Kotlin Programming

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Objective

Kotlin - Why?

- JetBrains - 2010
- We kind of needed a language that was..
  Concise, Expressive, Interoperable, but above all, pragmatic
- Two Options: Ceylon e Scala
- Apache 2 OSS License

Objective

Kotlin

- Statically Typed Language
- Inspired by Java, Scala, C# and Groovy
- Targets: JVM, JavaScript, Native
- Very good adoption in Android
- Similarity to other languages
- Interoperable allows gradual adoption

Objective

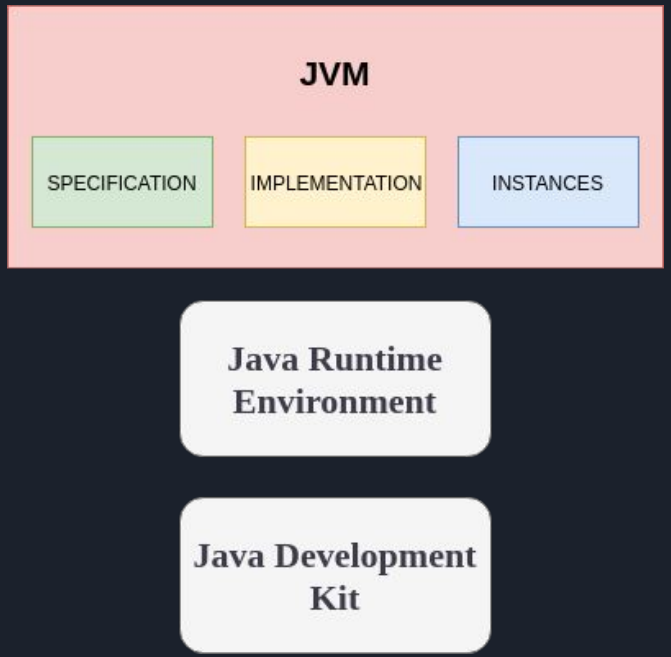
Current state

- The first official 1.0 release was in February 2016.
- The currently released version is 1.3.50, published on August 22, 2019.
- Current team size is 50+
- 250+ external contributors on GitHub.
- Amex, Netflix, NBC News, Square, Pinterest, Basecamp or Corda.

Objective

The Java Virtual machine
A.K.A The JVM

- Abstract machine running Java Applications
- Single specification, Multiple implementations
- An instance is what runs a Java application
- Applications compiled to Bytecode
- JRE and JDK



Objective

Languages on JVM

- Truly Polyglot ecosystem
- All languages either compile to bytecode (or transpile to Java first)
- Java, Kotlin, Scala, Ceylon, Clojure, Frege

Objective

Kotlin and JVM

Customer.kt

```
class Customer(val name: String) {
    fun validate(): Boolean {
        …
    }
}
```

compiler

Customer.class

```
L0
    LINENUMBER 5LD
    ALOAD 0
    GETFIELD Customer.name
    ARETURN
L1
    LOCALVARIABLE this LCustomer
    MAXSTACK = 1
```

Execute using the JVM
java myApp

Objective

Kotlin and Java

- Java and Kotlin are 100% interoperable
- You can call Java from Kotlin and vice-versa

Objective

Kotlin Basics

- Two ways to declare variables in Kotlin
  - var for mutable
  - val for immutable
- For loops can use ranges (1..100) for iteration
- if and when can be used as expressions

Objective

Kotlin Functions

- Functions are declared using keyword `fun`
- by default return type is `Unit`, equivalent to `void`
- functions allow
  - default parameters
  - named parameters
  - unlimited arguments
- single expression functions don't need function block

Objective

Kotlin Visibility Modifiers

- 4 visibility modifiers
  - public - Default and anywhere accessible
- Top level declarations
  - private - Available inside file containing declaration
  - internal - Anywhere in the same module
- Classes
  - private - Only available to class members
  - protected - Same as private and subclasses
  - internal - Any client inside the module

Objective

Kotlin Classes

- Classes are first class citizens in Kotlin
- Provide expected functionality such properties and functions
- The are no fields in kotlin
- We have access to "backing" field if required in custom getters/setters
- Data classes provide functionality to reduce boiler-plate code
- Objects provide an easy way to create singletons

Objective

Kotlin Inheritance et al.

- By default classes are final in Kotlin
  - open annotation allows classes to inherit
- Abstract classes are similar to interfaces, but allow state
- Kotlin support for generic types and functions

Objective

Kotlin Null Safety

- By default types cannot be null
- We can declare types as nullable by suffixing a `?`
- The `?` operator also providers us the ability to access members when value not null
- When we have a nullable reference r, we can say "if r is not null, use it, otherwise use some non-null value x", using the `?:` operator
- the `!!` operator provide a way to access members without the null checks

Objective

Kotlin Tidbits

- Smart cast in Kotlin can save on boiler-plate code
- Tuples are restricted to Pairs and Triples
- Value Deconstruction allows better semantics
- No checked exceptions in Kotlin
- Constants can be objects or top-level properties
- Annotations are available in Kotlin and compatible with java

Objective

Kotlin Getting Functional

- Any function that takes or returns function is Higher-Order function
- Kotlin allows for Lambda Expressions using {} syntax
- Allows access to modified closures
- Extension functions allow extending functionality of class without inheriting from it

Objective

Kotlin Collections

- Kotlin doesn't have its own collections
- Provide is a set of interfaces on top of Java collections
- List, Arrays, Maps, Sets, HashMap, HashSet, etc ...

Objective

Kotlin Standard Library

- Series of common functionality including support for collections
- Filter, Map, Sum
- Lazy Evaluation
- Sequences are the "equivalent" of Java Streams
- Scope Functions

Objective

Kotlin Scope Function

- `let` "can be used to invoke one or more functions on results of call chains"
- `with` "with this object, do the following."
- `run` does the same as with but invokes as let
- `apply` "apply the following assignments to the object"
- `also` "and also do the following"

Objective

Kotlin Scope Function

- Executing a lambda on non-null objects: `let`
- Introducing an expression as a variable in local scope: `let`
- Object configuration: `apply`
- Object configuration and computing the result: `run`
- Running statements where an expression is required:
  non-extension: `run`
- Additional effects: `also`
- Grouping function calls on an object: `with`

Objective

Kotlin Scope Function

Function	Object reference	Return value	Is extension function
`let`	`it`	Lambda result	Yes
`run`	`this`	Lambda result	Yes
`run`	-	Lambda result	No: called without the context object
`with`	`this`	Lambda result	No: takes the context object as an argument.
`apply`	`this`	Context object	Yes
`also`	`it`	Context object	Yes

Objective

Kotlin Diving Deeper into functions

- Kotlin provides ability to create local functions for code-reuse
- Infix functions allow to create a more fluent call
- Inline functions optimise higher-order by inlining
- We can use labels to perform local returns from lambdas
- Tail recursion allows for TCO
- Certain operators can be overloaded using conventions
- Language can be extended easily with new functionality

Objective

References

- Github repository
- Functional Calisthenics
- Kotlin Docs reference
- Functional Programming (Uncle Bob): What? Why? When?
- Introduction to Kotlin Programming
- Advanced Kotlin Programming

Objective