

Mobile Programming

An Overview

Mayank Goel

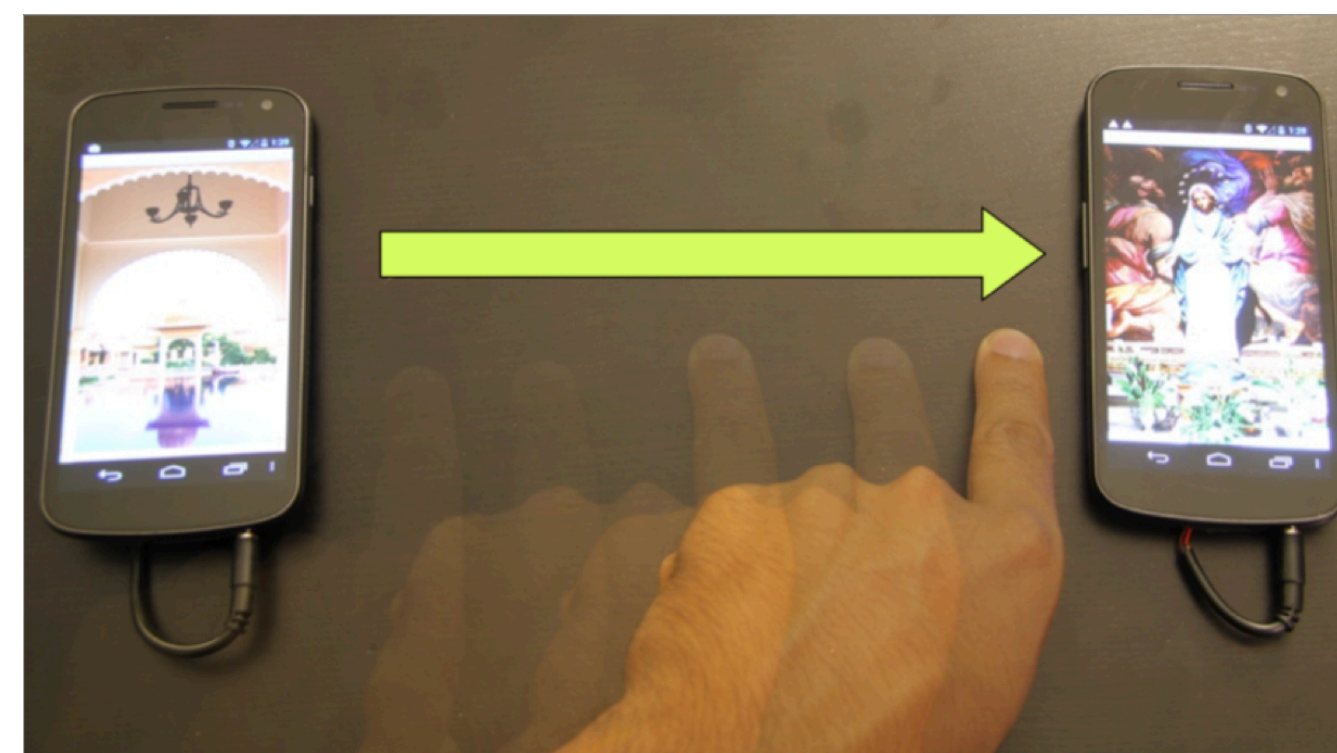
Mobile Programming

Past Experience

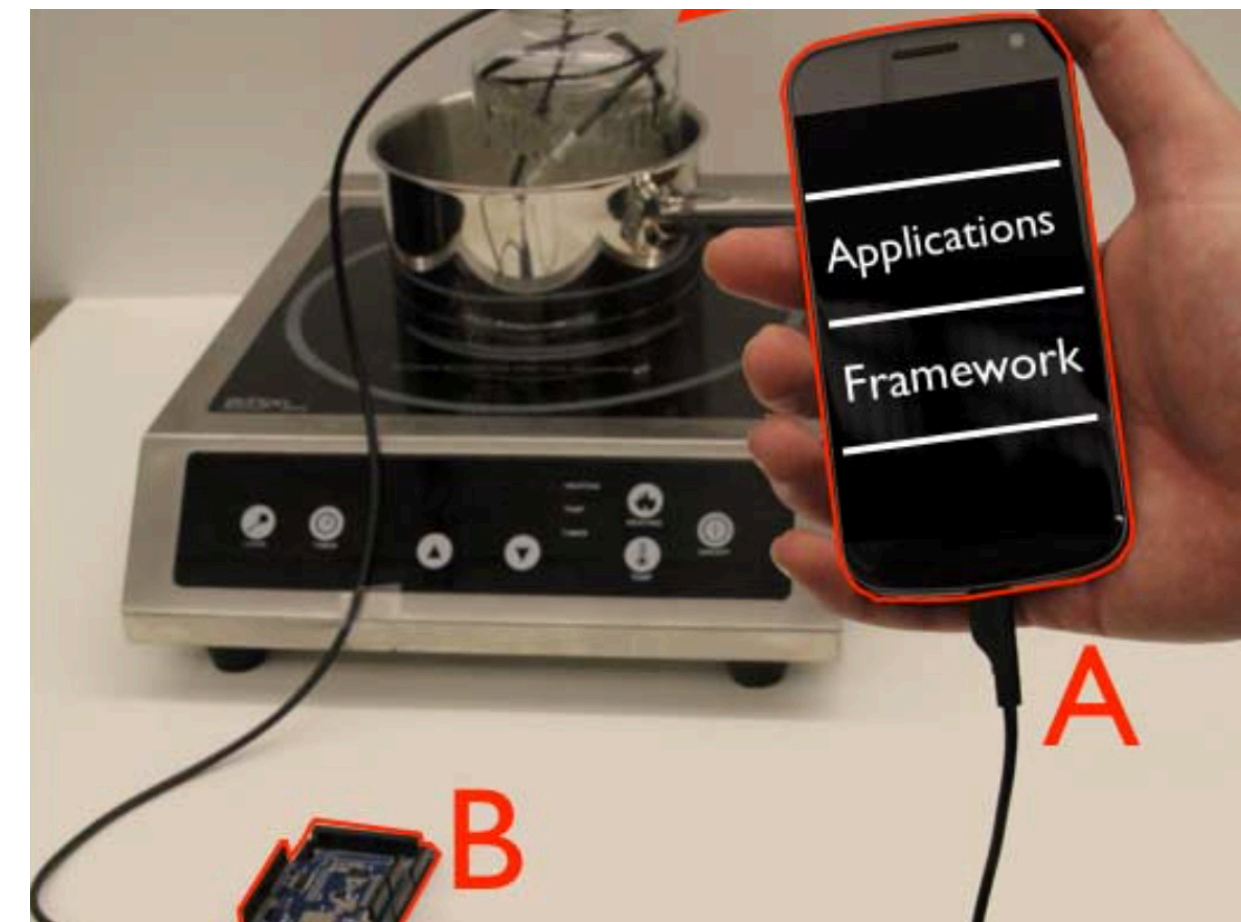
- *Any* experience in mobile programming
- What language / platform?

Mobile Programming

My Experience



Improving Interactions



Health Sensing

Flutter

Things you have already read about

- What do you already know?

Flutter

Things you have already read about

- What do you already know?
- Other such toolkits:
 - React Native
 - Xamarin
- One single codebase for different mobile OS (mostly iOS and Android)
- Clean and responsive apps that allow you to maintain similar user experience

Unified Toolkits

Reasons to not use

- Harder to work with third-party libraries
- Newer programming languages (*e.g.*, Dart)
- Can lead to very big application sizes
- Can be resource hogs

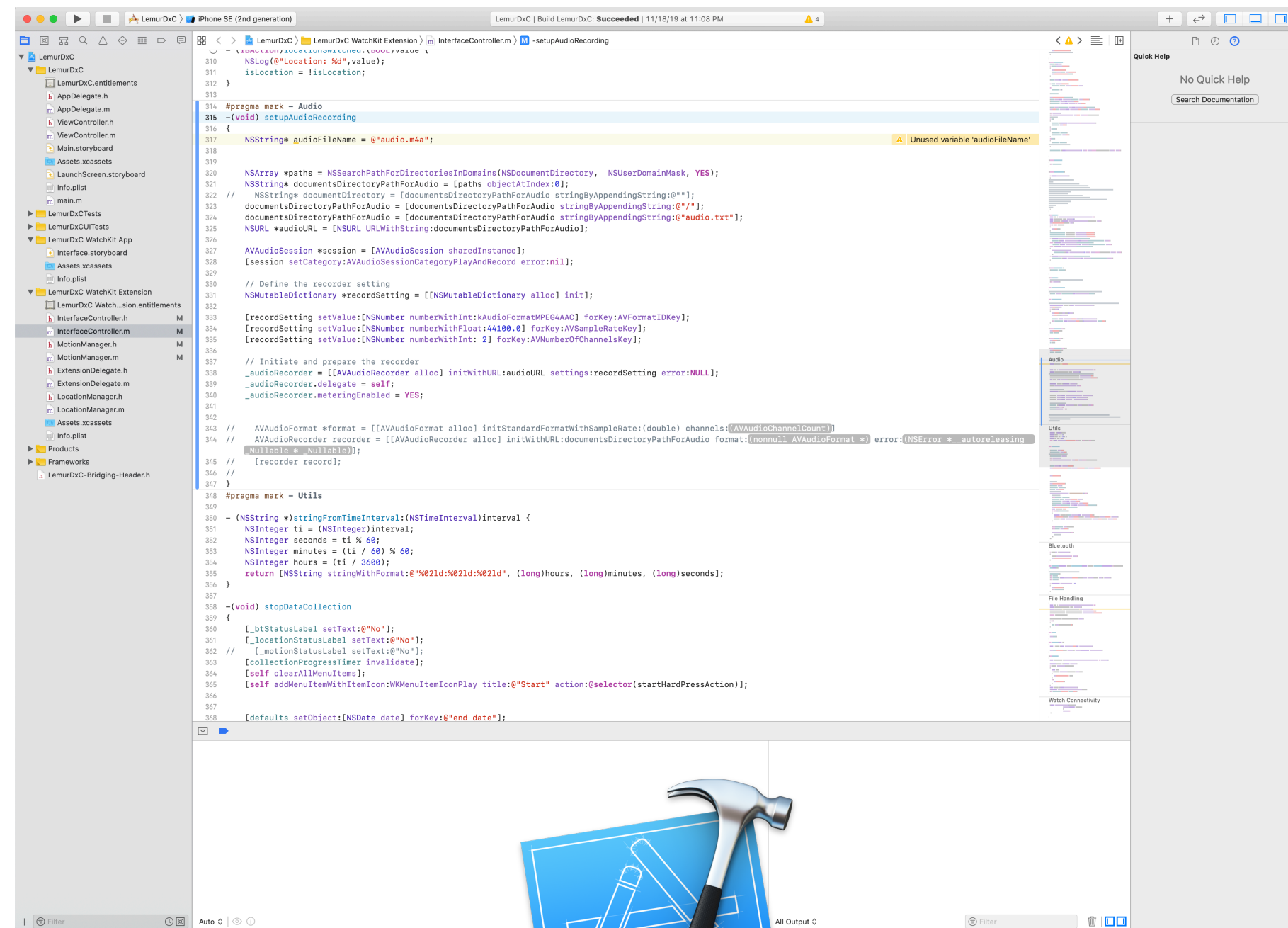
iOS and Android

What was new?

- For the user:
 - Touchscreen that did not need a stylus
 - More sensors
- For the developer:
 - Same things as the user
 - plus,
 - A better marketed and organized app store
 - Successfully convinced the user to pay for the apps

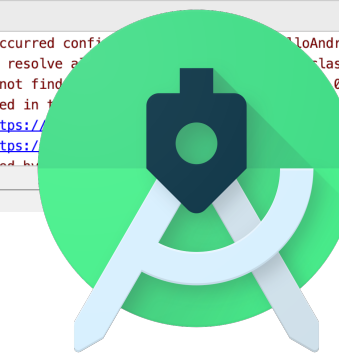
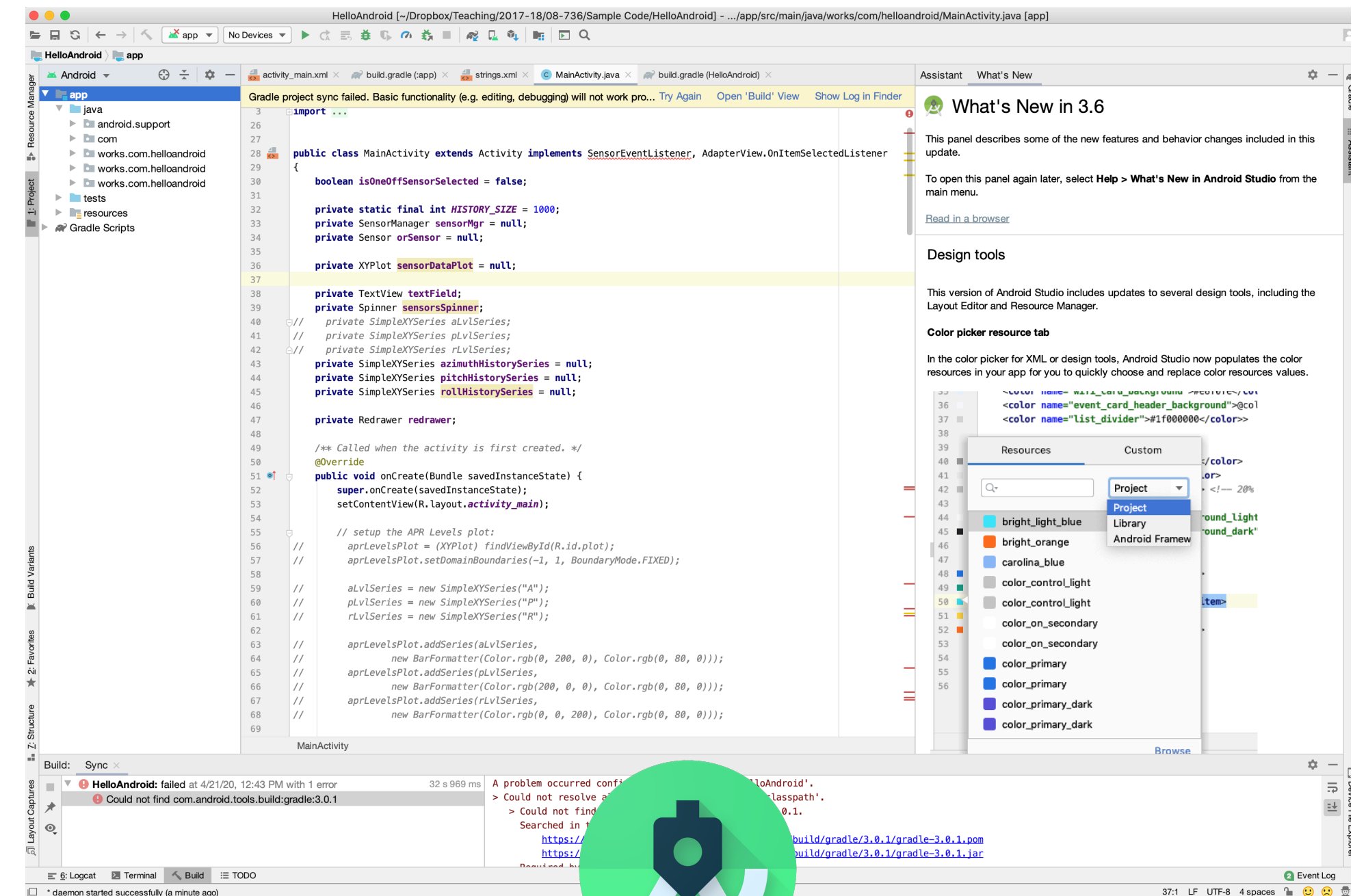
Programming for iOS and Android

Default IDEs



Xcode

Objective-C
Swift



Android Studio

JAVA
Kotlin

Programming for iOS and Android

Why new languages?

- Objective-C and JAVA are:

- old
- verbose

“The nicest explanation is that Objective-C is a horrible language to learn — and so the introduction of Swift will massively increase the number of developers who are happy and willing to develop iOS and OS X apps.”

- **Python**

- Tighter control over the evolution of the language

Before iOS and Android

Popular Mobile OSes

- Windows Mobile
- Symbian
- J2ME



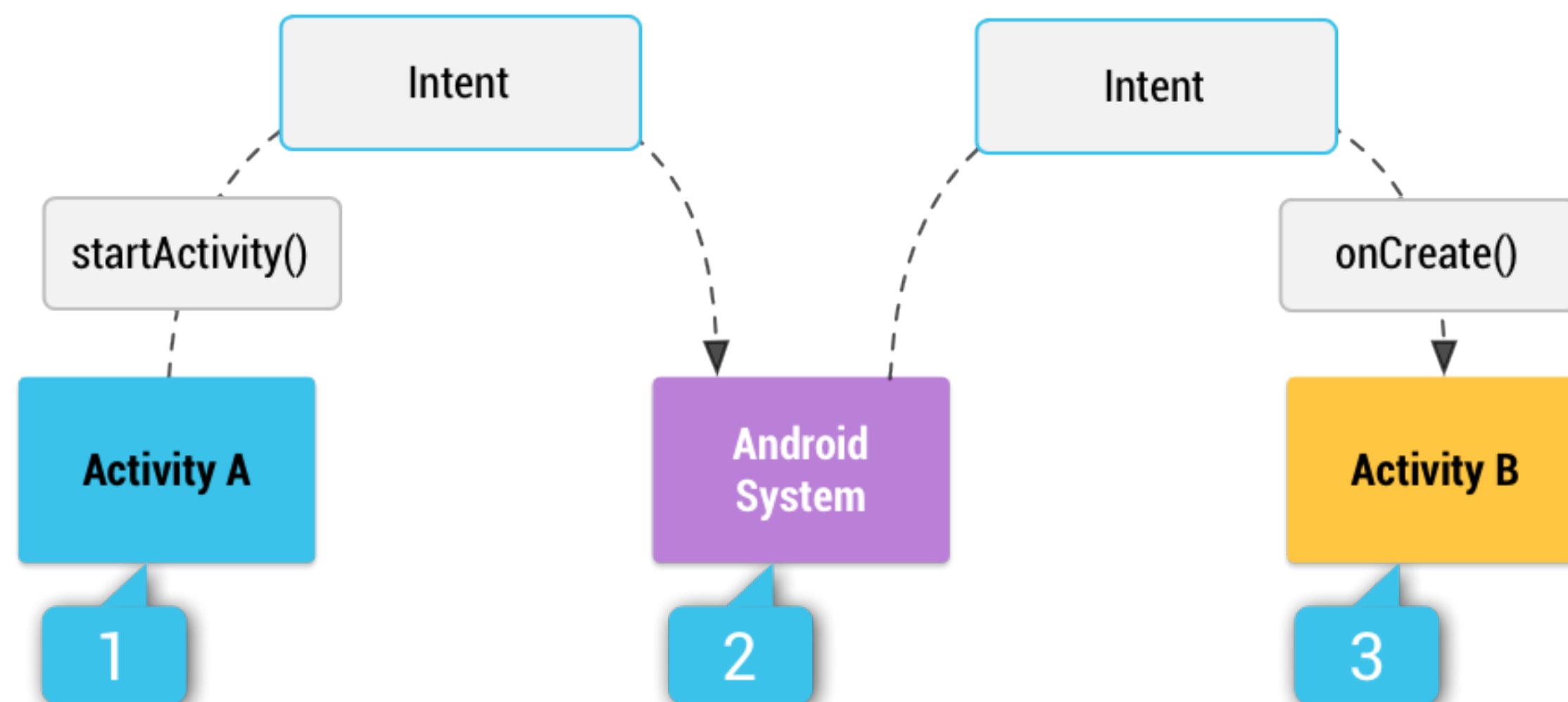
Aspects of Modern Mobile OSs

Things we will touch today

- Sandboxed architecture and how applications interact
- Application life cycle
- A quick look at GUI layout tools
- Gestures
- Sensors
- Beyond phones

Application Sandboxes

- To ensure security and smooth functioning of the device
- Makes inter-app communication much harder
- Android uses *Intents* and iOS uses *App Extensions* and *URLs*



Intents

Explicit Intent

```
// Executed in an Activity, so 'this' is the Context  
// The fileUrl is a string URL, such as "http://www.example.com/image.png"  
Intent downloadIntent = new Intent(this, DownloadService.class);  
downloadIntent.setData(Uri.parse(fileUrl));  
startService(downloadIntent);
```

Intents

Explicit Intent

```
// Create the text message with a string
Intent sendIntent = new Intent();
sendIntent.setAction(Intent.ACTION_SEND);
sendIntent.putExtra(Intent.EXTRA_TEXT, textMessage);
sendIntent.setType("text/plain");

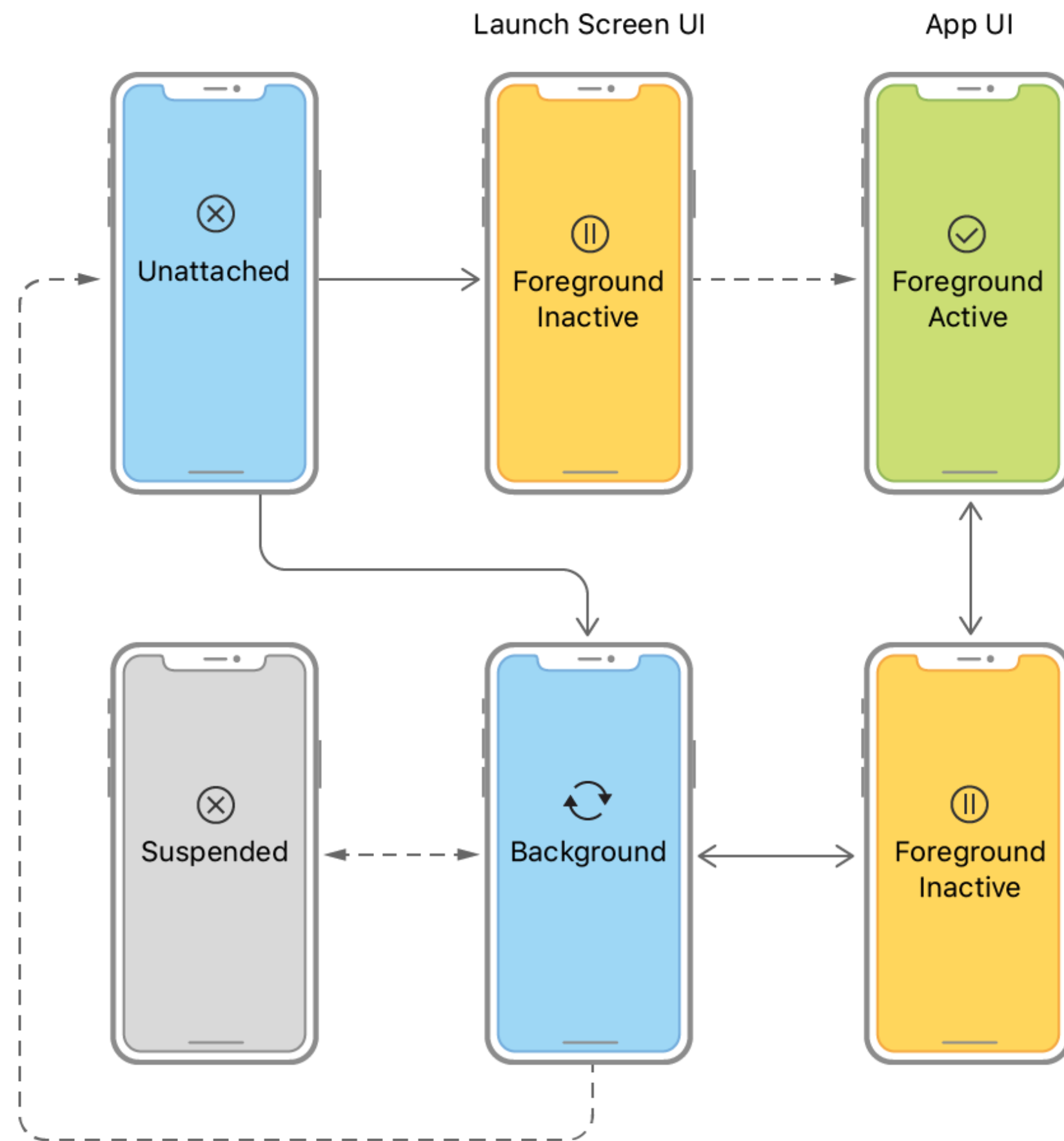
// Verify that the intent will resolve to an activity
if (sendIntent.resolveActivity(getPackageManager()) != null) {
    startActivity(sendIntent);
}
```

<- **Calling** app

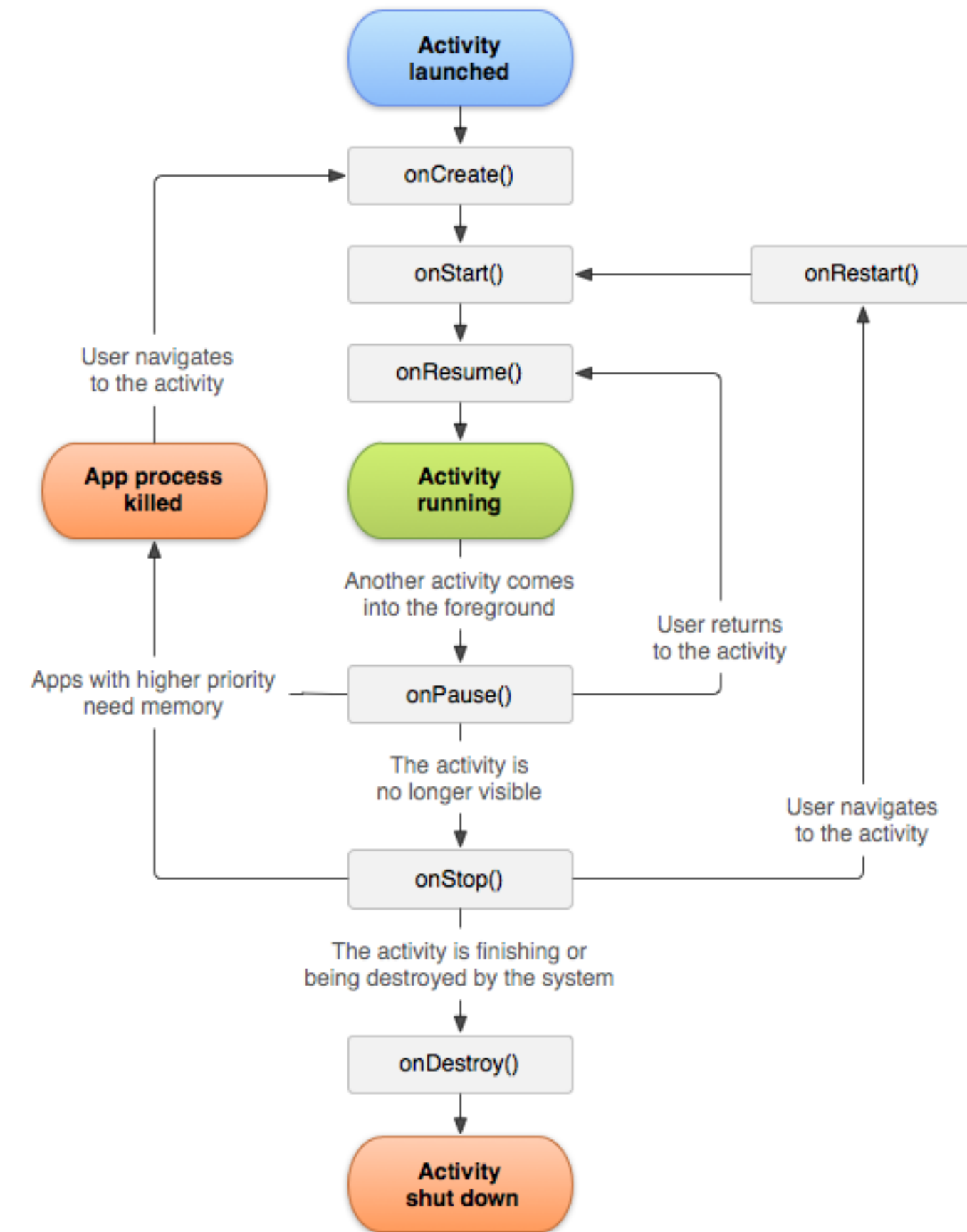
```
<activity android:name="ShareActivity">
    <intent-filter>
        <action android:name="android.intent.action.SEND" />
        <category android:name="android.intent.category.DEFAULT" />
        <data android:mimeType="text/plain" />
    </intent-filter>
</activity>
```

<- In the manifest of the **Receiving** app

Application Lifecycle



iOS



Android

Touchscreen Gestures

- A big change from older OSs
- Multitouch
- Discoverability is a challenge

Touchscreen Gestures

- Primitives:
 - Touch Down
 - Touch Up
 - Touch Move
 - Number of touch points
- Derivations:
 - Single/Double tap
 - Long press
 - Swipe vs. “Flings”
 - Pan vs. Edge-of-the-screen Pan
 - Pinch
 - Rotation

Built-in Sensors



Sensing Techniques for Mobile Interaction

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Proximity range sensor:

Infrared (IR) receiver
IR emitter (below receiver to right)

Touch sensitivity:

Screen bezel
On sides & back of device

Tilt sensor:

Inside device, in plane of the display
2-axis linear accelerometer



Beyond Phones

- Tablets
- Smartwatch
- Smart Glasses
- TV
- Camera
- Refrigerator
- Car
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