Kotlin for Android

Writing Android Apps in Kotlin

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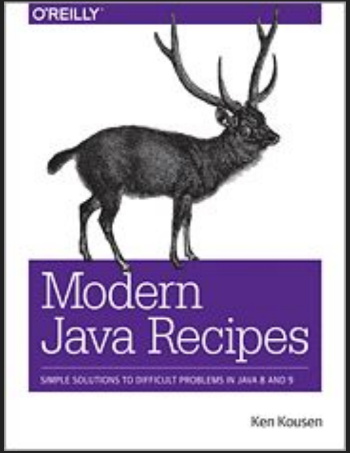

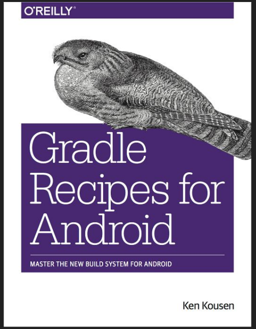
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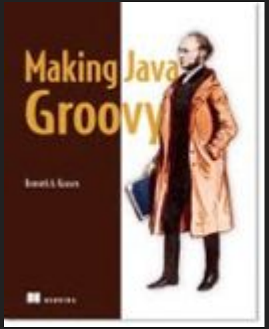

Videos

O'Reilly video courses: See Safari Books Online for details

- Groovy Programming Fundamentals
- Practical Groovy Programming
- Mastering Groovy Programming
- Learning Android
- Practical Android
- Gradle Fundamentals
- Gradle for Android
- Spring Framework Essentials
- Advanced Java Development

Kotlin

JetBrains created and maintains the language

Provides null safety at the compiler level

Statically typed and statically bound by default

Runs on the JVM → Clean interoperability with Java

Kotlin

Home page is https://kotlinlang.org

Many code simplifications borrowed from other languages

- Closures similar to Groovy
- Typing similar to Scala
- Co-routines similar to .Net (and others)

Kotlin

Officially endorsed by Google as an Android development language

Android Studio is the official IDE for Android

Kotlin is a plugin for both Android Studio and IntelliJ IDEA

JetBrains supports an Eclipse plugin as well

Learning Kotlin

http://try.kotlinlang.org/ → online script engine

Kotlin Koans → https://kotlinlang.org/docs/tutorials/koans.html

    Get complex fairly quickly (don't be discouraged :)

Kotlin reference → https://kotlinlang.org/docs/reference/

Kotlin idioms → https://kotlinlang.org/docs/reference/idioms.html

    Demonstrates good practices and usage patterns

Kotlin for Android

Book: Kotlin for Android Developers

LeanPub, Antonio Leiva

GitHub repo:

https://github.com/antoniolg/Kotlin-for-Android-Developers

Udacity Course

Kotlin for Android Developers

https://www.udacity.com/course/kotlin-for-android-developers--ud888

Basic Syntax

Types declared after the variable, separated by a colon

```
var s : String
```

var and val define types

- `var` is a variable (mutable)
- `val` is a value (immutable, i.e., final)

Basic Syntax

Variables are non-null by default

Must declare nullable types using "?"

```
val s : String?
```

Implies "s" can be assigned null; not true otherwise

Data Classes

Classes defined using the keyword "data"

```
data class Customer(val name: String, val email: String)
```

(That's the entire class)

Data classes have:

- generated getters and setters
- toString, equals, hashCode
- `copy()` method

Functions

Functions defined with the "fun" keyword

```
fun main(args: Array<String>) { … }
```

If function consists of one statement, can use assignment

```
fun sayHello(name: String) = println("Hello, $name!")
```

(note: semicolons not needed)

Functions

Return type shown after signature

```
fun sum(a: Int, b:Int) : Int {
    return a + b
}
```

Simpler:

```
fun sum(a: Int, b: Int) = a + b
```

Return type inferred

(Use "Unit" return type for Java "void")

Functions

Support default parameters

```
fun read(b: Array<Byte>, off: Int = 0, len: Int = b.size) {
    ...
}
```

Override defaults by supplying actual values

Functions

Can use named parameters

```
fun reformat(str: String, normalizeCase: Boolean = true,
    upperCaseFirstLetter: Boolean = true,
    divideByCamelHumps: Boolean = false,
    wordSeparator: Char = ' ') {
        ...
}

reformat(str, normalizeCase = true,
    upperCaseFirstLetter = true,
    divideByCamelHumps = false, wordSeparator = '_')
```

if

"if" clause returns value automatically

```
val max = if (a > b) a else b
```

Acts like Java ternary operator (which isn't supported)

when

Like a Java switch statement with a return

```
when (x) {
    1 -> print("x == 1")
    2 -> print("x == 2")
    else -> {
        print("x is neither 1 nor 2")
    }
}
```

when

Works with many options, including ranges

```
when (x) {
    in 1..10 -> print("x is in the range")
    in validNumbers -> print("x is valid")
    !in 10..20 -> print("x is outside the range")
    else -> print("none of the above")
}
```

when

- when expressions also return a value
- If you return a value, conditionals must be exhaustive
  - Either cover all cases, or include an else clause

```
fun modulo3(arg: Int) = when (arg % 3) {
    0 -> "$arg divisible by 3"
    1 -> "$arg % 3 == 1"
    2 -> "$arg % 3 == 2"
    else -> "Houston, we have a problem..."
}
```

for

Traditional Java for loop not supported

Use for-in loop

```
for (item in collection) print(item)
```

```
for (item: Int in ints) {
    // …
}
```

for

Looping over arrays, using indices

```
for (i in array.indices) {
    print(array[i])
}
```

Looping over maps, use "destructuring"

```
for ((index, value) in array.withIndex()) {
    println("the element at $index is $value")
}
```

Elvis operator

- Can use ?: as in Groovy
  - If value is not null, use it, otherwise default

```
val s = person.name ?: "World"
```

Lambdas

Kotlin supports lambda expressions

```
max(strings, { a, b -> a.length < b.length })
```

Lambda contained within { }

```
max(strings) { a, b -> a.length < b.length }
```

Can place lambda after parentheses in method call

Lambdas

Basic syntax:

```
val sum = { x: Int, y: Int -> x + y }
```

Can declare return type (optional here)

```
val sum: (Int, Int) -> Int = { x, y -> x + y }
```

If single argument, default is "it"

```
ints.filter { it > 0 }
```

Lambdas

Like Java, lambdas can access variables in scope

Unlike Java (but like Groovy), it can modify them

```
var sum = 0
ints.filter { it > 0 }.forEach {
    sum += it
}
print(sum)
```

Note: don't do it this way → use `sum()` instead

Classes and Objects

Classes are defined as usual

Don't need "new" to instantiate

```
val customer = Customer("Fred", "flintstone@slatequarry.com")
```

Classes and Objects

To extend, class must be declared "open"

Functions must also have "open" or you can't override them

```
open class Base {
    open fun v() {}
    fun nv() {}
}
class Derived() : Base() {
    override fun v() {}
}
```

Classes and Objects

Kotlin does not support static members

Use "object" and companion objects instead

```
object DataProviderManager {
    fun registerDataProvider(provider: DataProvider) {
        // ...
    }
}
```

Result is a singleton

Classes and Objects

Companion objects are singletons inside classes → home for statics

```
class MyClass {
    companion object {
        fun create(): MyClass = MyClass()
    }
}

val instance = MyClass.create()
```

Classes and Objects

- Note default access for everything is public
- Also can put functions inside a file without a class
    - Become part of the generated class

Extension functions

Can add methods to existing classes

Good for optional methods

```
fun MutableList<Int>.swap(index1: Int, index2: Int) {
    val tmp = this[index1]
    this[index1] = this[index2]
    this[index2] = tmp
}
```

"MutableList" is class, "swap" is added method; "this" is instance

Sequences

- Methods like "map", "filter" are added to collections
- The "`asSequence()`" method converts collection to sequence
    - Like Java streams
    - Evaluated element at a time
    - No data processed unless there is a terminal expression

Anko Library

Extension library for Android

https://github.com/Kotlin/anko

Wiki has usage info

KTX

Kotlin extensions provided by Google

https://github.com/android/android-ktx

Blog post:

https://android-developers.googleblog.com/2018/02/introducing-android-ktx-even-sweeter.html

For more information

See reference at kotlinlang.org, but also:

https://github.com/JetBrains/kotlin-workshop

- Two-day workshop

Presentations are on slideshare.net (linked in GitHub repo)

- e.g., https://speakerdeck.com/svtk/1-intro-kotlin-workshop

GitHub Repository

https://github.com/kousen/HelloKotlinAndroid

App consumes RESTful web service

Works with Sqlite database

Converts JSON data to Kotlin data classes

Operates asynchronously using Anko extension library