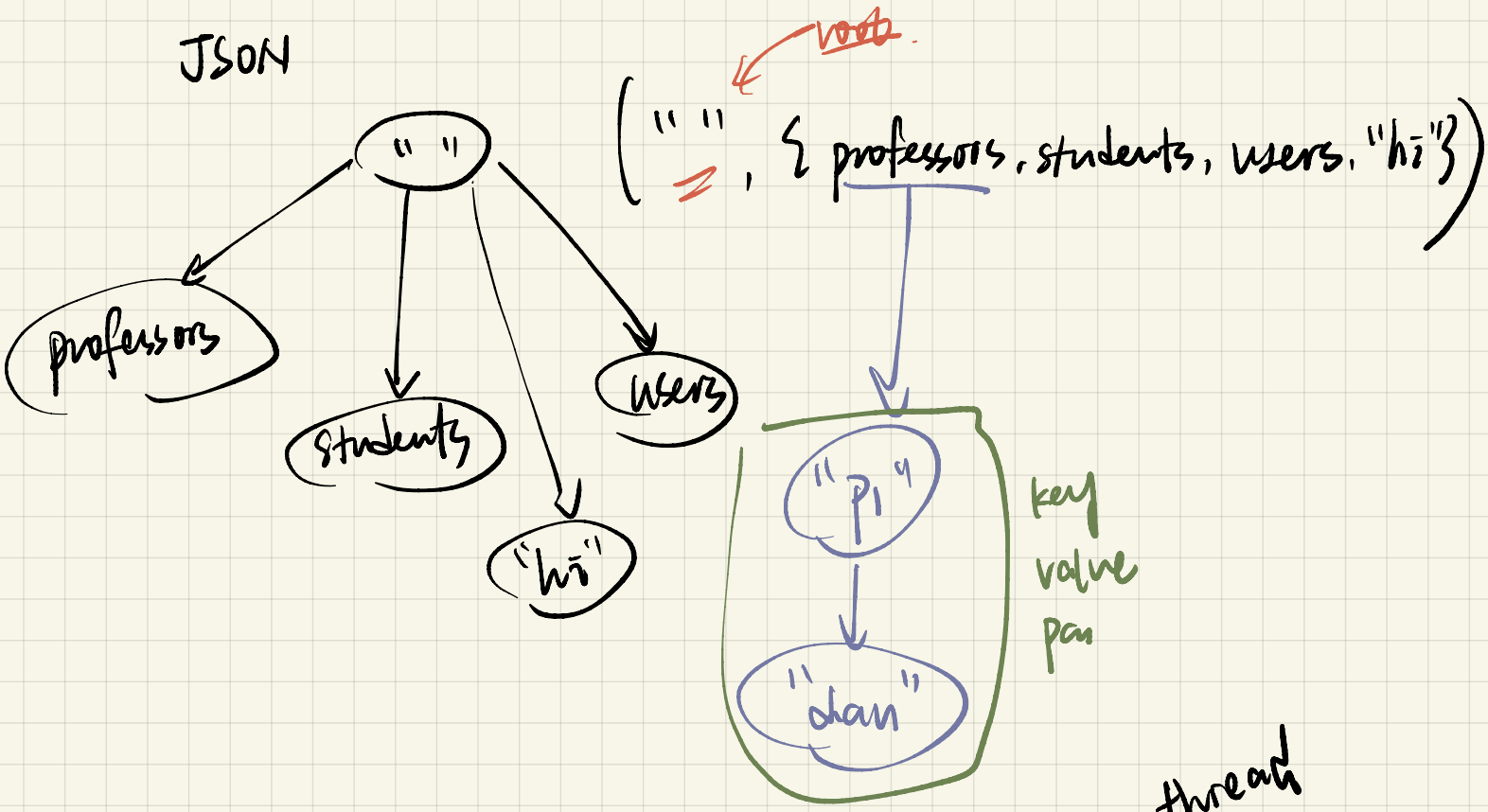
CSCB07 - Software Design

Introduction to Android

Fall 2023

firebase database. No-SQL.

JSON



thread

query. addValueEventListener.

a thread whose job is to monitor

listening to particular code

monitoring.

```
query.addValueEventListener(new ValueEventListener() {...});
setOutputText();
}
```

在 thread 改变 is found 的值并 return original value.

Android

- Android is a platform comprising three entities
  - An operating system
  - A framework for developing applications
  - Devices that run the Android operating system and the applications created for it
- Android SDK
  - A collection of libraries and tools that are needed for developing Android applications
- Android Studio
  - IDE for Android application development

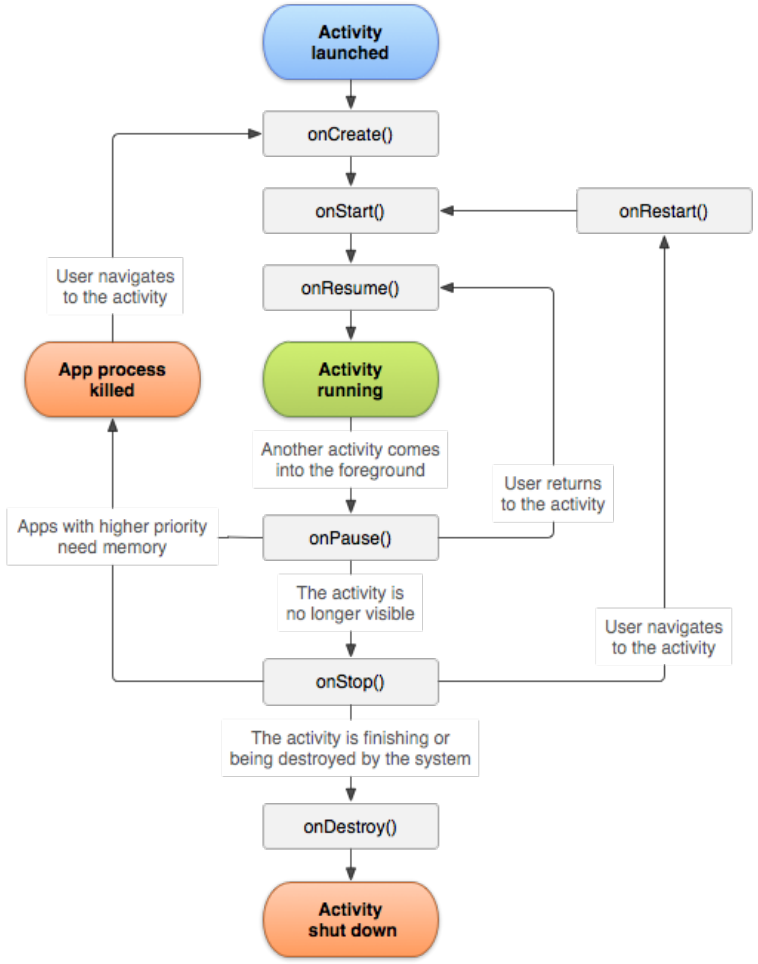
Dawn Griffiths and David Griffiths, Head First Android Development, O'Reilly Media, Inc., 2015.

Android App Basics

- An Android app is a collection of screens, and each screen is comprised of a layout and an activity
  - Layout: describes the appearance of a screen (written in XML)
  - Activity: responsible for managing user interaction with the screen (written in java)
- An activity can make use of one or more fragments
  - This promotes modularity (e.g. handling navigation and content separately)

Dawn Griffiths and David Griffiths, Head First Android Development, O'Reilly Media, Inc., 2015.

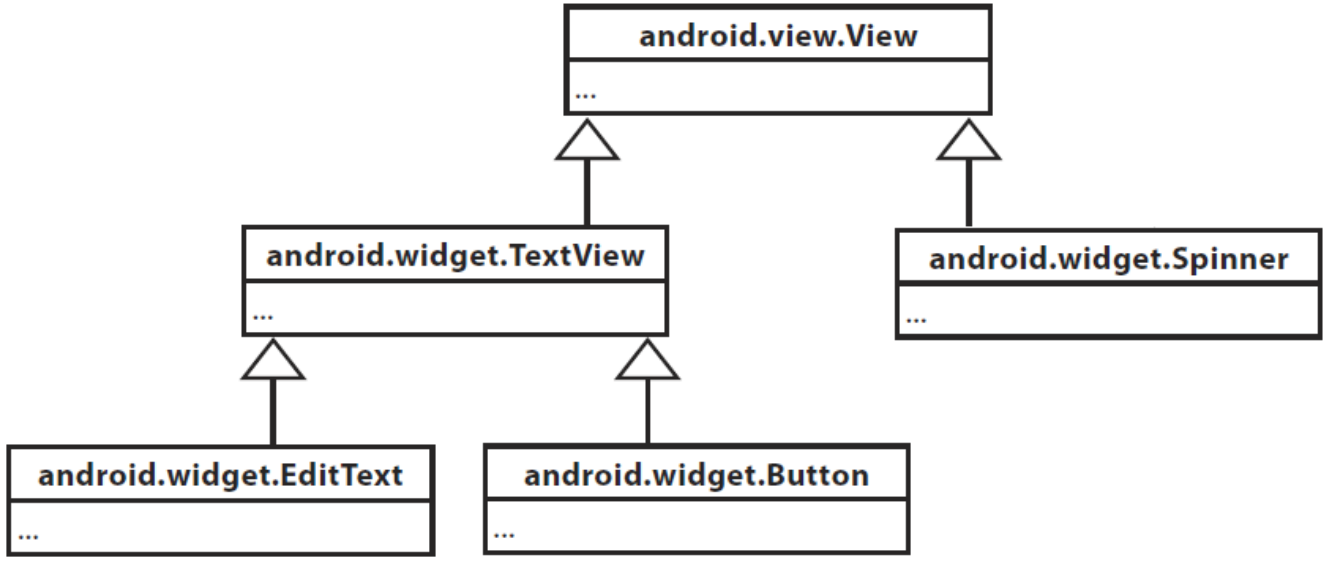
Activity Lifecycle



https://developer.android.com/reference/android/app/Activity

View

- Most GUI components in Android applications are instances of the **View** class or one of its subclasses
  - E.g. Button, EditText, ImageView, etc.



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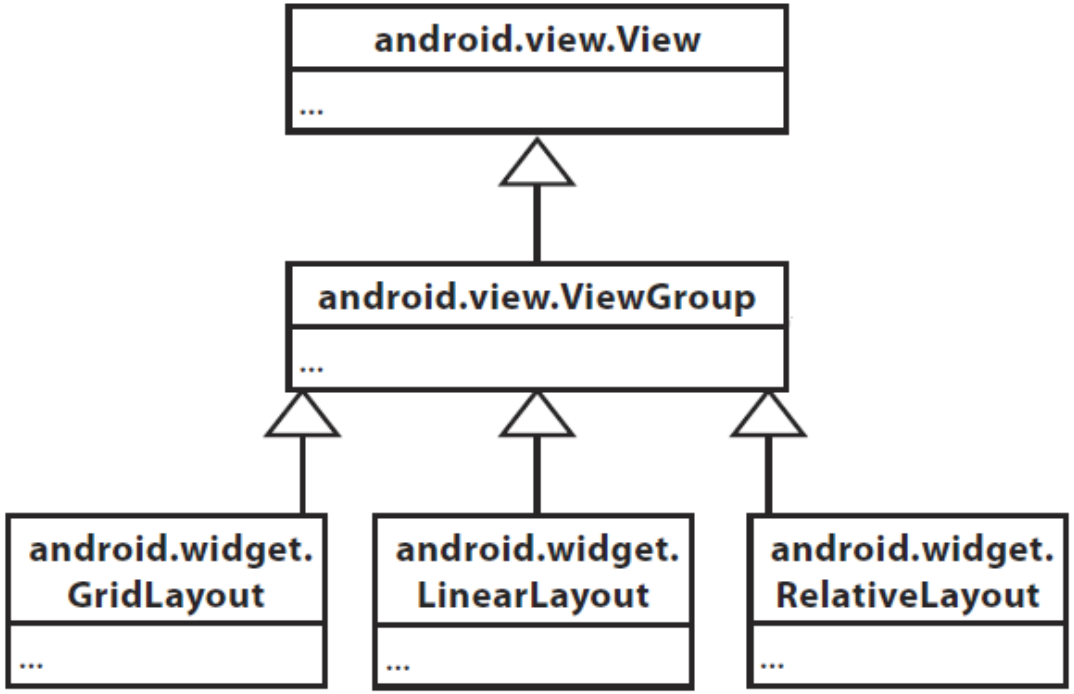
View Group

- A special type of view that can contain other views
- A layout is a type of view group



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Folder Structure of an Android project

- Manifest file
  - It defines the structure and metadata of an application, its components, and its requirements
  - Stored in the root of its project hierarchy as an XML file
- Java files
- Resource files
  - Resources are maintained in sub-directories of the app/res directory (e.g. res/layout)
  - A resource can be accessed in the code using its resource ID (e.g. R.layout.activity_main)
- Gradle scripts
  - Used to automate the build process

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Data storage options

- File system
- Shared preferences
- Databases
  - E.g. SQLite, Firebase Realtime Database

Firebase Realtime Database

- Cloud-hosted
- Employs data synchronization
  - ➢ Every time data changes, all connected clients automatically receive updates
- NoSQL
  - ➢ Data is stored as JSON
- The Firebase SDK provides many classes and methods to store and sync data. E.g.
  - **`DatabaseReference`**
  - **`DataSnapshot`**
  - **`ValueEventListener`**

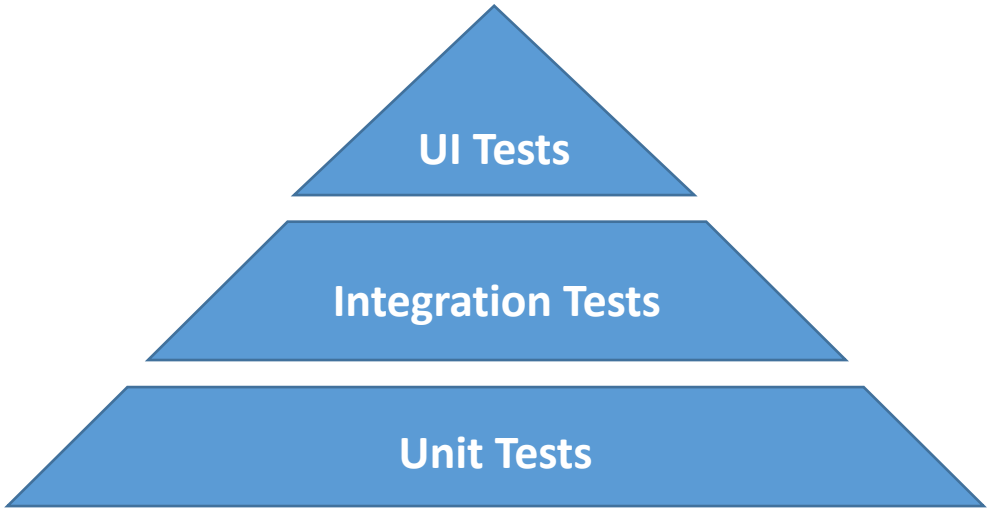
JSON

- **J**ava**S**cript **O**bject **N**otation
- Language-independent
- Supported by many programming languages
- Uses readable text to represent data in the form of key/value pairs
- Example

```
{
        “name”: “Alex”,
        “age”: 25,
        “address”: {
                “country”: “Canada”,
                “city”: “Toronto”
        }
}
```

Testing an Android Application

- Local unit tests
  - Run on the machine's local JVM
  - Do not depend on the Android framework
- Instrumented tests
  - Run on an actual device or an emulator
  - Usually used for integration and UI tests



Commonly used tools

- JUnit
  - Writing unit tests
- Mockito
  - Creating dummy (mock) objects to facilitate testing a component in isolation
- Roboelectric
  - Running tests that involve the Android framework without an emulator or a device
- Espresso
  - Writing UI tests

Mock Objects

- A mock is a software component that is used to replace the “real” component during testing
- Mock objects could be used to:
  - Represent components that have not yet been implemented
  - Speed up testing
  - Reduce the cost
  - Avoid unrecoverable actions

Mockito

- A mocking framework for Java
- Features include:
  - Creating mocks
  - Stubbing
  - Verifying behavior

Model-View-Presenter

- An architectural design pattern that results in code that is easier to test
- It consists of three components:
  1. Model (Data)
  2. View (UI)
  3. Presenter (Business logic)