

Deep Dive Kotlin: du Hello World au ByteCode

#DevoxxFR #Kotlin @emmanuelVinas @ilaborie

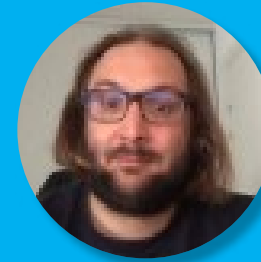


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- VI. Lambda
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ByteCode Java ?

```
package _00_helloworld;  
  
public class HelloWorld {  
  
    public static void main(String[] args) {  
        System.out.println("Hello Devoxx");  
    }  
}
```

```
$ javac HelloWorld.java
```

Java ByteCode binary

4

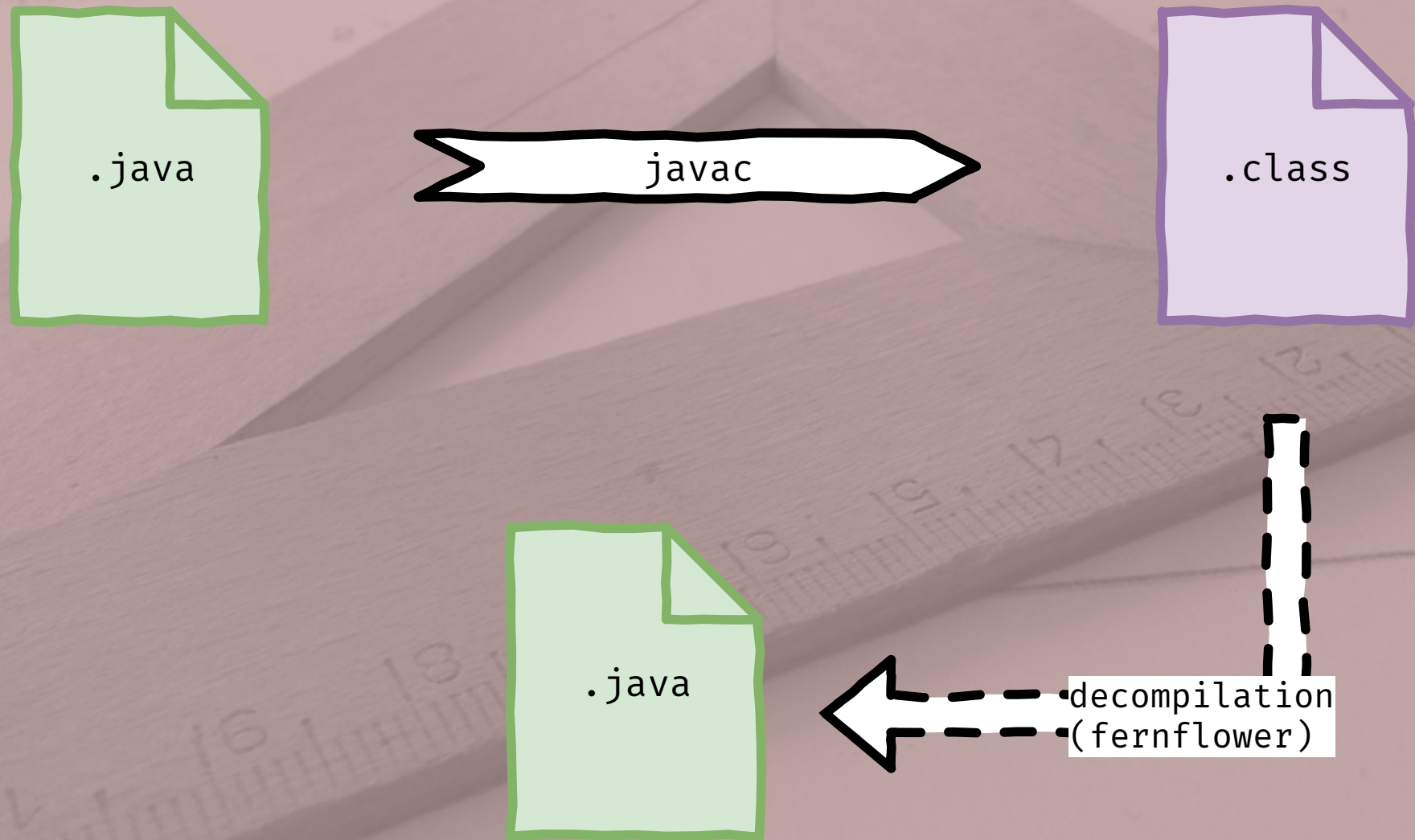
```
$ hexdump -C HelloWorld.class
```

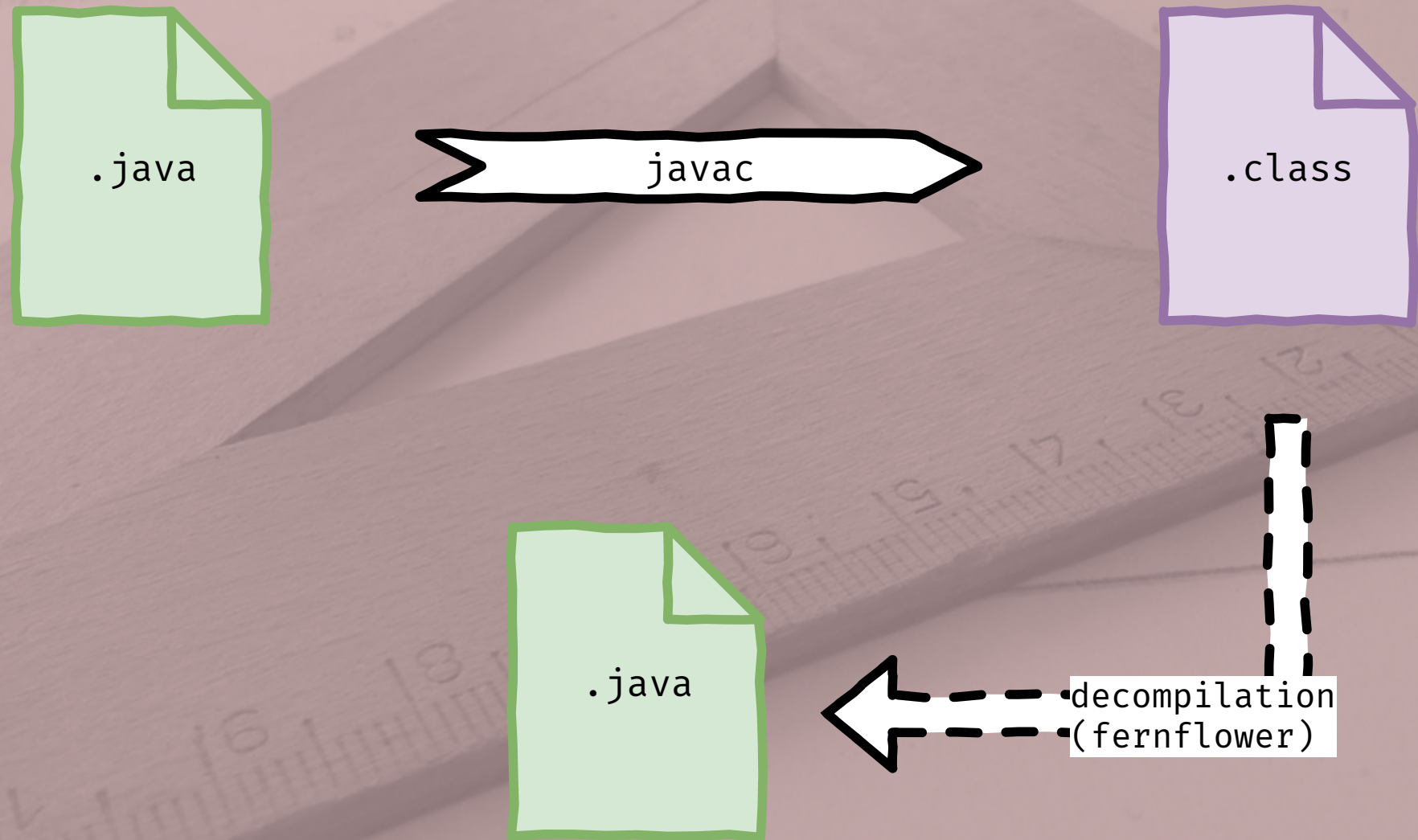
```
00000000  ca fe ba be 00 00 00 34 00 1d 0a 00 06 00 0f 09 |.....4.....|
00000010  00 10 00 11 08 00 12 0a 00 13 00 14 07 00 15 07 |.....|
00000020  00 16 01 00 06 3c 69 6e 69 74 3e 01 00 03 28 29 |..... ()|
00000030  56 01 00 04 43 6f 64 65 01 00 0f 4c 69 6e 65 4e |V ... Code ... LineN|
00000040  75 6d 62 65 72 54 61 62 6c 65 01 00 04 6d 61 69 |umberTable ... mai|
00000050  6e 01 00 16 28 5b 4c 6a 61 76 61 2f 6c 61 6e 67 |n ... ([Ljava/lang|
00000060  2f 53 74 72 69 6e 67 3b 29 56 01 00 0a 53 6f 75 |/String;)V ... Sou|
00000070  72 63 65 46 69 6c 65 01 00 0f 48 65 6c 6c 6f 57 |rceFile ... HelloW|
00000080  6f 72 6c 64 2e 6a 61 76 61 0c 00 07 00 08 07 00 |orld.java.....|
00000090  17 0c 00 18 00 19 01 00 0c 48 65 6c 6c 6f 20 44 |.....Hello D|
000000a0  65 76 6f 78 78 07 00 1a 0c 00 1b 00 1c 01 00 19 |evoxx.....|
000000b0  5f 30 30 5f 68 65 6c 6c 6f 77 6f 72 6c 64 2f 48 |_00_helloworld/H|
000000c0  65 6c 6c 6f 57 6f 72 6c 64 01 00 10 6a 61 76 61 |elloWorld ... java|
000000d0  2f 6c 61 6e 67 2f 4f 62 6a 65 63 74 01 00 10 6a |/lang/Object ... j|
000000e0  61 76 61 2f 6c 61 6e 67 2f 53 79 73 74 65 6d 01 |ava/lang/System.|
000000f0  00 03 6f 75 74 01 00 15 4c 6a 61 76 61 2f 69 6f | ..out ... Ljava/io|
00000100  2f 50 72 69 6e 74 53 74 72 65 61 6d 3b 01 00 13 |/PrintStream; ...|
00000110  6a 61 76 61 2f 69 6f 2f 50 72 69 6e 74 53 74 72 |java/io/PrintStr|
00000120  65 61 6d 01 00 07 70 72 69 6e 74 6c 6e 01 00 15 |eam ... println ...|
00000130  28 4c 6a 61 76 61 2f 6c 61 6e 67 2f 53 74 72 69 |(Ljava/lang/Stri|
00000140  6e 67 3b 29 56 00 21 00 05 00 06 00 00 00 00 00 |ng;)V.!.....|
00000150  02 00 01 00 07 00 08 00 01 00 09 00 00 00 1d 00 |.....|
```

```
$ javap -c -v HelloWorld.class
```

```
Compiled from "HelloWorld.java"
public class _00_helloworld.HelloWorld {
    public _00_helloworld.HelloWorld();
        Code:
            0: aload_0
            1: invokespecial #1           // Method java/lang/Object."":()V
            4: return

    public static void main(java.lang.String[]);
        Code:
            0: getstatic     #2           // Field java/lang/System.out:Ljav
            3: ldc           #3           // String Hello Devoxx
            5: invokevirtual #4           // Method java/io/PrintStream.prin
            8: return
}
```



- ➡ Introduction to Java Bytecode
- ➡ Mastering Java Bytecode at the Core of the JVM
- ➡

Introduction Kotlin

- **2011**
Dévoilé par JetBrains
- **2016:**
v1.0
Supporté par Spring Framework
- **2017:**
v1.1: coroutines, ...
Officiellement supportée par Google
v1.2: multiplatform
- **2018:**
Kotlin Native (external) 0.6



JVM et Android



JavaScript



**Native avec
LLVM**

```
package _00_helloworld

fun main(args: Array<String>) {
    println("Hello Devoxx")
}
```

```
$ kotlinc HelloWorld.kt
```



```
00000000 ca fe ba be 00 00 00 32 00 33 01 00 1b 5f 30 30 |.....2.3 ..._00|
00000010 5f 68 65 6c 6c 6f 77 6f 72 6c 64 2f 48 65 6c 6c |_helloworld/Hell|
00000020 6f 57 6f 72 6c 64 4b 74 07 00 01 01 00 10 6a 61 |oWorldKt.....ja|
00000030 76 61 2f 6c 61 6e 67 2f 4f 62 6a 65 63 74 07 00 |va/lang/Object..|
00000040 03 01 00 04 6d 61 69 6e 01 00 16 28 5b 4c 6a 61 |....main...([Lja|
00000050 76 61 2f 6c 61 6e 67 2f 53 74 72 69 6e 67 3b 29 |va/lang/String;)|
00000060 56 01 00 23 4c 6f 72 67 2f 6a 65 74 62 72 61 69 |V..#Lorg/jetbrai|
00000070 6e 73 2f 61 6e 6e 6f 74 61 74 69 6f 6e 73 2f 4e |ns/annotations/N|
00000080 6f 74 4e 75 6c 6c 3b 01 00 04 61 72 67 73 08 00 |otNull;...args..|
00000090 08 01 00 1e 6b 6f 74 6c 69 6e 2f 6a 76 6d 2f 69 |....kotlin/jvm/i|
000000a0 6e 74 65 72 6e 61 6c 2f 49 6e 74 72 69 6e 73 69 |nternal/Intrinsi|
000000b0 63 73 07 00 0a 01 00 17 63 68 65 63 6b 50 61 72 |cs.....checkPar|
000000c0 61 6d 65 74 65 72 49 73 4e 6f 74 4e 75 6c 6c 01 |ameterIsNotNull.|
000000d0 00 27 28 4c 6a 61 76 61 2f 6c 61 6e 67 2f 4f 62 |.'(Ljava/lang/Ob|
000000e0 6a 65 63 74 3b 4c 6a 61 76 61 2f 6c 61 6e 67 2f |ject;Ljava/lang/|
000000f0 53 74 72 69 6e 67 3b 29 56 0c 00 0c 00 0d 0a 00 |String;)V.....|
00000100 0b 00 0e 01 00 0c 48 65 6c 6c 6f 20 44 65 76 6f |.....Hello Devo|
00000110 78 78 08 00 10 01 00 10 6a 61 76 61 2f 6c 61 6e |xx.....java/lan|
00000120 67 2f 53 79 73 74 65 6d 07 00 12 01 00 03 6f 75 |g/System.....ou|
00000130 74 01 00 15 4c 6a 61 76 61 2f 69 6f 2f 50 72 69 |t...Ljava/io/Pri|
00000140 6e 74 53 74 72 65 61 6d 3b 0c 00 14 00 15 09 00 |ntStream;.....|
00000150 13 00 16 01 00 13 6a 61 76 61 2f 69 6f 2f 50 72 |.....java/io/Pr|
00000160 69 6e 74 53 74 72 65 61 6d 07 00 18 01 00 07 70 |ntStream.....p|
00000170 72 69 6e 74 6c 6e 01 00 15 28 4c 6a 61 76 61 2f |rintln... (Ljava/|
00000180 6c 61 6e 67 2f 4f 62 6a 65 63 74 3b 29 56 0c 00 |lang/Object;)V..|
00000190 1a 00 1b 0a 00 19 00 1c 01 00 13 5b 4c 6a 61 76 |.....[Ljav|
000001a0 61 2f 6c 61 6e 67 2f 53 74 72 69 6e 67 3b 01 00 |a/lang/String;..|
```


Compiled from "HelloWorld.kt"

```
public final class _00_helloworld.HelloWorldKt {  
    public static final void main(java.lang.String[]);  
    Code:  
        0: aload_0  
        1: ldc          #9          // String args  
        3: invokestatic #15         // Method kotlin/jvm/internal/Intr  
        6: ldc          #17         // String Hello Devoxx  
        8: astore_1  
        9: getstatic    #23         // Field java/lang/System.out:Ljav  
       12: aload_1  
       13: invokevirtual #29         // Method java/io/PrintStream.prin  
       16: return  
}
```

```
package _00_helloworld;

import kotlin.Metadata;
import kotlin.jvm.internal.Intrinsics;
import org.jetbrains.annotations.NotNull;

@Metadata(
    mv = {1, 1, 9},
    bv = {1, 0, 2},
    k = 2,
    d1 = {"\u0000\u0012\n\u0000\n\u0002\u0010\u0002\n\u0000\u0000"},
    d2 = {"main", "", "args", "", "", "([Ljava/lang/String;)"}
)
public final class HelloWorldKt {
    public static final void main(@NotNull String[] args) {
        Intrinsics.checkNotNull(args, "args");
        String var1 = "Hello Devoxx";
        System.out.println(var1);
    }
}
```

- Kotlin ajoute des contrôles
- du coup on a besoin de JAR en plus

jar	taille
kotlin-runtime.jar	921K

| kotlin-reflect.jar | 2.5M |

- Performances ?

Les bases

val/var, Number, String

#19

null-safety

Fonction

Lambda

Class

Types

Extensions de fonction

Structure

Pause

ByteCode Android

Collection

Delegate

Plus sur les fonctions

Serialization

Coroutines

DSL

Conclusion

