import my settings which will be selected by default.
- If not then select it and click ok.



Complete Installation

You can import your settings from a previous version of Studio.

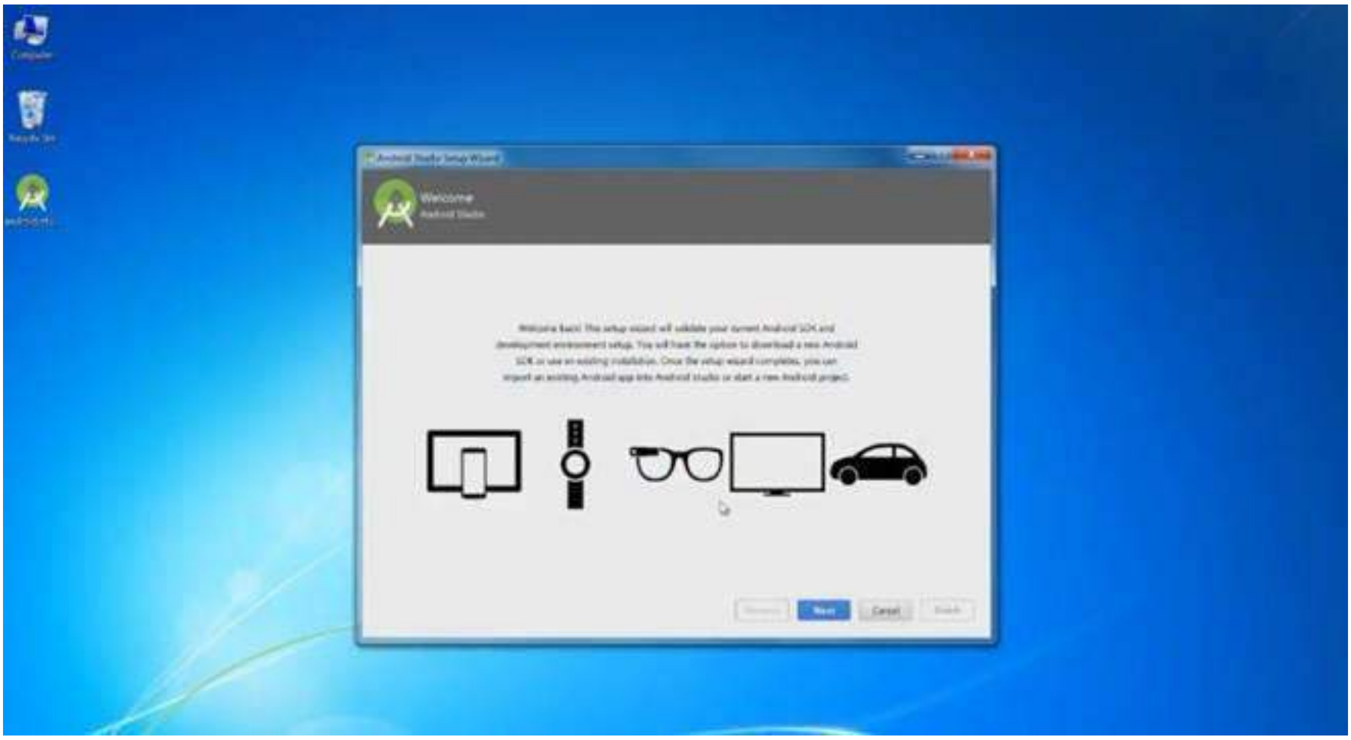
○ I want to import my settings from a custom location

Specify config folder or installation home of the previous version of Studio:

● I do not have a previous version of Studio or I do not want to import my settings

Fig. 1.10.2(vi) Snapshot of the web to know about how to install android studio

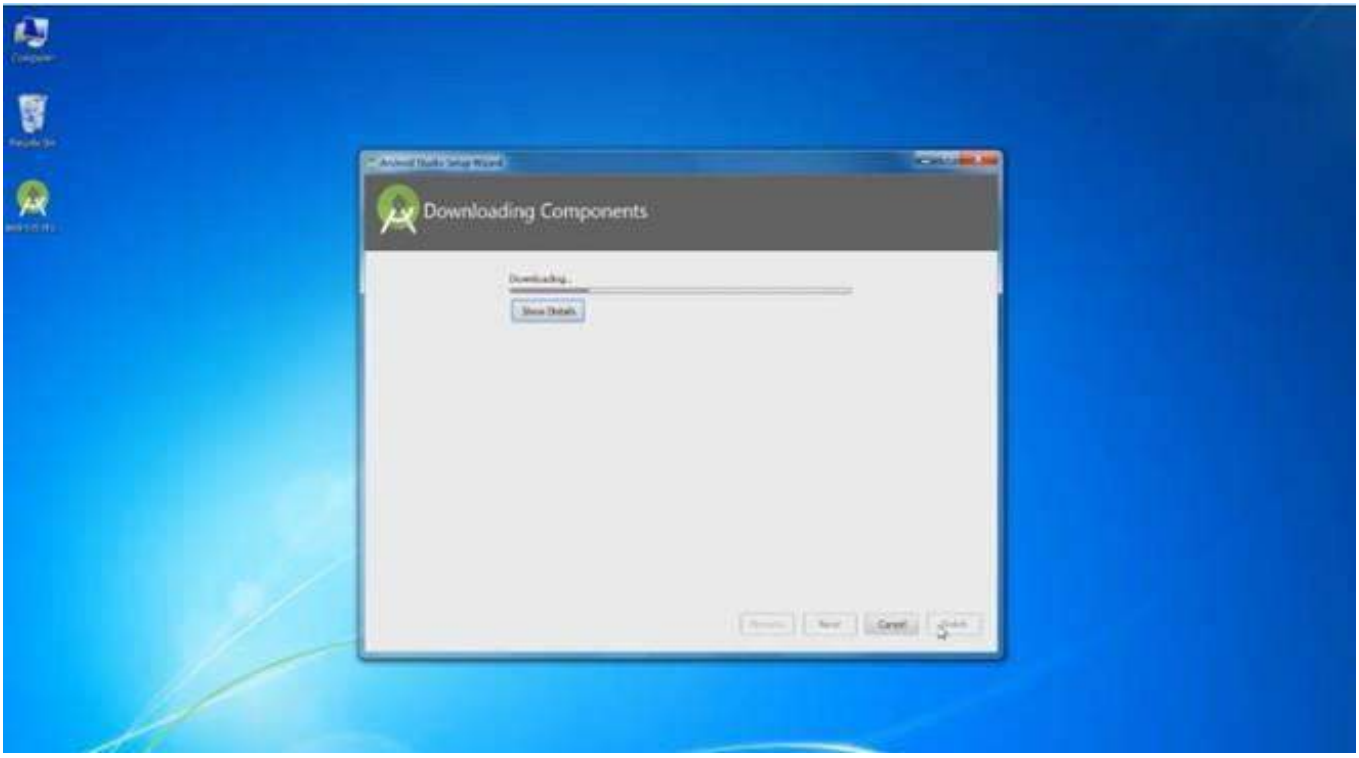
- The Android studio setup wizard window will open. Click Next.



Welcome back! This setup wizard will validate your current Android SDK and development environment setup. You will have the option to download a new Android SDK or use an existing installation. Once the setup wizard completes, you can import an existing Android app into Android Studio or start a new Android project.

Fig. 1.10.2(vii) Snapshot of the web to know about how to install android studio

- The setup will start downloading the necessary files.



Downloading...

Fig. 1.10.2(viii) Snapshot of the web to know about how to install android studio

- After the downloading and extracting of the files is done, Click Finish to complete installation.

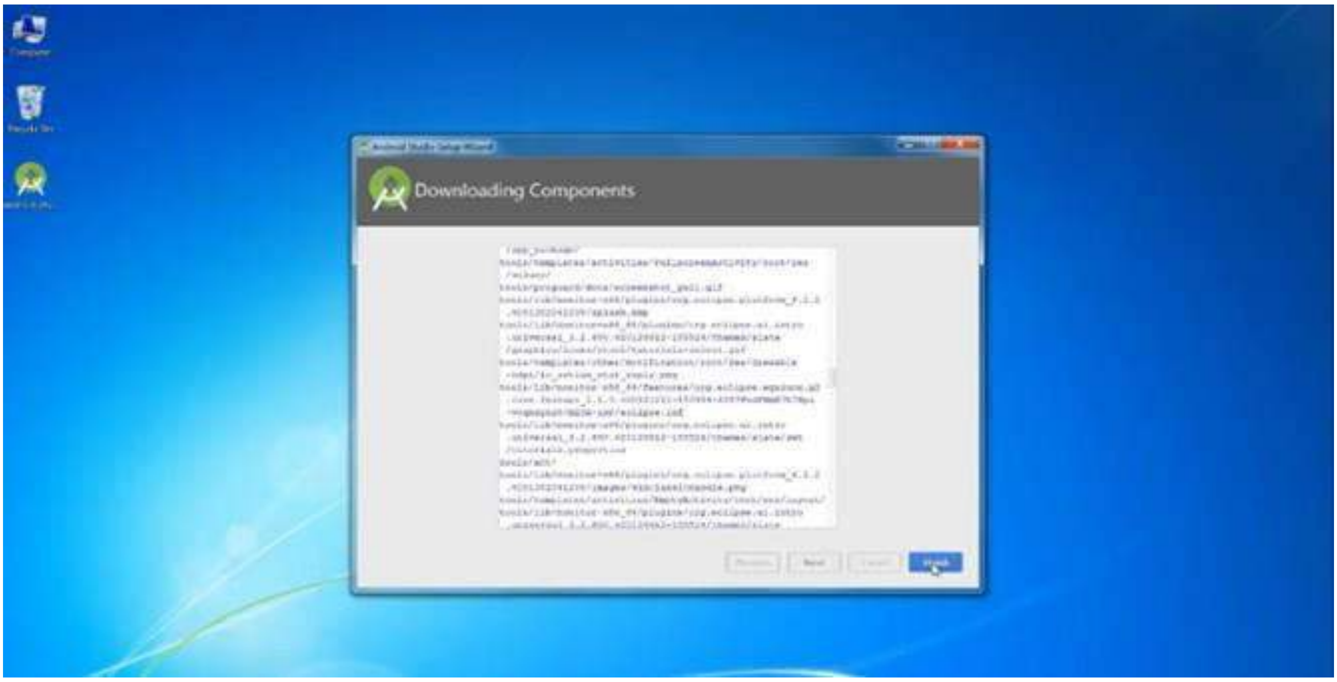


Fig. 1.10.2(ix) Snapshot of the web to know about how to install android studio

- Now Android Studio is installed successfully on the computer and you can begin creating your project.

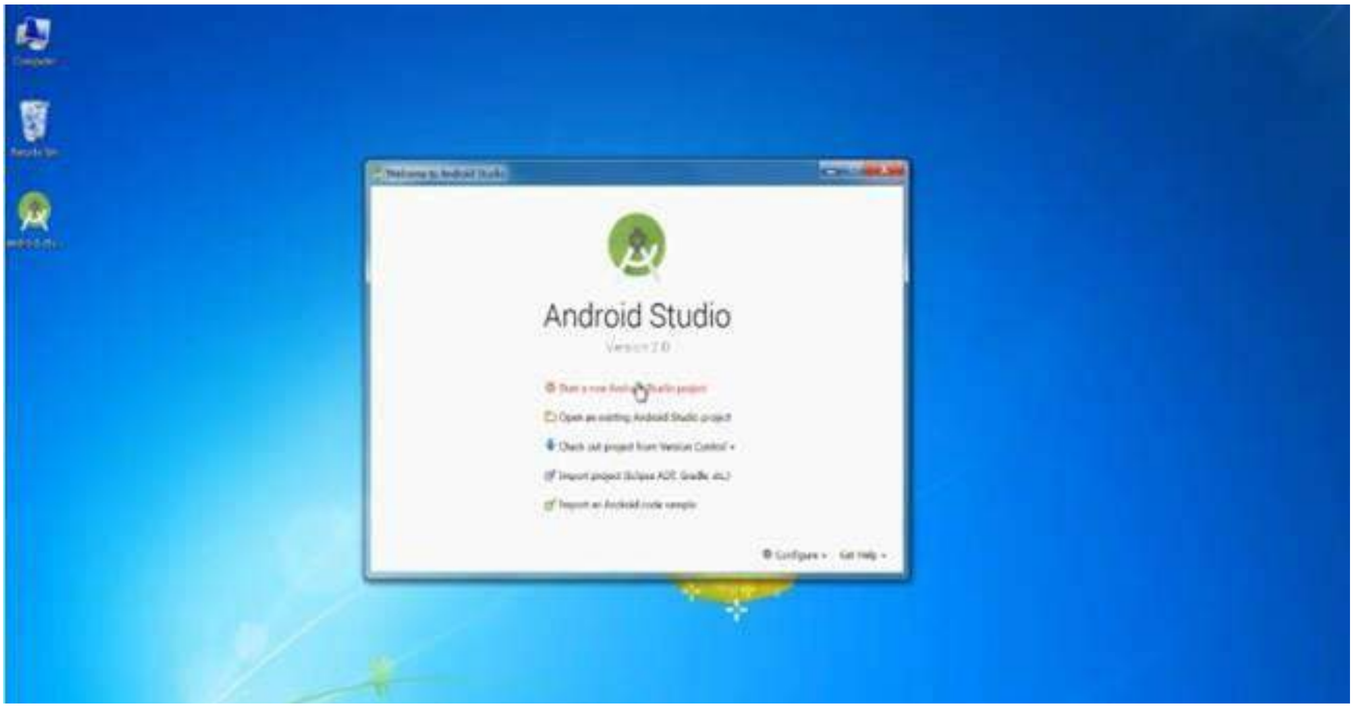
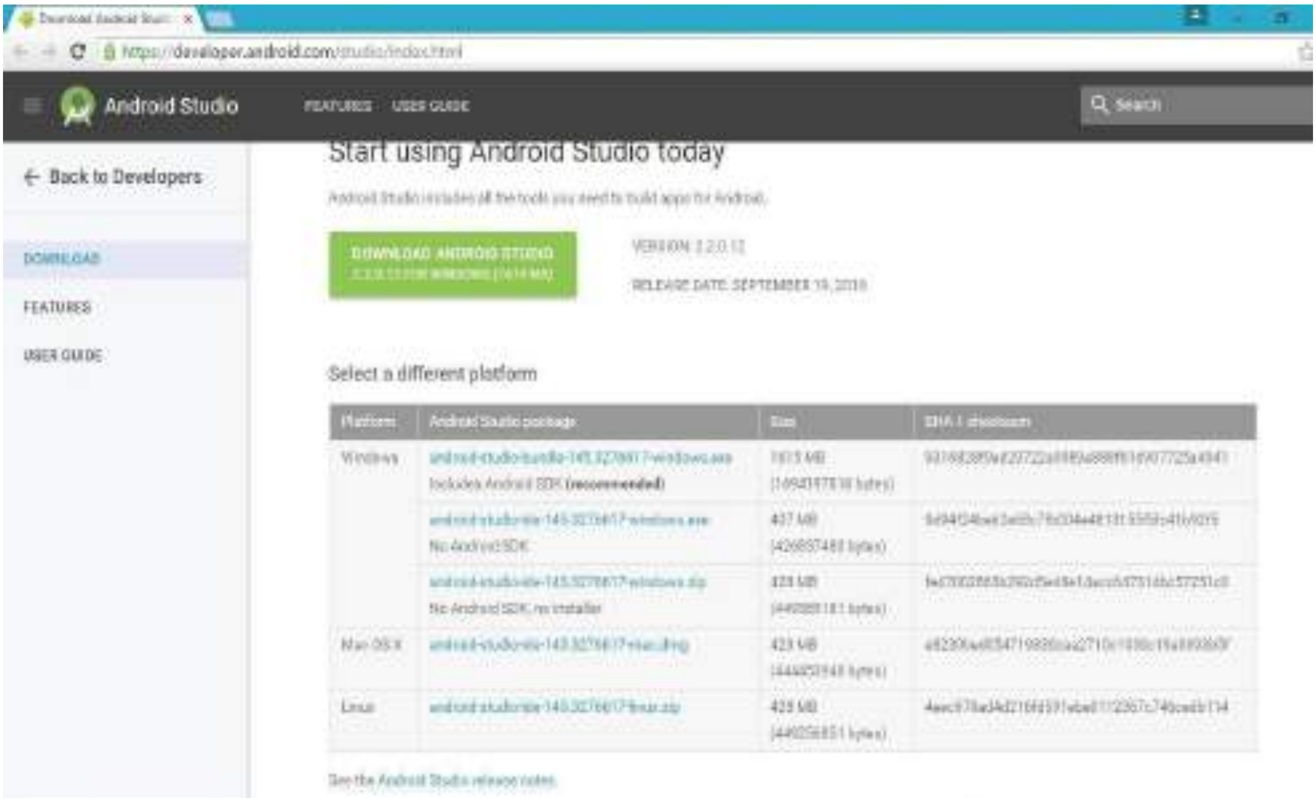

Welcome to Android Studio
Android Studio
Version 2.0
Start a new Android Studio project
Open an existing Android Studio project
Check out project from Version Control ▾
Import project (Eclipse ADT, Gradle, etc.)
Import an Android code sample
Configure ▾
Get Help ▾

Fig. 1.10.2(x) Snapshot of the web to know about how to install android studio

1.10.3 Installing Android Studio on Linux

Go to **https://developer.android.com/studio/index.html** and download Android studio for Linux



Start using Android Studio today

Android Studio includes all the tools you need to build apps for Android.

VERSION: 2.2.0.12

RELEASE DATE: SEPTEMBER 19, 2016

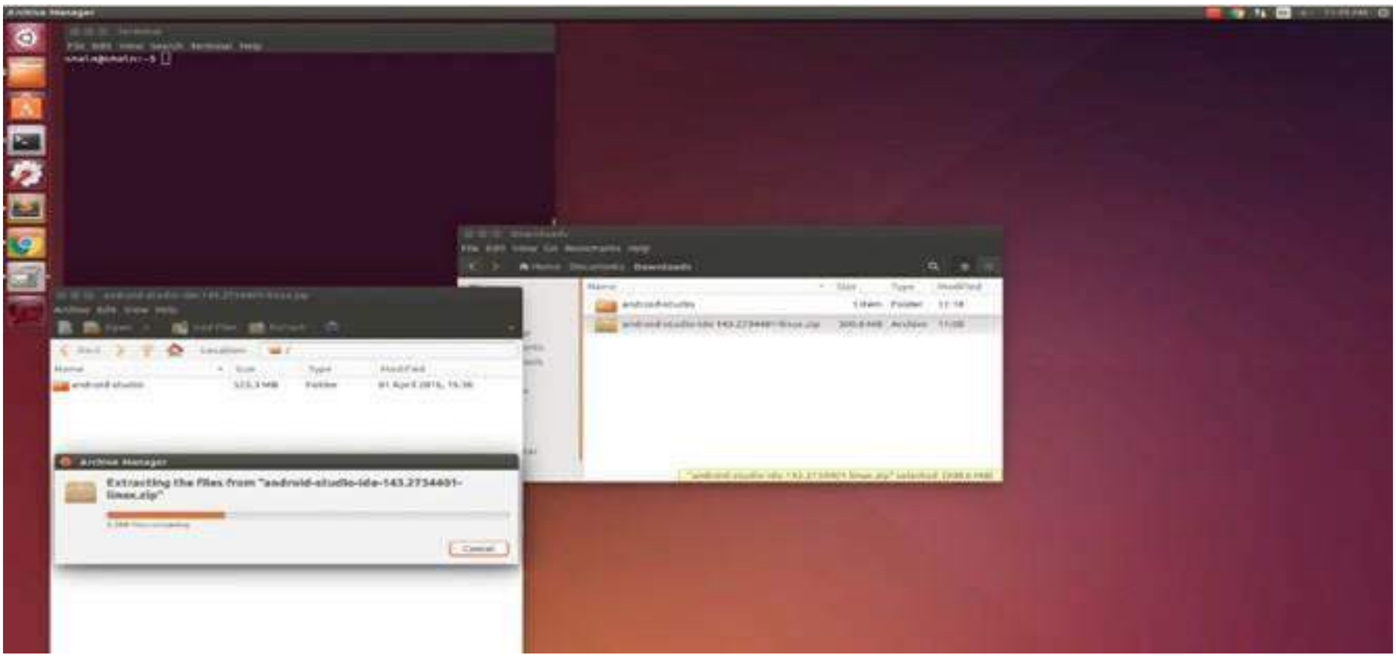
Select a different platform

Platform	Android Studio package	Size	SHA-1 checksum
Windows	android-studio-bundle-145.3276617-windows.exe Includes Android SDK **(recommended)**	1613 MB ([illegible] bytes)	[illegible]
	android-studio-ide-145.3276617-windows.exe No Android SDK	437 MB ([illegible] bytes)	[illegible]
	android-studio-ide-145.3276617-windows.zip No Android SDK, no installer	423 MB ([illegible] bytes)	[illegible]
Mac OS X	android-studio-ide-145.3276617-mac.dmg	423 MB ([illegible] bytes)	[illegible]
Linux	android-studio-ide-145.3276617-linux.zip	423 MB ([illegible] bytes)	[illegible]

See the Android Studio release notes.

Fig. 1.10.3(i)Snapshot of the web to know about how to install android studio for Linux

- Extract the downloaded file to your desired location by using "/opt"



Extracting the files from "android-studio-ide-143.2734401-linux.zip"

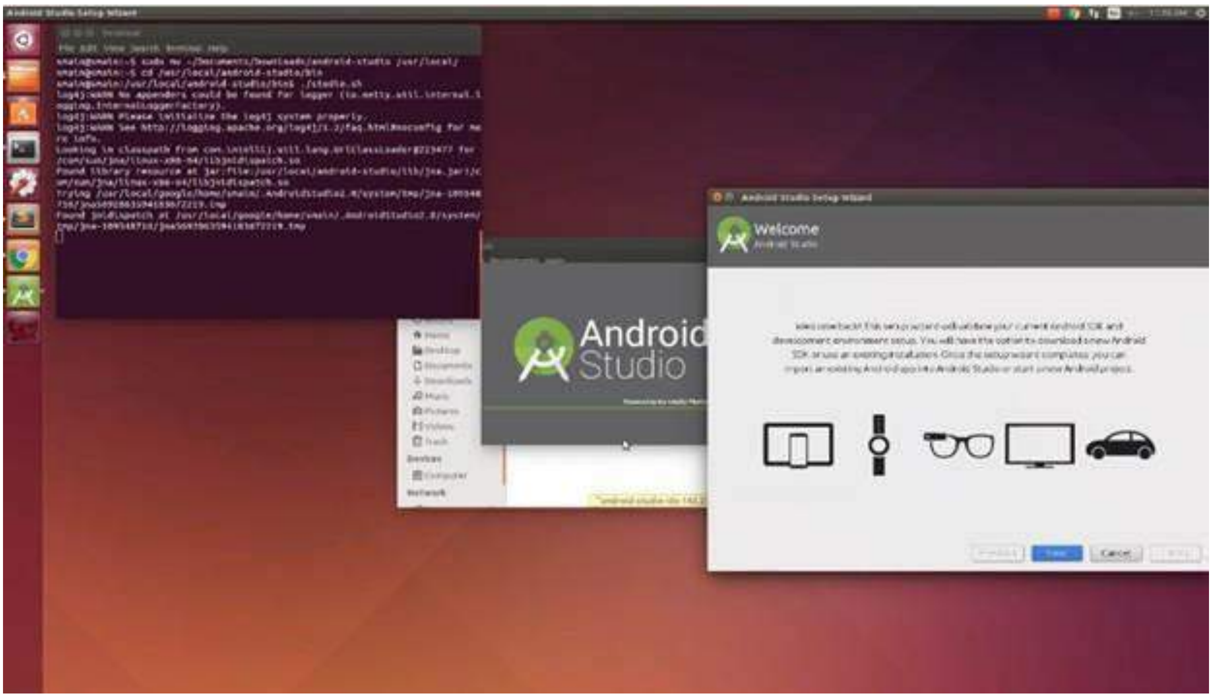
Fig. 1.10.3(ii) Snapshot of the web to know about how to install android studio for Linux

- Use the filename of the downloaded file, for instance android-studio-ide-145.3276617-linux.zip

  "sudo unzip android-studio-ide-145.3276617-linux.zip –d /opt"

- To launch Android Studio, navigate to the "/opt/android-studio/bin" directory in a terminal and run "./studio.sh"

  add "/opt/android-studio/bin" to your path environment variable. This will enable you to start Android Studio from any directory.

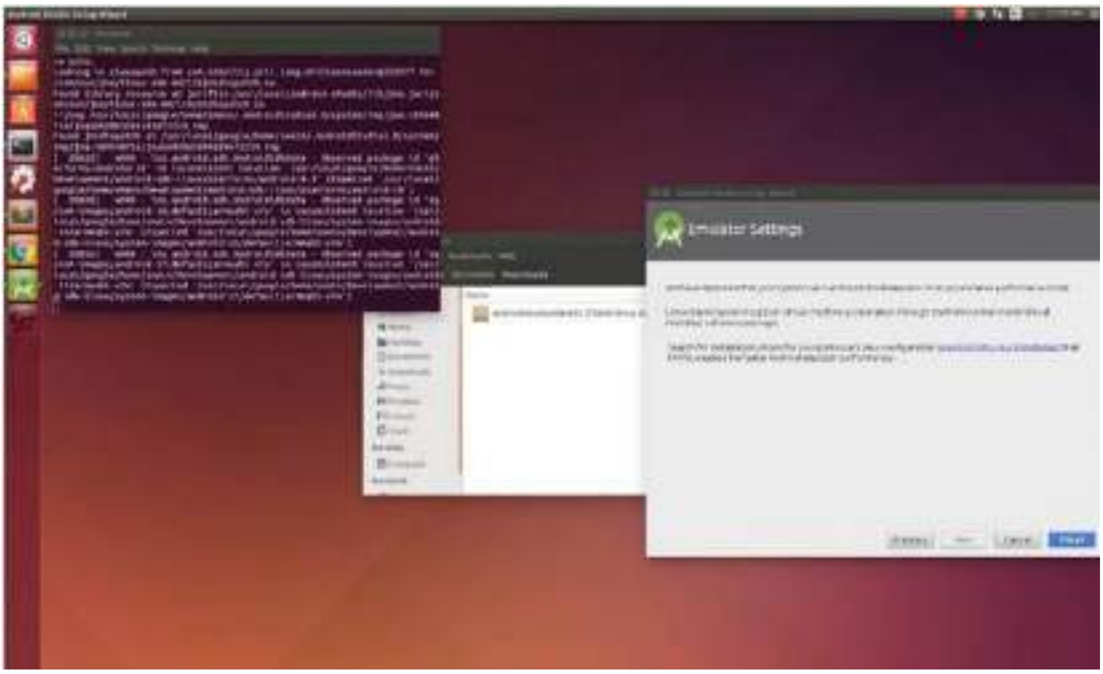


```
smalin@smalin:~$ sudo mv ~/Documents/Downloads/android-studio /usr/local/
smalin@smalin:~$ cd /usr/local/android-studio/bin
smalin@smalin:/usr/local/android-studio/bin$ ./studio.sh
log4j:WARN No appenders could be found for logger (io.netty.util.internal.l
ogging.InternalLoggerFactory).
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for mo
re info.
Looking in classpath from com.intellij.util.lang.UrlClassLoader@[illegible] for
/com/sun/jna/linux-x86-64/libjnidispatch.so
Found library resource at jar:file:/usr/local/android-studio/lib/jna.jar!/c
om/sun/jna/linux-x86-64/libjnidispatch.so
Trying /usr/local/google/home/smalin/.AndroidStudio2.0/system/tmp/jna-[illegible]
[illegible].tmp
Found jnidispatch at /usr/local/google/home/smalin/.AndroidStudio2.0/system/
tmp/jna-[illegible].tmp
```

Welcome back! This setup wizard will validate your current Android SDK and development environment setup. You will have the option to download a new Android SDK or use an existing installation. Once the setup wizard completes, you can import an existing Android app into Android Studio or start a new Android project.

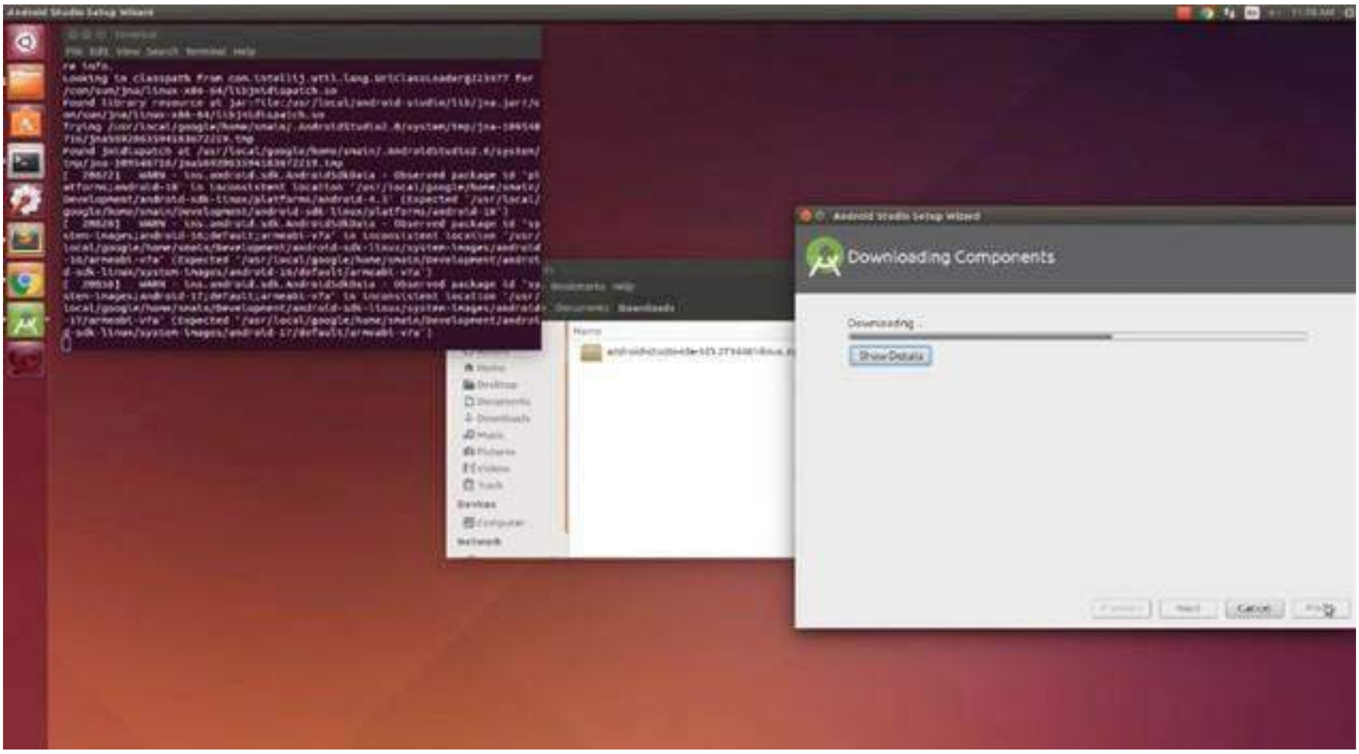
Fig. 1.10.3(iii) Snapshot of the web to know about how to install android studio for Linux

- Click "Next" and follow the instructions
- Now click "Finish" and the studio will start downloading Additional Files to complete the installation



Android Studio Setup Wizard
Terminal
File Edit View Search Terminal Help
Emulator Settings
Previous
Next
Cancel
Finish

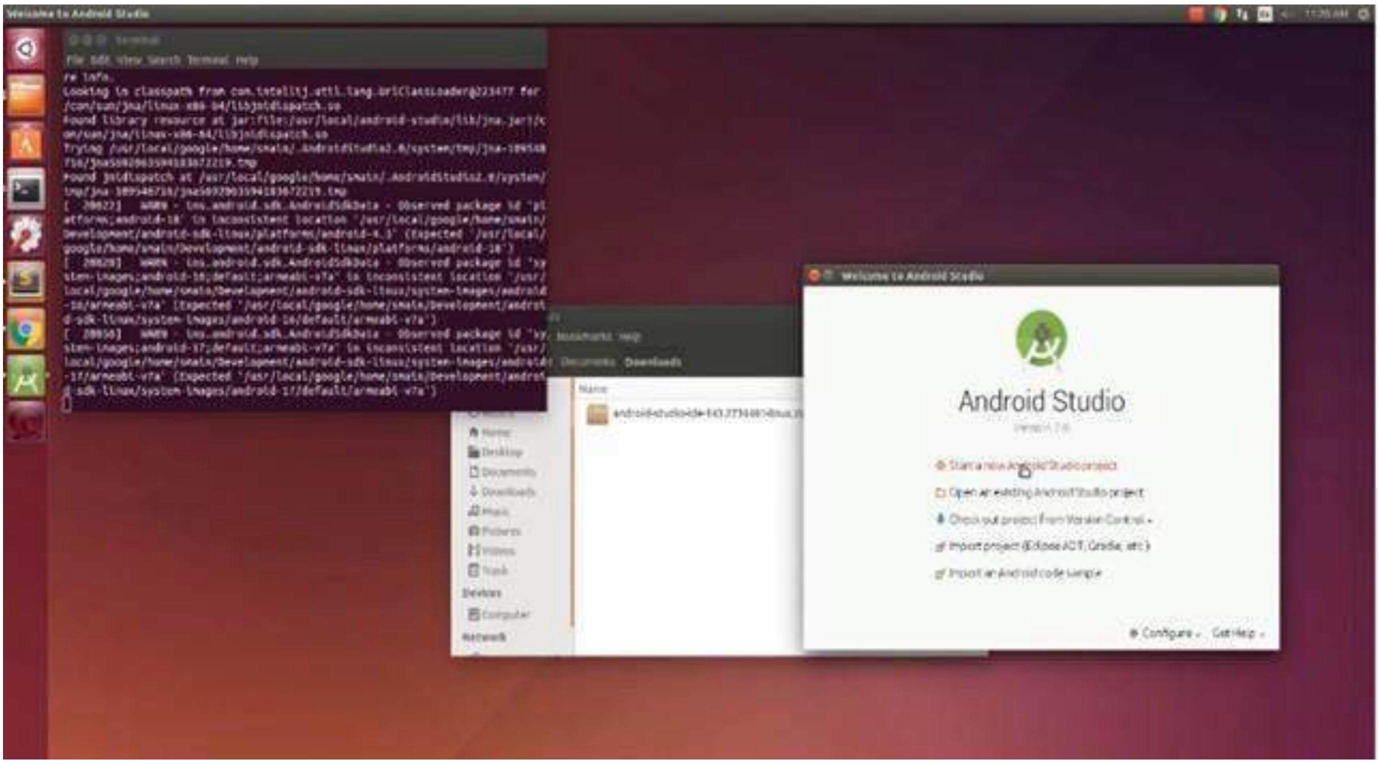
Fig. 1.10.3(iv) Snapshot of the web to know about how to install android studio for Linux



```
re info.
Looking in classpath from com.intellij.util.lang.UrlClassLoader@23477 for
/com/sun/jna/linux-x86-64/libjnidispatch.so
Found library resource at jar:file:/usr/local/android-studio/lib/jna.jar!/c
om/sun/jna/linux-x86-64/libjnidispatch.so
Trying /usr/local/google/home/smain/.AndroidStudio2.0/system/tmp/jna-109548
716/jna5092863594183672219.tmp
Found jnidispatch at /usr/local/google/home/smain/.AndroidStudio2.0/system/
tmp/jna-109548716/jna5092863594183672219.tmp
[  206221]   WARN - ins.android.sdk.AndroidSdkData - Observed package id 'pl
atforms;android-18' in inconsistent location '/usr/local/google/home/smain/
Development/android-sdk-linux/platforms/android-4.3' (Expected '/usr/local/
google/home/smain/Development/android-sdk-linux/platforms/android-18')
[  206281]   WARN - ins.android.sdk.AndroidSdkData - Observed package id 'sy
stem-images;android-18;default;armeabi-v7a' in inconsistent location '/usr/
local/google/home/smain/Development/android-sdk-linux/system-images/android
-18/armeabi-v7a' (Expected '/usr/local/google/home/smain/Development/androi
d-sdk-linux/system-images/android-18/default/armeabi-v7a')
[  206301]   WARN - ins.android.sdk.AndroidSdkData - Observed package id 'sy
stem-images;android-17;default;armeabi-v7a' in inconsistent location '/usr/
local/google/home/smain/Development/android-sdk-linux/system-images/android
-17/armeabi-v7a' (Expected '/usr/local/google/home/smain/Development/androi
d-sdk-linux/system-images/android-17/default/armeabi-v7a')
```

Fig. 1.10.3(v) Snapshot of the web to know about how to install android studio for Linux

- After the downloading is over, studio will open the window where you can start a new project.



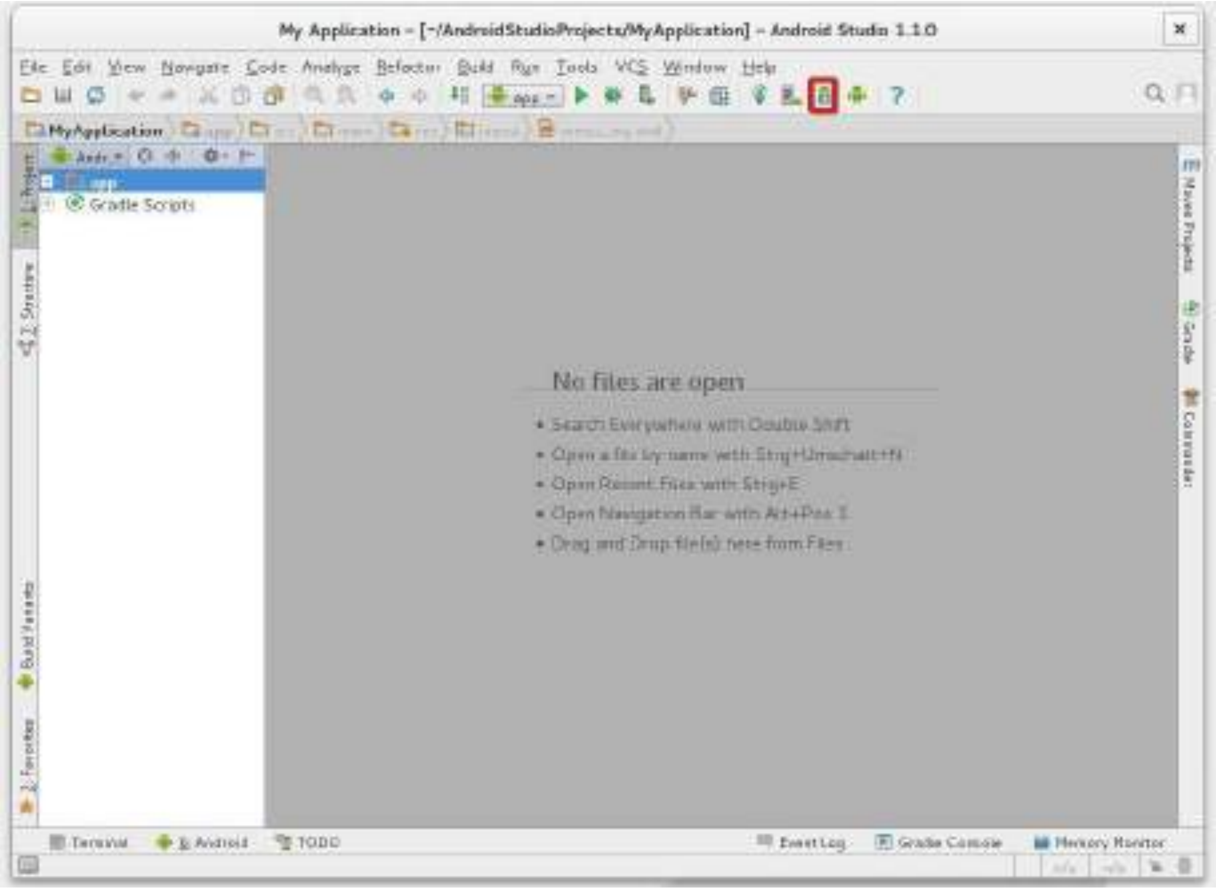
```
re info.
Looking in classpath from com.intellij.util.lang.UrlClassLoader@23477 for
/com/sun/jna/linux-x86-64/libjnidispatch.so
Found library resource at jar:file:/usr/local/android-studio/lib/jna.jar!/c
om/sun/jna/linux-x86-64/libjnidispatch.so
Trying /usr/local/google/home/smain/.AndroidStudio2.0/system/tmp/jna-109548
716/jna5092863594183672219.tmp
Found jnidispatch at /usr/local/google/home/smain/.AndroidStudio2.0/system/
tmp/jna-109548716/jna5092863594183672219.tmp
[  206221]   WARN - ins.android.sdk.AndroidSdkData - Observed package id 'pl
atforms;android-18' in inconsistent location '/usr/local/google/home/smain/
Development/android-sdk-linux/platforms/android-4.3' (Expected '/usr/local/
google/home/smain/Development/android-sdk-linux/platforms/android-18')
[  206281]   WARN - ins.android.sdk.AndroidSdkData - Observed package id 'sy
stem-images;android-18;default;armeabi-v7a' in inconsistent location '/usr/
local/google/home/smain/Development/android-sdk-linux/system-images/android
-18/armeabi-v7a' (Expected '/usr/local/google/home/smain/Development/androi
d-sdk-linux/system-images/android-18/default/armeabi-v7a')
[  206301]   WARN - ins.android.sdk.AndroidSdkData - Observed package id 'sy
stem-images;android-17;default;armeabi-v7a' in inconsistent location '/usr/
local/google/home/smain/Development/android-sdk-linux/system-images/android
-17/armeabi-v7a' (Expected '/usr/local/google/home/smain/Development/androi
d-sdk-linux/system-images/android-17/default/armeabi-v7a')
```

Welcome to Android Studio
Terminal
File Edit View Search Terminal Help
Welcome to Android Studio
Android Studio
Version 2.0
Start a new Android Studio project
Open an existing Android Studio project
Check out project from Version Control
Import project (Eclipse ADT, Gradle, etc.)
Import an Android code sample
Configure
Get Help
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Trash
Devices
Computer
Network
Name
android-studio-ide-143.2739481-linux.zip
11:35 AM

Fig. 1.10.3(vi) Snapshot of the web to know about how to install android studio for Linux

1.10.4 Installing Software Development Kit

1. In the below figure, you will see a marked button in red. Find that button on your Android Studio and click on it.



No files are open

- Search Everywhere with Double Shift
- Open a file by name with Strg+Umschalt+N
- Open Recent Files with Strg+E
- Open Navigation Bar with Alt+Pos 1
- Drag and Drop file(s) here from Files

Fig. 1.10.4(i) Snapshot of the android studio

2. Download the latest tools and Android platform.

   Follow these steps:

   i. Open the tools directory and select

      (a) Android SDK Tools

      (b) Android SDK Platform-tools

      (c) Android SDK Build-tools (highest version)

   ii. Open the first Android (latest version X.X) folder and select

      (a) SDK Platform

      (b) A system image for the emulator, such as ARM EABI v7a System Image

3. Getting Support libraries for additional APIs

   open the "Extras" directory and select:

   i. Android Support Repository

   ii. Android Support Library

4. Getting Google Play Services for even more APIs

   If we are required to develop with the help of Google APIs, we need the Google Play Services Package:

Open the “Extras” directory and select:

i. Google Repository

ii. Google Play services

5. Installing the packages

once we have selected all the required packages, we will begin the installation

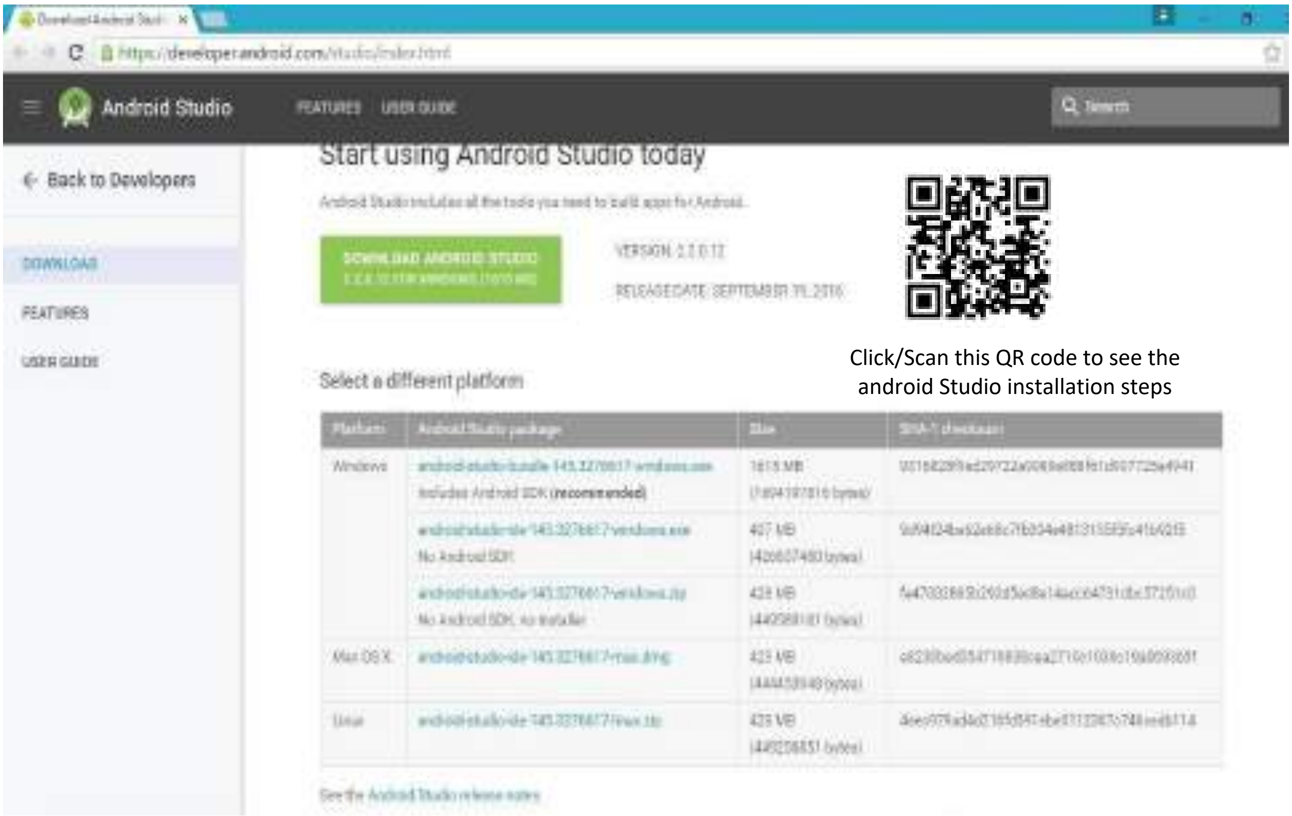
1. Click “Install X packages”
2. Another window will open
3. Double-click on each package name on the left to accept the agreement for each package
4. Click Install

Note: If you are running 64-bit version of Linux, you need to install some 32-bit libraries with the following command:

sudo apt-get install lib32z1 lib32ncurses5 lib32bz2-1.0 lib32stdc++6

1.10.5 Installing Android Studio on Mac iOS

Go to https://developer.android.com/studio/index.html and download Android studio for Mac iOS



Start using Android Studio today

Android Studio includes all the tools you need to build apps for Android.

VERSION: 2.2.0.12

RELEASE DATE: SEPTEMBER 19, 2016

Select a different platform

Platform	Android Studio package	Size	SHA-1 checksum
Windows	android-studio-bundle-145.3276617-windows.exe Includes Android SDK (recommended)	1615 MB (1694197816 bytes)	[illegible]
	android-studio-ide-145.3276617-windows.exe No Android SDK	407 MB (426607480 bytes)	[illegible]
	android-studio-ide-145.3276617-windows.zip No Android SDK, no installer	423 MB (443928181 bytes)	[illegible]
Mac OS X	android-studio-ide-145.3276617-mac.dmg	423 MB (444538949 bytes)	[illegible]
Linux	android-studio-ide-145.3276617-linux.zip	423 MB (443208851 bytes)	[illegible]

See the Android Studio release notes

Click/Scan this QR code to see the android Studio installation steps

Fig. 1.10.5(ii) Snapshot of the web to know about how to download android studio for Mac ios

- Now run the downloaded .DMG file and drag Android Studio to your applications folder

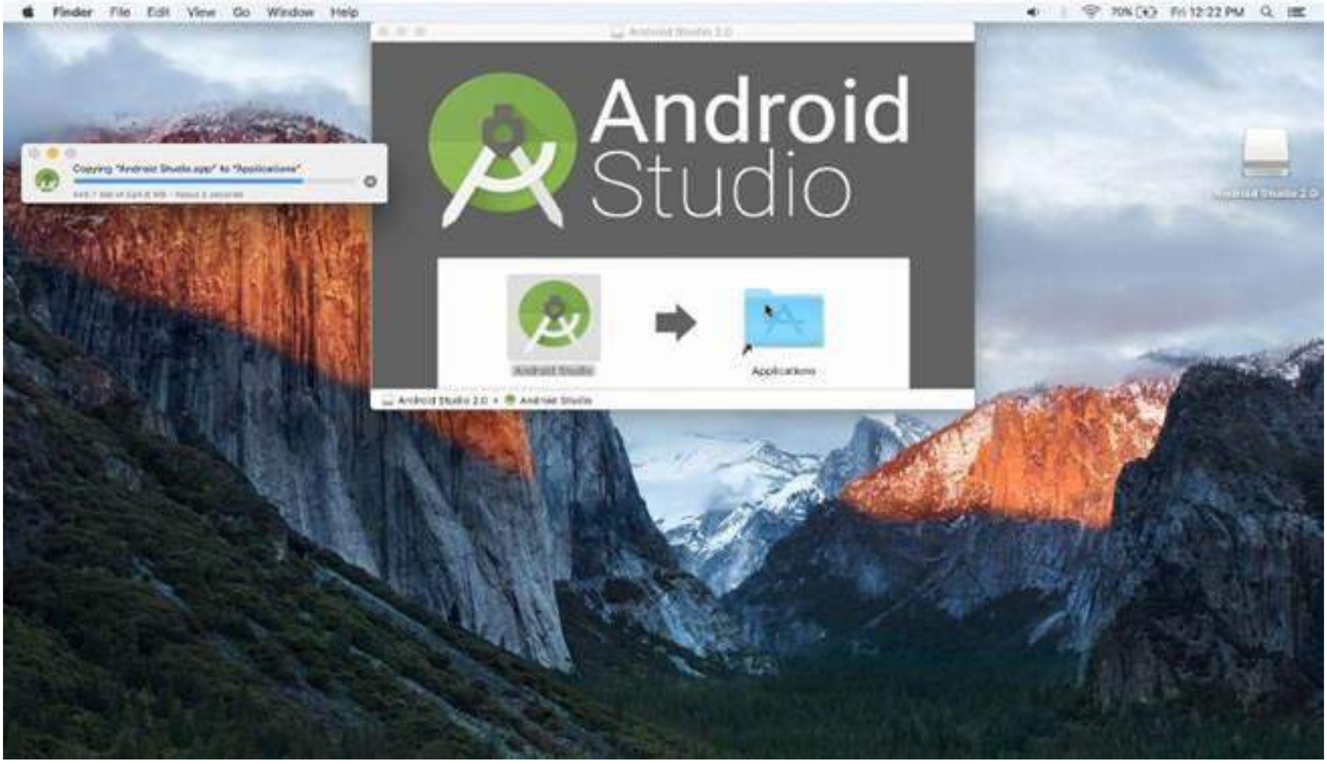
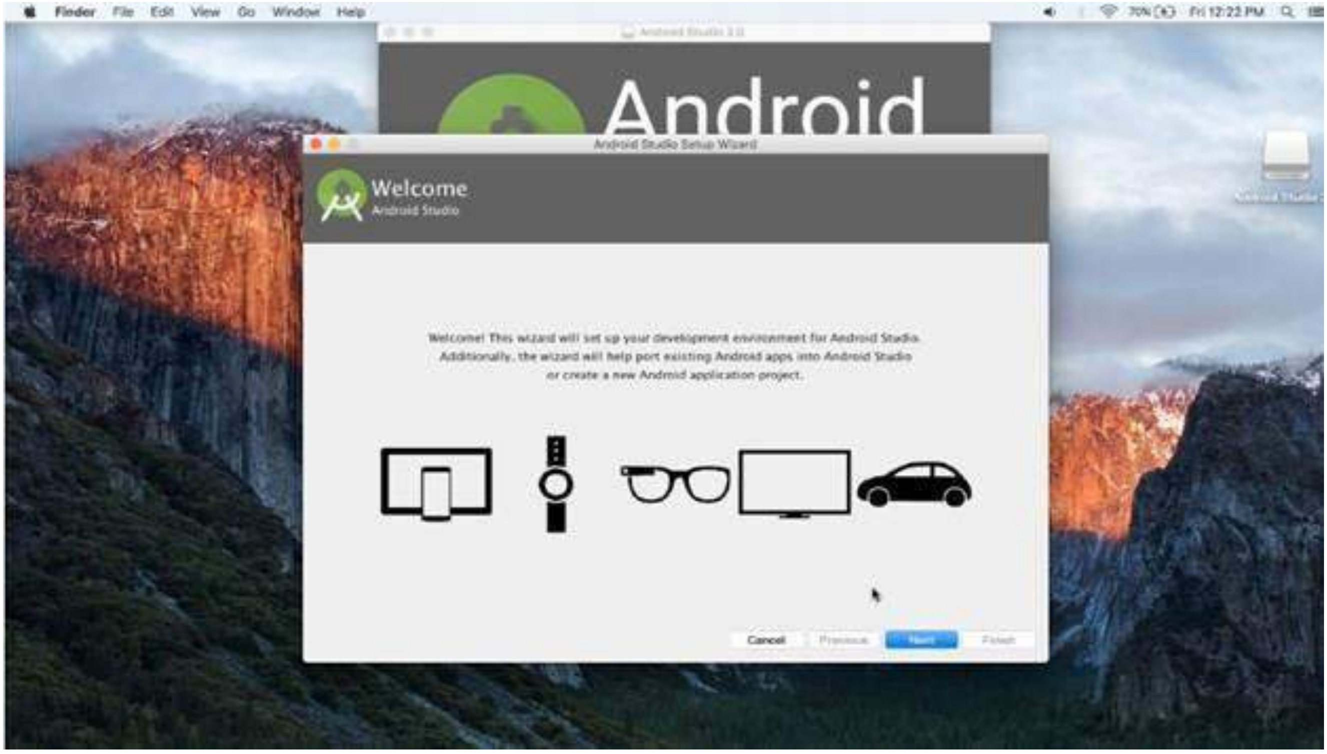

Finder File Edit View Go Window Help
Fri 12:22 PM
Android Studio 2.0
Copying "Android Studio.app" to "Applications"
Android Studio
Android Studio
Applications
Android Studio 2.0
Android Studio 2.0 ▸ Android Studio

Fig. 1.10.5(iii) Snapshot of the web to know about how to download android studio for Mac ios

- After the transfer is done, the setup for Android Studio will begin



Welcome! This wizard will set up your development environment for Android Studio. Additionally, the wizard will help port existing Android apps into Android Studio or create a new Android application project.

Fig. 1.10.5(iv) Snapshot of the web to know about how to download android studio for Mac ios

- Now keep following the instructions until the additional files for the software start downloading

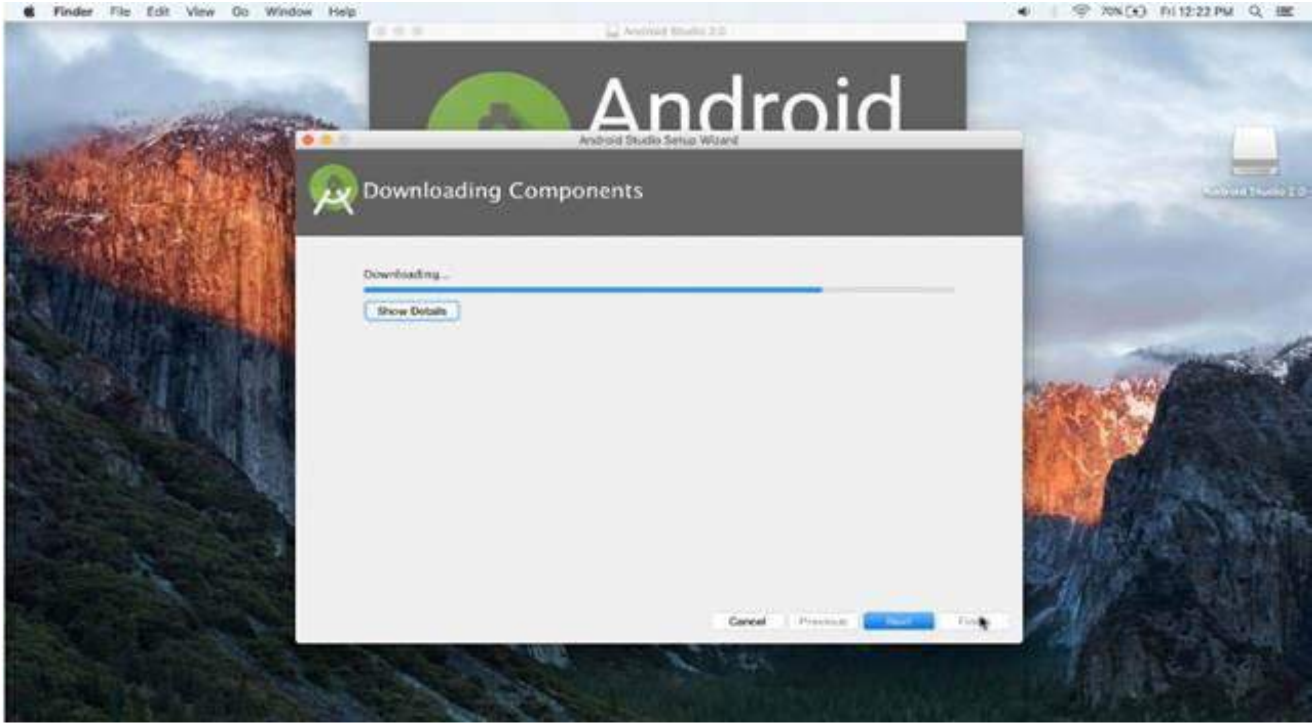


Fig. 1.10.5(v) Snapshot of the web to know about how to download android studio for Mac ios

- After the files are downloaded click “Finish” to complete the installation.
- You will be directed to a window to start working on the Studio.

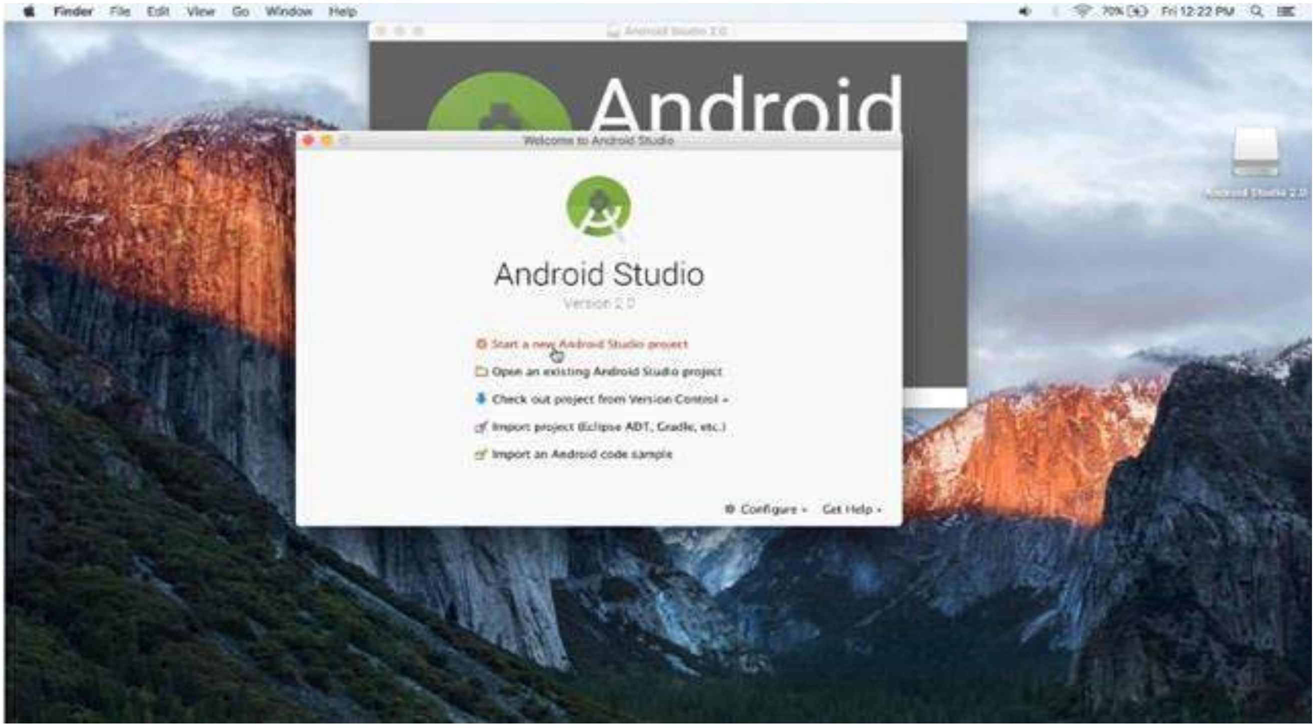

Finder
File
Edit
View
Go
Window
Help
Fri 12:22 PM
Android Studio 2.0
Android
Welcome to Android Studio
Android Studio
Version 2.0
Start a new Android Studio project
Open an existing Android Studio project
Check out project from Version Control ▾
Import project (Eclipse ADT, Gradle, etc.)
Import an Android code sample
Configure ▾
Get Help ▾

Fig. 1.10.5(vi) Snapshot of the web to know about how to download android studio for Mac ios

Exercise

Tick the correct answer:

1. Hardware which holds a collection of circuits is called as:
   a. RAM
   b. ROM
   c. Chipset
   d. Video card
2. The minimum Random Access Memory(RAM) for installing Android on the system should be
   a. 90 MB
   b. 128 MB
   c. 75 MB
   d. 60 MB
3. Which of the following is an Object Oriented Programming Language
   a. ASP.NET
   b. AutoCAD
   c. Java
   d. ANSYS
4. An object has
   a. States and behaviour
   b. Logic and behaviour
   c. States and variables
   d. Logic and variables
5. Which is the correct syntax of writing the method name
   a. public void MYMETHODNAME( )
   b. public void mymethodname( )
   c. public void MYmethodname( )
   d. public void myMethodName( )
6. Using blank line in the program in Java
   a. Does not compile the program.
   b. Is independent of the blank line
   c. Shuts down the software
   d. Makes the program slow

7. System.out.printIn(“”)
    a. Prints the argument in the inverted comas.
    b. Is a comment line and gets ignored by Java
    c. Does not participate in the program
    d. Is a command to avoid printing the argument
8. /* this is an android learning process */
    a. Is a comment line
    b. Is a blank line
    c. Is an argument
    d. Is a path
9. Eclipse is a(an)
    a. Software development kit
    b. Language
    c. Integrated development environment
    d. Game
10. Java is case sensitive
    a. True
    b. False
    c. Is independent of the case

Click the QR code to view the video on steps to download android studio

Notes

Skill India
कौशल भारत - कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

2. Set up Android framework/Development Environment and creating user interface

Telecom
Sector
Skill
Council

Unit 2.1 – Creating a Simple Project

Unit 2.2 – Running the Project

Unit 2.3 – Creating and Running a Simple User Interface

TEL/N2300

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand and develop system flow and coding
2. Conceptualize applications
3. Create Android Virtual Device
4. Understand the working of emulators
5. Identify the components of an Android Project

UNIT 2.1: Creating a Simple Android Project

Unit Objectives

At the end of this unit, you will be able to:

1. Learn how to create an Android Project
2. Identify components of a Class definition and their functions

2.1.1 Creating a Simple Android Project

- Start opening the Android Studio.
- Now in Android Studio, create a new project
- Select File – New Project

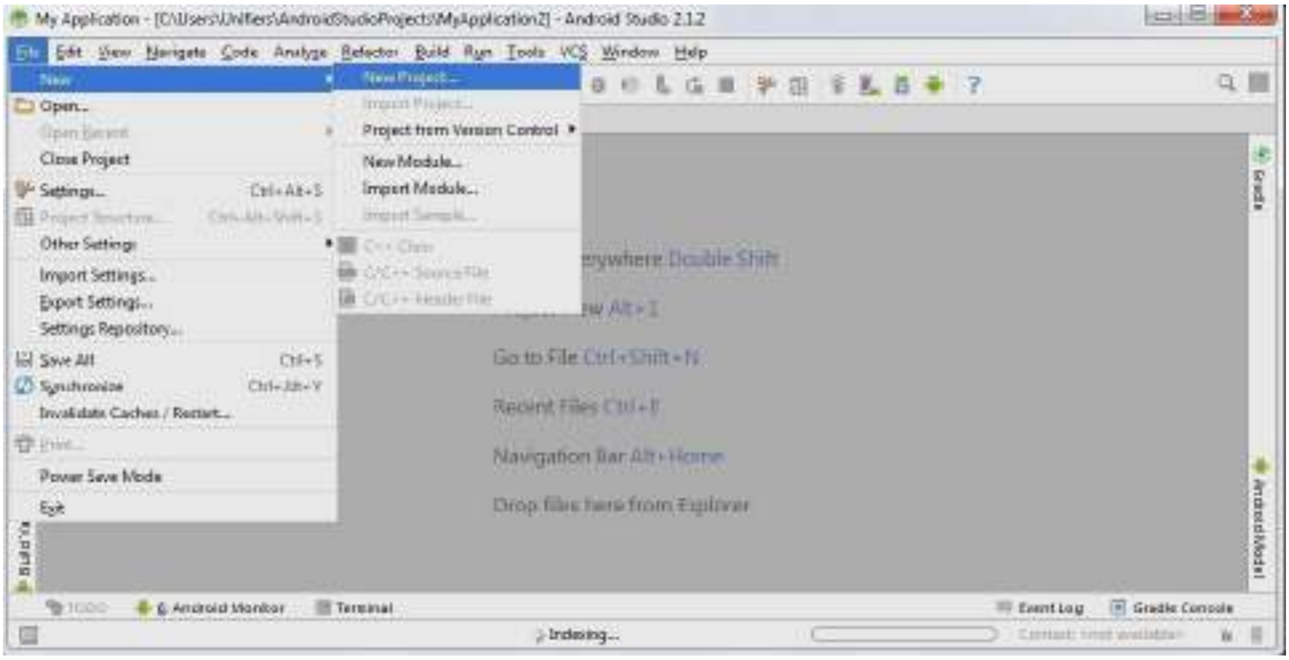
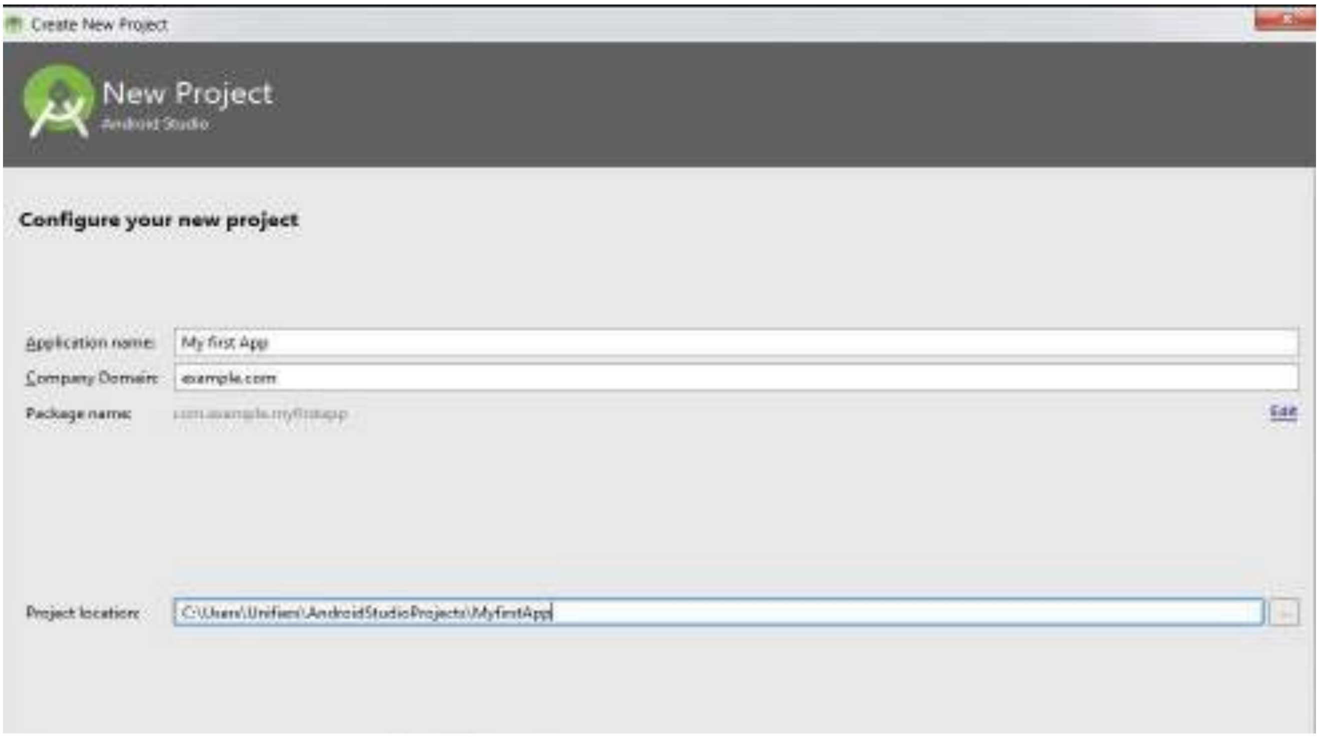


Fig. 2.1.1(i) Creating a simple android project

- Now in New Project enter the values for
  i. Application Name – for example “My First App”
  ii. Company Domain – for example “example.com”
- Package name and Project location are filled by default but we can edit them if we want



Configure your new project

Application name: My first App

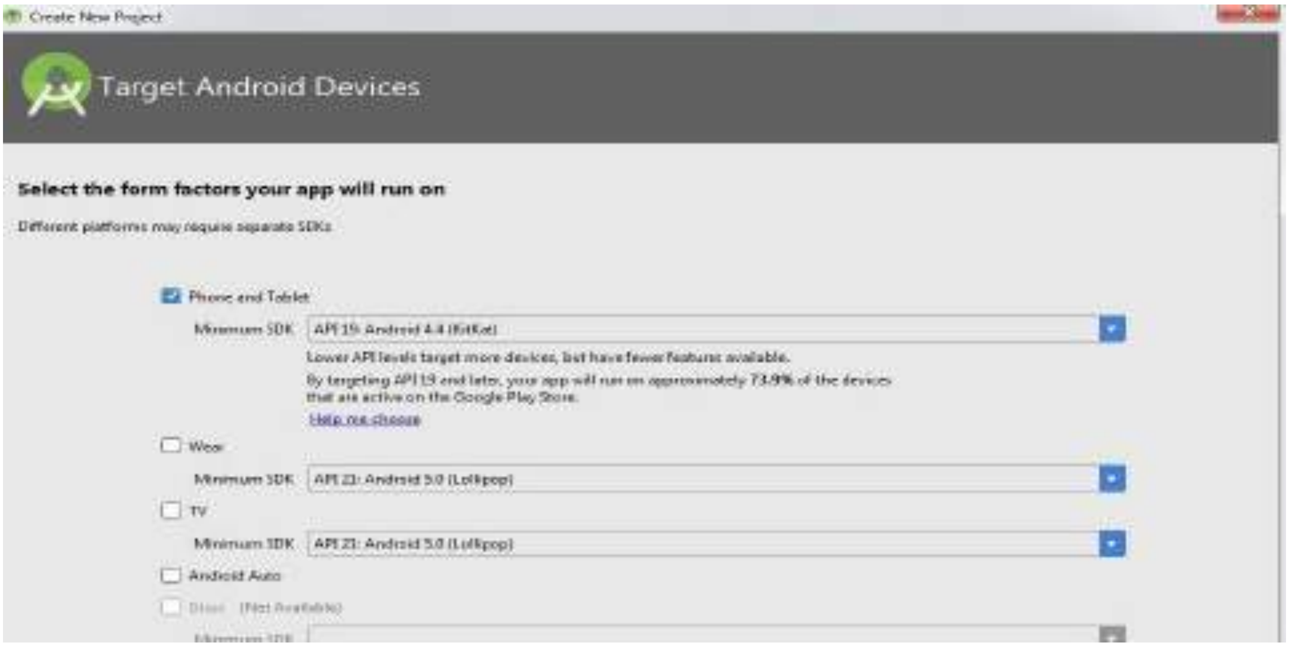
Company Domain: example.com

Package name: com.example.myfirstapp

Project location: C:\Users\Unifiers\AndroidStudioProjects\MyfirstApp

Fig. 2.1.1(ii) Creating a simple android project

- Click Next
- You will see the “Target Android Devices” window. We don’t have to change any values here. So click Next.



Select the form factors your app will run on

Different platforms may require separate SDKs

☑ Phone and Tablet

Minimum SDK: API 19: Android 4.4 (KitKat)

Lower API levels target more devices, but have fewer features available.

By targeting API 19 and later, your app will run on approximately 73.9% of the devices that are active on the Google Play Store.

☐ Wear

Minimum SDK: API 21: Android 5.0 (Lollipop)

☐ TV

Minimum SDK: API 21: Android 5.0 (Lollipop)

☐ Android Auto

☐ Glass (Not Available)

Minimum SDK

Fig. 2.1.1(iii) Creating a simple android project

- To support more than a couple of devices, set the level of Android to a lower version so that the applications will provide their core feature set.
- Now in the “Add an Activity to Mobile” window, select “Empty Activity” and click Next.

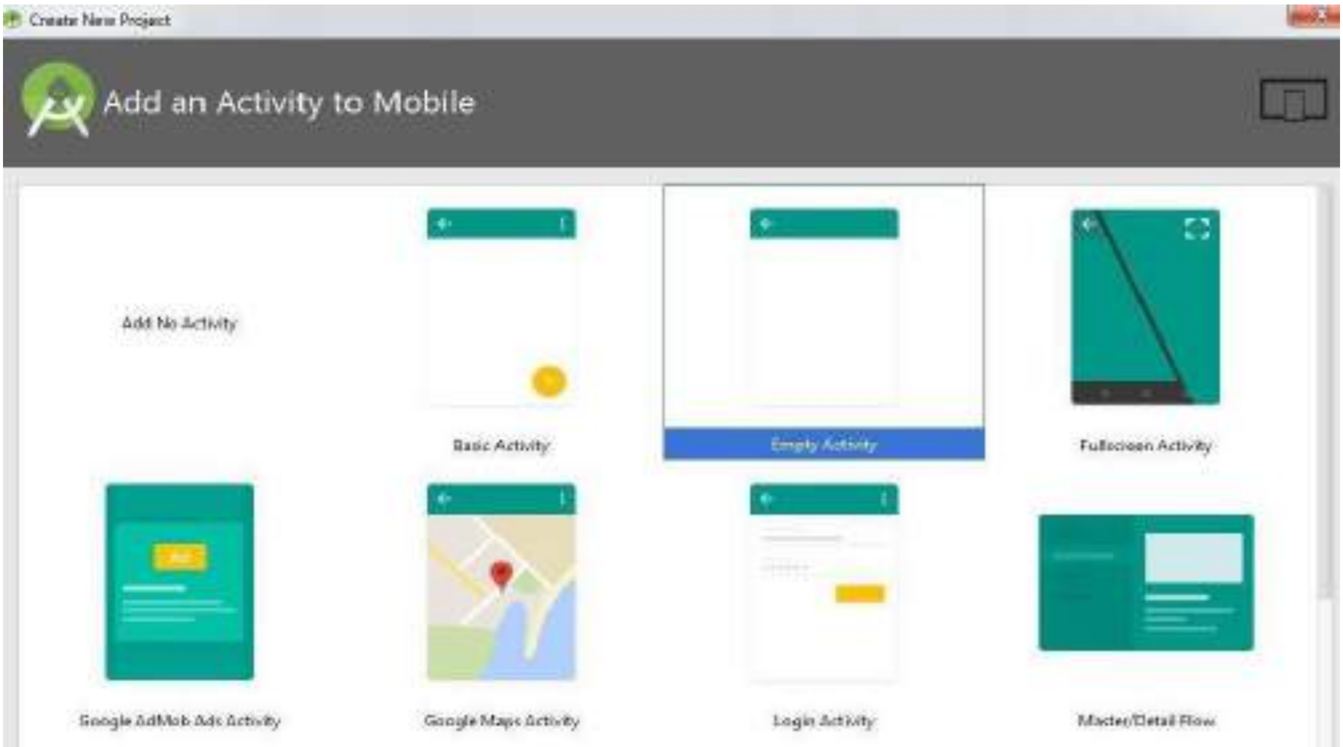
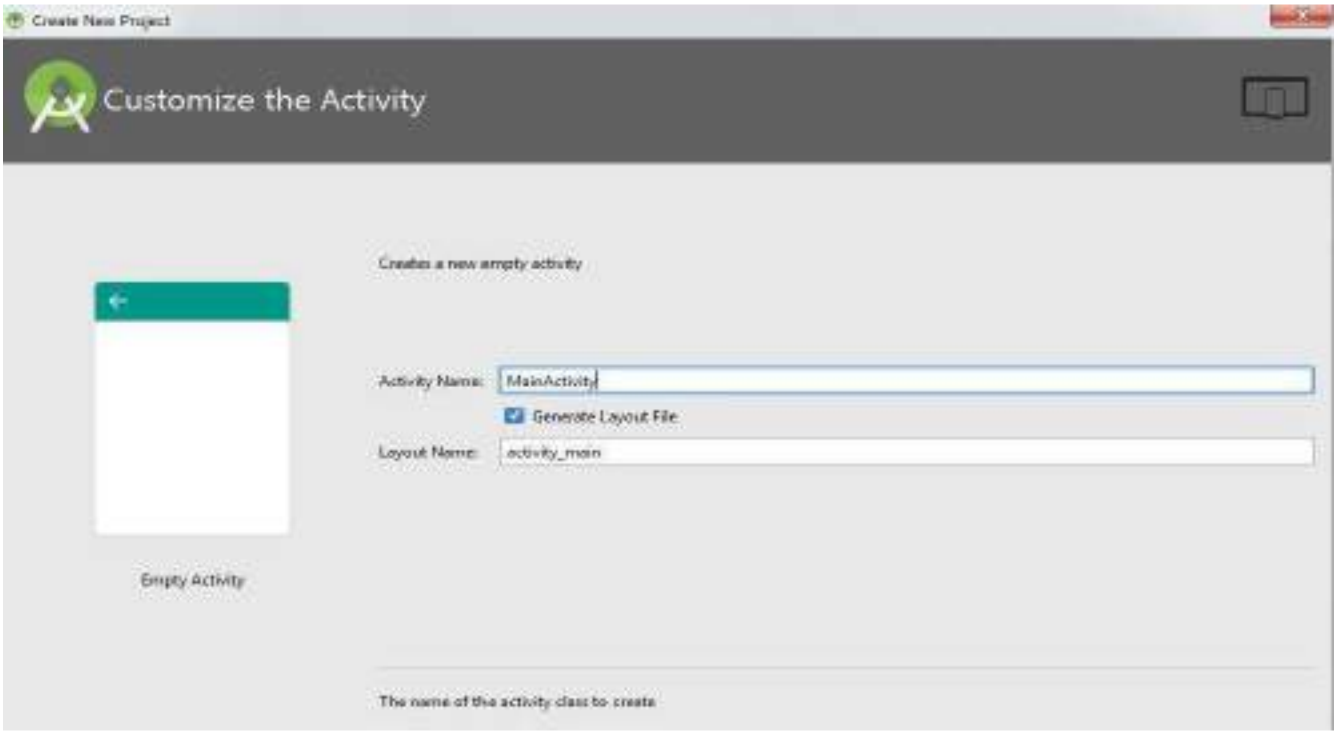


Fig. 2.1.1(iv) Creating a simple android project

- Then on the “Customize the Activity” window, don’t change the values and click “Finish”



Creates a new empty activity

Activity Name: MainActivity

☑ Generate Layout File

Layout Name: activity_main

The name of the activity class to create

Fig. 2.1.1(v) Creating a simple android project

- Wait for some time till the Studio Opens and Displays a “Hello World” application with default files.
- Check if the Project window is open
- For that go to View – Tool Windows – Project and the view will be selected from the drop down list at the top.
- You will see the following files

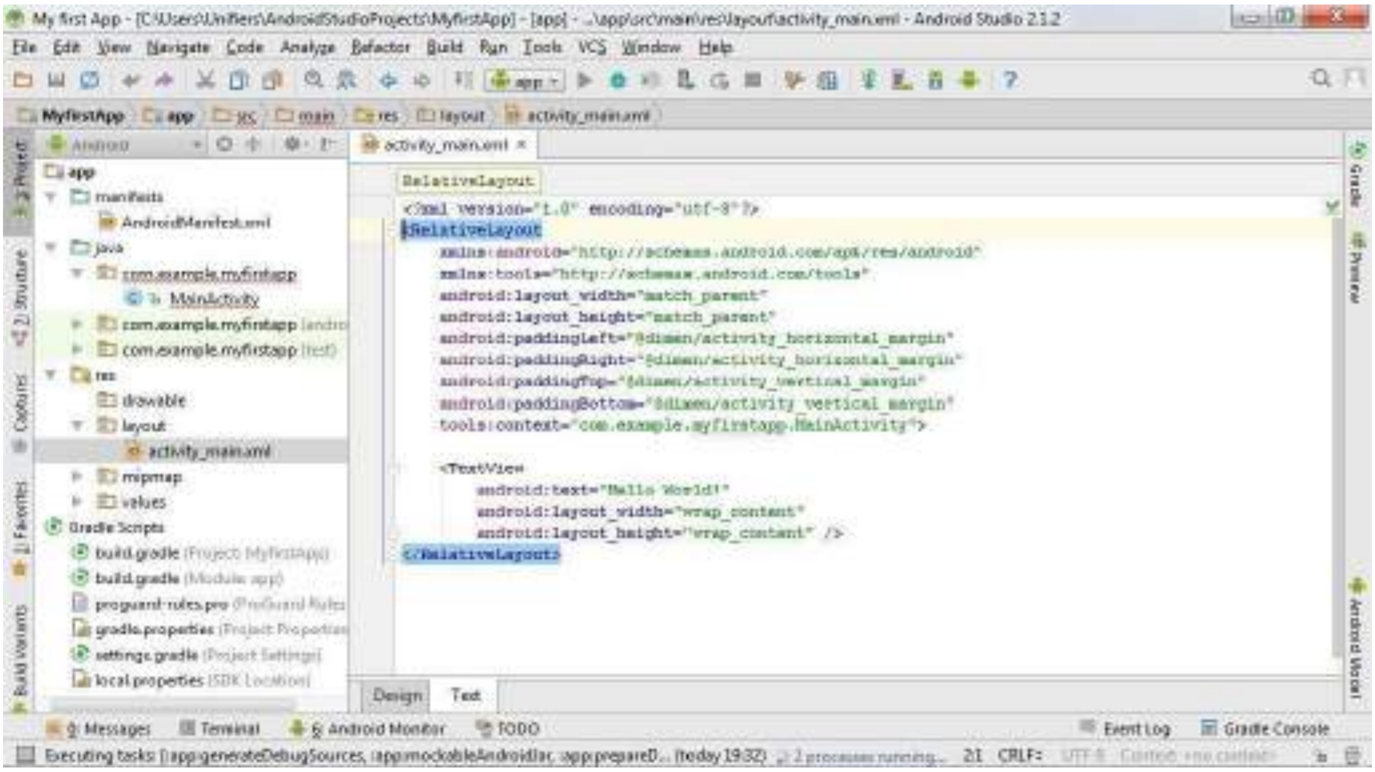
  app – java – com.example.myfirstapp – MainActivity.java

  app – res – layout – activity_main.xml

  app – manifest – AndroidManifest.xml

  Gradle Scrips – build.gradle

  (see the figure below / look to the left side of the window and you will see the files.)
- The MainActivity.java contains the class definition for the activity that we had performed earlier.
- It helps in running the app as soon as the activity starts and loads the layout file.
- The Manifest file is used to define the fundamentals of the application. It also defines each component it possesses.
- The activity_main.xml file contains the “view” element and defines the layout of the activity.



My first App - [C:\Users\Unifiers\AndroidStudioProjects\MyfirstApp] - [app] - ..\app\src\main\res\layout\activity_main.xml - Android Studio 2.1.2
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MyfirstApp app src main res layout activity_main.xml
Android
activity_main.xml
app
manifests
AndroidManifest.xml
java
com.example.myfirstapp
MainActivity
com.example.myfirstapp (androidTest)
com.example.myfirstapp (test)
res
drawable
layout
activity_main.xml
mipmap
values
Gradle Scripts
build.gradle (Project: MyfirstApp)
build.gradle (Module: app)
proguard-rules.pro (ProGuard Rules)
gradle.properties (Project Properties)
settings.gradle (Project Settings)
local.properties (SDK Location)
Design
Text
0: Messages
Terminal
6: Android Monitor
TODO
Event Log
Gradle Console
Gradle
Preview
Android Model
1: Project
2: Structure
Captures
2: Favorites
Build Variants
RelativeLayout

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    android:paddingBottom="@dimen/activity_vertical_margin"
    tools:context="com.example.myfirstapp.MainActivity">

    <TextView
        android:text="Hello World!"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content" />
</RelativeLayout>
```

Executing tasks: [app:generateDebugSources, :app:mockableAndroidJar, :app:prepareD... (today 19:32)   2 processes running...   21   CRLF: UTF-8   Context: <no context>

Fig. 2.1.1(vi) Coding process

UNIT 2.2: Running the Project

Unit Objectives

At the end of this unit, you will be able to:

1. Learn to enable On-device developer options
2. Understand how to run an application on an Android Emulator
3. Describe the procedure to run the application on a real device

2.2.1 Running the Application on a Real Device

- Before running the application on a Real device, we need to configure if the device is compatible with the computer.
- If developing on Windows we need to install the appropriate USB drivers first.
- Download the appropriate USB driver from your manufacturer's website. I will mention a few mobile brands and their associated driver links. If you don't find your device here please visit your mobile phone's manufacturer's website.

Acer	http://www.acer.com/worldwide/support/mobile.html
Asus	http://support.asus.com/download/
Blackberry	https://swdownloads.blackberry.com/Downloads/entry.do?code=4EE0932F46276313B51570F46266A608
Dell	http://support.dell.com/support/downloads/index.aspx?c=us&cs=19&l=en&s=dhs&~ck=anavml
HTC	http://www.htc.com
Lenovo	http://support.lenovo.com/us/en/GlobalProductSelector
Motorola	https://motorola-global-portal.custhelp.com/app/answers/detail/a_id/88481/
Samsung	http://www.samsung.com/us/support/downloads
Sony	http://developer.sonymobile.com/downloads/drivers/
Xiaomi	http://www.xiaomi.com/c/driver/index.html

- Once you have downloaded the USB driver, follow the steps to install/update the drivers based on your version of windows.

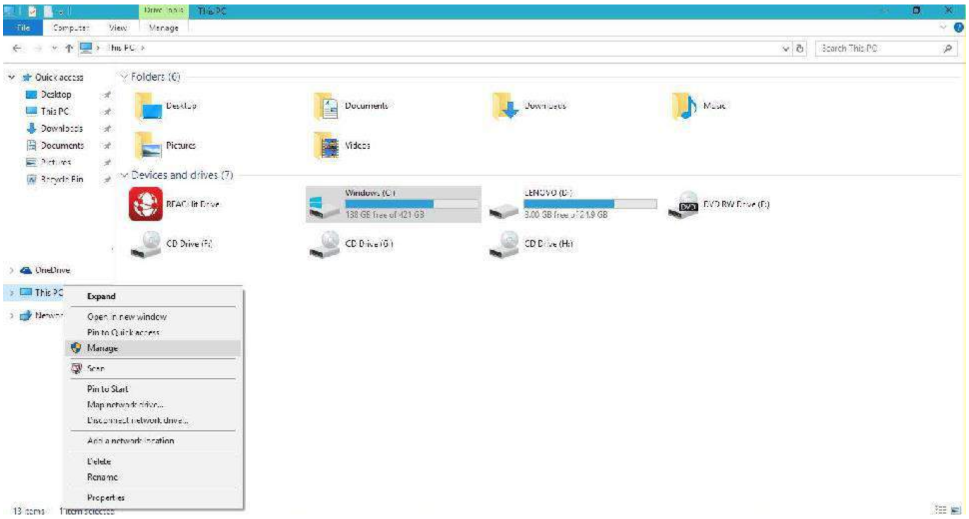
Windows 7 or higher

- To install the Android USB driver on Windows 7 and higher for the first time:
- Connect your Android-powered device to your computer's USB port.
- Right-click on Computer from your desktop or Windows Explorer, and select Manage.
- Select Devices in the left pane.

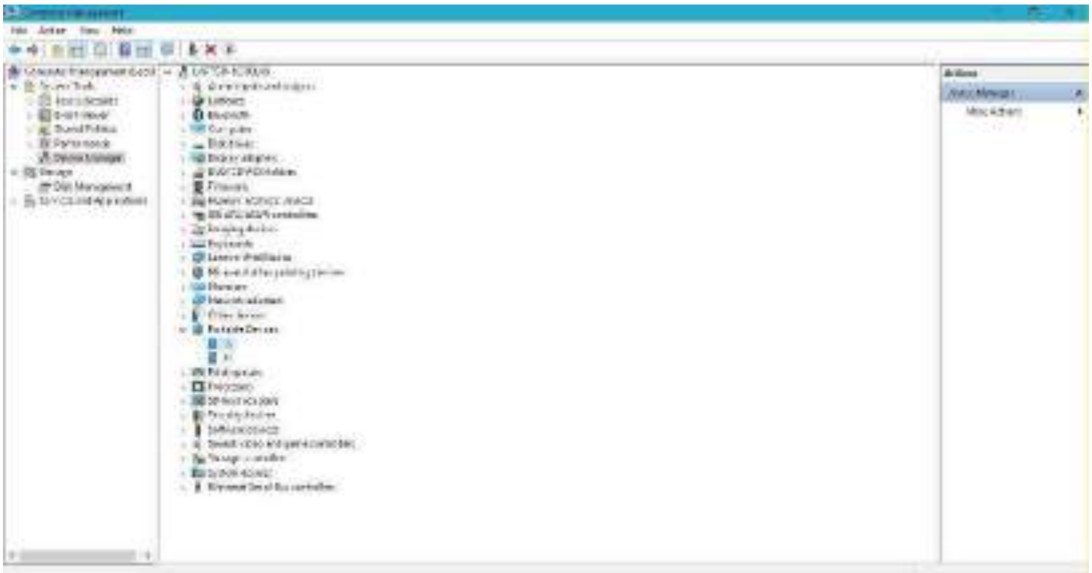
- Locate and expand other device in the right pane.
- Right-click the device name (such as Nexus S) and select Update Driver Software. This will launch the Hardware Update Wizard.
- Select Browse my computer for driver software and click Next.
- Click Browse and locate the USB driver folder. (The Google USB Driver is located in <sdk>\extras\google\usb_driver\.)
- Click Next to install the driver.

Upgrading an existing Android USB driver on windows 7 or higher

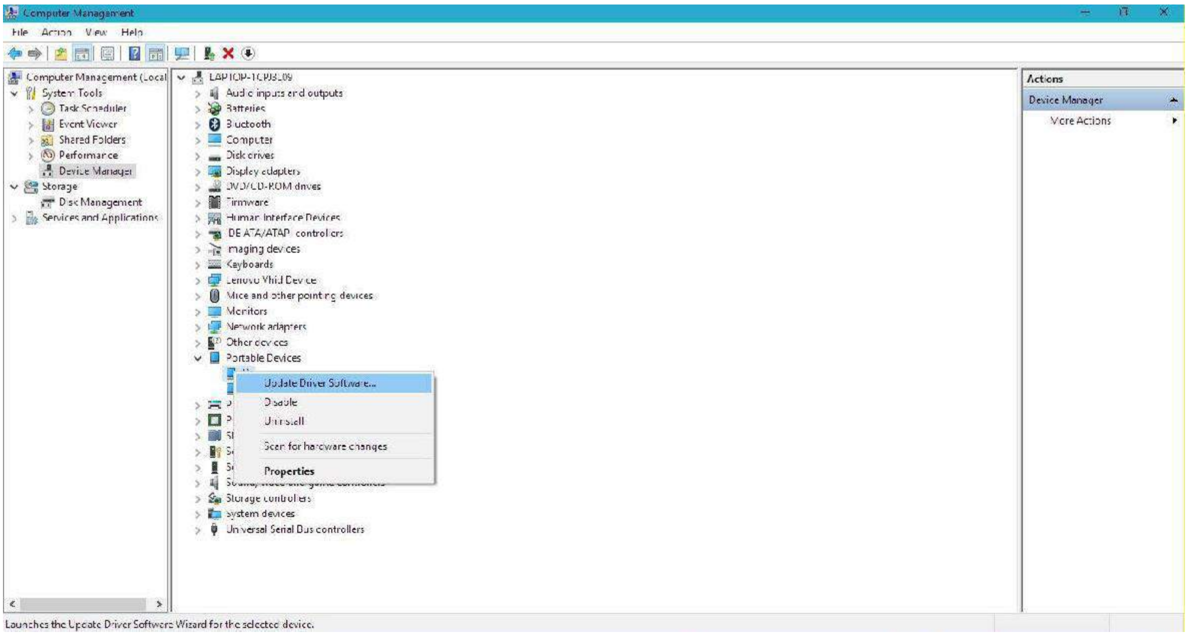
- Connect your Android-powered device to your computer's USB port.
- Right-click on Computer from your desktop or Windows Explorer, and select Manage.



- Select Device Manager in the left pane of the Computer Management window.

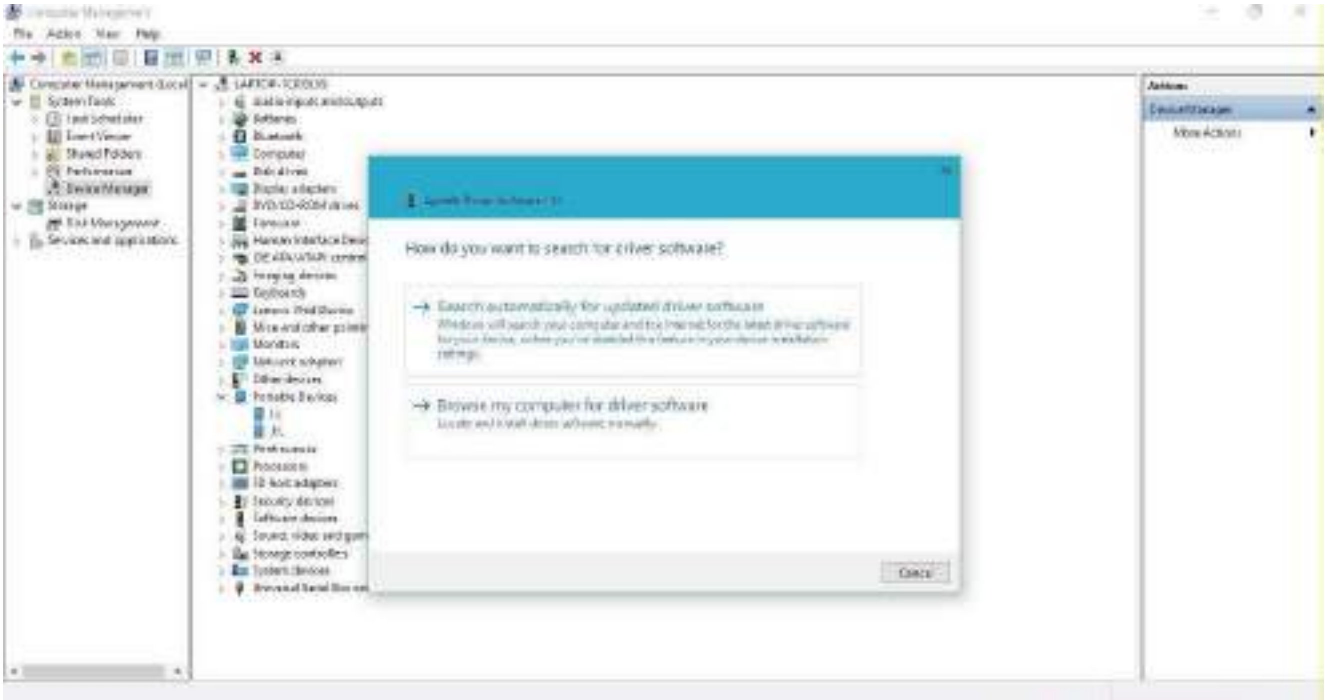


- Locate and expand Android Phone in the right pane.



Launches the Update Driver Software Wizard for the selected device.

- Right-click on Android Composite ADB Interface and select Update Driver. This will launch the Hardware Update Wizard.
- Select Install from a list or specific location and click Next.



How do you want to search for driver software?

Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.

Locate and install driver software manually.

- Click Browse and locate the USB driver folder. (The Google USB Driver is located in <sdk>\extras\google\usb_driver\.)
- Click Next to upgrade the driver.

For Mac OS skip the above installation step.

- If developing on Linux, add an “udev” rules file that contains a USB configuration for each type of device you want to use for development.
- In the rules file you will find out that every manufacturer is identified by a unique vendor ID as specified by the ATTR{idVendor} property.
- Now to setup device detection on Linux:

  a. Log in as root and create this file: /etc/udev/rules.d/51-android.rules.

  Use this format to add each vendor to the file:

  ```
  SUBSYSTEM=="usb", ATTR{idVendor}=="0bb4", MODE="0666", GROUP="plugdev"
  ```

  In this example, the vendor ID is for HTC. The MODE assignment specifies read/write permissions, and GROUP defines which Unix group owns the device node.

  Note: The rule syntax may vary slightly depending on your environment. Consult the udev documentation for your system as needed. For an overview of rule syntax, see this guide to writing udev rules.

  b. Now execute:

  ```
  chmod a+r /etc/udev/rules.d/51-android.rules
  ```

  Note: When you connect a device running Android 4.2.2 or higher to your computer, the system shows a dialog asking whether to accept an RSA key that allows debugging through this computer. This security mechanism protects user devices because it ensures that USB debugging and other adb commands cannot be executed unless you're able to unlock the device and acknowledge the dialog. This requires that you have adb version 1.0.31 (available with SDK Platform-tools r16.0.1 and higher) in order to debug on a device running Android **4.2.2** or higher.
- When plugged in over USB, you can verify that your device is connected by executing adb devices from your SDK platform-tools/ directory. If connected, you'll see the device name listed as a "device."
- If using Android Studio, run or debug your application as usual. You will be presented with a Device Chooser dialog that lists the available emulator(s) and connected device(s). Select the device upon which you want to install and run the application.

2.2.2 Enabling On-device Developer Options

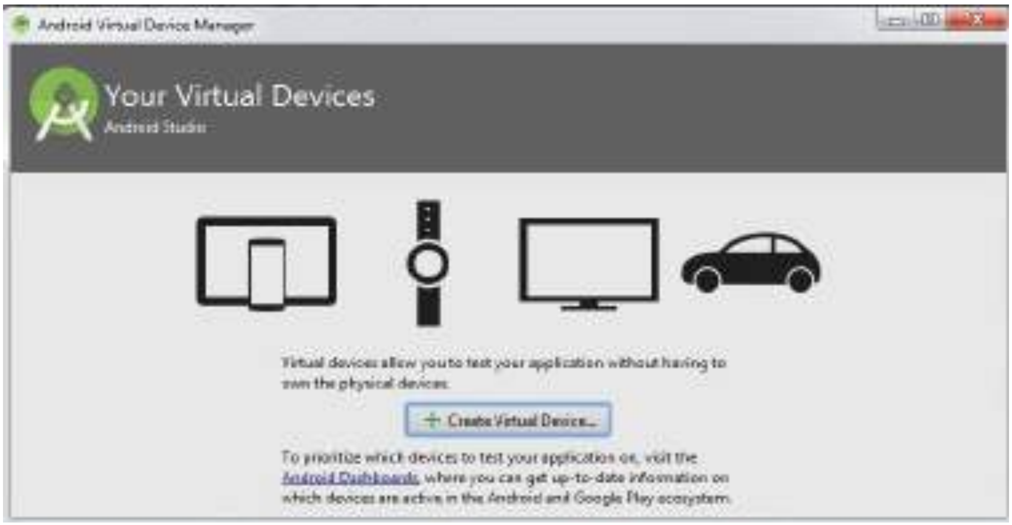
- Connect the phone or tablet to the computer with the help of a USB cable.
- In your Phone settings enable USB Debugging by going to Settings – Developer options.
- (for Android version 4.2 and above go to About phone. Find Build number and tap it seven times. This will activate the developer option and on returning to a previous window you will find the Developer Options)
- In Android Studio,

  click Run

  In the Select Deployment Target Window, find your device and click ok.

2.2.3 Running the Application on an Android Emulator

- First we need to create an Android Virtual Device
- For that click on the AVD Manager icon in the toolbar
- Your Virtual Devices window will open. Click Create Virtual Device



Android Virtual Device Manager

Your Virtual Devices

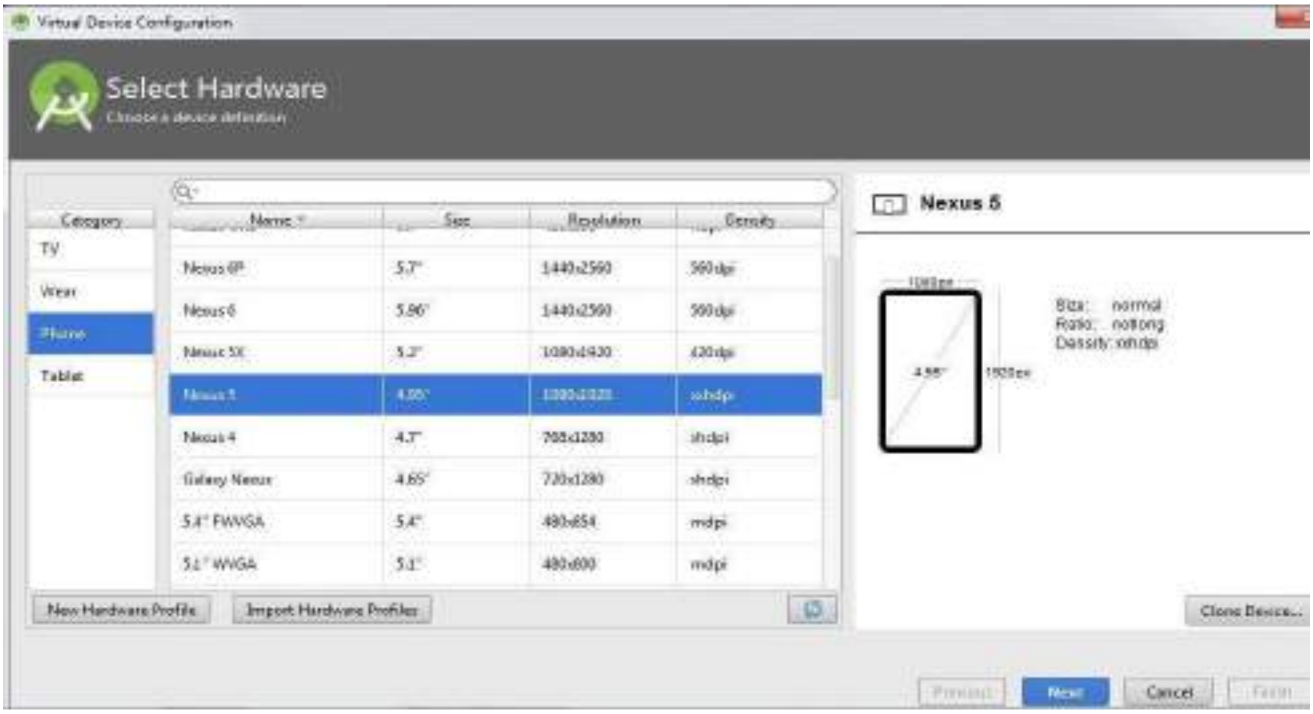
Android Studio

Virtual devices allow you to test your application without having to own the physical devices.

To prioritize which devices to test your application on, visit the Android Dashboards, where you can get up-to-date information on which devices are active in the Android and Google Play ecosystem.

Fig. 2.2.3 (i) Running the App on an android emulator

- Select a virtual device in the "Select Hardware" window. For instance, select Nexus 4 and click Next.



Virtual Device Configuration

Select Hardware

Choose a device definition

Category
TV
Wear
Phone
Tablet

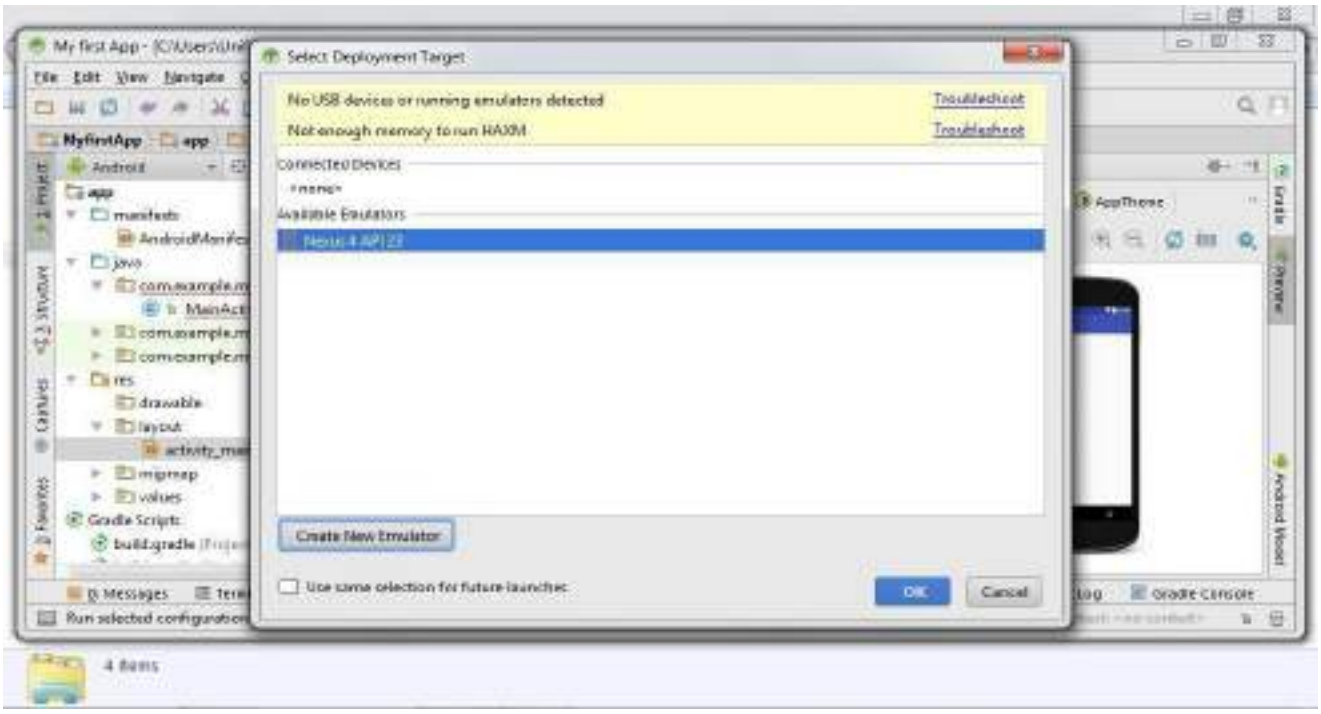
Name	Size	Resolution	Density
Nexus 6P	5.7"	1440x2560	560dpi
Nexus 6	5.96"	1440x2560	560dpi
Nexus 5X	5.2"	1080x1920	420dpi
Nexus 5	4.95"	1080x1920	xxhdpi
Nexus 4	4.7"	768x1280	xhdpi
Galaxy Nexus	4.65"	720x1280	xhdpi
5.4" FWVGA	5.4"	480x854	mdpi
5.1" WVGA	5.1"	480x800	mdpi

Nexus 5

Size: normal
Ratio: notlong
Density: xxhdpi

Fig. 2.2.3 (ii) Running the App on an android emulator

- In the “System Image” window, choose the image you want for the virtual device and click Next.



Select Deployment Target

No USB devices or running emulators detected — Troubleshoot

Not enough memory to run HAXM — Troubleshoot

Connected Devices

<none>

Available Emulators

Nexus 4 API 23

Fig. 2.2.3 (iii) Running the App on an android emulator

- Check the configuration and then click “Finish”.
- Now select the Project and click Run from the toolbar.
- In the Select Deployment Target window, select the Emulator and Click OK
- Studio will take some time to process and the emulator will appear after a few minutes showing the output of the application.

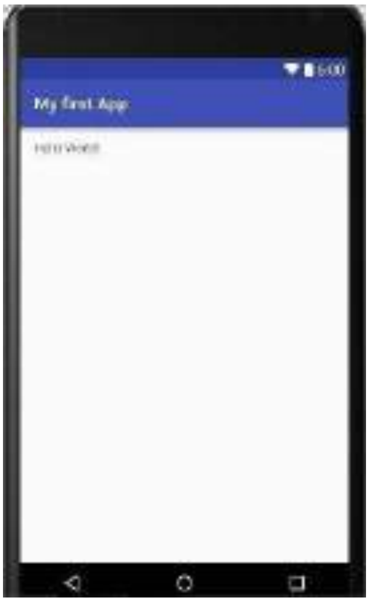


Fig. 2.2.3 (iv) Sample Project Created

UNIT 2.3: Creating and Running a Simple User Interface

Unit Objectives

At the end of this unit, you will be able to:

1. Create and run a simple User Interface
2. Understand how to add a text field
3. Learn how to add a button

2.3.1 Creating and Running a Simple User Interface

Now to understand the working a little better we will write another app. We will build a simple user interface and complete the whole task in a few steps:

1. We will edit our previous project. Go to app – res – layout – activity_main.xml on the left side of the window.
2. In the window where the code is written you will find Design and Text written at the bottom of that window.
3. Click Text tab for switching to the text editor.
4. Delete everything that was already there and insert the following XML

For instance

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
   xmlns:android="http://schemas.android.com/apk/res/android"
   xmlns:tools="http://schemas.android.com/tools"
   android:layout_width="match_parent"
   android:layout_height="match_parent"
   android:orientation="horizontal">
</LinearLayout>
```

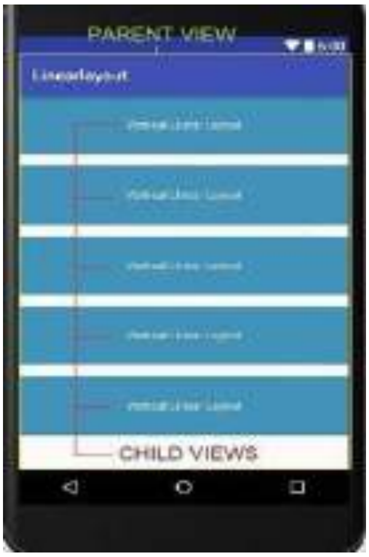


Fig. 2.3.1 (i) Create simple UI

- LinearLayout is a subclass of view group which is used to layout views in either a horizontal position or a vertical position.
- Here it is defined by android:orientation=”horizontal”.
- android:layout_width and android:layout_height specify the size.
- “match_parent” declares that width or height of the view should match the parent view.
- The Fig. shows a vertical linear layout and shows what a child view and a parent view is for basic understanding of the concepts.

2.3.2 Adding a Text Field

- Add the following text to the text in activity_main.xml in the following way

```
<LinearLayout
   xmlns:android="http://schemas.android.com/apk/res/android"
   xmlns:tools="http://schemas.android.com/tools"
   android:layout_width="match_parent"
   android:layout_height="match_parent"
   android:orientation="horizontal">
   <EditText android:id="@+id/edit_message"
      android:layout_width="wrap_content"
      android:layout_height="wrap_content"
      android:hint="@string/edit_message" />
</LinearLayout>
```

- You will get “@string/edit_message” in a different colour showing an error. We will take care of it ahead.

Adding String Resources

- Include the following code in the resource file at res – values – strings.xml
- Two strings will be added here which will also clear out the error for us

```
1.  <?xml version="1.0" encoding="utf-8"?>
<resources>
   <string name="app_name">My First App</string>
   <string name="edit_message">Enter a message</string>
   <string name="button_send">Send</string>
</resources>
```

2.3.3 Adding a Button

- Now in the activity_main.xml file, add a button below the “EditText” in the following way

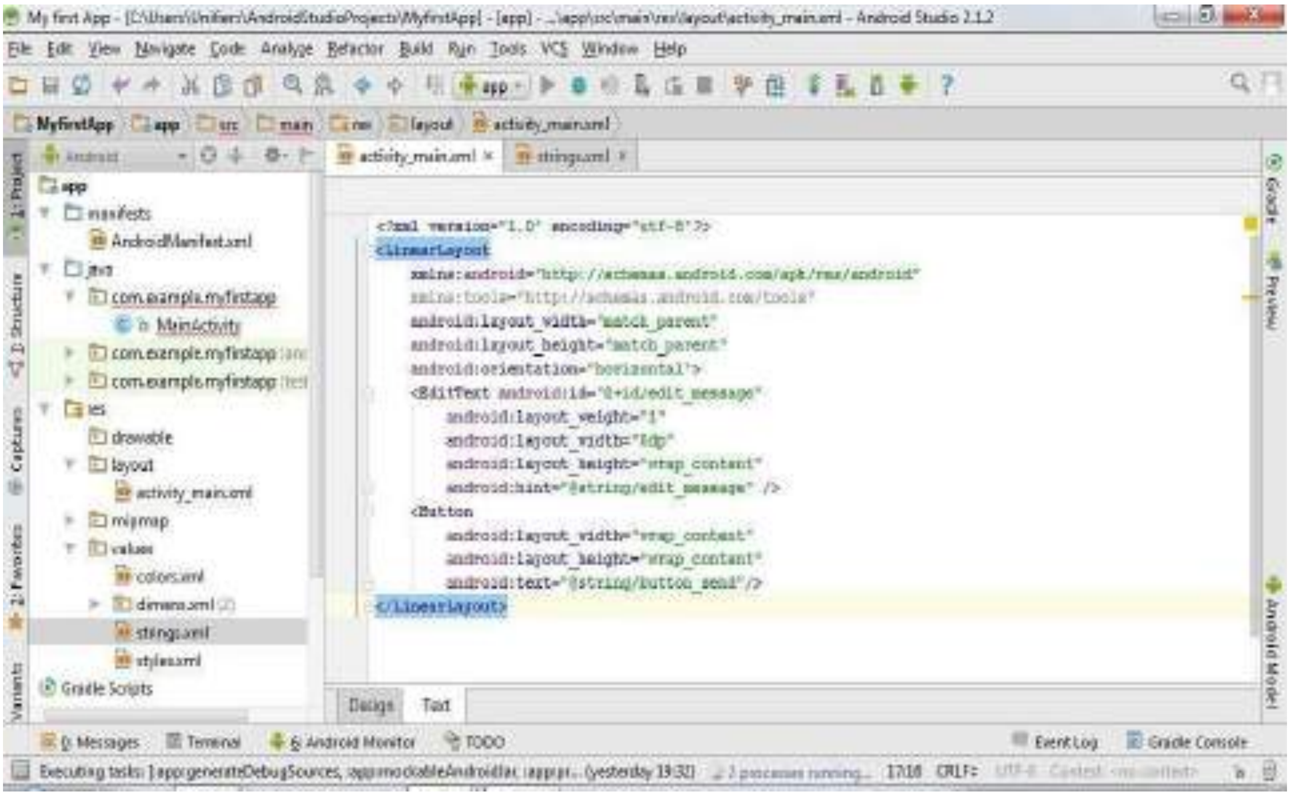
```
   <LinearLayout
   xmlns:android="http://schemas.android.com/apk/res/android"
   xmlns:tools="http://schemas.android.com/tools"
   android:orientation="horizontal"
   android:layout_width="match_parent"
   android:layout_height="match_parent">
      <EditText android:id="@+id/edit_message"
        android:layout_width="wrap_content"
```

```
     android:layout_height="wrap_content"
     android:hint="@string/edit_message" />
    <Button
     android:layout_width="wrap_content"
     android:layout_height="wrap_content"
     android:text="@string/button_send"  />
</LinearLayout>
```

- In activity_main.xml, modify the program to make the input box fill in the screen

```
<EditText android:id="@+id/edit_message"
   android:layout_weight="1"
   android:layout_width="0dp"
   android:layout_height="wrap_content"
   android:hint="@string/edit_message" />
```

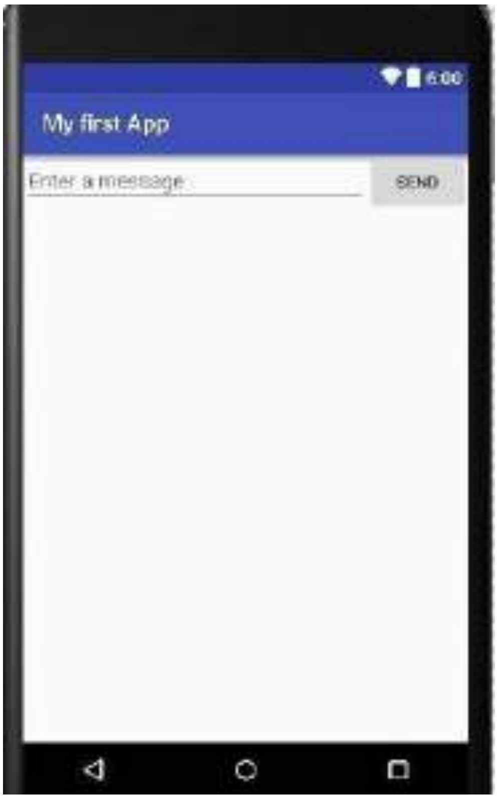
- Making the necessary changes to the program, the complete activity_main.xml file is as under



```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="horizontal">
    <EditText android:id="@+id/edit_message"
        android:layout_weight="1"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:hint="@string/edit_message" />
    <Button
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/button_send"/>
</LinearLayout>
```

My first App - [C:\Users\Unifiers\AndroidStudioProjects\MyfirstApp] - [app] - ...\app\src\main\res\layout\activity_main.xml - Android Studio 2.1.2
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MyfirstApp app src main res layout activity_main.xml
activity_main.xml strings.xml
app
manifests
AndroidManifest.xml
java
com.example.myfirstapp
MainActivity
com.example.myfirstapp
com.example.myfirstapp
res
drawable
layout
activity_main.xml
mipmap
values
colors.xml
dimens.xml
strings.xml
styles.xml
Gradle Scripts
Design Text
Messages Terminal Android Monitor TODO Event Log Gradle Console
Executing tasks: [:app:generateDebugSources, :app:mockableAndroidJar, :app:pr... (yesterday 19:32)
17:18 CRLF

- Running the App
- Click Run
- Select the Emulator and click ok
- The final result will be:



My first App

Enter a message

SEND

Exercise

Tick the correct answer:

1. Which software is used for developing the Android Application?
   a. AutoCAD
   b. Maya
   c. Android Studio
   d. Turbo C
2. To support more than a couple of virtual devices, what should be the version level of Android?
   a. Higher
   b. Lower

c. Medium

d. Is independent of the version Level

3. The file which defines the fundamentals of an application which developing in Android Studio is known as:

a. Java file

b. Manifest file

c. Dump file

d. HTML file

4. USB Debugging helps in:

a. Installing an App on the Device

b. Playing media files on the device

c. Programming

d. Powering off the device

5. Deployment target window shows

a. Only Real devices

b. Only Emulators

c. Real devices and Emulators

d. Programming window

6. The file for defining an earlier performed activity is

a. MainActivity.java

b. Manifest.xml

c. Androidstudio.exe

d. Mainactivity.xml

7. What does android:layout_width and android:layout_height in the syntax signify?

a. Size

b. Height

c. Orientation

d. Width

8. At what percentage of devices will the application run if the API level is 19 and later?

a. 22%

b. 70.5%

c. 73.9%

d. 100%

9. “view” element of the layout is defined by

    a. Activity_main.xml

    b. MainActivity.java

    c. Androidmanifest.xml

    d. AndroidManifest.java

10. What is the correct syntax for declaring the width or height of a view?

    a. Match_parent

    b. Match_Parent

    c. MatchParent

    d. match_parent

Notes

Skill India
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सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Telecom
Sector
Skill
Council

3.Developing Android VAS Application

Unit 3.1 – Basic Layout, Short Messaging Services and Networking
Unit 3.2 – Data Storage
Unit 3.3 – Working with Database Management System SQLite

TEL/N2301

Key Learning Outcomes

At the end of this module, you will be able to:

1. Learn to create various layouts
2. Understand messaging services - sending and processing SMS
3. Understand how to perform networking operations
4. Learn about different types of mobile processors
5. Learn about different type of storages
6. Understand how to save the data in the internal as well as external storage
7. Understand how to work with SQLite
8. Create and loading the database
9. Deleting and Updating database

UNIT 3.1: Basic Layout, Short Messaging Services and Networking

Unit Objectives

At the end of this unit, you will be able to:

1. Learn to create different layouts
2. Understand messaging services - sending and processing SMS
3. Learn to perform networking operations by implementing a simple application in Android studio

3.1.1 Basic Layout

- A layout can also be defined as a display other layout classes like linear layout, table layout, buttons, etc.

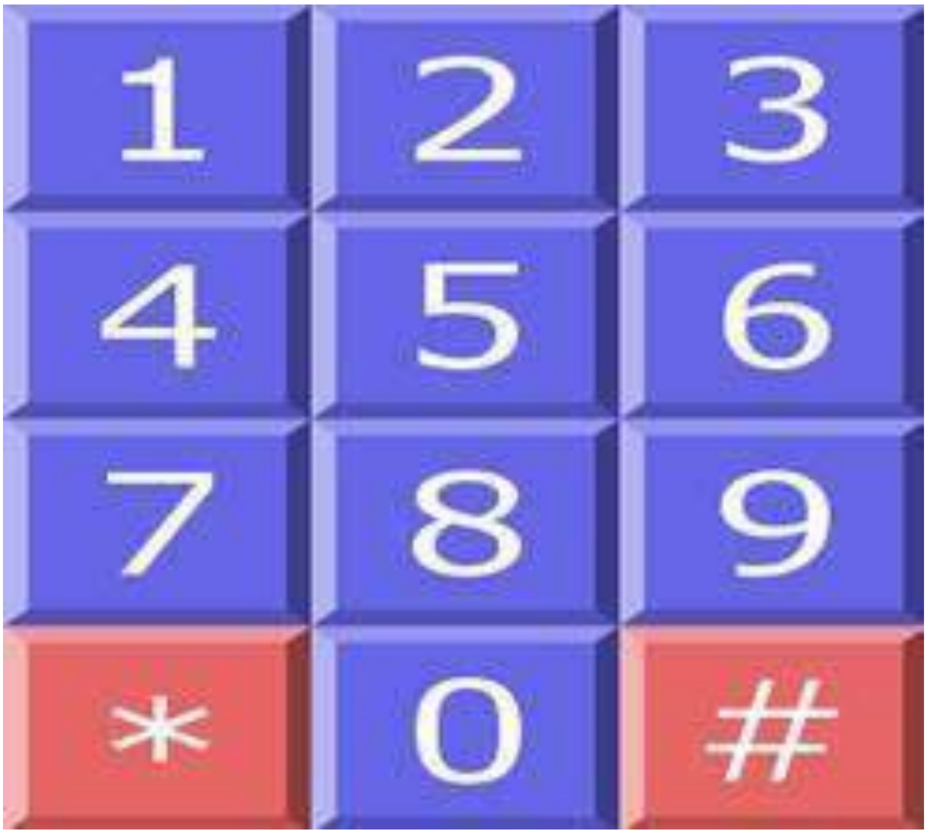


Fig. 3.1.1 Layout

- A layout can also be defined as a display like other layout classes like linear layout, table layout, buttons, etc.

3.1.2 Basic Syntax

xmlns:android

It provides the android namespace. Adding this namespace to our layout provides access to the attributes. The attribute should always be set to

xmlns:android="http://schemas.android.com/apk/res/android.

android:layout_weight

It assigns an importance value in terms of how much space should occupy the interface. Height and width being examples of weight.

In relative layout

android:layout_alignParentTop – if "true", it makes the top edge of the view

android:layout_centerVertical – If "true", the child is centered vertically

android:layout_below – positions the top edge of this view below the view but with a specified ID

android:layout_toRightOf – position left edge of the view to the right with a specified ID

match_parent

if we set a layout weight, i.e width and height as match_parent, it will occupy the whole area as the parent view. fill_parent is same as that of the match_parent but it should be used below API level 8

wrap_text

It is used when the whole text has to be shown in a given weight of space.

Colour

It is an XML resource that carries a hexadecimal Colour

Id

It is an XML resource that provides a unique identity for application resources.

dp

It is also known as Density independent pixels which depend upon physical density of the screen. 1dp is roughly equal to 1px (pixel).

sp

It is also known as scale-independent pixels. Here the dimensions are scaled according to user's font size preferences.

- While using "dp" and "sp", we should be aware what suffix should be used where so as to make the output look aesthetically pleasing although either one of them can be used. Since "dp" means density independent, therefore it should be used when writing a "button". For instance:

```
<Button android:layout_width="wrap_content"
   android:layout_height="wrap_content"
   android:text="@string/clickme"
   android:layout_marginTop="20dp" />
```

And "sp" should be used when defining text size. For instance:

```
<TextView  android:layout_width="match_parent"
```

Click the QR code to view the video on how to learn android application Development

```
    android:layout_height="wrap_content"
    android:textSize="20sp" />
```

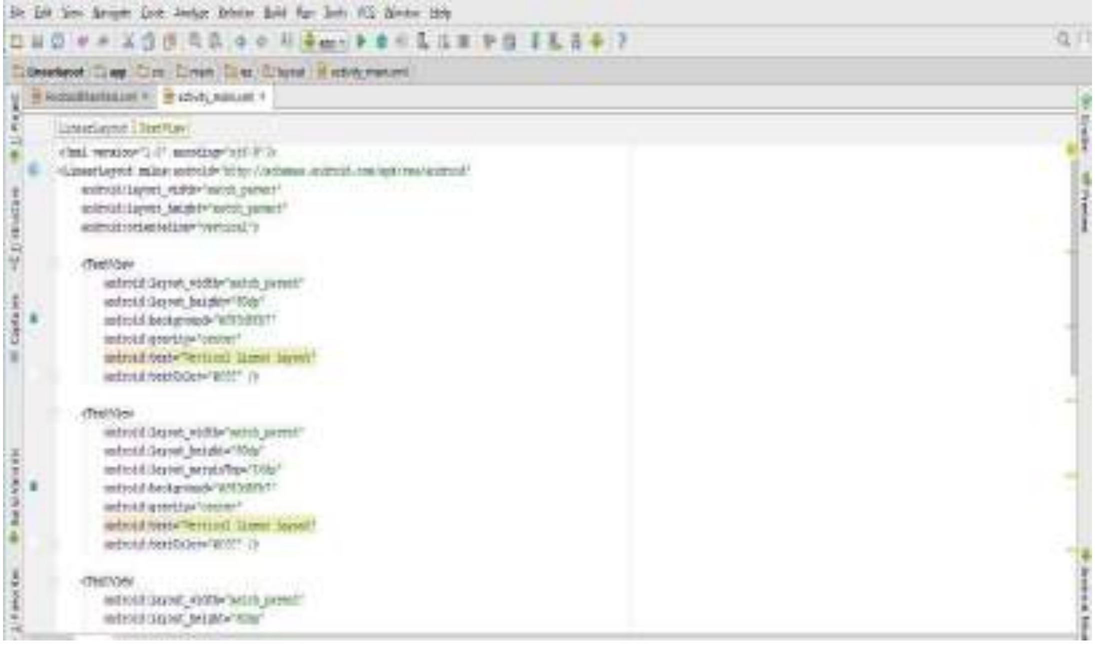
3.1.3 Linear Layout

- Linear layout is the simple and most basic layout.
- It is arranged in both horizontal direction and vertical direction. We will study the code for both the layouts and then run on the emulator to check the application.

Vertical Layout

Procedure:

- Start Android Studio and create a new project like we did earlier
- Name the file as vertical layout.
- Create a new Layout resource file.
- Name it as “activity_main” and hit enter. An “activity_main.xml” file will be created. Now in the file setup the emulator like we studied in the previous chapter. That being ready, type the following code in the workspace window:



```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical">

    <TextView
        android:layout_width="match_parent"
        android:layout_height="[illegible]"
        android:background="[illegible]"
        android:gravity="center"
        android:text="Vertical linear layout"
        android:textColor="[illegible]" />

    <TextView
        android:layout_width="match_parent"
        android:layout_height="[illegible]"
        android:layout_marginTop="[illegible]"
        android:background="[illegible]"
        android:gravity="center"
        android:text="Vertical linear layout"
        android:textColor="[illegible]" />

    <TextView
        android:layout_width="match_parent"
        android:layout_height="[illegible]"
```

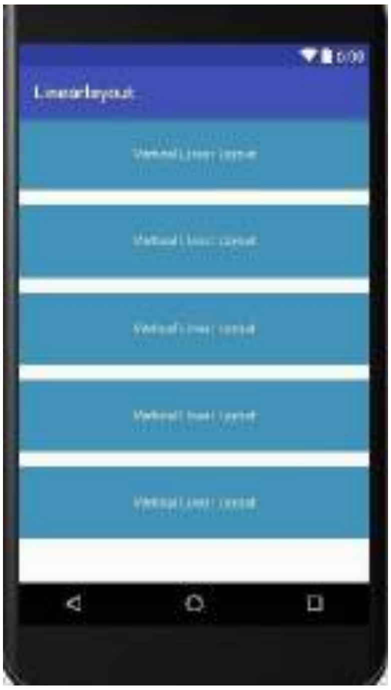
Fig. 5.1.2 Linear layout

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientati on="vertical">
```

```
<LinearLayout    xmlns:android="http://schemas.android.com/apk/res/android"
        android:layout_width="match_parent"
```

```
<TextView
    android:layout_width="match_parent"
    android:layout_height="80dp"
    android:background="#f83d8fb7"
    android:gravity="center"
    android:text="Vertical Linear Layout"
    android:textColour="#fff" />

<TextView
    android:layout_width="match_parent"
    android:layout_height="80dp"
    android:layout_marginTop="16dp"
    android:background="#f83d8fb7"
    android:gravity="center"
    android:text="Vertical Linear Layout"
    android:textColour="#fff" />

<TextView
    android:layout_width="match_parent"
    android:layout_height="80dp"
    android:layout_marginTop="16dp"
    android:background="#f83d8fb7"
    android:gravity="center"
    android:text="Vertical Linear Layout"
    android:textColour="#fff" />

<TextView
    android:layout_width="match_parent"
    android:layout_height="80dp"
    android:layout_marginTop="16dp"
    android:background="#f83d8fb7"
    android:gravity="center"
    android:text="Vertical Linear Layout"
    android:textColour="#fff" />
    <TextView
        android:layout_width="match_parent"
        android:layout_height="80dp"
        android:layout_marginTop="16dp"
        android:background="#f83d8fb7"
        android:gravity="center"
        android:text="Vertical Linear Layout"
        android:textColour="#fff" />

</LinearLayout>
```

- After you paste the code, "run" it.
- You will get the following output:

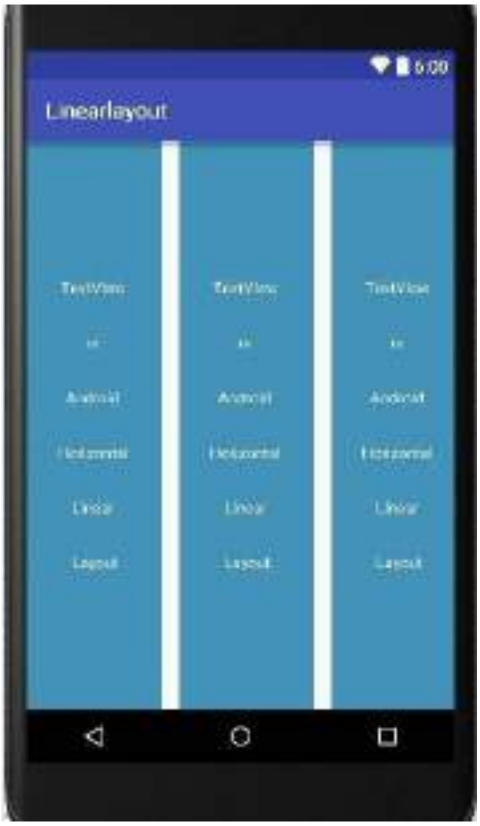


Horizontal Layout

- Follow the same procedure as of the vertical layout.
- Again, create a new Layout resource file and name it
- In the workspace type the following code:

```
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="horizontal">

    <TextView
        android:layout_width="121dp"
        android:layout_height="match_parent"
        android:background="#f83d8fb7"
        android:gravity="center"
        android:text="TextView \n\n\nin \n\n\nAndroid \n\n\nHorizontal \n\n\nLinear \n\n\nLayout"
        android:textColour="#fff" />

    <TextView
        android:layout_width="121dp"
        android:layout_height="match_parent"
        android:layout_marginLeft="16dp"
        android:background="#f83d8fb7"
        android:gravity="center"
        android:text="TextView \n\n\nin \n\n\nAndroid \n\n\nHorizontal \n\n\nLinear \n\n\nLayout"
        android:textColour="#fff" />

    <TextView
        android:layout_width="121dp"
        android:layout_height="match_parent"
        android:layout_marginLeft="16dp"
        android:background="#f83d8fb7"
        android:gravity="center"
        android:text="TextView \n\n\nin \n\n\nAndroid \n\n\nHorizontal \n\n\nLinear \n\n\nLayout"
        android:textColour="#fff" />
</LinearLayout>
```

- Run the program
- The output obtained will be as under:

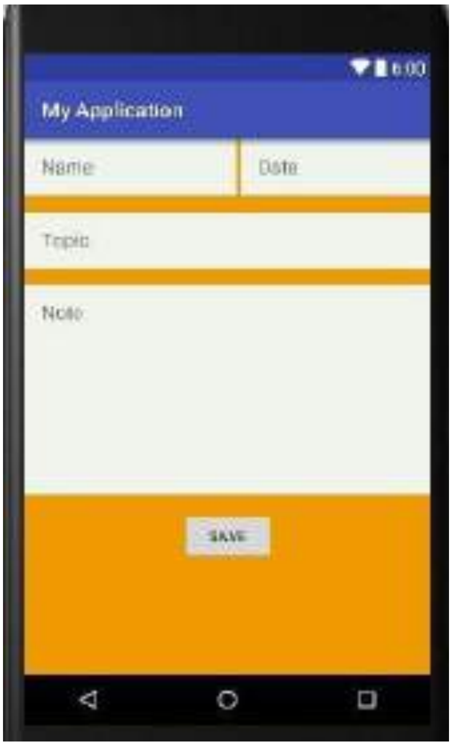


3.1.4 Relative Layout

- Relative layout displays the child views in relative positions.
- The procedure for creating the relative layout is same.
- Type the following code in the workspace
- You can change the values as you desire

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#ef9b00"
    android:orientation="vertical">
    <EditText
        android:id="@+id/name"
        android:layout_width="200dp"
        android:layout_height="wrap_content"
        android:background="#f8eff8f3"
        android:hint="Name"
        android:padding="16dp" />
    <EditText
        android:id="@+id/email"
        android:layout_width="180dp"
        android:layout_height="wrap_content"
        android:layout_marginLeft="5dp"
        android:layout_toRightOf="@+id/name"
        android:background="#f8eff8f3"
        android:hint="Address"
        android:padding="16dp" />
    <EditText
        android:id="@+id/subject"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_below="@+id/name"
        android:layout_marginTop="16dp"
        android:background="#f8eff8f3"
        android:hint="Subject"
        android:padding="16dp" />
    <EditText
        android:id="@+id/message"
        android:layout_width="match_parent"
        android:layout_height="200dp"
        android:layout_below="@+id/subject"
        android:layout_marginTop="16dp"
        android:background="#f8eff8f3"
        android:gravity="top"
        android:hint="Message"
        android:padding="16dp" />
    <Button
        android:id="@+id/submit"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@+id/message"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="16dp"
        android:padding="16dp"
        android:text="Submit" />
</RelativeLayout>
```

- The output hence obtained is:



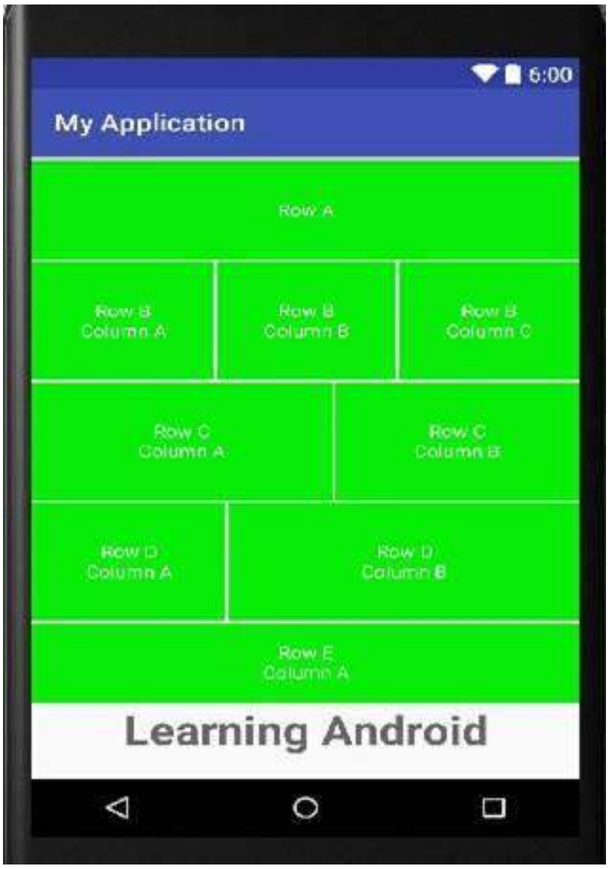
3.1.5 Table Layout

- Table layout is used to display child views in rows and columns.
- Image, text, button view can be shown in different child views through table layout.
- Again, create a new project with the desired name
- In the layout file type the following code:

```
<?xml version="1.0" encoding="utf-8"?>
<TableLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/table_layout"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
    <TableRow
        android:id="@+id/row_1"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:layout_marginTop="4dp"
        android:background="#ed8404">
        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_weight="1"
            android:gravity="center"
            android:padding="32dp"
            android:text="Row 1"
            android:textColour="#fff" />
    </TableRow>
    <TableRow
        android:id="@+id/row_2"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:layout_marginTop="2dp">
        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_weight="1"
            android:background="#ed8404"
            android:gravity="center"
            android:padding="32dp"
            android:text="Row 2\nColumn 1"
            android:textColour="#fff" />
        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_marginLeft="2dp"
            android:layout_marginRight="2dp"
            android:layout_weight="1"
            android:background="#ed8404"
            android:gravity="center"
            android:padding="32dp"
            android:text="Row 2\nColumn 2"
            android:textColour="#fff" />
        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_weight="1"
            android:background="#ed8404"
            android:gravity="center"
            android:padding="32dp"
            android:text="Row 2\nColumn 3"
            android:textColour="#fff" />
    </TableRow>
    <TableRow
        android:id="@+id/row_3"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:layout_marginTop="2dp">
        <TextView
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_marginRight="2dp"
            android:layout_weight="2"
            android:background="#ed8404"
```

```
        android:gravity="center"
        android:padding="32dp"
        android:text="Row 3\nColumn 1"
        android:textColour="#fff" />
      <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_weight="1"
        android:background="#ed8404"
        android:gravity="center"
        android:padding="32dp"
        android:text="Row 3\nColumn 2"
        android:textColour="#fff" />
    </TableRow>
    <TableRow
      android:id="@+id/row_4"
      android:layout_width="match_parent"
      android:layout_height="match_parent"
      android:layout_marginTop="2dp">
      <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_marginRight="2dp"
        android:layout_weight="1"
        android:background="#ed8404"
        android:gravity="center"
        android:padding="32dp"
        android:text="Row 4\nColumn 1"
        android:textColour="#fff" />
      <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_weight="10"
        android:background="#ed8404"
      android:gravity="center"
      android:padding="32dp"
      android:text="Row 4\nColumn 2"
      android:textColour="#fff" />
  </TableRow>
  <TableRow
    android:id="@+id/row_5"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:layout_marginTop="2dp">
    <TextView
      android:layout_width="match_parent"
      android:layout_height="wrap_content"
      android:layout_weight="1"
      android:background="#ed8404"
      android:gravity="center"
      android:padding="16dp"
      android:text="Row 5\nColumn 1"
      android:textColour="#fff" />
  </TableRow>
  <LinearLayout>
    <TextView
      android:layout_width="match_parent"
      android:layout_height="wrap_content"
      android:gravity="center"
      android:padding="4dp"
      android:text="ViralAndroid.com"
      android:textColour="#666"
      android:textSize="33sp"
      android:textStyle="bold" />
  </LinearLayout>
</TableLayout>
```

- Output:



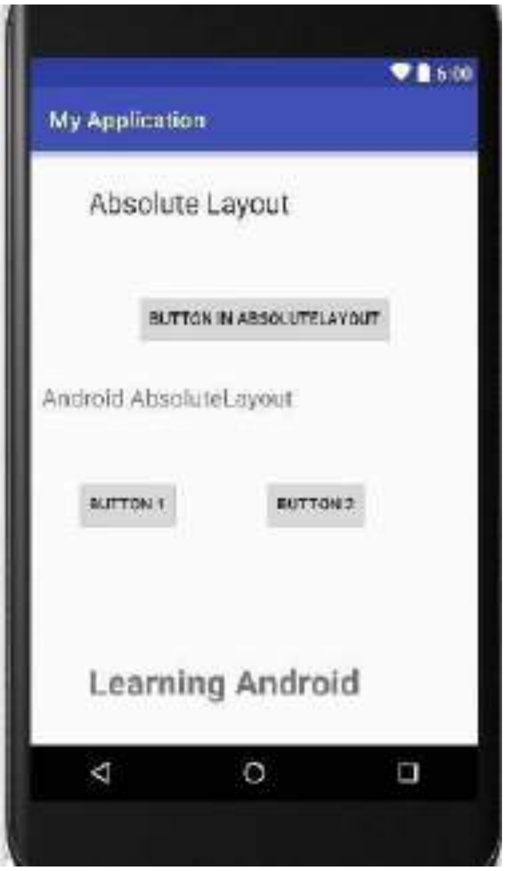
3.1.5 Absolute Layout

- Create a new project and name it absolute layout
- In the layout resource file, type the following code

```
<?xml version="1.0" encoding="utf-8"?>
<AbsoluteLayout xmlns:android="http://schemas.android.com/apk/res/android"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  android:orientation="vertical">
  <TextView
    android:id="@+id/textViewAbsoluteLayout"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_x="50dp"
    android:layout_y="30dp"
    android:text="AbsoluteLayout Example"
    android:textColour="#333"
    android:textSize="24sp" />
  <Button
    android:id="@+id/buttonAbsoluteLayout"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_x="90dp"
    android:layout_y="120dp"
    android:text="Button in AbsoluteLayout" />
  <TextView
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_x="10dp"
    android:layout_y="200dp"
    android:text="Android AbsoluteLayout"
    android:textSize="20sp" />
  <Button
    android:id="@+id/toggleButtonAbsoluteLayout"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_x="38dp"
```

```
        android:layout_y="280dp"
        android:text="Button 1" />
    <Button
        android:id="@+id/toggleButtonAbsoluteLayout1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_x="200dp"
        android:layout_y="280dp"
        android:text="Button 2" />
    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_x="50dp"
        android:layout_y="440dp"
        android:text="unifiers.com"
        android:textSize="30dp"
        android:textStyle="bold" />
</AbsoluteLayout>
```

- Output:



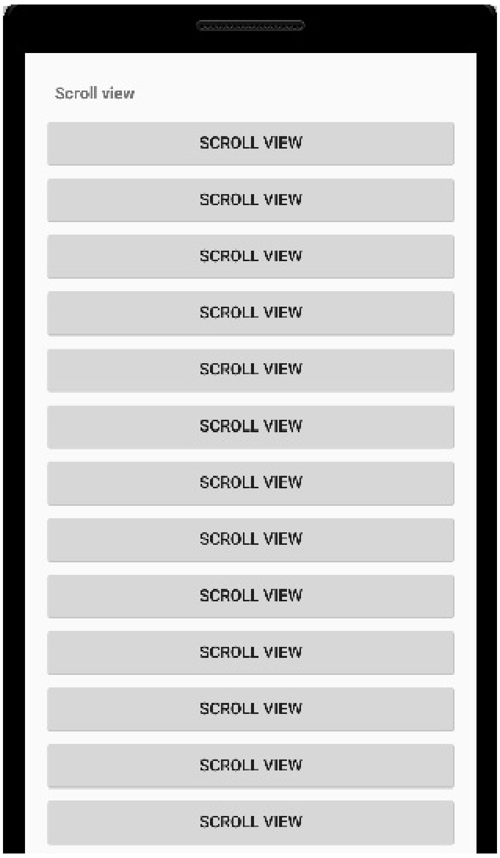
3.1.6 Scroll view

- Create a new project with the name “scroll view”
- In the Layout Resource file type the following code.

```
<?xml version="1.0" encoding="utf-8"?>
<ScrollView xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
    <LinearLayout
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:layout_margin="16dp"
        android:orientation="vertical">
        <TextView
            android:layout_width="fill_parent"
            android:layout_height="fill_parent"
    android:padding="10dp"
    android:text="Android ScrollView Example"
    android:textStyle="bold" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="Android ScrollView Example" />
<Button
```

```
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:text="Android ScrollView Example" />
     <Button
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:text="Android ScrollView Example" />
     <Button
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:text="Android ScrollView Example" />
     <Button
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:text="Android ScrollView Example" />
     <Button
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:text="Android ScrollView Example" />
     <Button
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:text="Android ScrollView Example" />
     <Button
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:text="Android ScrollView Example" />
  </LinearLayout>
</ScrollView>
```

- Output:



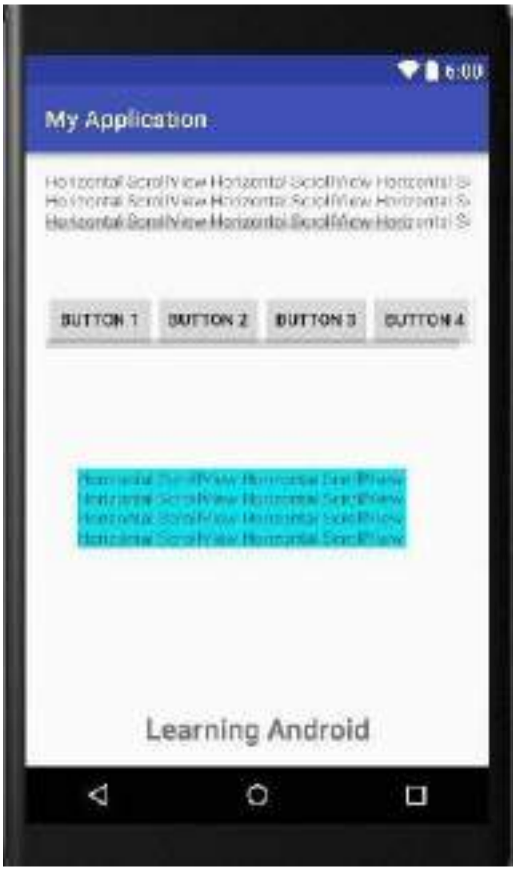
3.1.7 Horizontal Scroll View

- Create a new project and name it horizontal layout
- In the layout resource file, type the following code

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout  xmlns:android="http://schemas.android.com/apk/res/android"
```

```
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:layout_margin="16dp"
    android:orientation="vertical">

    <HorizontalScrollView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content">
        <TextView
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
                android:text="Android Horizontal ScrollView Example Android Horizontal ScrollView Example Android
Horizontal ScrollView Example\nAndroid Horizontal ScrollView Example Android Horizontal ScrollView Example
Android Horizontal ScrollView Example\nAndroid Horizontal ScrollView ExampleAndroid Horizontal ScrollView
ExampleAndroid Horizontal ScrollView Example" />
    </HorizontalScrollView>
    <HorizontalScrollView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="50dp">
        <LinearLayout
            android:layout_width="wrap_content"
            android:layout_height="wrap_content">
            <Button
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Android Button 1" />
            <Button
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Android Button 2" />
            <Button
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Android Button 3" />
            <Button
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
        android:text="Android Button 4" />
    </LinearLayout>
  </HorizontalScrollView>
  <HorizontalScrollView
    android:layout_width="300dp"
    android:layout_height="wrap_content"
    android:layout_gravity="center"
    android:layout_marginTop="100dp">
    <LinearLayout
      android:layout_width="wrap_content"
      android:layout_height="wrap_content"
      android:background="#e4a526">
      <TextView
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
            android:text="Android Horizontal ScrollView Example Android Horizontal ScrollView Example\nAndroid Horizontal ScrollView ExampleAndroid Horizontal ScrollView Example\nAndroid Horizontal ScrollView ExampleAndroid Horizontal ScrollView Example\nAndroid Horizontal ScrollView ExampleAndroid Horizontal ScrollView Example" />
    </LinearLayout>
  </HorizontalScrollView>
  <TextView
    android:layout_width="match_parent"
    android:layout_height="fill_parent"
    android:gravity="center|bottom"
    android:text="unifiers.com"
    android:textSize="24sp"
    android:textStyle="bold" />
</LinearLayout>
```

- Output:

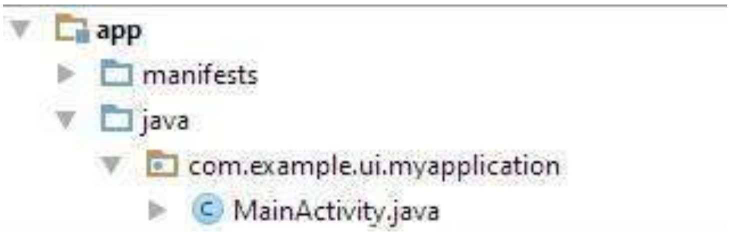

6:00
My Application
Horizontal ScrollView Horizontal ScrollView Horizontal S
Horizontal ScrollView Horizontal ScrollView Horizontal S
Horizontal ScrollView Horizontal ScrollView Horizontal S
BUTTON 1
BUTTON 2
BUTTON 3
BUTTON 4
Horizontal ScrollView Horizontal ScrollView
Horizontal ScrollView Horizontal ScrollView
Horizontal ScrollView Horizontal ScrollView
Horizontal ScrollView Horizontal ScrollView
Learning Android

3.1.8 Simple Android List View

- Create a new project and name it simple list view
- In the layout resource file, type the following code

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/android_simple_listview_example"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical">
    <ListView
        android:id="@+id/android:list"
        android:layout_width="match_parent"
        android:layout_height="wrap_content" />
</LinearLayout>
```

- Now after you finish typing the above code, go to the Java Activity File

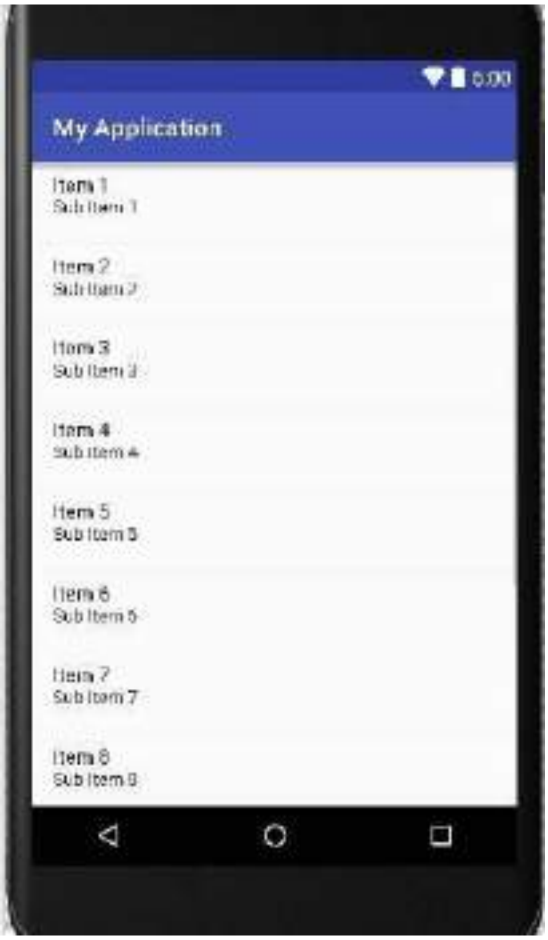


```
▼ app
    ▶ manifests
    ▼ java
        ▼ com.example.ui.myapplication
            ▶ MainActivity.java
```

- In the file, type the following java code:

```
import android.app.ListActivity;
import android.os.Bundle;
import android.view.View;
import android.widget.ArrayAdapter;
import android.widget.ListView;
import android.widget.Toast;

public class SimpleListViewExample extends ListActivity {
    String[] listViewItems = {"ListView", "Java Programming", "Android Material Design",
            "ListView",  "ListView/Learning  Android",  "ListView",
            "Java Programming", "Android Material Design", "ListView",
            "ListView/Learning Android",  "ListView", "Java Programming",
        "Android Material Design", "ListView",
        "ListView/Learning Android"
    };
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.simple_listview);
        setListAdapter(new ArrayAdapter<String>(this, android.R.layout.simple_list_item_A, listViewItems));
    }
    @Override
    protected void onListItemClick(ListView A, View v, int position, long id) {
        super.onListItemClick(A, v, position, id);
        Toast.makeText(this, "You have selected : " + listViewItems[position], Toast.LENGTH_LONG).show();
    }
}
```

- Output:



0:00

My Application

Item 1
Sub Item 1

Item 2
Sub Item 2

Item 3
Sub Item 3

Item 4
Sub Item 4

Item 5
Sub Item 5

Item 6
Sub Item 6

Item 7
Sub Item 7

Item 8
Sub Item 8

3.1.9 Edit Text

- Create a new project and name it Edit text
- In the layout resource file, type the following code

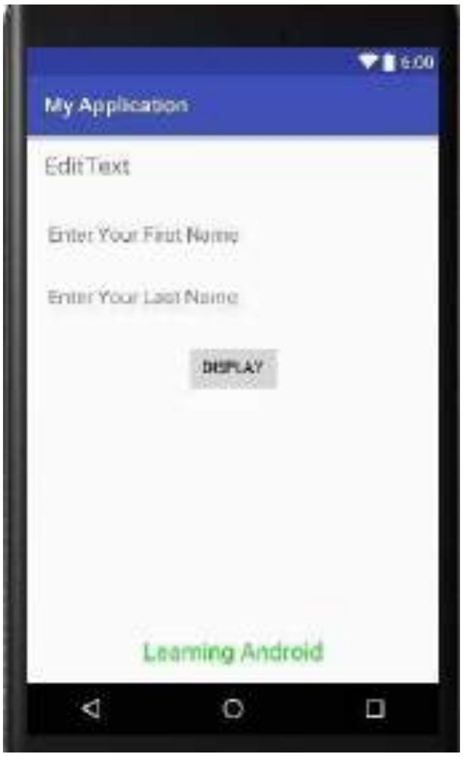
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  android:layout_margin="16dp"
  android:gravity="center_horizontal"
  android:orientation="vertical">
  <TextView
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:layout_marginBottom="30dp"
    android:text="Android EditText Example"
    android:textSize="22sp" />
  <EditText
    android:id="@+id/firstName"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:hint="Enter Your First Name" />
  <EditText
    android:id="@+id/lastName"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:layout_marginTop="16dp"
    android:hint="Enter Your Last Name" />
  <Button
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="20dp"
    android:onClick="display"
    android:text="Display" />
  <TextView
    android:id="@+id/displayName"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="16dp"
```

```
        android:textColour="#e60404"
        android:textSize="22sp" />
    <TextView
        android:layout_width="fill_parent"
        android:layout_height="fill_parent"
        android:gravity="center|bottom"
        android:text="unifiers.com"
        android:textColour="#e60404"
        android:textSize="22sp" />
</LinearLayout>
```

- Now type the below java code into the MainActivity.java:

```
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.EditText;
import android.widget.TextView;

public class AndroidEditTextExample extends AppCompatActivity {
    EditText firstName, lastName;
    TextView displayname;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.edittext_example);
        firstName = (EditText) findViewById(R.id.firstName);
        lastName = (EditText) findViewById(R.id.lastName);
        displayname = (TextView) findViewById(R.id.displayName);
    }

    public void display(View view) {
        String getFirstName = firstName.getText().toString();
        String getLastName = lastName.getText().toString();
        displayname.setText("My Name is " + getFirstName + " " + getLastName);
    }
}
```

- Output:



3.1.10 Check Box

- Create a new project and name it Check box
- In the layout resource file, type the following code

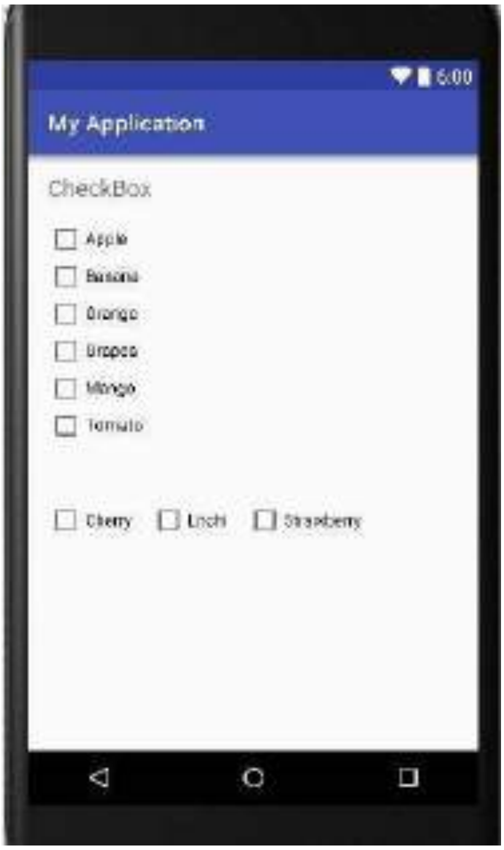
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical"
    android:paddingBottom="@dimen/activity_vertical_margin"
    android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    tools:context=".MainActivity">
    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginBottom="16dp"
        android:text="Android CheckBox Example"
        android:textSize="20sp" />
    <CheckBox
        android:id="@+id/checkBox"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:onClick="androidCheckBoxClicked"
        android:text="Android" />
    <CheckBox
        android:id="@+id/checkBox2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:onClick="androidCheckBoxClicked"
        android:text="Java" />
    <CheckBox
        android:id="@+id/checkBox3"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:onClick="androidCheckBoxClicked"
        android:text="XML" />
    <CheckBox
        android:id="@+id/checkBox4"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:onClick="androidCheckBoxClicked"
        android:text="HTML" />
    <CheckBox
        android:id="@+id/checkBox5"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:onClick="androidCheckBoxClicked"
        android:text="CSS" />
    <CheckBox
        android:id="@+id/checkBox6"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:onClick="androidCheckBoxClicked"
        android:text="jQuery" />
    <LinearLayout
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:layout_marginTop="50dp"
        android:orientation="horizontal">
        <CheckBox
            android:id="@+id/checkBox7"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:onClick="androidCheckBoxClicked"
            android:text="Java" />
        <CheckBox
            android:id="@+id/checkBox8"
            android:layout_width="wrap_content"
```

```
            android:layout_height="wrap_content"
            android:layout_marginLeft="16dp"
            android:layout_marginRight="16dp"
            android:onClick="androidCheckBoxClicked"
            android:text="PHP" />
        <CheckBox
            android:id="@+id/checkBox9"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:onClick="androidCheckBoxClicked"
            android:text="ASP" />
    </LinearLayout>
</LinearLayout>
```

- Type the following code in MainActivity.java and Run:

```
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.CheckBox;
public class MainActivity extends AppCompatActivity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
    public void androidCheckBoxClicked(View view) {
        // action for checkbox click
        switch (view.getId()) {
            case  R.id.checkBox:
                //DO something when user check the box
                break;
            case  R.id.checkBox2:
                //DO something when user check the box
                break;
            case  R.id.checkBox3:
                //DO something when user check the box
                break;
            case R.id.checkBox4:
                //DO something when user check the box
                break;
            case R.id.checkBox5:
                //DO something when user check the box
                break;
            case R.id.checkBox6:
                //DO something when user check the box
                break;
            case R.id.checkBox7:
                //DO something when user check the box
                break;
            case R.id.checkBox8:
                //DO something when user check the box
                break;
            case R.id.checkBox9:
                //DO something when user check the box
                break;
        }
    }
}
```

- Output:



3.1.11 Date Picker

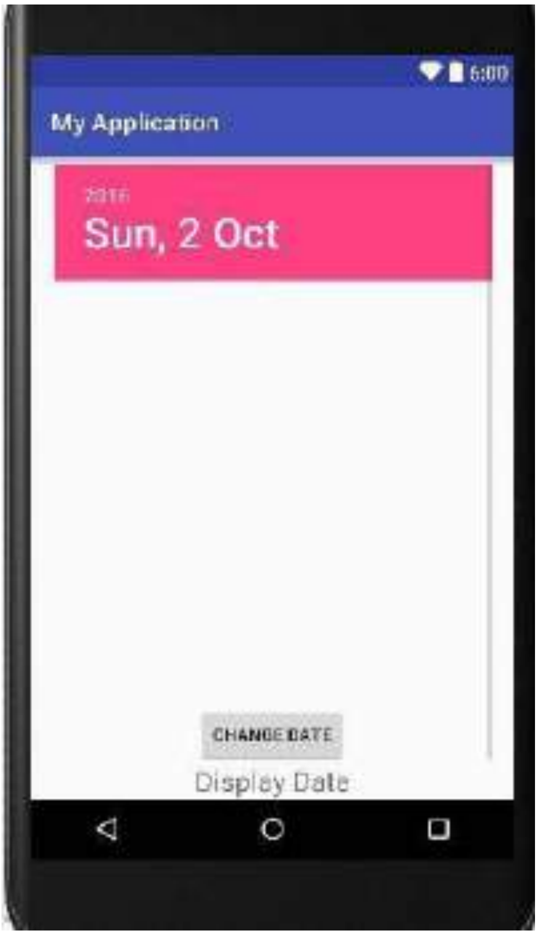
- Create a new project and name it Date Picker
- In the layout resource file, type the following code

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:id="@+id/android_date_picker"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:layout_marginTop="5dp"
    android:gravity="center_horizontal"
    android:orientation="vertical"
    tools:context=".MainActivity">
    <ScrollView
        android:layout_width="wrap_content"
        android:layout_height="match_parent">
        <LinearLayout
            android:layout_width="wrap_content"
            android:layout_height="match_parent"
            android:gravity="center_horizontal"
            android:orientation="vertical">
            <DatePicker
                android:id="@+id/datePicker"
                android:layout_width="wrap_content"
                android:layout_height="match_parent" />
            <Button
                android:id="@+id/change_date_button"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Change Date" />
            <TextView
                android:id="@+id/display_date"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Display Date"
                android:textSize="22sp" />
            <TextView
                android:layout_width="fill_parent"
                android:layout_marginTop="5dp"
                android:layout_height="fill_parent"
                android:gravity="center|bottom"
                android:text="unifiers.com"
                android:textSize="24sp"
                android:textStyle="bold" />
        </LinearLayout>
    </ScrollView>
</LinearLayout>
```

- The java activity file is as under:

```
import  android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;
import android.widget.DatePicker;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {
    DatePicker datePicker;
    TextView displayDate;
    Button changeDate;
    int   month;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        datePicker = (DatePicker) findViewById(R.id.datePicker);
        displayDate = (TextView)  findViewById(R.id.display_date);
        displayDate.setText("Display Date");
        changeDate  =  (Button)  findViewById(R.id.change_date_button);
        displayDate.setText(currentDate());
        changeDate.setOnClickListener(new  View.OnClickListener() {
          @Override
          public void onClick(View view) {
            displayDate.setText(currentDate());
          }
        });
    }

    public String currentDate() {
        StringBuilder mcurrentDate = new StringBuilder();
        month = datePicker.getMonth() + 1;
        mcurrentDate.append("Date: " + month + "/" + datePicker.getDayOfMonth() + "/" + datePicker.getYear());
        return mcurrentDate.toString();
    }
}
```

- Output:



3.1.12 Time Picker

- Create a new project and name it Time Picker
- In the layout resource file, type the following code

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
  xmlns:tools="http://schemas.android.com/tools"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  android:gravity="center_horizontal"
  android:orientation="vertical"
  android:paddingBottom="@dimen/activity_vertical_margin"
  android:paddingLeft="@dimen/activity_horizontal_margin"
  android:paddingRight="@dimen/activity_horizontal_margin"
  android:paddingTop="@dimen/activity_vertical_margin"
  tools:context=".MainActivity">
  <TimePicker
    android:id="@+id/timePicker"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content" />
  <Button
    android:id="@+id/bchange_time"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Change Time" />
  <TextView
    android:id="@+id/textView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="16dp"
    android:text="Display Current Time"
    android:textSize="22dp" />
  <TextView
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:text="unifiers.com"
    android:gravity="center|bottom"
    android:textStyle="bold" />
</LinearLayout>
```

- The java activity file for time picker user interface is as follows:

```
import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;
import android.widget.TimePicker;

public class MainActivity extends AppCompatActivity {
  TimePicker timePicker;
  TextView displayTime;
  Button changeTime;
  @Override
  protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);
    timePicker = (TimePicker) findViewById(R.id.timePicker);
    displayTime = (TextView) findViewById(R.id.textView);
    changeTime = (Button) findViewById(R.id.bchange_time);
    timePicker.setIs24HourView(true);
    displayTime.setText(currentTime());
    changeTime.setOnClickListener(new  View.OnClickListener() {
      @Override
      public void onClick(View view) {
        displayTime.setText(currentTime());
      }
     });
  }
  public String currentTime() {
    String mcurrentTime = "Time: " + timePicker.getCurrentHour() + ":" + timePicker.getCurrentMinute();
    return mcurrentTime;
  }
}
```

- Output:

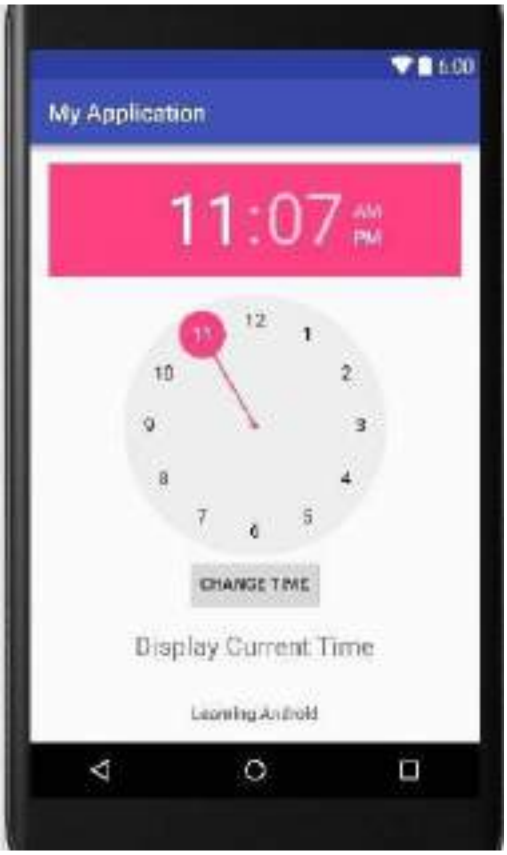


Fig 3.1.12 app displaying time using time picker

3.1.13 Calendar View

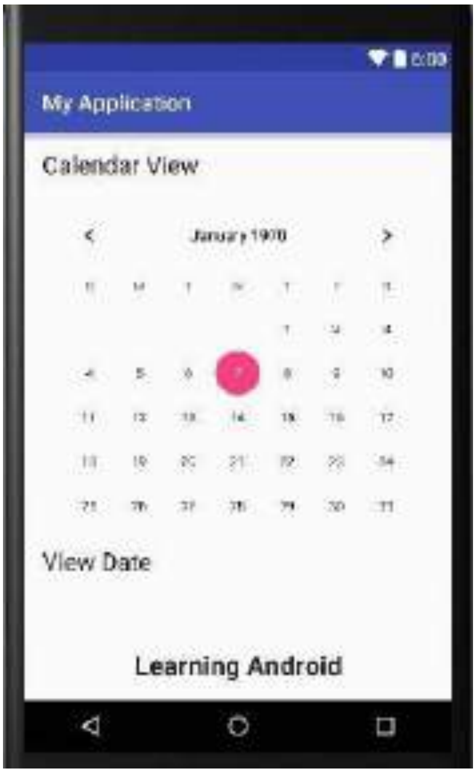
- Create a new project and name it Calendar View
- In the layout resource file, type the following code

```
<?xml version=”1.0” encoding=”utf-8”?>
<LinearLayout xmlns:android=”http://schemas.android.com/apk/res/android”
    android:layout_width=”match_parent”
    android:layout_height=”match_parent”
    android:layout_margin=”16dp”
    android:orientation=”vertical”
    android:scrollbars=”vertical”>
    <TextView
        android:id=”@+id/textView8”
        android:layout_width=”wrap_content”
        android:layout_height=”wrap_content”
        android:text=”Android Calendar View Example”
        android:textAppearance=”?android:attr/textAppearanceLarge”   />
    <CalendarView
        android:id=”@+id/calendarView”
        android:layout_width=”match_parent”
        android:layout_height=”300dp”
        android:layout_marginBottom=”16dp”
        android:layout_marginTop=”16dp” />
    <TextView
        android:id=”@+id/date_display”
        android:layout_width=”wrap_content”
        android:layout_height=”wrap_content”
        android:text=”Calendar View Date Display”
        android:textAppearance=”?android:attr/textAppearanceLarge” />
    <TextView
        android:id=”@+id/textView9”
        android:layout_width=”fill_parent”
        android:layout_height=”fill_parent”
        android:autoLink=”web”
        android:gravity=”bottom|center”
        android:text=”unifiers.com”
        android:textAppearance=”?android:attr/textAppearanceLarge”
        android:textSize=”24sp”
        android:textStyle=”bold” />
</LinearLayout>
```

- The java activity file for the above view is as under:

```
import android.support.v7.app.AppCompatActivity;
import android.widget.CalendarView;
import android.widget.TextView;
import android.widget.Toast;

public class CalendarViewExample  extends AppCompatActivity {
    CalendarView calendarView;
    TextView dateDisplay;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.android_calendar_view_example);
        calendarView = (CalendarView) findViewById(R.id.calendarView);
        dateDisplay = (TextView) findViewById(R.id.date_display);
        dateDisplay.setText(“Date: “);
        calendarView.setOnDateChangeListener(new CalendarView.OnDateChangeListener() {
            @Override
            public void onSelectedDayChange(CalendarView calendarView, int i, int i1, int i2) {
                dateDisplay.setText(“Date:  “ + i2 + “ / “ + i1 + “ / “ + i);
                Toast.makeText(getApplicationContext(), “Selected Date:\n” + “Day = “ + i2 + “\n” + “Month = “ + i1 + “\n”
+ “Year = “ + i, Toast.LENGTH_LONG).show();
            }
        });
    }
}
```

- Output:



3.1.14 Sending SMS

- In android, SMS can be sent using either SmsManager API or device's built in SMS application to send SMS.
- Code for sending SMS in the SMS manager:

```
SmsManager smsManager = SmsManager.getDefault();
smsManager.sendTextMessage("phoneNo", null, "sms message", null, null);
```

- Code for sending SMS through built-in application

```
Intent sendIntent = new Intent(Intent.ACTION_VIEW);
sendIntent.putExtra("sms_body", "default content");
sendIntent.setType("vnd.android-dir/mms-sms");
startActivity(sendIntent);
```

To send an SMS we need the permission for which the code is as follows:

```
<uses-permission android:name="android.permission.SEND_SMS" />
```

Creating a messaging project

1. Open Android studio
2. Create an android application and name it *abc* under a package com.example.abc.
3. Target SDK and compile with the latest version of SDK
4. Modify src/MainActivity.java file to add required code
5. Modify layout XML file res/layout/activity_main.xml
6. Add any GUI component
7. Modify AndroidManifest.xml as shown below
8. Run the application. It will launch android emulator.
9. Verify

Following is the content of the main activity java file

Src/com.example.abc/MainActivity.java

```
package    com.example.abc;
import     android.os.Bundle;
import  android.app.Activity;
import android.telephony.SmsManager;
import android.util.Log;
import android.view.Menu;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;
public class MainActivity extends Activity {
   Button sendBtn;
   EditText txtphoneNo;
```

```
  EditText txtMessage;
  @Override
  protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);
    sendBtn = (Button) findViewById(R.id.btnSendSMS);
    txtphoneNo = (EditText) findViewById(R.id.editText);
    txtMessage = (EditText) findViewById(R.id.editText2);
    sendBtn.setOnClickListener(new View.OnClickListener() {
      public void onClick(View view) {
        sendSMSMessage();
      }
    });
  }
  protected void sendSMSMessage() {
    Log.i("Send SMS", "");
    String phoneNo = txtphoneNo.getText().toString();
    String message = txtMessage.getText().toString();
    try {
      SmsManager smsManager = SmsManager.getDefault();
      smsManager.sendTextMessage(phoneNo, null, message, null, null);
      Toast.makeText(getApplicationContext(), "SMS sent.", Toast.LENGTH_LONG).show();
    }
    catch (Exception e) {
      Toast.makeText(getApplicationContext(), "SMS faild, please try again.", Toast.LENGTH_LONG).show();
      e.printStackTrace();
    }
  }
  @Override
  public boolean onCreateOptionsMenu(Menu menu) {
    // Inflate the menu; this adds items to the action bar if it is present.
    getMenuInflater().inflate(R.menu.main, menu);
    return true;
  }
}
```

The XML content is as follows:

```
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
  xmlns:tools="http://schemas.android.com/tools"
  android:layout_width="match_parent"
  android:layout_height="match_parent"
  android:paddingBottom="@dimen/activity_vertical_margin"
  android:paddingLeft="@dimen/activity_horizontal_margin"
  android:paddingRight="@dimen/activity_horizontal_margin"
  android:paddingTop="@dimen/activity_vertical_margin"
  tools:context="MainActivity">
  <TextView
    android:id="@+id/textView1"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Sending SMS Example"
    android:layout_alignParentTop="true"
    android:layout_centerHorizontal="true"
    android:textSize="30dp" />
  <TextView
    android:id="@+id/textView2"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Tutorials point "
    android:textColour="#ff87ff09"
    android:textSize="30dp"
    android:layout_below="@+id/textView1"
    android:layout_alignRight="@+id/imageButton"
    android:layout_alignEnd="@+id/imageButton"   />
  <ImageButton
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:id="@+id/imageButton"
    android:src="@drawable/abc"
    android:layout_below="@+id/textView2"
    android:layout_centerHorizontal="true" />
  <EditText
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:id="@+id/editText"
    android:hint="Enter Phone Number"
    android:phoneNumber="true"
    android:textColourHint="@colour/abc_primary_text_material_dark"
    android:layout_below="@+id/imageButton"
    android:layout_centerHorizontal="true" />
  <EditText
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:id="@+id/editText2"
    android:layout_below="@+id/editText"
    android:layout_alignLeft="@+id/editText"
    android:layout_alignStart="@+id/editText"
    android:textColourHint="@colour/abc_primary_text_material_dark"
    android:layout_alignRight="@+id/imageButton"
    android:layout_alignEnd="@+id/imageButton"
    android:hint="Enter SMS" />
  <Button
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Send Sms"
    android:id="@+id/btnSendSMS"
    android:layout_below="@+id/editText2"
    android:layout_centerHorizontal="true"
    android:layout_marginTop="48dp" />
</RelativeLayout>
```

Following will be the content of res/values/strings.xml

```
<?xml version="1.0" encoding="utf-8"?>
<resources>
  <string name="app_name">tutorialspoint</string>
  <string name="action_settings">Settings</string>
</resources>
```

Following is the default content of AndroidManifest.xml:

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="com.example.tutorialspoint"
  android:versionCode="1"
  android:versionName="1.0" >
  <uses-sdk
    android:minSdkVersion="8"
    android:targetSdkVersion="22" />
  <uses-permission android:name="android.permission.SEND_SMS" />
  <application
    android:allowBackup="true"
    android:icon="@drawable/ic_launcher"
    android:label="@string/app_name"
    android:theme="@style/AppTheme" >
    <activity
      android:name="com.example.tutorialspoint.MainActivity"
      android:label="@string/app_name" >
      <intent-filter>
        <action android:name="android.intent.action.MAIN" />
        <category android:name="android.intent.category.LAUNCHER" />
      </intent-filter>
    </activity>
  </application>
</manifest>
```

3.1.15 Networking

For this the application manifest must have the following permissions:

```
<uses-permission android:name="android.permission.INTERNET" />
<uses-permission android:name="android.permission.ACCESS_NETWORK_STATE" /
```

- **Choose an HTTP Client**

  The Android possesses the HttpURLConnection client which support the more secure HTTPS, streaming uploads and downloads, configurable timeouts, IPv6 and connection pooling.

- **Check the network connection**

  You should check whether a network connection is available before the application attempts to connect to the network. Use getActiveNetworkInfo( ) and isConnected( ).

```
public void myClickHandler(View view) {
  ...
  ConnectivityManager connMgr = (ConnectivityManager)
    getSystemService(Context.CONNECTIVITY_SERVICE);
  NetworkInfo networkInfo = connMgr.getActiveNetworkInfo();
  if (networkInfo != null && networkInfo.isConnected()) {
    // fetch data
  } else {
    // display error
  }
  ...
}
```

- Performing networking operations on a separate thread

The AsyncTask class provides helps in providing a new task from the UI thread. Now in the following snippet we will see the myClickHandler( ) method invokes new DownloadWebpageTask( ) .execute(stringUrl).

The DownloadWebpageTask uses the following AsyncTask methods:

1. doInBackground( ) executes downloadUrl( ) which processes the web page content and on finishing the task produces a result string.
2. onPostExecute( ) takes the returned string and displays it in the user interface

```
3. public class HttpExampleActivity extends Activity {
    private static final String DEBUG_TAG = "HttpExample";
    private EditText urlText;
    private TextView textView;
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);
        urlText = (EditText) findViewById(R.id.myUrl);
        textView = (TextView) findViewById(R.id.myText);
    }
    // When user clicks button, calls AsyncTask.
    // Before attempting to fetch the URL, makes sure that there is a network connection.
    public void myClickHandler(View view) {
        // Gets the URL from the UI's text field.
        String stringUrl = urlText.getText().toString();
        ConnectivityManager connMgr = (ConnectivityManager)
            getSystemService(Context.CONNECTIVITY_SERVICE);
        NetworkInfo networkInfo = connMgr.getActiveNetworkInfo();
        if (networkInfo != null && networkInfo.isConnected()) {
new  DownloadWebpageTask().execute(stringUrl);
        } else {
            textView.setText("No network connection available.");
    }
  }
  // Uses AsyncTask to create a task away from the main UI thread. This task takes a
  // URL string and uses it to create an HttpUrlConnection. Once the connection
  // has been established, the AsyncTask downloads the contents of the webpage as
  // an InputStream. Finally, the InputStream is converted into a string, which is
  // displayed in the UI by the AsyncTask's onPostExecute method.
  private class DownloadWebpageTask extends AsyncTask<String, Void, String> {
    @Override
    protected String doInBackground(String... urls) {
      // params comes from the execute() call: params[0] is the url.
      try {
        return downloadUrl(urls[0]);
      } catch (IOException e) {
        return "Unable to retrieve web page. URL may be invalid.";
      }
    }
    // onPostExecute displays the results of the AsyncTask.
    @Override
    protected void onPostExecute(String result) {
      textView.setText(result);
    }
  }
  ...
}
```

- Connect and download data
- Use HttpURLConnection to download the data. After calling connect( ) an input stream is obtained by calling getInputStream( )
- The following code will give you an idea of how it might work:

```
// Given a URL, establishes an HttpUrlConnection and retrieves
// the web page content as a InputStream, which it returns as
// a string.
private String downloadUrl(String myurl) throws IOException {
  InputStream is = null;
  // Only display the first 500 characters of the retrieved
  // web page content.
  int len = 500;
```

```
    try {
        URL url = new URL(myurl);
        HttpURLConnection conn = (HttpURLConnection) url.openConnection();
        conn.setReadTimeout(10000 /* milliseconds */);
        conn.setConnectTimeout(15000 /* milliseconds */);
        conn.setRequestMethod("GET");
        conn.setDoInput(true);
        // Starts the query
        conn.connect();
        int response = conn.getResponseCode();
        Log.d(DEBUG_TAG, "The response is: " + response);
        is = conn.getInputStream();
        // Convert the InputStream into a string
        String contentAsString = readIt(is, len);
        return contentAsString;
    // Makes sure that the InputStream is closed after the app is
    // finished using it.
    } finally {
        if (is != null) {
            is.close();
        }
    }
}
```

Exercise

Practice all the layouts and run the code for different set of variables.

Notes

3.1.16 Processor

A processor may be defined as an electrical circuit whose function is to perform operations on some external data source which may usually be a memory or some other data stream. A processor is found in a computer as well as mobile phone and since we are more aligned towards study of mobile phones, so we will be studying about the types of processors used in the phone.

Types of processors

Nvidia Tegra

Tegra comes under a system of chip (SoC) series which is developed by Nvidia for use in personal digital assistants and smartphones. Tegra comprises of an ARM architecture CPU, graphics processing unit (GPU), North Bridge, south bridge, and a memory controller. They are efficient media processors and emphasise the gaming performance without the consumption of the power.

Fig. 3.1.16(i) Nvidia Tegra processor

Northbridge

There are two chips in the core logic chipset architecture on a PC motherboard. One of them is called a Northbridge and the other is called as Southbridge. The application of northbridge is to handle communications among the central processing unit, Random access memory in some cases, video cards and southbridge. In Intel systems, some of the northbridges also have integrated video controllers.

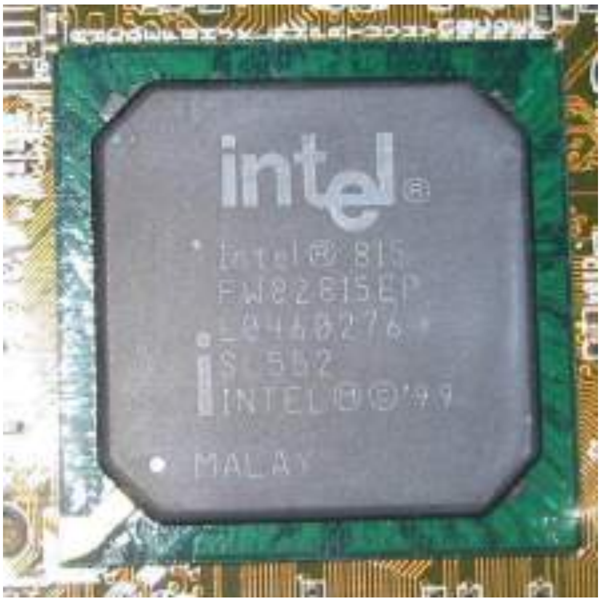


Fig. 3.1.16(ii) Northbridge

Southbridge

The function of southbridge is that it handles all of the computer's input and output functions which include audio, USB etc. Northbridge and southbridge can be placed in any combination on the mother board but keep in mind that they must be designed to work together.

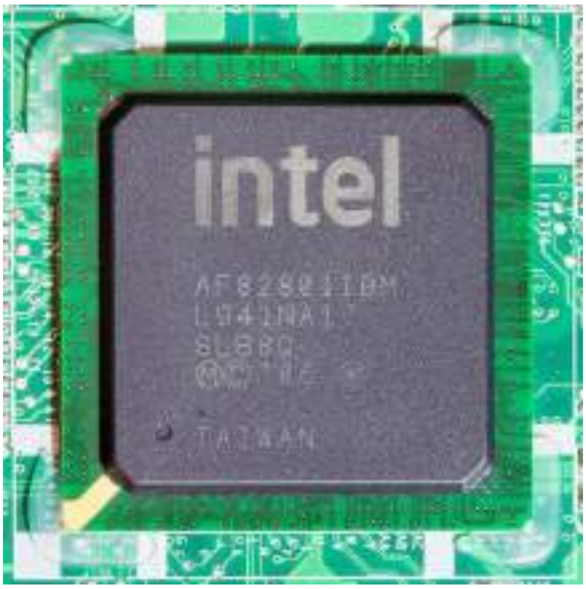


Fig. 3.1.16(ii) Southbridge

3.1.17 Samsung Exynos

Manufactured by Samsung Electronics, Exynos is a series of ARM based system-on-chips (SoCs). It was launched as "Exynos 3 Single" with Samsung Galaxy S smartphone featuring ARM A8 CPU. It followed with Exynos 2 dual, Exynos 3 Quad, Exynos 4 Dual/Quad, Exynos 5 Dual/Hexa/Octa range of processors. The aforementioned processors are from the ARMv7 System on chip (SoC) whereas Exynos 7 Octa, Exynos 8 Octa (and other versions in the Exynos 7/8 processors) are the ARMv8 SoC processors where single, dual, Quad, Hexa and Octa are the number of cores in the processor.

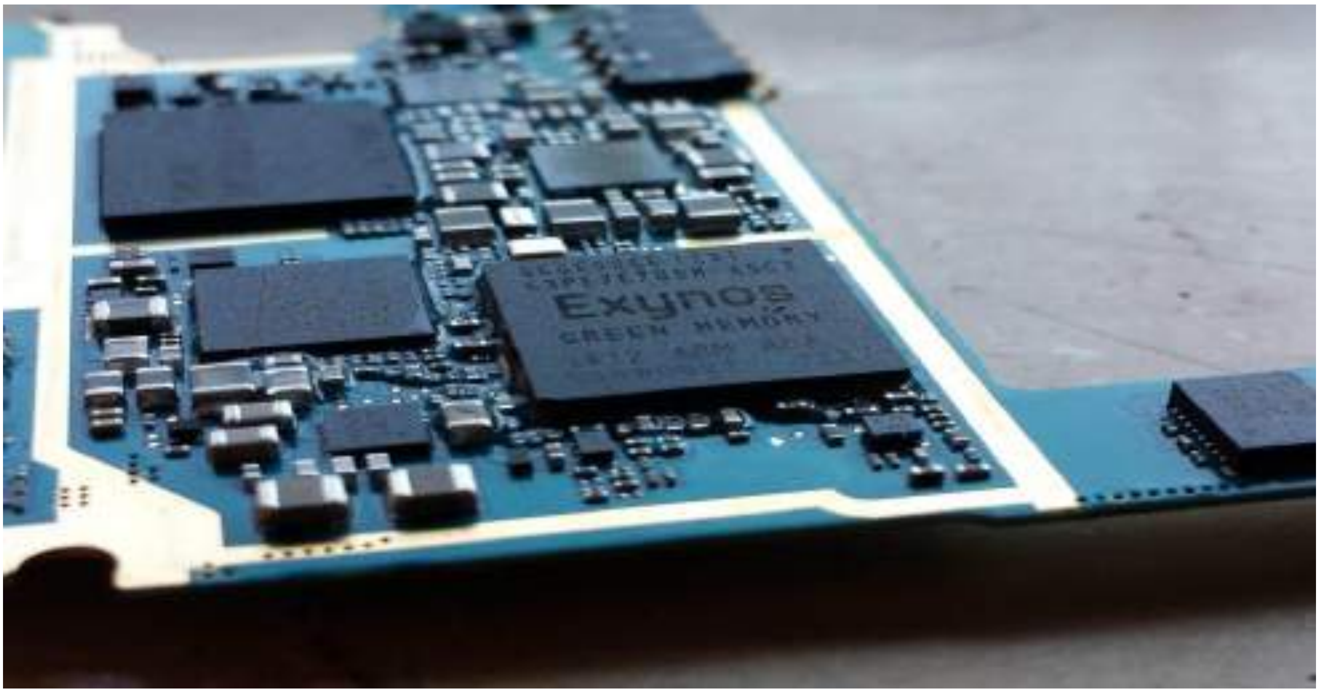


Fig. 3.1.16(iv) Samsung Exynos processor

UNIT 3.2: Data Storage

Unit Objectives

At the end of this unit, you will be able to:

1. Learn about different type of storages
2. Understand how to save the data in the internal as well as external storage

3.2.1 Data Storage

Internal storage

Using java.io file input/output APIs one can read and write files into the Android system. Since internal storage is private and only accessible to the developer, it is specifically kept for the application. To write a file to the internal storage you will use the following commands

```
// Create a file in the Internal Storage
String fileName = "MyFile";
String content = "hello world";
FileOutputStream outputStream = null;
try {
   outputStream = openFileOutput(fileName, Context.MODE_PRIVATE);
   outputStream.write(content.getBytes());
   outputStream.close();
} catch (Exception e) {
   e.printStackTrace();
}
```

On execution of the above code, “MyFile” will be created with content “help world” in the internal storage. You will find this file specified by the application’s package name where the files created will be found in the directory called “files”.

In order to prevent yourself from storing the data into the files continuously, it is useful to create “cache” files. For this use the getCacheDir( ) method to access the cache files. To create the cache files, follow the code given below which will create the cache files in the directory “cache”.

```
String content = "hello world";
File file;
FileOutputStream outputStream;
try {
   // file = File.createTempFile("MyCache", null, getCacheDir());
   file = new File(getCacheDir(), "MyCache");
   outputStream = new FileOutputStream(file);
   outputStream.write(content.getBytes());
   outputStream.close();
} catch (IOException e) {
   e.printStackTrace();
}
```

The storage allocated to the cache files is not more than 1MB. Therefore if the storage for the cache files gets full, the new cache files get overwritten on the old cache files. But it is recommended to delete the cache files manually to free up the space.

To quickly read the files, we execute:

```
BufferedReader input = null;
File file = null;
try {
   file = new File(getCacheDir(), "MyCache"); // Pass getFilesDir() and
"MyFile" to read file
   input = new BufferedReader(new InputStreamReader(new
FileInputStream(file)));
   String line;
   StringBuffer buffer = new StringBuffer();
   while ((line = input.readLine()) != null) {
      buffer.append(line);
   }
   Log.d(TAG, buffer.toString());
} catch (IOException e) {
   e.printStackTrace();
}
```

3.2.2 External Storage

To get the current state of the primary external storage use getExternalStorageState( ) command. Since the external storage is user accessible, there are two ways in which you can save the files,

1. Public files
2. Private files

In order to read/write files to the external storage we need READ_EXTERNAL_STORAGE and WRITE_EXTERNAL_STORAGE permissions.

1. Public files

Public files are those files that stay on the device even if the user does any modification. To save files here, we need getExternalStorageDirectory( ) command which returns the external storage directory and getExternalStoragePublicDirectory( ) which returns a top level public external storage directory where we can save files. So in order to save the file into the external storage execute the following code:

```
String content = "hello world";
File file;
FileOutputStream outputStream;
try {
   file = new File(Environment.getExternalStorageDirectory(), "My-
Cache");
    outputStream = new FileOutputStream(file);
   outputStream.write(content.getBytes());
   outputStream.close();
} catch (IOException e) {
   e.printStackTrace();
}
```

2. Private files

Private files are the files which are accessible for applications and they get deleted as soon as the application is removed. The directories in which the files will be saved are best for saving the private files. To get the appropriate directory path for saving the private files, use getExternalFilesDir( ). Path to the files on the external storage is defined by Android/data/[package name]/files/.

Notes

UNIT 3.3: Working with SQLite

Unit Objectives

At the end of this unit, you will be able to:

1. Learn how to create and load databases
2. Learn to delete and update databases

3.3.1 Saving Data in SQL Database

For repeating or structured data, such as some contact information, it is ideal to save the data on a database. The APIs needed to access the database on Android are available in android.database.sqlite package.

3.3.2 Defining Schema and Contract

A formal declaration of how the data should be arranged in SQLITE database is called as schema. The SQL statements used to create a database will reflect this schema. Creating a contract class helps in specifying the layout of the schema in a systematic way. A contract class, on the other hand, is a class which keeps the constants that are helpful in defining the names for URLs, tables and columns and allows using the same constants across all other packages in the same package. Providing definitions that define the whole class in the root level proves to be an efficient way of organizing a contract class.

Create an inner class for each table that defines its columns one by one. For instance the table name and the column name for a single table can be defined as:

```
public final class FeedReaderContract {
   // To prevent someone from accidentally instantiating the contract class,
   // make the constructor private.
   private FeedReaderContract() {}
   /* Inner class that defines the table contents */
   public static class FeedEntry implements BaseColumns {
      public static final String TABLE_NAME = "entry";
      public static final String COLUMN_NAME_TITLE = "title";
      public static final String COLUMN_NAME_SUBTITLE = "subtitle";
   }
}
```

3.3.3 Creating a Database

After defining how the database should look try creating and maintain database and tables.

```
private static final String TEXT_TYPE = " TEXT";
private static final String COMMA_SEP = ",";
private static final String SQL_CREATE_ENTRIES =
  "CREATE TABLE " + FeedEntry.TABLE_NAME + " (" +
  FeedEntry._ID + " INTEGER PRIMARY KEY," +
  FeedEntry.COLUMN_NAME_TITLE + TEXT_TYPE + COMMA_SEP +
  FeedEntry.COLUMN_NAME_SUBTITLE + TEXT_TYPE + " )";
private static final String SQL_DELETE_ENTRIES =
  "DROP TABLE IF EXISTS " + FeedEntry.TABLE_NAME;
```

These databases are stored in the space which the applications use and since the security of the space does not allow the user to manipulate it making them secure. Access the SQLiteOpenHelper class to access other useful set of APIs. Long running operations of updating of the database happens when it is required by the system as this class is used. For that purpose you need to call getWritableDatabase( ) or getReadableDatabase( ).

Now to use SQLiteOpenHelper:

- Create a subclass that overrides onCreate( ), onUpgrade( ) and onOpen( ) callback methods.
- Implementation of SQLiteOpenHelper class takes place on execution of the following code:
- public class FeedReaderDbHelper extends SQLiteOpenHelper {

```
  // If you change the database schema, you must increment the database version.
  public static final int DATABASE_VERSION = 1;
  public static final String DATABASE_NAME = "FeedReader.db";
  public FeedReaderDbHelper(Context context) {
    super(context, DATABASE_NAME, null, DATABASE_VERSION);
  }
  public void onCreate(SQLiteDatabase db) {
    db.execSQL(SQL_CREATE_ENTRIES);
  }
  public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {
    // This database is only a cache for online data, so its upgrade policy is
    // to simply to discard the data and start over
    db.execSQL(SQL_DELETE_ENTRIES);
    onCreate(db);
  }
  public void onDowngrade(SQLiteDatabase db, int oldVersion, int newVersion) {
    onUpgrade(db, oldVersion, newVersion);
  }
}
```

To access the database,

```
FeedReaderDbHelper mDbHelper = new FeedReaderDbHelper(getContext());
```

3.3.4 Loading the Database

Insert data into the database by passing a ContentValues object to the insert( ) method:

```
// Gets the data repository in write mode
SQLiteDatabase db = mDbHelper.getWritableDatabase();
// Create a new map of values, where column names are the keys
ContentValues values = new ContentValues();
values.put(FeedEntry.COLUMN_NAME_TITLE, title);
values.put(FeedEntry.COLUMN_NAME_SUBTITLE, subtitle);
// Insert the new row, returning the primary key value of the new row
long newRowId = db.insert(FeedEntry.TABLE_NAME, null, values);
```

3.3.5 Reading Data on the Database

Use query( ) for selecting the desired columns. The results of query are obtained in the form of cursor object:

```
SQLiteDatabase db = mDbHelper.getReadableDatabase();
// Define a projection that specifies which columns from the database
// you will actually use after this query.
String[] projection = {
   FeedEntry._ID,
   FeedEntry.COLUMN_NAME_TITLE,
   FeedEntry.COLUMN_NAME_SUBTITLE
   };
// Filter results WHERE "title" = 'My Title'
String selection = FeedEntry.COLUMN_NAME_TITLE + " = ?";
String[] selectionArgs = { "My Title" };
// How you want the results sorted in the resulting Cursor
String sortOrder =
   FeedEntry.COLUMN_NAME_SUBTITLE + " DESC";
Cursor c = db.query(
   FeedEntry.TABLE_NAME,                 // The table to query
   projection,                   // The columns to return
   selection,                    // The columns for the WHERE clause
```

```
  selectionArgs,                    // The values for the WHERE clause
  null,                        // don't group the rows
  null,                        // don't filter by row groups
  sortOrder                         // The sort order
  );
```

3.3.6 Deleting Information From the Database

First we need to provide selection criteria to select the rows and then delete them. The mechanism for creating selection criteria is provided by the database API. Mechanism is divided into two

- a selection clause
- a selection argument

clause defines the columns and helps in combining the column tests whereas the argument are the values that are used to test against what is bound inside the clause.

```
// Define 'where' part of query.
String selection = FeedEntry.COLUMN_NAME_TITLE + " LIKE ?";
// Specify arguments in placeholder order.
String[] selectionArgs = { "MyTitle" };
// Issue SQL statement.
db.delete(FeedEntry.TABLE_NAME, selection, selectionArgs);
```

3.3.7 Updating Database

Use update( ) method to modify database subset values.

```
SQLiteDatabase db = mDbHelper.getReadableDatabase();
// New value for one column
ContentValues values = new ContentValues();
values.put(FeedEntry.COLUMN_NAME_TITLE, title);
// Which row to update, based on the title
String selection = FeedEntry.COLUMN_NAME_TITLE + " LIKE ?";
String[] selectionArgs = { "MyTitle" };
int count = db.update(
  FeedReaderDbHelper.FeedEntry.TABLE_NAME,
  values,
  selection,
  selectionArgs);
```

This is a combination of the content values syntax of insert( ) and delete ( ).

Exercise

Tick the correct answer:

1. Tegra is a processor of which manufacturer
   a. Samsung
   b. Nvidia
   c. Motorola
   d. Nokia
2. Which hardware component is responsible for handling communication among the CPU, RAM, video cards etc:
   a. Northbridge
   b. Eastbridge
   c. Westbridge
   d. Southbridge
3. Which files stay in the system even after the user does any modification?
   a. Private files
   b. Public files
   c. Video files
   d. Text files
4. Handling computers input and output functions is done by?
   a. Northbridge
   b. Southbridge
   c. Graphical user interface
   d. Hard drive
5. A formal declaration of how the data should be arranged in SQLITE database is called as:
   a. Schema
   b. Clause
   c. Argument
   d. Statement
6. A class which keeps the constants that are helpful in defining the names for URLs, tables and columns and allows using the same constants across all other packages in the same package is called as
   a. Schema
   b. Contract
   c. Argument
   d. Public

7. Correct syntax for the table to query
   a. FeedEntry.TABLE_NAME,
   b. FeedEntry.table_name,
   c. FeedEntry.TABLENAME,
   d. FeedEntryTABLE_NAME,
8. A clause defines a
   a. Class
   b. Argument
   c. Column
   d. Contract
9. To test against what is bound inside the clause, we use
   a. Statement
   b. Contract
   c. Argument
   d. Class
10. The files that stay on the system even after any manipulation is being done are known as
    a. Private files
    b. Public files

Notes

Telecom
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4.Testing and Publishing

Key Learning Outcomes

At the end of this module, you will be able to:

1. Understand testing fundamentals
2. Learn to test an application to understand the working fundamentals
3. Understand the process of debugging
4. Learn security practices
5. Understand publishing of an application

UNIT 4.1: Testing and Publishing

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the basics of errors and how to debug an application
2. Know various types of testing
3. Learn how to decide the degree of an error

4.1.1 Bug

A bug or a software bug is a term used in the field of computers for an error or fault in a computer program that causes the program to crash or produce a wrong output while compiling. The error can be in the source code or in the design, thus making the program crash. The effect of the bug on the program may be considered on various levels from very less effects like crashing the program to enable a different user to hack into the system to obtain unauthorized privileges. Bugs are mostly because of human error. For example while writing a program for a calculator, in spite of using "<" if the programmer types ">", then the resulting program will show an error at the end when the program starts to compile it.

4.1.2 Severity

The impact of a bug on the user tells its severity. The impact is different for different types of software which a programmer decides. For instance, the impact of the crashing of, say, a designing software will be different than the impact of the crashing of a music player software. But for specific software, the level of severity of a bug can be placed in the levels from high severity to low severity.

4.1.3 Testing

Testing is an important process in the software development and application process. As we already studied that there is always a possibility of human error, bugs, which can cause a bad impact on the user. So, in order to deliver error free software, testing is essential. It helps in figuring out the bugs in very early stages of the development process which saves a lot of time and energy of the programmer. There are many open source toolkits available used for testing for measuring and reporting java errors. Some areas in the development of android which should be taken into consideration are as following:

1. **Activity lifecycle**

   The developer should be able to test if the system is able to run the lifecycle events correctly. Also, the state of the activities when the event is onPause or onDestroy. The developer should also be able to check that the system is able to recover the state of application back to onCreate when saved in a bundle onSaveInstanceState so that the user doesn't lose the prior information.

2. **Database and file system operations**

   The developer needs to test these operations in isolation at lower system levels and through application at higher system levels.

3. **Device hardware**

   The developer must test the software is device friendly, which means that the software is supported on most of the devices and for that there are specific parameters that need to be tested like different screen sizes and resolutions, storage capabilities, input devices, networking and random access memory.

4.1.4 Types of Testing

1. **Unit testing:** In unit testing, the programmer takes the individual units of the source code in isolation together with associated control data and then tests if the program has any errors or not. Unit tests are created by programmers during the development of the software. Other than this mock objects and fakes are also used to assist the test. The advantages of unit testing are as following:

- Since the individual fragments of the source code are being tested, it helps in the early detection of a bug or of a specific code component in the program by making the developer aware of the problem before submitting the code.
- The test allows the developer to recode the system libraries at a later stage.
- It becomes easy for the developer to test the program in individual fragments rather than testing the whole source code which can be very complex and time consuming.

» **Mock Objects:** Mock objects are simulated objects that are used instead of real objects because mock objects copy the behaviour of the real objects in controlled ways. These objects are a part of the object-oriented programming and are mostly used to test the objects of a source code. For a better understanding let us take the example of a car. When the car is under designing, it is tested for safety. So a dummy car is made which inherit the same properties of the real car and then a crash testing is done on the dummy car to check the safety measures provided for the user. In a similar fashion a dummy object or mock object is used instead of the real object and the testing is done on it.

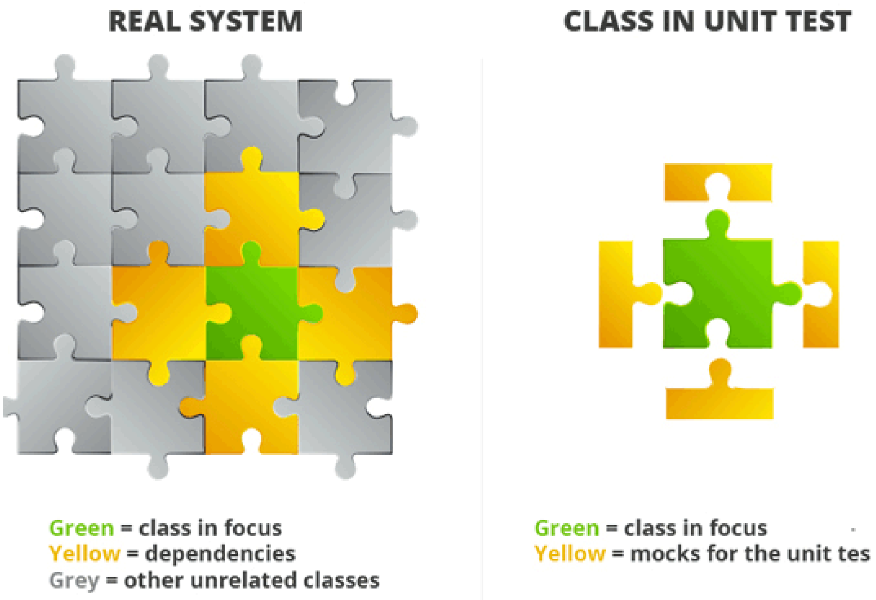

Fig. 4.1.4(i) A schematic of unit testing

2. **Alpha testing**

   At the developers' site, alpha testing is a simulated or actual testing. It is a sort of internal acceptance testing before the software goes for beta testing.

3. **Beta testing**

   Beta testing can also be called as user acceptance testing. A version of the software known as the beta version is released for a limited amount of users to ensure if the software is working correctly. Any bugs or faults, if found, are reported back to the developer through a feedback. The problem is then sorted out and an update is released with the fixed bugs and faults and the software is released for every user.

4. **UI testing**

   UI testing or graphical user interface testing is used to test if the GUI meets the said specifications. This is usually done through test case generation. The test designers generate the test cases which cover all the functionality of the system in the GUI itself. Testing of GUI is really difficult since there are too many operations in the GUI that are needed to be tested. A simple wordpad has 325 GUI operations and these operations will increase as the program becomes of a larger magnitude.

   Sequencing is another problem that a tester faces while testing GUIs. For instance, to save a file a user has to click on File Menu then select Save which will open a dialogue box to specify the name of the file to be saved and its File type. This will increase the sequencing problem as the number of operations will be increased.

   The graphical user interface cases can also be generated by simulating a new user which has very less knowledge of the environment. This is because the GUI that an expert user will generate will be through the same path without any possibility of exploring new states while a beginner will follow an unorthodox path and is very much likely to explore new states of the user interface.

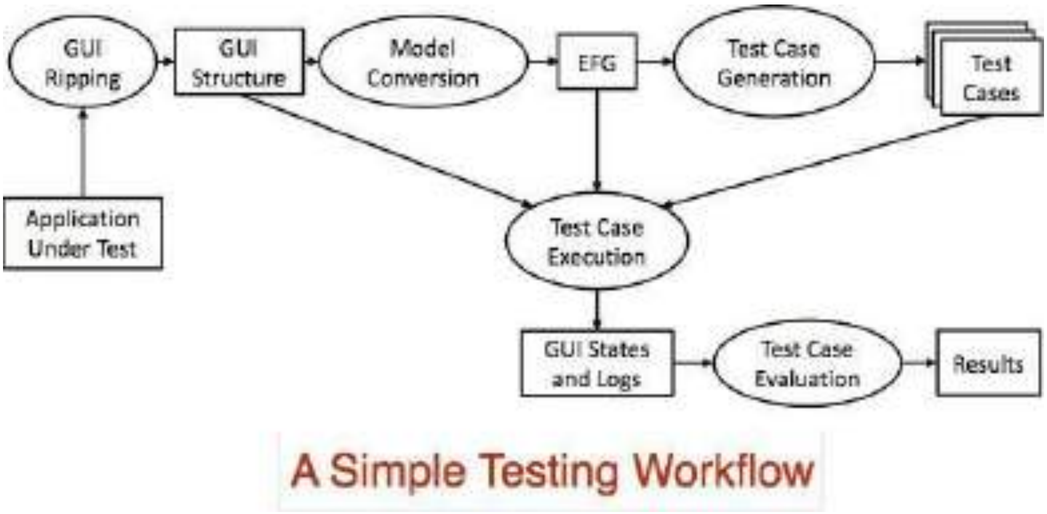

Fig. 4.1.4(i) A schematic for GUI testing

5. **User Acceptance test**

   User acceptance test tells us that the software if free from faults and bugs and it ready for distribution. It is recommended that the user acceptance testing should be done by a subject-matter expert (SME) and provides his findings in that matter. It is also important during the test that the components given to the tester must be similar to that given to the user.

To carry out the acceptance test, the test suite may be needed to run multiple times as single test iteration may not be sufficient for all the test cases. The tester runs the suite using predefined test procedures step-by-step to get the expected result after the test is being executed. Then a comparison is done between the results obtained and the expected results. If the actual results match the expected results, the test is said to pass.

6. **Performance test**

   Performance test tells us how well an application works when it is run. If there is a need to improve the said application, then the performance test should be conducted before and after the improvement to check the efficiency and performance.

7. **System test**

   After every unit is tested, improved and integrated there is a need of testing the system as a whole which tells us if everything is working with respect to one another. This may include graphical user interface tests, installation tests, unit tests, etc.

4.1.5 Test Cases

Following are the set of test cases to specify number of elements of implementation. There must be an interface called Adder with an implementing class with a zero argument constructor called AdderImpl. This asserts that the adder interface should have a method called add, with two integer parameters, which returns another integer.

```
import  static  org.junit.Assert.*;
import org.junit.Test;
public class TestAdder {
  public void testSumPositiveNumbersOneAndOne() {
    Adder adder = new AdderImpl();
    assert(adder.add(1, 1) == 2);
  }
  // can it add the positive numbers 1 and 2?
  @Test
  public void testSumPositiveNumbersOneAndTwo() {
    Adder adder = new AdderImpl();
    assert(adder.add(1, 2) == 3);
  }
  // can it add the positive numbers 2 and 2?
  @Test
  public void testSumPositiveNumbersTwoAndTwo() {
    Adder adder = new AdderImpl();
    assert(adder.add(2, 2) == 4);
  }
  // is zero neutral?
```

```
    @Test
    public void testSumZeroNeutral() {
        Adder adder = new AdderImpl();
        assert(adder.add(0, 0) == 0);
    }
    // can it add the negative numbers -1 and -2?
    @Test
    public void testSumNegativeNumbers() {
        Adder adder = new AdderImpl();
        assert(adder.add(-1, -2) == -3);
    }
    // can it add a positive and a negative?
    @Test
    public void testSumPositiveAndNegative() {
        Adder adder = new AdderImpl();
        assert(adder.add(-1, 1) == 0);
    }
    // how about larger numbers?
    @Test
    public void testSumLargeNumbers() {
        Adder adder = new AdderImpl();
        assert(adder.add(1234, 988) == 2222);
    }
}
```

Here, the unit tests have been written first which work as a design document explaining the behaviour of a desired solution left for the programmer. The easiest solution that will make the test pass is as follows:

```
interface Adder {
    int add(int a, int b);
}
class AdderImpl implements Adder {
    public int add(int a, int b) {
        return a + b;
    }
}
```

Unit testing has an advantage that as a design document it can be used to verify that the implementation adheres to the design. If the developer is unable to implement the solution according to the design, the test will never pass.

4.1.6 Adding a Test

To create either a local unit test or an instrumented test, you can create a new test for a specific class or method by following these steps:

1. Open the Java file containing the code you want to test.
2. Click the class or method you want to test, then press Ctrl+Shift+T.
3. In the menu that appears, click Create New Test.
4. In the Create Test dialog, edit any fields and select any methods to generate, and then click OK.
5. In the Choose Destination Directory dialog, click the source set corresponding to the type of test you want to create: androidTest for an instrumented test or test for a local unit test. Then click OK.

Alternatively, you can create a generic Java file in the appropriate test source set as follows:

1. In the Project window on the left, click the drop-down menu and select the Project view.
2. Expand the appropriate module folder and the nested src folder. To add a local unit test, expand the test folder and the nested java folder; to add an instrumented test, expand the androidTest folder and the nested java folder.
3. Right-click on the Java package directory and select New > Java Class.
4. Name the file and then click OK.

Also be sure you specify the test library dependencies in your app module's build.gradle file:

```
dependencies {
  // Required for local unit tests (JUnit 4 framework)
  testCompile 'junit:junit:4.12'

  // Required for instrumented tests
  androidTestCompile 'com.android.support:support-annotations:24.0.0'
  androidTestCompile  'com.android.support.test:runner:0.5'
}
```

4.1.7 Debugging

Debugging may be defined as resolving defects that prevent proper function of software or a device. Debugging an android app can be done on the android studio. For that purpose the studio provides an android emulator of which we already know.

For debugging a device launch android studio.

1. Now click Debug in the toolbar. An APK extension is being built up inside the software which signs it with a debug key, installs it on the selected device, runs it and then opens the Debug window.
2. If now window opens then start again by clicking Debug and then connect a device. Either that or click Create

New Emulator to setup the Android Emulator.

3. Now click Attach debugger to android process
4. From the Choose process dialogue, select the process you want to attach the debugger to.
5. Select Show all processes which for instance is java.
6. Click OK.
7. To end a debugging session, click the tab for session and then click terminate

4.1.8 Debugging with Breakpoints

In the Android studio there are several types of breakpoints which the studio supports to initiate different debugging actions. Line breakpoint is the most common type of it. It pauses execution of the application at a specific line of code which will help us to check and evaluate the expressions and then with the help of line by line execution one can figure out the causes of the runtime errors.

In order to add a line breakpoint:

1. Find the line of code which you think might possess the error and then pause the execution; then either click the left gutter along the line of the code or place the caret on the line and press Ctrl+F8.
2. If the application is running just click attach debugger to android process otherwise click Debug.

```
int id = item.getItemId ( ) ;
if (id == R.id.action_settings) {
```

A red dot will appear next to the line when a breakpoint is being set.

3. When the breakpoint is reached, Android studio pauses the execution of the app.
4. Now we need to examine the app using the debugging tools.
5. We can examine the object tree for a variable by expanding it in the Variables view. If the variables view is not visible, click Restore variables View.
6. Click Evaluate.
7. To move to the next line, click Step Over.
8. To go to the first line inside a method call, click Step Into.
9. To go to the next line outside the current method, click Step Out.
10. Click Resume Program to run the application normally.

4.1.9 View and Configure Breakpoints

To view all breakpoints and configure the settings;

1. Click view breakpoints on the left side of the debug window.
2. Here you can enable or disable breakpoints.
3. Now select a breakpoint to configure the settings.
4. If disable, you can enable a breakpoint after hitting another breakpoint.
5. To set a breakpoint for any exception, select Exception breakpoints

View variables and evaluate expressions

1. Start debugging.
2. From the watches pane, click Add.
3. A textbox will appear, you can type the name of the variable you want to watch and then hit enter.
4. To remove an item from that list, click Remove.

Notes

UNIT 4.2: Security

Unit Objectives

At the end of this unit, you will be able to:

1. Learn about security threats like malwares
2. Understand security measures

4.2.1 Malware

Malware or malicious software is a type of software which is used to tamper with computer operations, gain access into private computers and gather sensitive information. Malware may be made to spy on one computer or the other without the knowledge of the user. Malware is a general term. It defines computer viruses, worms, Trojan horses, spyware, adware and other malicious software. Mostly malware is hidden inside the unlicensed files that are downloadable over the internet.

Anti-virus, anti-malware and firewalls are used to prevent any of the malware from getting inside the computer. The most common malware are as under:

1. **Virus**

   A virus is a computer program which is hidden inside another program which when installed produces copies of it and spreads them across other files infecting them as well and destroying all the data.

2. **Trojan horse**

   A Trojan horse is named after the wooden horse used by the Greek troops to invade the city of Troy by stealth. It usually appears harmless and as the user executes it, it hides into the computer undetected and provides its controller unauthorized access to the computer. They do not spread into the files and infects it rather; it stays hidden and uses the computer to run itself thereby reducing the processing speed of the system.

4.2.2 Android Built-in Security

Android is equipped with built in security which helps in reducing the impact of application security. The security features that help you to build secure applications include:

1. Android application sandbox which isolates the app data and code execution from other applications.
2. Technologies like ASLR, NX, ProPolice, safe_iop, OpenBSD dlmalloc, OpenBSD calloc, and Linux mmap_min_aadr to counter the risks that are associated with common memory management errors.
3. Encrypted filesystem to protect data
4. User granted permissions to restrict access to application data by the user.

4.2.3 Internal Storage Security

The files that you will create on the internal storage are, by default, only accessible to your application which is actually a protection by Android sufficient for most applications. Using a content provider helps in sharing the data with other application processes and provides read and write permissions to other applications. Also, using encrypt local files might prove to be useful in providing additional protection for sensitive data.

4.2.4 External Storage Security

The external storage is a memory card that helps in storing data on it. As you know that the external storage can be removed by the user and any modification can be done with the help of various other applications which might make the sensitive data vulnerable. So it is recommended not to store any sensitive information on the external storage. Perform input validation for the data downloaded from any untrusted source.

4.2.5 Content Providers

The content providers provide storage mechanisms that can be limited to your applications or exported to allow access by other applications. Now if you want that other applications should not access your contentprovider, you can mark them as android:exported=false otherwise android:exported=true if you want other applications to access your content providers.

You can use the android:protectionLevel attribute to set a signature protection if you are using the content provider for sharing data only between your own apps. The reason behind attributing signature permissions to your content provider data is that it does not require permission but can easily access the data that are signed with the same key.

Content providers also provide access by attributing android:grantUriPermissions and using the FLAG_GRANT_READ_URI_PERMISSION and FLAG_GRANT_READ_WRITE_PERMISSION flags in the intent object that activates the component.

4.2.6 Permissions

1. **Requesting**

   - Minimize number of permissions that the application requests.
   - Do not request a permission if the application does not need one to function.
   - Not have access to permissions makes the sensitive data less vulnerable to the attackers.
   - Android inter process communication (IPC) is security sensitive so use the <permissions> which will make the application to protect IPC.
   - Permission-protected data should not be leaked so use the signature protection level on permissions for IPC communication between applications provided by a developer.

2. **Creating**

   - Try to complete your tasks with a signature protection level. They are only accessible by those applications that are signed by the same developer.

- To create a permission with a dangerous protection level, you should consider the following:
- Permissions that have a string that will make the user to make a security decision according to his choice.
- The string should be multi-lingual.
- The applications that have a confusing permission or are marked as risky should not be installed bythe user.

Notes

UNIT 4.3: Networking and Publishing

Unit Objectives

At the end of this unit, you will be able to:

1. Understand about networking and publishing
2. Understand the importance of networking and publishing
3. Know the process involved in networking and publishing

4.3.1 Using Internet Protocol

Appropriate protocols should be followed for the sensitive data like HttpsURLConnection for secure web traffic. Since mobile device have a tendency to get connected to unsecure locations, it is highly recommended to use HTTPS instead of HTTP. Encrypted socket-level communication can be easily implemented using the SSLSocket class. Ensure that no data should be downloaded from any HTTP protocol.

4.3.2 Handling Credentials

Minimize the frequency of asking for user credentials, instead use an authorization token and refresh it. The personal information of the user should not be stored on the device. Just perform an initial authentication like asking for username and a password. AccountManager should be used when accessing multiple applications. To verify the application that uses credentials and accesses AccountManager, use checkSignature( ).

4.3.3 Cryptography

Full-filesystem encryption and secure communication channels also provide data isolation. You can use a random key generator, SecureRandom, to initialize any cryptographic keys. You can use a keyStore to store a key which will be used repeatedly.

4.3.4 Publishing

Publishing is a process of releasing your application so that the user can access.

- Preparing the applications for release

  Prepare a release version of the application which will help the users to download and install application on their Android devices.

- Releasing the application

  Publicize, sell and distribute the released version of the application.

For Android applications, the platform for releasing the applications is Google Play. Besides this, the applications can also be made available for the user by sending them directly or making the users download the application from your website. The publishing should be done when the testing of the application is done. The applications should match the release criteria for functionality, performance and stability.

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4.3.6 Configuring the Application

From the manifest file, remove Log calls and remove the android:debuggable attribute. Provide values for the android:versionCode and android:versionName attributes which will be located in the <manifest> element. Configure the settings according to the Google Play requirements. Use the Gradle build files with release build type to build and sign a release version of the application.

Be sure that all application resources such as multimedia files and graphics are updated and in package with the application. You will need a private key for signing the application. An End User License Agreement (EULA) also needs to be prepared to protect the intellectual property. After the preparation is finished you will get the signed .apk file ready to distribute to the users.

4.3.7 Releasing Application Through Email

After preparing the application for the release, attach the application in the compose box of your mail. Put in the address of the person you want to send the app to. As the user opens the attachment, his device will recognise the android file and will flash an “install now” button. The user will click on the “install now” button and the installation of the application on the device will begin.

4.3.8 Releasing Through Website

If you do not wish to release your application through Google Play, you can use your website or personal server to make the application available for download. For that prepare the app for release and provide the APK file on your website. Now give the download link to the users. As the user follows the download link, they will be directed to the APK file. After the file is being downloaded, the device will recognise the file and will start the installation automatically. Here the users need to change the settings in their phone for installation from unknown sources before downloading the file.

Exercise

Tick the correct answer:

1. The internal acceptance testing done on the developers' site is known as:
   a. Unit testing
   b. Beta testing
   c. Alpha testing
   d. White-box testing
2. Removing an error from the program is known as:
   a. De-worming
   b. De-bugging
   c. Unit testing
   d. Processing
3. Testing of the whole system is known as:
   a. Unit testing
   b. Performance testing
   c. System testing
   d. User interface testing
4. The number of permissions that an application requests should be:
   a. Maximum
   b. Minimum
   c. Depends upon the developer
   d. Is independent of what an application requires
5. A Trojan horse is:
   a. Detectable and does not infect the files
   b. Not detectable and does not infect files
   c. Detectable and infects files
   d. Not detectable and infects files

6. Testing done by a selected number of users to check the performance of the application is called as:
   a. Alpha testing
   b. Performance testing
   c. Beta testing
   d. User interface testing
7. The extension used by android application at the time of release is:
   a. .APK
   b. .EXE
   c. .DLL
   d. .TXT
8. In unit testing if the developer is unable to implement the solution according to the design, the test will
   a. Pass
   b. Fail
   c. Come inconclusive
   d. Solution does not depend on the design
9. Publishing an application is:
   a. Releasing the application for the user
   b. Printing the source code
   c. Testing the application
   d. Securing an application from phishing attacks

Click/Scan this QR code to learn the steps to publish android app

10. Providing access to the content provider uses which attributes:
    a. Boolean
    b. Binary
    c. Java
    d. Eclipse

Notes

UNIT 4.4: Support and Maintenance

Unit Objectives

At the end of this unit, you will be able to:

1. Learn about various procedures for maintaining an Android App
2. Understand how to maintain the device
3. Know how to get rid of the junk files to clean the system

4.4.1Maintaining the User’s Android Device

- Android smartphones when used over time get filled with applications, photos, cache memory and other sort of data like messages, emails etc. which are responsible for slowing down the system.
- So in order to make the device work properly, we need to maintain it from time to time by cleaning the device and freeing up files.

Deleting Messaging Database

- Messages are something that is an important mode of communication from a long time.
- Deleting the messages is an option which can free up some system space.
- Select the messages the user want to keep
- Now forward the messages to the user’s Gmail account instead of typing a number.
- The messages will be forwarded to the user’s Gmail account and if the user’s phone is synced and the user can archive the user’s messages or save in any way the user like.
- For Android Lollipop and Marshmallow, the user can simply select the messages from the options menu, choose share
- Share it to the user’s Gmail account or Google drive which ever seems convenient.
- After creating the backup we will select the messages and then delete them thus freeing up some memory.

Deleting Media Files

- Files such as songs, videos, movies, pictures etc. are known as media files.
- We should remove the media files that we don’t need. The procedure for that is pretty simple.

For instance the user need to delete a picture

- Select the pictures the user needs to delete by tapping and holding till the system marks the picture as shown in the figure below

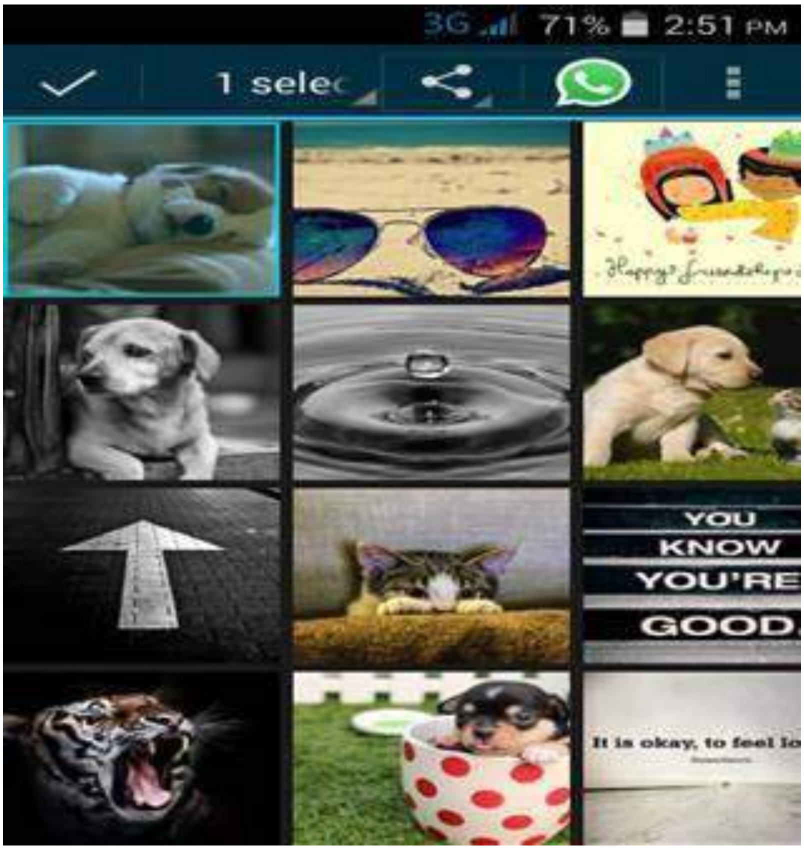


Fig. 4.4.1 (i)Select process to delete a picture

- Now from the options select delete and the files are deleted.

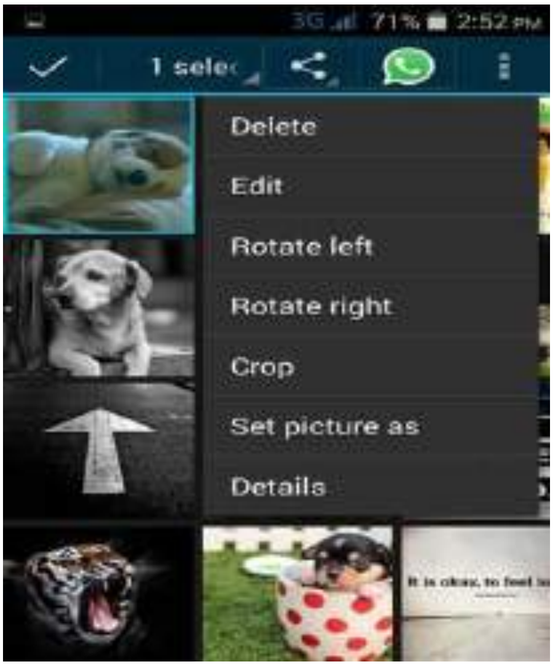


Fig. 4.4.1(ii) Delete a picture

Uninstalling applications

- Applications play a very important role in any operating system.
- The unwanted applications should be uninstalled from the system to make the system functions fast and quick.

The un-installation can be done in two ways.

- Go to Google Play store from the user’s phone.
- Now type the name of the application on the Google search box.
- It will show “uninstalled”.

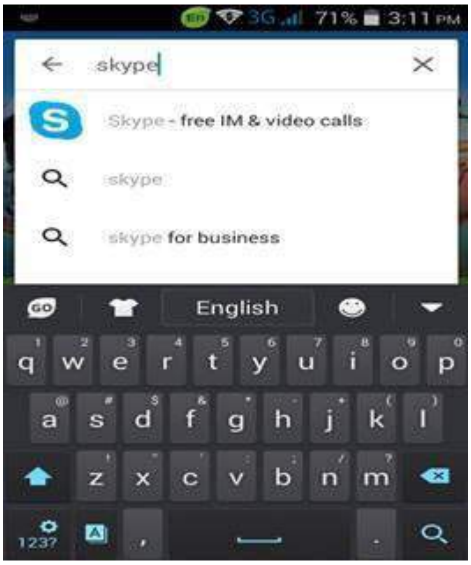


Fig. 4.4.1(iii) Uninstalling an app

- Tap the application to open it.

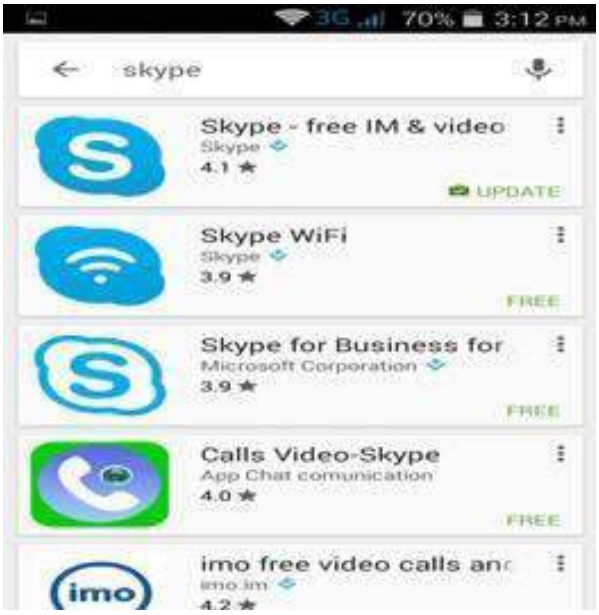
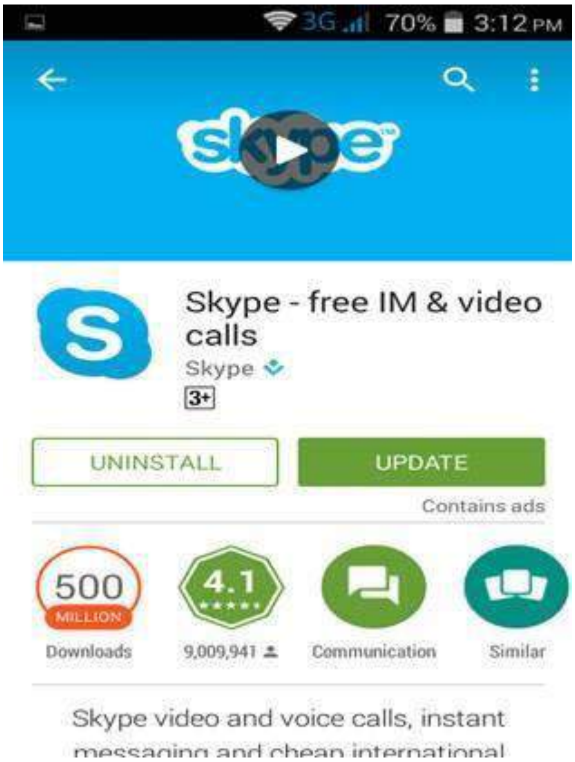


Fig. 4.4.1(iv) Uninstallation process

- Now tap “uninstall”.



Skype - free IM & video calls

Skype video and voice calls, instant messaging and cheap international

Fig. 4.4.1(v) Uninstallation process

This is one way of uninstalling the application.

Another way is to go to the settings of the user’s device:

- Tap on “Applications”.
- Find the applications that the user wants to uninstall.
- Tap open the application and tap “uninstall”

This will remove the application from the device along with its data. Now this method is more useful when the applications are installed from the third party or from the developer’s website because the user can only uninstall from Google play when the user have installed the application from Google play.

Application Cache

Deleting the cache from phone memory is really important as it uses a lot of space as we keep using the application.

Deleting it once a week can help restore the processing speed of the device. For doing that:

- Go to mobile settings
- Under “Applications”
- Open any application and find the button with “clear cache” written on it.
- Just tap it.
- The cache gets deleted.
- Same can be done to other applications.

Exercise

1. What are the three points you will focus on when you talk to people face to face?

____

____

____

Fill in the blanks

1. Before sending the mail it's important to check the ______________and of the content.

2. When you interact through phone, provide your identity details like , ______and ___

3. Add your ____________________at the bottom of your mail.

4. The Customer Care Executive is mainly responsible for handling ______________.

Notes

5.Organise work and resource as per health and safety standards

Unit 5.1 -Workplace health and Safety
Unit 5.2 - Different types of health hazards
Unit 5.3- Importance of Safe working practices
Unit 5.4- Reporting safety hazards
Unit 5.5 -Waste Management
Unit 5.6 - Organizations' Focus on Greening of Jobs

TEL/N9101

Key Learning Outcomes

At the end of this module, you would be able to

- Understandwhat is communication andthe importance of communication in the workplace
- Understand effective communication and communicate effectively for success
- Discuss types of communication -verbal and non-verbal
- Communicate at workplace
- Communicate effectively with superiors
- Communicate effectively withcolleagues and customersusing different modes viz face-to face, telephonic and email communication
- Understand the hurdles for effective communication
- Conduct professionally at work place
- Respect differences in gender and ability
- Communicate effectively with person with disabilities
- Respect for disable people

UNIT 5.1: Workplace health & safety

Unit Objectives

At the end of this unit, you will be able to:

1. Understand about workplace health and safety
2. Explain tips to design a safe workplace
3. Explain precautions to be taken at a workplace

5.1.1 Safety: Tips to Design a Safe Workplace

Workplace health and safety policy defines the best possible work conditions and safety for the employees. Employees have a right to feel safe in their workplace. Hence the organizations create and follow legal standards and ensure a hazard-free workplace.

Every organization is obligated to ensure that theworkplace follows the highest possible safety protocol. When setting up a business some tips to remember:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Ensure presence of emergency exits and they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Get expert advice on workplace safety and follow it
- Get regular inspection of electrical wiring and also the electrical switches and gadgets
- Install fire extinguishers and fire alarms.

5.1.2 Precautions to be taken while at work

Every employee is obligated to follow all safety protocols put in place by the organization. All employees must make it a habit to:

- Immediately report unsafe conditions to the supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to the supervisor
- Wear the correct protective equipment when required
- Learn how to correctly use equipment provided for safety purposes
- Be aware of and avoid actions that could endanger other people
- Always be alert
- Educate the employees about the first/emergency exits on the floor, and also where the fire extinguishers are kept.
- Keep the list of emergency numbers
- Practice evacuation drills regularly to avoid chaotic evacuations

UNIT 5.2: Different types of Health hazards

5.2.1 First Aid

Illness, injuries, and pain are part of human life. This can happen anyway. Every individual is prone to illness and injuries at anytime and anywhere.

In case of any of these, some kind of immediate medical attention or treatment is needed to reduce the discomfort, pain, and deterioration of the condition. The medical attention that is given at the first instance before seeking professional medical help is called "First Aid". First aid is the immediate and temporary treatment given to the victim of an accident or sudden illness while awaiting the arrival of "Medical Aid". First Aid means providing the initial treatment and life support for people with an injury or illness. However, First Aid has its limitations and does not take the place of professional medical treatment. Proper early assistance given by First Aider helps in saving the life of a patient.

Illness and injuries can happen anywhere, be at home, the workplace, or in the market place. Whatever safety measures we adopt, we are all prone to illness sometime or the other.

Some common injuries and their rescue techniques:

5.2.2 First Aid Techniques

- Direct pressure must be applied to the cut or wound with a clean cloth, tissue, or piece of gauze, until bleeding stops.
- If blood soaks through the material, it is highly recommended not to remove it.
- More cloth or gauze must be put on top of it, and pressure must be Continued.
- If the wound is on the arm or leg, the limbmust be raised above the heart to help slow the bleeding.
- Hands must be washed again after giving first aid and before cleaning and dressing the wound.
- A tourniquet must not be applied unless the bleeding is severe and not stopped with direct pressure.

click/scan to view the video on First Aid at workplace

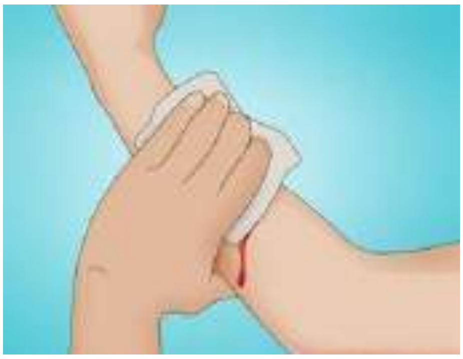


Fig. 5.2.2(i): Clean cut or wound

Clean cut or wound

- The wound must be cleaned with soap and lukewarm water.
- To prevent irritation and burning sensation, the soap solution must be rinsed out of the wound.
- Hydrogen peroxide or iodine must not be used to clean or treat the wound since they are corrosive and can damage live tissues.

Fig. 5.2.2(ii): apply hydrogen peroxide or iodine

Protect the wound

- Antiseptic cream or solution must be applied to the wound to reduce the risk of infection.
- Then the wound must be gently covered with a sterile bandage.
- Till the wound heals, the bandage must be changed (dressed) daily to keep the wound clean and dry.

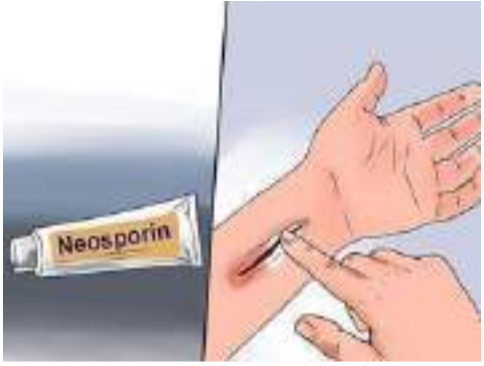


Fig. 5.2.2(iii): Protect the wound

Call the Emergency Helpline if:

- The bleeding is severe and deep
- You suspect Internal Bleeding
- Abdominal or Chest wound exists
- Bleeding continues even after 10 minutes of firm and steady pressure

For Burns:

- Immediately put the burnt area under cold water for a minimum of 10 minutes
- If the burned area is covered, take clean scissors, cut and remove the fabric covering the area
- In case clothing is stuck to the burned area, leave it as it is
- Before sterile dressing application, remove jewellery (if any)
- It is better to leave the burned area open
- Do not apply any medication or ointment
- Breaking a blister – it is an absolute no-no!

Fig. 5.2.2(iv): Put Burnt Area under Water

For Broken Bones and Fractures

1. Protruding bones must be left alone
   i. If a bone has broken the skin, it must not be pushed back into place.
   ii. The area must be covered with a clean bandage and immediate medical attention must be sought
2. Bleeding must be stopped
   i. steady and direct pressure must be applied with a clean piece of cloth for 15 minutes and the wound must be elevated
   ii. if a blood soaks through one must apply another cloth over the first and seek immediate medical attention
3. Swelling must be controlled
   i. The RICE (Rest,Ice, Compression and Elevation) Therapy must be applied to control and reduce swelling
   ii. Rest the injured part by having the person stay off it
   iii. Ice must be applied on the area with the help of an ice pack or by wrapping the ice in a clean cloth. Ice must not be directly placed against the skin.

For Heart Attack/Stroke

Think FAST:

1. Face: is there weakness on one side of the face,
2. Arms: can they raise both arms?
3. Speech: is there speech easily understood?
4. Time:to call emergency help line

Immediately call medical/ambulance helpline or get someone else to do it.

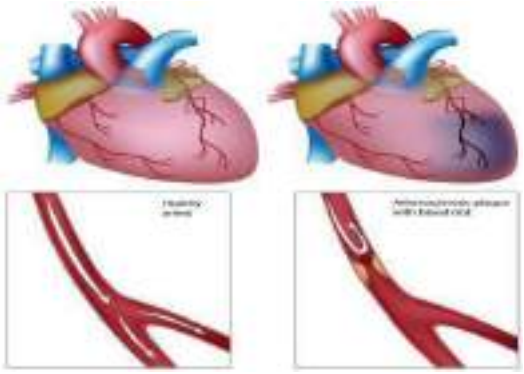
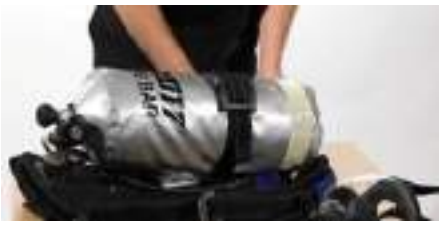


Fig 5.2.2(v): Anatomy of Heart Attack

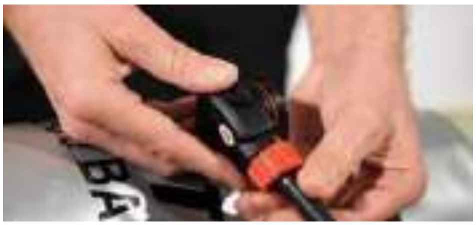
For Head Injury

1. Ask the victim to rest and apply a cold compress to the injury (e.g ice bag)
2. if the victim becomes drowsy or vomits, call Medical helpline or get some one else to do it

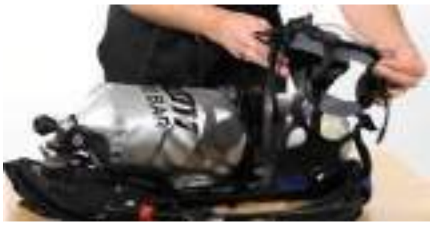
Fig 5.2.2(vi)Steps of using breathing apparatus:



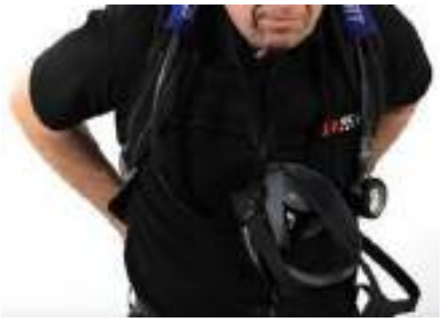
Check theparts of the breathing apparatus thoroughly.



Check the bypass knob (red). Close it if you seeit open. After this, press the reset button (area above bypass nob – black)



Inspect the facemask to See that it is

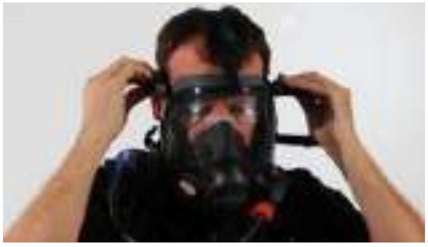


Lift thecylinder ensuringthat on the top the cylinder valve should be present. The back plate of the cylinder should face the wearer. Wear the breathing apparatus on the shoulder like a bag pack and by the neck strap, hang the face mask.

Afterwearing the breathingapparatustighten shoulder straps and fasten the waist belt.

The cylinder valve should be opened slowly to inspect the pressure gauge.

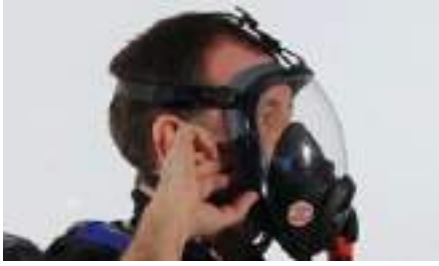
Makesure that 80% of the cylinder is full.



Wear the mask slowly by resting your chin in the resting cusp andpull the head strapslowly over your head.

Pull the head straps for a snug but comfortable fit.

Breath inand normally tosee if you can breathe normally or not.



Nowinsert afingersidewise of the face mask for easy outward airflow.

Slowly close the cylinder valvewithout leaving the knob.

Be steady for 10 minutes and hold your breath or extremely slow to listen to any wheezing sound.
Also, check the pressure gaugefor any dip in the pressure.

Normally Breathe to vent system
Listenfor a whistle alarm while observing thepressure gauge
at 55 bar (+/-5 bar)

Briefing and Guidance for Fire Fighters

There are basically three methods with the help of which people can be rescued from a building engulfed in a blazing fire. To ensure on-site reception, here are two of the important steps that we will discuss now. These come under the best safe lifting and carrying practices.

Conventional Technique: This is a good method if there is an open area close by. The first rescuers will make the victim sit reach under their armpits and finally, grab their wrist. The other rescuer will cross the ankle (victim), pull up that person's legs on his shoulder. Finally, on the count of 3, both will lift the person up and move out.

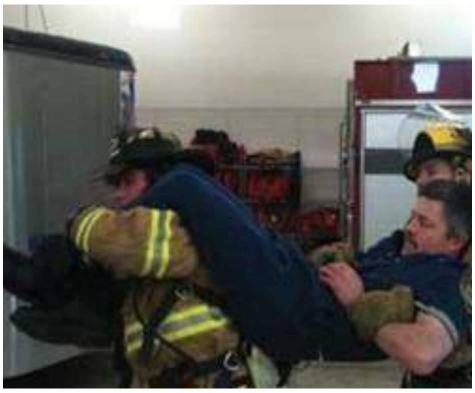


Fig. 5.2.2(vii)f: Fast Strap

Fast Strap: In case the victim is completely incapable of moving out of the fire zone. The rescuers should follow this method. One of the rescuers will place their knee between victim's shoulder and head. Pin the loop of webbing to the ground with the help of the knee. This acts as an anchor. With the non- dominant hand hold the other end of the webbing and make a loop. With steady hands, pull the victim's hand in from the loop, tie it securely and finally clip the webbing loops.

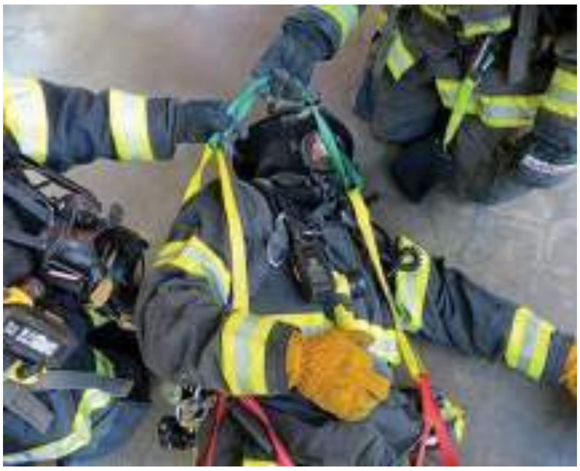


Fig. 5.2.2(vi): Fast Strap

Essentials for Smooth Evacuation: The following are essentials to have a smooth evacuation during an outbreak:

1. clear passage ways to all escape routes
2. signage indicating escape routes should be clearly marked
3. enough exits and routes should be present to allow large number of people to be evacuated quickly
4. emergency doors that open easily
5. emergency lights where needed
6. training for all employees to know and use the escape routes
7. A safe meeting point or assembly area for staff
8. instructions on not using the elevator during a fire

Special Evacuation Requirements For Specially Abled Persons

1. Visually Impaired

- Announce the type of emergency
- offer your arm for help

2. With Impaired Hearing

- Turn lights on/off to gain the person's attention, or indicate directions with gestures, or write a note with evacuation details

3. People with Prosthetic Limbs, Crutches, Canes, Walkers

- Evacuate these individuals as injured persons
- assist and accompany to evacuation site if possible
- use sturdy chair or a wheeled one to move the person to an enclosed stairwell
- notify emergency crew of their location

UNIT 5.3: Importance of Safe Working Practices

Unit Objectives

At the end of this unit, you will be able to:

1. Explain Basic Hygiene Practices
2. Understand the importance of Social Distancing
3. Demonstrate the safe working practices

5.3.1 Basic Hygiene Practices

We are living in an environment with millions of germs and viruses. And our body can be a breeding space for these microbial organisms. They grow and multiply and cause many diseases which sometimes can prove to be fatal for the human beings. These disease-causing microbial organisms kill over 17 million people every year. Some simple hacks and little changes of basic personal hygiene habits can bring amazing changes to all of us. We can prevent contracting these diseases if we follow these hygiene practices every day.

Personal Hygiene

Personal hygiene is all about managing your body hygiene, essentially caring for your well-being incorporating some physical hygiene habits. Also, there are mental health benefits as well, as they affect each other immensely.

What are good personal hygiene habits?

Good personal hygiene includes but not limited to -

- Take regular shower
- Maintain oral hygiene
- Wash your hands frequently
- Wash your genitals
- Keep your clothes and surrounding dry and clean

These habits should be practiced on a regular basis, at home, at work, basically where you are!

That’s the whole idea of preventing your body system collapse over a tiny microbe

Personal Hygiene Practices at Home

Take Regular shower

- Do not wait up to feel the dried sweat in your body to feel the urge to take shower, make it a routine, you have the choice to either take them before you head to work or after the long day or even before you head to sleep, whichever one suits your routine. Make sure to rinse your body thoroughly, especially the genitals and underarms as they produce more sweat and are more prone to fungal activities.

Wash your hands frequently

- We use our hands to do our most physical acts, from picking up the keys, browsing through our phones, cooking or eating to attending our pets. While we agree and accept the importance of washing hands before eating and after visiting the toilet, it is also important to wash our hands with soap or sanitizer every now and then. The pandemic covid-19 which crippled the life all over the world has taught us an important lesson that sanitizing our hands regularly is the only way we can avoid transmission of the disease. Use alcohol-based sanitizer to wash hands well to prevent the spread of communicable diseases

Maintain oral hygiene practices

- It is very important to take care of the teeth and gum, to prevent tooth decay and bad odour.
- Just brushing them twice a day is not enough, but using fluoride toothpaste and
- brushing properly is very essential.
- And wash it well with water to remove any food particles that is stuck in the gap in between the teeth.
- It is advised to wash the teeth everyday twice to maintain healthy teeth and gum.

Nails and hairs hygiene

- The cleanliness of nails and hair is also very important. They store dirt and grease. And even the microbes could be in there stuck and spreading. If the nail is not clean they can cause severe food poisoning, as we use our hands to eat food. Trim the nails once in a fortnight and wash hair at least twice a week with a shampoo to keep them healthy .

Nose and ears hygiene

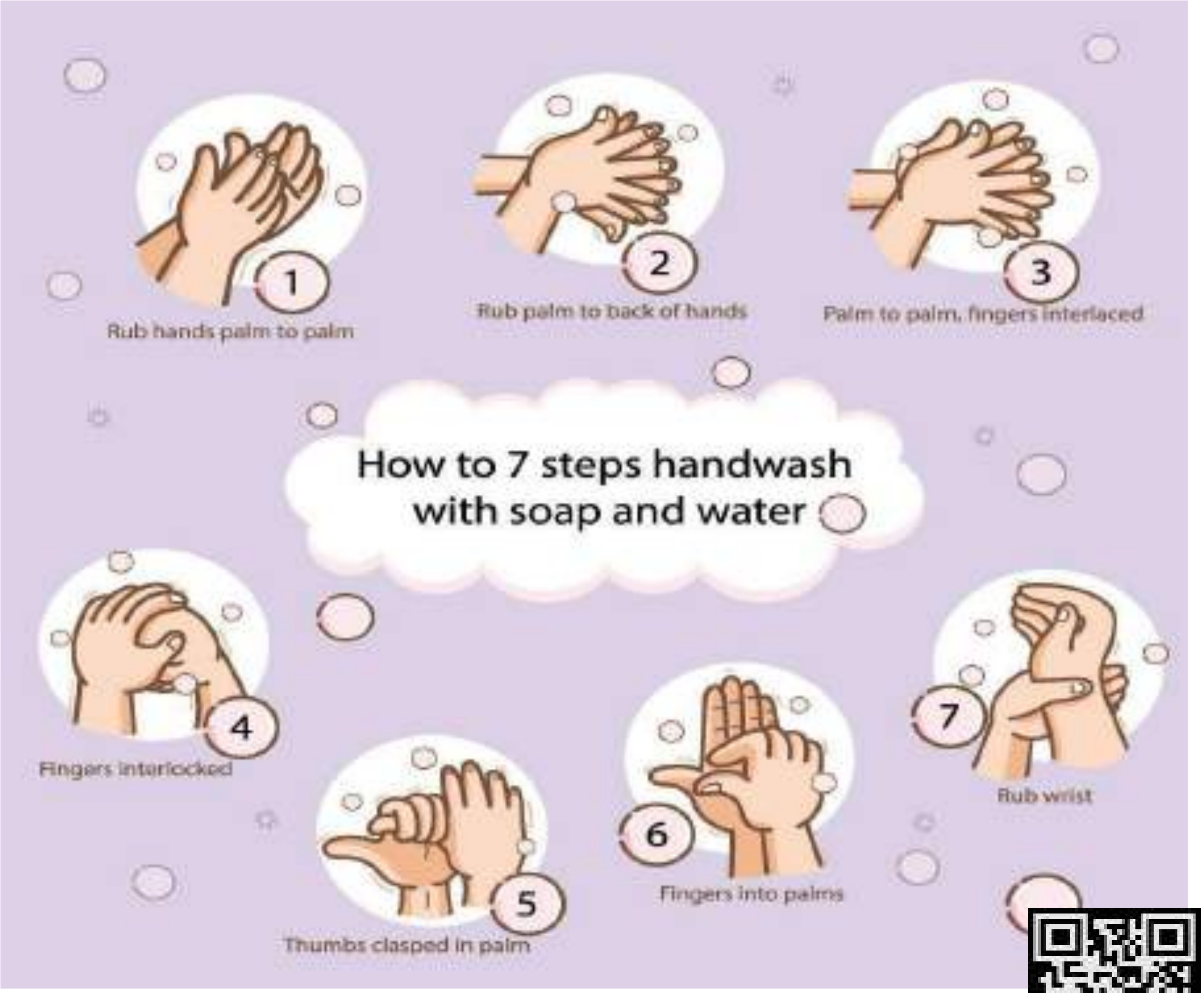
- Wherever we are most likely to breathe in some pollutants, and most of the particles are bound to be stuck in the nasal hair. So, rinse the nose and ear with warm water once you return from outside

Wear fresh and clean clothes

- Changing into neat and clean clothes will prevent many infectious diseases. It will also give the mental effect immediately and it will boost the mind. Wash clothes with a good detergent every day and dry it in the sun.
- This will ward off any microbes attached to the clothes. If possible, Dettol can be used while rinsing which is an anti-disinfectant.

Food hygiene

- You can get severely sick from food-borne diseases, as most of your foods are raw, purchased from outside, they risk being cross-contaminated with harmful microbes.
- Food hygiene is basically the idea of better storage, handling, and preparation of food to prevent contamination and to prevent food poisoning.


How to 7 steps handwash with soap and water
1
Rub hands palm to palm
2
Rub palm to back of hands
3
Palm to palm, fingers interlaced
4
Fingers interlocked
5
Thumbs clasped in palm
6
Fingers into palms
7
Rub wrist

5.3.1 - 7 steps for Handwashing

Click/scan to view the video on hand washing techniques

5.3.2 Importance of Social Distancing

Preventing communicable diseases:

All these above practices will help us to prevent communicable diseases. These diseases are highly infectious and contagious and spread through air, urine, feaces, saliva, skin (through touch) and using same towels and utensils.

Social Distancing and isolation, Self-Quarantine:

Ever since the spread of the pandemic covid-19, several health organisations have been insisting on following social distancing and isolation. Communicable diseases mainly spread through coming close to the infected individual and through physical touch. If a person is infected with diseases like normal flu or cold and spread it to others, the symptoms and may remain with the infected person for a day or two. The virus may be destroyed by taking an antibiotic. But in severe cases like corona virus the infection is severe and can prove fatal to the affected people. To prevent the spread of the virus, the entire world adopted lockdown, ***social distancing*** and compulsory face mask. And the infected person has to be in ***self isolation*** and ***quarantine*** till the time the symptoms are over. This was the advisory from the World Health Organisation, and the entire world followed it to prevent the rapid spread of the virus. The same can be applicable to all types of communicable diseases that are spread mainly through air and touch.

As communities reopen and people are more often in public after the pandemic, the term “physical distancing” (instead of social distancing) is being used to reinforce the need to stay at least 6 feet from others, as well as wearing face masks.
Historically, social distancing was also used interchangeably to indicate physical distancing which is defined below.
However, social distancing is a strategy distinct from the physical distancing behavior.

What is self-quarantine?
Self quarantine was imposed on people who have been exposed to the new covid-19 and who are at risk for getting infected with the virus were recommended to practice ***self-quarantine***. Health experts advised the self- quarantine for 14 days or two weeks. Two weeks provides enough time for them to know whether or not they will become ill and be contagious to other people.

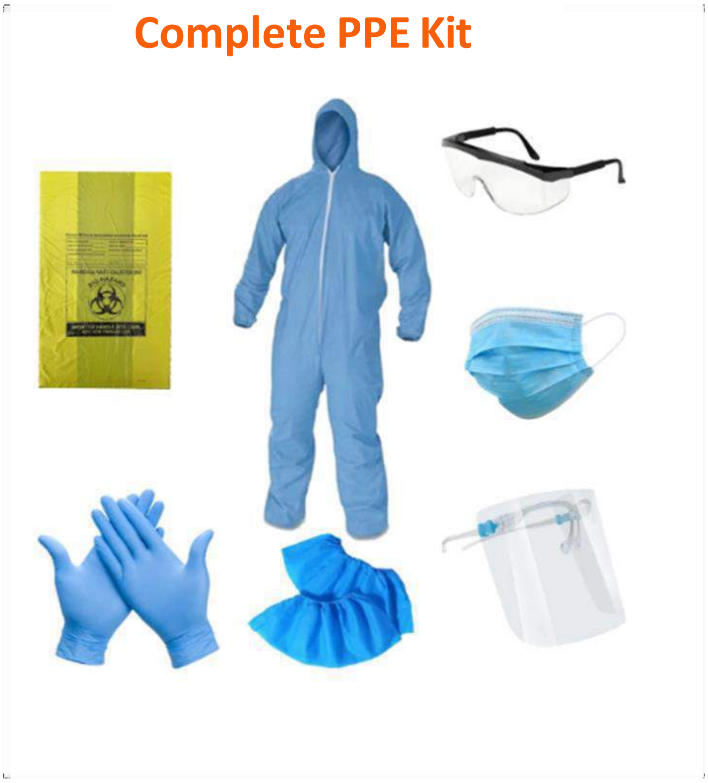
self-quarantine was also recommended for people who have recently returned from traveling to a part of the country or the world where COVID-19 was spreading rapidly, or if a person has knowingly been exposed to an infected person.

Self-quarantine involves:

- Using standard hygiene and washing hands frequently
- Not sharing things like towels and utensils
- Staying at home
- Not having visitors
- Staying at least 6 feet away from other people in your household

Once your quarantine period has ended, if the symptoms are not there, then the person may return to normal routine as per doctor’s advice.

What is isolation?
Anybody who is infected with a contagious disease needs to practice isolation in order to prevent the spread of the germs to their near and dear ones. This became very popular and was strictly adhered to during the covid-19 pandemic. People who were confirmed to have COVID-19, **isolation** was mandatory. Isolation is a health care term that means keeping people who are infected with a contagious illness away from those who are not infected. Isolation can take place at home or at a hospital or care facility. Special personal protective equipment will be used to care for these patients in health care settings. They are attended by well trained nurses and specialised doctors. And these people have to be in the PPE kits all through their presence in the hospital.



5.3.2Complete PPE Kit

Disposing off the PPE Kits

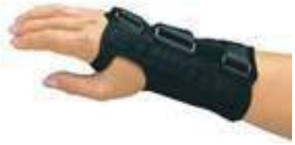
The PPE kits are worn by health workers and doctors who are attending to patients with highly infectious diseases and who are kept is isolation in order to arrest the spread. They have to wear it every time they go near the patient and have to remove it once their duty is over. Most of the PPE components are used for single use, however the face mask and goggles can be reused provided they are sanitised properly. The PPE kits have to be disposed off safely as they might have contaminants stuck to them and they may infect the healthy person if they are not discarded properly. The health workers may be all the more vulnerable to contact the disease.

5.3.3 Safe Workplace Practices

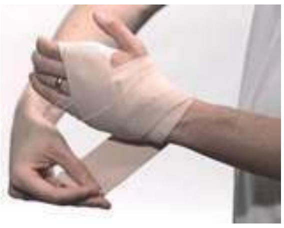
Every company has the provision of first aid box. As you have already read about the types of injuries that technicians can receive in their field of work, it is imperative for the companies to have appropriate first aid accessories.

The basic first aid supplies and accessories that a first aid box should have are:

Fig 5.3.3 Supplies and Accessories in the First Aid Box



Splint



Elastic wraps

Latex gloves

Adhesive tape

Tweezers

Blanket

Scissors

Wound Cleaning Agent

Triangle Bandage

Gauze roller bandage

Adhesive bandages

Gauze pads

Antiseptic cleansing wipes

Burn cream or gel

Eyewash liquid

Gauze roller bandage

Adhesive bandages

Gauze pads

Antiseptic cleansing
wipes

Burn cream or gel

Eyewash
liquid

CPR Kit

Chemical hazards are caused by toxic materials, which are poisonous. And being poisonous in nature, they can either be fatal or cause serious damages in case the preventive actions are not taken on time. Now, the exposure to chemicals can be in 3 forms.

They can be:

1. Inhaled (**entering the** body through nose)
2. Directly in contact with skin
3. Ingested (consumed)

The symptoms, in this case, will be:

- Seizures
- Partial or complete loss of responsiveness
- Burning sensation
- Stomach Cramping with bouts of excruciating pain
- Nausea
- Vomiting (and in times with blood-stains)

Fig 5.3.3(ii) Right way of coughing

Now, where there are problem, their solutions come side by side. In such situations, the person giving first aid requires to be calm and take certain preventative actions.

Some of the essential actions are:

1. Using insulated equipment
2. Wearing protective clothing, goggles, masks, shoes and gloves
3. Ensuring the place has enough ample ventilation

Remedial action

1. The foremost thing that one should do is to provide immediate first aid. However, it is to be remembered that the victim should not be given any kind of fluid (water, milk) until doctors from Poison control unit gives a green signal.
2. Aside from this, there are a few things a person can perform to the victim of toxic material exposure.
3. Remove the victim from the toxic zone or vicinity
4. Call for an ambulance
5. Remove contaminated clothing
6. Splash water in the eyes
7. If ingested, do not try to make the victim puke (vomit)
8. Wash their mouth with water

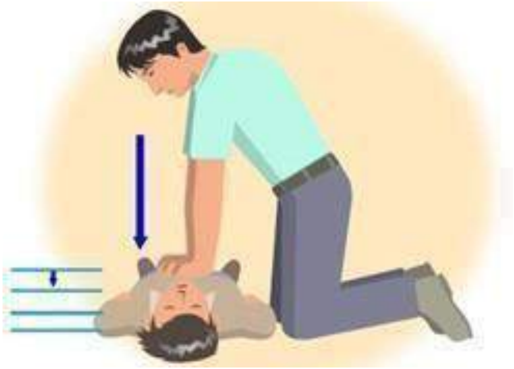


Fig. 5.3.3(iii): CPR

Click/Scan this QR code to view the video on CPR techniques

- In case the victim's breathing has stopped, give CPR (Cardiopulmonary resuscitation)
- In case of burning due to toxic material, apply burn gel or water gel on that area.
- Avoid any cream based or oil-based lotion or ointment
- Even though giving first aid is the right thing to do in the first place, it is also important to report the incident to their supervisor.

Exercise

1. Burnt area should be kept under ________________________ for a minimum of 10 minutes

2. _____________________ exits should be easily accessible in case of fire

3. ________________ or ____________________ must be applied to the wound to reduce the risk of infection

4. The RICE which is ____________________, ____________________, __________________ and ___________________ therapy must be applied to control and reduce swelling

5. CPR is ____________________________________

UNIT 5.4: Reporting Safety Hazards

Unit Objectives

At the end of this unit, you will be able to:

- Discuss the process of reporting in case of emergency (safety hazards)
- Understand methods of reporting hazards

5.4.1 Methods of Reporting Safety Hazards

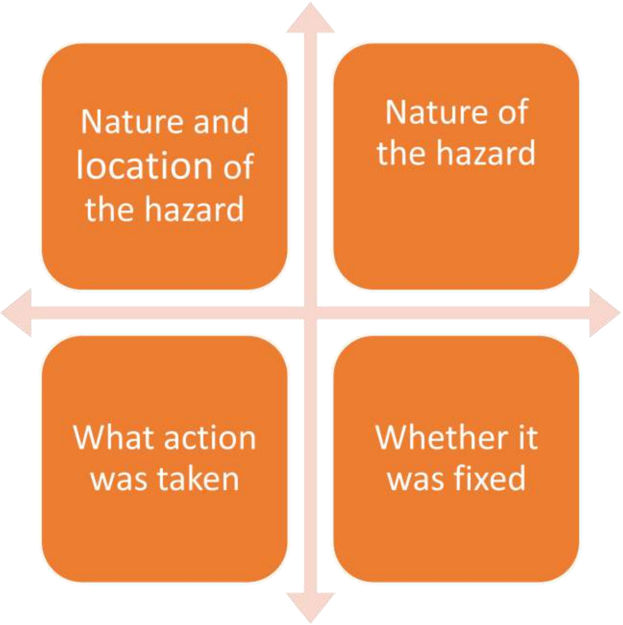
Every organization, from every industry, has a standard reporting protocol, comprising the details of people in the reporting hierarchy as well as the guidelines to be followed to report emergencies. However, the structure of this reporting hierarchy varies between organizations, but the basic purpose behind the reporting procedure remains same.

The general highlights of the Organizational Reporting Protocol, commonly known as

The 6Cs, are:

- Communicate First
  - The first source of information during emergency is the preferred source.
  - Crises situations are time-bound and hence it is important to communicate promptly.
- Communicate Rightly
  - Distortion of information due to panic must be avoided.
  - Proper, accurate information must be provided to concerned authorities and this can save lives.
- Communicate credible
  - Integrity and truthfulness must never be forgotten during emergencies.
- Communicate empathetically
  - One must wear the shoes of the victims while communicating emergencies.
- Communicate to instigate appropriate action
  - Communicating to the right authorities help in taking the necessary action.
- Communicate to promote respect
  - Communicating with the victims with respect help in earning their trust and thus eases the disaster management process.

Hazards and potential risks / threats can be identified and then reported to supervisors or other authorized persons in the following ways:
While identifying and reporting a hazard / potential threat / potential risk, one must describe the following:



Part A: to be completed by the worker details required

- Name of worker
- Date of filling up the form
- Time of incident/accident
- Supervisor/Manager Name
- Work Location/Address
- Description of the Hazard/what happened(includes area, task, equipment, tools and people involved

Possible solutions to prevent recurrence(suggestions)

Part B: to be completed by the supervisor/Manager Details Required:

- Results of Investigation (Comment on if the hazard is severe enough to cause an injury and mention the causes of the incident / accident)

Part C: to be completed by the supervisor/Manager-Details Required

- Actions taken/Measures adopted (identify and devise actions to prevent further injury, illness and causalty

Action	Responsibility	Completion Date

Any job role and any occupation in this world have some hazards, in varying severity, associated with it. These are called Occupational Hazards. Occupational Hazard can be defined as “a risk accepted as a consequence of a particular occupation”. According to the Collins English Dictionary, it is defined as “something unpleasant that one may suffer or experience as a result of doing his or her job”. Occupational Hazards are caused by the following:

Hazard Report Form	
Name:	
Location:	Date:
Tools/ Equipment:	
Description of hazards:	
Suggested Corrective Action	
Signature:	
Supervisor's remarks:	
Corrective action taken:	
Signature of Supervisor:	Date:

UNIT 5.5: Waste Management

Unit Objectives

At the end of this unit, you will be able to:

1. Understand what e-Waste
2. Understand the concept of Waste-Management
3. Explain the process of recycling of e-waste

5.5.1 Introduction to E-Waste

Electrical and electronic products are all around us. We can’t imagine a world without these gadgets. Our life is indispensable without electricity and electronic devices. Growth in the IT and communication sectors has increased the usage of electronic equipment immensely. Frequent change on the technological features of electronic products is forcing consumers to discard their old electronic products very quickly, which, in turn, adds to e-waste to the solid waste pool. What this translates to is mountainous masses of electrical and electronic waste which has a high potential to pollute the environment. This growing menace of e- waste calls for a greater focus on recycling e-waste and better e-waste management.

E-waste means electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment, and repair processes. E-waste usually is made up of usable and non-usable material. Some of the waste if left unattended will be destructive to the environment. E-waste is made up of hazardous substances like lead, mercury, toxic material, and gases.

There are many companies these days who are engaged in the collection, handling, and disposal of this e-waste in a safer and more secure place to protect the environment.

5.5.2 What is E-Waste?

The amount of e-wastes comprising computers and computer parts, electronic devices, mobile phones, entertainment electronics, refrigerators, microwaves, TV, fridges, and industrial electronics that are obsolete or that have become unserviceable is growing. All these electronic devices contain plastics, ceramics, glass, and metals such as copper, lead, beryllium, cadmium, and mercury and all these metals are harmful to humans, animals, and the earth. Improper disposal only leads to poisoning the Earth and water and therefore all life forms. Our effort is meant to preserve the environment and prevent pollution by proper handling of e-waste. While it will take a lot of effort to educate people to dispose of such wastes in the right way, we are doing our part by providing a channel to collect e-wastes and dispose off them in a sustainably safe manner. We convert waste to usable resources.

The electronic industry is not only the world's largest industry but also a fast-growing manufacturing industry. It has been instrumental in the socio-economic and technological growth of the developing society of India.

At the same time, it poses a major threat in the form of e-waste or electronics waste which is causing harmful effects on the whole nation

e-waste is creating a new challenge to the already suffering Solid waste management, which is already a critical task in India.

5.5.3 Electronic goods/gadgets are classified under three major heads:

White goods: Household appliances
Brown goods: TVs, Camcorders, Cameras etc.,
Grey goods: Computers, printers, fax machines, scanners etc

The complete process is carried out as per the government guidelines.

5.5.4 E-Waste Management Process

- Collection of e-Waste from all the electronic stores, manufacturing companies etc.
- Transport to e-waste to the disposal unit
- Segregation of e-waste at the disposal unit
- Manual dismantling of e-waste to segregate components into various types such as metal, plastics and ceramics
- convert into raw material(recylce and reuse)
- Supply recovered raw material to processors and electrical/electronic industries
- Dispatch hazardous e-waste for safe disposal

5.5.4 E-Waste Management Process (contd.)

Waste management is carried out to ensure that all types of waste and garbage are collected, transported, and disposed of properly. It also includes recycling waste so that it can be used again

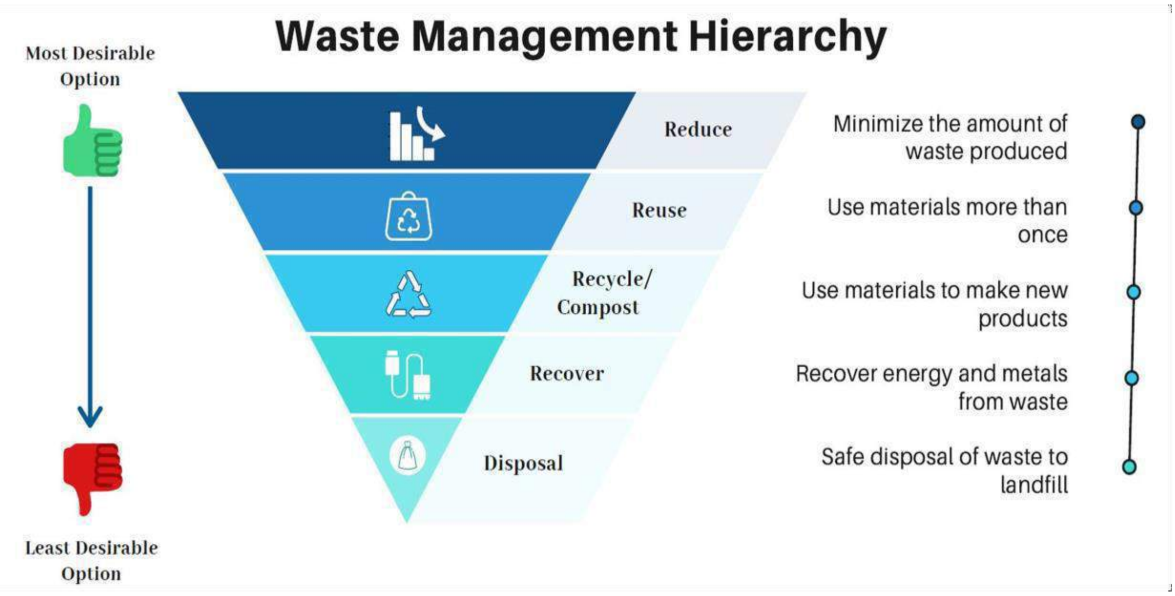

Waste Management Hierarchy
Most Desirable Option
Least Desirable Option
Reduce
Reuse
Recycle/ Compost
Recover
Disposal
Minimize the amount of waste produced
Use materials more than once
Use materials to make new products
Recover energy and metals from waste
Safe disposal of waste to landfill

Fig 5.5.4 waste Management Hierarchy

5.5.5 Recyclable and Non-Recyclable waste

Recyclable waste is **renewable or can be reused**. This means that the waste product is converted into new products or raw material, like paper, corrugated cardboard (OCC), glass, plastics containers and bags, hard plastic, metal, wood products, e-waste, textile, etc

Recycling not only conserves important areas in our landfills but also assists decrease greenhouse gas emissions.

Contrary to this, Non-recyclable waste cannot be recycled and cause a major threat to the environment.

The following items cannot be recycled:

Shredded paper, aerosol cans, paper coffee cups, milk and juice cans, used baby diapers, and bottle caps.

Recycling is one of the best ways to have a favorable influence on the world where we live.

Recycling will greatly help us to save both the environment and us from pollution. If we take immediate action, we can control this, as the quantity of waste we are accumulating is increasing all the time.

Click/Scan this QR code to view the video on Waste Management

5.5.6 Colour codes of waste collecting bins

Waste collecting bins colour code

India's urban population of 429 million citizens produce a whopping 62 million tonnes of garbage every year. Out of this, 5.6 million tonnes is the plastic waste, 0.17 million tonnes is the biomedical waste, 7.90 million tonnes is hazardous waste and 15 lakh tonnes is e-waste.

According to an estimate, 40% of municipal waste in the city is 'wet' waste, which can easily be composted and used as manure. Nearly 30% of the municipal waste comprises of plastic and metal, which can be sent to an authorized dealer for recycling, and about 20% of it is e-waste, from which precious metals can be taken apart and recycled. However, out of the total municipal waste collected, 94% is dumped on land and only 5% is composted. To gather the garbage two color bin system was suggested. Green bin for wet waste and blue for dry waste. However, there is a drawback in that system. People do through the sanitary napkins and children's diaper along with wet waste causing the contamination of things. Hence the government has come up with three colored garbage collection bins

5.5.6 Tricolored Bins

1. **Green Bin**

The green coloured bin is used to dump biodegradable waste. This bin could be used to dispose off wet/organic material including cooked food/leftover food, vegetable/fruit peels, egg shell, rotten eggs, chicken/fish bones, tea bags/coffee grinds, coconut shells and garden waste including fallen leaves/twigs or the puja flowers/garlands will all go into the green bin.

2. **Blue bin**

The blue coloured bin is used for segregating dry or recyclable left over. This category includes waste like plastic covers, bottles, boxes, cups, toffee wrappers, soap or chocolate wrapper and paper waste including magazines, newspapers, tetra packs, cardboard cartons, pizza boxes or paper cups/plates will have to be thrown into the white bin. Metallic items like tins/cans foil paper and containers and even the dry waste including cosmetics, hair, rubber/thermocol (polystyrene), old mops/dusters/sponges.

3. **Black bin**

Black bin, make up for the third category, which is used for domestic hazardous waste like sanitary napkins, diapers, blades, bandages, CFL, tube light, printer cartridges, broken thermometer, batteries, button cells, expired medicine etc.

5.5.7 Waste disposal methods:

- Incineration: Combusting waste in a controlled manner to minimize incombustible matter like waste gas and ash.
- Waste Compaction: Waste materials are compacted in blocks and are further sent away for recycling.
- Landfill: Waste that can't be recycled or reused can be thinly spread out in the low-lying areas of the city.
- Composting: Decay of organic material over time by microorganisms.
- Biogas Generation: With the help of fungi, bacteria, and microbes, biodegradable waste is converted to biogas in bio-degradation plants.
- Vermicomposting: Transforming the organic waste into nutrient-rich manure by degradation through worms.

5.5.8 Sources of Waste

Construction waste – waste coming from construction or demolition of buildings.

Commercial waste from commercial enterprises

Household waste- garbage from households is either organic or inorganic

Medical or clinical waste -wastes from the medical facilities- like used needles and syringes, surgical wastes, blood, wound dressing

Agricultural waste- Waste generated by agricultural activities that include empty pesticide containers, old silage packages, obsolete medicines, used tires, extra milk, cocoa pods, wheat husks, chemical fertilizers, etc.

Industrial waste-The waste from manufacturing and processing industries like cement plants, chemical plants, textile, and power plants

Electronic waste-The defective, non-working electronic appliances are referred to as electronic waste. These are also called e-waste. Some e-waste (such as televisions) contains lead, mercury, and cadmium, which are harmful to humans and the environment

Mining waste- chemical gases emitted in mine blasting pollutes the environment. And the mining activity greatly alters the environment and nature.

Chemical waste-waste from the chemical substance is called chemical waste.

Radioactive waste: radioactive waste includes nuclear reactors, extraction of radioactive materials, and atomic explosions.

5.5.9 Sources of Pollution

All these above-mentioned waste also adds to environmental pollution. The contaminants that cause detrimental change to the environment are called pollution. It is one of the most serious problems faced by humanity and other life forms on our planet. The earth's physical and biological components have been affected to

such an extent that normal environmental processes could not be carried out properly

5.5.10 Types of Pollution

Types of Pollution	**Detail/Pollutants involved**
Air pollution	1. Solid particles and gases mixed in the air cause air pollution 2. Pollutants: emissions from the car, factories emitting chemical dust, and pollen
Water pollution	1. Water gets polluted when toxic substances enter water bodies such as lakes, rivers, oceans, and so on. They get dissolved in it and cause it unfit for consumption. 2. Pollutants that contaminate the water are discharges of untreated sewage, and chemical contaminants, release of waste and contaminants into surface
Soil pollution	1, It is the presence of toxic chemicals (pollutants or contaminants) in soil, in high enough concentrations to pose a risk to human health and/or the ecosystem 2 Sources of soil pollution include metals, inorganic ions, and salts (e.g. phosphates, carbonates, sulfates, nitrates),
Noise pollution	1. Noise pollution happens when the sound coming from planes, industry or other sources reaches harmful levels 2. Underwater noise pollution coming from ships has been shown to upset whales' navigation systems and kill other species that depend on the natural underwater world
Light pollution	1. Light pollution is the excess amount of light in the night sky. 2. Light pollution, also called photo pollution, is almost always found in urban areas. 3. Light pollution can disrupt ecosystems by confusing the distinction between night and day.

UNIT 5.6: Organizations' focus on the Greening of jobs

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the concept of ESG
2. Explain the different factors of ESG

5.6.1 What is ESG?

The ESG is the short form of environmental, social, and governance. ESG guidelines are used to evaluate businesses on how well they control emissions, governance, human rights, and other factors of their business.

Several companies audit these companies for ESG compliance. They will let the companies know how well the ESG policies are implemented in their company hat let companies know how well their ESG policy is working.

Every business enterprise is deeply intertwined with Environmental, Social, and Governance (ESG) issues. ESG has been looked at seriously by the corporate, government establishments and stakeholders.

ESG is important as it creates high value, drives long-term returns, and global stakeholders are paying attention to the topic.

ESG is said to have created high value, and focuses on long-term returns, and stakeholders are focusing more on this concept.

5.6.2 Factors of ESG

Several factors are used to determine how well a business is doing in maintaining its ESG policies. For creating the ESG Policy, thorough knowledge of these factors are critical.

The factors are divided into three categories; environmental, social, and governance. Knowing about these factors come a long way in designing the effective ESG policy.

Environmental

Environmental factors relate to a business's impact on the environment. Examples include:

- Usage of renewable energy
- Effective waste management
- Policies for protecting and preserving the environment

Social

Social factors relate to the people of the organization. How they are treated in the organization is what it focuses on. The major entities are the stakeholders, employees, and customers. Examples include:

- diversity and inclusion
- proper work conditions and labor standards
- relationships with the community

Governance

Governance factors relate to the company policies for effectively running it. They include:

- tax strategies
- structure of the company
- relationship with stakeholders
- payments to the employees and CEO

Every factor is important and matters a lot to the overall rating of the company in ESG compliance. Ignoring one aspect in favor of another can affect the rating and in turn the reputation of the company.

The companies make a clear communication about these policies to all the employees, and to the public, they should mention what their various activities are that will protect the environment, people, and the governing factors.

Exercise

1. ESG stand for ___________________________, ____________________, ____________.

2. Governance factors include ______________, ____________________, __________,

3. The three causes of air pollution _________, ___________________and

4. Mining waste includes_________________.

5. Landfill is a _____________________________.

6. ____________ and ___________coloured bins are used for disposing the waste

7. The plastics cans are trashed in __________coloured bin.

8. __________________and _______________________________________are considered as e-Waste

9. ___________part of e-waste is recycled and used again

10. E-waste is made up of hazardous substances like _______________,_________ and ______________________

-

6. Communication and Interpersonal Skills

Unit 6.1 - Interaction with supervisor, peers, customers and differently-abled persons

Unit 6.2 - Explain the importance of developing sensitivity towards disabled persons

TEL/N9102

Key Learning Outcomes

At the end of this module, you would be able to

- Understandwhat is communication andthe importance of communication in the workplace
- Understand effective communication and communicate effectively for success
- Discusstypes of communication -verbal and non-verbal
- Communicate at workplace
- Communicate effectively with superiors
- Communicate effectively withcolleagues and customersusing different modes viz face-to face, telephonic and email communication
- Understand the hurdles for effective communication
- Conduct professionally at work place
- Respect differences in gender and ability
- Communicate effectively with person with disabilities
- Respect for disable people

UNIT 6.1: Interaction with supervisor, peers ,customers and differently abled persons

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the importance of communication
2. Understand types of communication

6.1.1 Why is communication important?

- Communication Skills are more important than ever, for all fields of endeavor.
- Whatever the role a person is holding in the organization, having a firm grasp of effective communication will undoubtedly be a key role in the individual's as well as the organization's success
- Oftentimes, people with excellent technical skills don't get promoted to higher roles because of their inability to communicate effectively
- Hence one fundamental skill everybody should be proficient along with the technical skill is Communication Skills
- Effective communication help us to build rapport with the customer both internal and external and help us resolve issues and conflicts easily and quickly.

6.1.2 What is Communication?

- Communication is the process of sending and receiving information among people. It is imparting or exchanging of information by speaking, writing, or using some other medium
- The purpose of communication is to convey your thoughts and opinions to others. Communication is said to be successful only when both the sender and the receiver perceive it in the same way.
- In your personal and professional life, you would be communicating with the following people-

– Colleagues

– Customers

– Friends

– Parents

– Relatives

6.1.3 Effective Communication

Effective communication is the process of delivering messages to a target audience in a way that guarantees satisfactory reception and understanding. If the communication is effective, both the sender and the receiver will share the same information at the end of the process. Effective communication is about more than just exchanging information. It's about understanding the emotion and intentions behind the information

Click/Scan the QR code to view the video on
Types of Communication

6.1.4 Effective Communication for Success

Effective Communication is critical to a business's success. From top to bottom, among colleagues, from subordinates to superiors, and from the organization to the outside, several messages are delivered daily. All the people must communicate these messages properly. Content, language, remarks, tone of voice, and non-verbal communication are elements that affect the effectiveness of messages

Clear and effective communication will

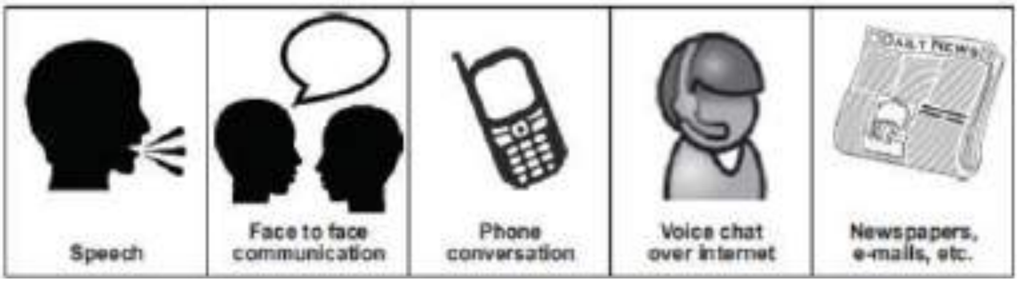
1. Increase customer satisfaction
2. Bring more business to the company
3. Increase productivity among team members

6.1.5 Types of Communication

Communicationhas been divided into two types:-

- Verbal Communication
- Non-Verbal Communication

Verbal communication takes place when people exchange words with eachother, either spoken or written. It includes the **choice and use of words and language to convey a message**. Examples of verbal communication are face-to-face conversation, telephonic conversation, and a speech or presentation.



6.1.5(i) Ways of Verbal Communication

Speech has certain characteristics which will affect the message that is being spoken:

- Volume – loud speech may sound bossy, very quiet speech cannot be heard.
- Tone – use warm tones without sounding over-friendly. Cool tones are very unwelcoming.
- Pace – fast speech is not easy to follow. Speak at a reasonable pace so that the other person has a chance to understand.

Correct body language also plays an important role in effective communication. Forexample, a warm smile accompanying 'Have a nice day' or looking directly at the person who is being spoken to give a positive image of the organisation.

Non –Verbal Communication

Non-verbal communication includes the overall body language of a person. There are two kinds of non-verbal communication:

Signs and symbols: for example, pictures, or notices, or signboards, or even photographs, sketches and paintings. Here are some examples of different signs and symbols:

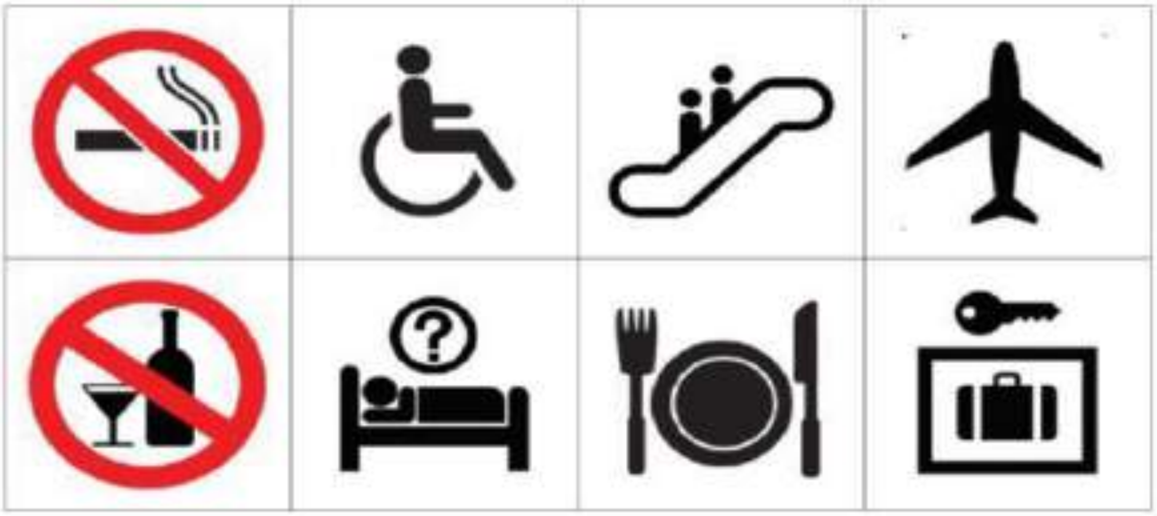


Fig 6.1.5(ii) Non-Verbal Communication

Gestures and expressions: hand signs, facial expressions, body postures or body language that can help to convey a message. You can learn to communicate better with others if you learn to recognise some of these.

Facial expressions - A smile or a frown

Gestures - movements of hands and body to help explain or emphasize the verbal message

Body posture - how we stand or sit. Maintain a good posture. When you are talking to a colleague or guest, remember to stand up straight, look professional and be positive. Do not slouch, lean against something or fidget with equipment or your hands.

Orientation - whether we face the other person or turn away

Eye contact - whether we look at the other person and for how long

Proximity - the distance we are from a person

Head nods - for encouragement, indication of agreement or disagreement

Appearance - dress and grooming

Non-verbal aspects of speech - tone and pitch of voice

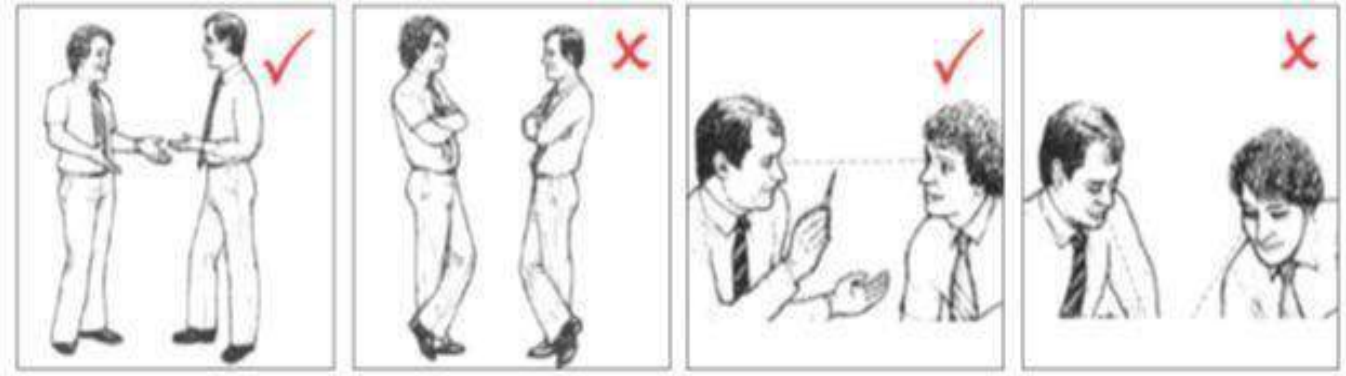


Fig 6.1.5(iii) Gestures and Expressions

These non-verbal clues are important as they can be used to improve the quality of communication. They can be used to reinforce any verbal communication; for example, leaning forward and looking at the person you are speaking to and smiling naturally. Your expressions, posture and appearance must be appropriate and should tell the guest that you are professional, competent and willing to help.

Communication takes place in mainly three different ways:

1. **Talking and listening** face-to-face and on the telephone
2. **Writing and reading** messages, forms, report etc.
3. **Through body language** including facial expression, gestures, eye contact or looking away/looking at the floor and how close you are to a person.

6.1.6 Communication at workplace

In every situation, while interacting with people, we make use of both verbal and Non-Verbal Communication. It is the key to the success of any organization. Be it communication with customers, supervisors, or peers. In today's scenario having technical skills alone is not enough to get the work done, but communication skill is also equally important. Completing the task must require the support of the whole team, and without proper communication, it cannot happen. Effective Communication helps managers to perform their jobs and responsibilities and it serves as a foundation for planning.

6.1.7 Communication with supervisors

Effective and open communication within a team will build a common purpose among team members that will allow them to reach their goals. Team leaders know that group communicationenhances organizational efficiency. The team members should always follow the communication guidelines. Some of the points to remember while interacting with supervisors:

1. Beware of the communication guidelines of the organization
2. understand and interpret clearly, the work requirements from the supervisor
3. Keep the supervisor informed about the progress of the task assigned.
4. Participate in all the discussions which call for decision-making, and provide fact and figures
5. Give/accept suggestions during the discussions
6. Accept the feedback positively and work towards rectifying errors if any. Make sure the same mistakes are not repeated.
7. Give/accept suggestions during the discussions.

Click/Scan this QR code to view the video on communication with customers and Colleagues

6.1.8 Communication with colleagues & customers

- Themain responsibility of a Customer Care Executive is to handle customers' concerns.
- Interaction with colleagues/peers is also equally essential and it enhances productivity in the workplace.
- Be polite in speaking to your peers at the office.
- Value other people's time as much as you value your own.
- Before you begin discussing something, ask your coworker if it is the right time to talk, and give a true picture of how much time you expect to take. Always start the conversation
- Communication with colleagues/customers can be through face-to-face, telephonic, or email.
- Keeping a few points in mind while communicating will make the interaction pleasant and fruitful.

6.1.9 Face-to-face Communication

This is an important medium of oral communication, wherein two or more persons talk to each other and see each other physically. This form of communication is direct or straight.

Things to remember while you are communicating face to face

1. Adjust the tone of voice, don't be too loud
2. Make eye contact
3. Use appropriate language
4. Maintain adequate distance
5. Acknowledge, nod during interaction
6. Use appropriate non-verbal gestures to communicate with persons with disabilities

Benefits of face-to-facecommunication

1. Instant feedback
2. Information conveyed clearly
3. Build rapport

6.1.10 Telephonic Communication

Another widely adopted mode of communication is through the telephone. This is the person-to-person conversation where nobody sees others but hears each other and interacts instantly. Nowadays mobile phones are becoming more popular along with landlines as a mechanical media of oral communication.

The following suggestions are recommended to follow while making telephone calls-

1. Make the call at the appropriate time
2. Provide details about your identity like name, company, department, etc.
3. Discuss the purpose of the call
4. Think about the tone of your voice
5. Listen carefully
6. Speak clearly
7. If you don't understand something, ask
8. Use please, thank you, sorry wherever necessary
9. Follow the organization's policies and procedures while interacting on the telephone

Click/Scan this QR code to view the video on Effective Telephonic Communication

6.1.11 Email Communication

Email or Electronic mail is a method of exchanging messages using electronic media. The official or business communication between colleagues or inter-department communication usually happens through email. The advantage of email is you can send communication to many people at the same time.

Points to remember in email communication

1. Be clear and concise
2. Keep the content short and to the point
3. Avoid using jargon and short forms
4. Re-readthe message, before sending it for grammar and spelling mistakes
5. The subject line should describe the mainmail content
6. Use readable font size (don't keep it too small)
7. Add signature at the bottom of themail body
8. Check the attachments for viruses before sending

6.1.12 Importance of timely completion of tasks

Time is a major factor that evaluates **the success or failure of a project**. Even when the whole team has done a wonderful job and produced high-quality results, with half the cost allotted to the project, everything will be a waste if it was not delivered on time. Any deviation from the timeline will call for a penalty and sometimes may result in losing the project and eventually the customer. so adhering to the timeline is important when it comes to any organization who are into products and services.

Benefits of adhering to timelines:

1. Increased and improved customer satisfaction
2. Increased productivity and efficiency of the individual
3. Team feels motivated
4. Sense of adhering to the SLA's and Standard Operating Procedures
5. Shows the commitment toward the work and the organization
6. Good word of mouth from the customers

6.1.13 Standard Operating Procedure

A ***Standard Operating Procedure (SOP)*** is a standardized process that outlines a set of detailed instructions to help workers perform complex tasks properly and safely. The main objective of standard operating procedures is to develop an effective quality system and comply with industry- specific regulations and standards. Failure to follow SOPs can cause significant errors in operations and services.

For amobile repairing center, the SOP defines the different process ofoperations, namely handling customer, repairs, sales and interaction among the staff within the repair center.

SOP also clearly defines the responsibility of each and every designated person in the organisation and what is expected from them. It further defines what the various levels of engineers will handle with respect to the handsets coming for repair.

The escalation matrix specifies how the different levels escalate the issue to the next level and adhere to the timelines for repair and communication to the customer.

SOP is created keeping in mind the customer satisfaction as a main motive.

Each and every person in the organisation is expected to read the SOP thoroughly and work accordingly. Because every customer when they go for purchasing a product, one of the main things they see is the post-sales Support. If they find the brands deliver good service support then they don’t mind even spending few extra moneys.

6.1.14 Escalation Matrix

Escalation matrix is made up of several levels of contact based on the specific problem at hand. This is being followed by all who are working on that product and have to adhere to the service guidelines. And the problem has to be closed at aminimum turnaround time, and for any reason the repair is taking time proper reason has to be mentioned and notified to all the people concerned including the customer.

6.1.15 Escalation Mechanism

Customer service is a very important aspect of a typical service industry. Giving committed service to customers every time and on time is very crucial for the success of the brand. In recent times, customers do research on how the after-sales support of a product is, and based on that rating they will decide which brand to buy. If the customer service is not good, they will not go for that product even though the product is very good. Hence customer service is a second important aspect of a product and services organization.

The resolution time matters a lot, all these technology has become indispensable for business and people. Their business cannot function without that. Hence too much downtime is also not good. Once the complaint is raised the service center allocates it to the technicians who are trained to handle any kind of technical issues. The L1 support level looks into the problem and try to resolve it. If it's beyond their area of resolution the same is escalated to the next level. Every organization has ***Standard Operating Procedures*** clearly state the workflow for the customer service and Technical support for their business. Every individual working there must be aware of the same and adhere to the deadline for faster service and enriched customer satisfaction.

6.1.16 Escalation through CRM

Customer Relationship Management is a software, through which most of these companies who are into customer service, manage their customers. The customer details are entered in the system and also the services which are logged against a particular customer. This is the automated system, which takes a particular action after a period of time. For example, if a service request is assigned to an engineer for rectifying a problem of a client, and if the engineer does not update the status of the service in the system within a specified period of time, the problem is automatically escalated to the next level for resolution. Then the new engineer who is responsible for resolving pick it and try to find a solution. This system helps to maintain a track of a particular problem and the current status which will help the organization in effectively managing the customer queries. The complete escalation route is mentioned in the SOP and the same is implemented through the CRM software. This eases the manual escalation procedure which is time consuming and slow.

6.1.17 Escalation issues at work

Whether an issue arises among team members or with customers, sometimes the severity of the circumstance requires an escalation to management. Understanding how to approach an escalation can help you better find a solution when conflicts arise. We explore what it means to escalate an issue in the workplace and provide tips for how to do so successfully.

What does it mean to escalate an issue at work?

Escalating an issue in the workplace is the process of bypassing those involved by contacting upper/senior management. It involves raising awareness of the context to the right people in order to resolve a challenging situation. Typically, escalation occurs when there is an issue that the current staff working on the problem can't resolve and requires assistance from those with more authority and resources

When should you escalate an issue at work?

Deciding when to escalate an issue depends on the amount of risk it can bring to the company. Because escalating an issue can lead to difficult meetings and cause disruptions in work, you should reserve them for issues that truly require escalation. You can often avoid escalating an issue by solving the problem with the individual first.

However, some issues require support from those with higher authority. Consider escalating an issue at work when:

You have already tried other strategies but that did not work.

Resolving may incur additional cost to the company or the customer, while rectifying the problem.

Because of the non-availability of certain parts, the repair work is taking longer than usual.

The engineer broke another part while repairing a part. So escalation is required to get the approval to replace the broken part by the company.

6.1.18 Hurdles for Effective Communication

Following are factors contribute to communication not being effective.

Stress and out-of-control emotion. When you are stressed or emotionally disturbed, you're more likely to misread other people and send confusing non-verbal signals. Calm down before continuing the conversation.

Lack of focus. You can't communicate effectively when you're multitasking. If you're checking your phone, planning what you're going to say next, or day dreaming, you're almost certain to miss non-verbal cues in the conversation. To communicate effectively, you need to avoid distractions and stay focused.

Inconsistent body language. Non-verbal communication should support what is being said, not contradict it. If you say one thing, but your body language says something else, your listener will likely feel that you're being dishonest. For example, you can't say "yes" while shaking your head no.

Negative body language. If you disagree with or dislike what's being said, you might use negative body language to ignore the other person's message, such as crossing your arms, avoiding eye contact, or tapping your feet. You don't have to agree with, or even like what's being said, but to communicate effectively and not put the other person on the defensive, it's important to avoid sending negative signals.

6.1.19 Professional Conduct

There are six basic rules to be followed for professional conduct:

- **Be on time:** Being late impedes a company's operations and demonstrates a lack of consideration of the time concerns of others. If you are constantly late for work, meetings, or are always late with your reports and other tasks; it demonstrates to others that you are probably not executive material because you disregard the value of time.
- **Be discreet:** Keep company secrets such as new product designs, sales figures or any other confidences to yourself.
- **Be courteous, pleasant, and positive:** No matter how demanding your clients, customers, co-workers or employees might be; always remain upbeat and positive. Projecting a positive company image has the same effect.
- **Be concerned with others, not just yourself:** Finding out a customer or client's point of view naturally helps you get ahead in any industry. Concern for others should include your superiors, co-workers and subordinates as well.
- **Dress appropriately:** Dress to be comfortable in your environment. Dressing poorly or too casually does not convey a good image, neither does overdressing, which breeds suspicion and mistrust, and will be seen as inappropriate.
- **Use proper written and spoken language:** People who can express themselves clearly are at an advantage. This goes beyond using good grammar, proper spelling, and appropriate diction in all your communications; you should also speak and write to the point.

6.1.20 Respect Gender Differences

In any business, be it a small company to a big corporate, the workforce is a mix of both genders. The ratio of men vs. women varies from 70:30 or 60:40. Studies show that business teams with an equal gender mix perform significantly better than male-dominated teams when it comes to both sales and profits. No two women or men are alike and yet at the same time there are some work related traits that are gender specific. Both men and women approach their work in a different way and deal with many hurdles that come their way. Since they all share the same workspace every organization has devised a policy as to how they treat the opposite gender at the workplace and what are the implications of any abuses

Some of the points to remember while interacting with female colleagues

1. Treat them with respect
2. Support them in case they approach you
3. Value their opinion and suggestions
4. Involve and include the opposite gender in all the discussions

Unit 6.2: Explain the importance of developing sensitivity towards disabled persons

Unit Objectives

At the end of the unit, you will be able to

1. Respect differences in gender and ability
2. communicate effectively with person with disabilities
3. Respect people with disability at work

6.2.1 Communication with disabled person

A **disability** is any condition that makes it more difficult for a person to do certain tasks or interact with the people around them (socially or materially). These conditions, or defects, may be cognitive, developmental, intellectual, mental, physical, sensory, or a combination of multiple conditions. Defects may be present from birth or can be acquired during a person's lifetime. Often, disabled people are excluded from full participation in any activity." But things are changing, every organization has allotted some percentage of employees from this section of the society. They are also allowed to exhibit their skills in a few jobs which they can perform without putting their life at risk

General tips for communication with disabled people

Keep these points in mind while interacting with people with a hearing problem

1. Speak to them as you would speak to anyone else in a soft and low tone.
2. Respect the person first, not their disability. For example, use the term ‘a person with disability’ rather than ‘a disabled person’.
3. Do not use phrases such as ‘suffers from’ and ‘crippled’ rather the phrase should be ‘people who use a wheelchair’ rather than ‘wheelchair bound.
4. Don’t drag or push a person’s wheelchair, and don’t move their crutches or walking stick without their permission. It has to be in their personal space.
5. When talking to a person who is in a wheelchair, try to sit in such a way you could reach their eye level. This would not strain them much, to lift their head and talk.

6.2.2. Communicating with people with a hearing impairment

Keep these points in mind while interacting with people with a hearing problem

- Draw the person’s attention before you speak. Give a gentle tap on their shoulder, a wave of some other visual signal to the person’s attention
- Stand in front of the personand maintain eye contact
- Don’t cover the mouth while talking. They can figure out what is being said by just looking at the lip movement
- Speak at a normal pace don’t speak fast or slow
- Choose the words wisely
- Use short sentence

6.2.3 Respect people with disability

Learn the proper way to act and speak around someone with a disability.

- Do not use offensive or derogatory words like ‘handicapped’, ‘crippled’, and retarded etc.
- Don’tcriticize or blame them. Don’t shout at them or use abusive language
- Talk slowly with a low tone. Pause while talking
- Avoid excessive whispering, joking and laughing unnecessarily
- Assuming things about them or their situation.
- Don’t make jokes about their condition or be sarcastic
- Don’t look down upon them because of their disability
- Appreciate them for their efforts and work, and motivate them to perform better

6.2.4 Safety at workplace for people with disability

Disabilities of all types affect employees and can pose various mental or physical challenges. In many situations, a disability may impact the amount of time it takes for an employee to complete a task or get from one part of a facility to another. Some disabilities may be known while others remain unknown to an employer.

Health and safety legislation should not prevent disabled people from finding or staying in employment so it should not be used as an excuse to justify discrimination against them. Disabled people and those with health conditions, including mental health conditions, should be given the opportunity to both get into and stay in work.

Responsibilities of an employer towards disabled people

The employer is responsible for the health, safety and welfare of all of their employees, whether they have a disability or not. Disability is not always obvious so one might not realise a worker is disabled or they might choose not to tell you, particularly if their disability has no impact on their ability to do their job. Workers do not have to tell anybody unless they have a disability that could foreseeably affect the safety of themselves or anyone else connected to their work. If they do not reveal and there are no obvious indicators of any disability, then the organization are not under any obligation to make workplace adjustments. Periodically, consult with the employees (whether directly or through their representatives) on issues relating to health and safety. These discussions reflect good safety practice because employees have day-to-day understanding of the job, so they are likely to have good ideas on keeping themselves and others safe.

6.2.5 Workplace adaptation for people with disability

Few changes in the workplace to make it a safe place for the disable people will go a long way in the employee satisfaction for an organisation.

Workplace Adaptations

Workplace should be easily accessible for these people with special needs. One major compliance concern deals with accessibility. For example, if workplaces have been adjusted or created more accessible entrances and exits to their facilities, allowing more independence for persons in wheelchairs, would be a great idea. Other subtle changes may include the width of bathroom stalls, hand rails inside the stalls and long ramps instead of stairs. The path of travel that employees take should never be obstructed; there should be no barriers to prevent someone from getting to safety in an emergency.

Workstations easily can be adapted to follow this universal design. Many companies now use slide out keyboard trays and monitors on swinging arms to allow employees to adjust to their needs. Desks can accommodate wheelchairs in place of regular chairs, and general work spaces can be lowered to allow easier access. The main goal is to remove all barriers and allow everyone to concentrate more on completing their tasks.

The biggest challenge with universal design is accommodating the multitude of challenges that different disabilities present. Not all disabilities are the same, and not all will present the same challenges for employees. Some employees may have issues with their right hand while others have issues with their left. For some, it may involve not being able to stand or sit. Some may need low lighting, while others need bright lighting. Designing a facility to accommodate all is always going to be a challenge.

Complying with government guidelines can be more difficult in regards to employees with disabilities. This difficulty lies with ensuring that employees are aware of all hazards in the workplace. Multiple disabilities will create multiple reasons that may keep employees from recognizing hazards. Employees with impaired vision, for example, must have other means of identifying hazards. This may be remedied with audible alarms or touch-activated devices that warn employees not to go in an area. Other employees may have difficulties reading and may benefit from shapes or colors to further identify hazardous areas.

For workers who lack hearing ability, employers can utilize signs to demonstrate hazards or use flashing strobes to identify when employees need to evacuate an area and head to safety. Every organization has to make few adaptations in order to make it a better place to work even for people with dis-ability. It should provide an environment where they feel they are safe and can carry out their work rather than worrying about their safety.

Exercise

1. What are the three points you will focus on when you talk to people face to face?

____

____

____

Fill in the blanks

1. Before sending the mail it's important to check the _____________ and __________ of the content
2. when you interact through phone, provide your identity details like____________ and _____________
3. Add your ______________________ at the bottom of your mail.
4. The Customer Care Executives are responsible for handling ________________________

Notes

Annexure

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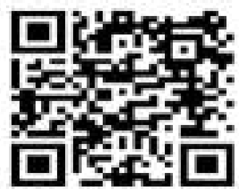
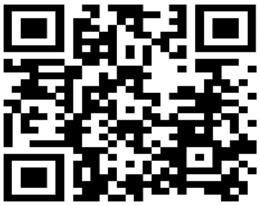
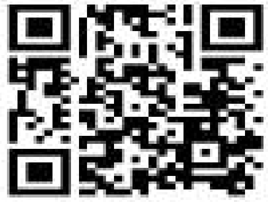
1	1.1	Introduction to the program	12	 Click the QR code to view the video on tips to become a mobile app developer
2	1.10	Android Studio Installation	59	 Click the QR code to view the video on steps to download android studio
3	3.1	Basic Layout,short messaging services and Networking	81	 Click the QR code to view the video on how to learn android application development
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