

UNIT: 2

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★ Naive Data Handling

Naive data handling could refer to the basic or straightforward approaches developers use to manage and process data within their applications.

* Some key consideration for handling data in MAD

- Caching : Implement caching strategies to store frequently used data.
- Data Storage
- User Input Handling
- Security
- Networking and APIs
- Local Database
- Testing
- Background Task
- Error Handling
- User Experience.

* 5 Benefits of Native MAD

- i) Native Apps Have the Best Performance.
- ii) More Secure.
- iii) Native Apps are More Interactive and Intuitive .
- iv) Allows Developers to Access Full Feature Set of Device .
- v) Tends to have Fewer Bugs during development .

★ Data and File Storage

Android uses a file system that's similar to disk-based file system on other platforms .

- Shared Preferences :- Private primitive data in key-value pairs.
- Internal Storage :- Private data on device memory.
- External Storage :- Public data on device or external storage.
- SQLite Database :- Structured data in a private database.
- Content Providers :- Store privately and make available publicly.
- Network Connection : You can use N/W to store and retrieve data.
- Cloud Backup .

* Internal Storage

- Always available.
- Uses device's filesystem.
- Only your app can access files.
- On uninstall, system removes all app's files from Inte. storage.
- Uses private directories.
- Permanent storage directory
— `getFilesDir()`.

External Storage

- Not always available.
- Uses device's filesystem or external storage like SD card.
- Any app can read.
- On uninstall, system does not remove file private to app.
- Set permission in Android manifest.

* Shared Preference: It is the way in which one can store and retrieve small amount of primitive data as key/value pairs to a file on the device storage such as String, int, float that make up your preference in XML files.

* SQLite Database

Relational database is a method of structuring data as tables associated to each other by shared attributes.

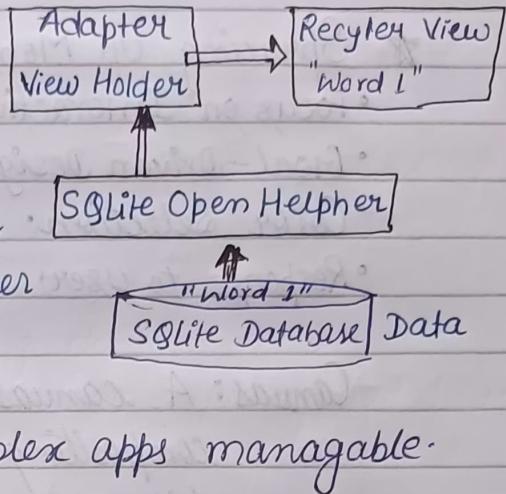
Structured Query Language (SQL) is a language for searching and updating a database.

SQLite is an open-source relational database i.e. used to perform database operation on android device.

* Using SQLite database:

- Versatile and straightforward to implement.
- Structured data.
- Access, search and change data frequently.
- Data can be represented as rows and columns.

* Component of SQLite database



* SQLite Open Helper

SQLite Database object all interactions with database through SQLite Open Helper

- Execute your requests.
- Manage your database.
- Separate data → keep complex apps manageable.

* Cursors: The basic purpose of cursor is to point to a single row of the result fetched by the query.

Operations — `getCount()` — number of rows in cursor.
`getColumnNames()` ; `getPosition()` ; `close()`.

* Content Values :- Represents one table row, stores data as key-value pairs. Key - Column Name ; Value - Field name.

* Implementing SQLite

- Create data model
- Subclass SQLite Open Helper
- In Main Activity, create instance of SQLite Open Helper.
- Call methods of SQLite Open Helper to work with database.

* Database Operations:

• Insert()

`Insert into <table>(<list of columns>)
Values (<list of values>);`

• Update()

`Update files Set title = "Profile"
where id = 5;`

• Query() method.

- Query can take and return any data type that UI need.
- Implement `query()` method in Open helper class.
- Delete():

★ Sprucing up Mobile App

- Focus on Interactive and goal - driven design.
 - Response to user.
 - Color selection.
- A canvas is the simplest, easiest way to draw objects on the screen.
- A drawable is a compiled visual resource that can be used as background, title or other part of the screen.

★ Animation

Animation is the process of adding a motion effect to any view, image or text. Animation in Android is used to give UI a rich look and feel.

Types :

- Property Animation: Property animation is one of the robust frameworks which allows animating almost everything. It can be used to add any animation in Checkbox, RadioButtons and widgets.
- View Animation: It can be used to add animation to a specific view to perform tweened animation on views.
- Drawable Animation: It is used if you want to animate one image over another.

* Methods of Animation:-

- `StartAnimation()`: Start the animation
- `ClearAnimation()`: clear the animation running on a view.

* Audio/ video Recorder

In Android for recording audio or video, there is a built-in class called `MediaRecorder`. This class helps to easily record video and audio files.

Methods — `Set AudioSource()`, `Set AudioEncoder()`,
`Stop()`, `Start()`, `Release()`.

→ For viewing videos in android, there is a class called "MediaPlayer". To insert videos, we put raw folder.

* Steps to build a Video Player:

1. In creating Frontend, we just need one component i.e. `Video View`.
2. The icons like play, rewind, forward will only come when we touch on `Video View`.
3. Backend part i.e. java Coding, we are getting media controls by:
`VW.setMediaController(new MediaController(this));`
4. Adding the videos of raw folder in `ArrayList` and making a call to a method called `set Video`.

`videolist.add(R.raw.faded)`

`videolist.add(R.raw.aeroplane);`

`set Video(videolist.get(0));`

Now in `set Video` —

`String uriPath = "android.resource://" + getPackageName() + "/" + id;`

`VW.setVideoURL(Uri);`

`VW.start();`

* There are two ways to get the current location of any Android device :

- i) Android's Location Manager API.
- ii) Fused Location Provider : Google Play Service Location APIs.



Debugging

Debugging allow you to go through each line of code, evaluating your app's variable, methods and how well code is working.

Start debugging -

- Set breakpoints in your app's code.
- In toolbar, Select a device to debug , from target device menu.
- In toolbar , click Debug..
- Click the Debugger tab.

The Android Debug Database library allows you to examine databases and shared preferences in Android apps.



Journey of Android App

Developing an android application involves several processes that happen in a sequential manner .

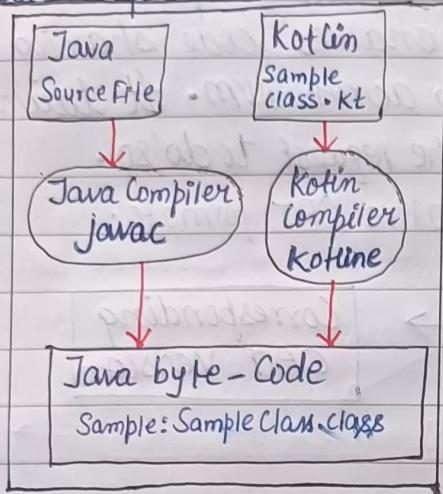
Critical Steps involved-

- i) Building the APK File.
- ii) Deploy the Application.
- iii) Run the Application.

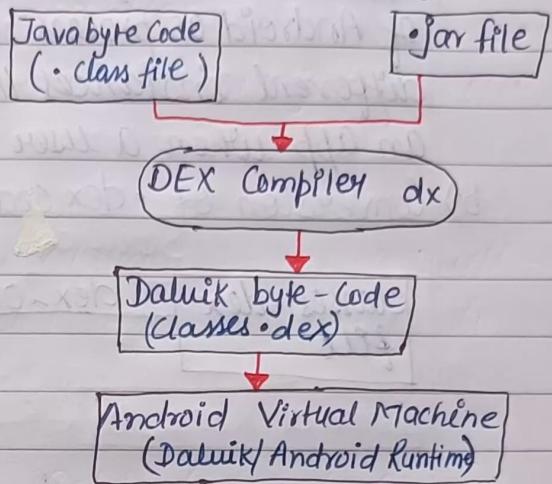
An APK (Android Package Kit) is the file format for application used on the Android OS.

Step 1: Building the APK Files:

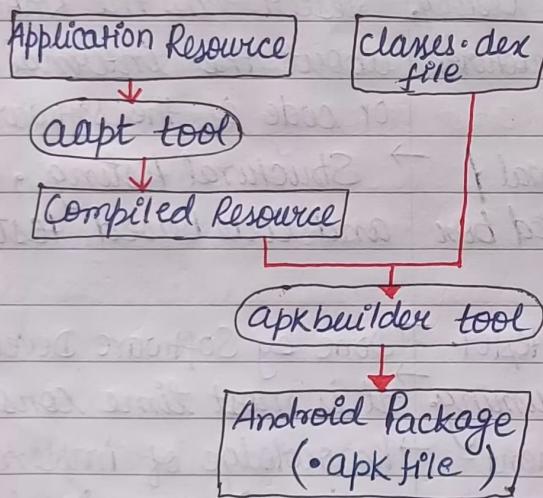
a) Code Compilation



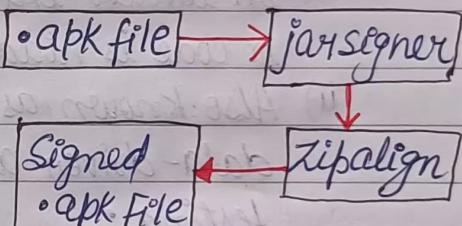
b) Conversion into Dalvik bytecode



c) Generating .apk file



d) App Distribution

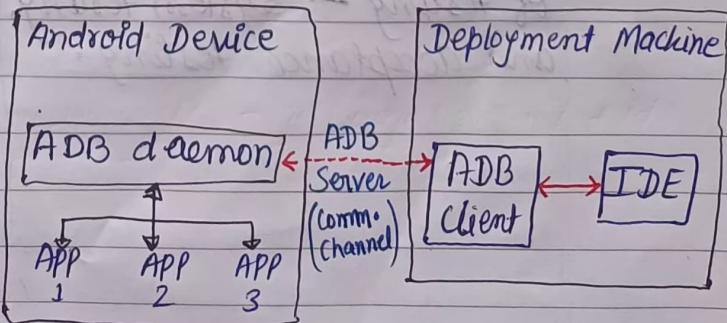


Step 2: Deploy the Application:

Application Deployment is the process of installing, configuring, and enabling a specific application, usually through an application manager to a specific URL on a Server.

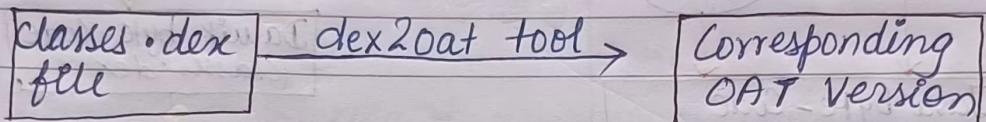
- a) Establish the ADB Server - Android Debug Bridge (ADB) deploys an application to Android device.

- b) Transfer .apk file to the Device.



Step3: Run the Application:

- App launch request - Zygote process, a special kind of Android OS process which enables code sharing b/w different instances that run across DVM. It launches an app when a user make the request to do so.
- Conversion of .dex code to native OAT format.



Black Box testing

- It is a way of software testing, in which internal structure or code is hidden.
- Also known as Functional / data-driven and closed box testing.
- Mostly done by software tester.
- It is least time consuming.
- No knowledge of implementation is required.
- Hard to automate Black-box.
- Not suitable for algorithm testing.
- It is done at higher levels of testing - System testing, and acceptance testing.

White Box Testing

- Tester has the knowledge about the internal structure or code of the software.
- Structural testing, clearbox and Code based testing.
- Done by Software Developers.
- It is most time consuming.
- Knowledge of implementation is required.
- Easy to automate this testing.
- Well suitable and recommended for algorithm testing.
- It is done at lower level of testing - unit testing and integration testing.

* Testing

- i) Testing is the process to find bugs and error.
- ii) Testing is display of error.
- iii) Testing is done by tester.
- iv) Can be manual or automated.
- v) Testing is initiated after code is written.

Debugging

- Debugging is the process of correcting the bugs found during testing.
- Debugging is a deductive process.
- Done by programmer or developers.
- It is always manual.
- It is concern with the execution of test case.

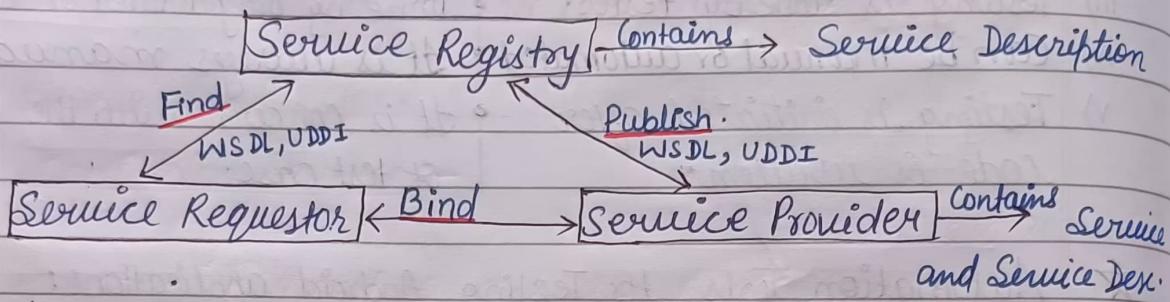
* Automation Tools for Testing Android applications:

Testing mobile apps is a critical component of the SDLC. It is quite time and resource consuming and can be challenge when there is a need to meet deadline.

1. Appium: This is an Open-source automation tools that support a wide range of Android os.
2. Robotium: Open-source automation tool that supports native and hybrid mobile apps.
Pros: Robust test, faster testing speed, simultaneous test.
3. Kobiton: This gives the tester the ability to check the real device.
Pros: Parallel test, Easy to install, Simple UI.
4. KMAX: It is one of the best automation tool for testing how mobile app behave under different network.
Pros: Customizable, Controlled and repeatable tests.
5. Squish for Android: Support native, web and hybrid mobile apps.

★ Web Service Architecture

The Web Service Architecture describe how to instantiate the elements and implement the operations in an interoperable manner.



* Three Roles :-

- I) Service Provider - It is the platform that host the services.
- II) Service Requestor - It is the application that is looking for and invoking an interaction with service.
- III) Service Registry - Service requestor find service and obtain binding info. for service during development.

* Operations :

- I) Publish - Publication of service description.
- II) Find - Finding of service description.
- III) Bind - Invoking of service based on service description.

⇒ Artifacts of web service - I) Service II) Service Registry.

★ Web Service Lifecycle :

A Web Service implementation lifecycle refers to the phases for developing web services from the requirement to development.

1. Requirement Phase: The objective is to understand the business requirement and translate them into web service requirement.
2. Analysis Phase: The purpose is to refine and translate web service into conceptual models.
3. Design phase ; 4. Coding Phase
5. Test phase ; 6. Deployment Phase.

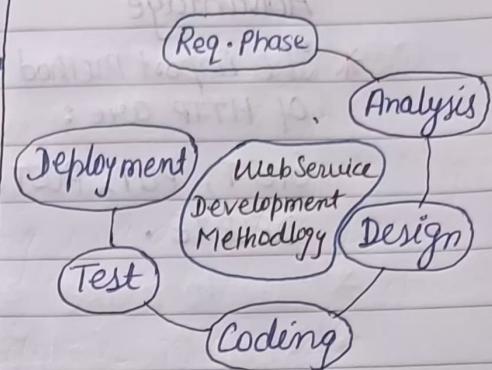


Diagram:

* Web Service Stack or Protocol Stack

→ A web service protocol stack typically stacks Four Protocols:

1. Transport Protocol (Service) :-

The network layer is the foundation of the web service stack.

2. Messaging Protocol (XML) :- It is responsible for encoding message in a common XML format.

3. Description Protocol (Service) : It is used for describing the public interface to a specific web service.

4. Discovery Protocol (Service) : It is a centralized service into a common registry so that network web service can publish their location and description.

Service Flow			WSFL
Quality of Service	Management	Security	Service Discovery
			static-UDDI
			Direct-
			WSDL
			XML-Based Messg.
			SOAP
			HTTP, FTP
			Network

* Types of Web Service :

- 1) RESTful web Service - REST stands for REpresentational State Transfer. REST is an architectural approach, not a protocol. It can be accessed through URI (Uniform Resource Identifier).

* The important methods of HTTP are :

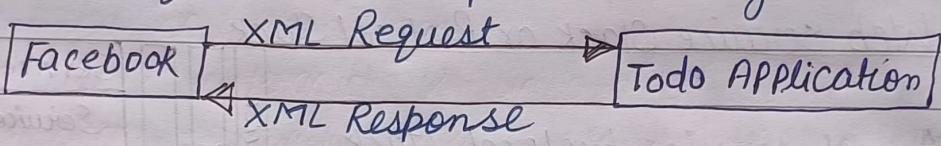
GET, PUT, POST, DELETE.

* Advantages of RESTful -

- RESTful web service are platform-Independent
- Provide diff. data formats - JSON, HTML, XML.
- These are reusable
- These are language neutral.

2) SOAP Web Service :-

Simple Object Access Protocol. It defines standard XML formats. Request and Response messages.



* SOAP Protocol

- i) SOAP is a protocol.
- ii) Stands for Simple Object Access Protocol.
- iii) Always exchange data in XML format.
- iv) SOAP uses Web Service Definition Language (WSDL).
- v) Harder to implement.
- vi) Uses HTTP or MQ transport protocol.

RESTful Web Service

- i) REST is an architectural approach.
- ii) REpresentational State Transfer.
- iii) There is no strict data exchange format.
- iv) REST does not have any standard definition language.
- v) Easier to implement.
- vi) Uses the most popular HTTP protocol.

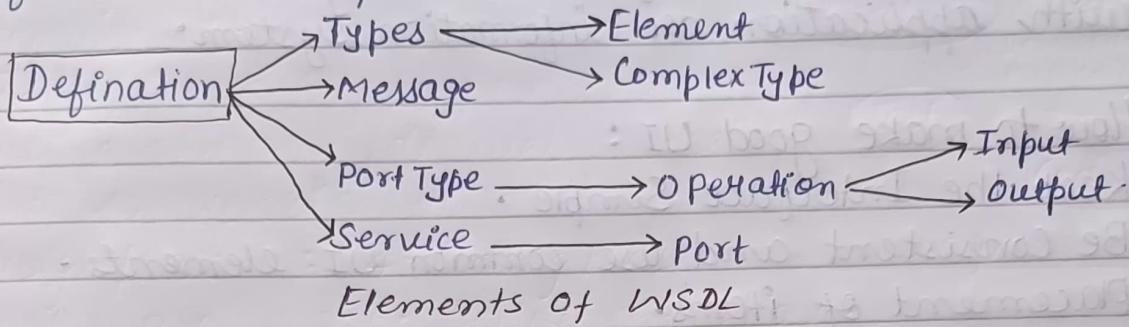
* Web Service Components:

There are two components of web services :

1) Web Service Description Language (WSDL) :

WSDL is an XML based interface description language. It is used for describing the functionality offered.

by a web service. It describes services as a collection of network endpoint, or ports.



2) Universal Description, Discovery and Integration (UDDI):

It is an XML based registry for businesses worldwide to list themselves on the internet. It makes the service available and the technical interface which may be used to access those services.

The UDDI business registry system has three directories -

- i) White Pages - Info. such as Company name, address, phone number.
- ii) Yellow Pages - Contain detailed business data.
- iii) Green Pages - Crucial business process, operating platform, supported program, etc.

* Debugging Web Services :-

Debugging Process -

- ↳ Problem identification and report preparation.
- ↳ Assigning report to Software engineer to verify.
- ↳ Defect Analysis using modeling, finding and testing flaws.
- ↳ Defect Resolution by making required changes.
- ↳ Validation of correction.

* Debugging Approaches: Brute Force, Backtracking, Forward analysis, Using Past Experience cause elimination.

Tools: Radare2, HidDbg, Valgrind.

UI stands for User Interface. It refers to the visual elements, controls, and interactions that users encounter when interacting with software applications or systems

* User Interface

User Interface (UI) defines the way human interact with application or information system.

* How to make good UI :

- Keep the Interface Simple .
- Be Consistent and use common UI elements .
- Placement of items .
- Uses of Right color .

* Significance / Advantages

- Make User's interaction simple and efficient .
- Uses of blocks, typography make user experience better .
- Easiness for non-technical people .

* Types of UI :

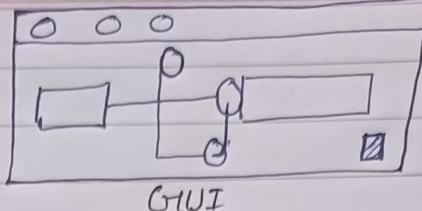
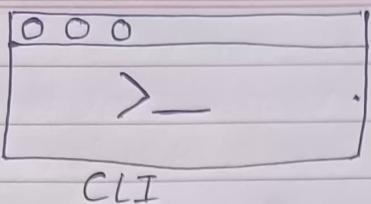
- i) Graphical User Interface (GUI) .
- ii) Command Line Interface (CLI) .
- iii) Menu Driven Interface — used on cash machines (ATM)
- iv) Form Based Interface — Enable you to interact with an applicn.
- v) Natural language Interface — User interact with the computer by talking to it.

* CLI

- i) Command Line Interface .
- ii) CLI is difficult to use .
- iii) CLI is faster than GUI .
- iv) OS need only a keyboard .
- v) Input is entered only at a command prompt .
- vi) It consume low memory .
- vii) There are no graphics .

GUI

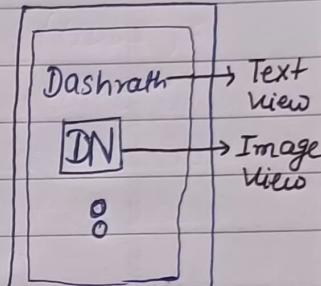
- Graphical User Interface
Easy to Use .
Slower than CLI .
Need both Keyboard & mouse .
Input can be entered anywhere on the screen .
Consumes more memory .
Graphics are used .



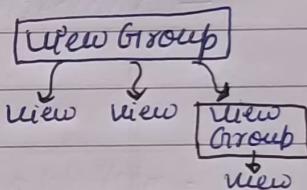
* Android UI Layout:

Android Layout is used to define the user interface that holds the UI controls or widgets that will appear on the screen of an android application or activity screen.

View: A view is defined as the UI which is used to create interactive UI components such as TextView, ImageView, RadioButton, EditText,

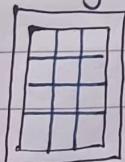


View Group: It acts as a base class for layout and layout parameter that holds other view or View Groups.

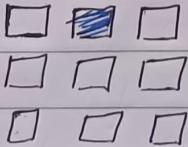


* Types of Android layout:

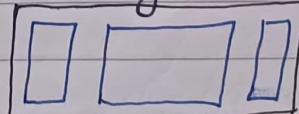
- **Android Linear Layout:** Horizontal or Vertical orientation property.
- **" Relative Layout:** Child View relative to each other.
- **" Constraint Layout:** Connect View with constraints.
- **" Table Layout :** Rows and Columns to view element.
- **Grid Layout:**



Frame Layout: Pins child View within its frame.



Linear Layout:



Relative Layout:

