



Getting started with Android and App Engine

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About you

Agenda

- **Introduction to Android**
- **Android Basics**
- **Managing Layouts and Resources**
- **Lists and Adapters**
- **Navigation between Components**
- **App Engine Basics**
- **Multithreading**

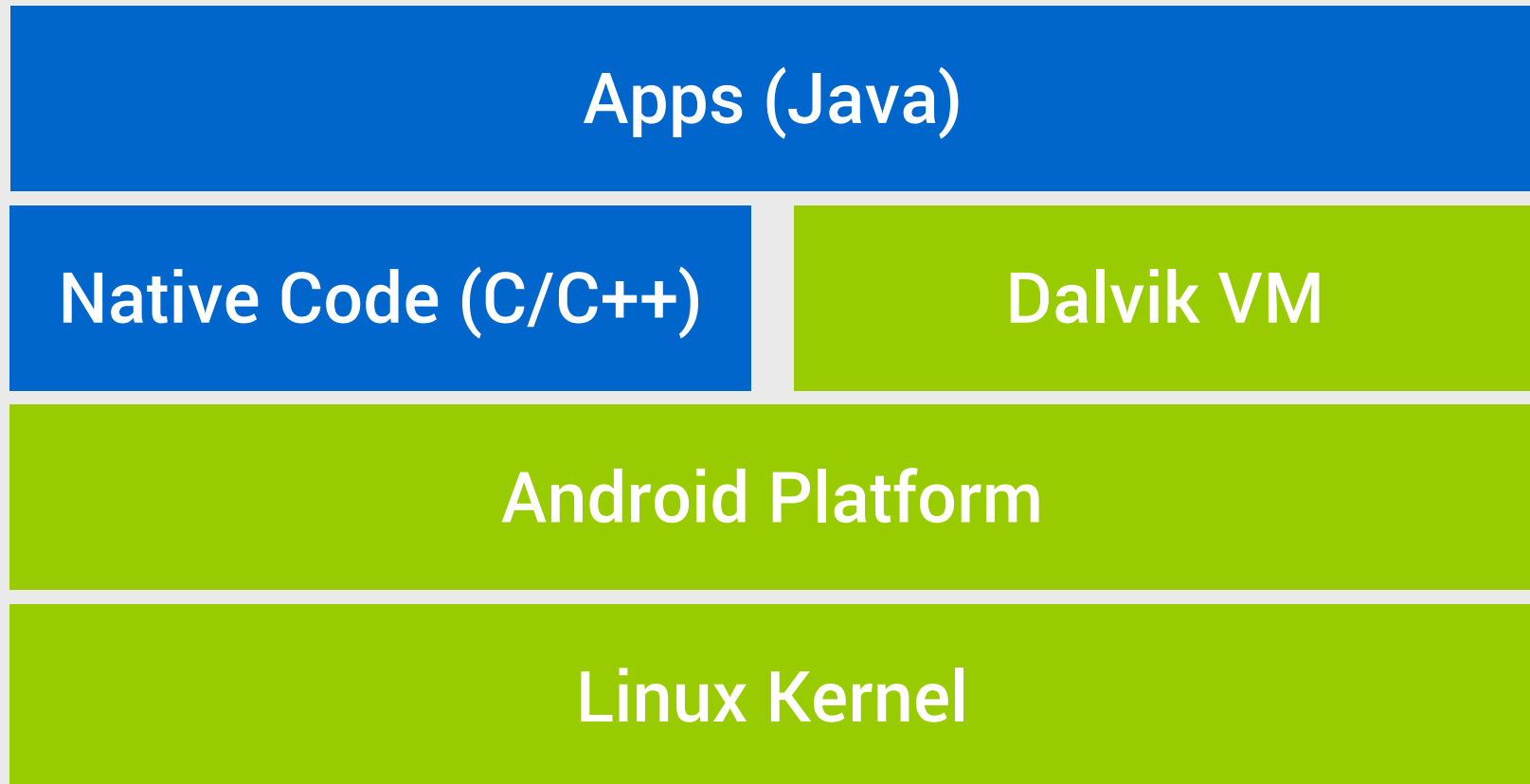
Disclaimer

All pictures annotated with ‡ are taken from
the official documentation at
<http://d.android.com>

Introduction to Android

or inside a droid

The Android Platform



APK

application.apk

classes.dex

resources

AndroidManifest.xml

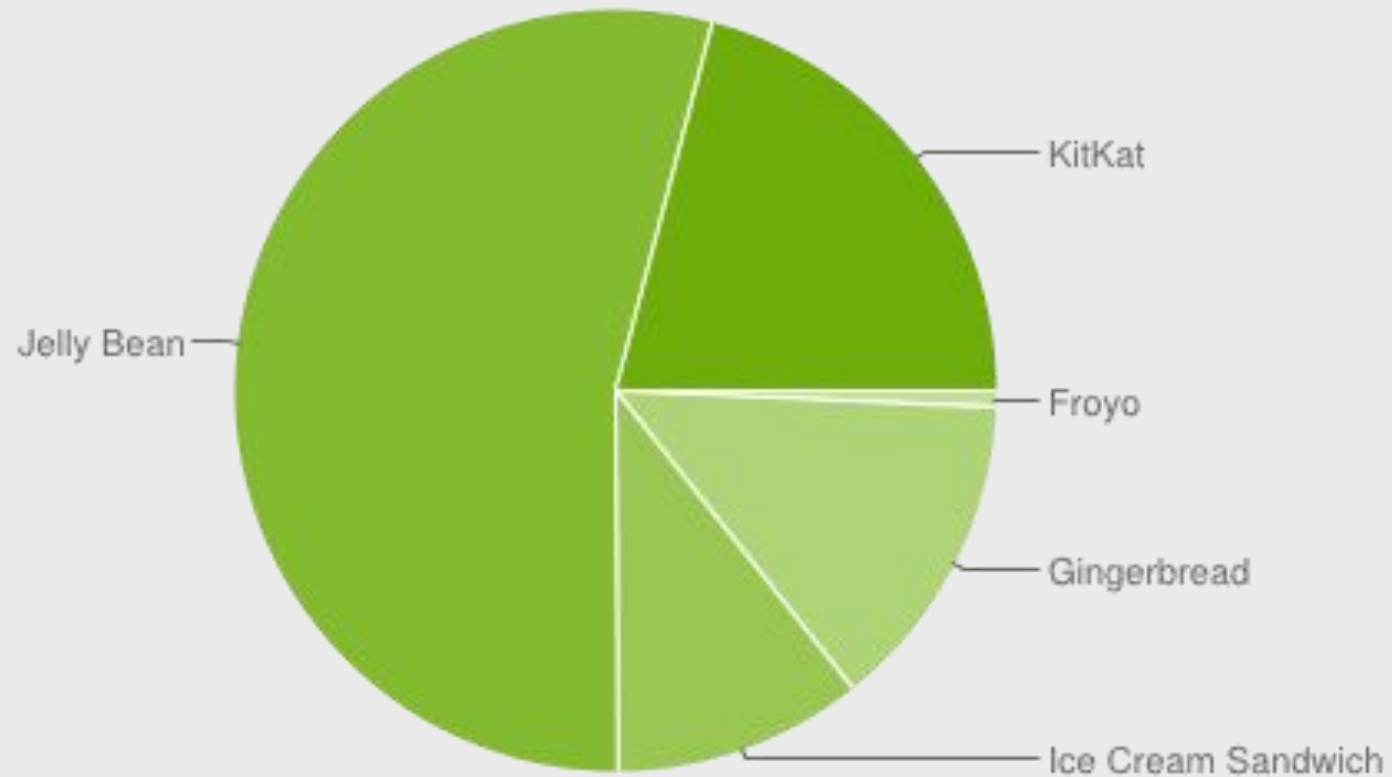
⋮

Signatures

API Level

| Level | Android Version | Version Name |
|-------|-----------------|------------------------|
| 8 | 2.2 | Froyo |
| 9 | 2.3 - 2.3.2 | Gingerbread |
| 10 | 2.3.3 - 2.3.x | Gingerbread MR1 |
| 11-13 | 3.x | Honeycomb |
| 14 | 4.0 - 4.0.2 | Ice Cream Sandwich |
| 15 | 4.0.3 - 4.0.4 | Ice Cream Sandwich MR1 |
| 16 | 4.1.x | Jelly Bean |
| 17 | 4.2.x | Jelly Bean MR1 |
| 18 | 4.3.x | Jelly Bean MR2 |
| 19 | 4.4.x | KitKat |

API Level distribution



Source: <https://developer.android.com/about/dashboards/index.html>

Tooling



Old System:

Eclipse IDE
ADT
Ant



New System:*

Android Studio
Gradle


* Beta

Android SDK Manager

Packages Tools

SDK Path: /opt/android-sdk



Packages

|  Name | API | Rev. | Status |
|--|-----|------|----------------------------|
| ▶ <input type="checkbox"/> Tools | | | |
| ▼ <input type="checkbox"/> Android L (API 20, L preview) | | | |
| <input type="checkbox"/> Documentation for Android 'L' Preview SDK | 20 | 1 | ✓ Installed |
| <input type="checkbox"/> SDK Platform Android L Preview | 20 | 3 | ✓ Installed |
| <input checked="" type="checkbox"/> Samples for SDK API L Preview | 20 | 1 | 🔄 Update available: rev. 2 |
| <input type="checkbox"/> Android TV ARM EABI v7a System Image | 20 | 1 | ✓ Installed |
| <input type="checkbox"/> Android TV Intel x86 Atom System Image | 20 | 1 | ✓ Installed |
| <input type="checkbox"/> ARM EABI v7a System Image | 20 | 1 | ✓ Installed |
| <input type="checkbox"/> Intel x86 Atom System Image | 20 | 1 | ✓ Installed |
| ▶ <input type="checkbox"/> Android 4.4W (API 20) | | | |
| ▶ <input type="checkbox"/> Android 4.4.2 (API 19) | | | |
| ▶ <input type="checkbox"/> Android 4.3 (API 18) | | | |
| ▶ <input type="checkbox"/> Android 4.2.2 (API 17) | | | |

Show: Updates/New Installed Obsolete Select New or Updates

Sort by: API Level Repository Deselect All








Install 2 packages... Delete 2 packages...

Done loading packages.  



Android AVD Manager

Android Virtual Devices Device Definitions

List of existing Android Virtual Devices Located at /home/timroes/.android/avd

| AVD Name | Target Name | Platform | API Lev | CPU/ABI |
|--|---------------------------|----------|---------|-------------------|
|  Android2.2 | Android 2.2 | 2.2 | 8 | ARM (armeabi) |
|  Android2.3 | Android 2.3.3 | 2.3.3 | 10 | ARM (armeabi) |
|  Android4.1 | Android 4.1.2 | 4.1.2 | 16 | ARM (armeabi-v7a) |
|  Android4.1- | Android 4.1.2 | 4.1.2 | 16 | ARM (armeabi-v7a) |
|  IntelTest | Android 4.1.2 | 4.1.2 | 16 | Intel Atom (x86) |
|  Android4.2 | Google APIs (Google Inc.) | 4.2.2 | 17 | ARM (armeabi-v7a) |
|  Android4.3 | Android 4.3 | 4.3 | 18 | Intel Atom (x86) |

Create...
Start...
Edit...
Repair...
Delete...
Details...
Refresh

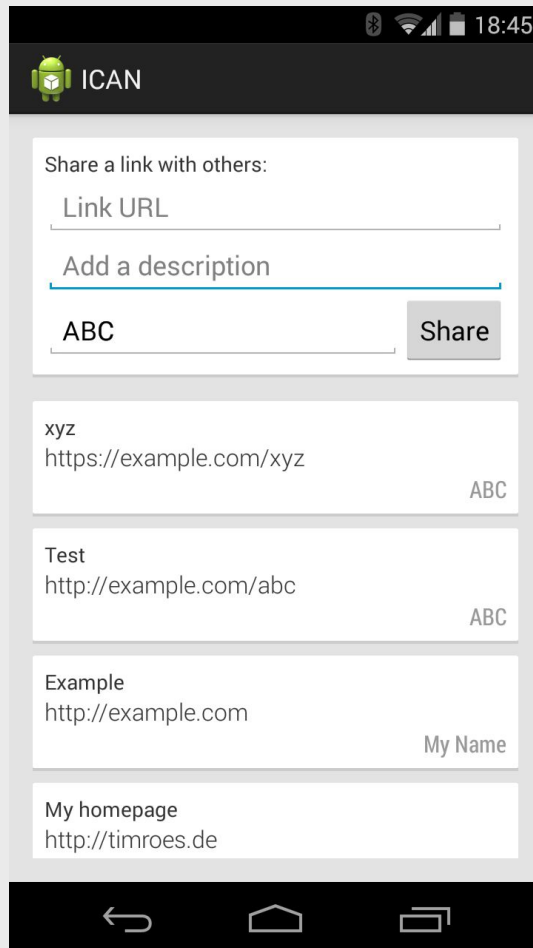
 A repairable Android Virtual Device.  An Android Virtual Device that failed to load. Click 'Details' to

ADB

- Android Debug Bridge



Demo Project



The screenshot shows the ICAN mobile application interface. At the top, there is a status bar with the time 18:45 and icons for Bluetooth, Wi-Fi, and battery. Below the status bar is a header with the ICAN logo and the text "ICAN". The main content area is titled "Share a link with others:" and contains a form with three input fields: "Link URL", "Add a description", and "ABC". A "Share" button is located to the right of the "ABC" field. Below the form, there are four rows of data, each with a description, a URL, and a name:

| Description | URL | Name |
|-------------|-------------------------|---------|
| xyz | https://example.com/xyz | ABC |
| Test | http://example.com/abc | ABC |
| Example | http://example.com | My Name |
| My homepage | http://timroes.de | |

At the bottom of the screen, there is a navigation bar with three icons: a back arrow, a home icon, and a recent apps icon.

- Share links with other people
- Links will be stored on App Engine
- Results may vary

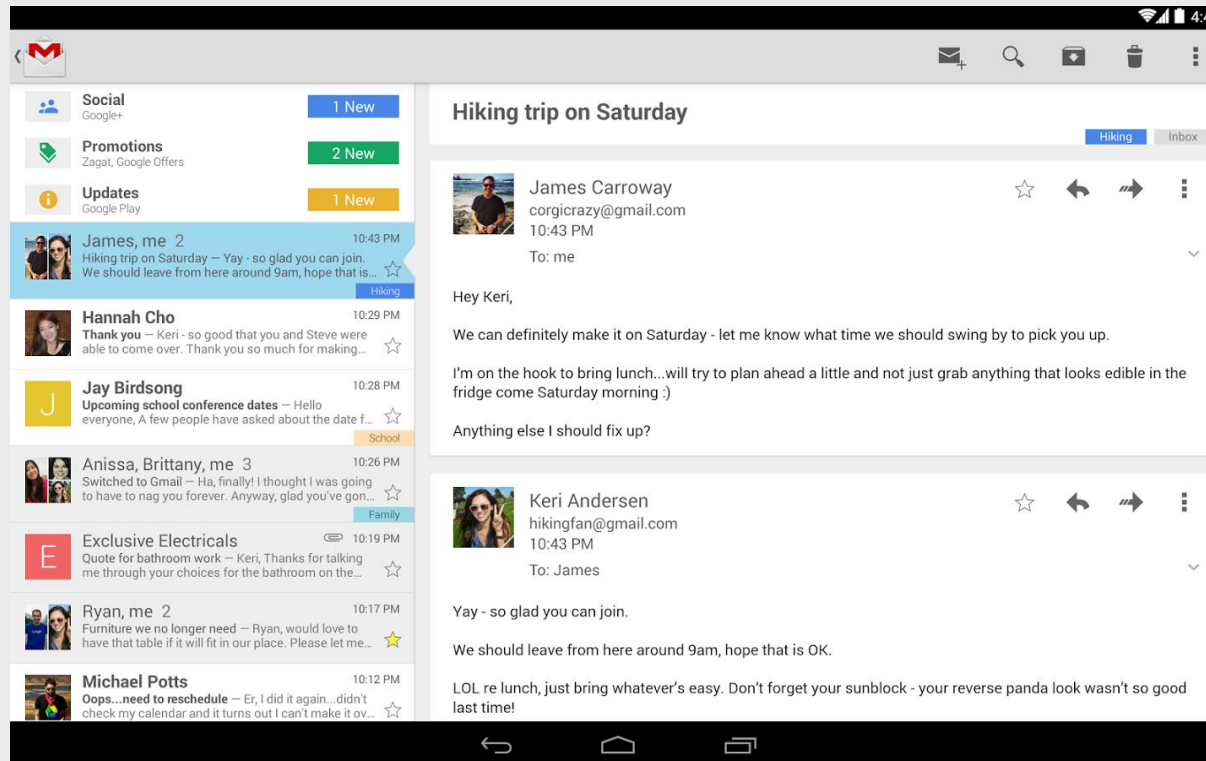
Get ready

or rollin' the droid



Android Basics

Activity

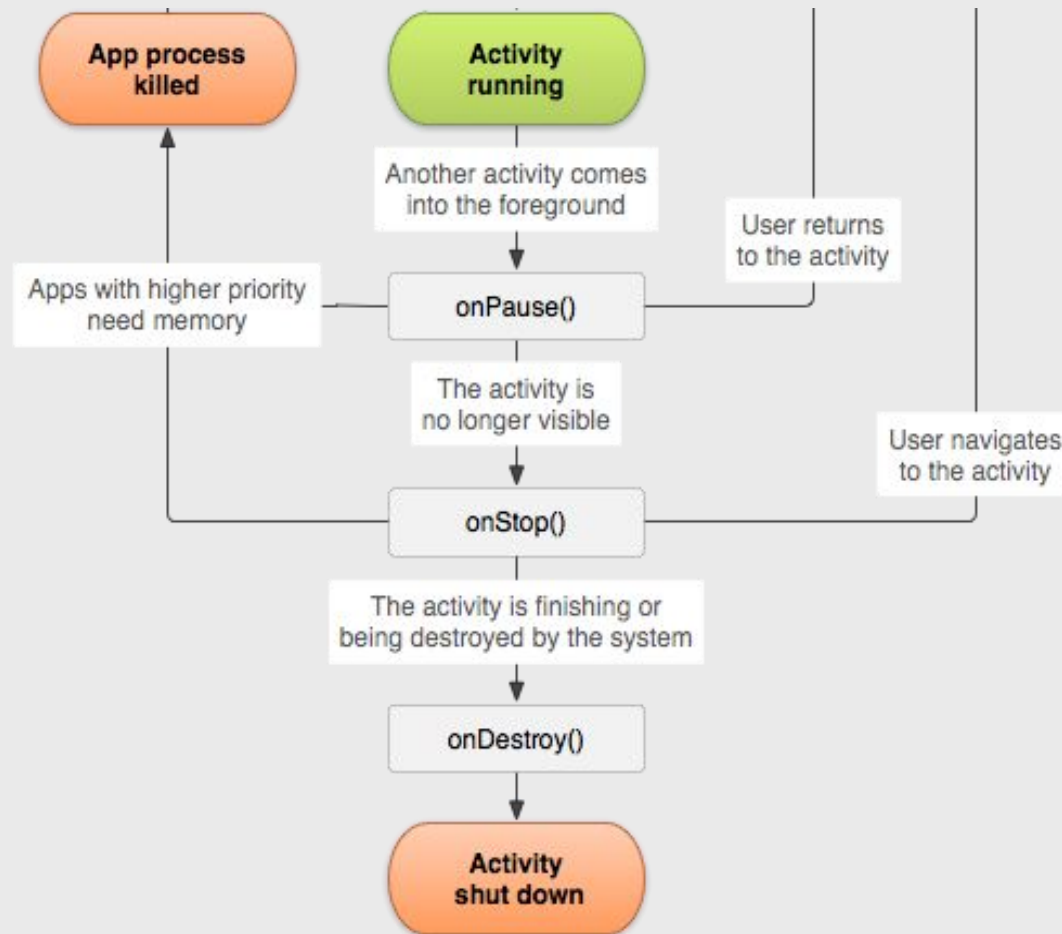


A "window" in an application

Activity

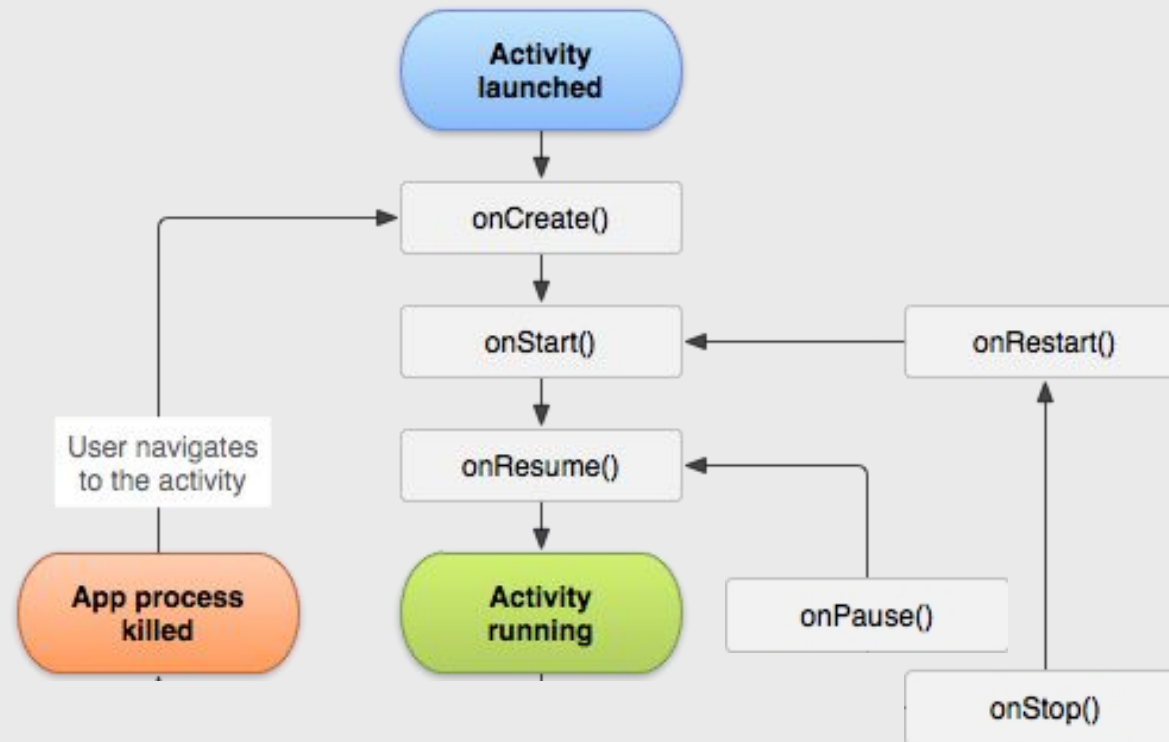
- An *application* contains multiple *activities*
- Only one *activity* displayed at a time
- Contains the UI elements, menus, etc.
- Contains code to glue the logic and UI together
- Defined in `AndroidManifest.xml`

Shutdown Phase Activity



‡

Startup Phase Activity



‡

Managing Layouts and Resources

or create your UI and ترجمه it

Resources

- Resource types:
 - Strings
 - Drawable
 - Layouts
 - Styles (of elements)
 - Menus
 - Colors
 - and more...

Resource Qualifier

- **Possible qualifiers:**
 - language/region (e.g. en-rUS, de)
 - screen sizes (e.g. small, normal, large)
 - screen orientation (e.g. port, land)
 - screen pixel density (e.g. mdpi, hdpi, xhdpi)
 - platform version level (e.g. v8, v14, v15)
 - and more...

Strings

in res/values/strings.xml

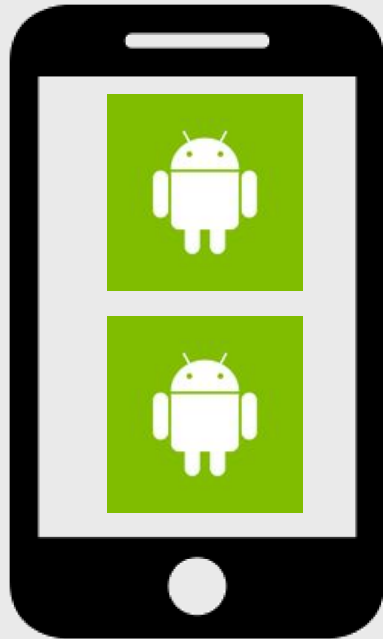
```
<?xml version="1.0" encoding="utf-8"?>  
<resources>  
  <string name="app_name">MyCloudApplication</string>  
  <string name="hello_world">Hello world!</string>  
  <string name="settings">Settings</string>  
</resources>
```

Strings

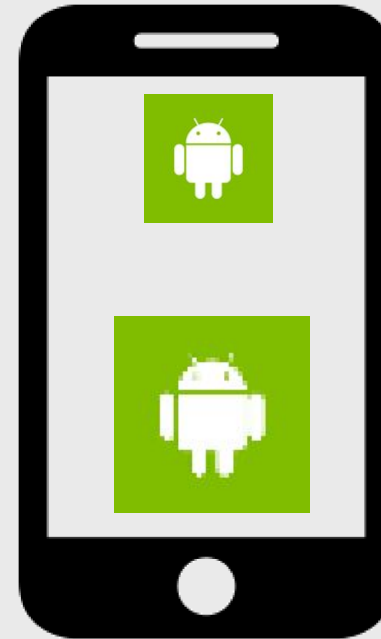
in res/values-de/strings.xml

```
<?xml version="1.0" encoding="utf-8"?>
<resources>
  <string name="app_name">MeineWolkenAnwendung</string>
  <string name="hello_world">Hallo Welt!</string>
  <string name="settings">Einstellungen</string>
</resources>
```

Screen densities

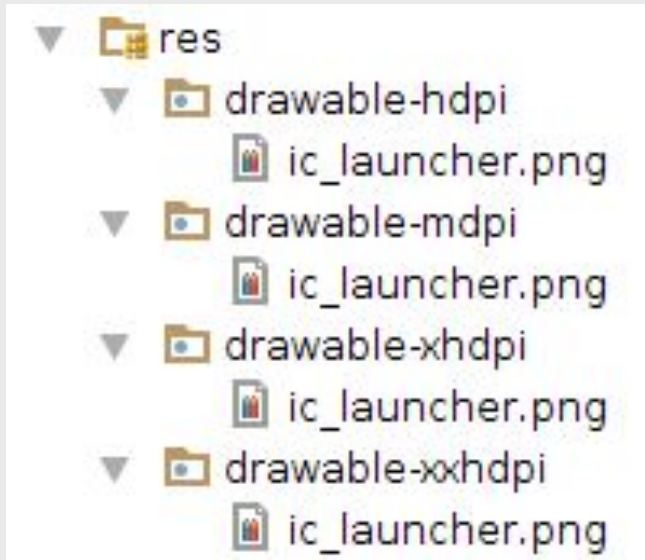


1280x720 → ca. 300 dpi



1920x1080 → ca. 450 dpi

Drawables

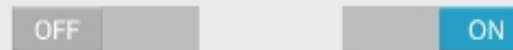


Layouts

- Describes the elements (*views*) on the screen
- Basically two different types:
 - View
 - ViewGroup

Views

- One element on the screen, e.g.
 - TextView
 - Button
 - Switches
 - EditText
 - and more...

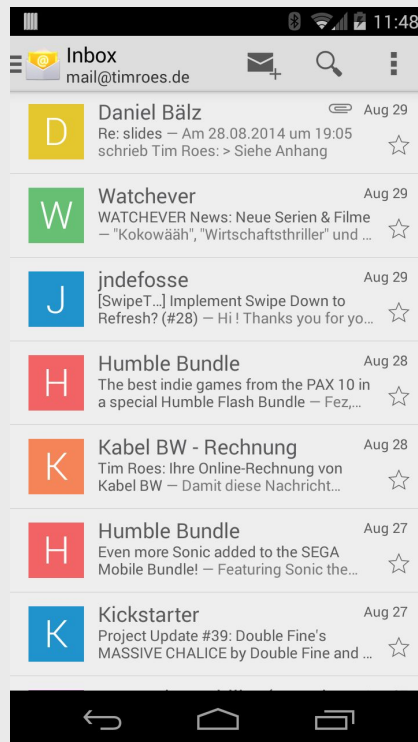


ViewGroups

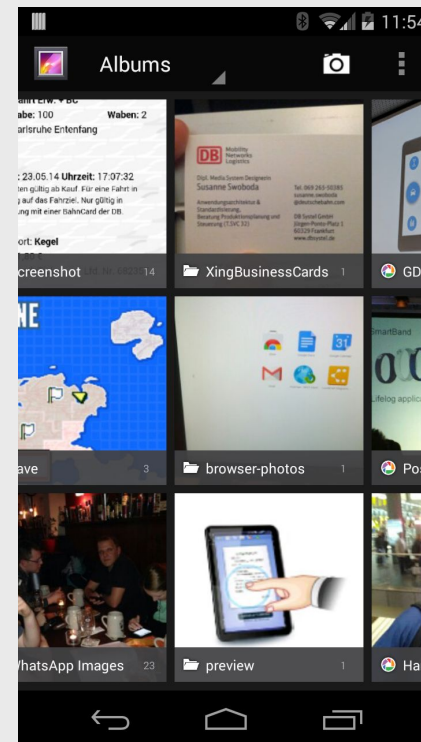
- Arrange views on the screen in a specific manner
 - LinearLayout (horizontal/vertical)
 - RelativeLayout
 - and more...

Lists and Adapters

Lists

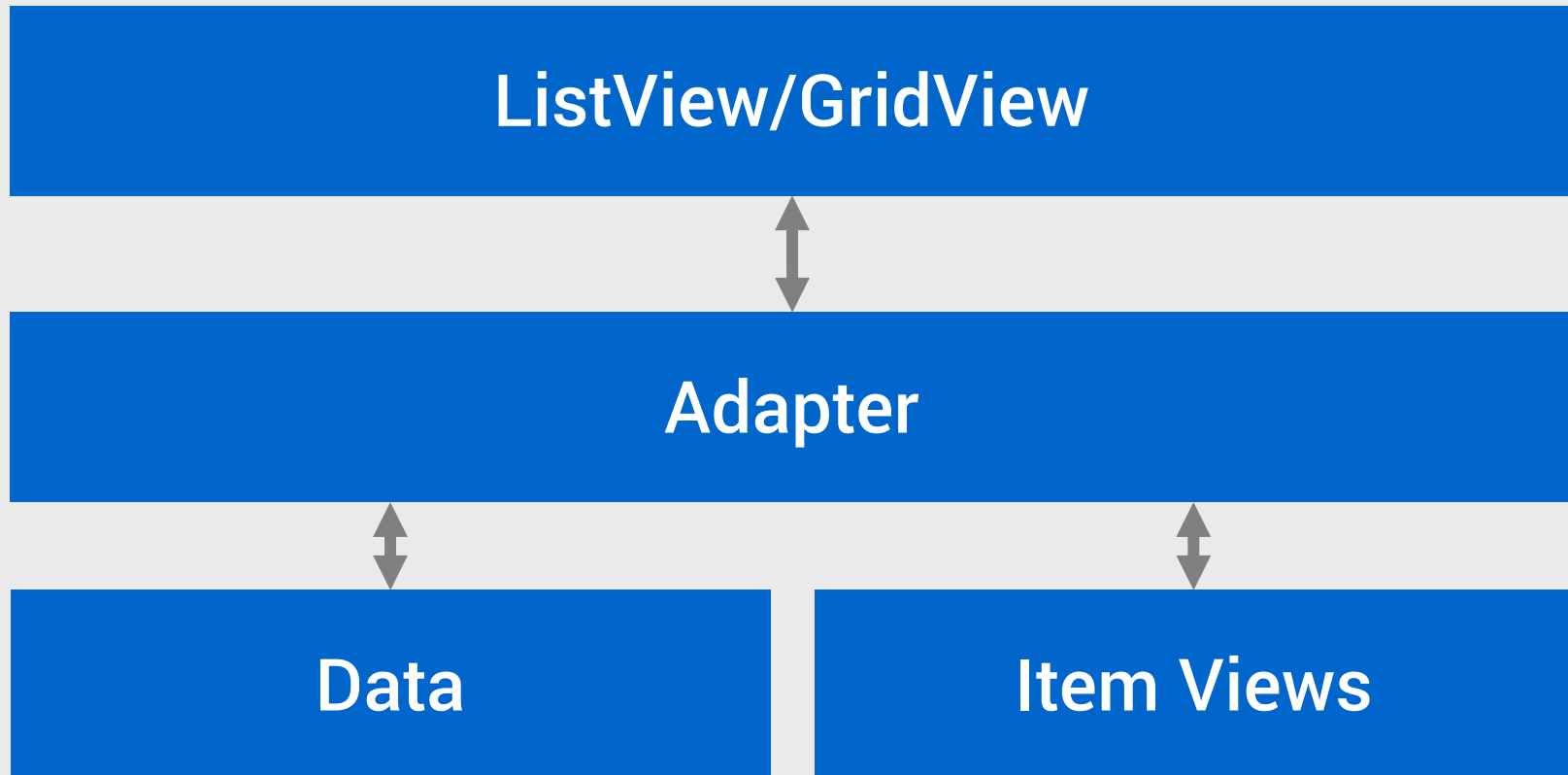


ListView



GridView

Adapters



Navigation between Components

Intents

Used for all communication between
components: Activities, Services,
BroadcastReceivers

Explicit vs. Implicit Intents

Implicit (what):

- View an image
- Open a link
- Send/Edit a file

- What to do (action)
- Which data (data)

Explicit (who):

- Call a specific component

- Target component
- Extra data (bundle)

Intent Example

Implicit

```
Intent intent = new Intent(Intent.ACTION_VIEW);  
intent.setData(Uri.parse("http://example.com"));  
  
startActivity(intent);
```

Explicit

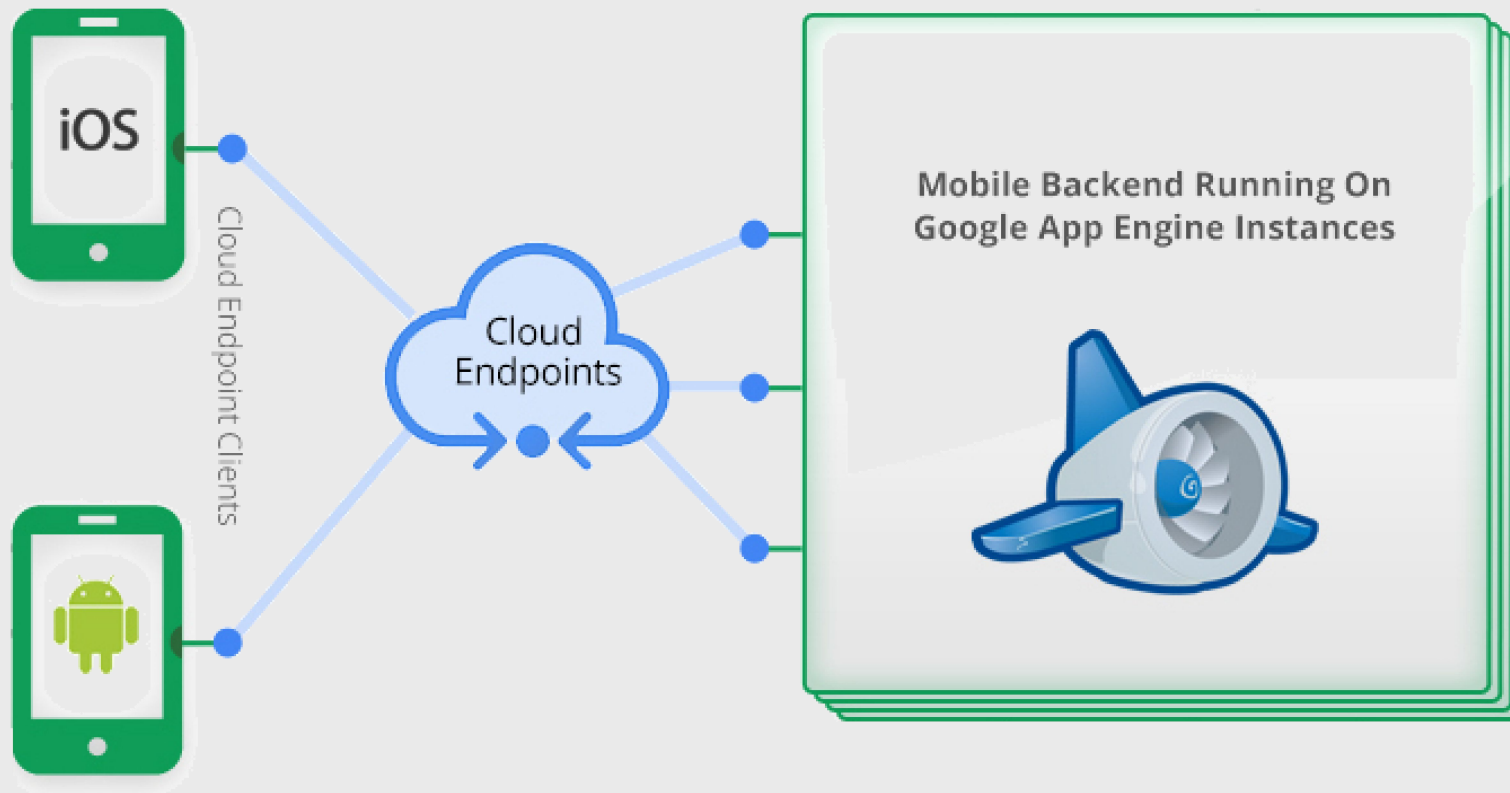
```
Intent ex = new Intent(this, Activity2.class);  
ex.putExtra("id", 42);  
  
startActivity(ex);
```


App Engine Basics

App Engine

- Platform as a Service for developing and hosting web applications
- Datastore for persistence
- Supports Python, Java, PHP and Go
- Most parts free for use

Structure



Source: <https://cloud.google.com/developers/articles/how-to-build-mobile-app-with-app-engine-backend-tutorial>

Using App Engine

- Gradle Plugin
- Android Studio integration
- Supports local development
- *Developer Console** for new projects
- Helpful tool *APIs Explorer*

* <https://console.developers.google.com/>

Persistence

- **Schemaless NoSQL datastore**
- **Access via JDO, JPA and a low level Datastore API**
- **Third party frameworks**
 - Objectify
 - Slim3

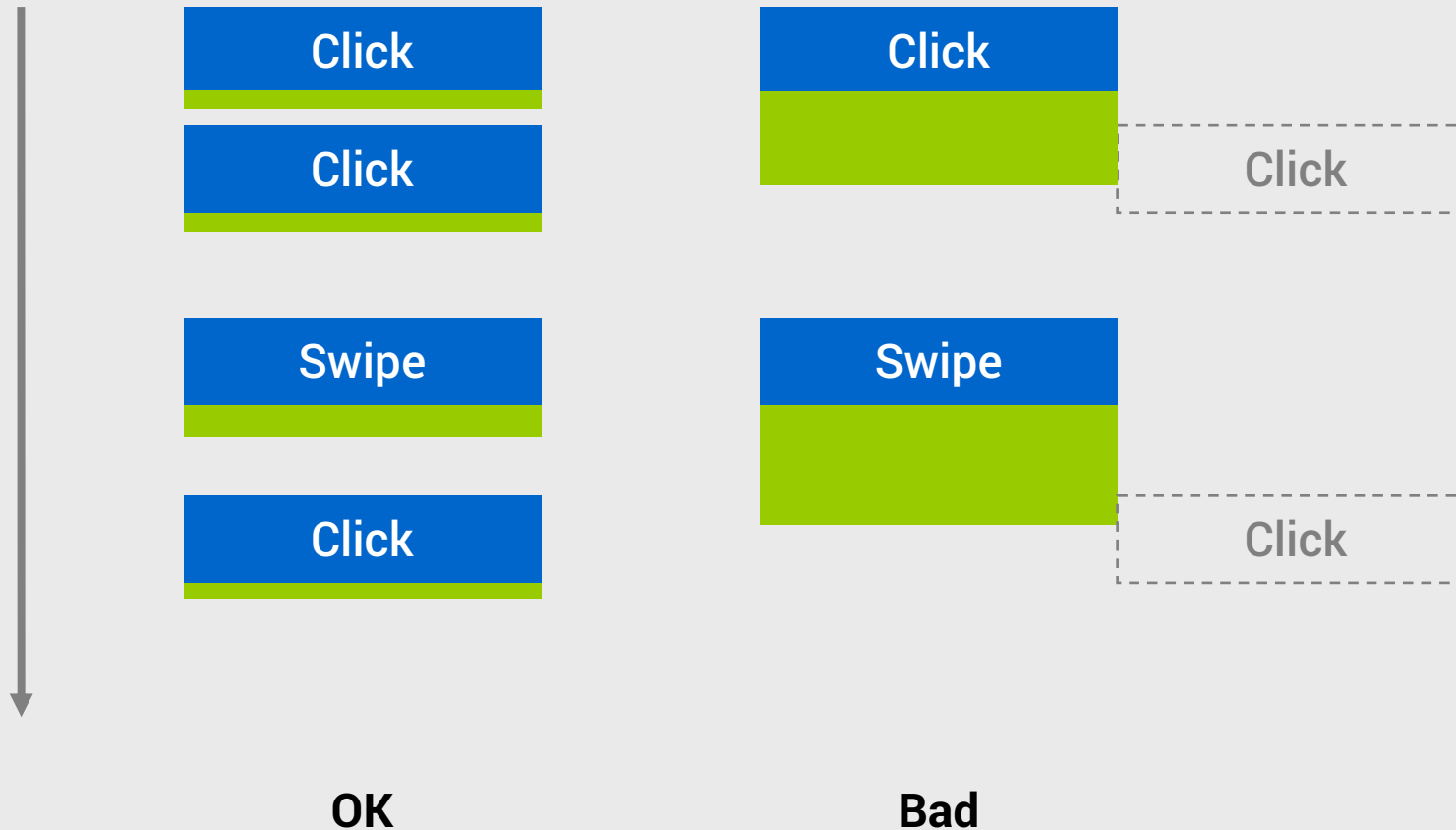
Objectify

- **Java data access API for App Engine datastore**
- **Simple and fast method for persistence**
- **Good documentation**



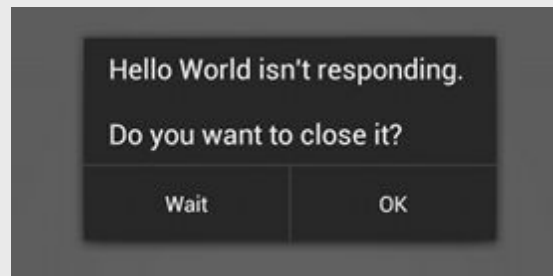
Multithreading

The problem

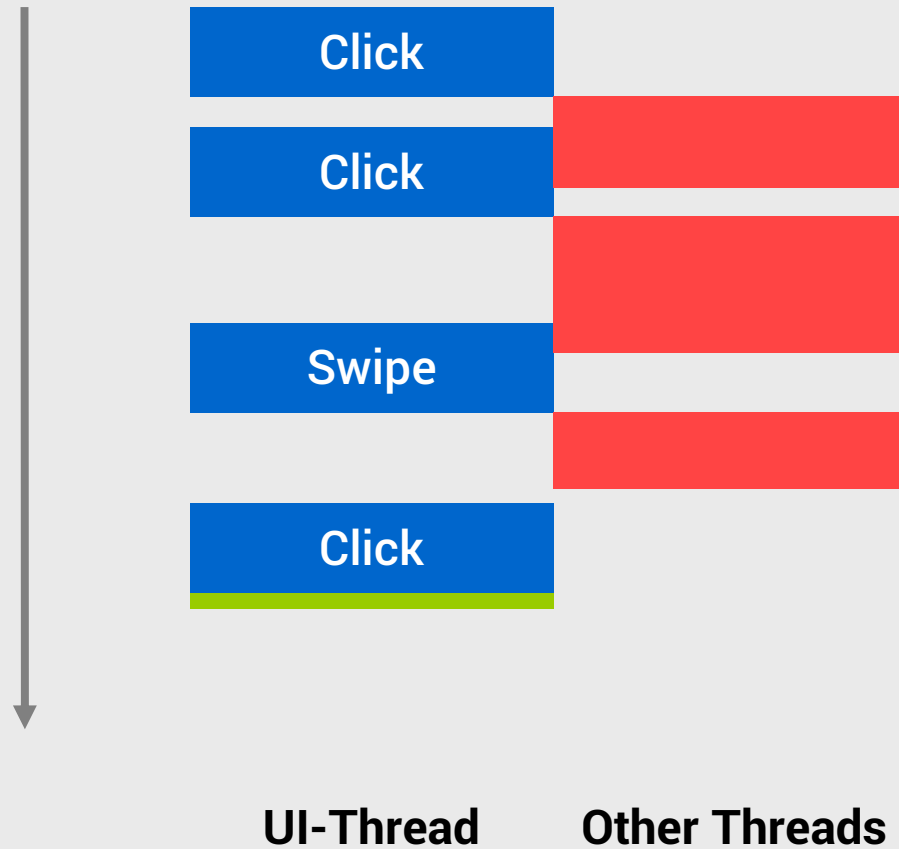


ANR

After 5 seconds Android will "solve" that problem for you



Solution



AsyncTask

```
class DownloadFileTask
    extends AsyncTask<URL, Void, File> {

    File doInBackground(URL... url) {
        // Background thread, do download here and
        // return the downloaded File
    }

    void onPostExecute(File result) {
        // Called on UI-Thread. Change UI in whatever
        // way with downloaded File
    }

}
```

Sample Project

<https://github.com/timroes/gridka-android-workshop>



Publish Apps

Publish your APK

- Sign APK with a release key
- Distribute it:
 - Google Play (\$25 one time fee / account)
 - Other App Stores (Amazon, AndroidPIT, ...)
 - Direct distribution (distribute APK)
- Don't lose release key

Outlook

or what you can do tomorrow

Documentation

<http://d.android.com>

Trainings

API Guides

Reference

Saving Data
(SQLite, SharedPreferences, File System)

Design
(Themes & Styles)

Notifications

Media Handling
(Camera, Audio In/Output, Videos)

More Components
(Service, Broadcast Receiver)

Automated Testing

Graphics Pipeline
(Open GL ES, Renderscript, Animations, Canvas)

Responsive Design
(Fragments)

Network
(Backup, SyncAdapters, ...)

Permissions

Connectivity
(Bluetooth, WiFi, NFC)

Accessibility

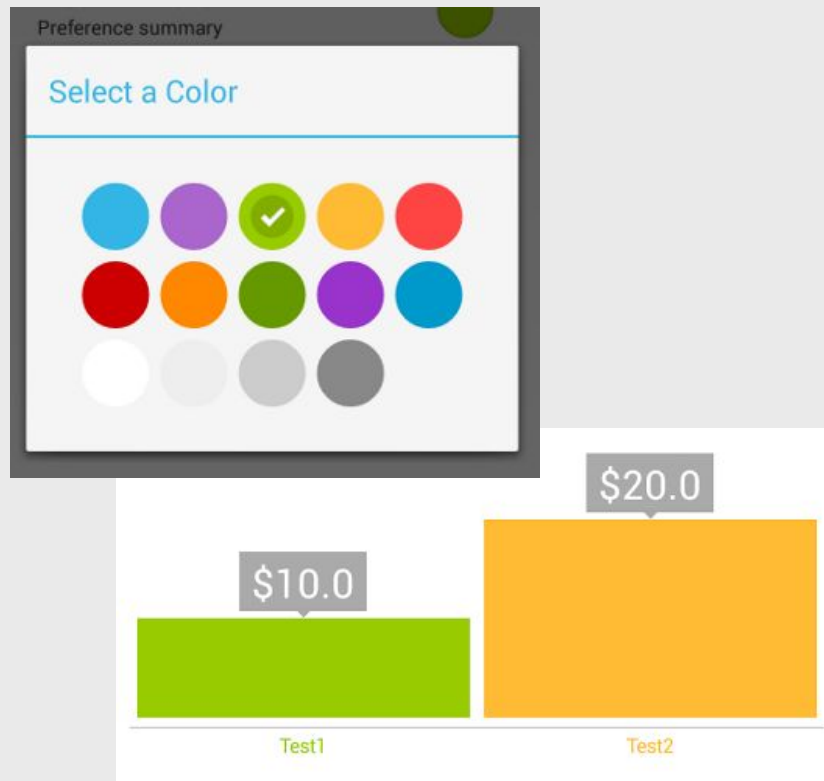
Optimization
(Performance, Traffic, Battery)

Locations
(GPS, Coarse Locations, Fuse)

Support Library

- **Support Library for backward support of newer APIs to older platforms:**
 - Notifications
 - Fragments
 - Several newer Views
 - ActionBar
 - Printing support
 - and more ...

View Libraries



| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|-----|-----|-----|-----|-----|-----|-----|
| 30 | 31 | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | 1 | 2 |

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|-----|-----|-----|-----|-----|-----|-----|
| 27 | 28 | 29 | 30 | 31 | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |

Sources:

- <https://github.com/gabrielemariotti/colorpickercollection>
- <https://bitbucket.org/danielnadeau/holographlibrary/wiki/Home>
- <https://github.com/square/android-times-square>

Utilization Libraries

- View injection
- Easy image loading/caching
- Dependency injection
- Message bus
- and more...

Other Google Services



Google Play Services



Google Play Game
Services

and more...

Questions?

or better run to catch the bus ;-)

In case of further questions:

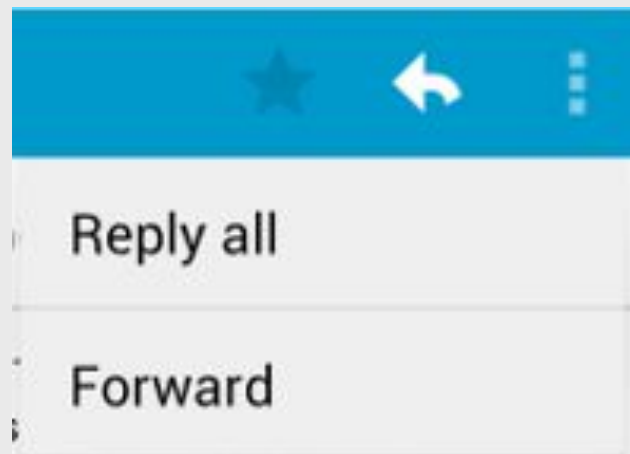
tim.roes@inovex.de

daniel.baelz@inovex.de

OPTIONAL CONTENT

Menus

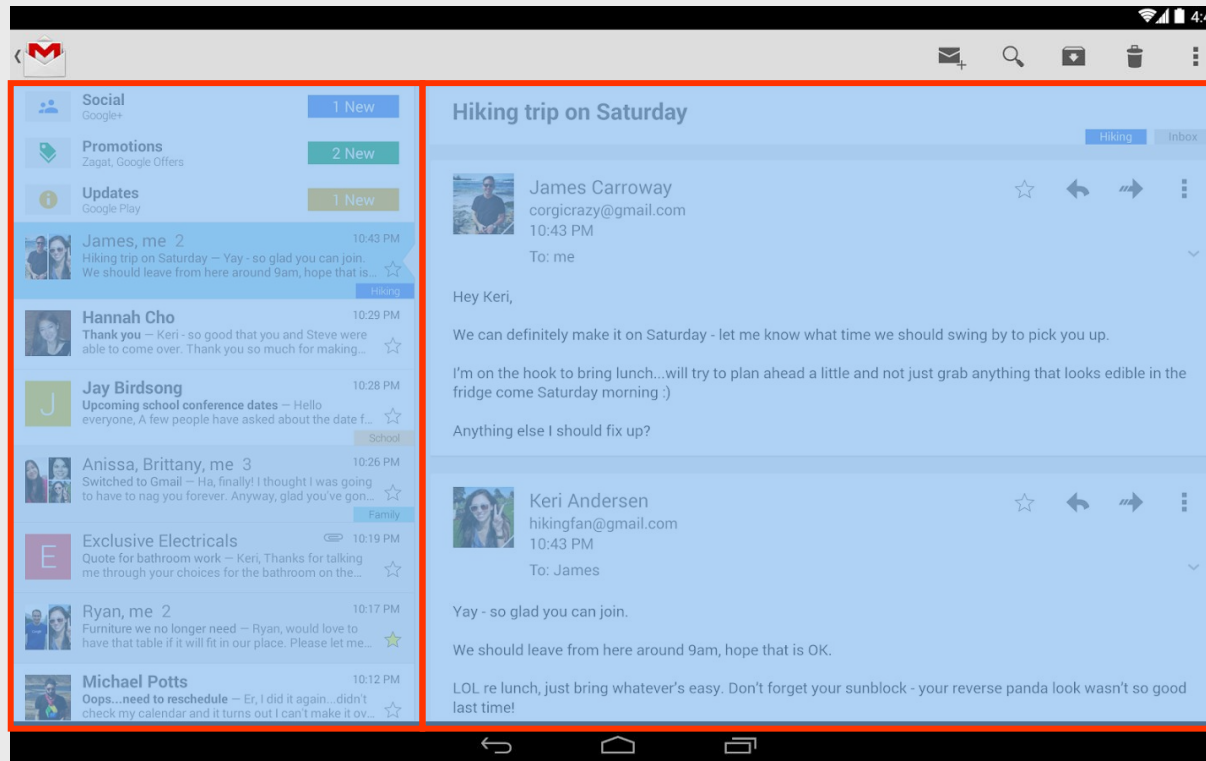
Menus in Android



SharedPreferences

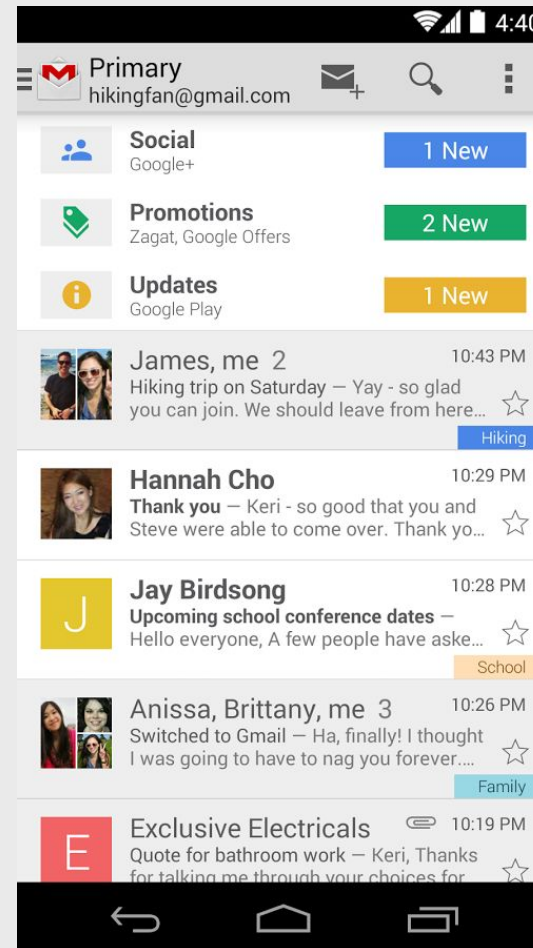
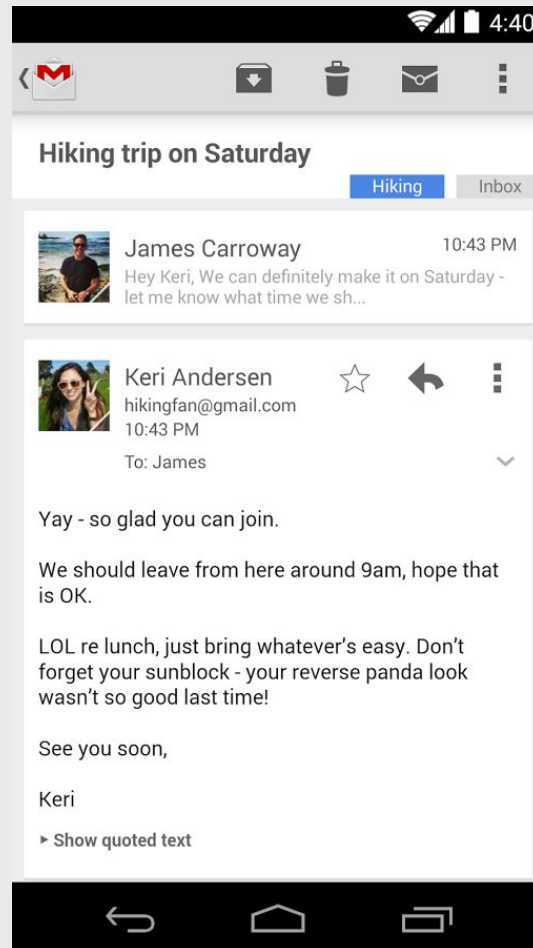
Fragments

Fragments

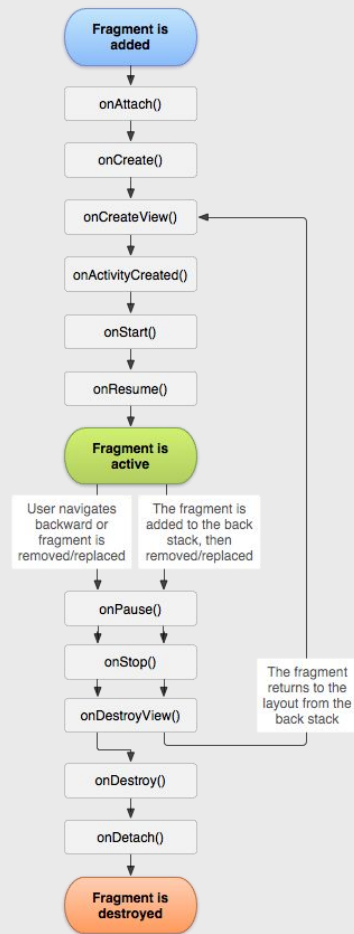


Parts of an *activity*

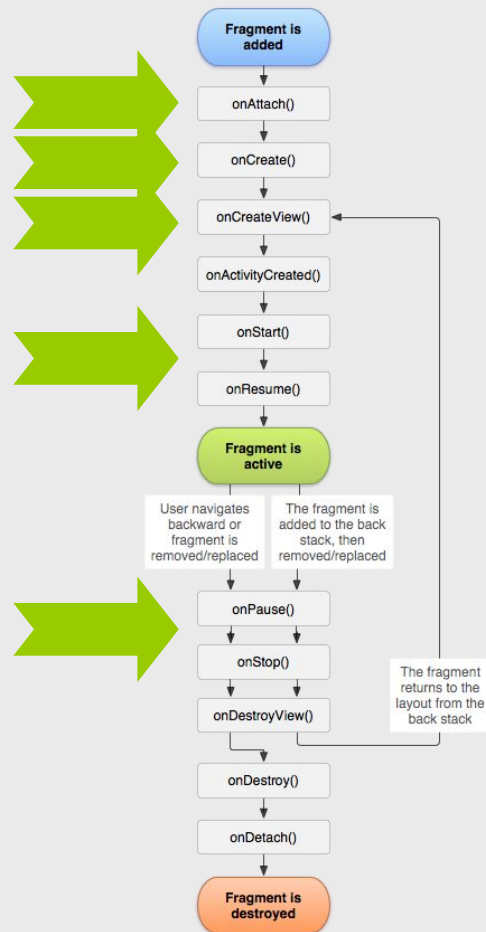
Fragments - why?



Fragment Lifecycle



Fragment Lifecycle



`onAttach(Activity)`

- Fragment got bound to a specific activity

`onCreate()`

- Fragment is created (same like Activity)

`onCreateView(..)`

- Method that must load the UI and return it

`onStart()/onResume()/onPause()/onStop()`

- Same as on activity