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One Language, All Tiers:

Developing Multiplatform Projects in Kotlin



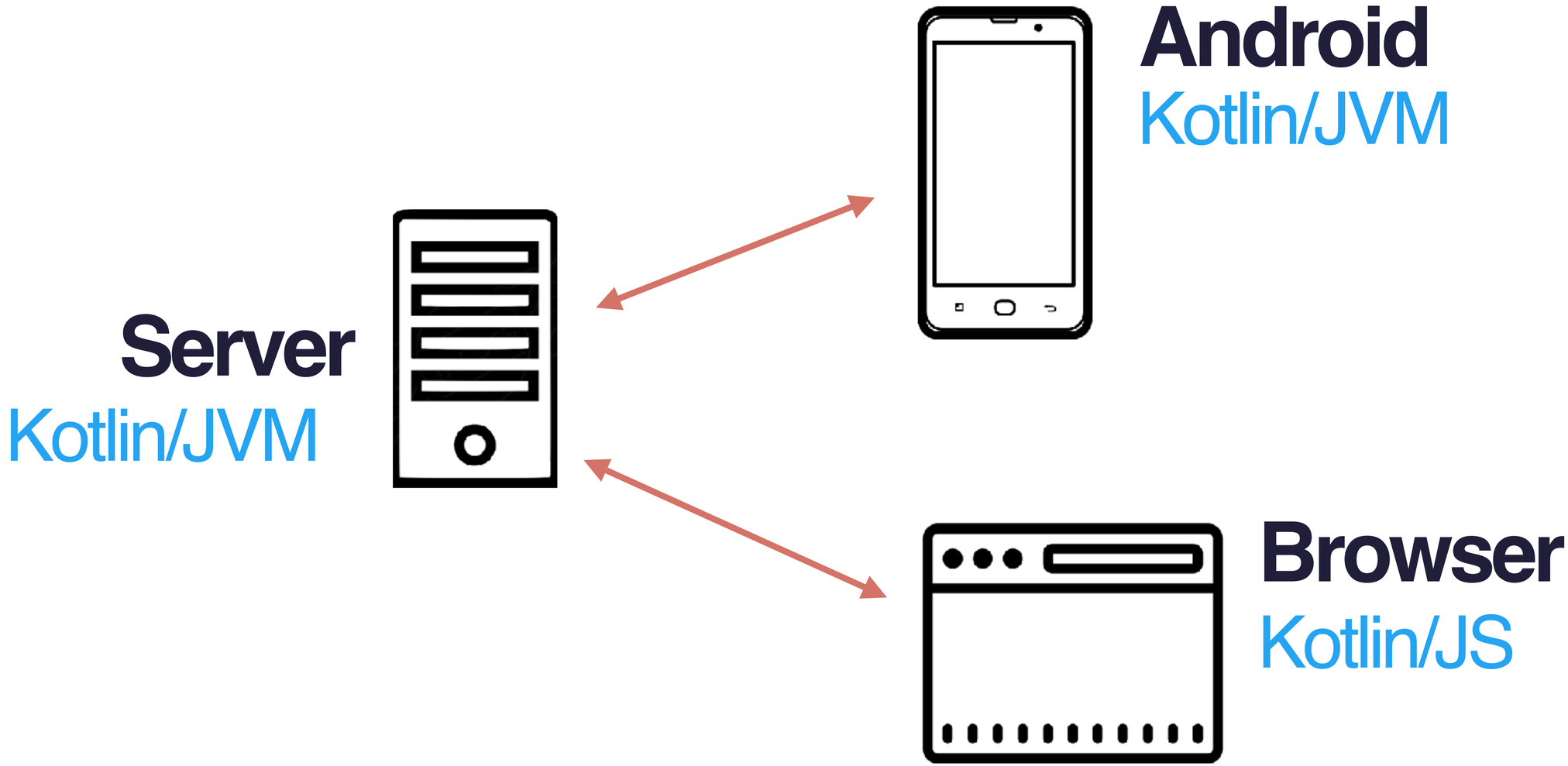
Dmitry Jemerov
@intelliyole

What is Kotlin

- Modern programming language
- Statically typed
- Concise, safe, pragmatic
- Interoperable
- ~~Targeting the JVM~~ Multiplatform



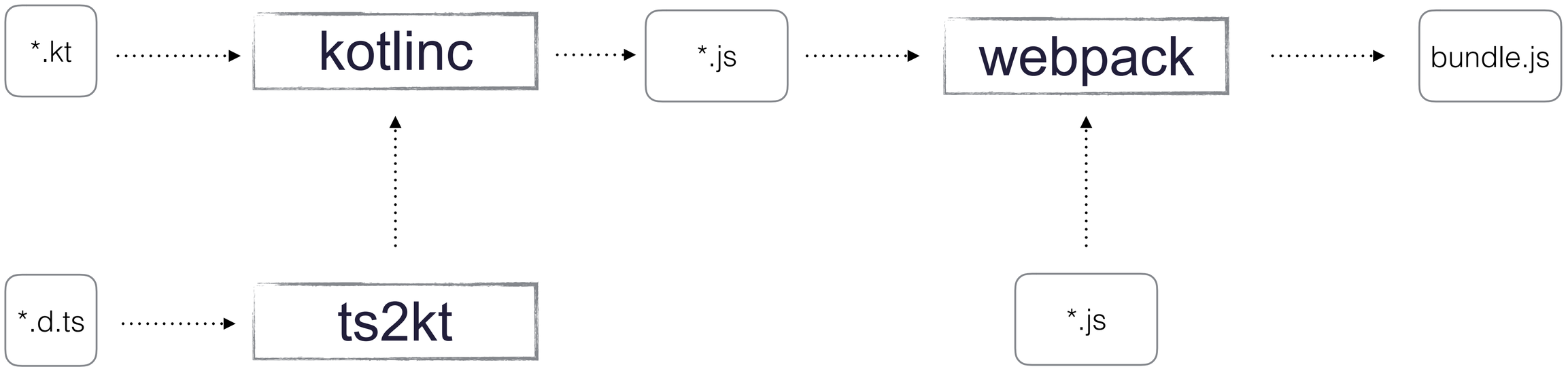
Kotlin/Anywhere



Kotlin/JS



Compiling a Kotlin/JS project



External declarations

```
external abstract class Window {
    val location: Location
    fun alert(message: String)
    // ...
}

external val window: Window
```

dynamic type

```
val response: dynamic = loadJson("example.com/api")
val text = response.messages[0].text
```

React support

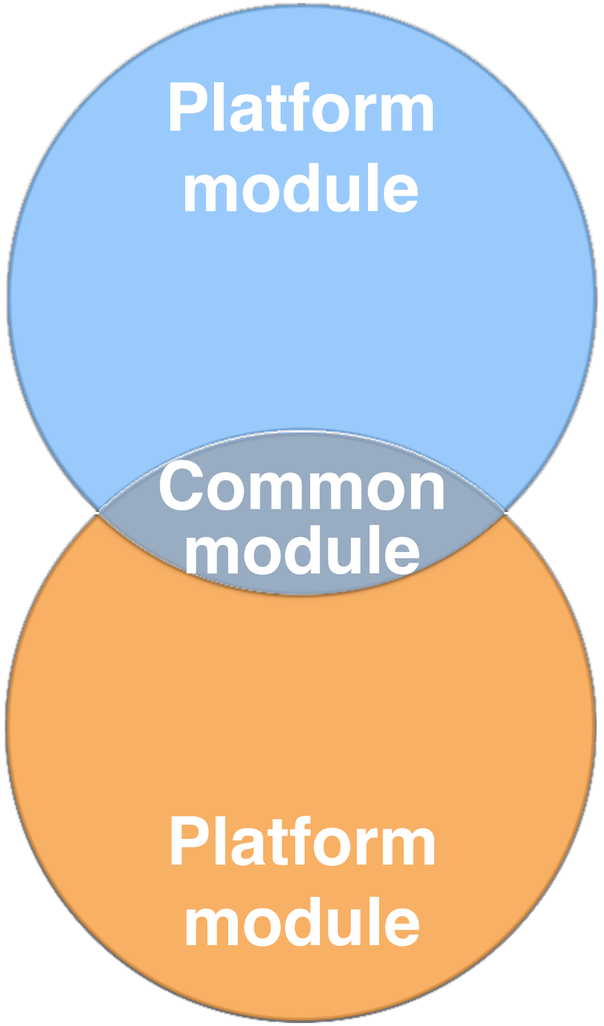
- Official bindings for react
  - https://github.com/jetbrains/kotlin-wrappers
- CLI tool to create React application
  - npm install -g create-react-kotlin-app
  - create-react-kotlin-app my-app

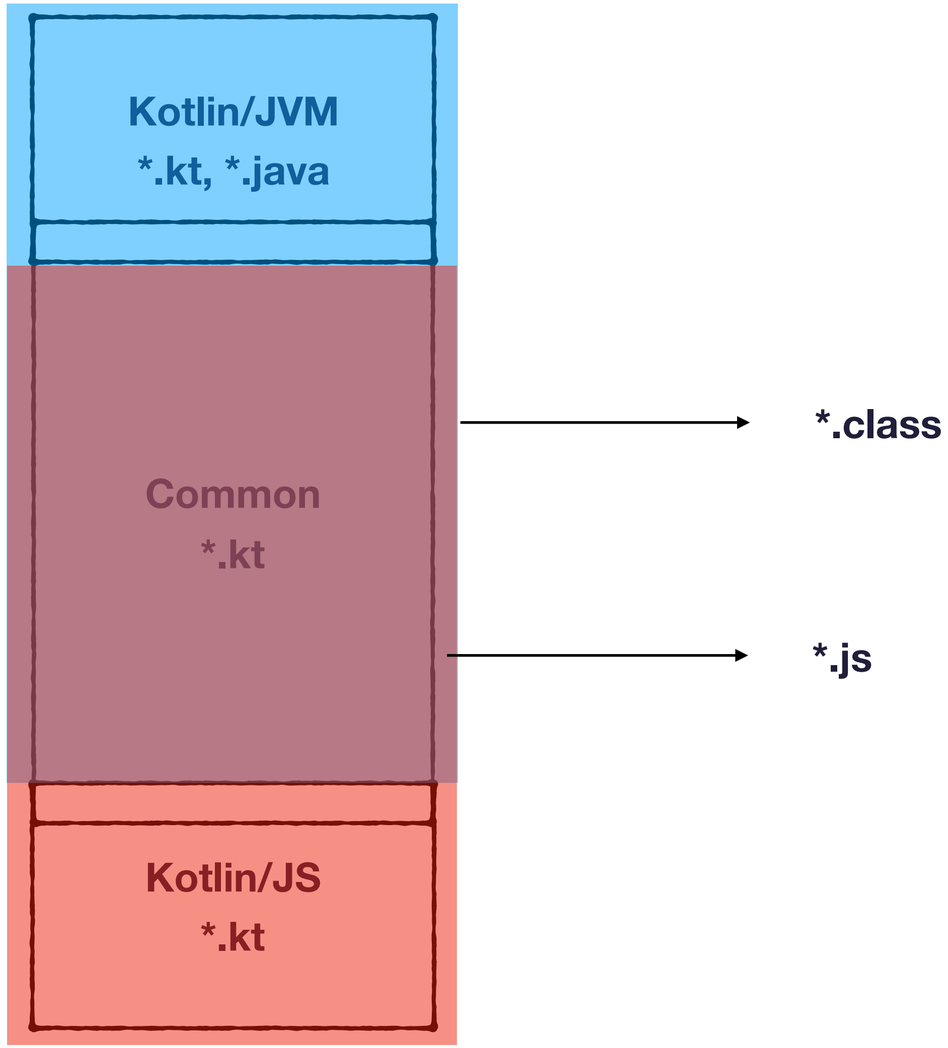
kotlin-frontend-plugin

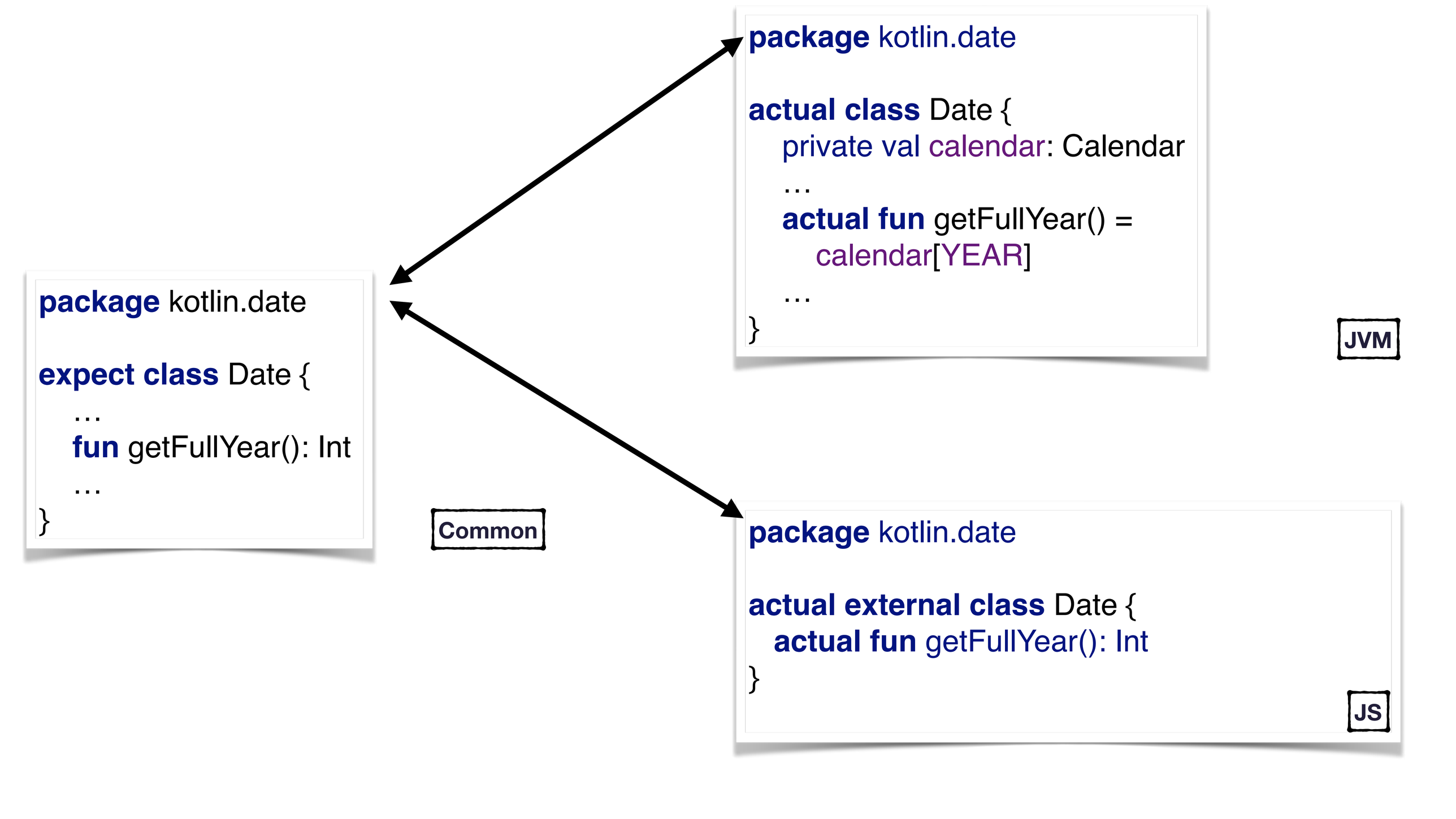
- Download JS dependencies from npm
- Create bundle using webpack
- Run tests using Karma
- Hot reload of changes

Multiplatform projects




Platform module
Common module
Platform module


Kotlin/JVM
*.kt, *.java
Common
*.kt
Kotlin/JS
*.kt
*.class
*.js


package kotlin.date
expect class Date {
…
fun getFullYear(): Int
…
}
Common
package kotlin.date
actual class Date {
private val calendar: Calendar
…
actual fun getFullYear() =
calendar[YEAR]
…
}
JVM
package kotlin.date
actual external class Date {
actual fun getFullYear(): Int
}
JS

```
package kotlin.date

expect class Date {
    …
    fun getFullYear(): Int
    …
}
```

```
fun isSameDay(from: Date, to: Date) =
    from.getFullYear() == to.getFullYear() && ...
```

Common

Why not interfaces?

```
expect class Date {
    constructor(value: Number)
}

expect fun parseDate(dateString: String): Date

expect fun Date.toReadableDateString(): String
```

Common

Reusing existing implementations

```
package kotlin.test

expect annotation class Test()
```

Common

```
package kotlin.test

actual typealias Test = org.junit.Test
```

JVM

Building a common module

```
apply plugin: 'kotlin-platform-common'

dependencies {
  compile "org.jetbrains.kotlin:kotlin-stdlib-common:$version"
}
```

Common

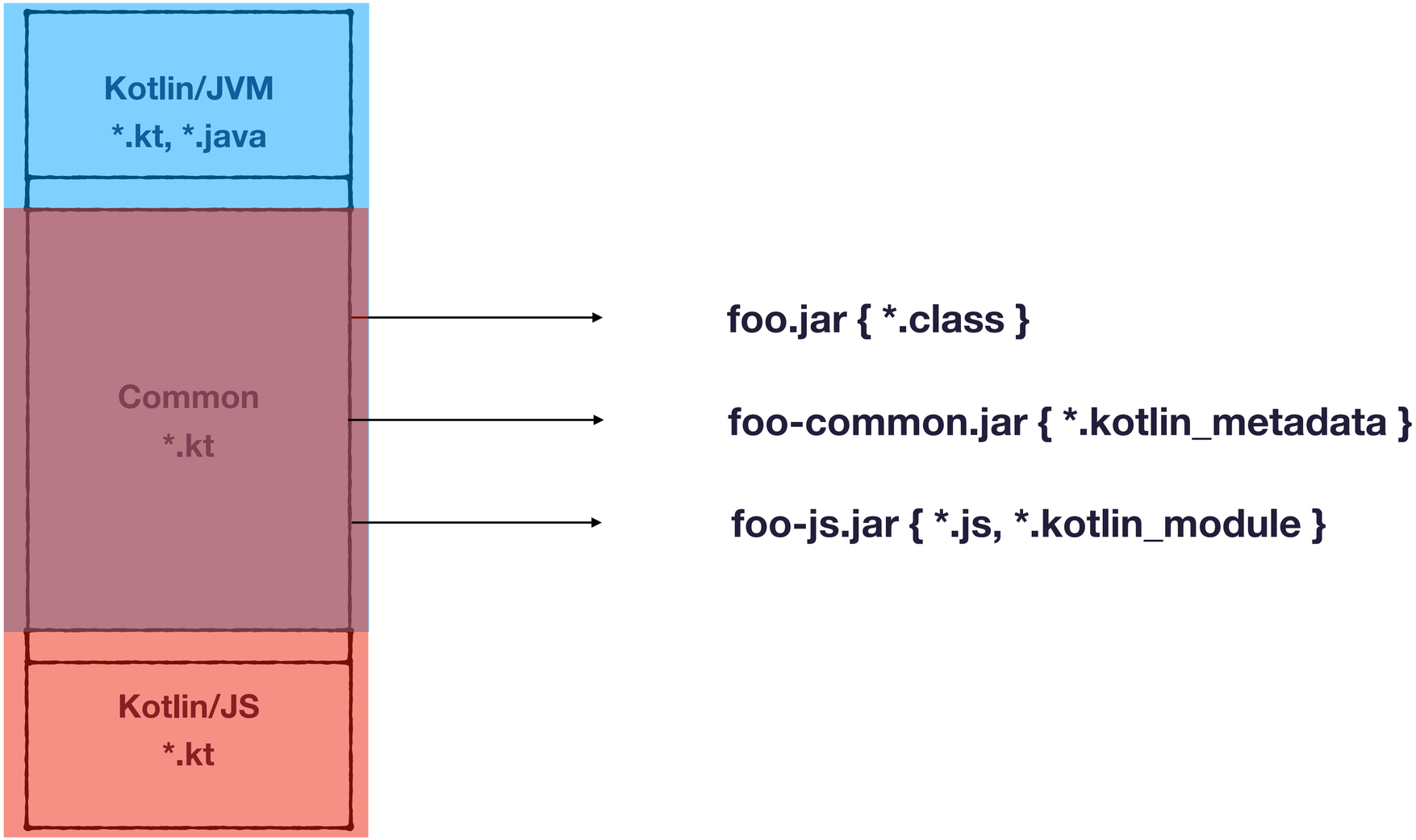
Building a platform module

```
apply plugin: 'kotlin-platform-jvm'

dependencies {
   compile "org.jetbrains.kotlin:kotlin-stdlib-jre8:$version"
   expectedBy project(":konf-common")
}
```



Common Libraries



Multiplatform libraries



Standard library

- Strings
- Collections
- Higher-order utility functions (with, apply etc.)
- Exceptions

kotlin.test

```
import kotlin.test.Test
import kotlin.test.assertEquals

class DateTest {
    @Test fun testParse() {
        val date = parseDate("2017-11-02")
        assertEquals(2017, date.getFullYear())
    }
}
```

kotlinx.html

```
div {
    a("http://kotlinlang.org") {
        target = ATarget.blank
        +"Main site"
    }
}
```

kotlinx.html

```
div {
    aNewWindow("http://kotlinlang.org") {
        +"Main site"
    }
}
```

kotlinx.serialization

- @Serializable
- Compiler plugin to generate serialization calls (no reflection)
- JSON and ProtoBuf support

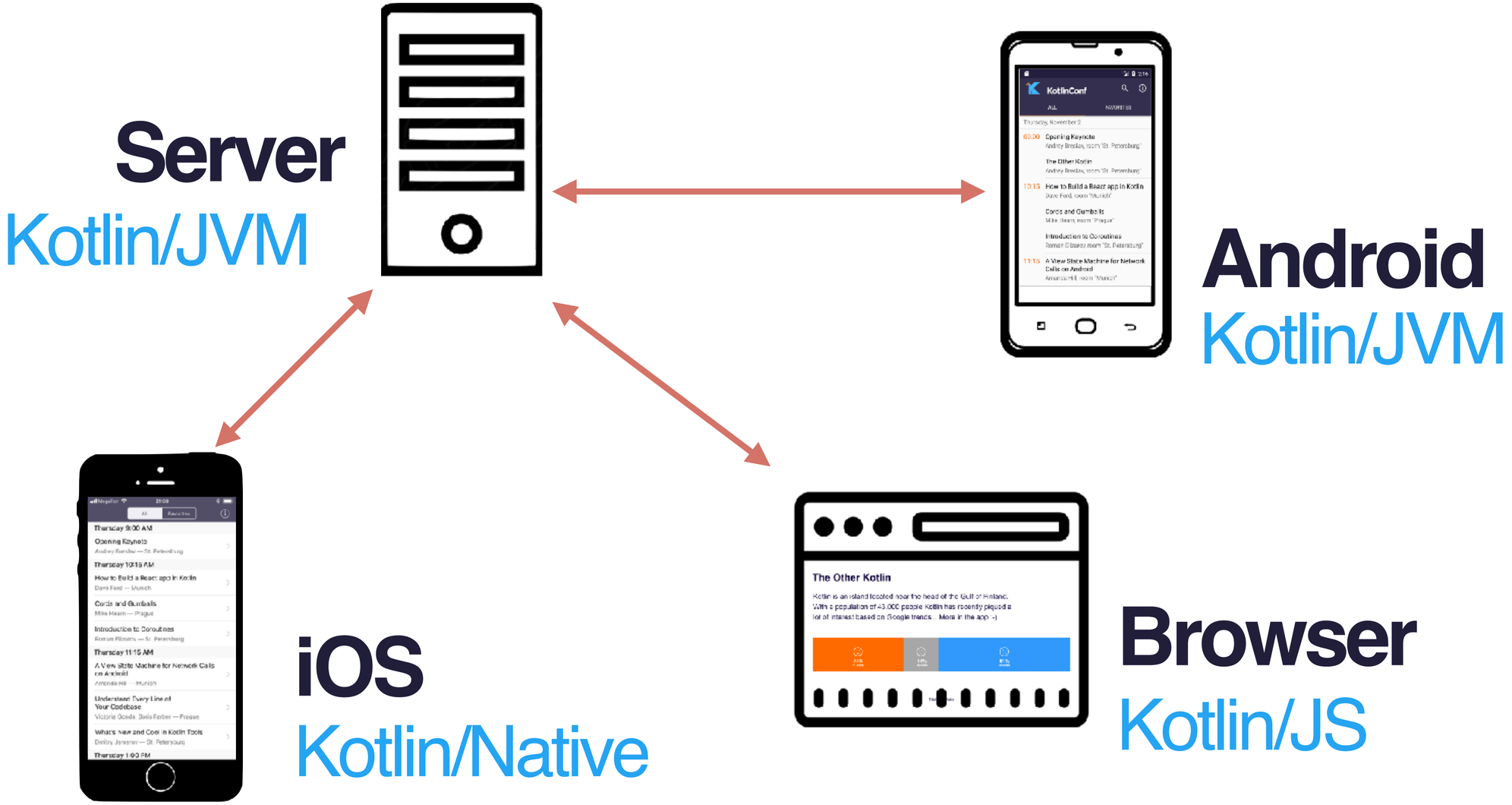
Future plans

- I/O
- Networking (TCP, HTTP etc.)
- Dates
- …more?

DEMO

Kotlin/Native




Server
Kotlin/JVM
Android
Kotlin/JVM
iOS
Kotlin/Native
Browser
Kotlin/JS
KotlinConf
The Other Kotlin

iOS app

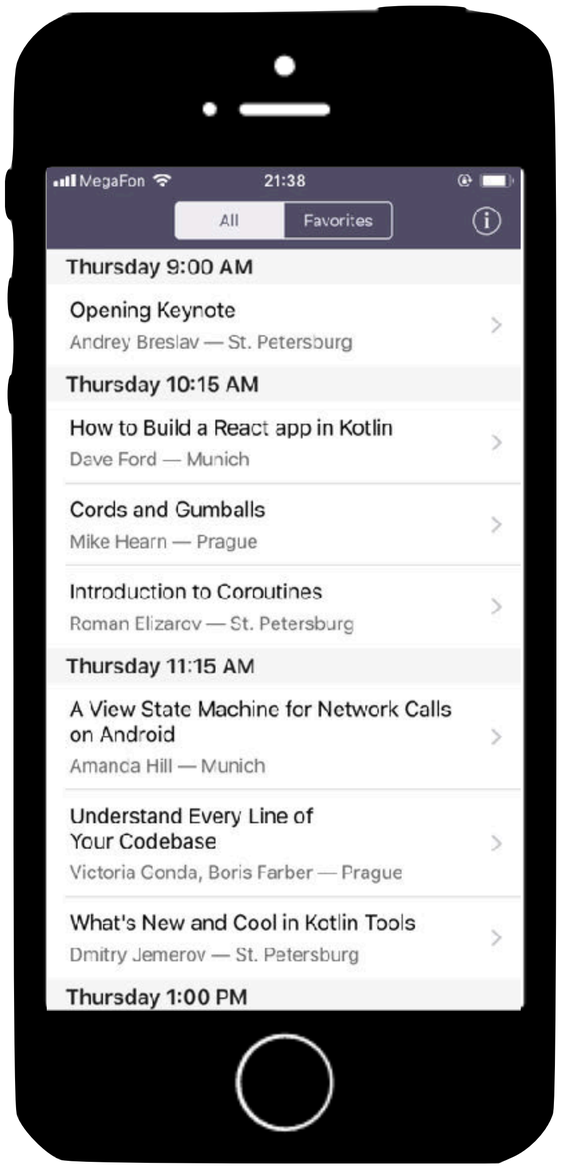
LLVM-based toolchain



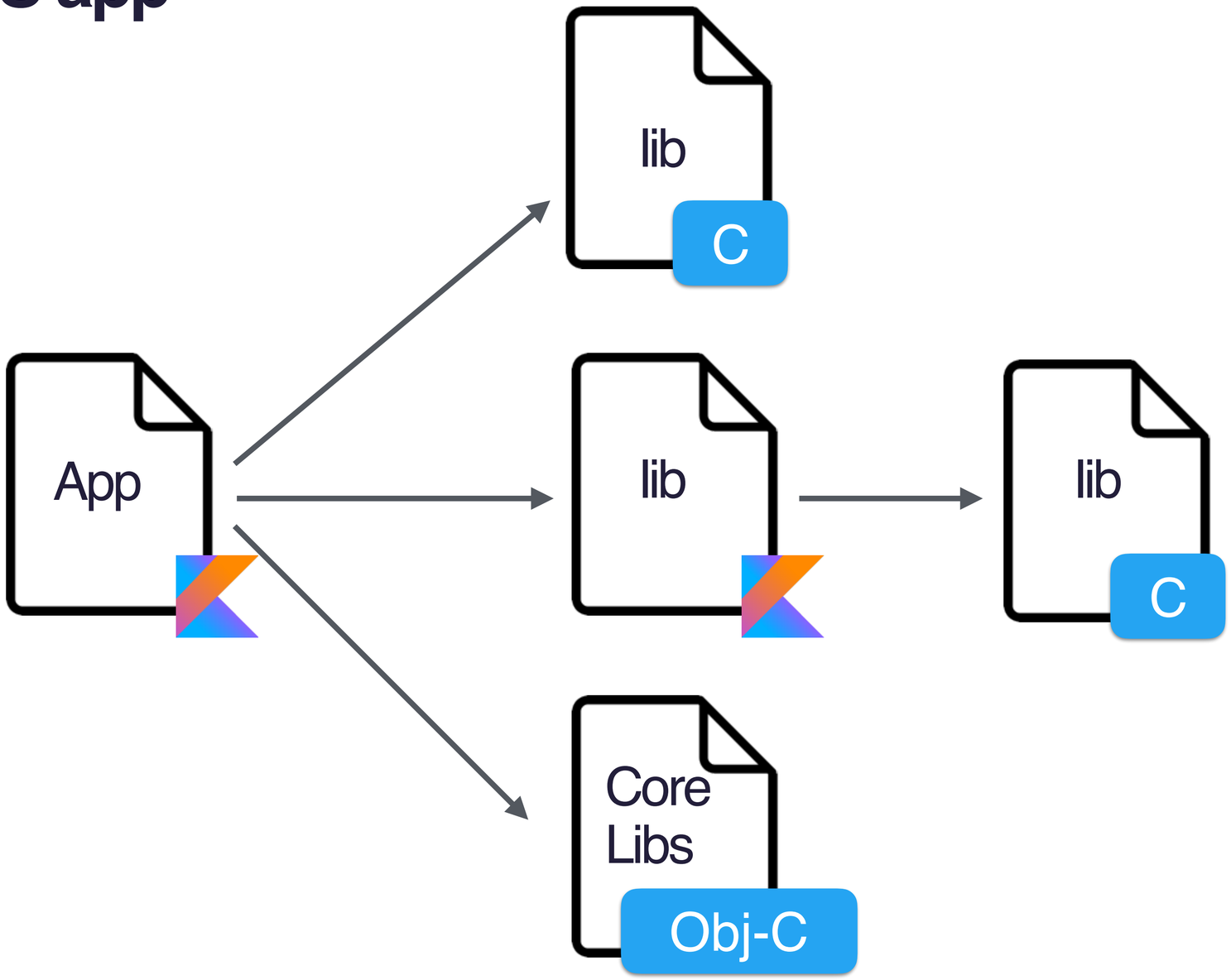


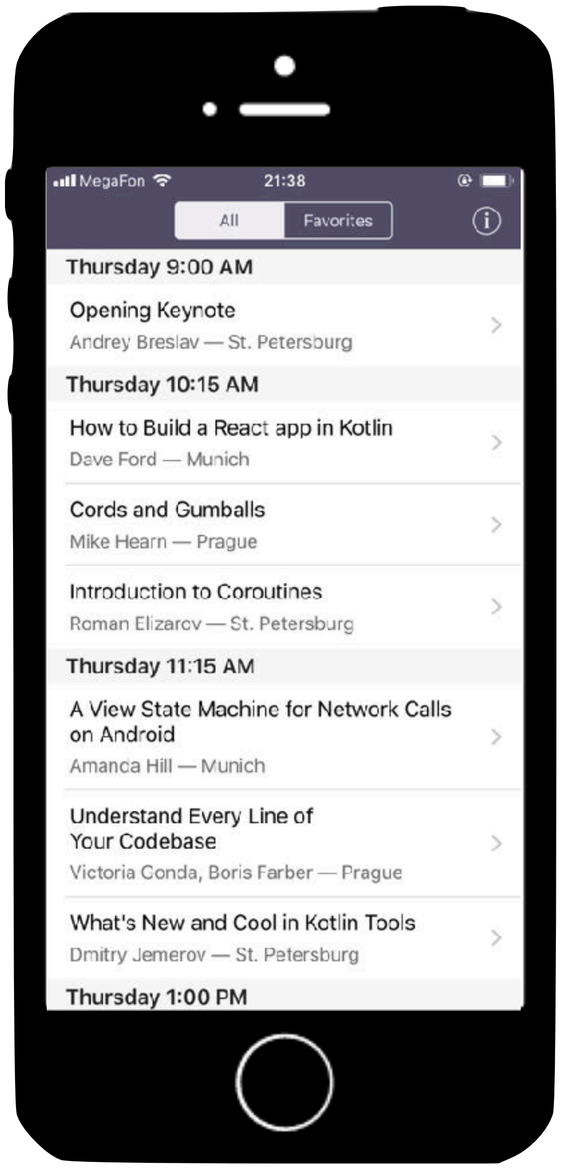
LLVM

Native Binary



iOS app

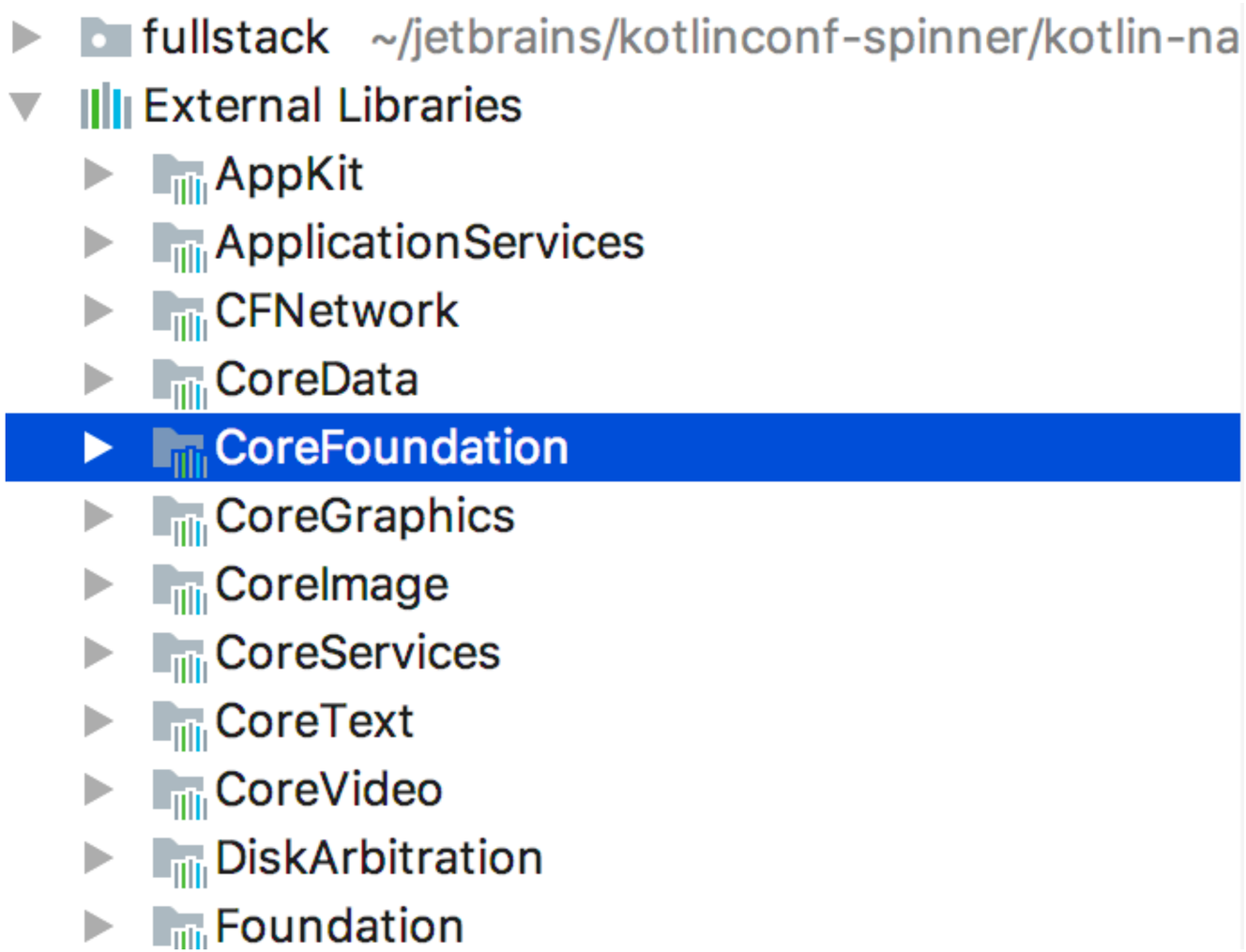

lib
C
App
lib
lib
C
Core
Libs
Obj-C


MegaFon
21:38
All
Favorites
Thursday 9:00 AM
Opening Keynote
Andrey Breslav — St. Petersburg
Thursday 10:15 AM
How to Build a React app in Kotlin
Dave Ford — Munich
Cords and Gumballs
Mike Hearn — Prague
Introduction to Coroutines
Roman Elizarov — St. Petersburg
Thursday 11:15 AM
A View State Machine for Network Calls on Android
Amanda Hill — Munich
Understand Every Line of Your Codebase
Victoria Gonda, Boris Farber — Prague
What's New and Cool in Kotlin Tools
Dmitry Jemerov — St. Petersburg
Thursday 1:00 PM

cinterop

- Clang-based tool to generate Kotlin metadata from C header files
- Supports all C types: strings, pointers, structs, callbacks
- Supports Objective-C types

iOS libraries



iOS libraries

```
fun showGameCenter() {
  val gkViewController = GKGameCenterViewController().apply {
    gameCenterDelegate = this@ViewController
    viewState = GKGameCenterViewControllerStateLeaderboards
    leaderboardTimeScope = GKLeaderboardTimeScopeToday
    leaderboardCategory = "main"
  }

  this.presentViewController(gkViewController,
        animated = true, completion = null)
}
```

Kotlin/Native Memory management

- Reference counting + cycle collector
- No shared memory between threads
- Still under design; final version likely to be different

Kotlin/Native Target Platforms

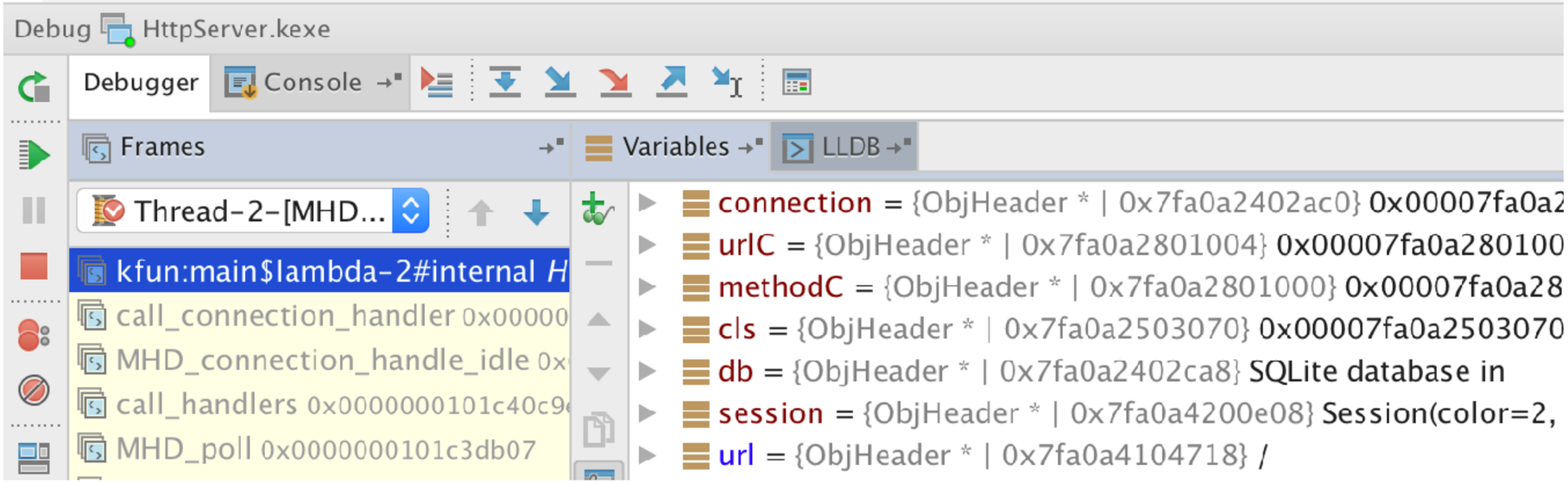
- Windows, Linux, macOS
- iOS, Android
- WebAssembly
- Embedded?

Tooling

- Plugin for CLion
- All features of regular Kotlin plugin
- Debugger
- Test runner

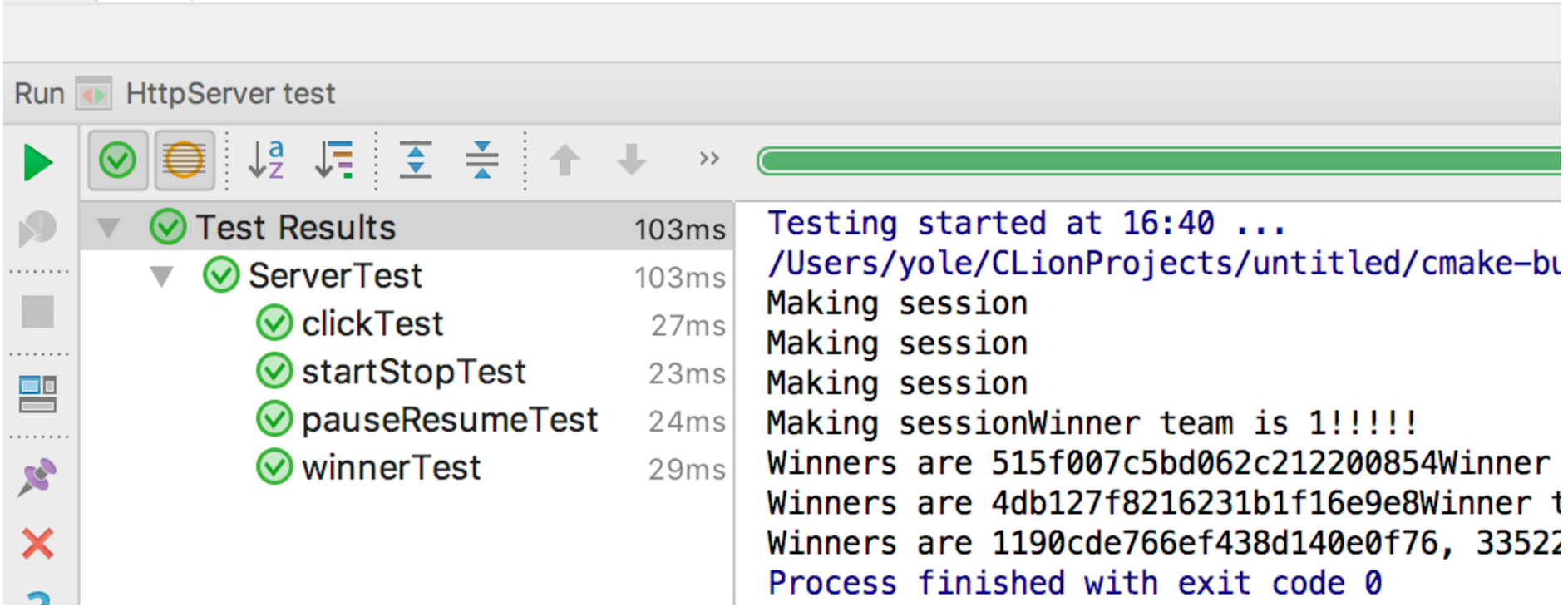
Tooling

```
try {
    val db = KSqlite(cls)  db: SQLite database in
    val session = initSession(connection, db)  session: Session(color=2, name=Unknown, coo
    val url = urlC?.toKString() ?: ""  url: /
    val method = methodC?.toKString() ?: ""
    val machine = MHD_lookup_connection_value(connection, MHD_GET_ARGUMENT_KIND, key: "mac
    val userAgent = MHD_lookup_connection_value(connection, MHD_HEADER_KIND, key: "User-Ag
    println("Connection to $url method $method from $machine agent $userAgent")
    if (method != "GET") return@staticCFunction MHD_NO
    val (contentType, responseArray) = makeResponse(db, url, session)
```



Tooling

```
@Test
fun clickTest() = withSqlite(DB_PATH) { db ->
    val admin = makeSession( name: "root",  password: "root", db)
    val json = KJsonObject()
    start(db, admin, json)
```



Summary

- Kotlin's goal is to allow you to write all parts of your app in the same language
- Full interoperability on every supported platform
- Shared business logic, platform-specific UI
- JVM/JS code reuse available today, native coming soon

To learn more

- http://kotlinlang.org/
- http://blog.jetbrains.com/kotlin
- http://slack.kotlinlang.org/
- "Kotlin in Action" book

Thank you!



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@intelliyole

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