



Waterford Institute *of* Technology

INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

Android Programming with Kotlin



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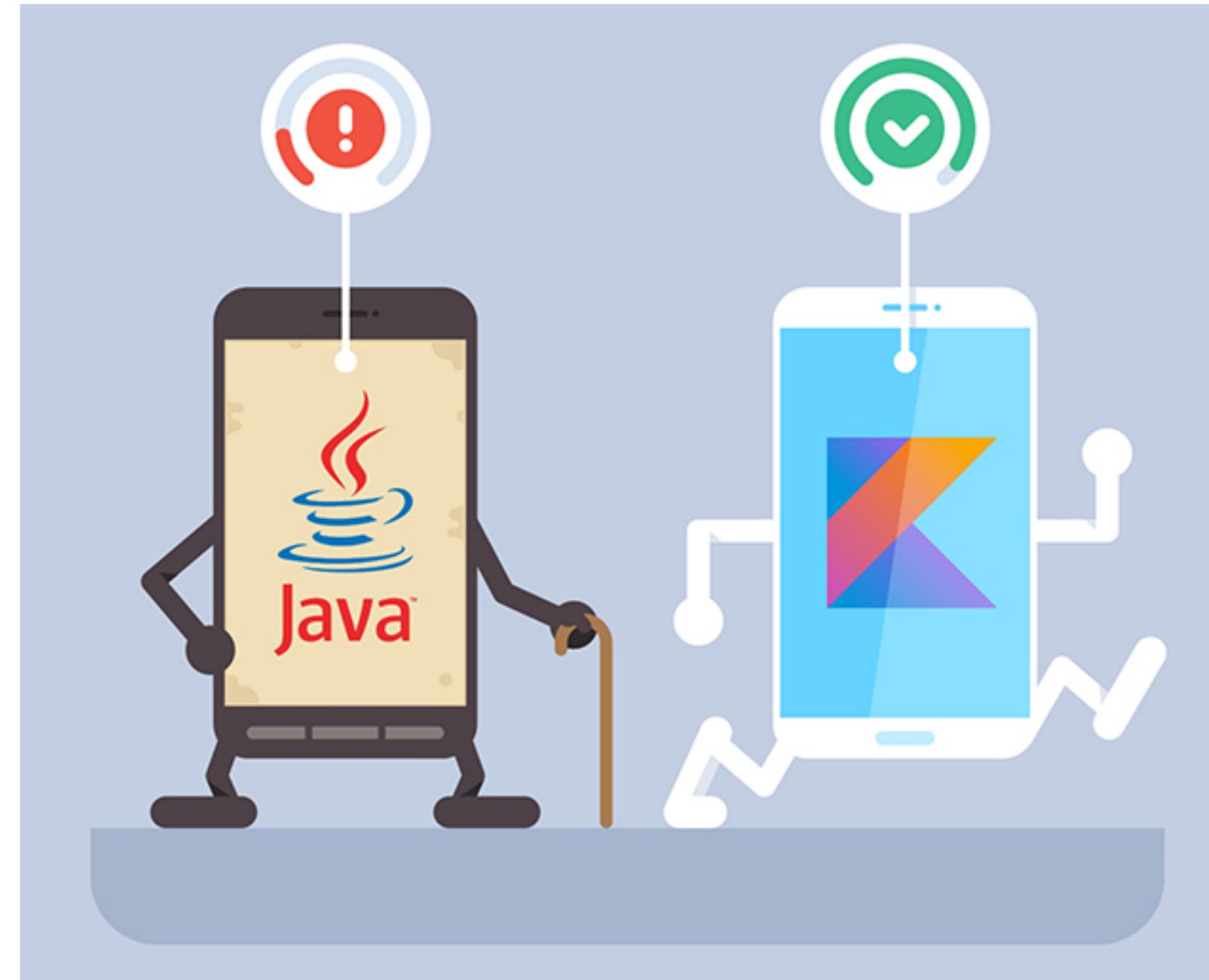


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2018

Android Programming with Kotlin

Course Mission: *Accelerate into Android App development leveraging the power & expressiveness of Kotlin*



00: Overview

Module Overview

01: Activities

Kotlin Context

Evolution

Convergence

Android Activities

Android: Foundation

Lab-01 Activities

Adapters

Kotlin Fundamentals

Kotlin Structure

Basic Syntax

Kotlin Deep Dive

Android Adapters

Android Application Object

Recycler View + Adapters

Lab-02 Adapters

03: Models

Kotlin Idioms

Idioms

J2K Variables & Expressions

Android Models

Toolbar

Memory Store

Adapter + Listener

Parcelable

Lab-03 Models

04: Images

Kotlin Deep Dive

Types

J2K Collections

Images

Resources

Model Updates

Images

Lab-04 Images

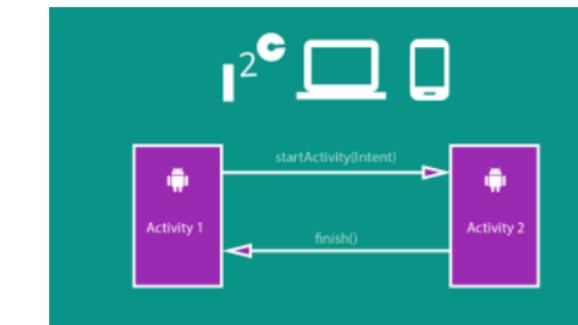
05: Maps

Android Programming with Kotlin

Eamonn de Leastar, WIT

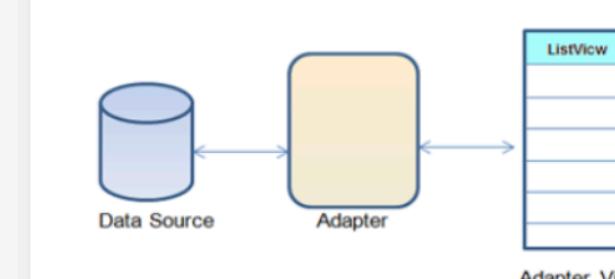


01: Activities



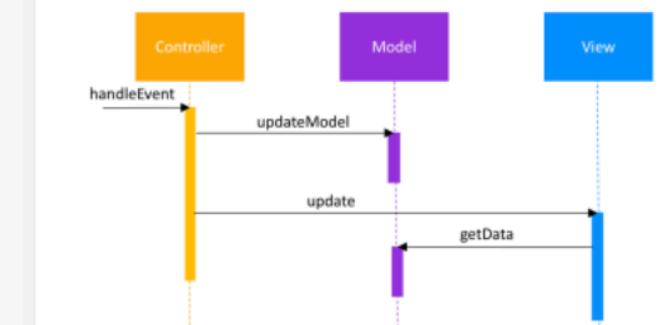
Trace the influences on the Kotlin Programming language. Create and explore a starter Kotlin Android application in detail.

Adapters



Look at Kotlin in more depth. Deep dive into some of its features. Extend the app to manage lists of placemarks using the adapter pattern.

03: Models



Examine key Kotlin Idioms. Start comparing simple Java & Kotlin statements. Introduce a more complete model into Placemark.

05: Maps



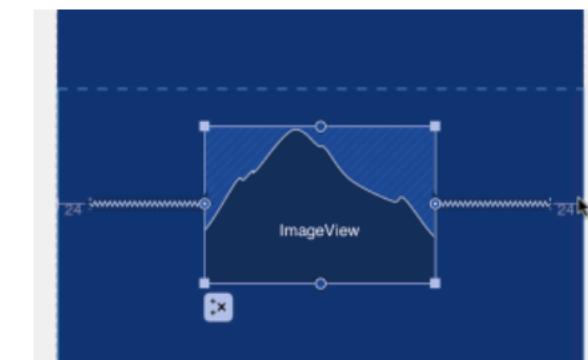
Review Kotlin Packages + Control flow. Introducing Google Maps into and android app.

06: Persistence



Kotlin Classes, inheritance, interfaces. Properties & fields. New Placemark Store class to save placemarks to the file system.

07: Layouts



Kotlin Data classes, sealed classes & extensions. Objects & Delegation. Include a Map widget onto an activity. Manage the map markers.

“Building Android applications is both exciting and challenging. The diversity of the applications one can build is fascinating, however their complexity can be overwhelming. Kotlin, a new language fully supported by google, dramatically enhances the power and simplicity of the programmers task.”



Kotlin is:

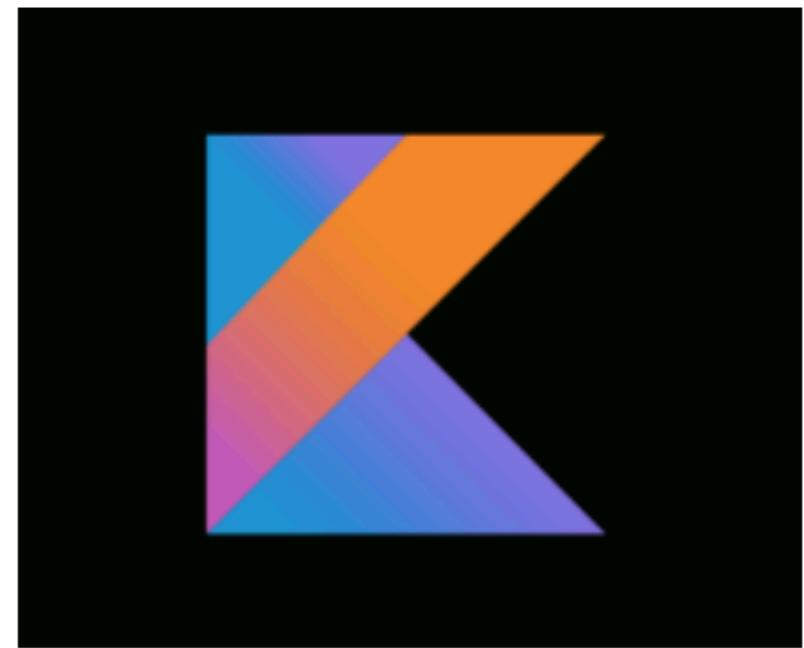
Modern

Secure

Typesafe

Expressive

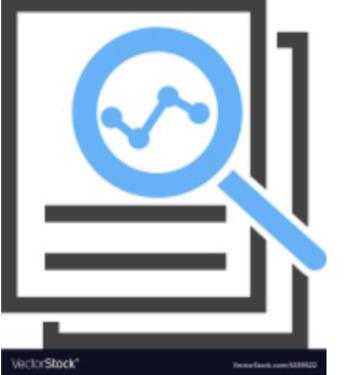
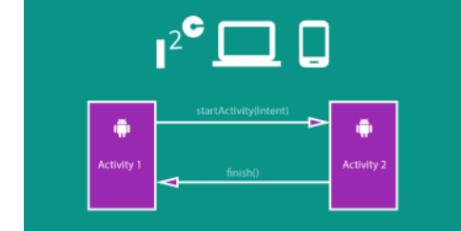
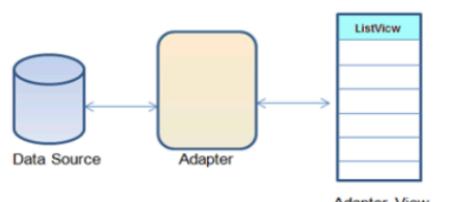
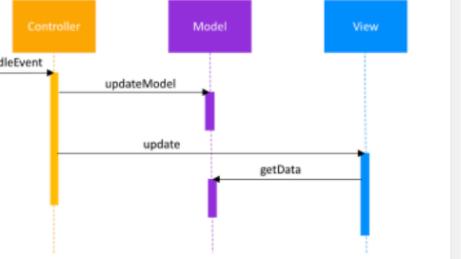
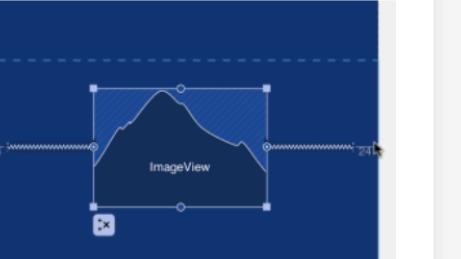
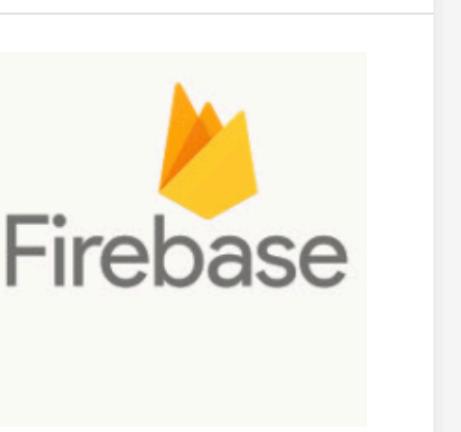
Concise

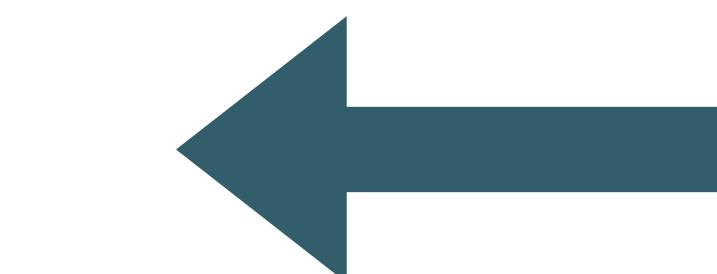


Assumptions:
Intermediate level Java or
closely related language
skills

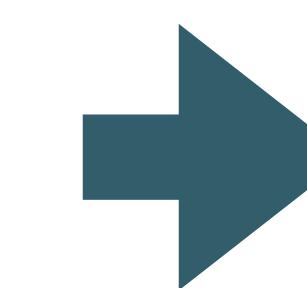
Accelerate into the
fundamentals of Kotlin we
need

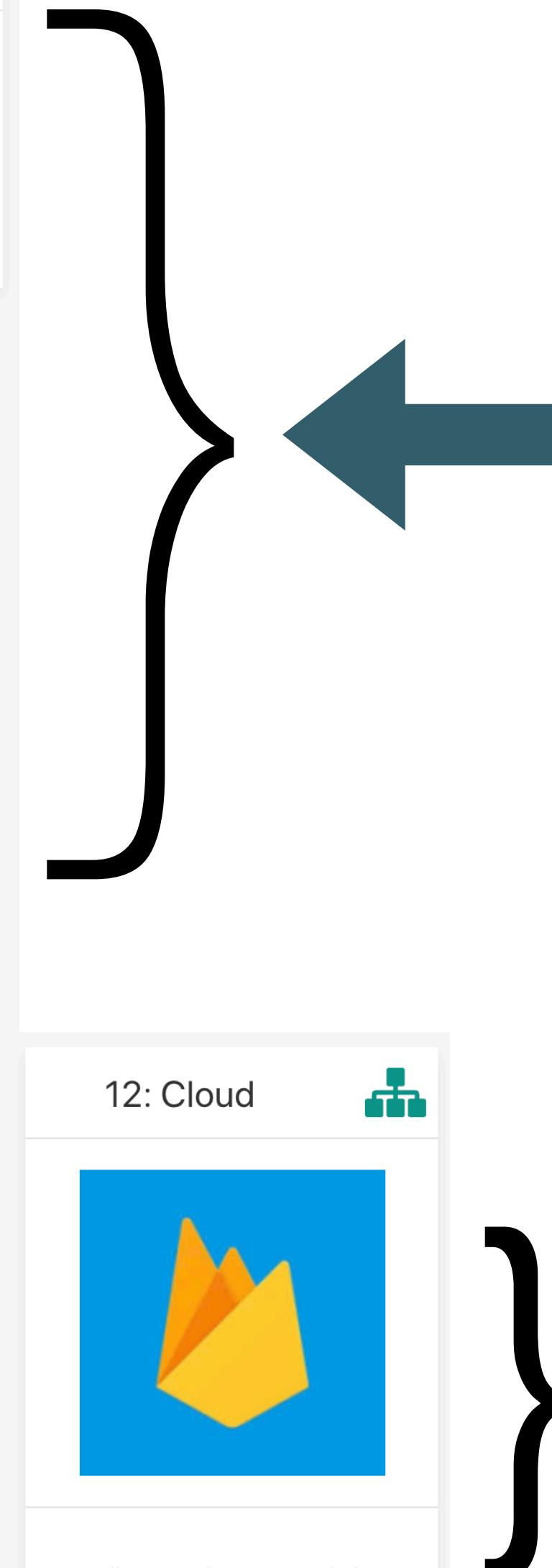
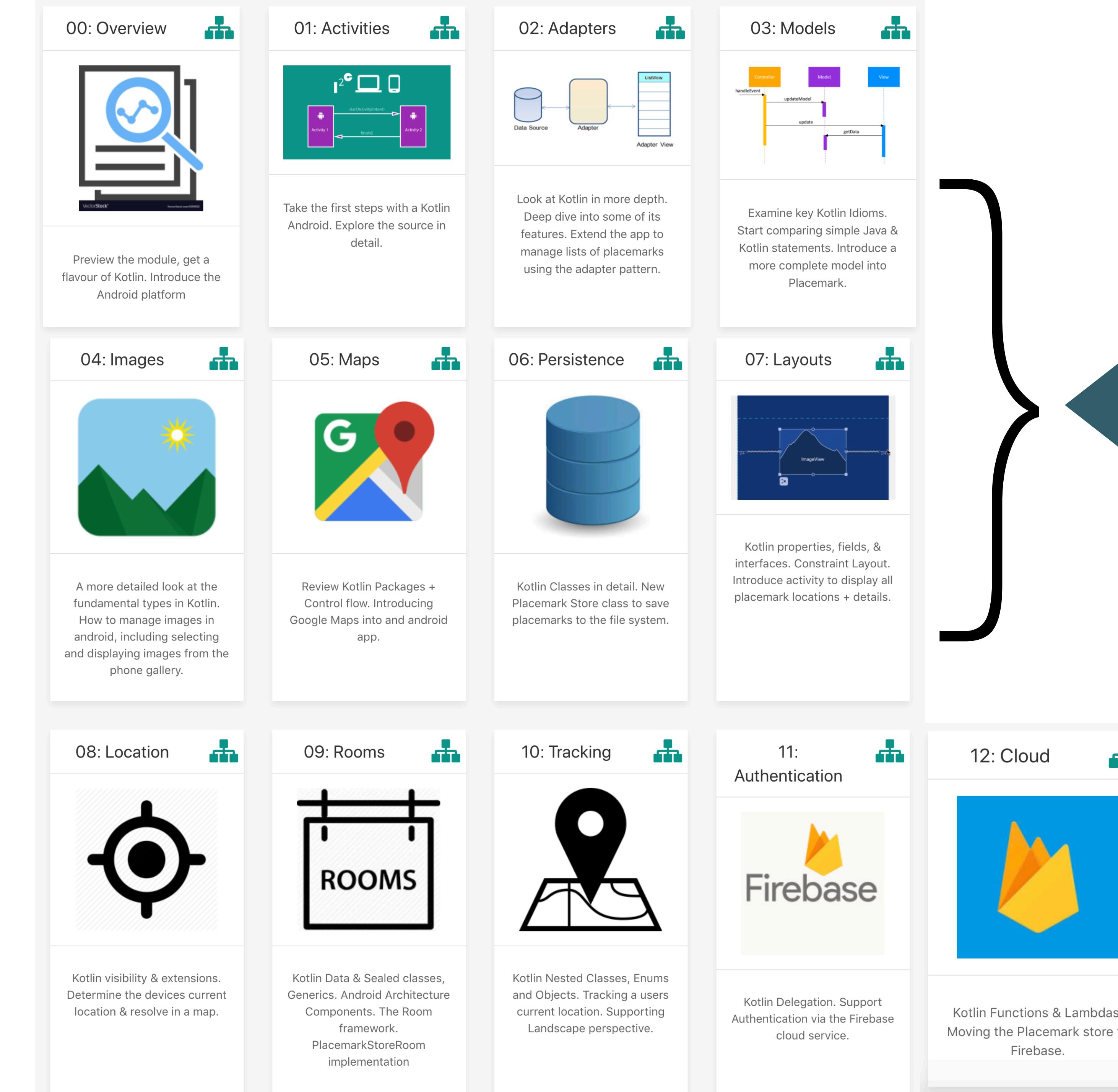
Every topic explores
specific Kotlin features *in parallel* to android code

00: Overview	01: Activities	02: Adapters	03: Models	
				
<p>Preview the module, get a flavour of Kotlin. Introduce the Android platform</p>	<p>Take the first steps with a Kotlin Android. Explore the source in detail.</p>	<p>Look at Kotlin in more depth. Deep dive into some of its features. Extend the app to manage lists of placemarks using the adapter pattern.</p>	<p>Examine key Kotlin Idioms. Start comparing simple Java & Kotlin statements. Introduce a more complete model into Placemark.</p>	
04: Images	05: Maps	06: Persistence	07: Layouts	
				
<p>A more detailed look at the fundamental types in Kotlin. How to manage images in android, including selecting and displaying images from the phone gallery.</p>	<p>Review Kotlin Packages + Control flow. Introducing Google Maps into and android app.</p>	<p>Kotlin Classes in detail. New Placemark Store class to save placemarks to the file system.</p>	<p>Kotlin properties, fields, & interfaces. Constraint Layout. Introduce activity to display all placemark locations + details.</p>	
08: Location	09: Rooms	10: Tracking	11: Authentication	12: Cloud
				
<p>Kotlin visibility & extensions. Determine the devices current location & resolve in a map.</p>	<p>Kotlin Data & Sealed classes, Generics. Android Architecture Components. The Room framework. PlacemarkStoreRoom implementation</p>	<p>Kotlin Nested Classes, Enums and Objects. Tracking a users current location. Supporting Landscape perspective.</p>	<p>Kotlin Delegation. Support Authentication via the Firebase cloud service.</p>	<p>Kotlin Functions & Lambdas. Moving the Placemark store to Firebase.</p>

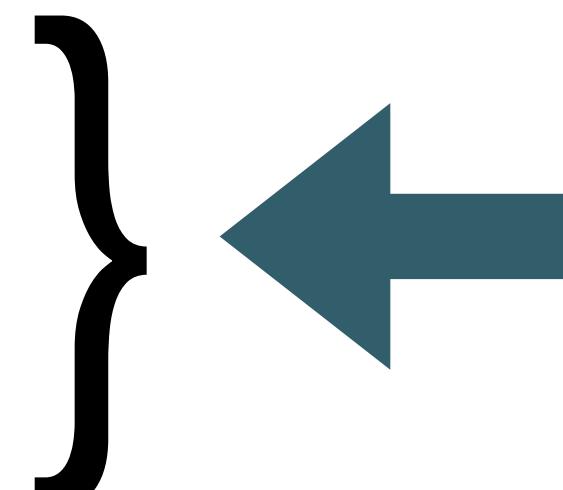


Module Topics





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On Site



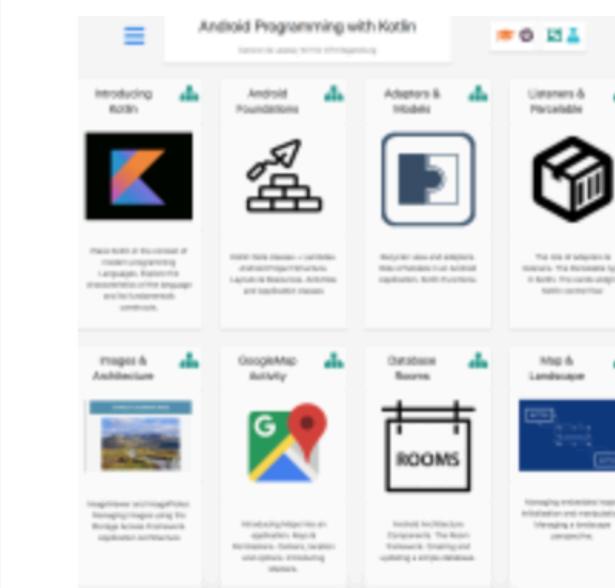
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00: Overview



Preview the module, get a flavour of Kotlin. Introduce the Android platform

Module Overview



Outline of the structure and content of the module

Android Overview

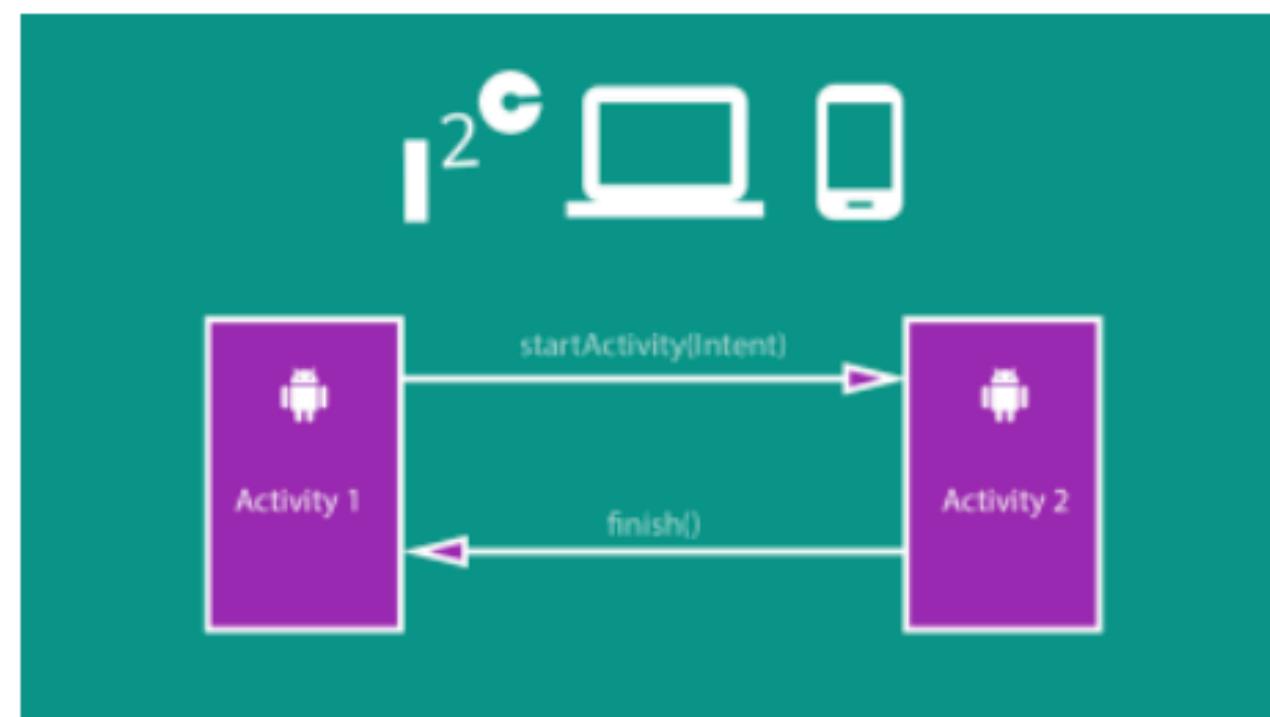


Introduction to the Android platform - its goals and major components

Convergence

```
import java.util.ArrayList  
import java.util.List  
  
class Base {  
    public void main(String[] args) {  
        String[] names = new String[args.length];  
        names[0] = "Tom";  
        names[1] = "Bob";  
        names[2] = "Sue";  
        names[3] = "Sam";  
        names[4] = "Tina";  
        names[5] = "John";  
        names[6] = "Jane";  
        names[7] = "Mike";  
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        names[431] = "Steve";  
        names[432] = "Paul";  
        names[433] = "Linda";  
        names[434] = "Mark";  
        names[435] = "Amy";  
        names[436] = "Doris";  
        names[437] = "Jeff";  
        names[438] = "Chris";  
        names[439] = "Mike";  
        names[440] = "Sarah";  
        names[441] = "David";  
        names[442] = "Lisa";  
        names[443] = "Steve";  
        names[444] = "Paul";  
        names[445] = "Linda";  
        names[446] = "Mark";  
        names[447] = "Amy";  
        names[448] = "Doris";  
        names[449] = "Jeff";  
        names[450] = "Chris";  
        names[451] = "Mike";  
        names[452] = "Sarah";  
        names[453] = "David";  
        names[454] = "Lisa";  
        names[455] = "Steve";  
        names[456] = "Paul";  
        names[457] = "Linda";  
        names[458] = "Mark";  
        names[459] = "Amy";  
        names[460] = "Doris";  
        names[461] = "Jeff";  
        names[462] = "Chris";  
        names[463] = "Mike";  
        names[464] = "Sarah";  
        names[465] = "David";  
        names[466] = "Lisa";  
        names[467] = "Steve";  
        names[468] = "Paul";  
        names[469] = "Linda";  
        names[470] = "Mark";  
        names[471] = "Amy";  
        names[472] = "Doris";  
        names[473] = "Jeff";  
        names[474] = "Chris";  
        names[475] = "Mike";  
        names[476] = "Sarah";  
        names[477] = "David";  
        names[478] = "Lisa";  
        names[479] = "Steve";  
        names[480] = "Paul";  
        names[481] = "Linda";  
        names[482] = "Mark";  
        names[483] = "Amy";  
        names[484] = "Doris";  
        names[485] = "Jeff";  
        names[486] = "Chris";  
        names[487] = "Mike";  
        names[488] = "Sarah";  
        names[489] = "David";  
        names[490] = "Lisa";  
        names[491] = "Steve";  
        names[492] = "Paul";  
        names[493] = "Linda";  
        names[494] = "Mark";  
        names[495] = "Amy";  
        names[496] = "Doris";  
        names[497] = "Jeff";  
        names[498] = "Chris";  
        names[499] = "Mike";  
        names[500] = "Sarah";  
        names[501] = "David";  
        names[502] = "Lisa";  
        names[503] = "Steve";  
        names[504] = "Paul";  
        names[505] = "Linda";  
        names[506] = "Mark";  
        names[507] = "Amy";  
        names[508] = "Doris";  
        names[509] = "Jeff";  
        names[510] = "Chris";  
        names[511] = "Mike";  
        names[512] = "Sarah";  
        names[513] =
```

01: Activities



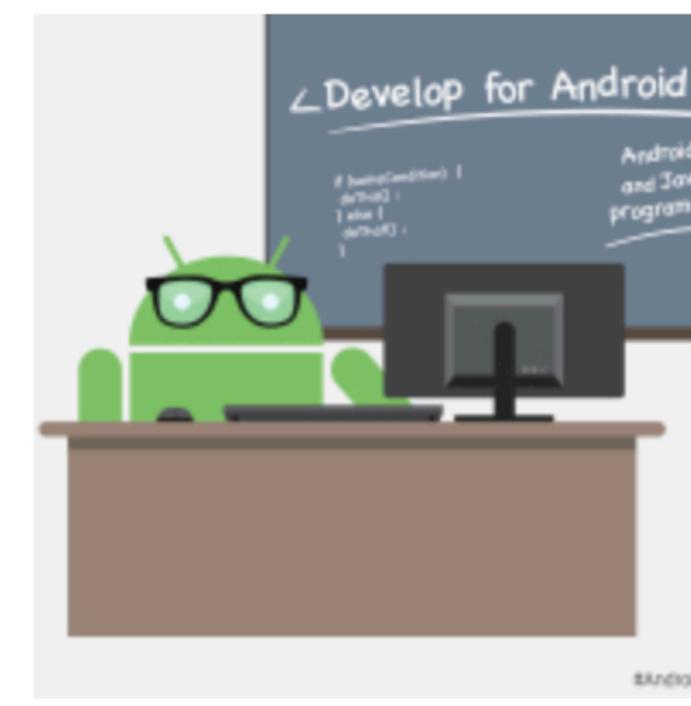
Take the first steps with a Kotlin
Android. Explore the source in
detail.

Android Anatomy



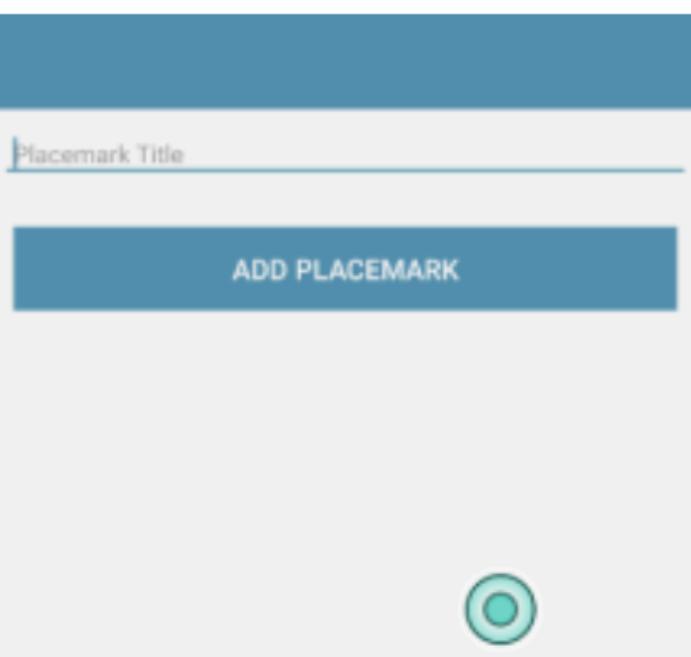
Explore the major features in
an android application

Android: Foundation



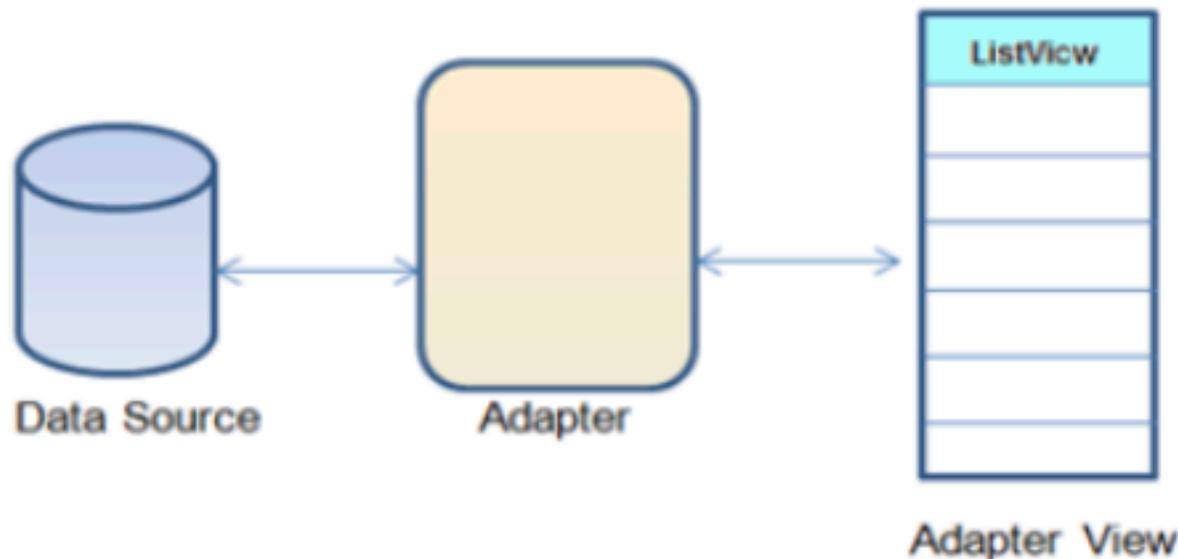
A first look at the structure
of a simple Kotlin Android
application

Lab-01 Activities



Layout the
PlacemarkActivity -
supporting create/edit of
placemarks

02: Adapters



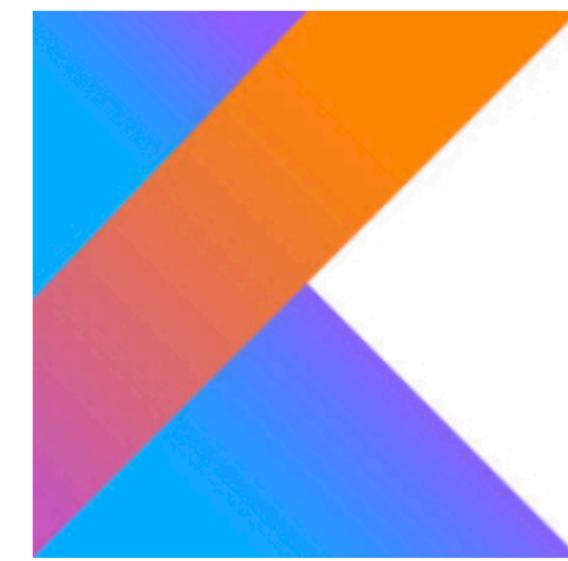
Look at Kotlin in more depth.
Deep dive into some of its features. Extend the app to manage lists of placemarks using the adapter pattern.

Kotlin Structure



The fundamental characteristics of the language

Basic Syntax



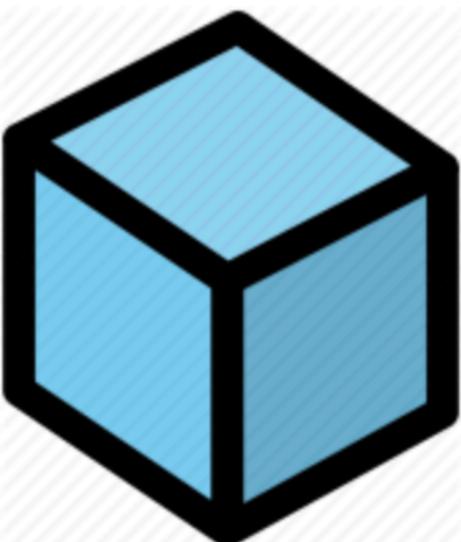
Rapid tour of the basic syntax of Kotlin

Kotlin Deep Dive



A deep dive into some key Kotlin features: Data Classes & Lambdas

Android Application Object



This class enables a global application object to be defined, accessible from all activities

Recycler View + Adapters



Managing lists is facilitated by the RecyclerView + Adapters - 2 key patterns in Android development

Lab-02 Adapters

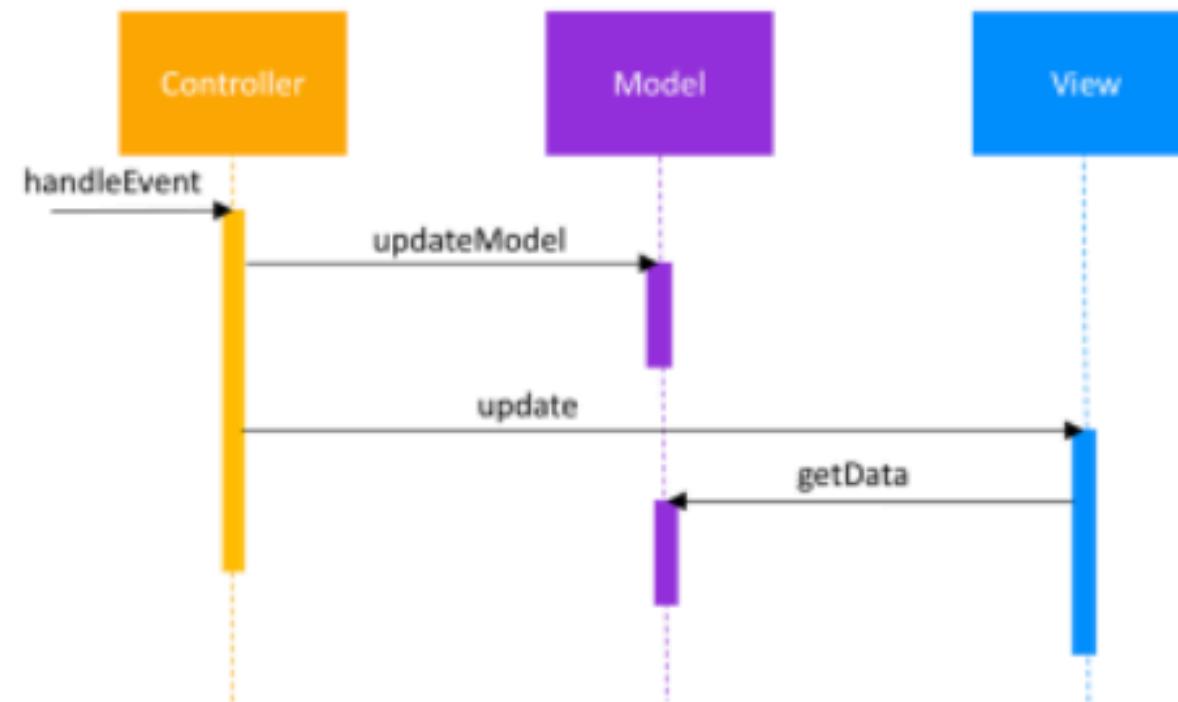
Placemark

Here
the place to be!

There
not so good..

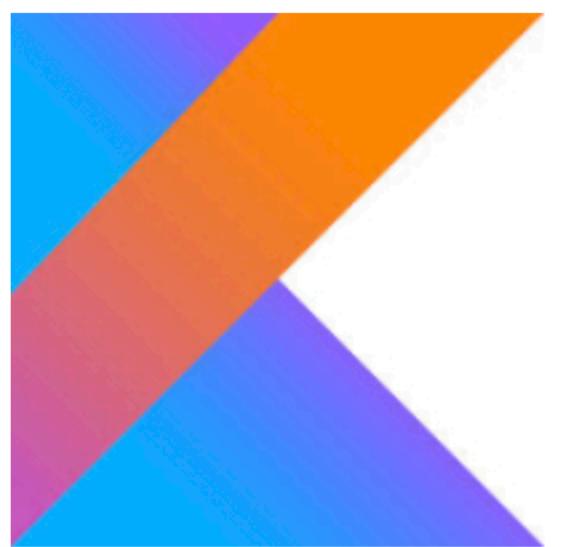
Introduce new activity to display a list of placemarks. Support adding to this list.

03: Models



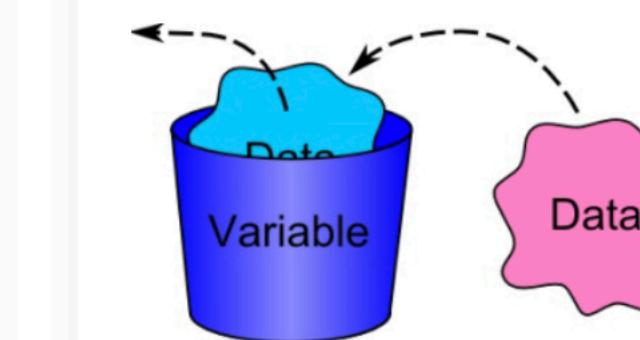
Examine key Kotlin Idioms.
Start comparing simple Java & Kotlin statements. Introduce a more complete model into Placemark.

Idioms



A tour of the common idioms in Kotlin

J2K Variables & Expressions



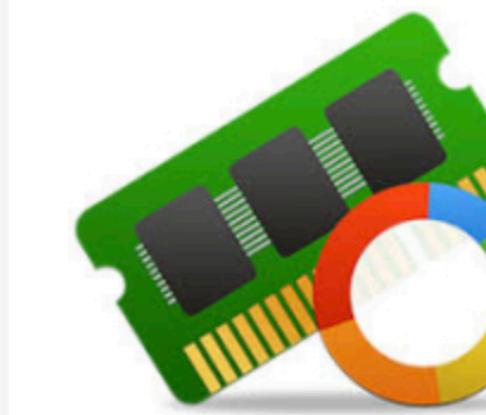
Snippets of the same code in Java & Kotlin

Toolbar



The Android Support Library implements AppCompatActivity + a range of general purpose components, including a Toolbar

Memory Store



Abstract the Placemarks data structure into PlacemarkStore interface + in-memory implementation.

Adapter + Listener



Equip the Adapter with a Listener interface. Use this interface to communicate from the adapter to the host Activity

Parcelable



Encapsulate model data for transmission between Activities

Lab-03 Models

Placemark CANCEL

Here _____

wish you were...

SAVE PLACEMARK

Application object + Model classes to manage placemarks.

04: Images



A more detailed look at the fundamental types in Kotlin.
How to manage images in android, including selecting and displaying images from the phone gallery.



Types



Summary of the basic types in the Kotlin programming language

J2K

Collections



Collection examples: Java & Kotlin equivalents



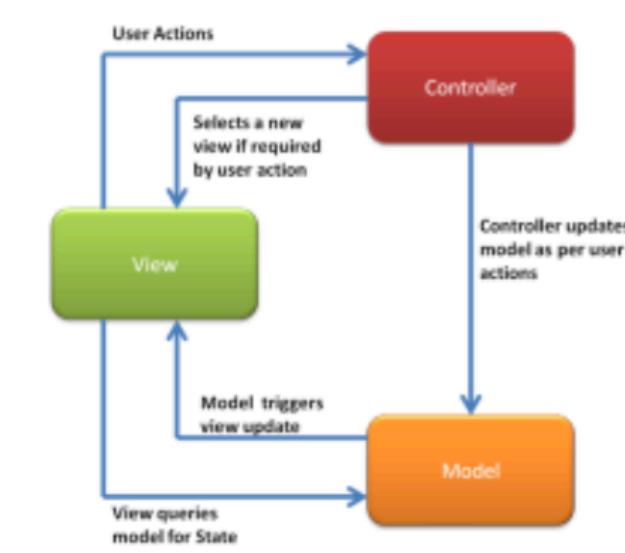
Resources



A general term for all layout, strings, bitmaps and other XML artefacts in an Android Project

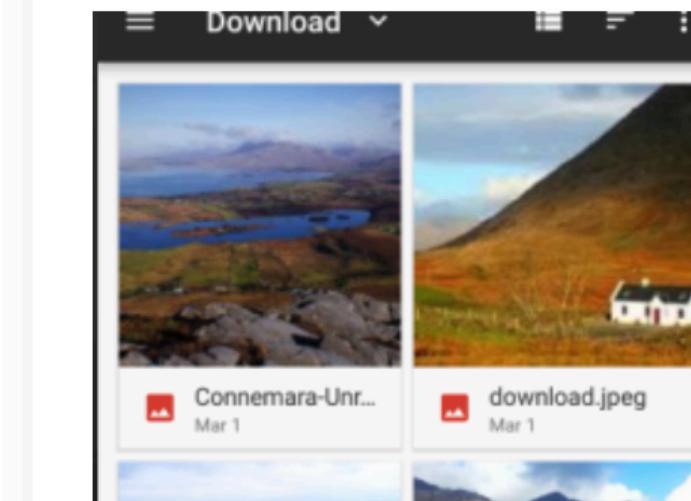


Model Updates



Creating and updating a Placemark. Updating the placemark list.

Images



Support selecting image from phone gallery, and then displaying them in an activity.



Lab-04 Images



Allow an image to be selected from the phones photos, and stored with the placemark



05: Maps



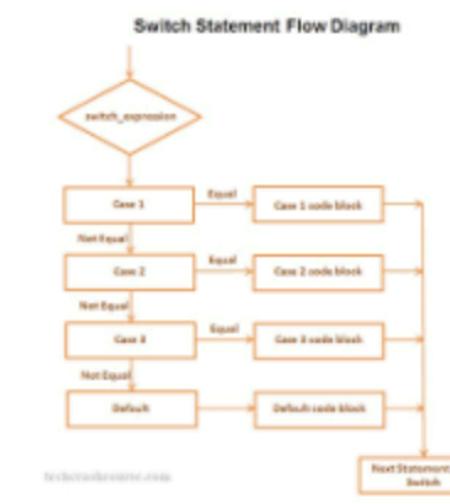
Review Kotlin Packages + Control flow. Introducing Google Maps into and android app.

Kotlin Packages



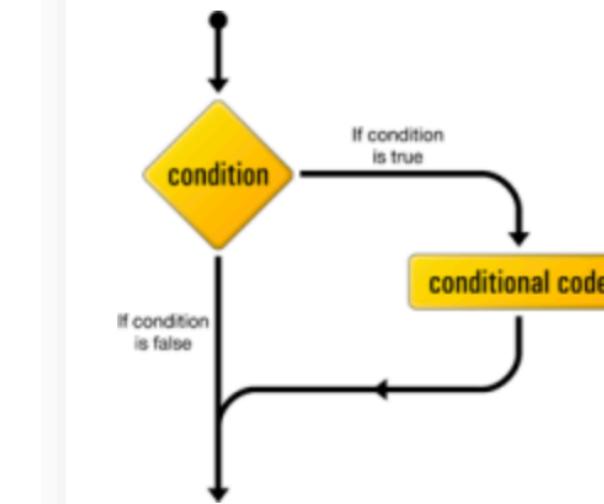
Source files start with a package declaration. This can be used to access (import) features from the source file.

Kotlin Control Flow



if, when, for and while statements

J2K Control Flow



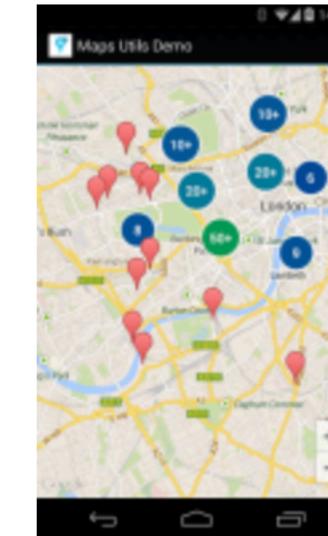
Control flow examples in Java and Kotlin

App Structure



Key classes and relationships in the application.

Map Activity



Google Map Activity can be inserted into an app via a Wizard from Studio. API Keys must be acquired from google directly.

Cameras & Markers



These abstractions enable the map view to be manipulated programmatically, and facilitate direct manipulation by the user.

Lab-05 MapActivity



Include a MapActivity, enabling the user to select the location of the placemark

06: Persistence



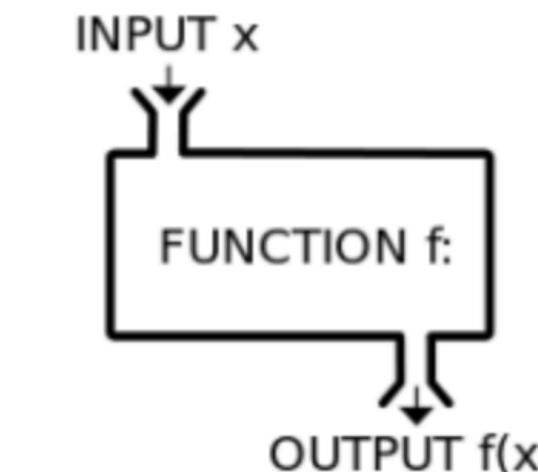
Kotlin Classes in detail. New Placemark Store class to save placemarks to the file system.

Classes & Inheritance

```
class class_name {  
    class variables  
    secondary constructors  
    functions (methods)  
}
```

In kotlin, classes are more concise, explicit and fine-grained than Java

J2K: Functions



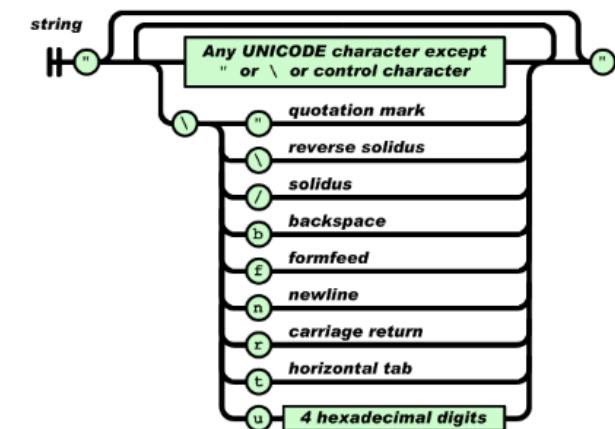
Functions in Java & Kotlin

File Formats

```
<?xml version="1.0"  
encoding="UTF-8"?>  
  
<coffee objname="c1">  
    <name> mocha </name>  
    <shop> costa </shop>  
    <price> 2.0 </price>  
    <rating> 3.5</rating>  
    <favourite> 0 </favourite>  
</coffee>
```

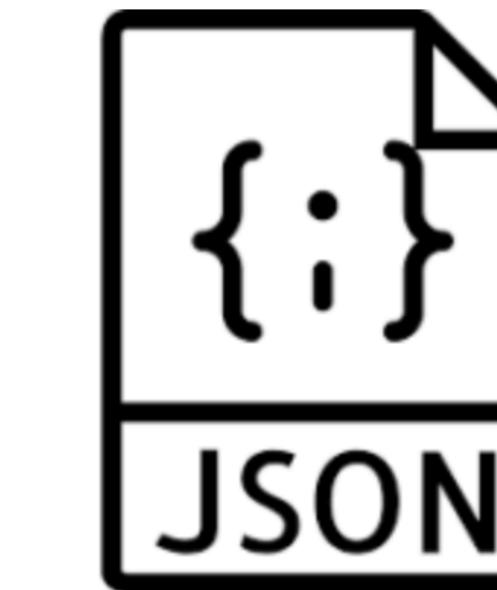
When a simple file persistence strategy, CSV, Name/Value, YAML, XML & JSON are all potential candidate formats for file-based storage.

JSON



A detailed look at the syntax of JSON

JSON Store



A new PlacemarkStore implementation - PlacemarkJSONStore - to persist placemarks to a JSON file.

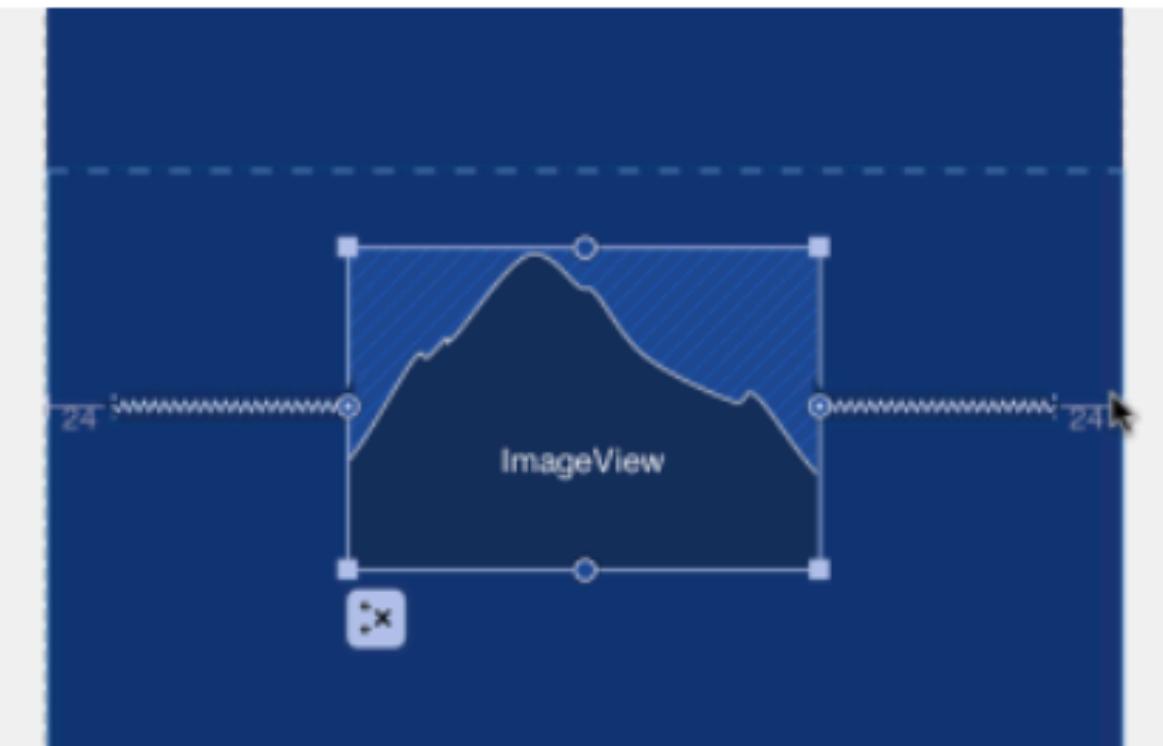
Lab-06 JSON



Save and restore placemarks from a JSON formatted file



07: Layouts



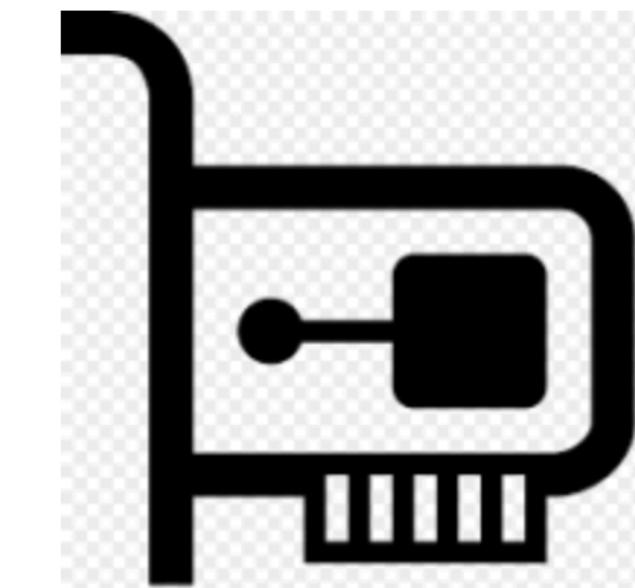
Kotlin properties, fields, & interfaces. Constraint Layout. Introduce activity to display all placemark locations + details.

Properties & Fields



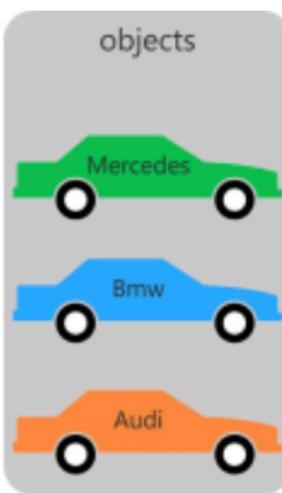
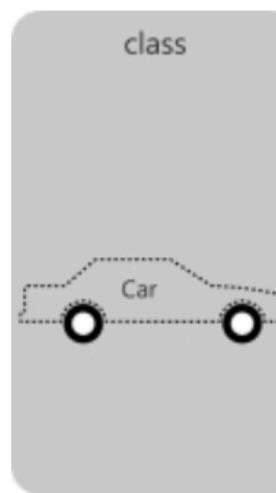
Kotlin properties and fields offer a richer set of features and variants over Java

Interfaces



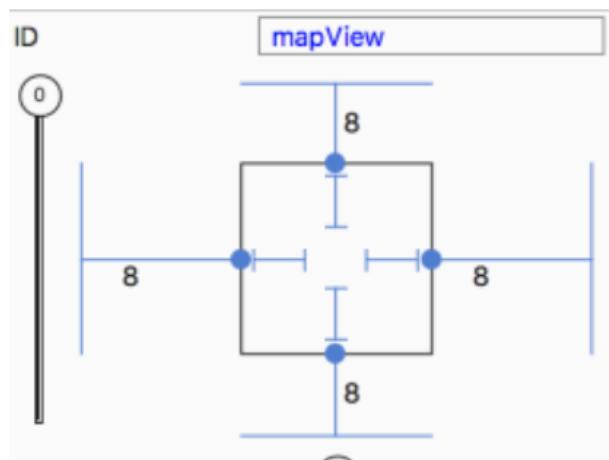
Kotlin interfaces largely follow Java 8 conventions

J2K : Classes



Classes in Java & Kotlin

Constraint Layout



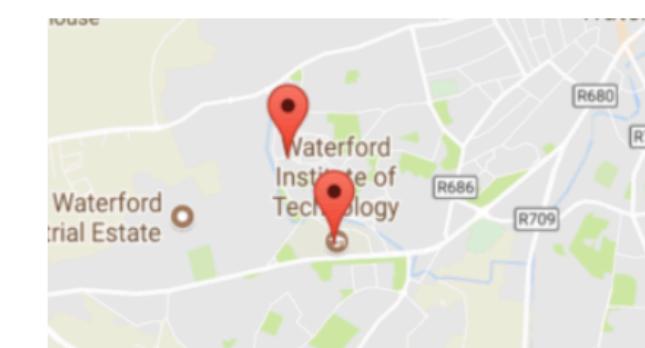
ConstraintLayout allows you to create large and complex layouts with a flat view

Map Widget



The map widget can be placed directly onto an existing layout

Lab-07a MapView



Display all placemarks on a map in a new activity

08: Location



Kotlin visibility & extensions.
Determine the devices current
location & resolve in a map.

09: Rooms



Kotlin Data & Sealed classes,
Generics. Android Architecture
Components. The Room
framework.
PlacemarkStoreRoom
implementation

10: Tracking



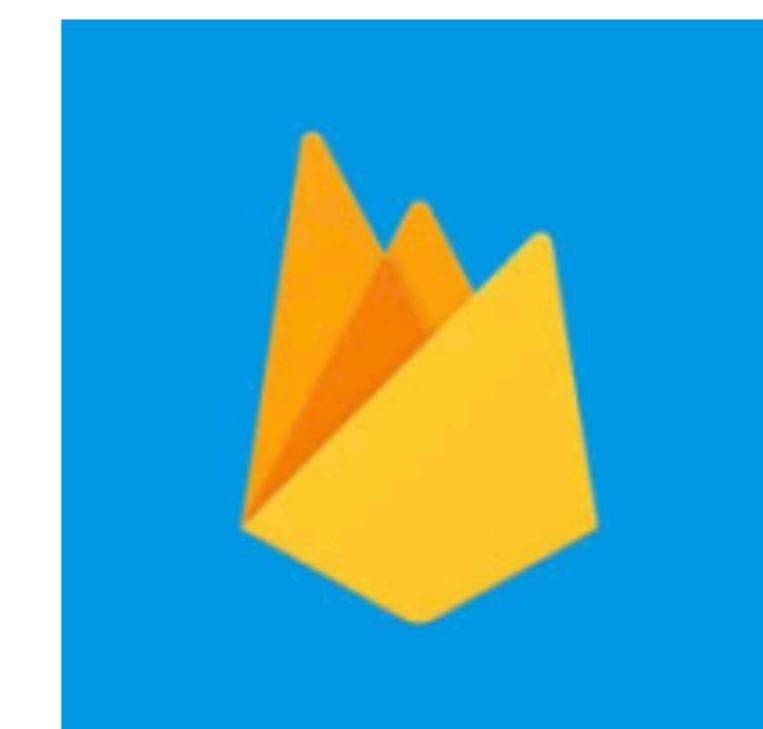
Kotlin Nested Classes, Enums
and Objects. Tracking a users
current location. Supporting
Landscape perspective.

11: Authentication



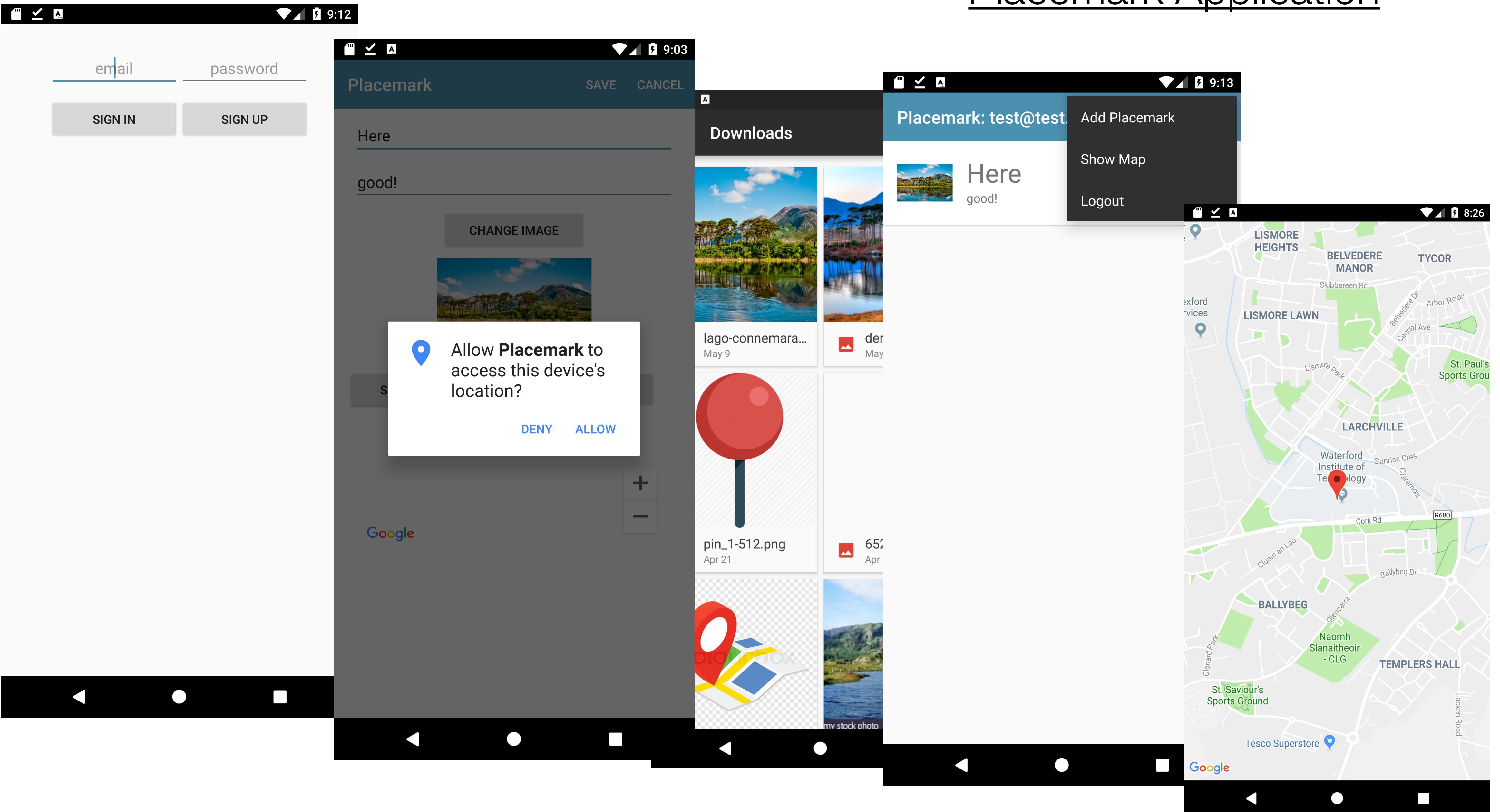
Kotlin Delegation. Support
Authentication via the Firebase
cloud service.

12: Cloud



Kotlin Functions & Lambdas.
Moving the Placemark store to
Firebase.

Placemark Application



	<i>Thursday</i> 25/10/2018	<i>Friday</i> 26/10/2018	<i>Saturday</i> 27/10/2018	<i>Monday</i> 29/10/2018	<i>Tuesday</i> 30/10/2018	<i>Wednesday</i> 31/10/2018
10:00 11:30			Lecture 04: Images Kotlin Types Images & Architecture			
11:45 13:15		Lecture 02: Adapters Basic Syntax Deep Dive AppObject, Recycler + Adapters		Lab 04: Images		
13:30 15:00		Lab 02: Adapters	Lecture 05: Maps Kotlin Packages + Control Flow Google Map Setup & Models			
15:15 16:45		Lecture 03: Models Kotlin Idioms Toolbars, MemoryStore, Adapter + Listener, Parcelable	Lab 05: Maps			
17:00 18:30	Lecture 01: Activities Activities	Lab 03: Models			Lab 06: Persistence	
18:45 20:15	Lab 01: Activities			Lecture 06: Persistence Classes & Objects I JSON, JSONStore,	Lecture 07: Layouts Classes & Objects II Map Widget & Markers	Lecture 08: Assignment Specification Lab 07: Layouts

Schedule

All classes in K140