Mobile Application Development

Produced by

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Android Anatomy

Agenda

- Overview of Android Application Components
- The Android Application Life Cycle
- The Online Developer Resources
- The "*Donation*" Case Study – a first (very brief!) look…

Android App Components

- App components are the essential building blocks of an Android app. Each component is a different point through which the system can enter your app.
- Not all components are actual entry points for the user and some depend on each other, but each one exists as its own entity and plays a specific role—each one is a unique building block that helps define your app's overall behavior.
- There are four different types of app components. Each type serves a distinct purpose and has a distinct lifecycle that defines how the component is created and destroyed.
- We'll briefly mention a few other components (of sorts) that also make up your App worth knowing about.

Android App Components

1. Activities

- represents a single screen with a user interface
- acts as the '*controller*' for everything the user sees on its associated screen
- implemented as a subclass of Activity
- e.g. email app (listing your emails)

2. Services

- a component that runs in the background to perform long-running operations or to perform work for remote processes
- does not provide a user interface
- can be started by an activity
- is implemented as a subclass of Service
- e.g. music player (playing in background)

Android App Components

3. Content Providers

- manages a shared set of app data
- can store the data in the file system, an SQLite database, on the web, or any other persistent storage location your app can access
- through the Content Provider, other apps can query or even modify the data
- e.g. Users Contacts (your app could update contact details)

4. Broadcast Receivers

- a component that responds to system-wide broadcast announcements
- broadcasts can be from both the system and your app
- implemented as a subclass of BroadcastReceiver and each broadcast is delivered as an Intent object
- e.g. battery low (system) or new email (app via notification)

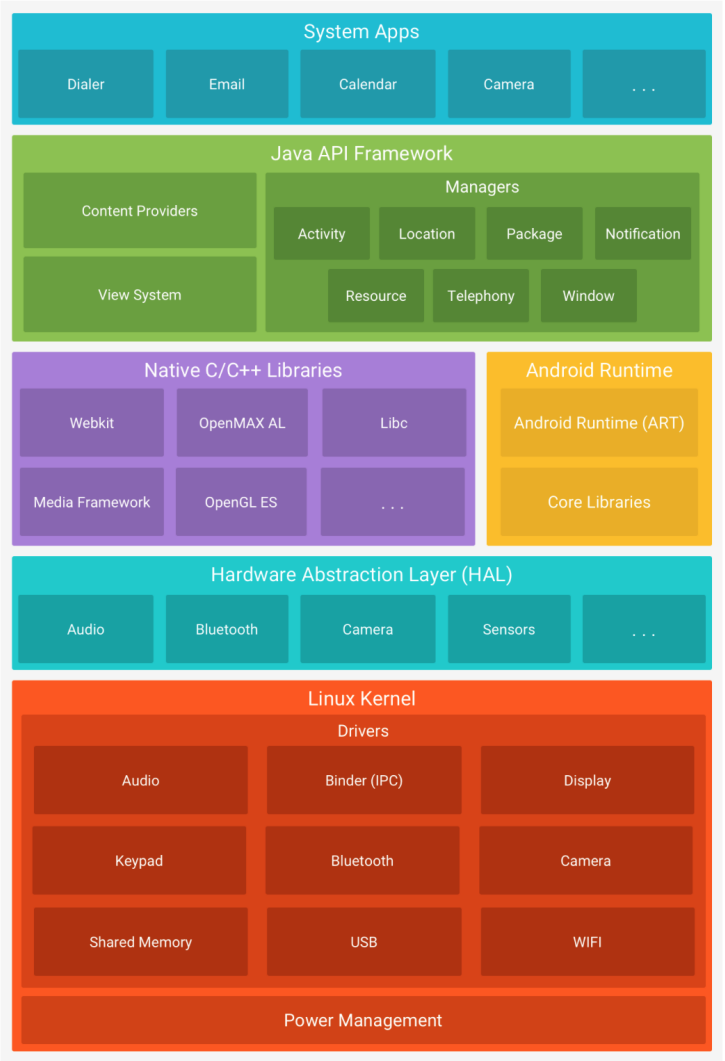
How it all Fits Together *

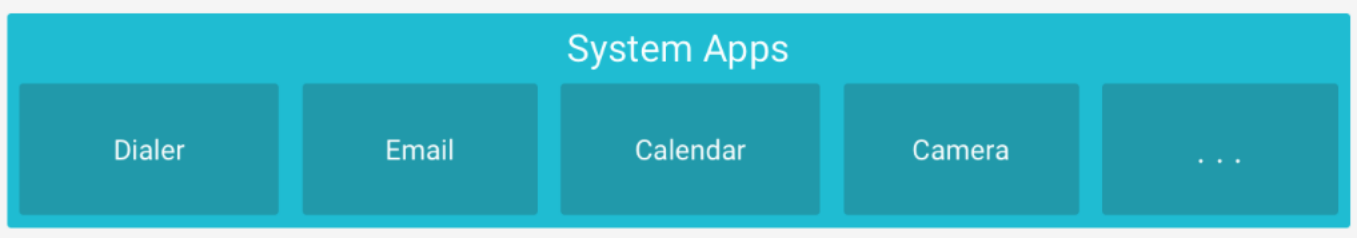
Big N.B.
for all these!

- Based on the *Model View Controller* design pattern.
- Don't think of your program as a linear execution model:
  - Think of your program as existing in logical blocks, each of which performs some actions.
- The blocks communicate back and forth via message passing (*Intents*)
  - Added advantage, **physical user interaction (screen clicks) and inter process interaction can have the same programming interface**
  - Also the OS can bring different pieces of the app to life depending on memory needs and program use

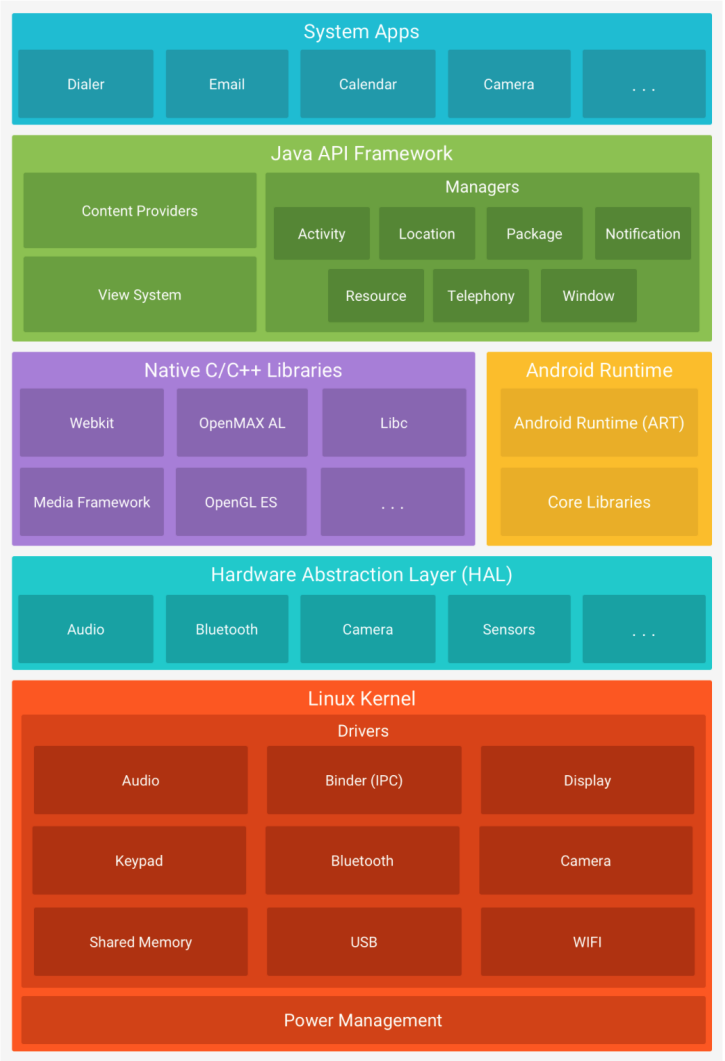
- For each distinct logical piece of program behavior you'll write a Java class (derived from a base class).
- Activities/Fragments: Things the user can *see* on the screen. Basically, the 'controller' for each different screen in your program.
- Services: Code that isn't associated with a screen (background stuff, fairly common)
- Content providers: Provides an interface to exchange data between programs (usually SQL based)
- You'll also design your layouts (screens), with various types of widgets (Views), which is what the user sees via *Activities & Fragments*

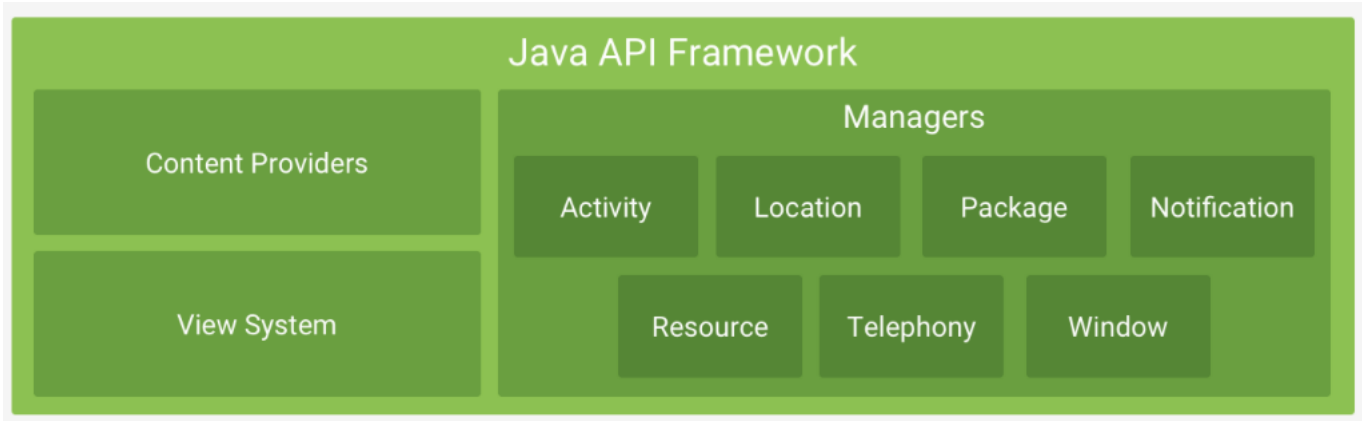
Layered Software Framework (s/w stack)



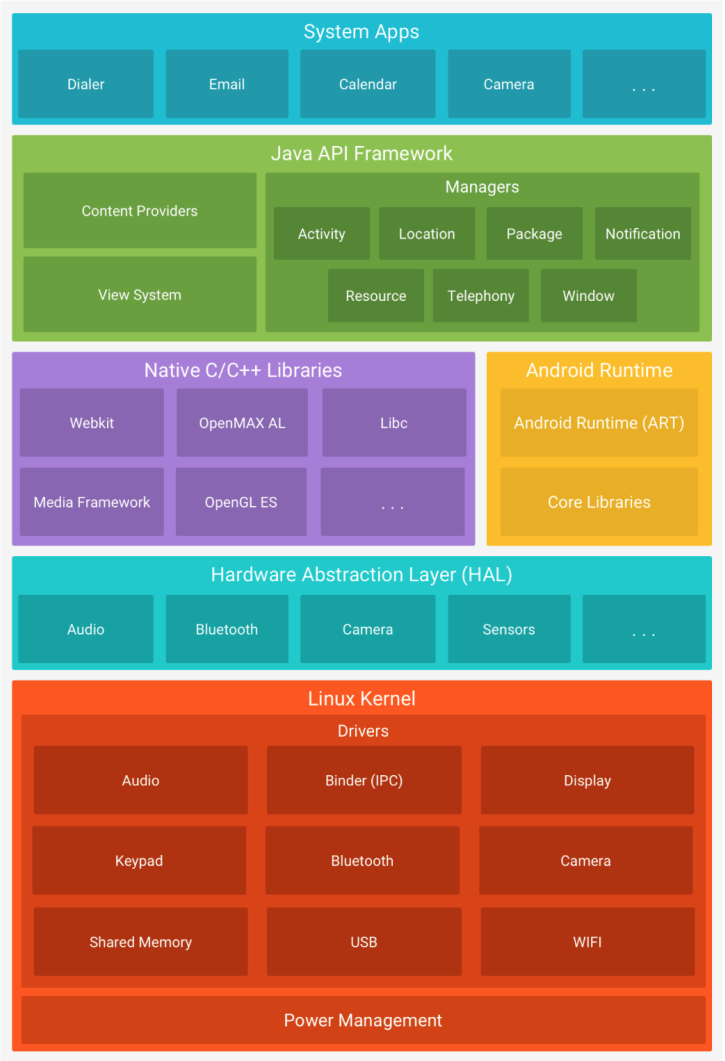


Layered Software Framework (s/w stack)





Layered Software Framework (s/w stack)



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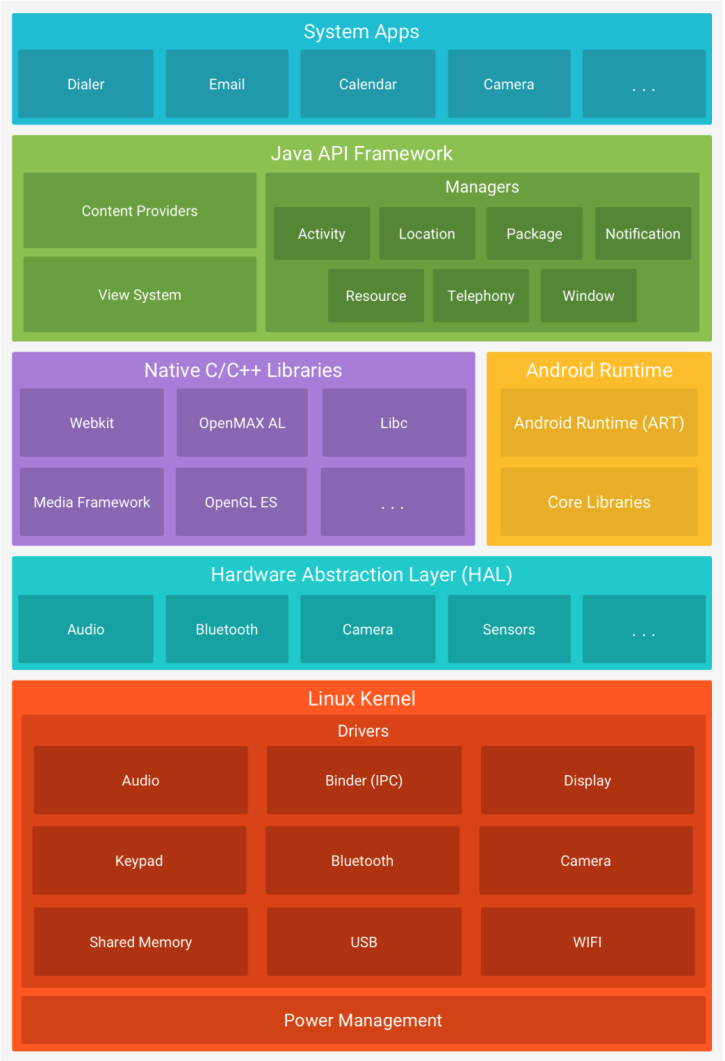

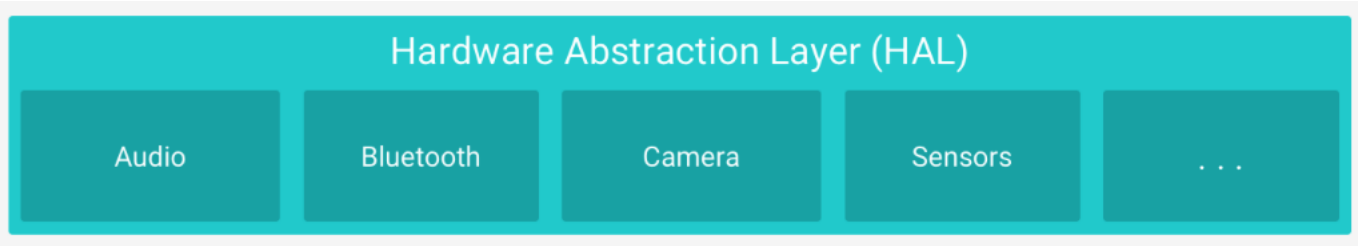

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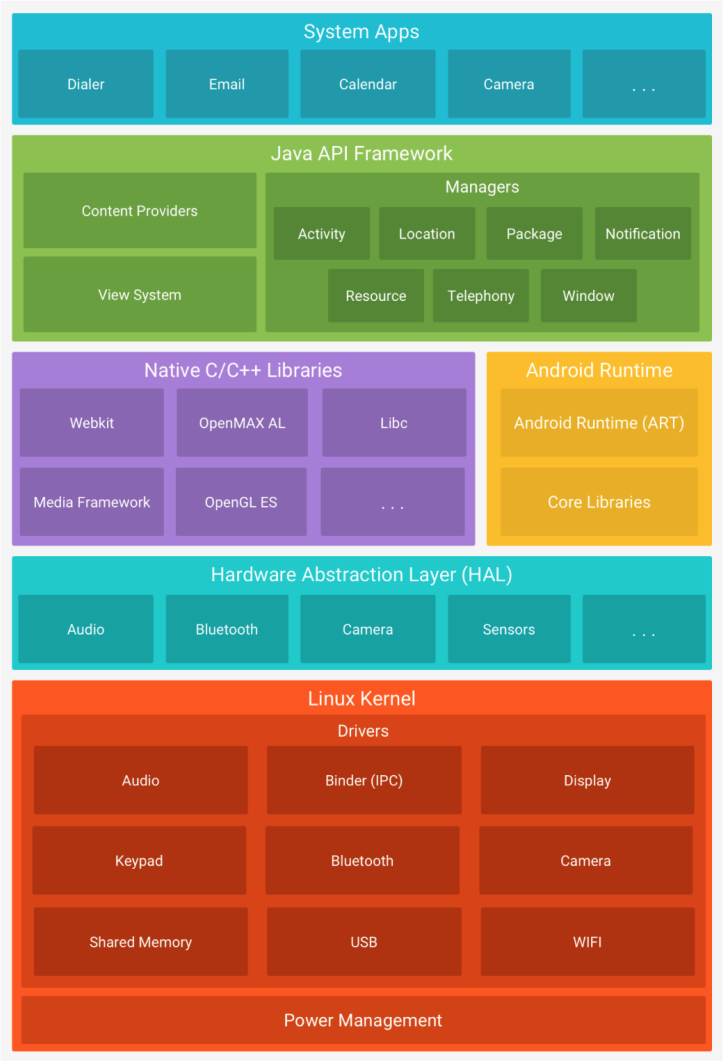
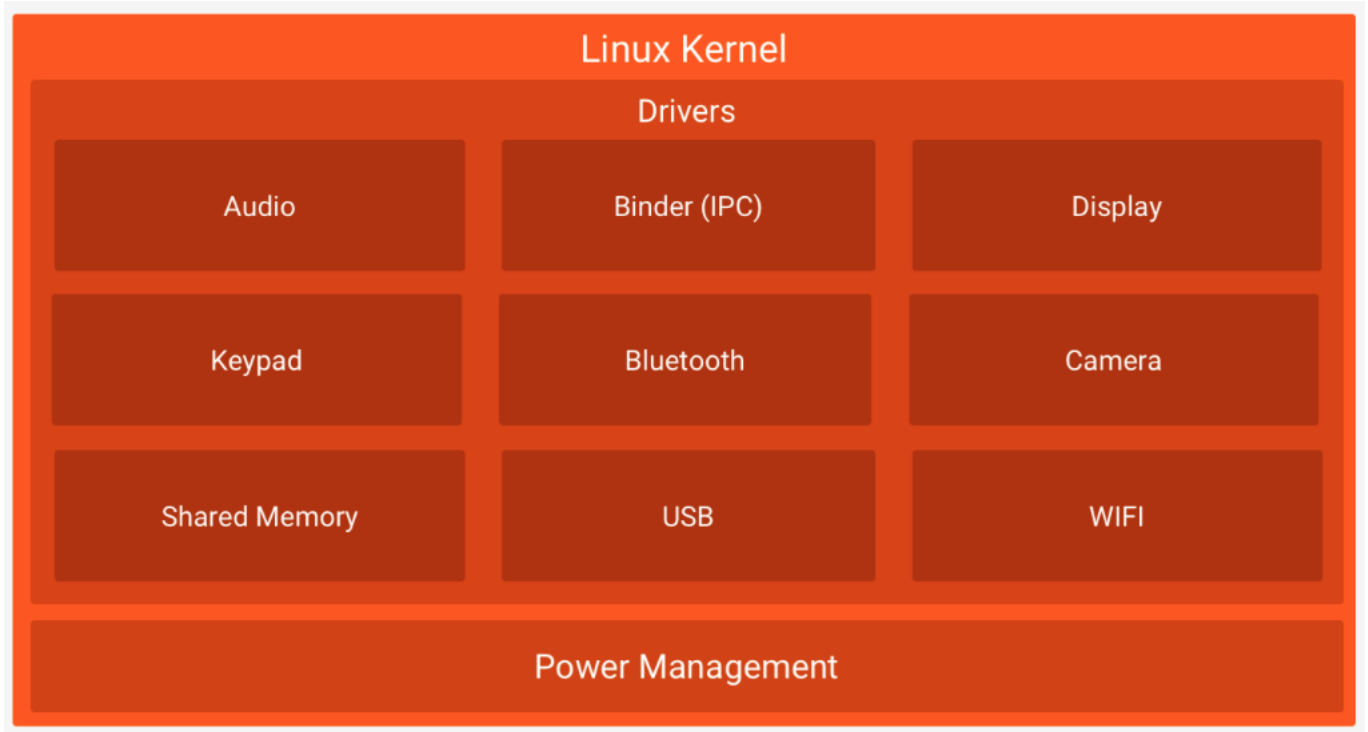




The (Application) Activity Life Cycle *

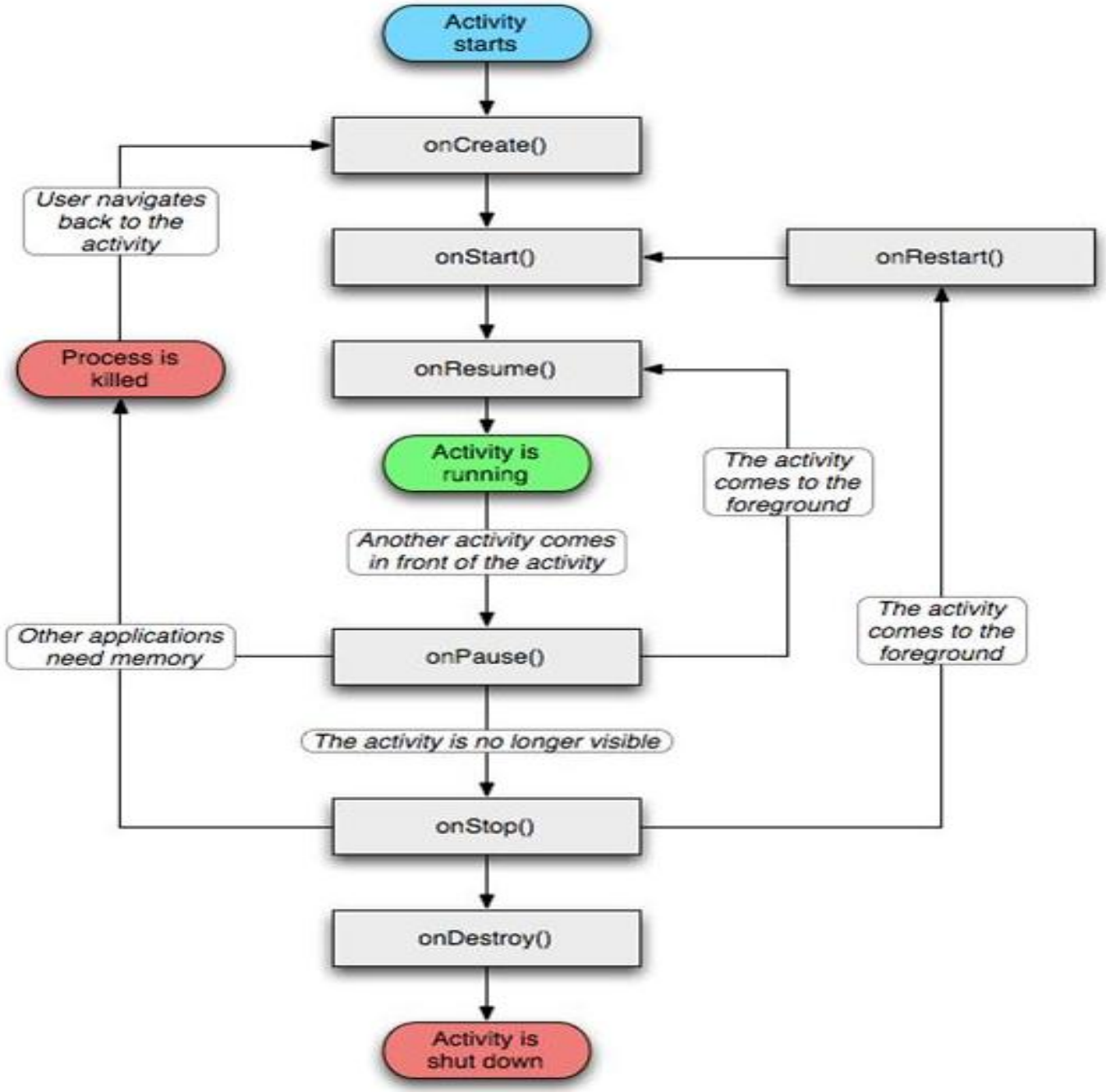
- Android is designed around the unique requirements of mobile applications.
  - In particular, Android recognizes that resources (memory and battery, for example) are limited on most mobile devices, and provides mechanisms to conserve those resources.
- The mechanisms are evident in the *Android Activity Lifecycle*, which defines the states or events that an activity goes through from the time it is created until it finishes running.

The (Application) Activity Life Cycle

- An application itself is a set of activities with a Linux process to contain them
  - However, an application DOES NOT EQUAL a process
  - Due to (previously mentioned) low memory conditions, an activity might be suspended at any time and its process be discarded
    - The activity manager remembers the state of the activity however and can reactivate it at any time
    - Thus, an activity may span multiple processes over the life time of an application

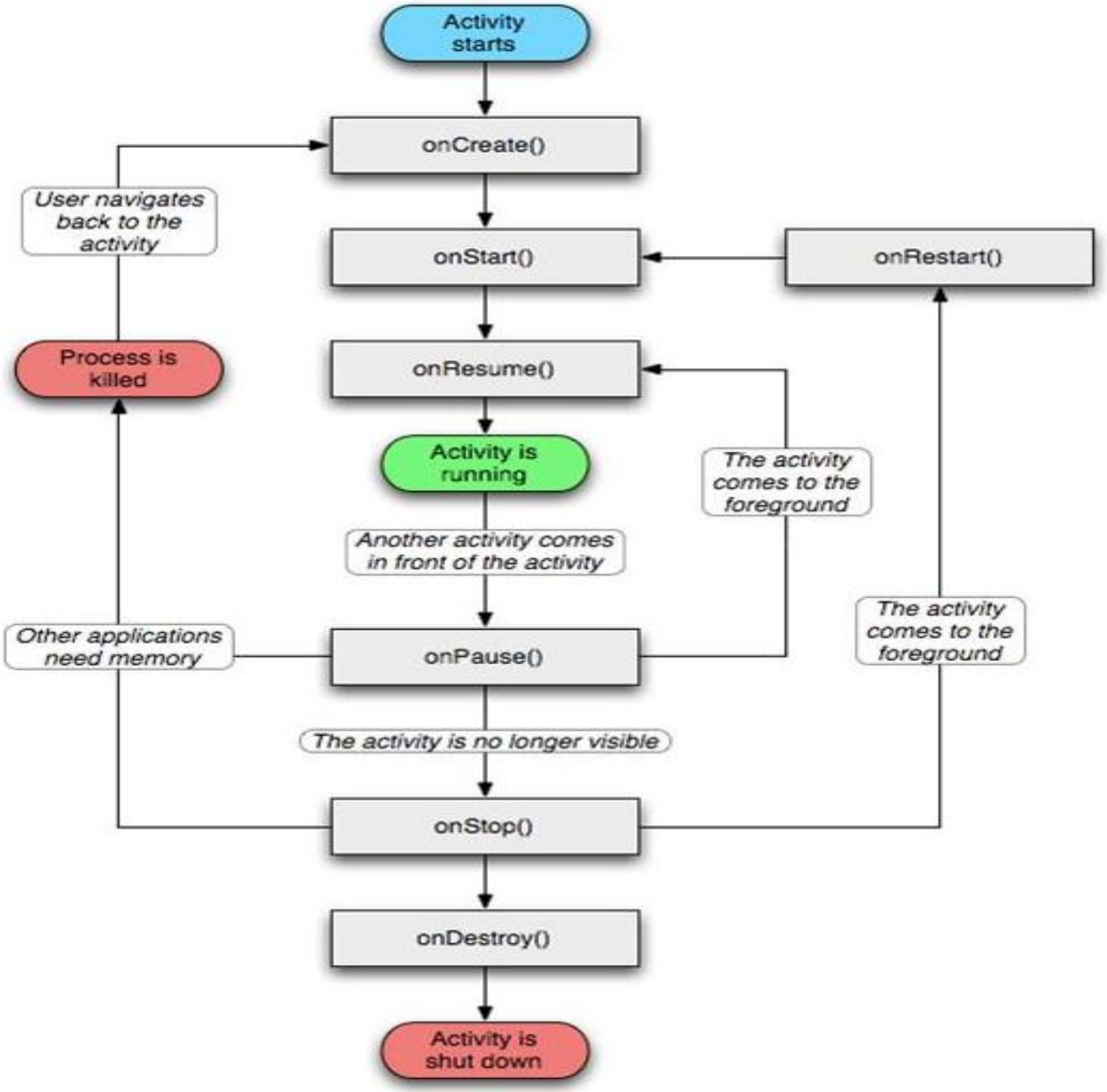
The Activity Life Cycle *

- The Activity has a number of predefined functions that you override to handle events from the system.
- If you don't specify what should be done the system will perform the default actions to handle events.
- Why would you want to handle events such as **`onPause()`**, etc… ?
  - You will probably want to do things like release resources, stop network connections, back up data, etc…



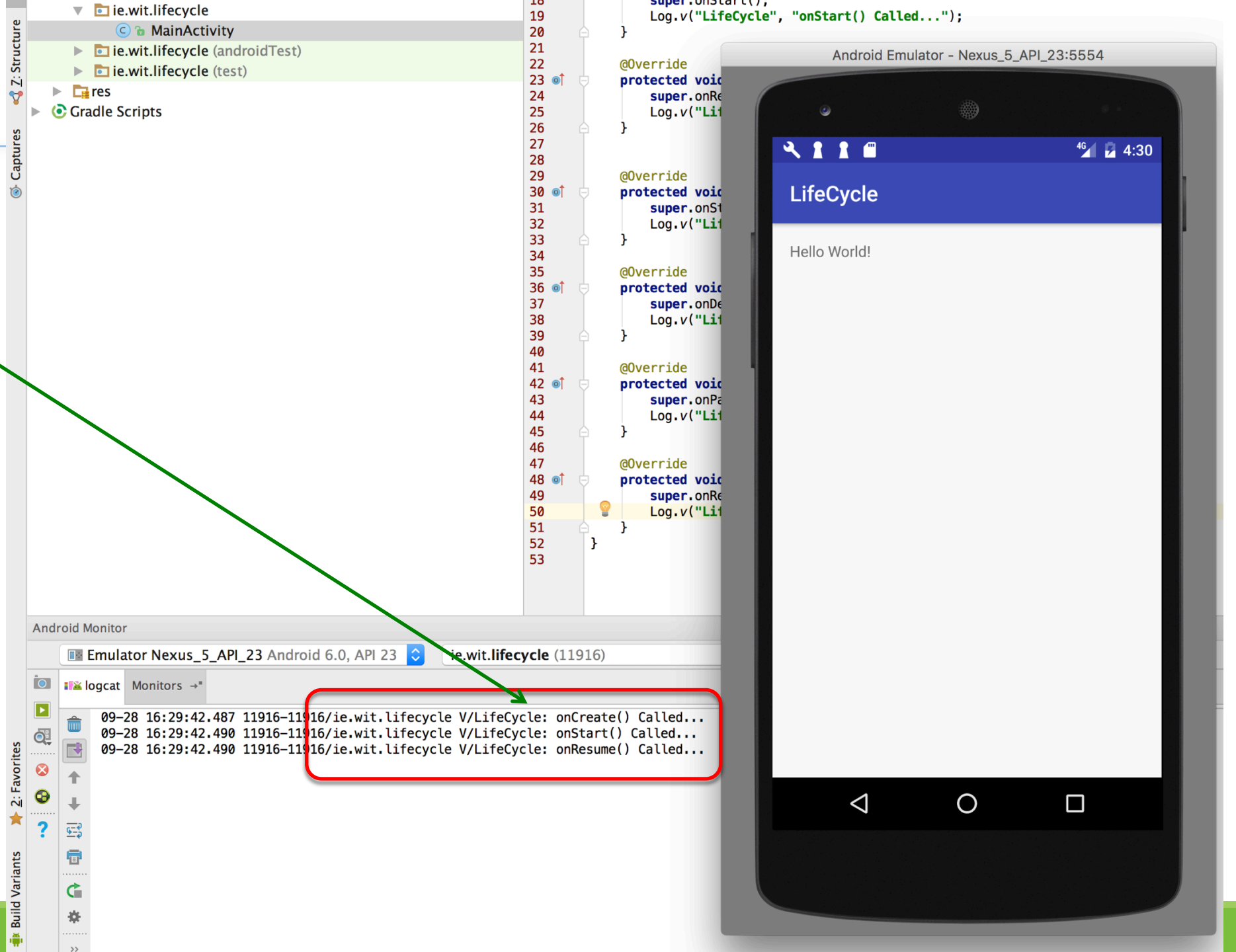
The Activity Life Cycle

- At the *very minimum* ,you need (and is supplied) **`onCreate()`**
- **`onStop()`** and **`onDestroy()`** are optional and may never be called
- If you need persistence, the save needs to happen in **`onPause()`**



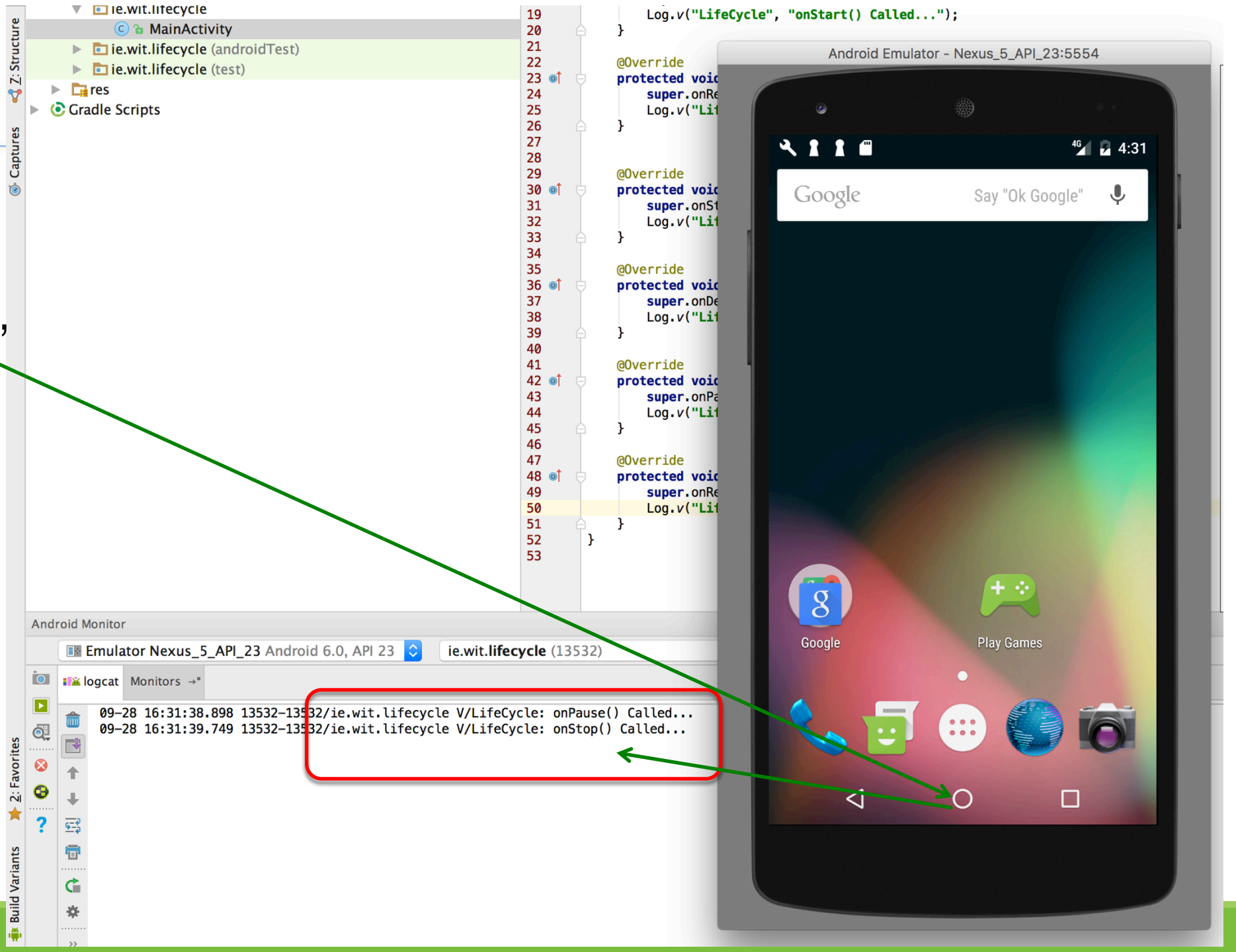
LifeCycle Example (1) *

User Launches App



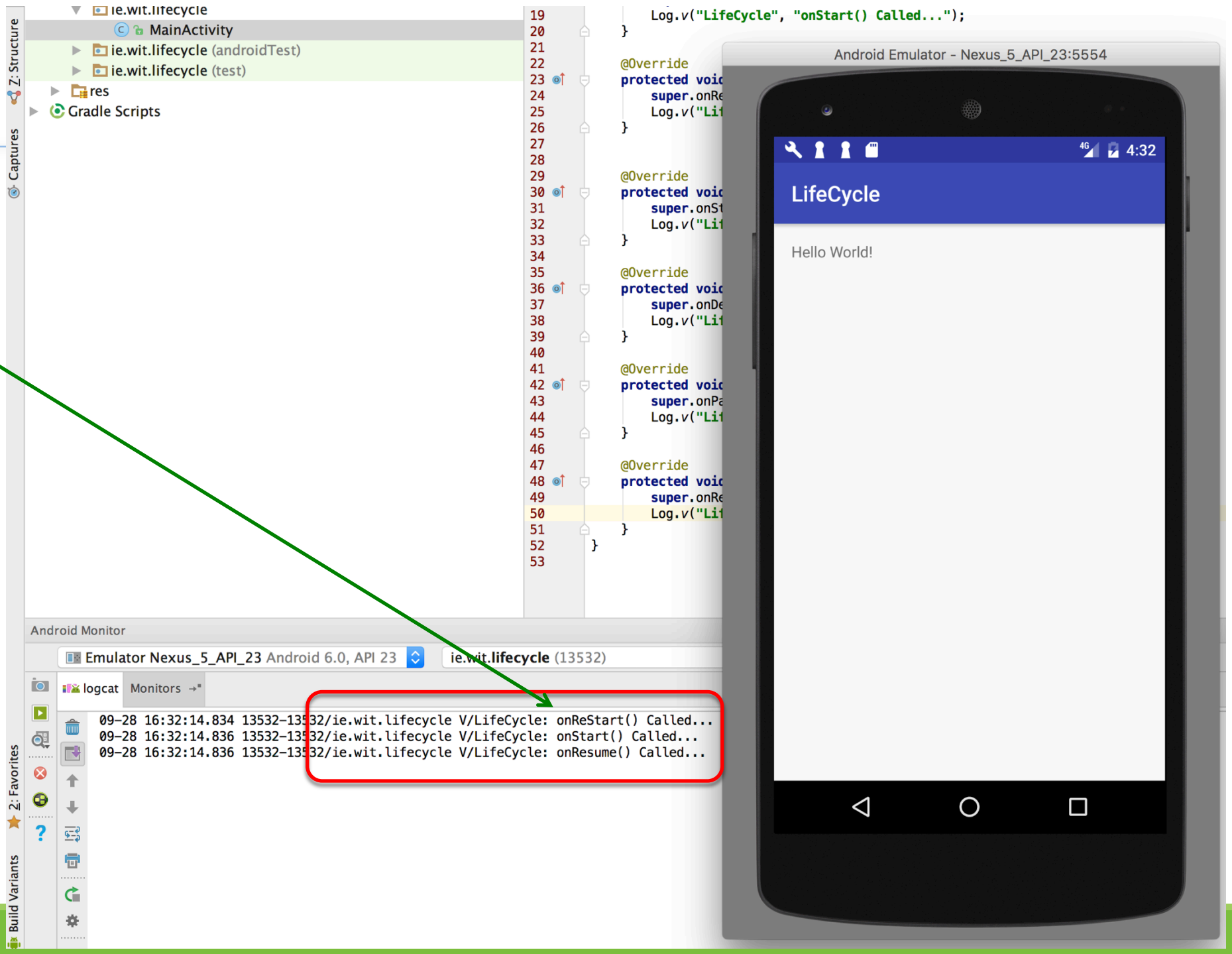
LifeCycle Example (2) *

User Selects ‘Home’



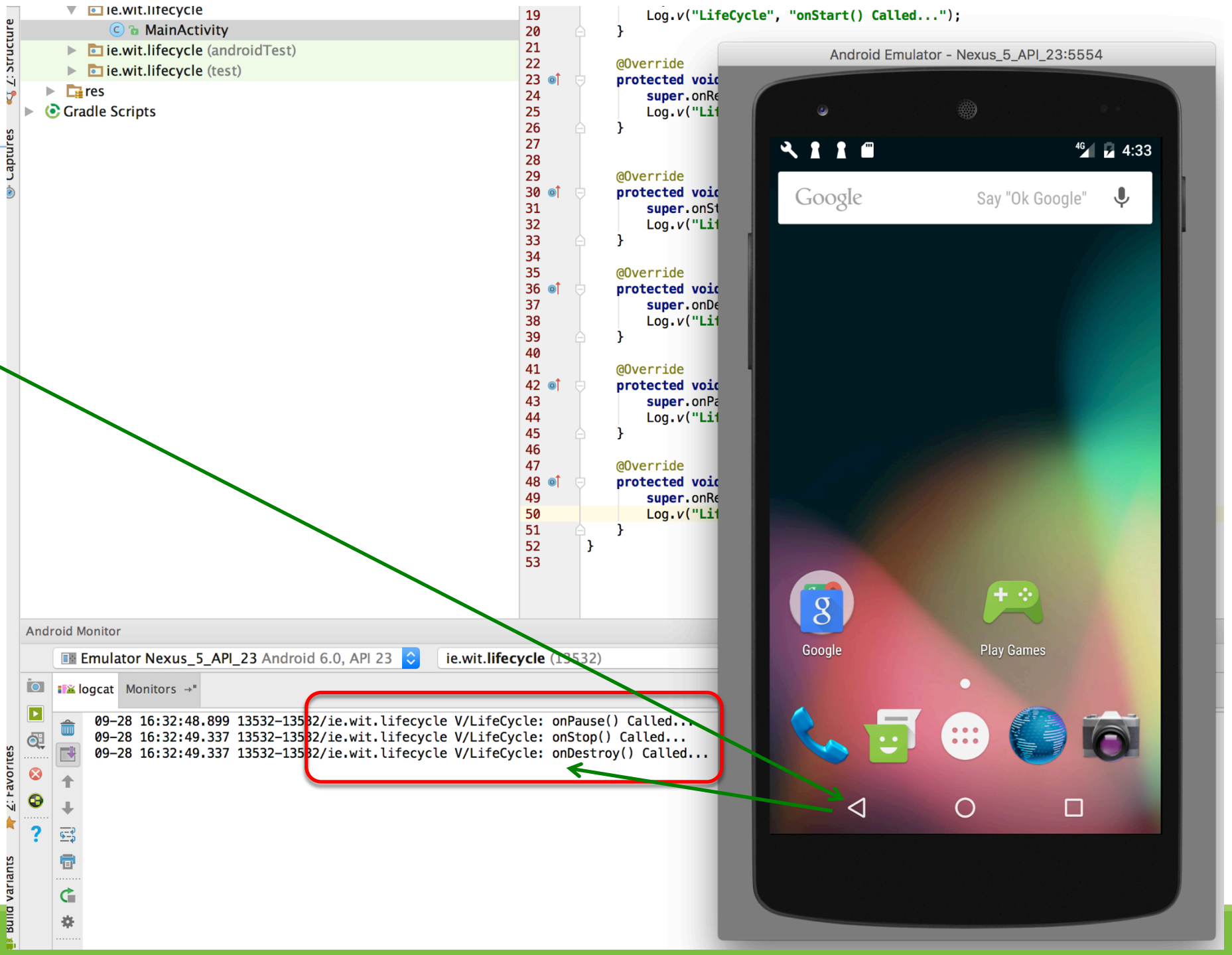
LifeCycle Example (3) *

User restarts App



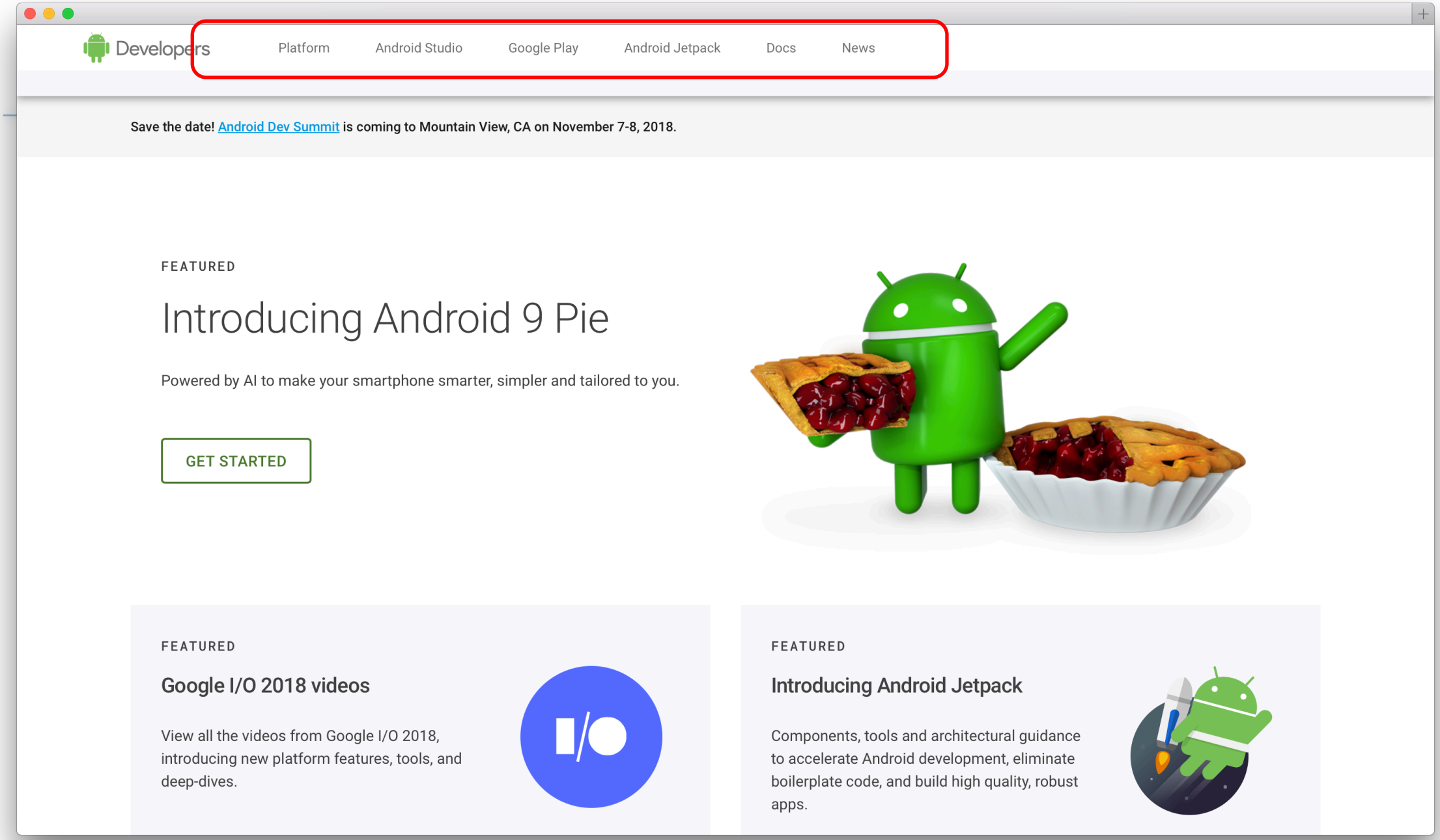
LifeCycle Example (4) *

User Selects ‘Back’



So, after all that, how do I Design my App?

- The way the system architecture is set up is fairly open:
  - App design is somewhat up to you, but you still have to live with the Android execution model.
- Start with the different *screens/layouts* (Views) that the user will see. These are controlled by the different *Activities* (Controllers) that will comprise your system.
- Think about the *transitions* between the screens, these will be the *Intents* passed between the Activities.
- Think about what background *services* you might need to incorporate.
  - Exchanging data
  - Listening for connections?
  - Periodically downloading network information from a server?
- Think about what *information* must be stored in long term memory (SQLite) and possibly design a content provider around it.
- Now connect the Activities, services, etc… with Intents…
- Don't forget good OOP ☺ and
- USE THE DEVELOPER DOCs & GUIDES (next few slides)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Save the date! Android Dev Summit is coming to Mountain View, CA on November 7-8, 2018.
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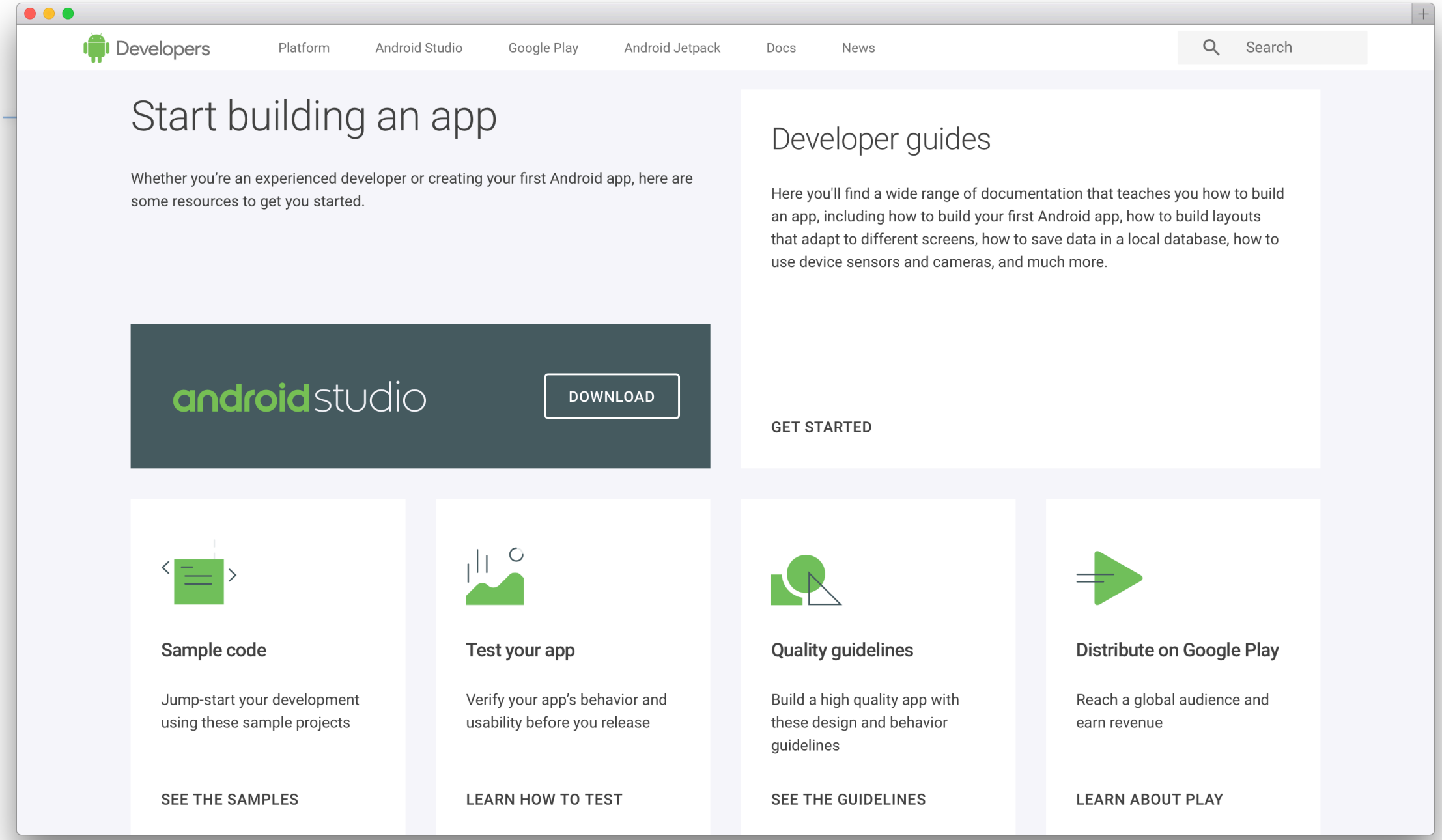
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Start building an app
Whether you're an experienced developer or creating your first Android app, here are some resources to get you started.
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Developer guides
Here you'll find a wide range of documentation that teaches you how to build an app, including how to build your first Android app, how to build layouts that adapt to different screens, how to save data in a local database, how to use device sensors and cameras, and much more.
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Verify your app's behavior and usability before you release
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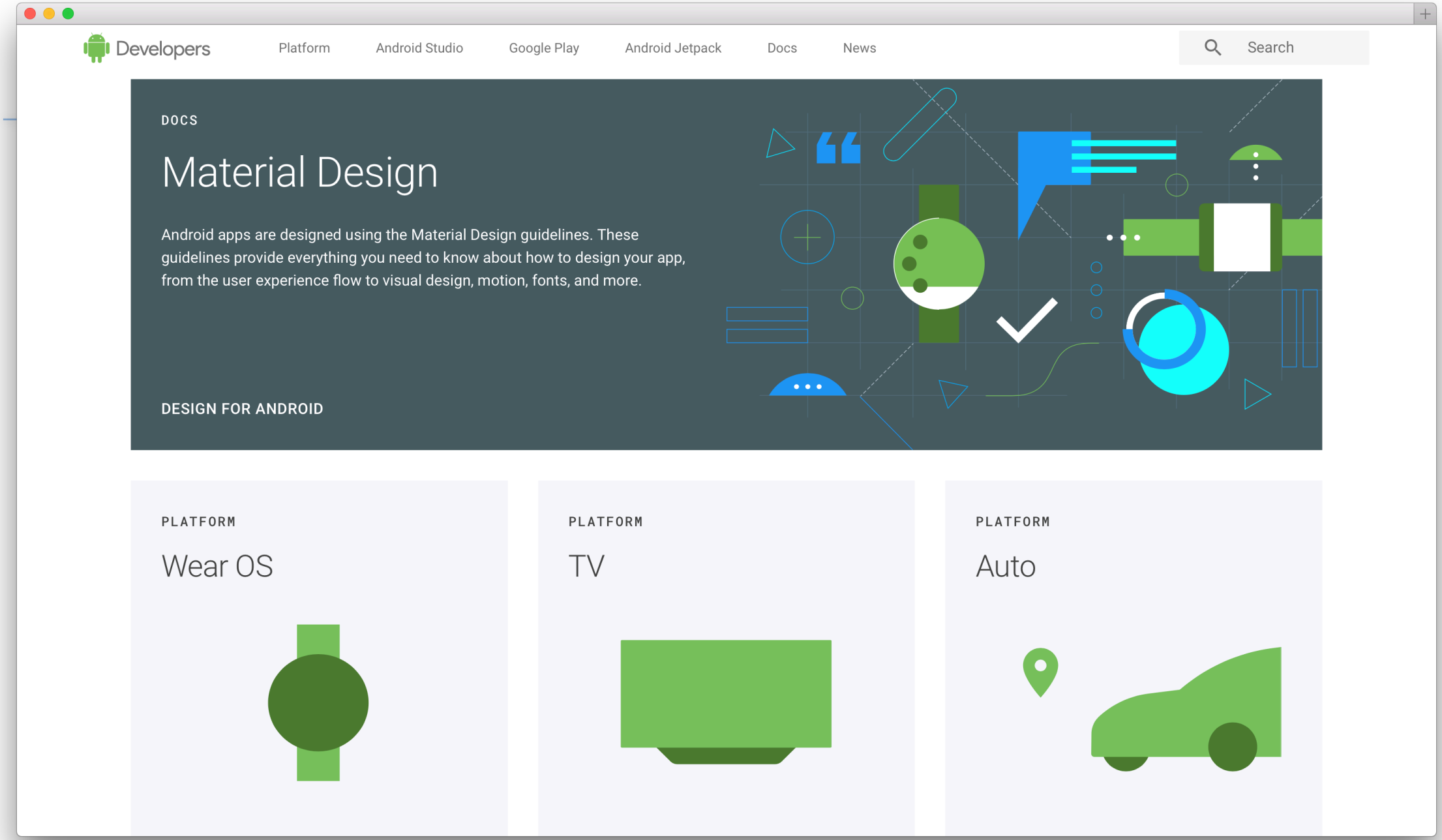
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Material Design
Android apps are designed using the Material Design guidelines. These guidelines provide everything you need to know about how to design your app, from the user experience flow to visual design, motion, fonts, and more.
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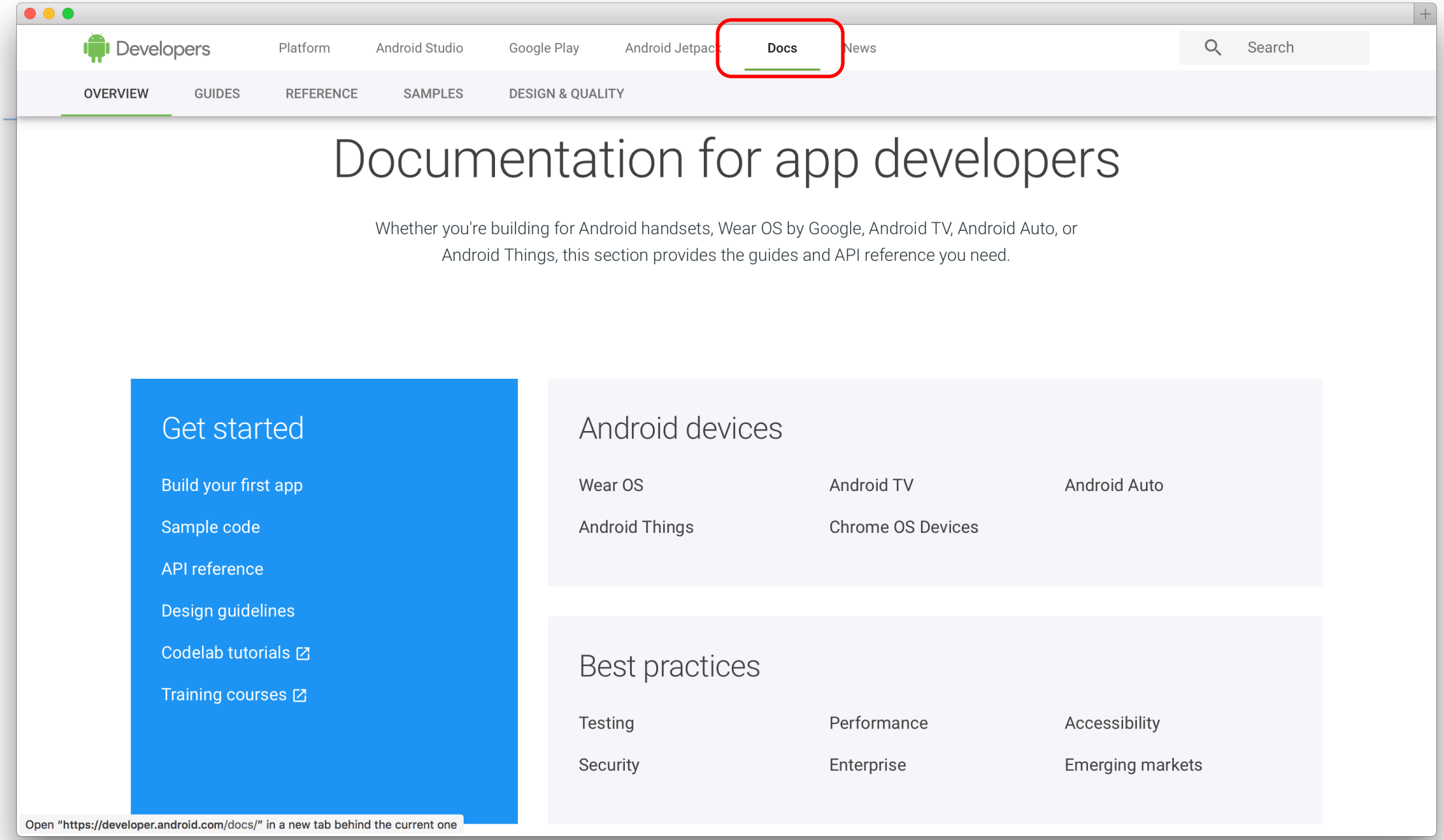
Wear OS
PLATFORM
TV
PLATFORM
Auto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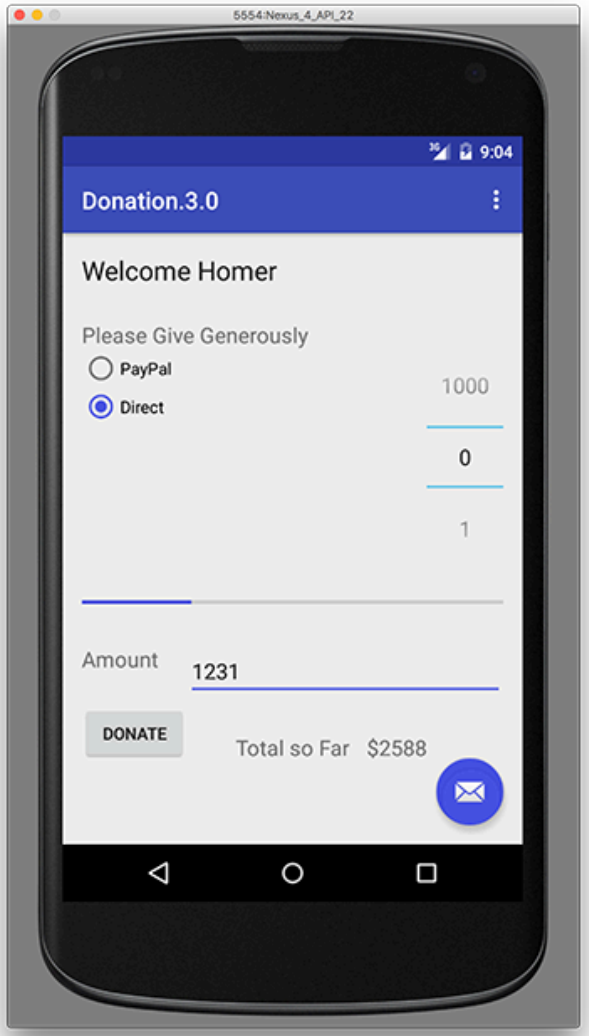
Open "https://developer.android.com/docs/" in a new tab behind the current one

Case Study

- *Donation* – an Android App to keep track of donations made to '*Homers Presidential Campaign* '.
- App Features
  - Accept donation via number picker or typed amount
  - Keep a running total of donations
  - Display report on donation amounts and types
  - Display running total on progress bar



Ultimate Case Study

Summary

- We looked at the Android Application Components
- Became aware of The Android Application Life Cycle
- Briefly viewed the Online Developer Resources
- Took a quick look at The "*Donation*" Case Study

Questions?


Thanks!