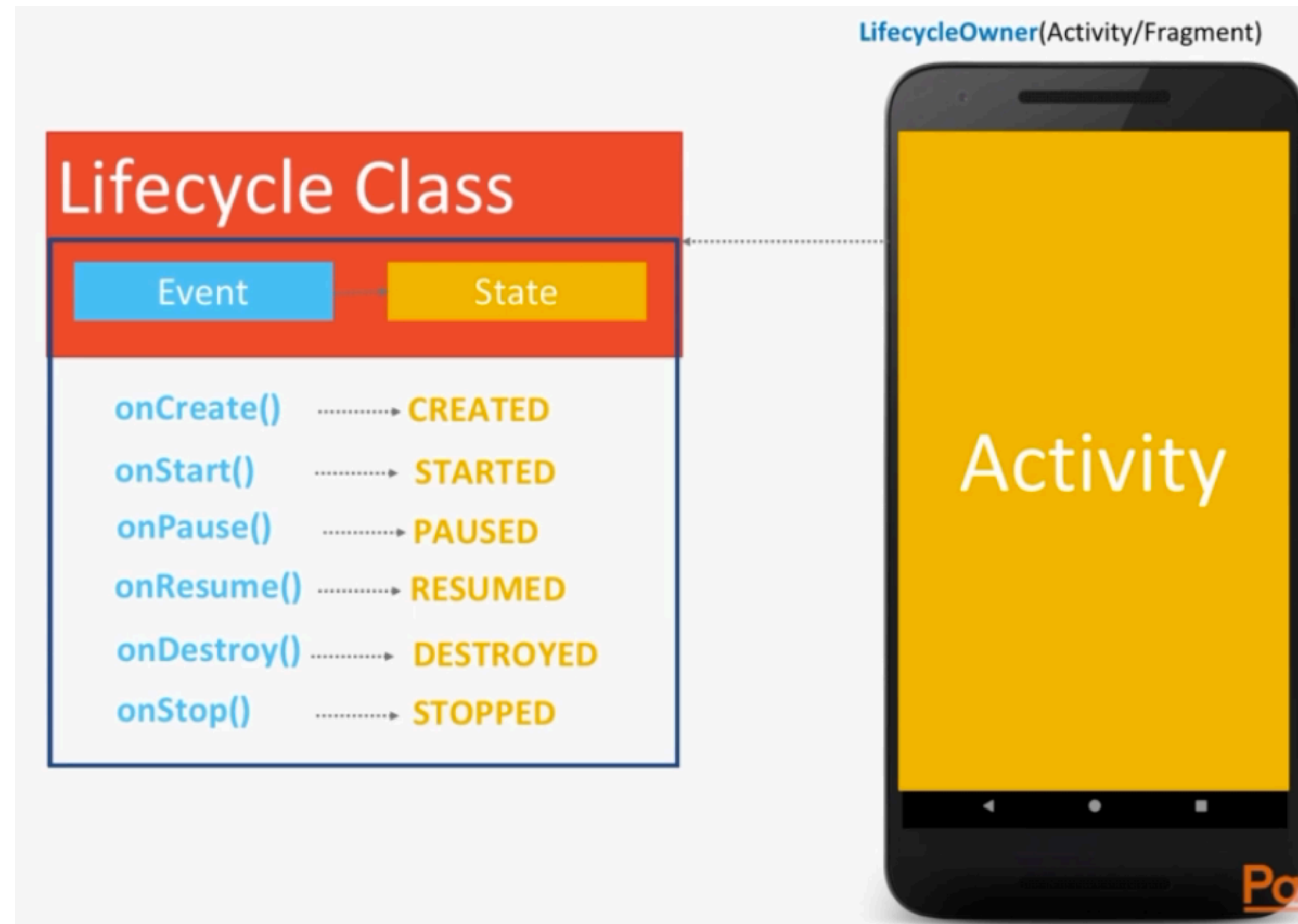
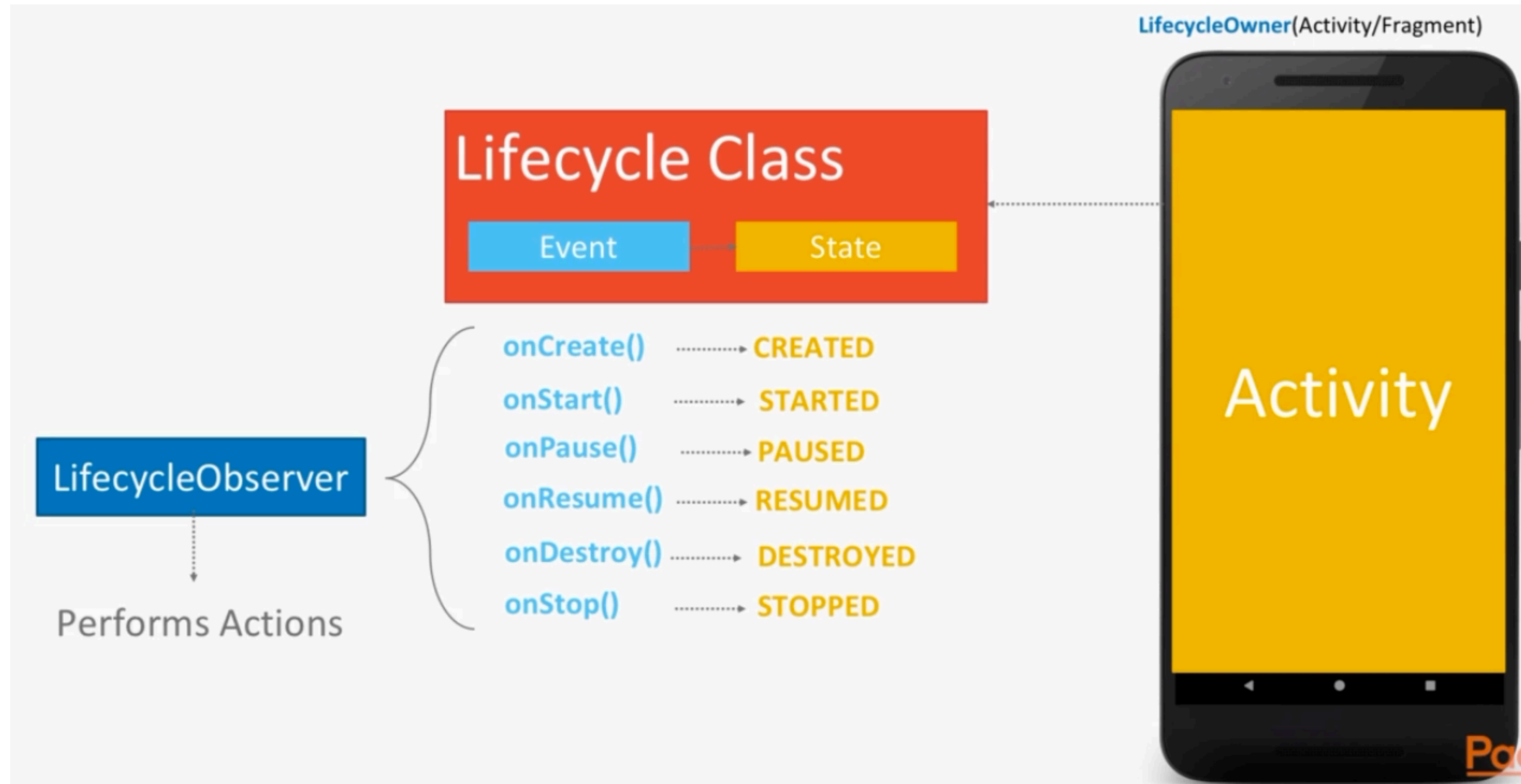


Lifecycle-Aware Components, ViewModel, LiveData

Jetpack Architecture





Documentation

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[GUIDES](#)
[REFERENCE](#)
[SAMPLES](#)
[DESIGN & QUALITY](#)

App Basics

- Introduction
- › Build your first app
- App fundamentals
- › App resources
- › App manifest file
- › App permissions

Devices

- › Device compatibility
- › Wear
- › Android TV
- › Android Auto
- › Android Things
- › Chrome OS devices

Core topics

- › Activities
- ▼ Architecture Components

Handling Lifecycles with Lifecycle-Aware Components



Part of [Android Jetpack](#).



Lifecycle-aware components perform actions in response to a change in the lifecycle status of another component, such as activities and fragments. These components help you produce better-organized, and often lighter-weight code, that is easier to maintain.

A common pattern is to implement the actions of the dependent components in the lifecycle methods of activities and fragments. However, this pattern leads to a poor organization of the code and to the proliferation of errors. By using lifecycle-aware components, you can move the code of dependent components out of the lifecycle methods and into the components themselves.

The `android.arch.lifecycle` package provides classes and interfaces that let you build *lifecycle-aware* components—which are components that can automatically adjust their behavior based on the current lifecycle state of an activity or fragment.



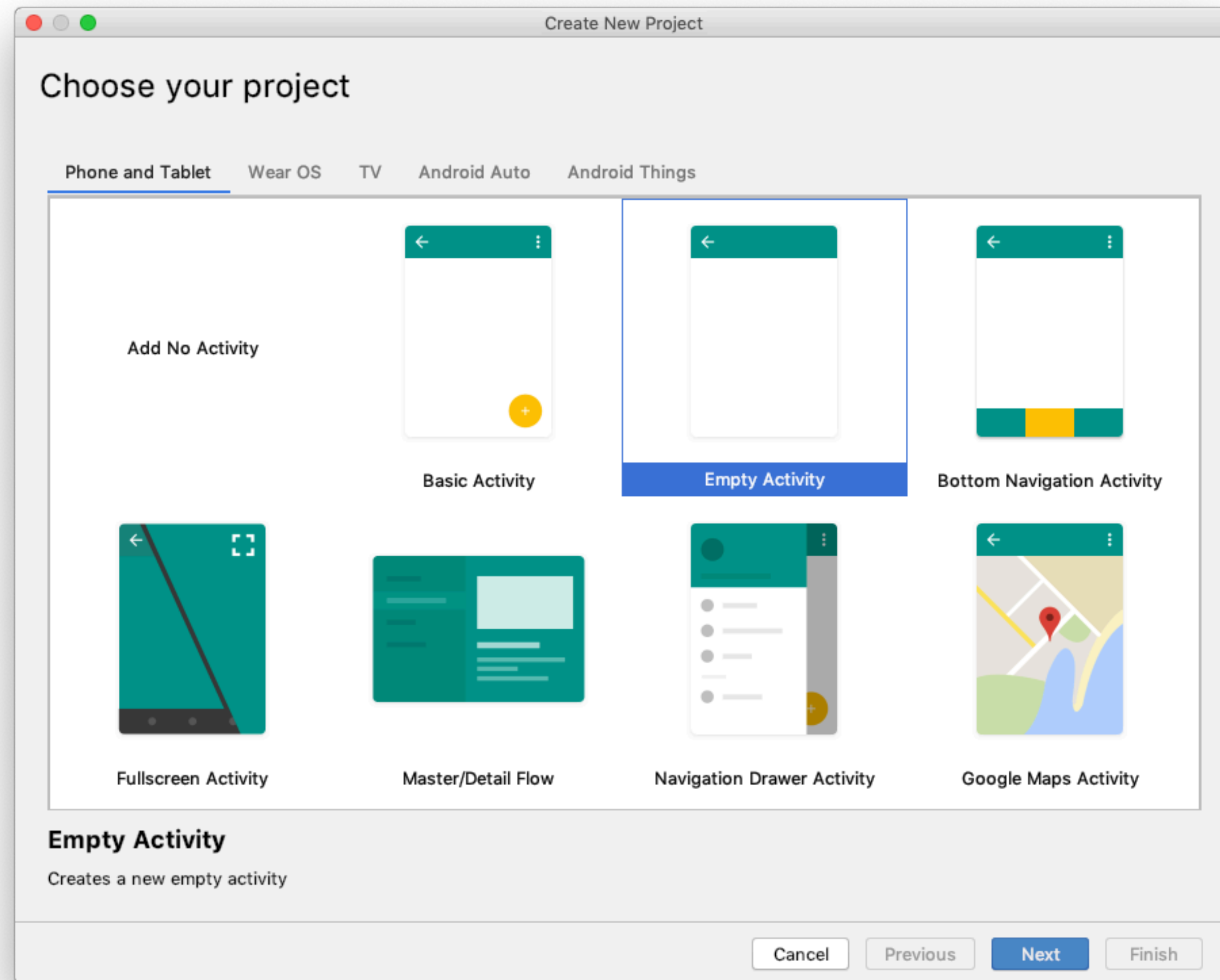
Note: To import `android.arch.lifecycle` into your Android project, see the instructions for declaring dependencies in the [Lifecycle release notes](#).

Contents

- Lifecycle
- LifecycleOwner
 - Implementing a custom LifecycleOwner
- Best practices for lifecycle-aware components
- Use cases for lifecycle-aware components
- Handling on stop events
- Additional resources

<https://developer.android.com/topic/libraries/architecture/lifecycle>

Lifecycle-Aware Components



Create New Project

Configure your project

←

Empty Activity

Creates a new empty activity

Name

LifecycleAware

Package name

at.htl.lifecycleaware

Save location

/Users/stuetz/work/jetpack.packt/projects/LifecycleAware

Language

Kotlin

Minimum API level

API 23: Android 6.0 (Marshmallow)

i

Your app will run on approximately 62.6% of devices.

[Help me choose](#)

☐

This project will support instant apps

☒

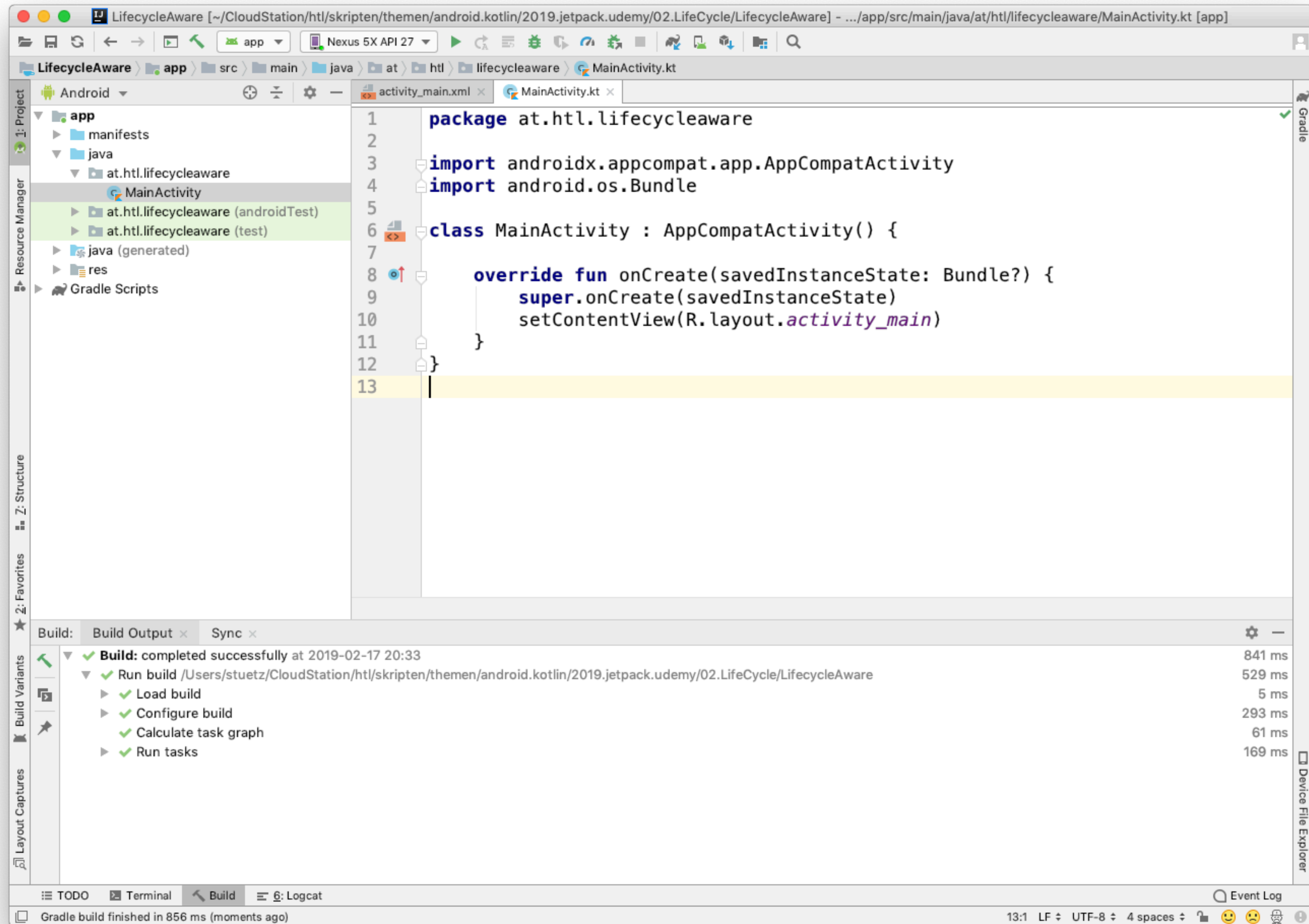
Use AndroidX artifacts

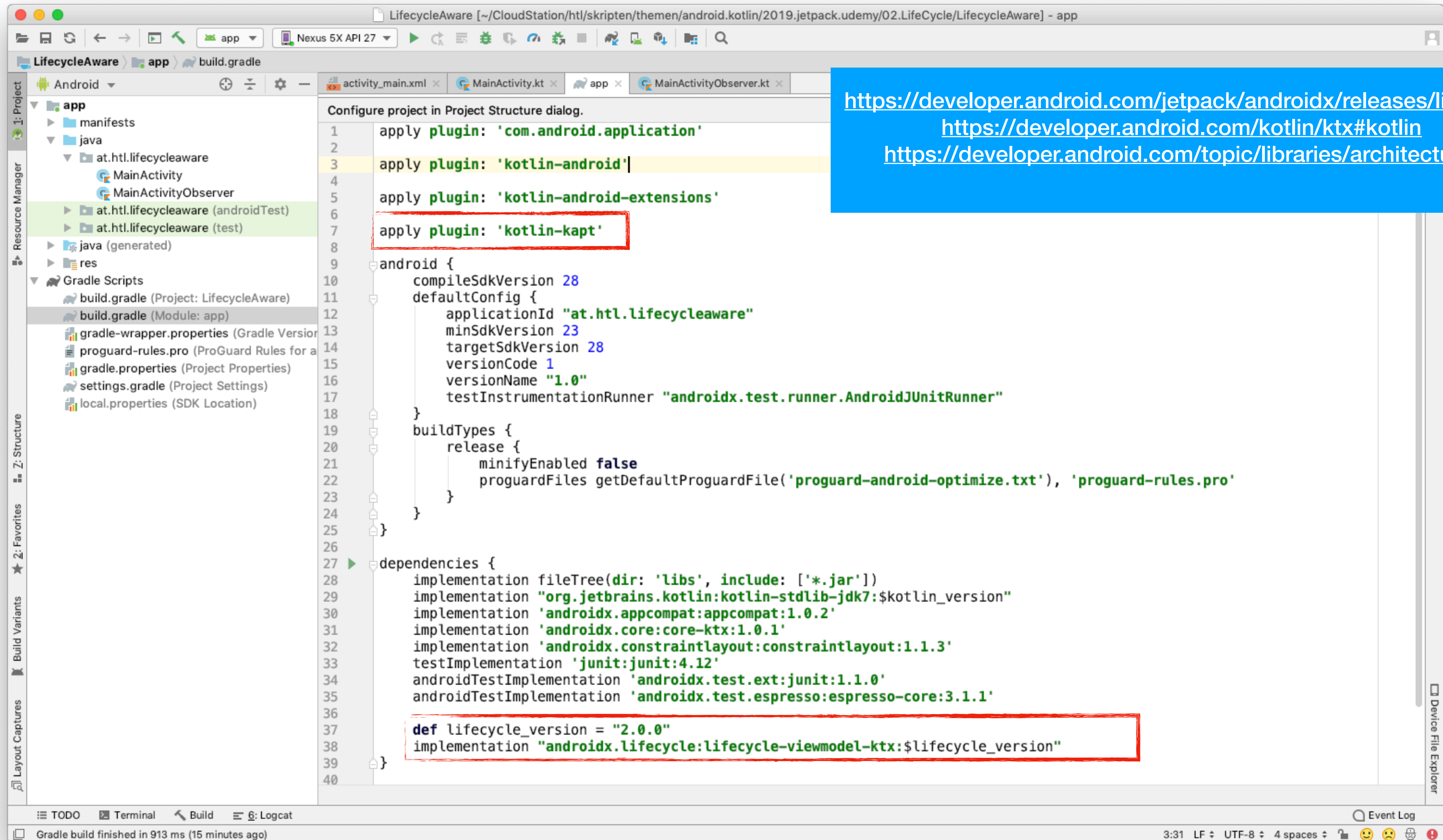
Cancel

Previous

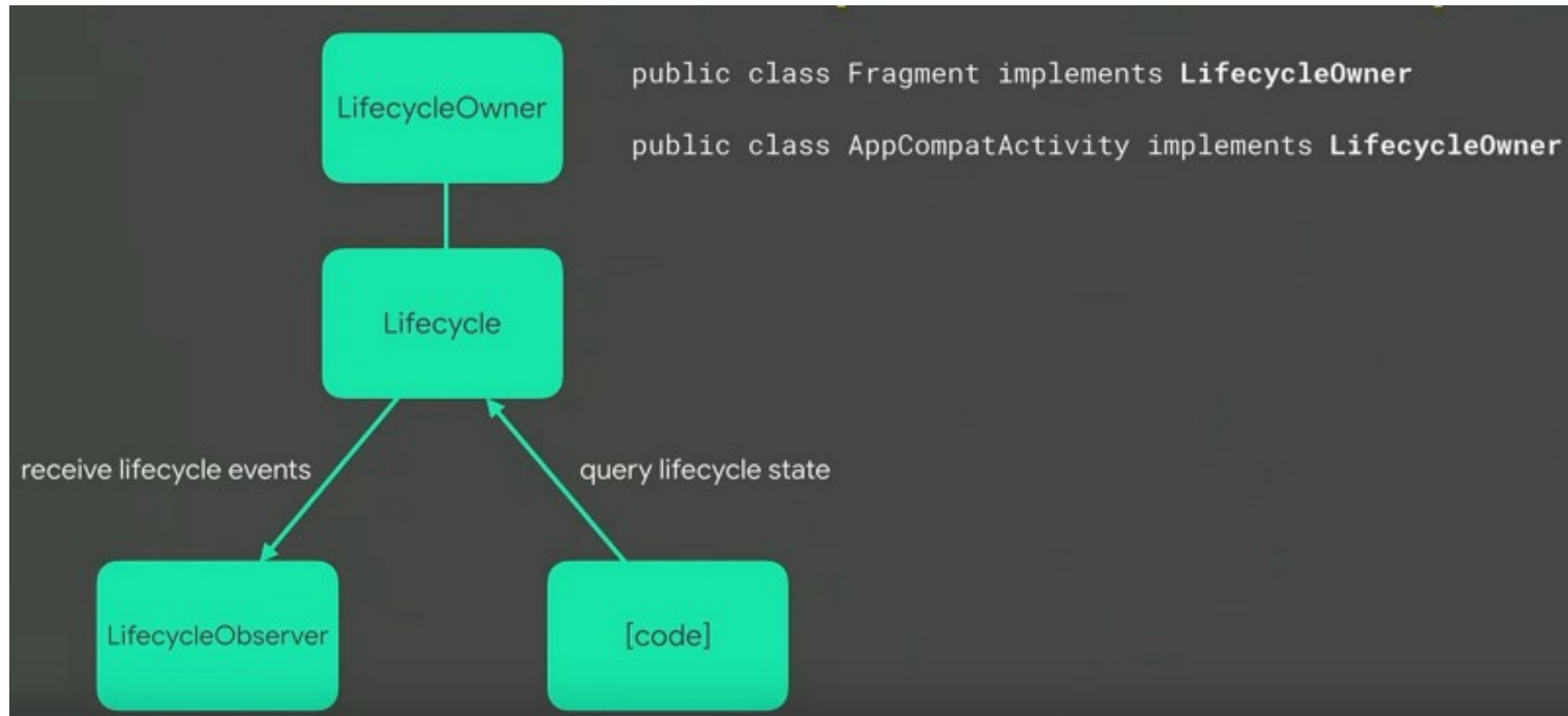
Next

Finish

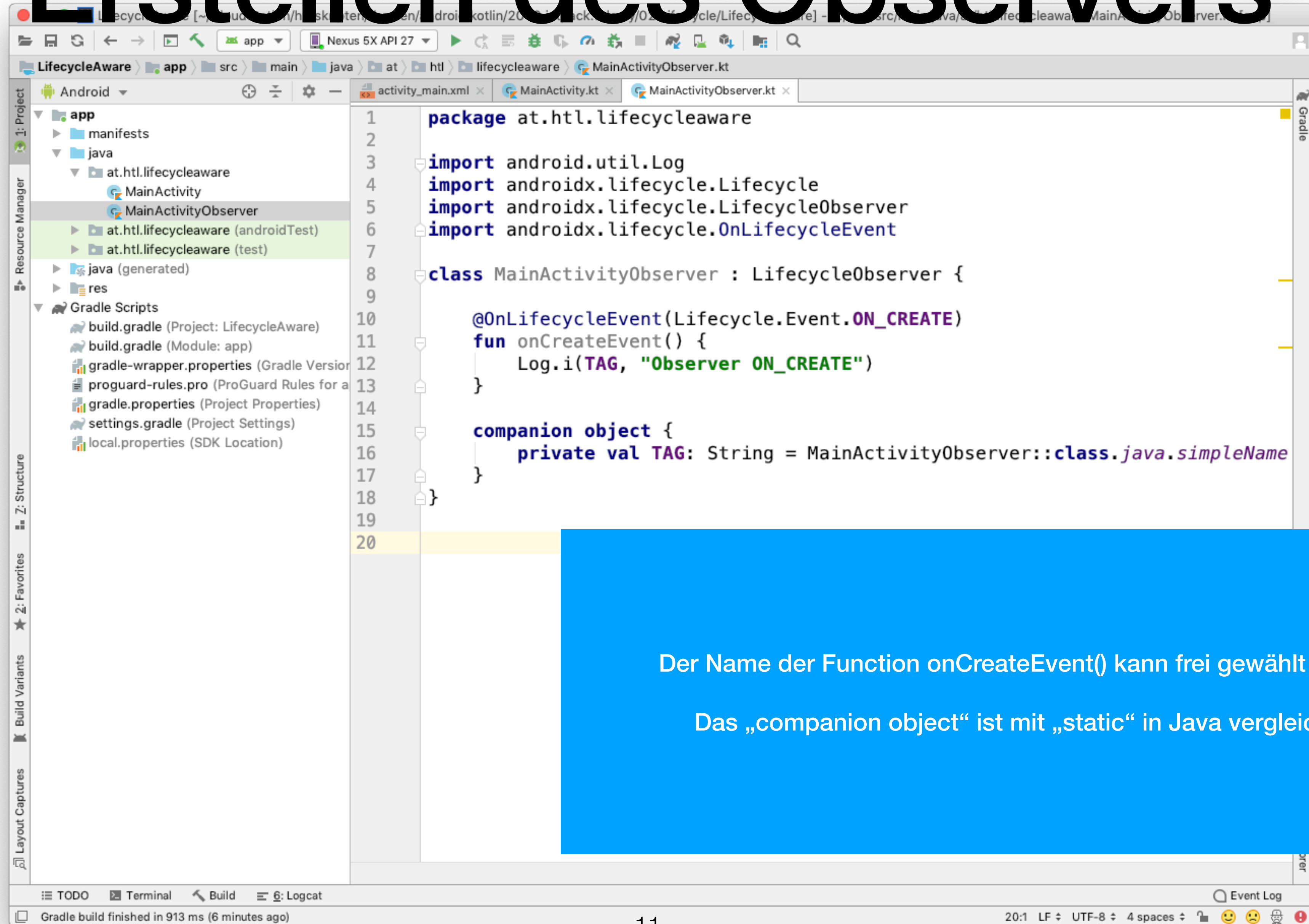




<https://developer.android.com/jetpack/androidx/releases/lifecycle>



Erstellen des Observers



```
1 package at.htl.lifecycleaware
2
3 import android.util.Log
4 import androidx.lifecycle.Lifecycle
5 import androidx.lifecycle.LifecycleObserver
6 import androidx.lifecycle.OnLifecycleEvent
7
8 class MainActivityObserver : LifecycleObserver {
9
10     @OnLifecycleEvent(Lifecycle.Event.ON_CREATE)
11     fun onCreateEvent() {
12         Log.i(TAG, "Observer ON_CREATE")
13     }
14
15     companion object {
16         private val TAG: String = MainActivityObserver::class.java.simpleName
17     }
18 }
19
20
```

Der Name der Function onCreateEvent() kann frei gewählt werden.

Das „companion object“ ist mit „static“ in Java vergleichbar

Gradle build finished in 913 ms (6 minutes ago)

20:1 LF UTF-8 4 spaces

Registrieren des Observers beim Owner

Die Activity ist der Lifecycle-Owner

```
1 package at.htl.lifecycleaware
2
3 import androidx.appcompat.app.AppCompatActivity
4 import android.os.Bundle
5 import android.util.Log
6
7 class MainActivity : AppCompatActivity() {
8
9     override fun onCreate(savedInstanceState: Bundle?) {
10         super.onCreate(savedInstanceState)
11         setContentView(R.layout.activity_main)
12
13         Log.i(TAG, "attached Observer to Owner - onCreate")
14         lifecycle.addObserver(MainActivityObserver())
15     }
16
17     companion object {
18         private val TAG: String = MainActivity::class.java.simpleName
19     }
20 }
21
```

Gradle build finished in 913 ms (14 minutes ago)

21:1 LF UTF-8 4 spaces

Android Studio interface showing the development of the LifecycleAware app. The main editor displays the MainActivity.kt file, which implements AppCompatActivity and overrides onCreate to log the observer attachment.

```
1  import androidx.appcompat.app.AppCompatActivity
2
3  import ...
4
5
6
7  class MainActivity : AppCompatActivity() {
8
9      override fun onCreate(savedInstanceState: Bundle?) {
10         super.onCreate(savedInstanceState)
11         setContentView(R.layout.activity_main)
12
13         Log.i(TAG, "attached Observer to Owner - onCreate")
14         lifecycle.addObserver(MainActivityObserver())
15     }
16
17     companion object {
18         private val TAG: String = MainActivity::class.java.simpleName
19     }
20 }
```

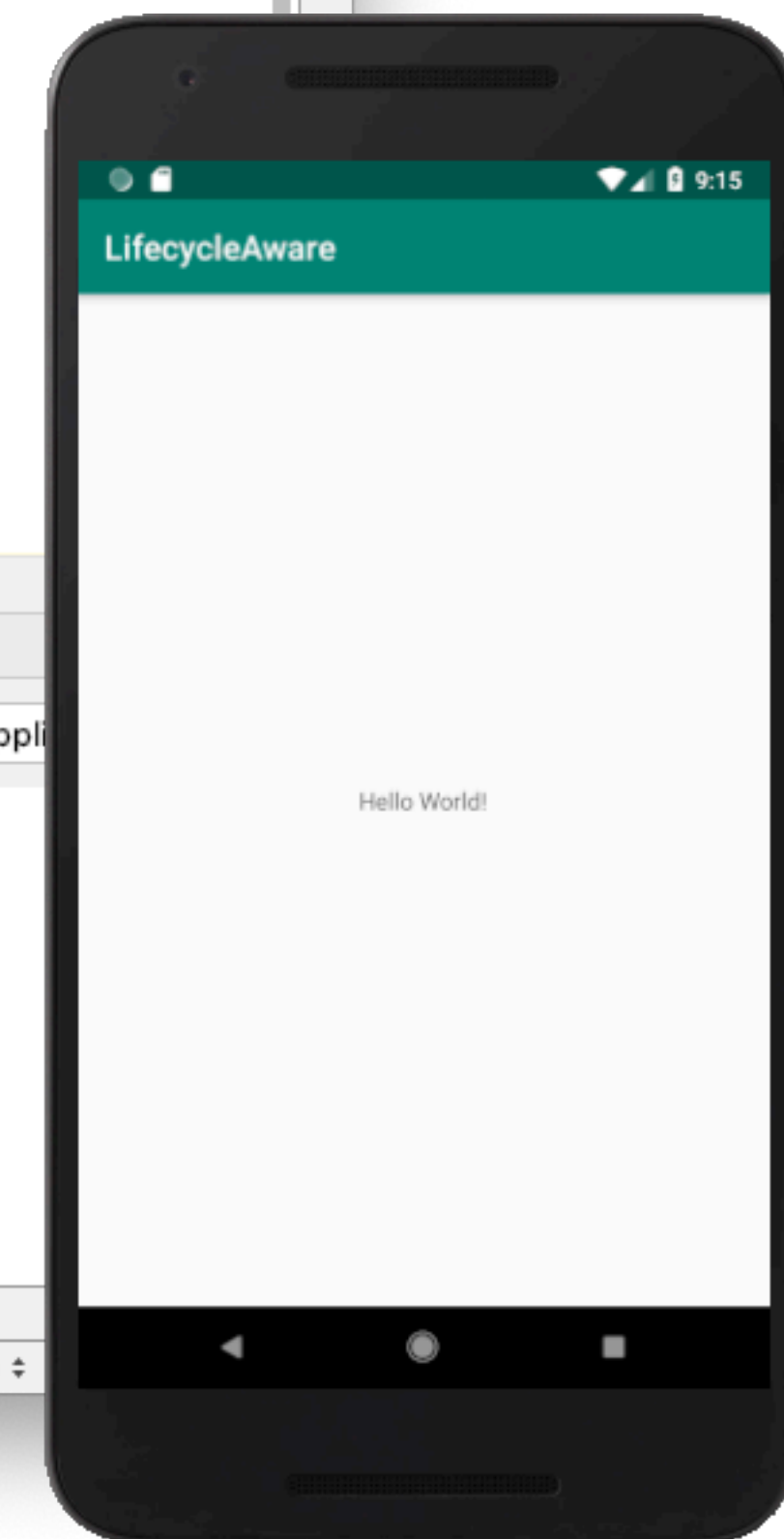
The Logcat window at the bottom shows the output of the app. A red box highlights the log messages related to the observer attachment:

```
2019-02-17 21:14:17.612 3968-3968/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)
2019-02-17 21:14:17.612 3968-3968/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)
2019-02-17 21:14:17.614 3968-3968/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)
2019-02-17 21:14:17.615 3968-3968/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)
2019-02-17 21:14:17.616 3968-3968/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)
2019-02-17 21:14:17.618 3968-3968/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)
2019-02-17 21:14:17.688 3968-3968/at.htl.lifecycleaware I/MainActivity: attached Observer to Owner - onCreate
2019-02-17 21:14:17.707 3968-3968/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_CREATE
```

Annotations on the image:

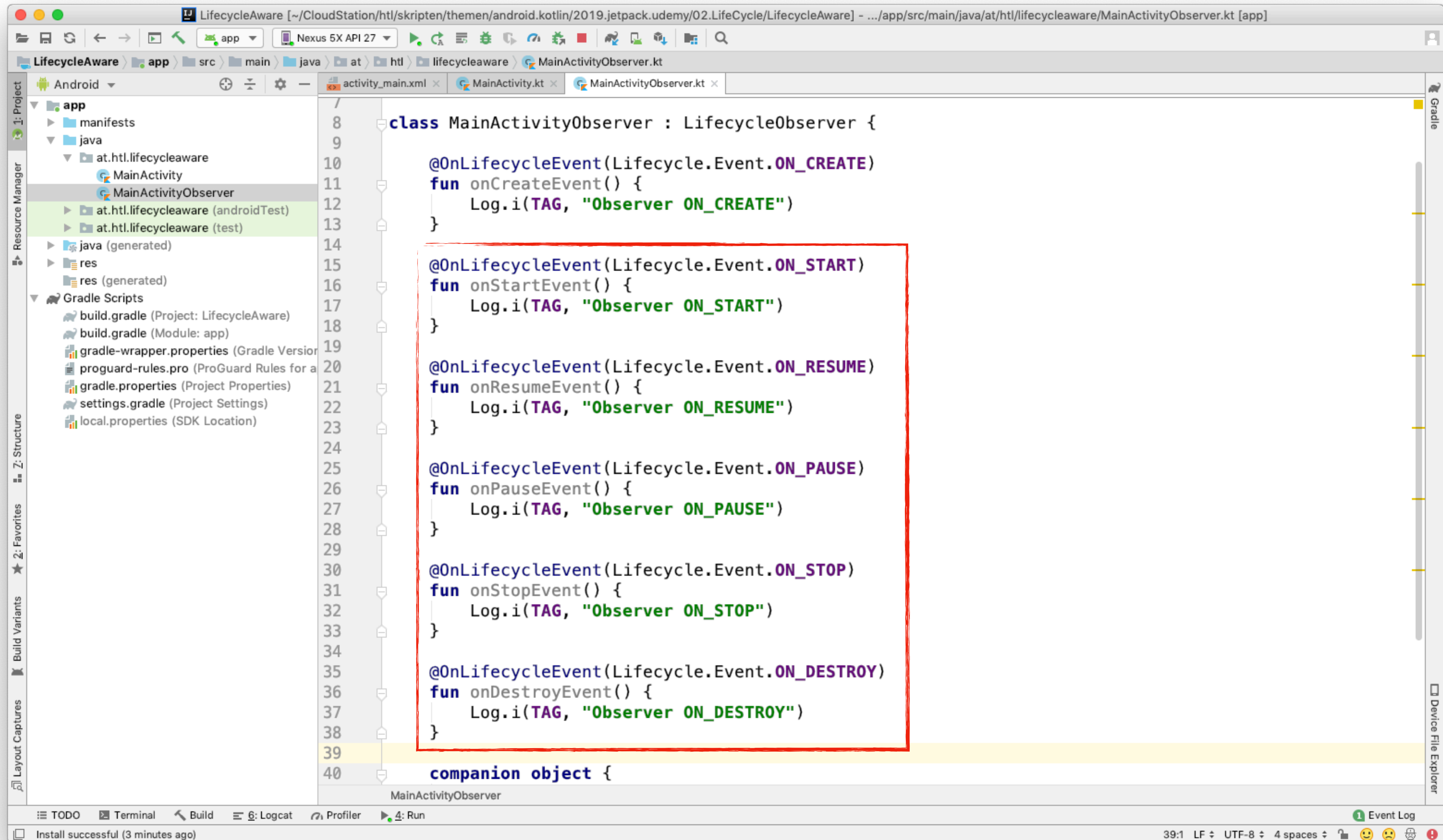
- Filtern Sie die Ausgaben mit „Main“ (Filter the outputs with „Main“)
- Hier sieht man das Ergebnis (Here you see the result)

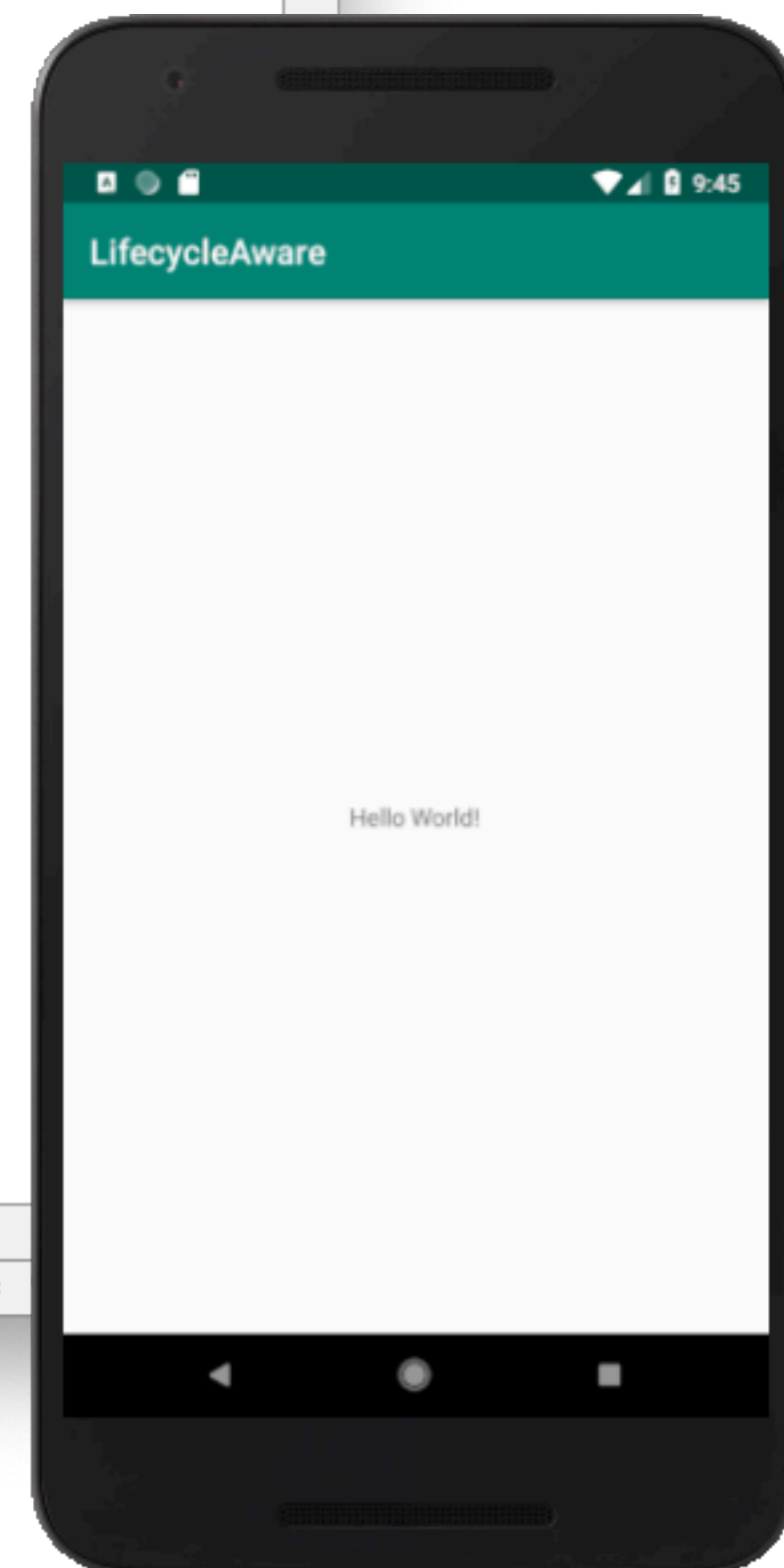
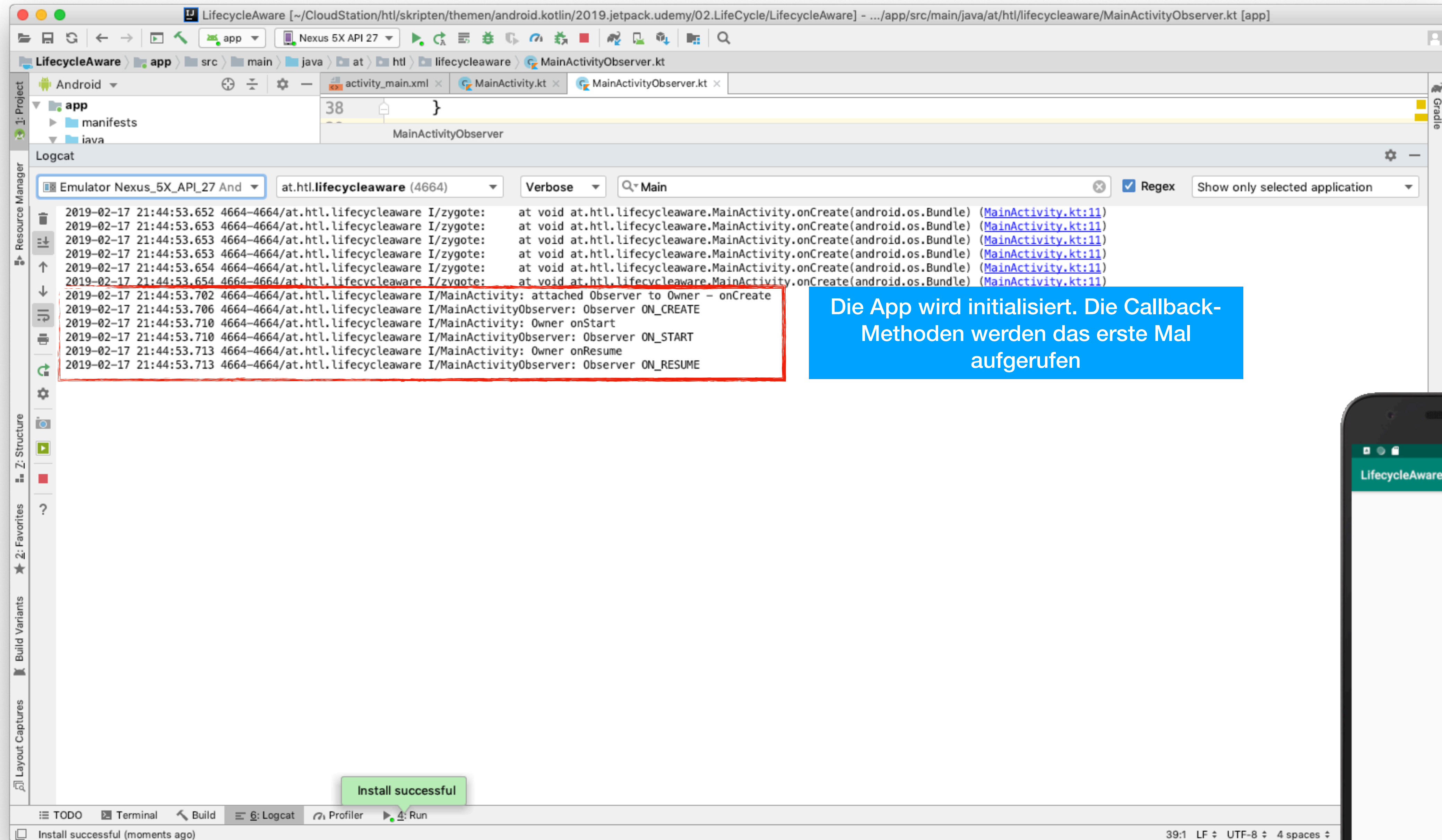
The app is running on an emulator (Nexus 5X API 27) and the output shows the observer being attached successfully.



The screenshot shows the Android Studio IDE with the following components:

- Project View (Left):** Shows the project structure for 'LifecycleAware' with modules 'app', 'at.htl.lifecycleaware (androidTest)', and 'at.htl.lifecycleaware (test)'. The 'app' module is selected, showing 'MainActivity' and 'MainActivityObserver'.
- Main Editor:** Displays the Kotlin code for 'MainActivity.kt'. The code includes package declarations, imports, and lifecycle methods: `onCreate`, `onStart`, `onPause`, `onResume`, `onDestroy`, and `onStop`. A red box highlights the `onStart` method.
- Override Members Dialog (Right):** A dialog box titled 'Override Members' is open. It has a search bar with 'onStart' entered. The list of methods includes `onStart(): Unit`, which is highlighted. Other methods like `setSupportProgressBarIndeterminate`, `getDelegate`, `onContentChanged`, `onWindowStartingSupportActionMode`, `startSupportActionMode`, `onTitleChanged`, `onSaveInstanceState`, and `openOptionsMenu` are also listed.
- Annotations:**
 - A green box with the text: 'Override Methods via ^O (Ctrl+O for Win/Linux)'
 - A blue box with the text: 'Mit Strg-O kann man das „Override Members“-Fenster öffnen. Nun gibt man zB „onStart“ ein. Anschließend navigiert man mit der Pfeiltaste ↓ bis man die korrekte Methode findet.'





LifecycleAware [~/CloudStation/htl/skripten/themen/android.kotlin/2019.jetpack.udemy/02.LifeCycle/LifecycleAware] - .../app/src/main/java/at/htl/lifecycleaware/MainActivityObserver.kt [app]

LifecycleAware > app > src > main > java > at > htl > lifecycleaware > MainActivityObserver.kt

activity_main.xml x MainActivity.kt x MainActivityObserver.kt x

38 }

MainActivityObserver

Logcat

Emulator Nexus_5X_API_27 And at.htl.lifecycleaware (4664) Verbose Q Main Regex Show only selected application

2019-02-17 21:44:53.652 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.653 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.653 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.653 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.654 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.654 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.702 4664-4664/at.htl.lifecycleaware I/MainActivity: attached Observer to Owner - onCreate

2019-02-17 21:44:53.706 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_CREATE

2019-02-17 21:44:53.710 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStart

2019-02-17 21:44:53.710 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_START

2019-02-17 21:44:53.713 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onResume

2019-02-17 21:44:53.713 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_RESUME

2019-02-17 21:45:32.178 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_PAUSE

2019-02-17 21:45:32.178 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onPause

2019-02-17 21:45:32.178 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_STOP

2019-02-17 21:45:32.181 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStop

2019-02-17 21:45:32.182 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_DESTROY

2019-02-17 21:45:32.182 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onDestroy

2019-02-17 21:45:32.231 4664-4664/at.htl.lifecycleaware I/MainActivity: attached Observer to Owner - onCreate

2019-02-17 21:45:32.231 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_CREATE

2019-02-17 21:45:32.232 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStart

2019-02-17 21:45:32.232 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_START

2019-02-17 21:45:32.236 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onResume

2019-02-17 21:45:32.236 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_RESUME

Install successful

Install successful (a minute ago)

Beim Drehen des Smartphones wird die Activity zerstört und neu erstellt

LifecycleAware

Hello World!

LifecycleAware [~/CloudStation/htl/skripten/themen/android.kotlin/2019.jetpack.udemy/02.LifeCycle/LifecycleAware] - .../app/src/main/java/at/htl/lifecycleaware/MainActivityObserver.kt [app]

app

Logcat

Emulator Nexus_5X_API_27 And at.htl.lifecycleaware (4664) Verbose Main

2019-02-17 21:44:53.652 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.653 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.653 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.653 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.654 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.654 4664-4664/at.htl.lifecycleaware I/zygote: at void at.htl.lifecycleaware.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:11)

2019-02-17 21:44:53.702 4664-4664/at.htl.lifecycleaware I/MainActivity: attached Observer to Owner - onCreate

2019-02-17 21:44:53.706 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_CREATE

2019-02-17 21:44:53.710 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStart

2019-02-17 21:44:53.710 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_START

2019-02-17 21:44:53.713 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onResume

2019-02-17 21:44:53.713 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_RESUME

2019-02-17 21:45:32.178 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_PAUSE

2019-02-17 21:45:32.178 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onPause

2019-02-17 21:45:32.178 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_STOP

2019-02-17 21:45:32.181 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStop

2019-02-17 21:45:32.182 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_DESTROY

2019-02-17 21:45:32.182 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onDestroy

2019-02-17 21:45:32.231 4664-4664/at.htl.lifecycleaware I/MainActivity: attached Observer to Owner - onCreate

2019-02-17 21:45:32.231 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_CREATE

2019-02-17 21:45:32.232 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStart

2019-02-17 21:45:32.232 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_START

2019-02-17 21:45:32.236 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onResume

2019-02-17 21:45:32.236 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_RESUME

2019-02-17 21:46:06.020 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_PAUSE

2019-02-17 21:46:06.020 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onPause

2019-02-17 21:46:06.020 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_STOP

2019-02-17 21:46:06.029 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStop

2019-02-17 21:46:06.029 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_DESTROY

2019-02-17 21:46:06.030 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onDestroy

2019-02-17 21:46:06.073 4664-4664/at.htl.lifecycleaware I/MainActivity: attached Observer to Owner - onCreate

2019-02-17 21:46:06.074 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_CREATE

2019-02-17 21:46:06.076 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onStart

2019-02-17 21:46:06.076 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_START

2019-02-17 21:46:06.079 4664-4664/at.htl.lifecycleaware I/MainActivity: Owner onResume

2019-02-17 21:46:06.079 4664-4664/at.htl.lifecycleaware I/MainActivityObserver: Observer ON_RESUME

Install successful

Install successful (a minute ago)

39:1 LF UTF-8 4 spaces

Funktioniert auch beim zweiten Mal

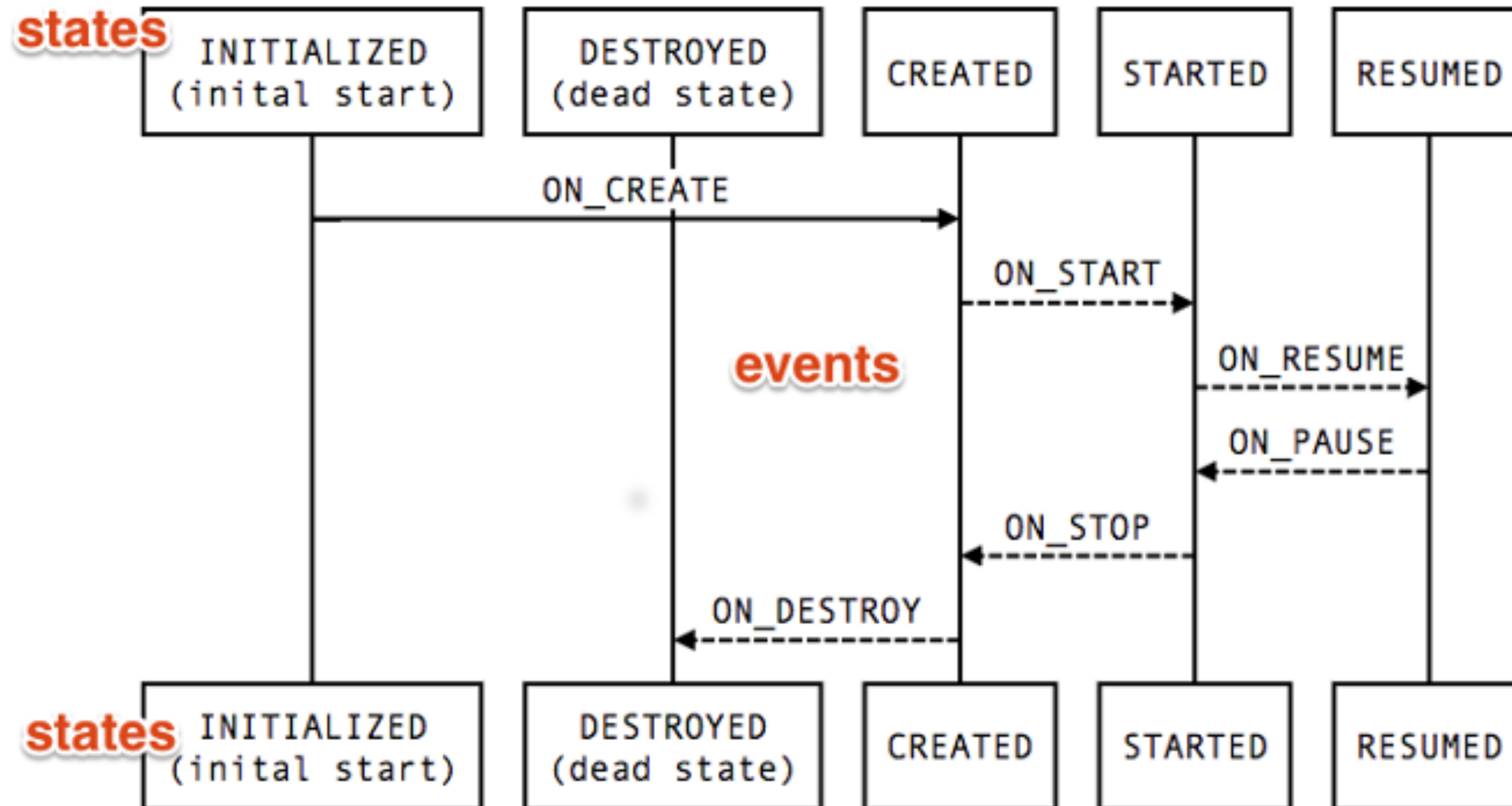
LifecycleAware

Hello World!

Zusammenfassung

- Lifecycle-Aware Components reagieren auf Änderungen des Zustands anderer UI-Komponenten
- Eintragen der Dependency und des kapt-Compilers
- Erstellen des Observer mit seinen @OnLifecycleEvent-Methoden
- Registrieren des Observer beim Owner (der Activity oder dem Fragment)
- Überschreiben der On-Methoden beim Owner

States and Events



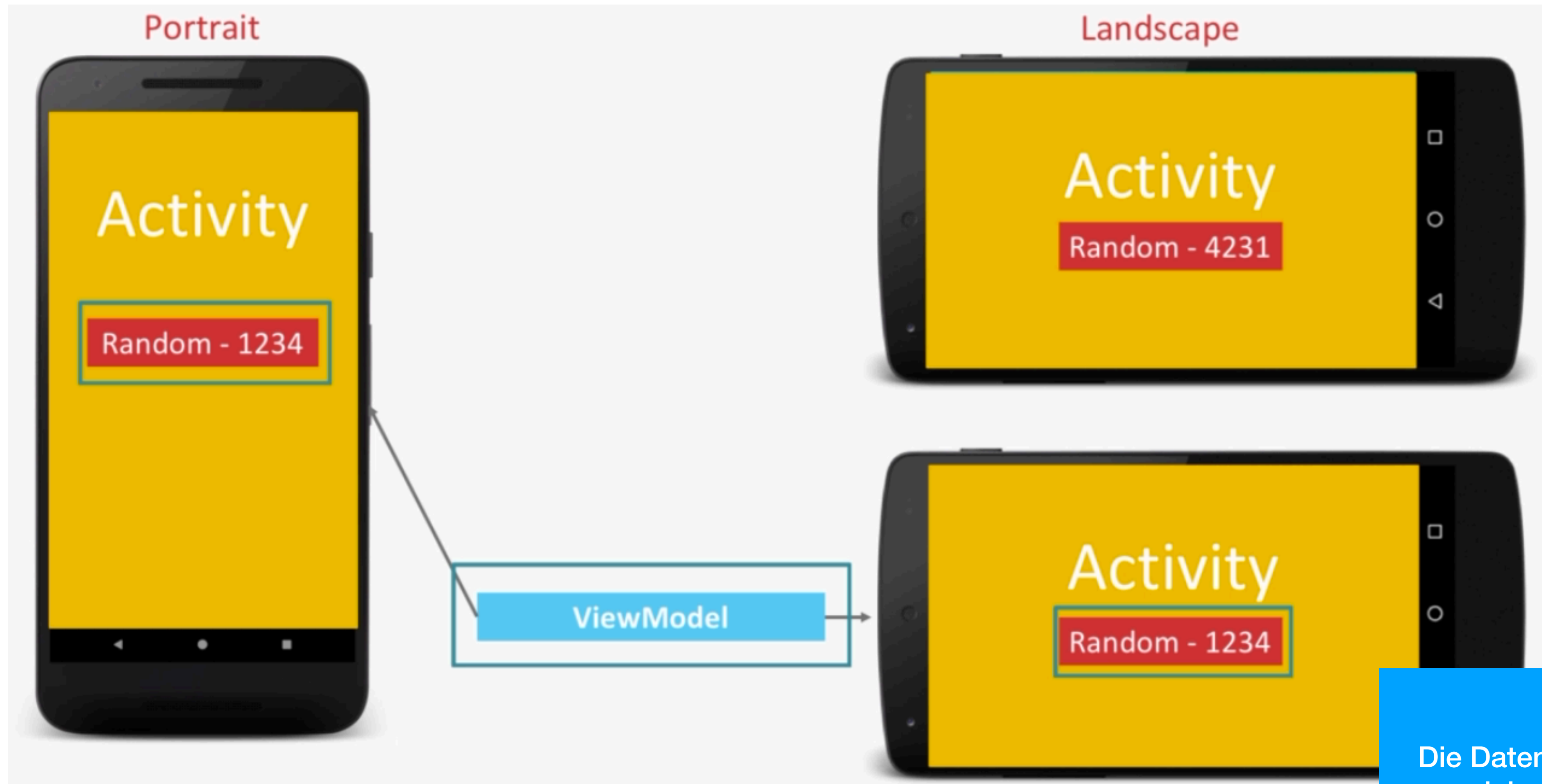
<https://developer.android.com/topic/libraries/architecture/lifecycle>

ViewModel

Problem

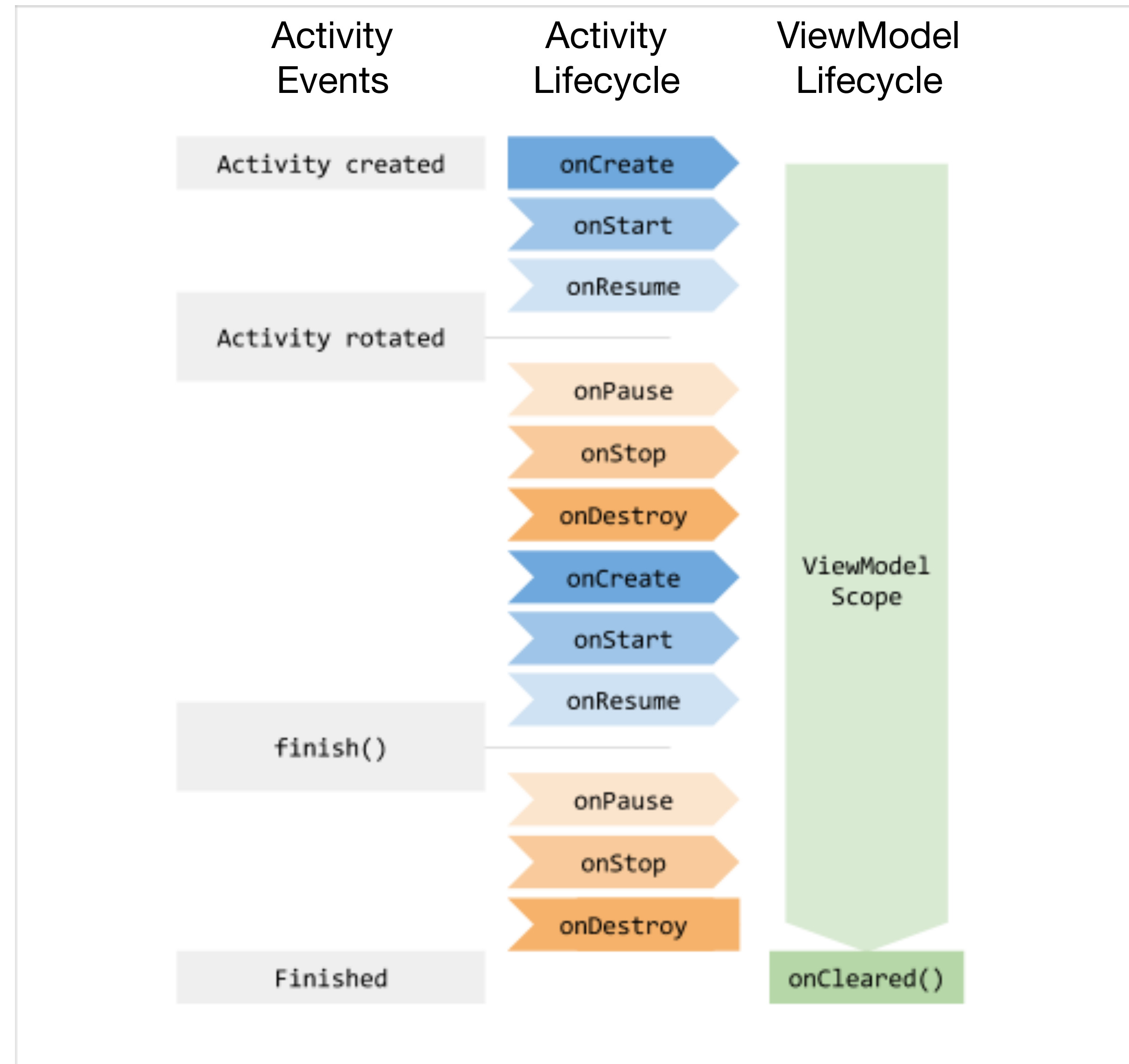


Lösung - ViewModel

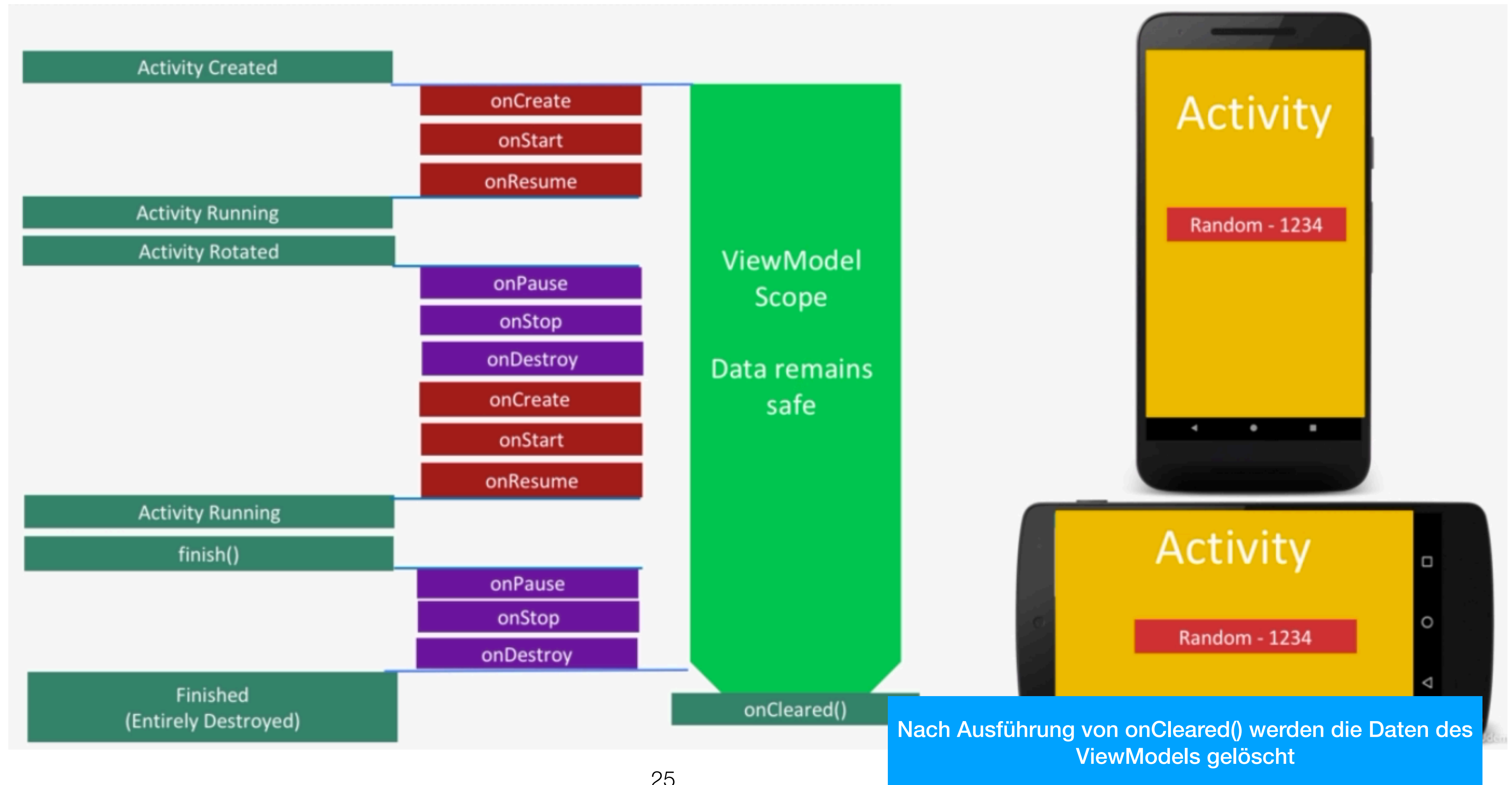


Die Daten werden im ViewModel gespeichert. Wird die neue Activity erstellt, so können diese gespeicherten Daten wiederverwendet werden.

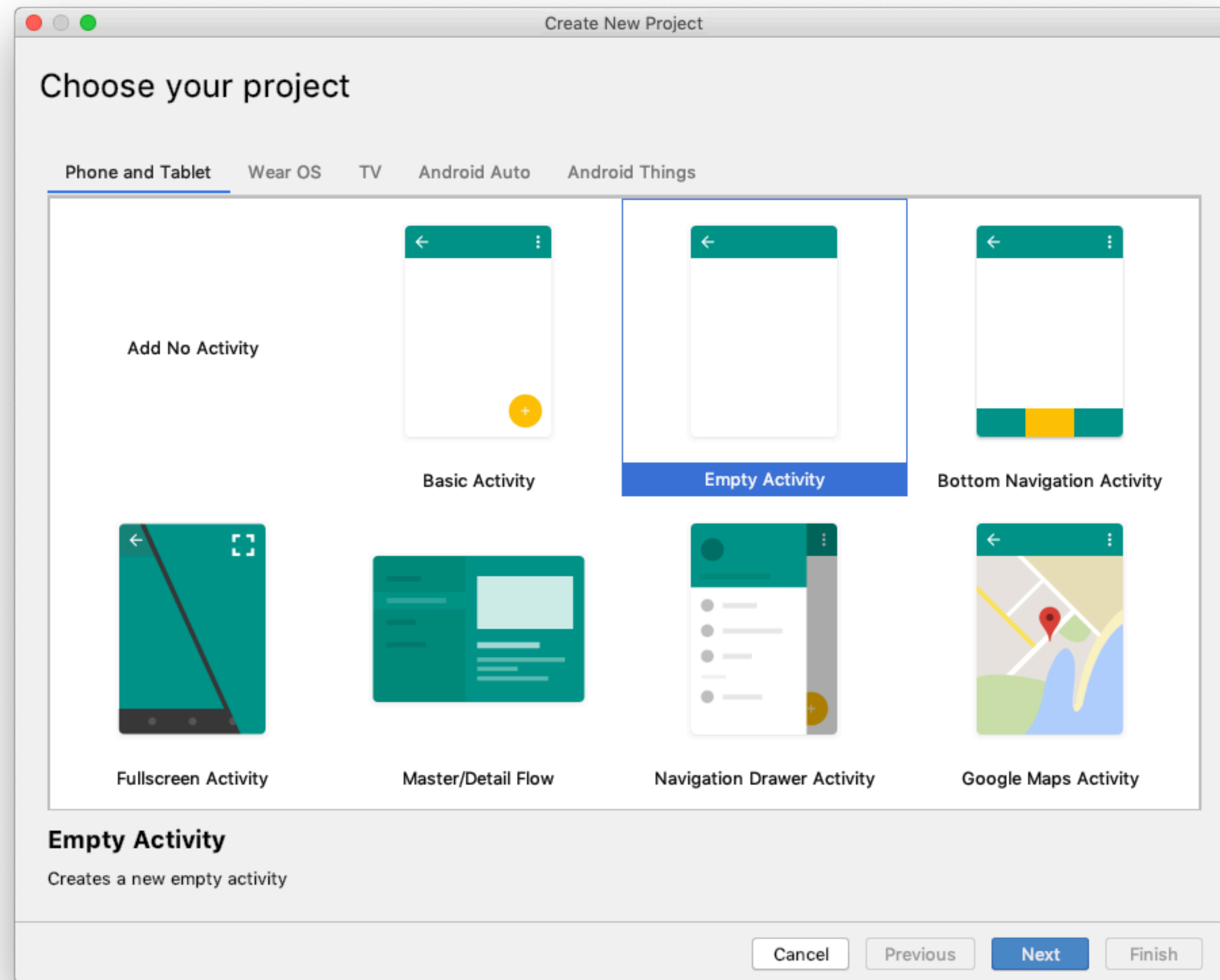
Lebenszyklus



Beispiel



Variante 1: Ohne ViewModel



Create New Project

Configure your project

←

Empty Activity

Creates a new empty activity

Name

ViewModelLiveData

Package name

at.htl.viewmodellivedata

Save location

ndroid.kotlin/2019.jetpack.udemy/02.LifeCycle/ViewModelLiveData

Language

Kotlin

Minimum API level

API 23: Android 6.0 (Marshmallow)

Your app will run on approximately **62.6%** of devices.
[Help me choose](#)

☐

This project will support instant apps

☒

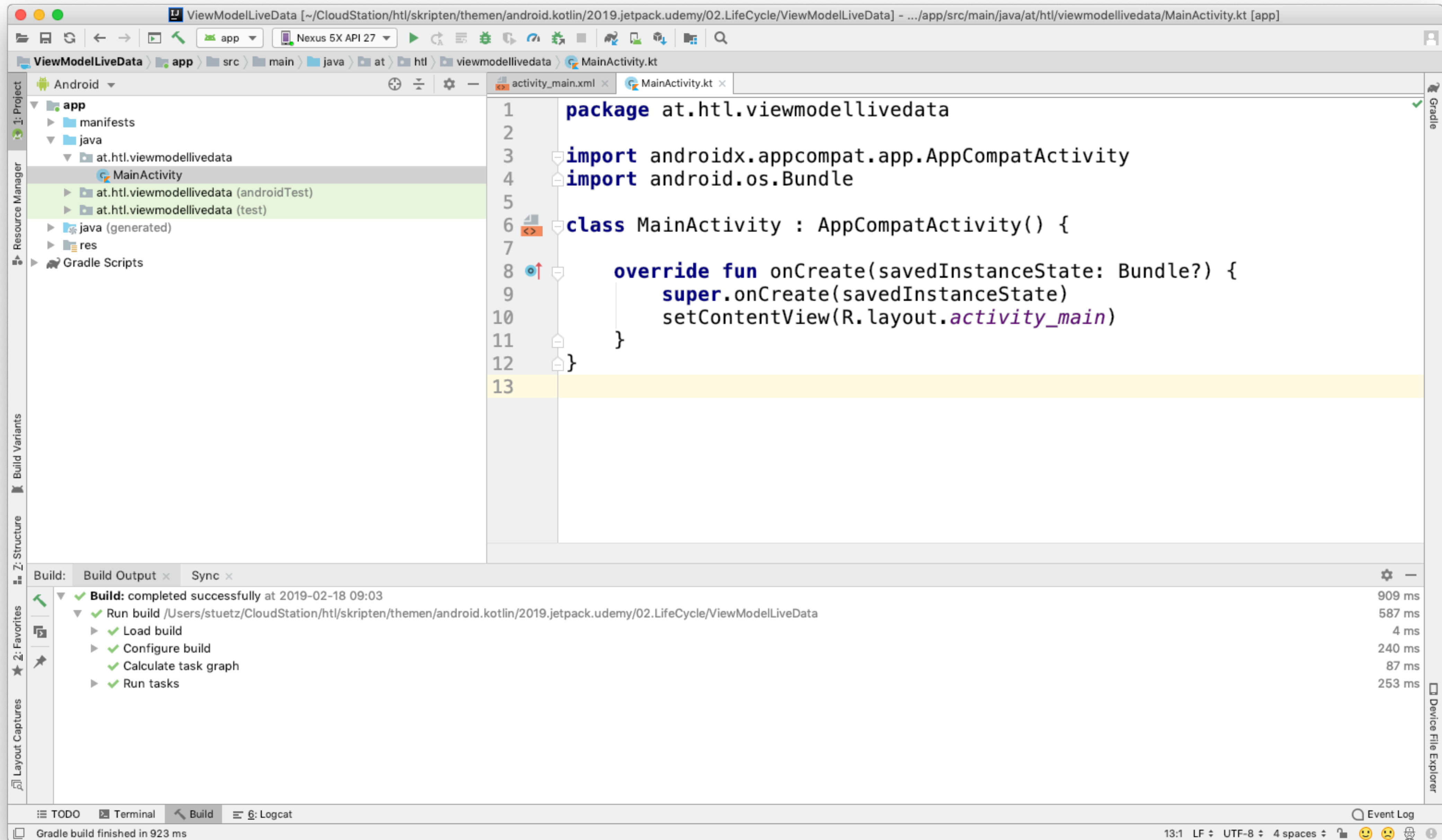
Use AndroidX artifacts

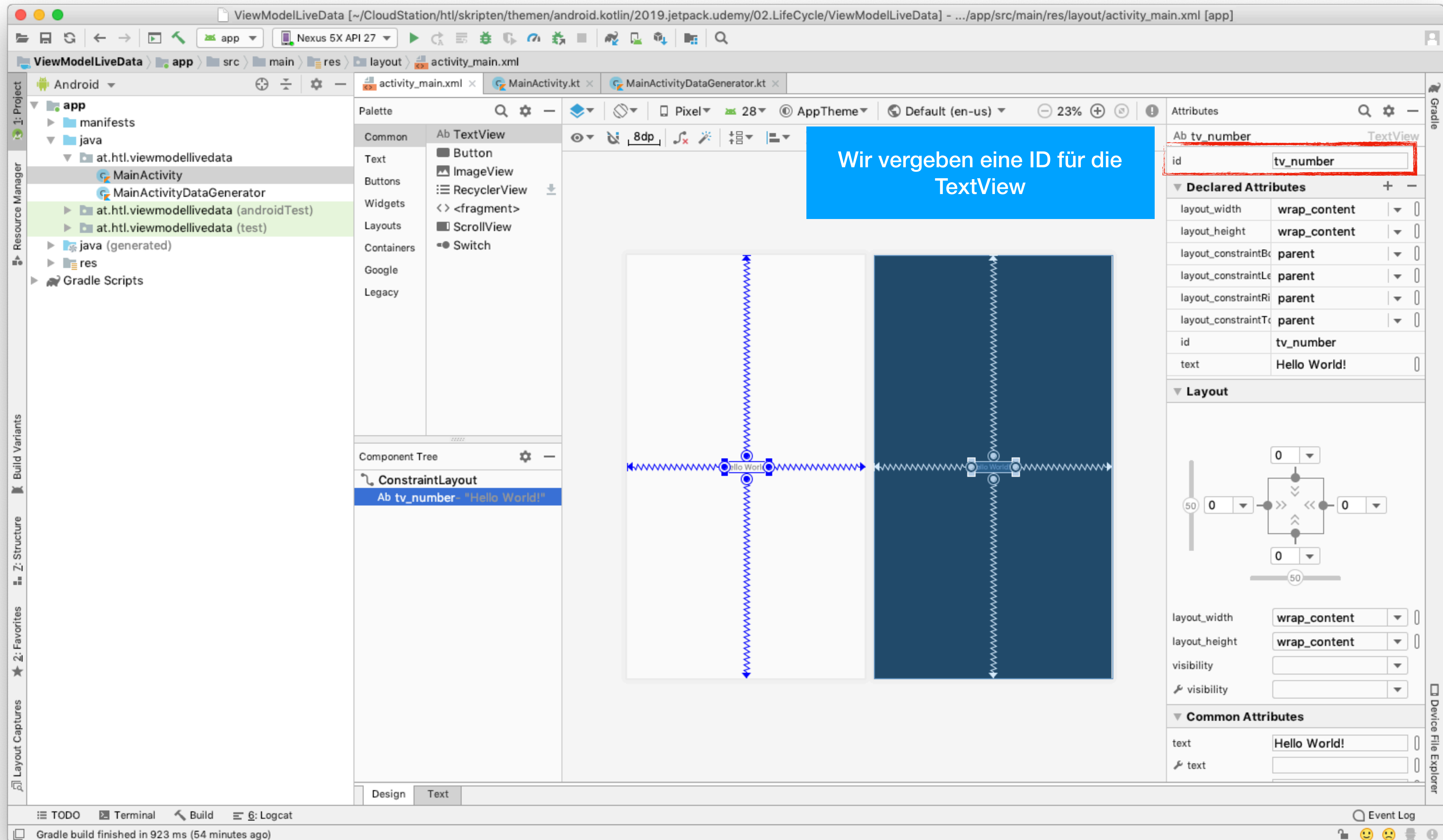
Cancel

Previous

Next

Finish





MainActivityDataGenerator.kt

The screenshot shows an IDE with the following components:

- Project View:** Shows the project structure with folders like `manifests`, `java`, and `at.htl.viewmodellivedata`. The `MainActivityDataGenerator` class is highlighted.
- Main Editor:** Displays the `MainActivityDataGenerator.kt` file. The code includes package declarations, imports, a class definition, a property, a getter function, a companion object, and a private function.
- Dialog:** A "New Kotlin File/Class" dialog is open, showing the name `MainActivityDataGenerator` and the kind `Class`.
- Callout Box:** A red arrow points from the `myRandomNumber` property in the code to a callout box explaining the `::` operator.

```
1 package at.htl.viewmodellivedata
2
3 import android.util.Log
4 import kotlin.random.Random
5
6 class MainActivityDataGenerator {
7
8     private lateinit var myRandomNumber: String
9
10    fun getNumber(): String {
11        Log.i(TAG, "Get number")
12
13        if (!::myRandomNumber.isInitialized) {
14            this.createNumber()
15        }
16        return myRandomNumber
17    }
18
19    // kotlin.random.Random
20    private fun createNumber() {
21        Log.i(TAG, "Create new number")
22        myRandomNumber = "Number: " + (Random.nextInt(10 - 1) + 1)
23    }
24
25    companion object {
26        private val TAG = MainActivityDataGenerator::class.java.simpleName
27    }
28
29    // java.util.Random
30    private fun createNumber() {
31        Log.i(TAG, "Create new number")
32        val random = java.util.Random()
33        myRandomNumber = "Number: " + (random.nextInt(10 - 1) + 1)
34    }
35 }
```

Callout Box:

`::myRandomNumber` entspricht `this::myRandomNumber`. Der `::`-Operator dient zum Zugriff auf Klassenattribute (property reference)

<https://kotlinlang.org/docs/reference/reflection.html#property-references>

Der `::`-Operator konvertiert auch eine Methode in einen Lambda-Ausdruck ()

<https://stackoverflow.com/a/52463295>

<https://kotlinlang.org/docs/reference/reflection.html#function-references>

`%`

:: - Operator

Function References

When we have a named function declared like this:

```
fun isOdd(x: Int) = x % 2 != 0
```

We can easily call it directly (`isOdd(5)`), but we can also use it as a function type value, e.g. pass it to another function. To do this, we use the `::` operator:

```
val numbers = listOf(1, 2, 3)
println(numbers.filter(::isOdd))
```

Target platform: JVM Running on kotlin v. 1.3.21

Here `::isOdd` is a value of function type `(Int) -> Boolean`.

<https://kotlinlang.org/docs/reference/reflection.html#function-references>

Property References

To access properties as first-class objects in Kotlin, we can also use the `::` operator:

```
val x = 1

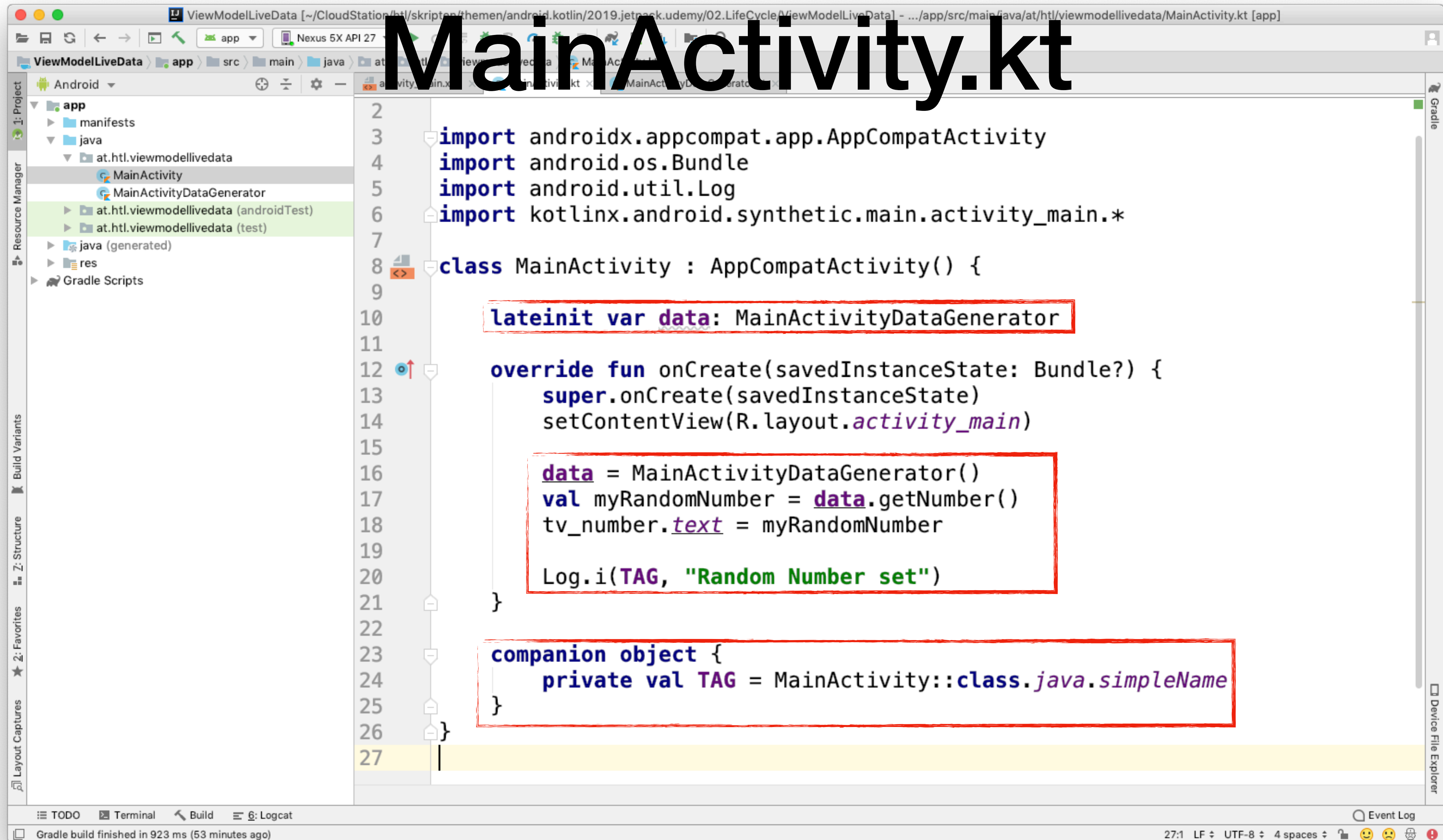
fun main() {
    println(::x.get())
    println(::x.name)
}
```

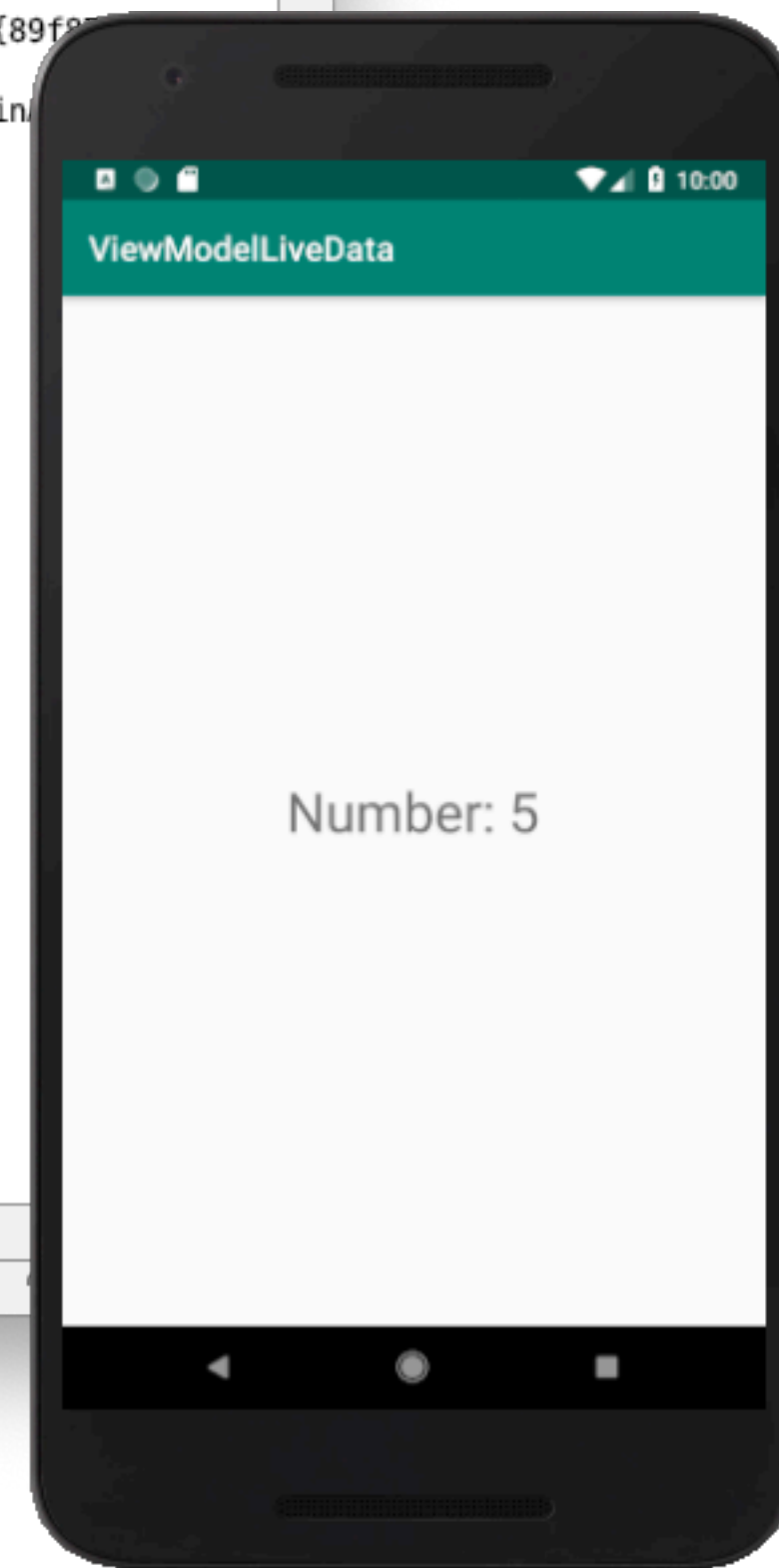
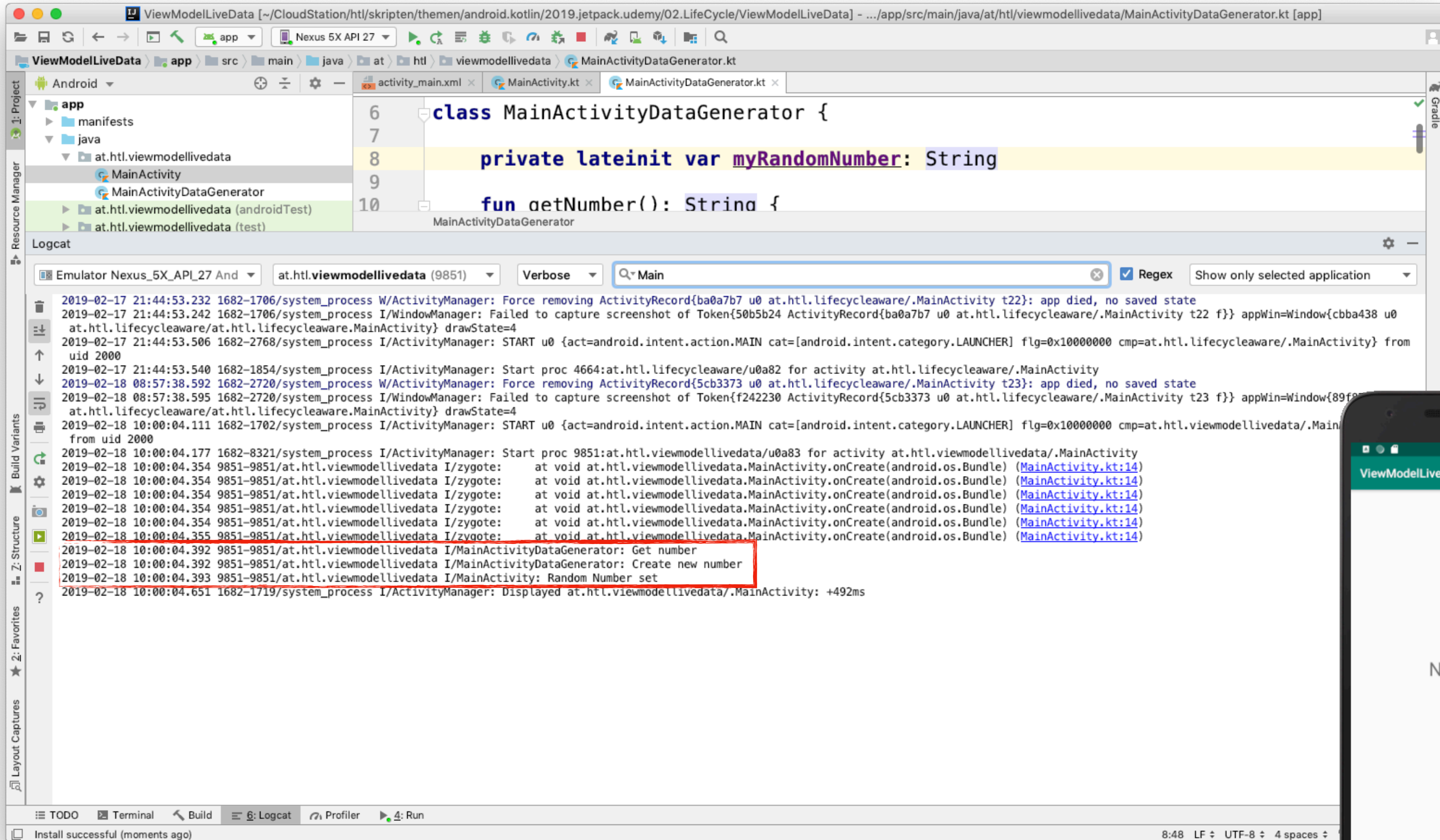
Target platform: JVM Running on kotlin v. 1.3.21

The expression `::x` evaluates to a property object of type `KProperty<Int>`, which allows us to read its value using `get()` or retrieve the property name using the `name` property. For more information, please refer to the [docs on the KProperty class](#).

<https://kotlinlang.org/docs/reference/reflection.html#property-references>

MainActivity.kt





ViewModelLiveData [~/CloudStation/htl/skripten/themen/android.kotlin/2019.jetpack.udemy/02.LifeCycle/ViewModelLiveData] - .../app/src/main/java/at/htl/viewmodellivedata/MainActivityDataGenerator.kt [app]

Project: app

- manifests
- java
 - at.htl.viewmodellivedata
 - MainActivity
 - MainActivityDataGenerator
 - at.htl.viewmodellivedata (androidTest)
 - at.htl.viewmodellivedata (test)

```
6 class MainActivityDataGenerator {
7
8     private lateinit var myRandomNumber: String
9
10    fun getNumber(): String {
        MainActivityDataGenerator
    }
}
```

Logcat

Emulator Nexus_5X_API_27 And at.htl.viewmodellivedata (9851) Verbose Main

2019-02-17 21:44:53.232 1682-1706/system_process W/ActivityManager: Force removing ActivityRecord{ba0a7b7 u0 at.htl.lifecycleaware/.MainActivity t22}: app died, no saved state

2019-02-17 21:44:53.242 1682-1706/system_process I/WindowManager: Failed to capture screenshot of Token{50b5b24 ActivityRecord{ba0a7b7 u0 at.htl.lifecycleaware/.MainActivity t22 f}} appWin=Window{cbba438 u0 at.htl.lifecycleaware/at.htl.lifecycleaware.MainActivity} drawState=4

2019-02-17 21:44:53.506 1682-2768/system_process I/ActivityManager: START u0 {act=android.intent.action.MAIN cat=[android.intent.category.LAUNCHER] flg=0x10000000 cmp=at.htl.lifecycleaware/.MainActivity} from uid 2000

2019-02-17 21:44:53.540 1682-1854/system_process I/ActivityManager: Start proc 4664:at.htl.lifecycleaware/u0a82 for activity at.htl.lifecycleaware/.MainActivity

2019-02-18 08:57:38.592 1682-2720/system_process W/ActivityManager: Force removing ActivityRecord{5cb3373 u0 at.htl.lifecycleaware/.MainActivity t23}: app died, no saved state

2019-02-18 08:57:38.595 1682-2720/system_process I/WindowManager: Failed to capture screenshot of Token{f242230 ActivityRecord{5cb3373 u0 at.htl.lifecycleaware/.MainActivity t23 f}} appWin=Window{89f8712 u0 at.htl.lifecycleaware/at.htl.lifecycleaware.MainActivity} drawState=4

2019-02-18 10:00:04.111 1682-1702/system_process I/ActivityManager: START u0 {act=android.intent.action.MAIN cat=[android.intent.category.LAUNCHER] flg=0x10000000 cmp=at.htl.viewmodellivedata/.MainActivity} from uid 2000

2019-02-18 10:00:04.177 1682-8321/system_process I/ActivityManager: Start proc 9851:at.htl.viewmodellivedata/u0a83 for activity at.htl.viewmodellivedata/.MainActivity

2019-02-18 10:00:04.354 9851-9851/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 10:00:04.354 9851-9851/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 10:00:04.354 9851-9851/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 10:00:04.354 9851-9851/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 10:00:04.354 9851-9851/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 10:00:04.355 9851-9851/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 10:00:04.392 9851-9851/at.htl.viewmodellivedata I/MainActivityDataGenerator: Get number

2019-02-18 10:00:04.392 9851-9851/at.htl.viewmodellivedata I/MainActivityDataGenerator: Create new number

2019-02-18 10:00:04.393 9851-9851/at.htl.viewmodellivedata I/MainActivity: Random Number set

2019-02-18 10:00:04.651 1682-1719/system_process I/ActivityManager: Displayed at.htl.viewmodellivedata/.MainActivity: +492ms

2019-02-18 10:00:59.678 9851-9851/at.htl.viewmodellivedata I/MainActivityDataGenerator: Get number

2019-02-18 10:00:59.678 9851-9851/at.htl.viewmodellivedata I/MainActivityDataGenerator: Create new number

2019-02-18 10:00:59.678 9851-9851/at.htl.viewmodellivedata I/MainActivity: Random Number set

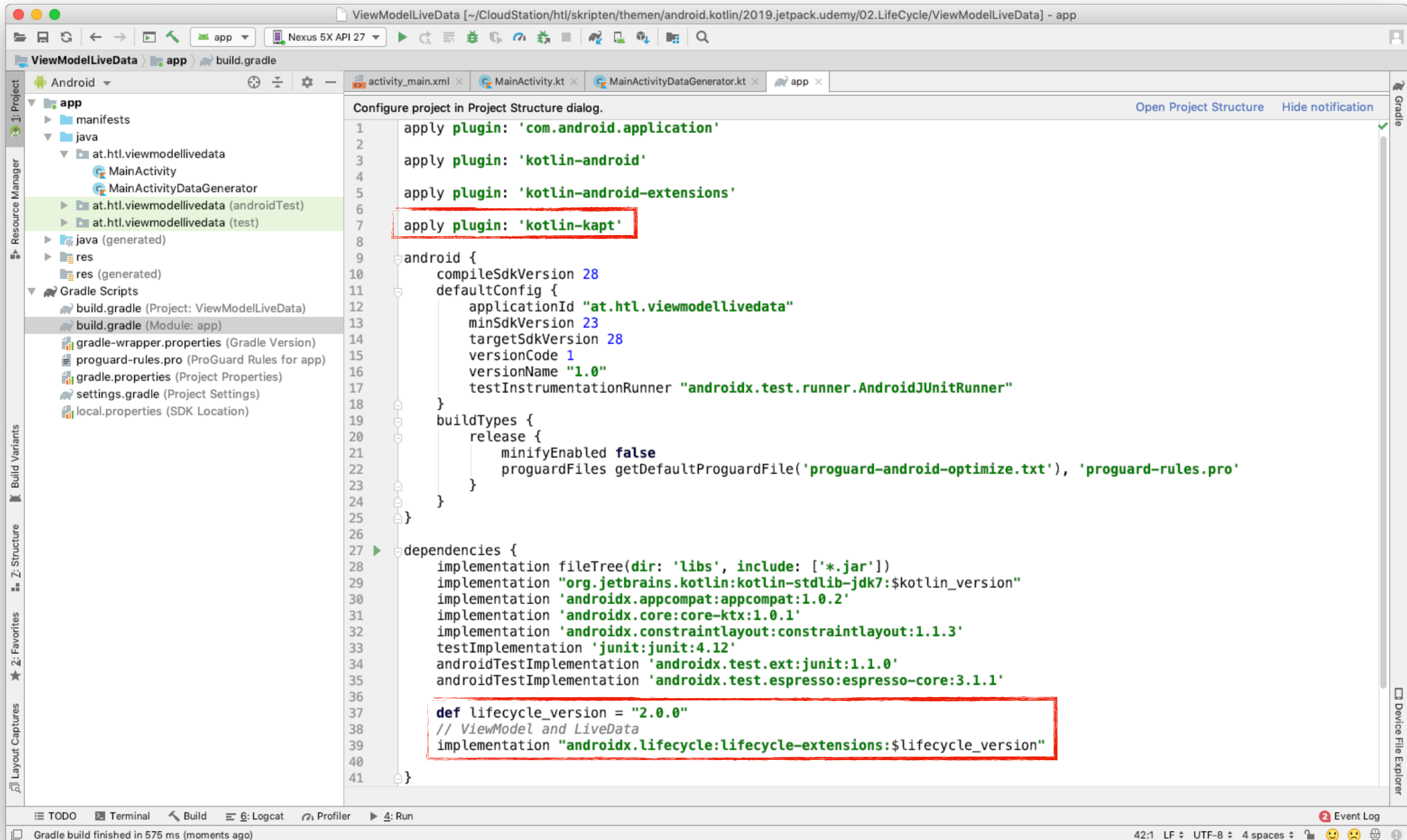
Man sieht: Die „Daten“ gehen verloren und werden neu generiert

ViewModelLiveData

Number: 2

Install successful (a minute ago)

Variante 2: mit ViewModel



<https://developer.android.com/jetpack/androidx/releases/lifecycle>

Erstellen eines ViewModels

```
class MainActivityDataGenerator: ViewModel() {  
  
    private lateinit var myRandomNumber: String  
  
    fun getNumber(): String {  
        Log.i(TAG, "Get number")  
  
        if (!::myRandomNumber.isInitialized) {  
            this.createNumber()  
        }  
        return myRandomNumber  
    }  
  
    // kotlin.random.Random  
    private fun createNumber() {  
        Log.i(TAG, "Create new number")  
        myRandomNumber = "Number: " + (Random.nextInt(10 - 1) + 1)  
    }  
  
    companion object {  
        private val TAG = MainActivityDataGenerator::class.java.simpleName  
    }  
}
```

Wir verwenden den bereits bestehenden MainActivityDataGenerator als ViewModel

ViewModel in MainActivity verwenden

```
class MainActivity : AppCompatActivity() {  
  
    // lateinit var data: MainActivityDataGenerator  
  
    override fun onCreate(savedInstanceState: Bundle?) {  
        super.onCreate(savedInstanceState)  
        setContentView(R.layout.activity_main)  
  
        val model = ViewModelProviders  
            .of(this)  
            .get(MainActivityDataGenerator::class.java)  
        val myRandomNumber = model.getNumber()  
  
        //data = MainActivityDataGenerator()  
        //val myRandomNumber = data.getNumber()  
        tv_number.text = myRandomNumber  
  
        Log.i(TAG, "Random Number set")  
    }  
  
    companion object {  
        private val TAG = MainActivity::class.java.simpleName  
    }  
}
```

Beachte: Verwende ViewModelProviders

ViewModelProviders (androidx.lifecycle)
ViewModelProvider (androidx.lifecycle)
Did you know that Quick Documentation View (F1) works in completion lookups as well? >>

ViewModelLiveData [~/CloudStation/htl/skripten/themen/android.kotlin/2019.jetpack.udemy/02.LifeCycle/ViewModelLiveData] - .../app/src/main/java/at/htl/viewmodellivedata/MainActivity.kt [app]

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Logcat

Emulator Nexus_5X_API_27 And at.htl.viewmodellivedata (10616) Verbose Main

2019-02-18 10:20:29.789 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.789 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.790 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.790 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.790 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.791 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.842 10616-10616/at.htl.viewmodellivedata I/MainActivityDataGenerator: Get number
2019-02-18 10:20:29.842 10616-10616/at.htl.viewmodellivedata I/MainActivityDataGenerator: Create new number
2019-02-18 10:20:29.843 10616-10616/at.htl.viewmodellivedata I/MainActivity: Random Number set

Eine neue Zufallszahl wird generiert

ViewModelLiveData

Number: 6

Gradle build finished in 1 m 47 s 313 ms

Install successful

Event Log

33:1 LF UTF-8 4 spaces

ViewModelLiveData [~/CloudStation/htl/skripten/themen/android.kotlin/2019.jetpack.udemy/02.LifeCycle/ViewModelLiveData] - .../app/src/main/java/at/htl/viewmodellivedata/MainActivity.kt [app]

activity_main.xml x MainActivity.kt x MainActivityDataGenerator.kt x

18 .of(this)
19 .get(MainActivityDataGenerator::class.java)

Logcat

Emulator Nexus_5X_API_27 And at.htl.viewmodellivedata (10616) Verbose Main

2019-02-18 10:20:29.789 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.789 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.790 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.790 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.790 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.791 10616-10616/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:15)
2019-02-18 10:20:29.842 10616-10616/at.htl.viewmodellivedata I/MainActivityDataGenerator: Get number
2019-02-18 10:20:29.842 10616-10616/at.htl.viewmodellivedata I/MainActivityDataGenerator: Create new number
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2019-02-18 10:21:04.279 10616-10616/at.htl.viewmodellivedata I/MainActivityDataGenerator: Get number
2019-02-18 10:21:04.279 10616-10616/at.htl.viewmodellivedata I/MainActivity: Random Number set

Die bestehende Zufallszahl wird wiederverwendet.
Die Daten gehen nicht verloren.

ViewModelLiveData

Number: 6

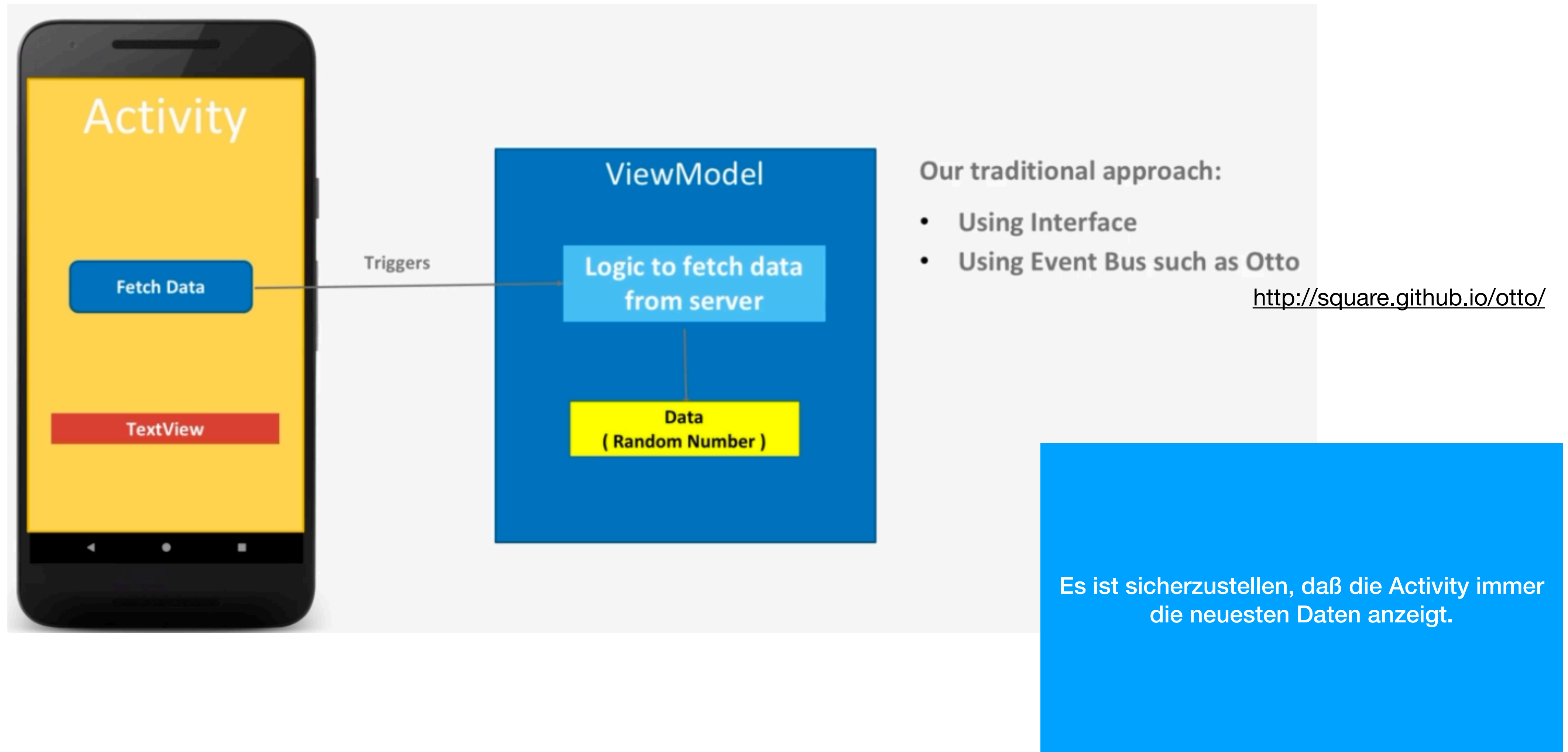
Event Log

Install successful (a minute ago)

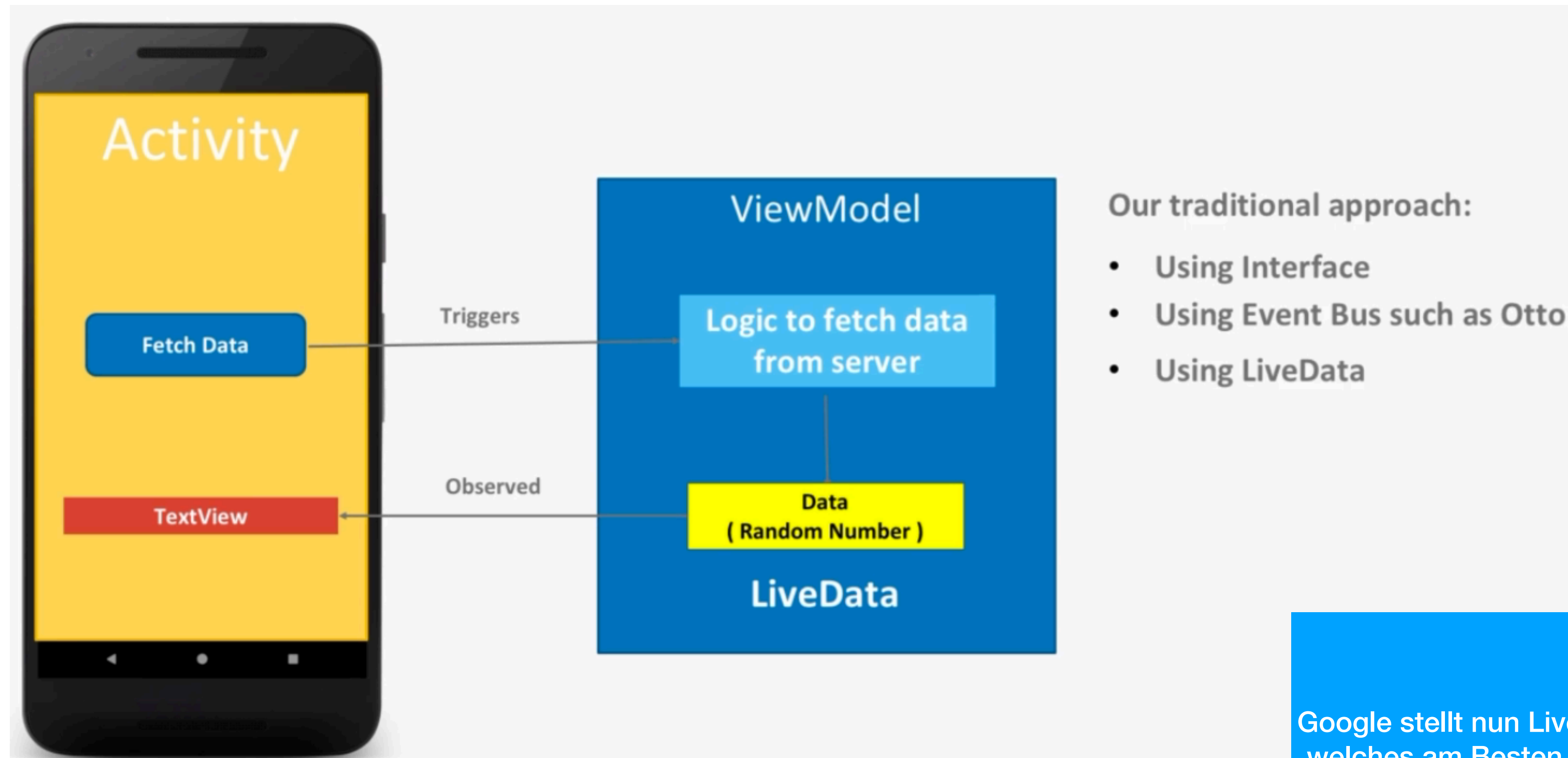
33:1 LF UTF-8 4 spaces

LiveData

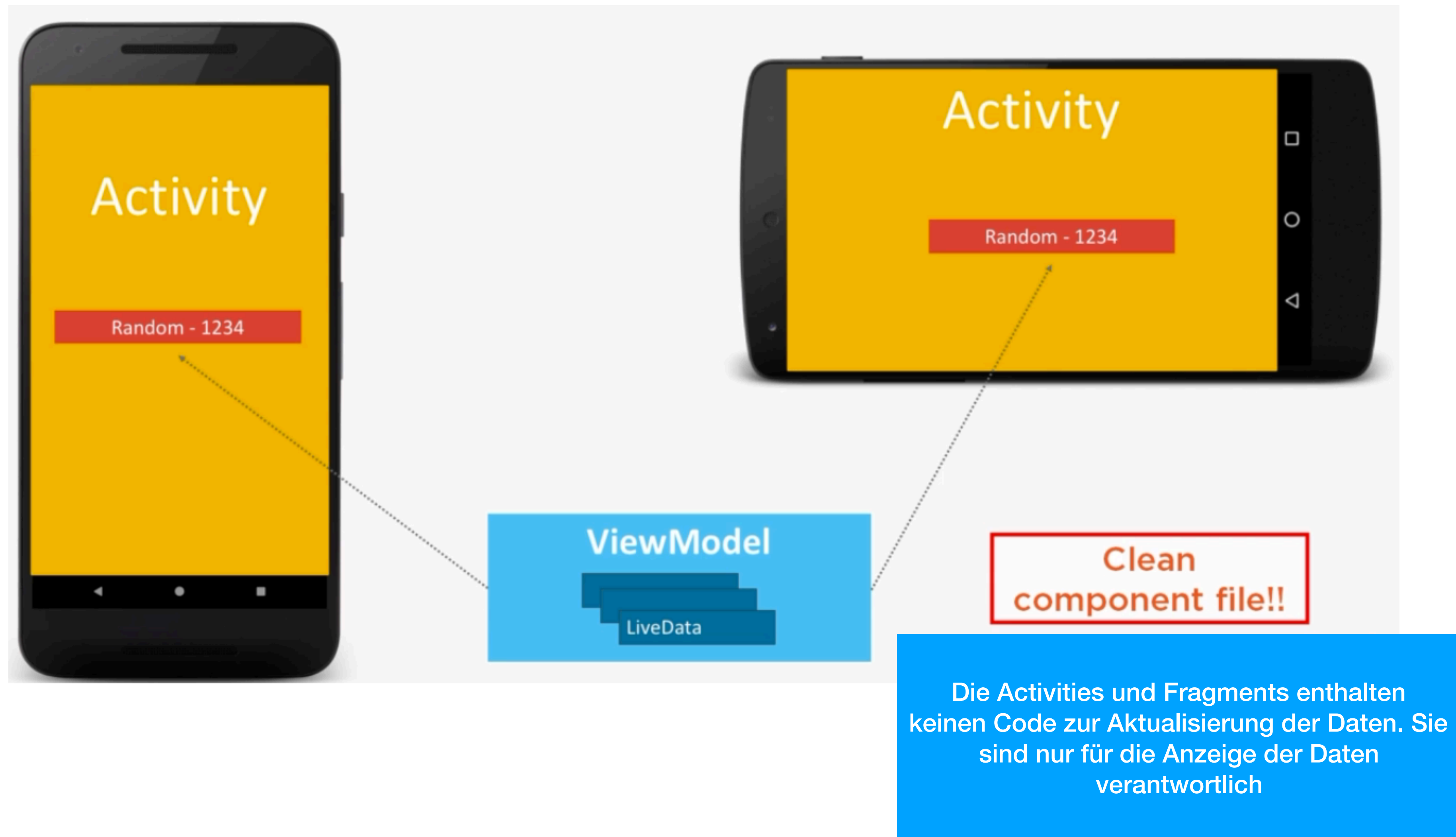
Problem



Lösung



Google stellt nun LiveData zur Verfügung, welches am Besten mit dem ViewModel kombiniert wird.



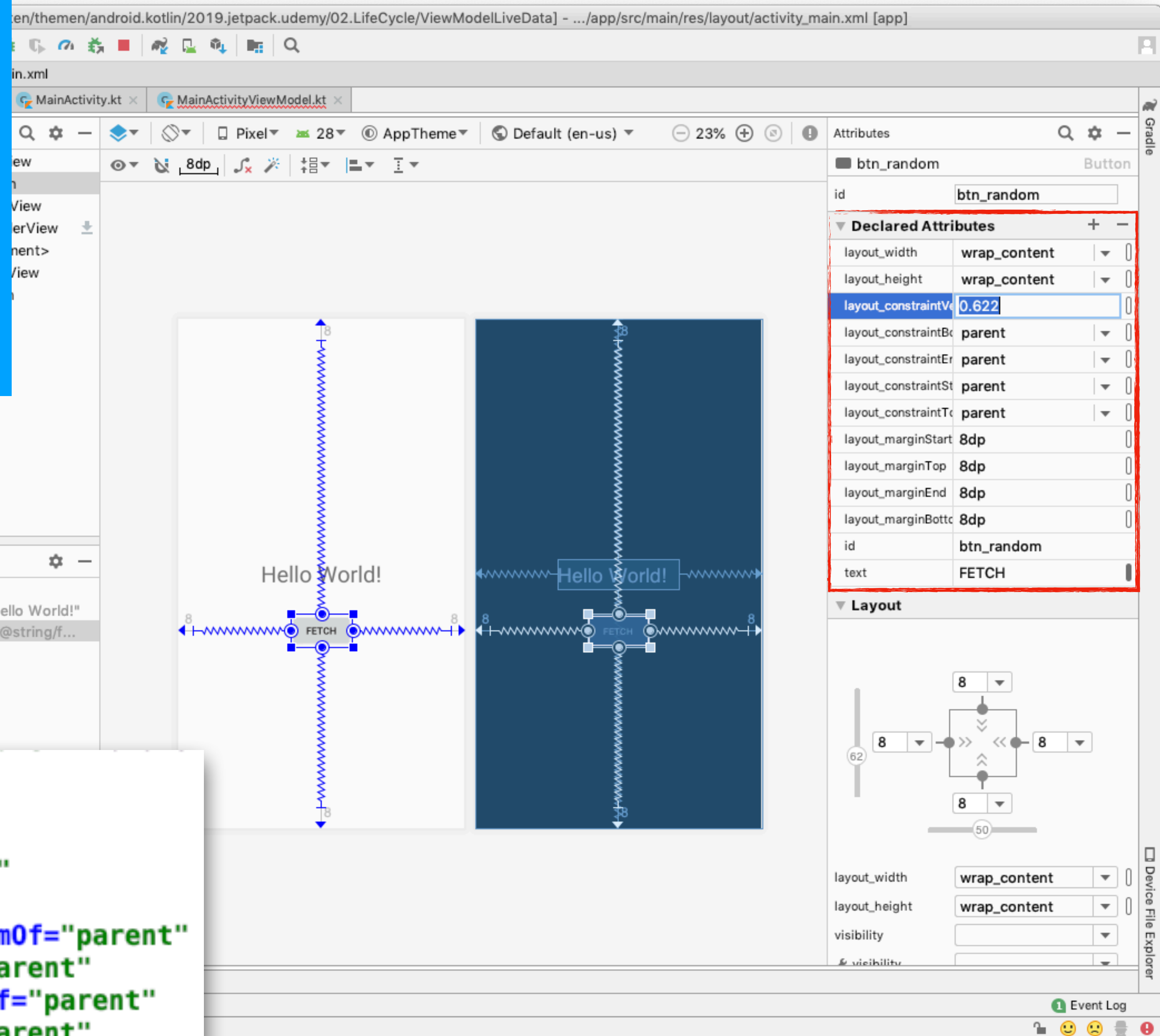
Zunächst führen wir ein paar Änderungen an unserem Beispiel durch:

Zunächst erstellen wir einen neuen Button.

Dabei wird eine String-Resource erstellt.

<Button

```
android:id="@+id/btn_random"
android:layout_width="wrap_content"
android:layout_height="wrap_content"
android:text="@string/fetch"
app:layout_constraintBottom_toBottomOf="parent"
app:layout_constraintEnd_toEndOf="parent"
app:layout_constraintStart_toStartOf="parent"
app:layout_constraintTop_toTopOf="parent"
app:layout_constraintVertical_bias="0.622"/>
```



MainActivityViewModel.kt

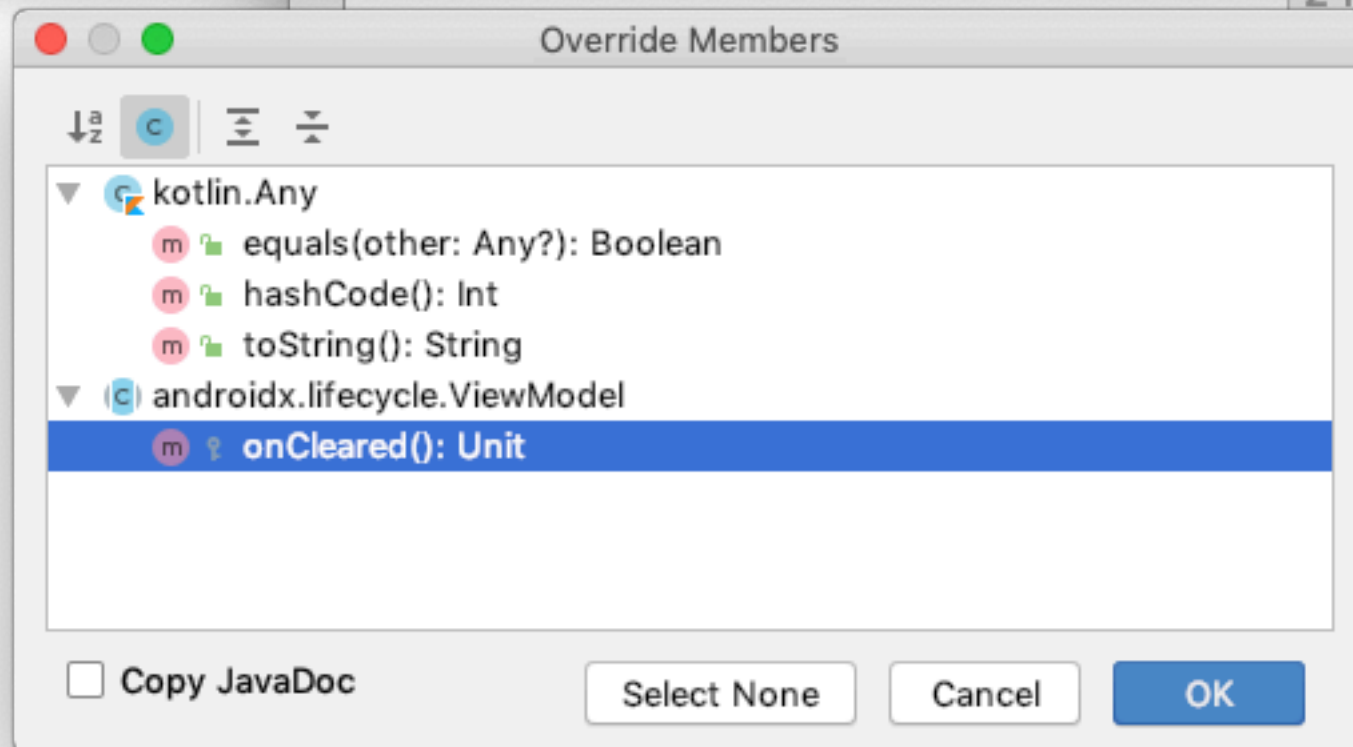
Wir verwenden MutableLiveData, da wir keinen Zugriff auf Methoden freigeben, die die Daten ändern könnten.
MutableLiveData wird von LiveData abgeleitet

```
package androidx.lifecycle;

/**
 * {@link LiveData} which publicly exposes {@link #setValue(T)}
 *
 * @param <T> The type of data held by this instance
 */
@WeakerAccess
public class MutableLiveData<T> extends LiveData<T> {
    @Override
    public void postValue(T value) { super.postValue(value); }

    @Override
    public void setValue(T value) { super.setValue(value); }
}
```

Override Methods via ^O (Ctrl+O for Win/Linux)



```
override fun onCleared() {
    super.onCleared()
    Log.i(TAG, "ViewModel destroyed")
}
```

```
companion object {
    private val TAG = MainActivityViewModel::class.java.simpleName
}
```

MainActivity.kt

```
package at.htl.viewmodellivedata

import ...

class MainActivity : AppCompatActivity() {

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContentView(R.layout.activity_main)

        val model = ViewModelProviders
            .of(this)
            .get(MainActivityViewModel::class.java)
        val myRandomNumber = model.getNumber()

        myRandomNumber.observe(this, Observer<String> { number ->
            tv_number.text = number
            Log.i(TAG, "Random number set")
        })

        btn_random.setOnClickListener {
            model.createNumber()
        }

    }

    companion object {
        private val TAG = MainActivity::class.java.simpleName
    }
}
```

die MainActivity beobachtet das
ViewModel und aktualisiert die
View

onClickListener für den Button

ViewModelLiveData [~/CloudStation/htl/skripten/themen/android.kotlin/2019.jetpack.udemy/02.LifeCycle/ViewModelLiveData] - .../app/src/main/java/at/htl/viewmodellivedata/MainActivityViewModel.kt [app]

Project: ViewModelLiveData

- app
 - manifests
 - java
 - at.htl.viewmodellivedata
 - MainActivity
 - MainActivityViewModel
 - at.htl.viewmodellivedata (androidTest)
 - at.htl.viewmodellivedata (test)
 - java (generated)
 - res
 - res (generated)
 - Gradle Scripts
 - build.gradle (Project: ViewModelLiveData)
 - build.gradle (Module: app)
 - gradle-wrapper.properties (Gradle Version)
 - proguard-rules.pro (ProGuard Rules for app)

```
1 package at.htl.viewmodellivedata
2
3 import ...
4
5 class MainActivityViewModel: ViewModel() {
6
7     private lateinit var myRandomNumber: MutableLiveData<String>
8     //private lateinit var myRandomNumber: String
9
10    fun getNumber(): MutableLiveData<String> {
11        Log.i(TAG, "Get number")
12
13        if (!myRandomNumber.isInitialized) {
14            myRandomNumber = MutableLiveData<String>()
15            myRandomNumber.value = generateRandomNumber()
16        }
17    }
18 }
```

Logcat

Emulator Nexus_5X_API_27 And at.htl.viewmodellivedata (11532) Verbose Main

2019-02-18 11:21:20.510 11532-11532/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 11:21:20.510 11532-11532/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 11:21:20.511 11532-11532/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 11:21:20.511 11532-11532/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 11:21:20.512 11532-11532/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 11:21:20.513 11532-11532/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

2019-02-18 11:21:20.611 11532-11532/at.htl.viewmodellivedata I/MainActivityViewModel: Get number

2019-02-18 11:21:20.611 11532-11532/at.htl.viewmodellivedata I/MainActivityViewModel: Create new number

2019-02-18 11:21:20.619 11532-11532/at.htl.viewmodellivedata I/MainActivity: Random number set

Nach dem Starten wird die Zahl neu generiert

ViewModelLiveData

Number: 8

FETCH

Install successful (a minute ago) 40:1 LF UTF-8 4 spaces

ViewModelLiveData [~/CloudStation/htl/skripten/themen/android.kotlin/2019.jetpack.udemy/02.LifeCycle/ViewModelLiveData] - .../app/src/main/java/at/htl/viewmodellivedata/MainActivityViewModel.kt [app]

Project: ViewModelLiveData

- app
 - manifests
 - java
 - at.htl.viewmodellivedata
 - MainActivity
 - MainActivityViewModel
 - at.htl.viewmodellivedata (androidTest)
 - at.htl.viewmodellivedata (test)
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 - gradle-wrapper.properties (Gradle Version)
 - proguard-rules.pro (ProGuard Rules for app)

```
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11        Log.i(TAG, "Get number")
12
13        if (!myRandomNumber.isInitialized) {
14            myRandomNumber = MutableLiveData<String>()
15            myRandomNumber.value = generateRandomNumber()
16        }
17    }
18 }
```

Logcat

Emulator Nexus_5X_API_27 And at.htl.viewmodellivedata (11532) Verbose Main

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2019-02-18 11:21:20.512 11532-11532/at.htl.viewmodellivedata I/zygote: at void at.htl.viewmodellivedata.MainActivity.onCreate(android.os.Bundle) (MainActivity.kt:14)

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2019-02-18 11:21:20.611 11532-11532/at.htl.viewmodellivedata I/MainActivityViewModel: Get number

2019-02-18 11:21:20.611 11532-11532/at.htl.viewmodellivedata I/MainActivityViewModel: Create new number

2019-02-18 11:21:20.619 11532-11532/at.htl.viewmodellivedata I/MainActivity: Random number set

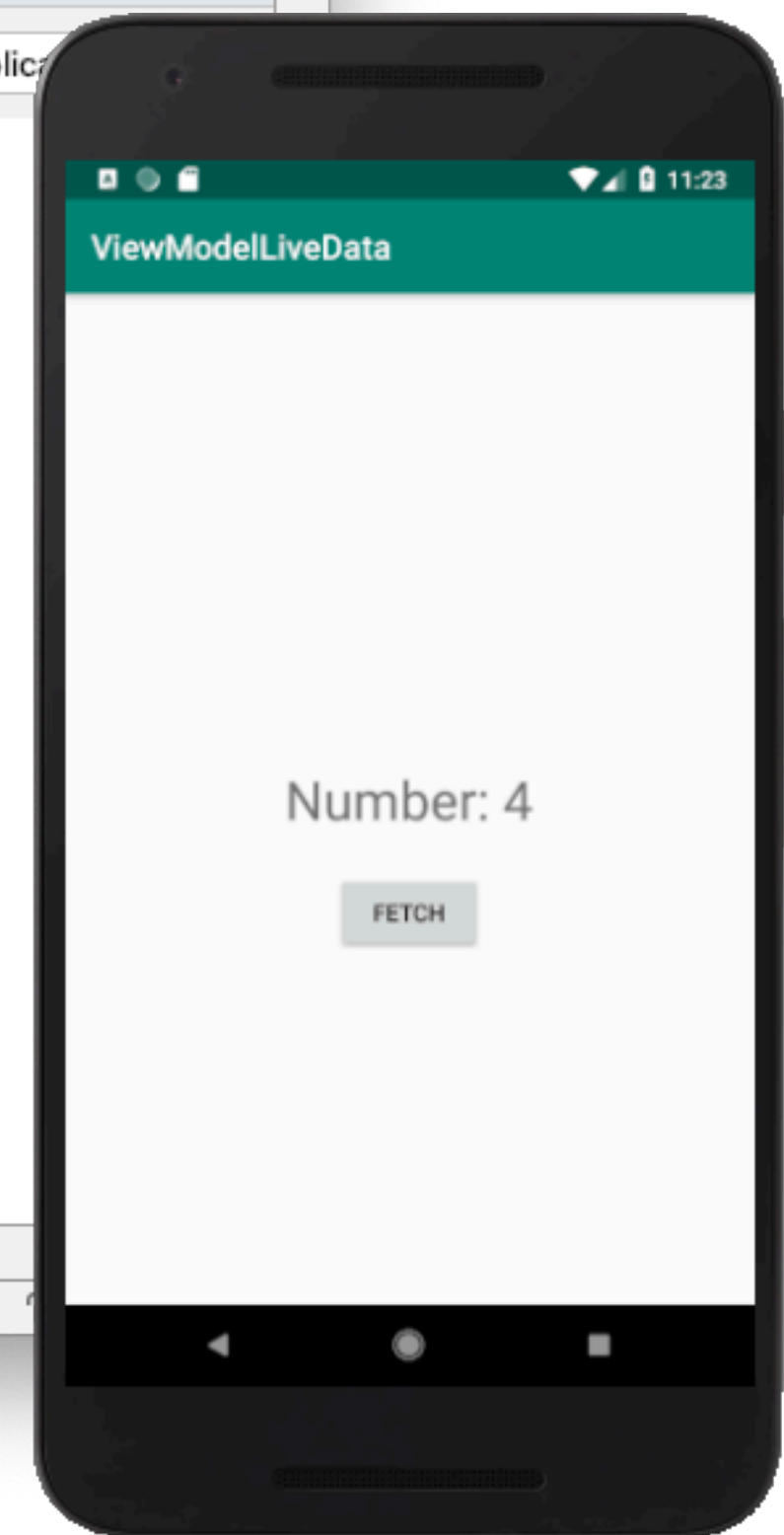
2019-02-18 11:23:12.684 11532-11532/at.htl.viewmodellivedata I/MainActivityViewModel: Create new number

2019-02-18 11:23:12.684 11532-11532/at.htl.viewmodellivedata I/MainActivity: Random number set

Install successful (2 minutes ago)

40:1 LF UTF-8 4 spaces

Durch Klicken des Button wird eine neue Zahl generiert und automatisch in der Activity dargestellt.



Wie gehts weiter?


- <https://codelabs.developers.google.com/codelabs/android-room-with-a-view/#0>
-





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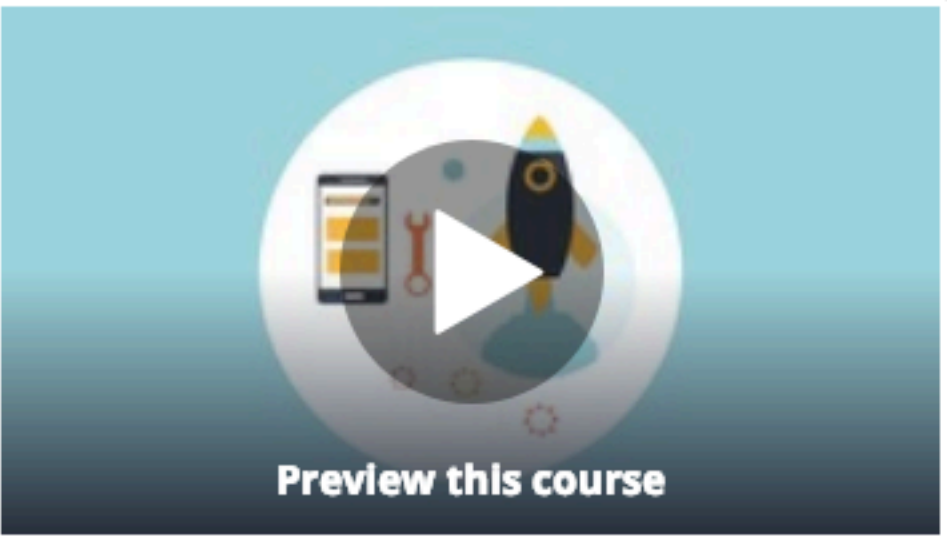
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- ✓ Get introduced to Android architecture components
- ✓ Provide stability in your app by handling life cycles, view models, and live data
- ✓ Load data gradually and gracefully in RecyclerView by using the Paging library
- ✓ Explore how to perform CRUD operations in the Room database
- ✓ Use the Data Binding library to bind data to the UI
- ✓ Implement effective in-app navigation by using the Navigation architecture component
- ✓ Implement a local database to store structured data by using the Room database
- ✓ Schedule tasks asynchronously by using Work Manager

