

The Wider Java Ecosystem

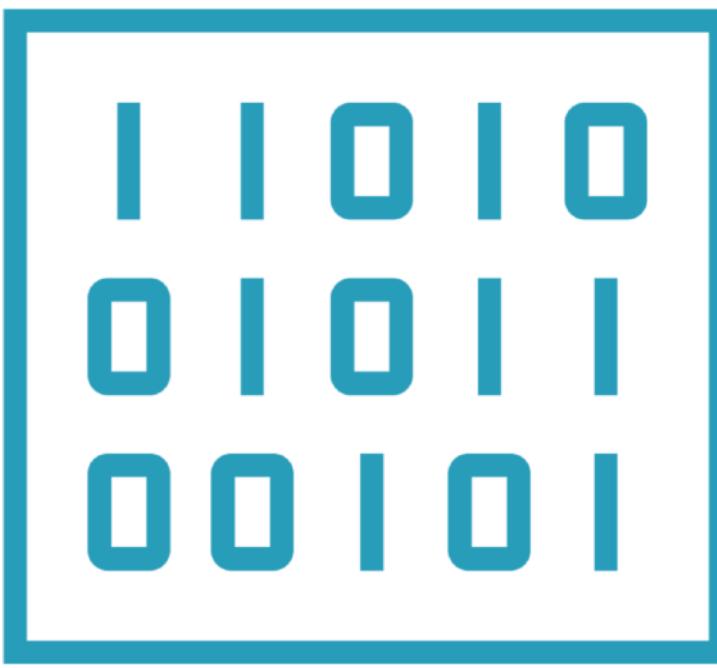


Sander Mak
Java Champion

@Sander_Mak

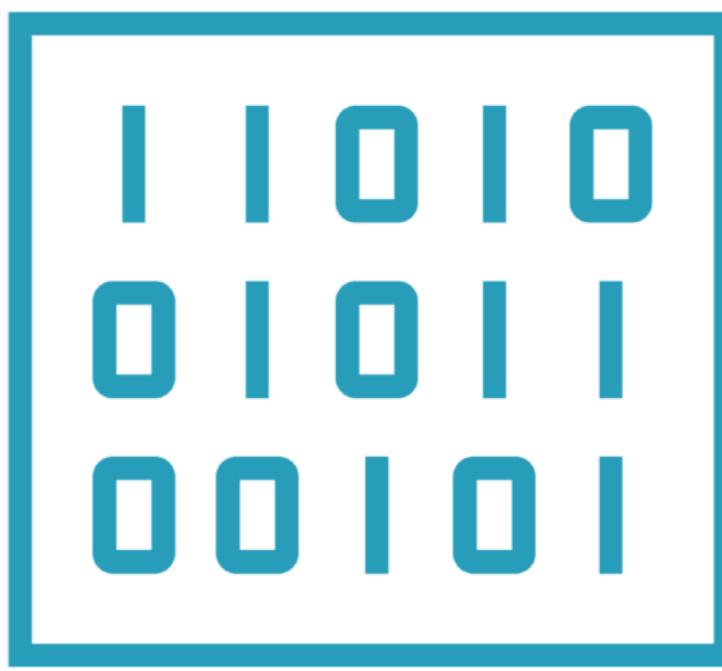
The Wider Java Ecosystem

The Wider Java Ecosystem



Libraries

The Wider Java Ecosystem

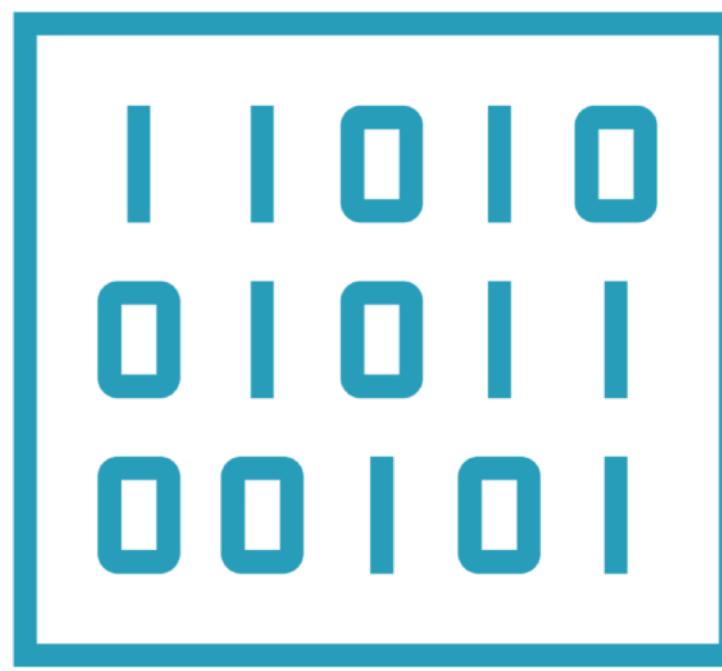


Libraries



Tools

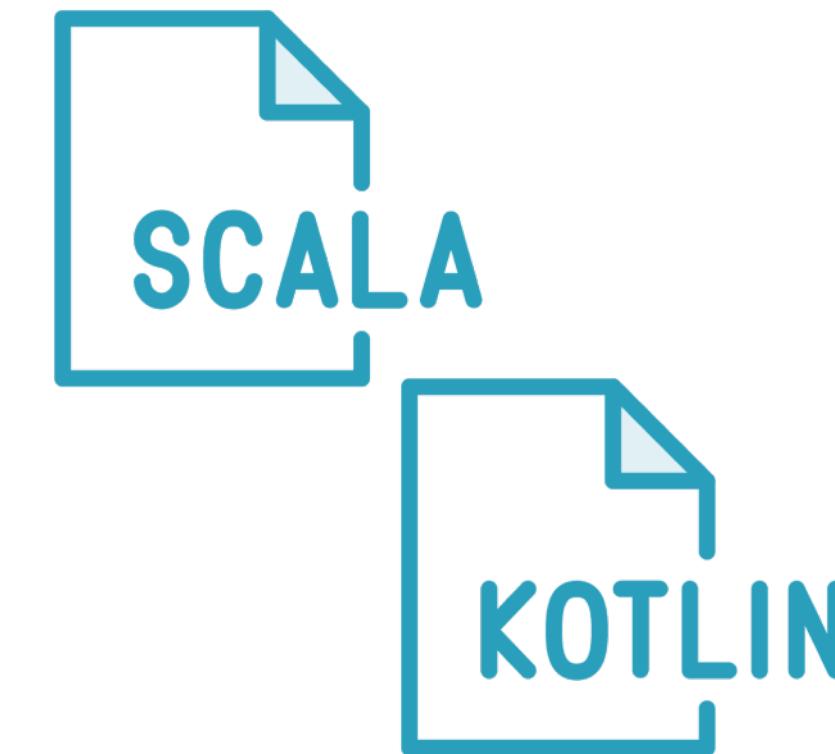
The Wider Java Ecosystem



Libraries



Tools

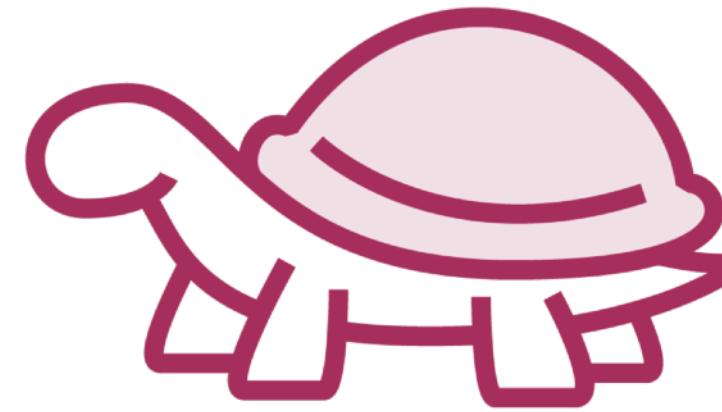
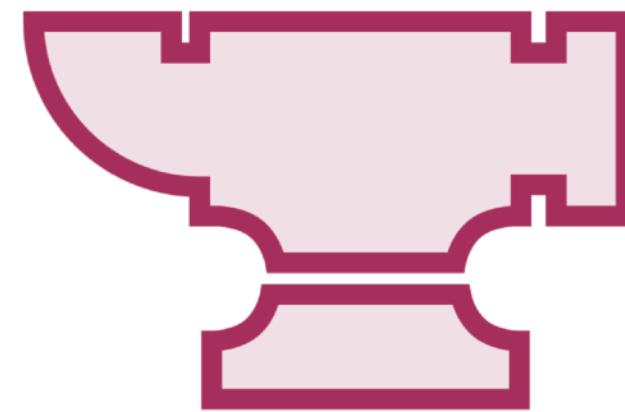


Languages

Spring Framework

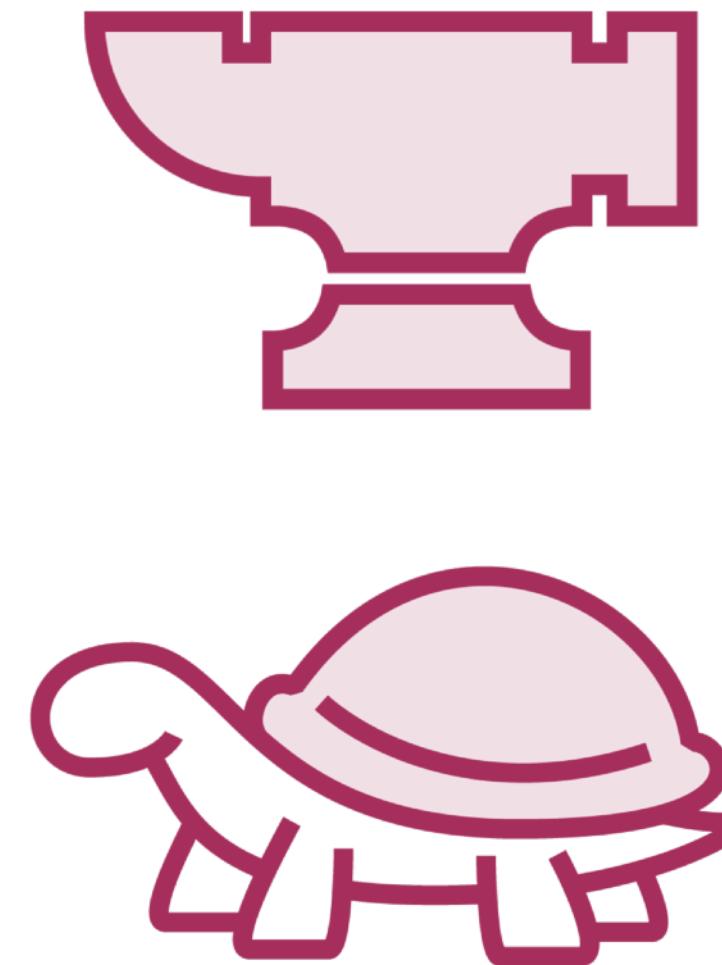
Spring Framework

Perception of Java EE



Spring Framework

Perception of Java EE



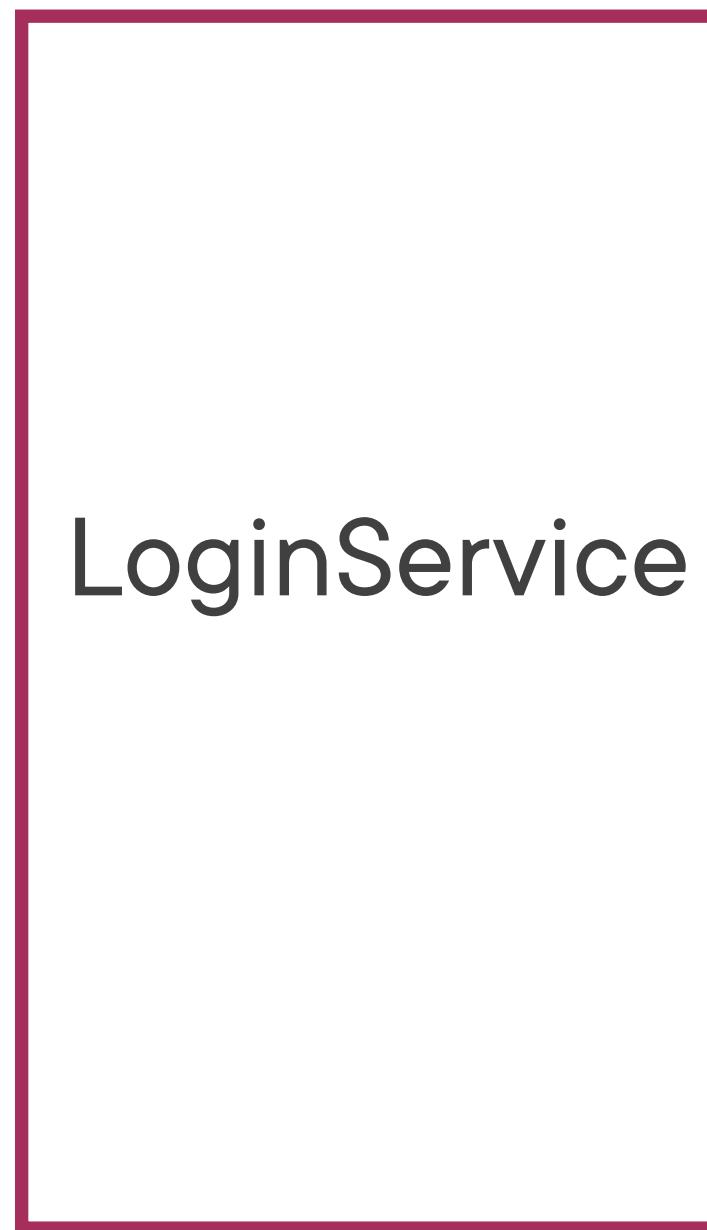
Spring as challenger



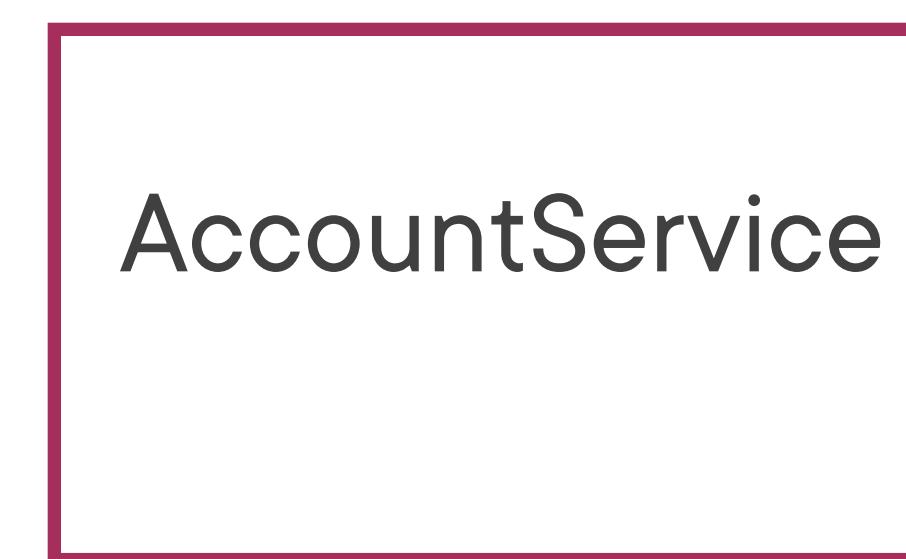
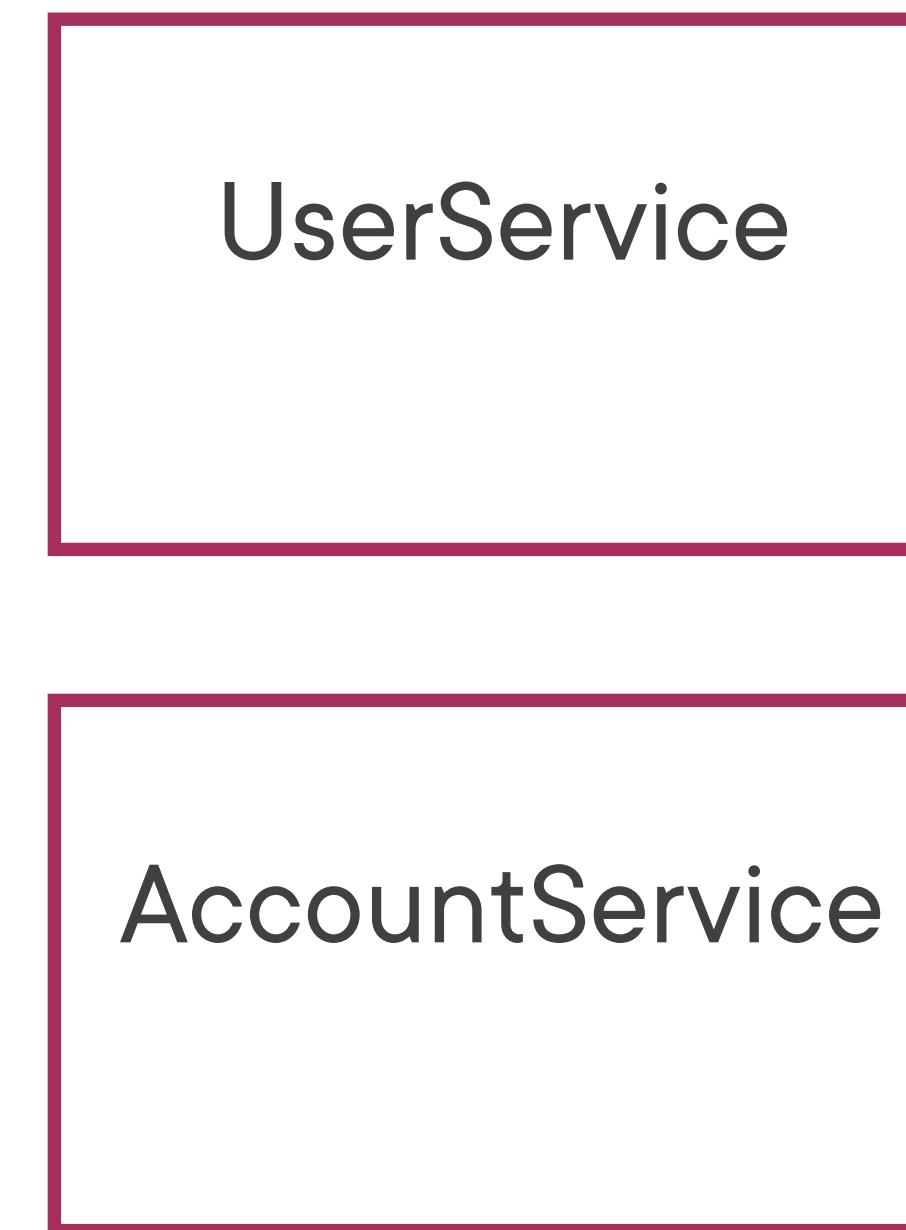
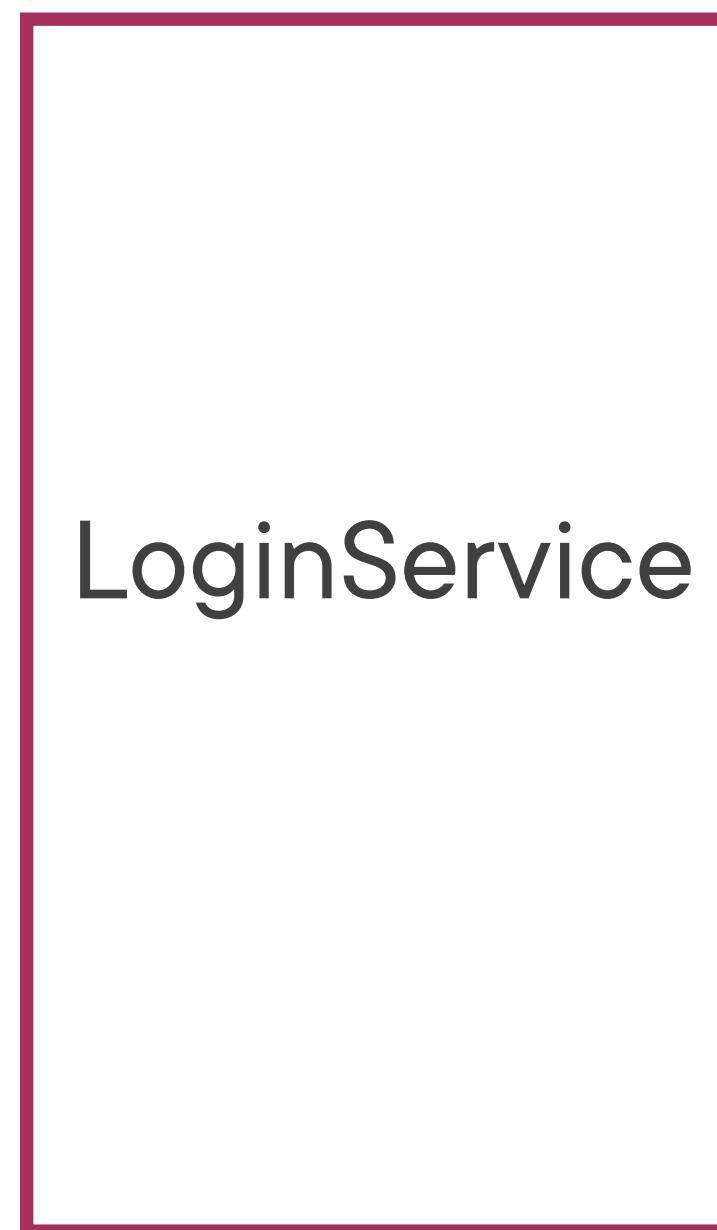
Spring: Dependency Injection



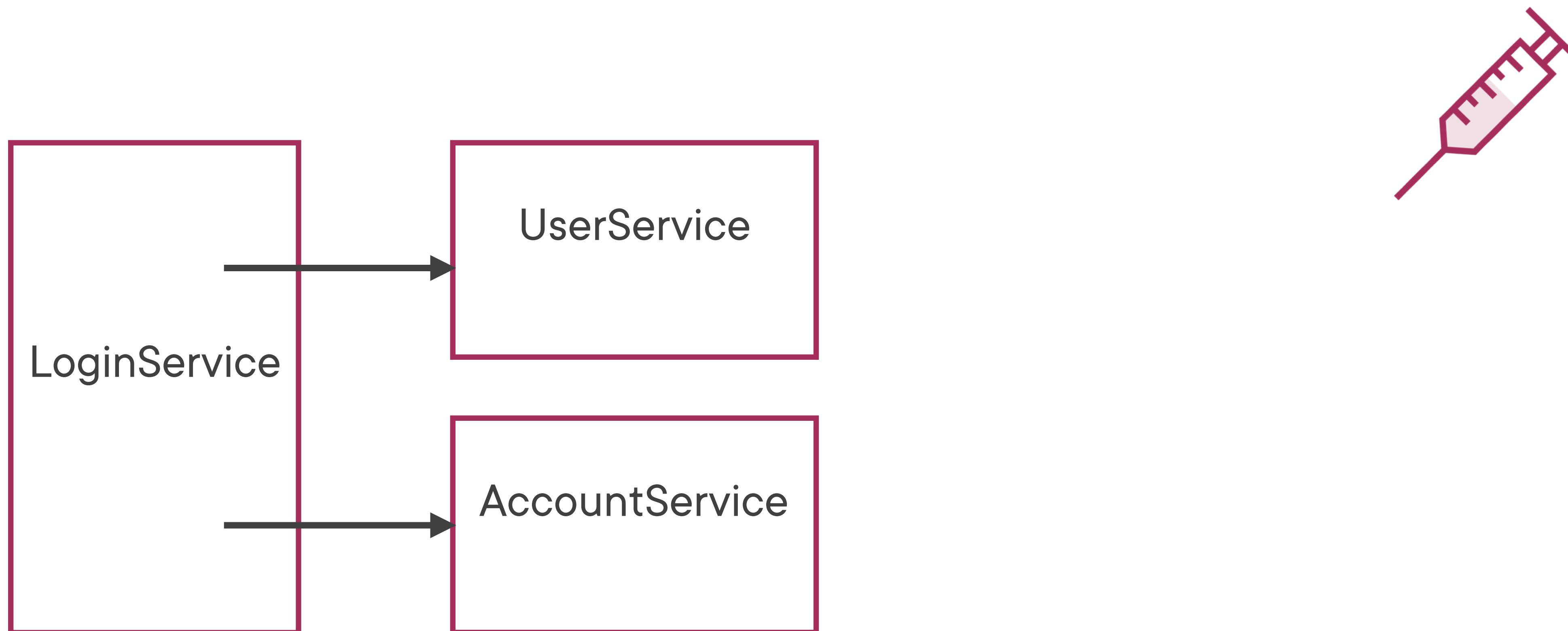
Spring: Dependency Injection



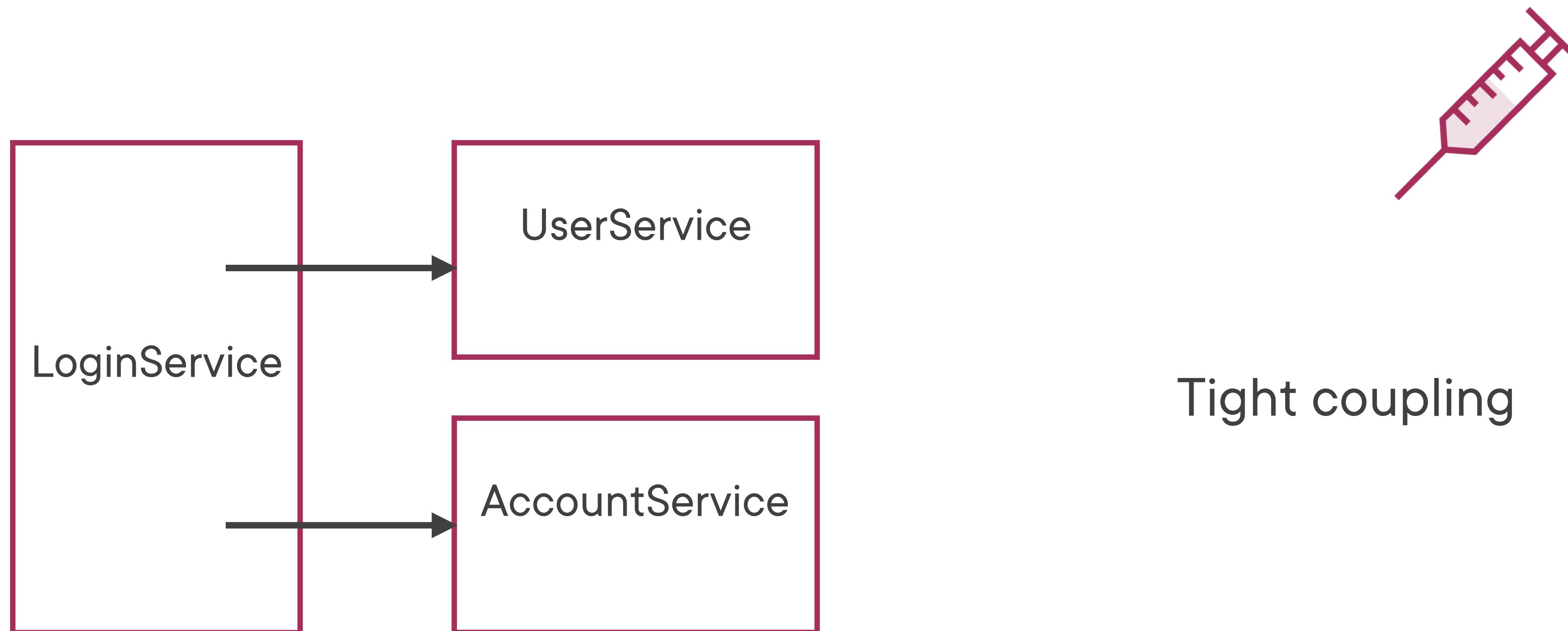
Spring: Dependency Injection



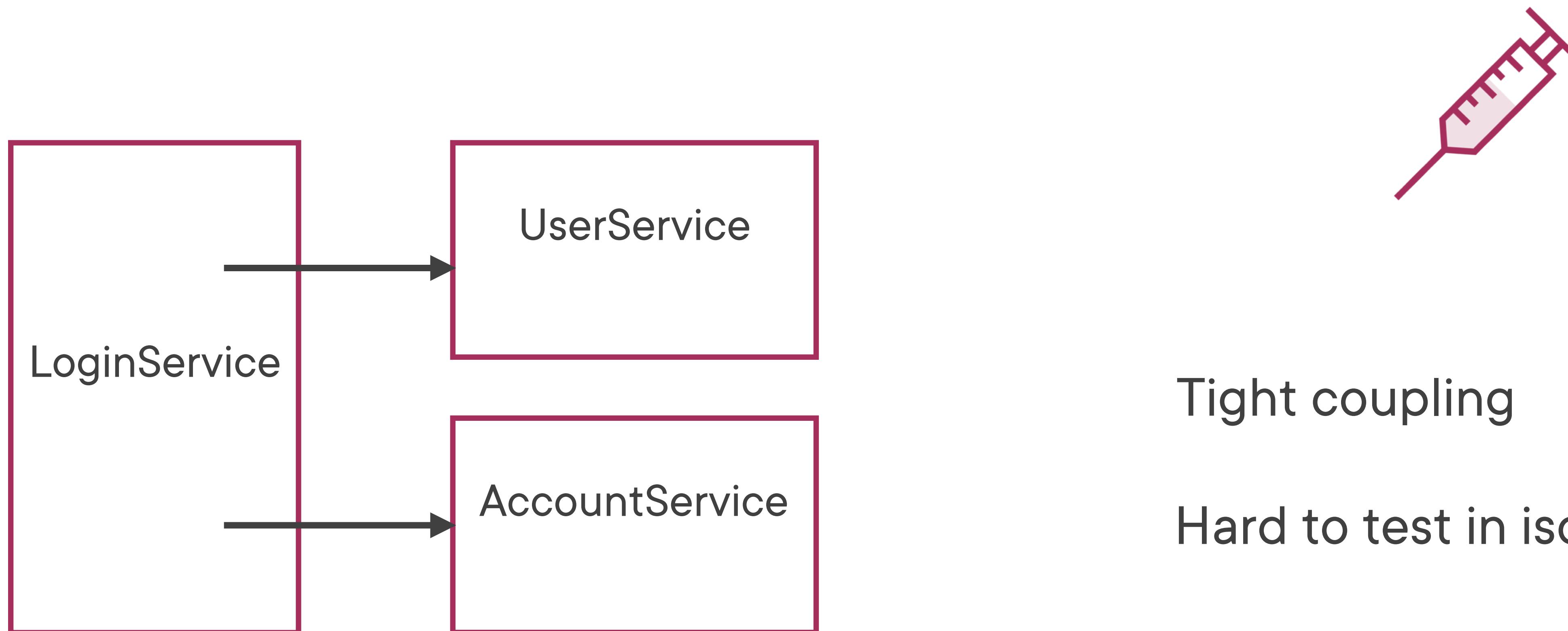
Spring: Dependency Injection



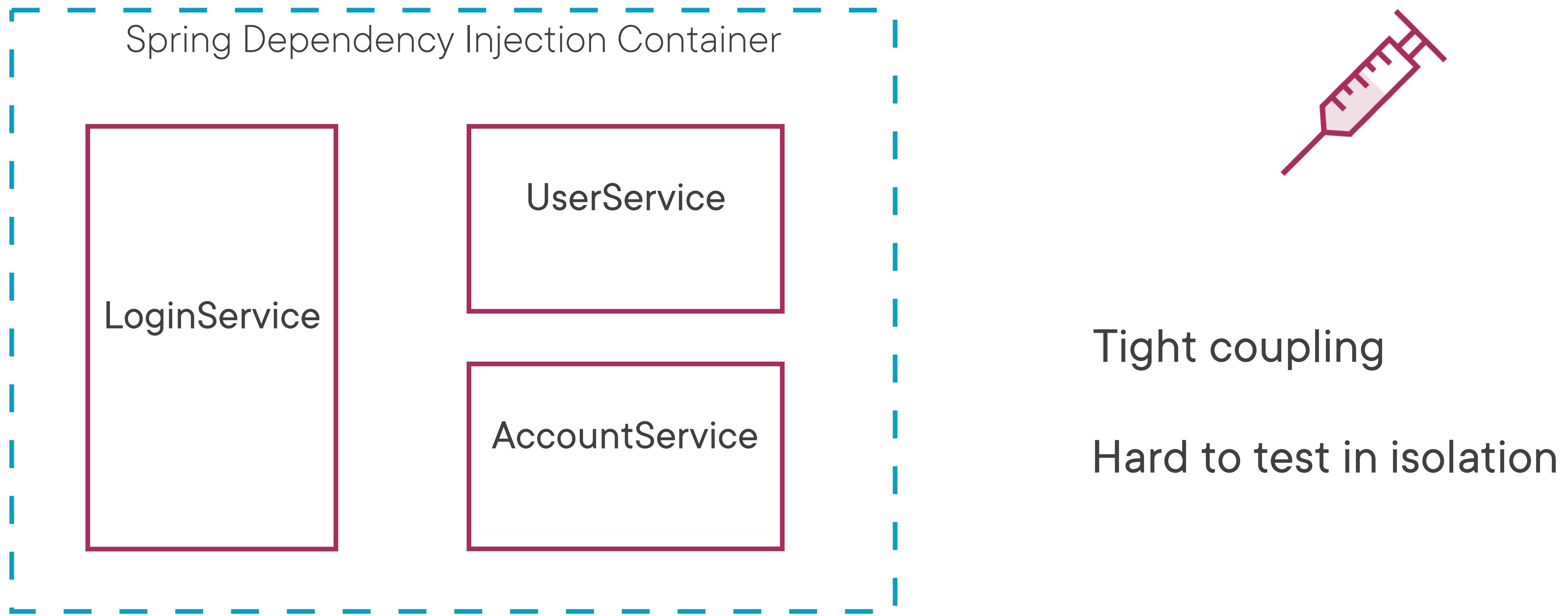
Spring: Dependency Injection



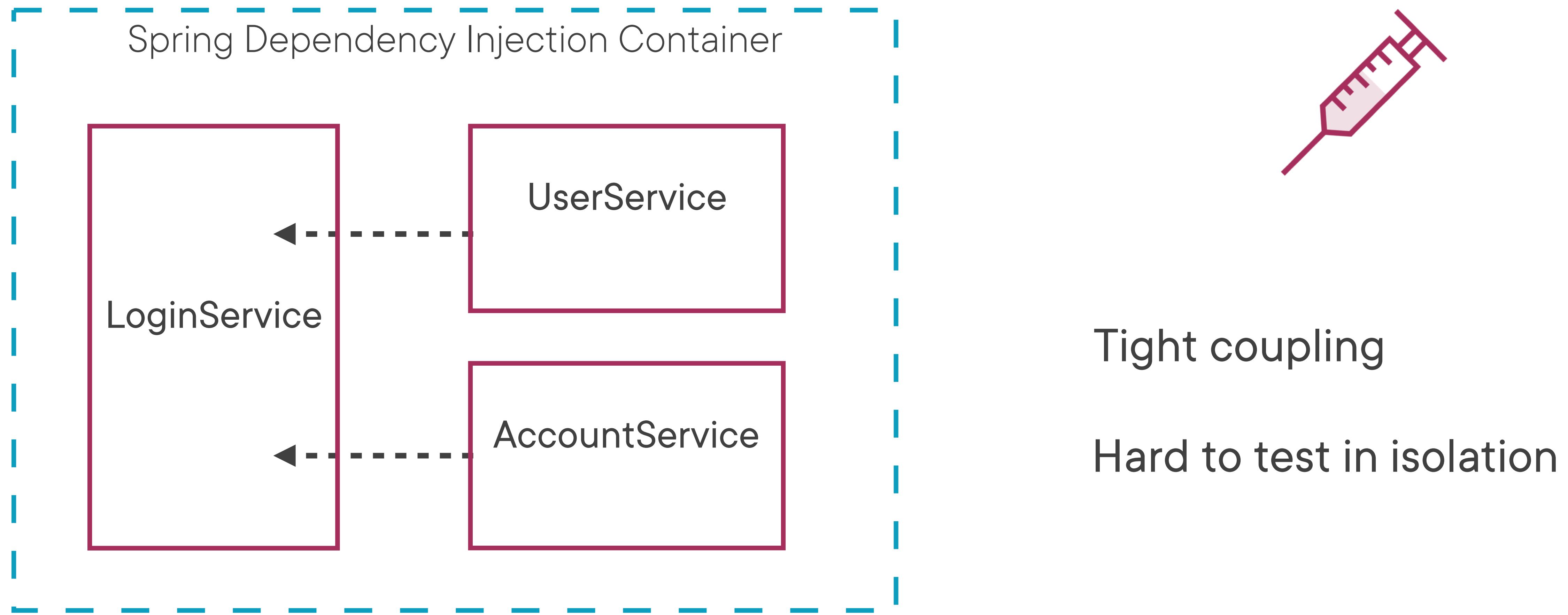
Spring: Dependency Injection



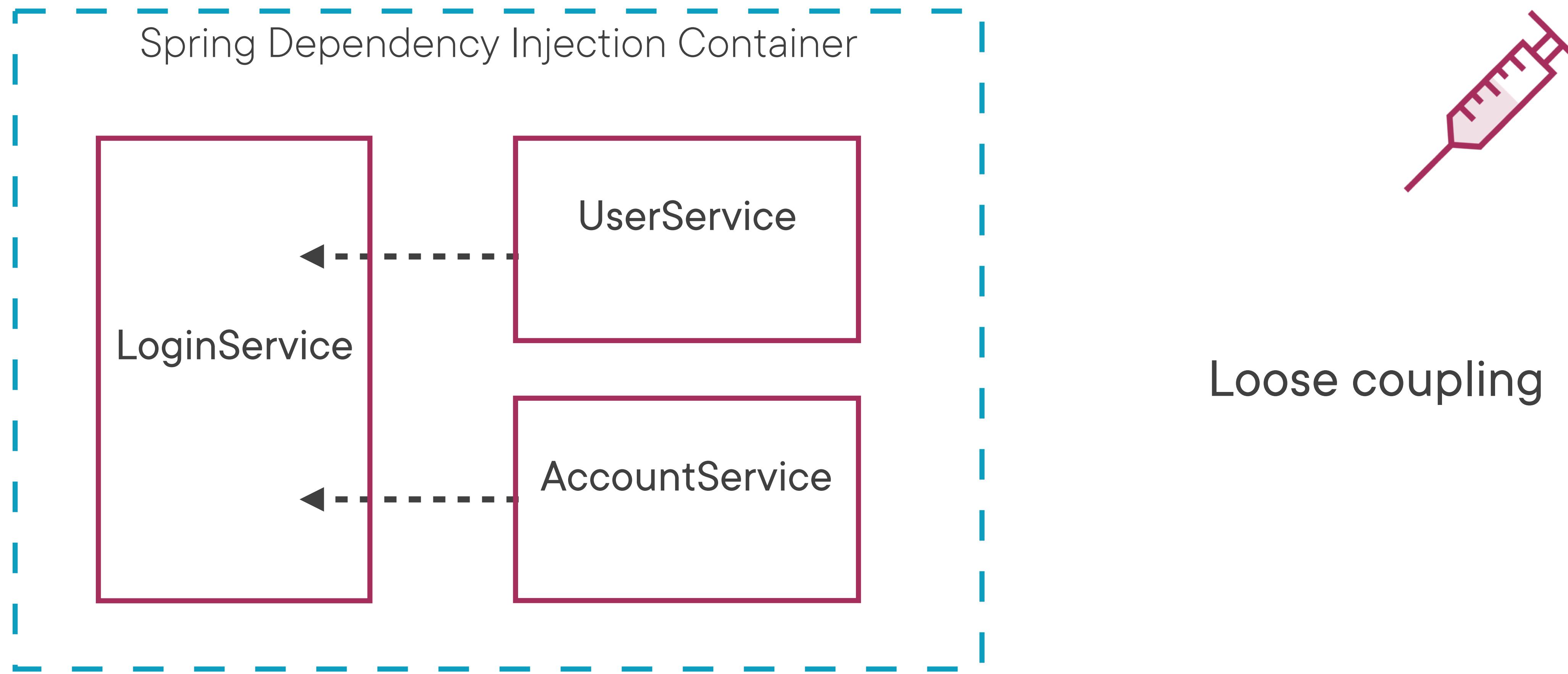
Spring: Dependency Injection



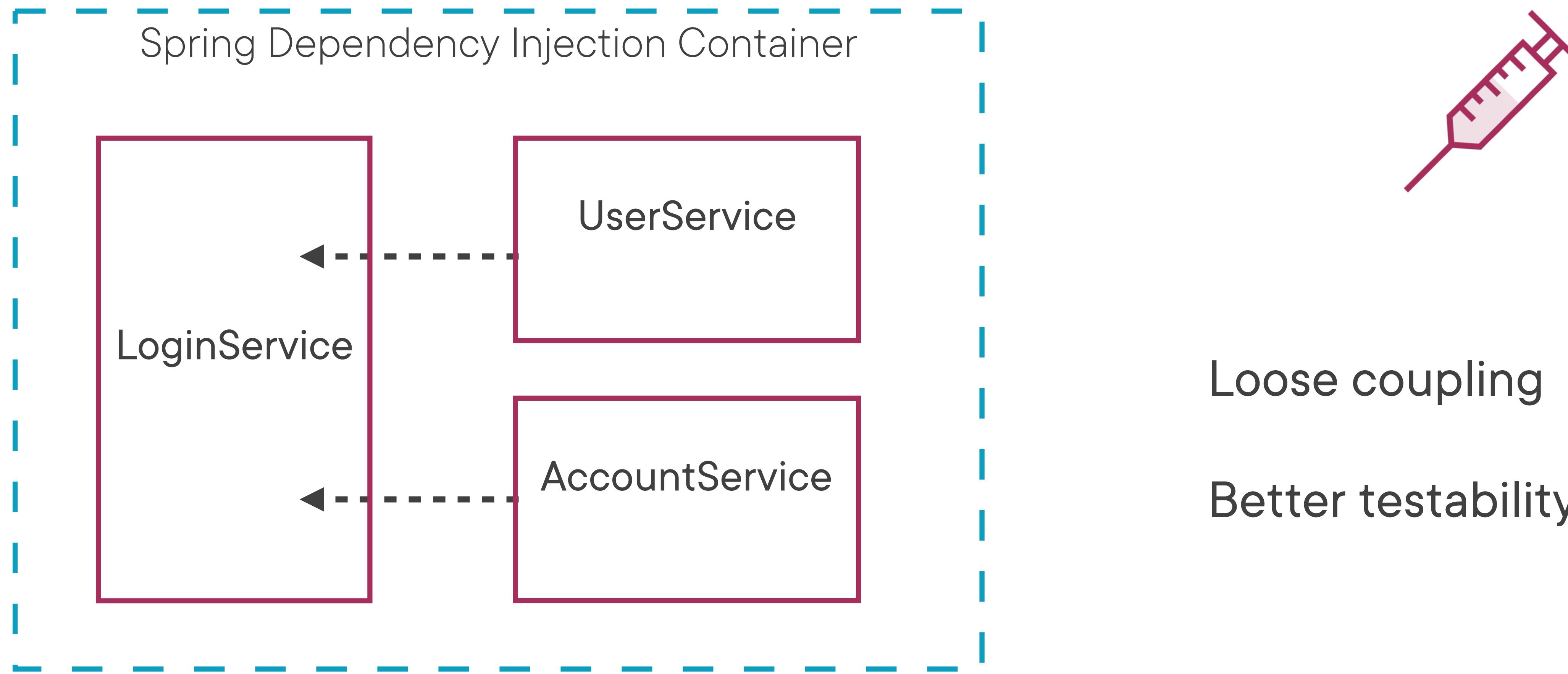
Spring: Dependency Injection



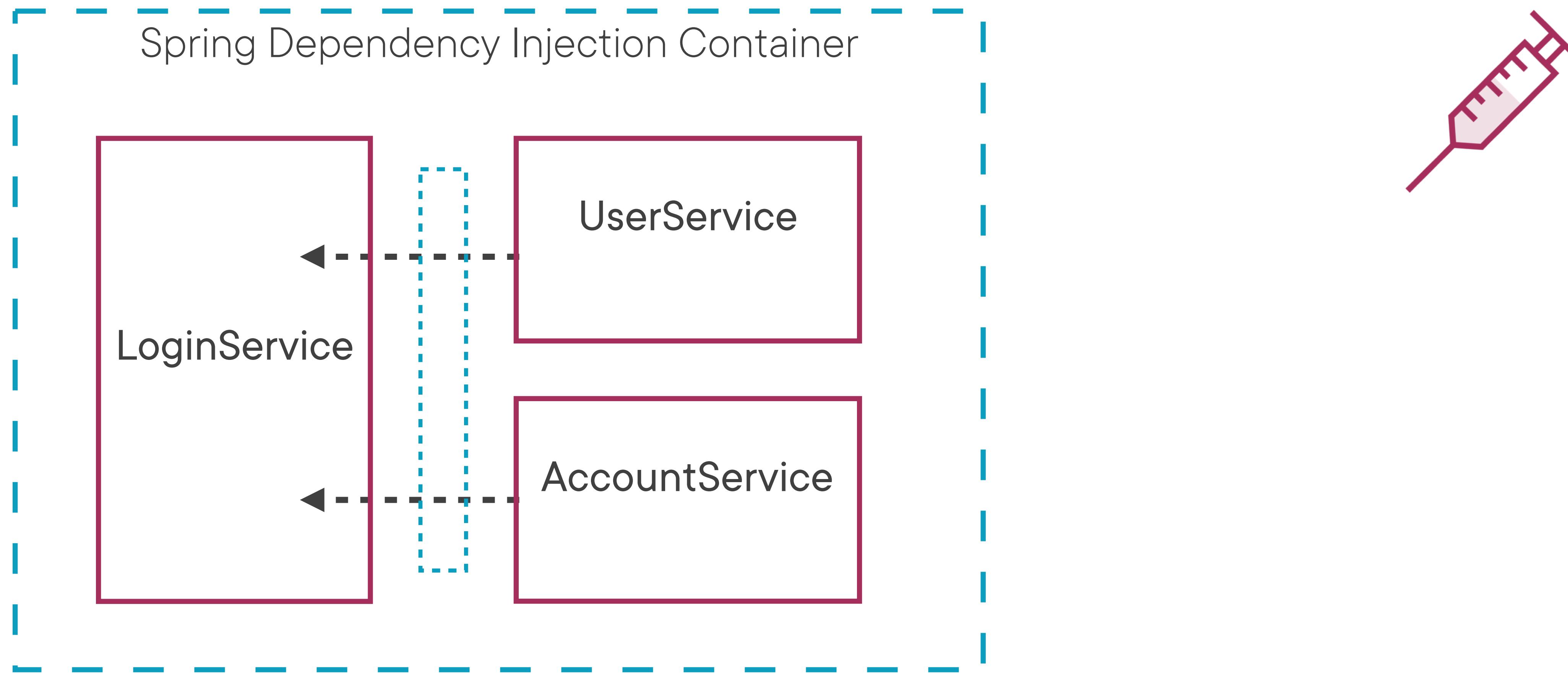
Spring: Dependency Injection



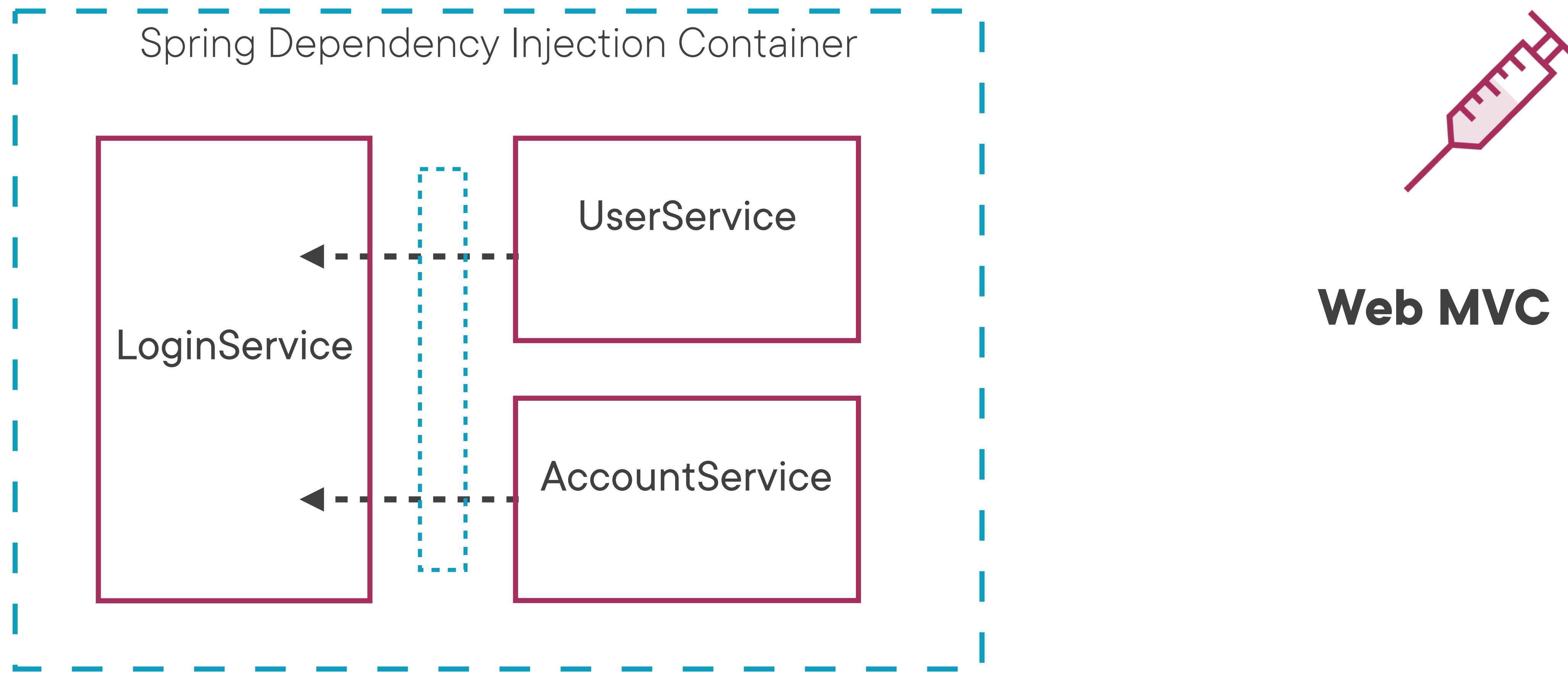
Spring: Dependency Injection



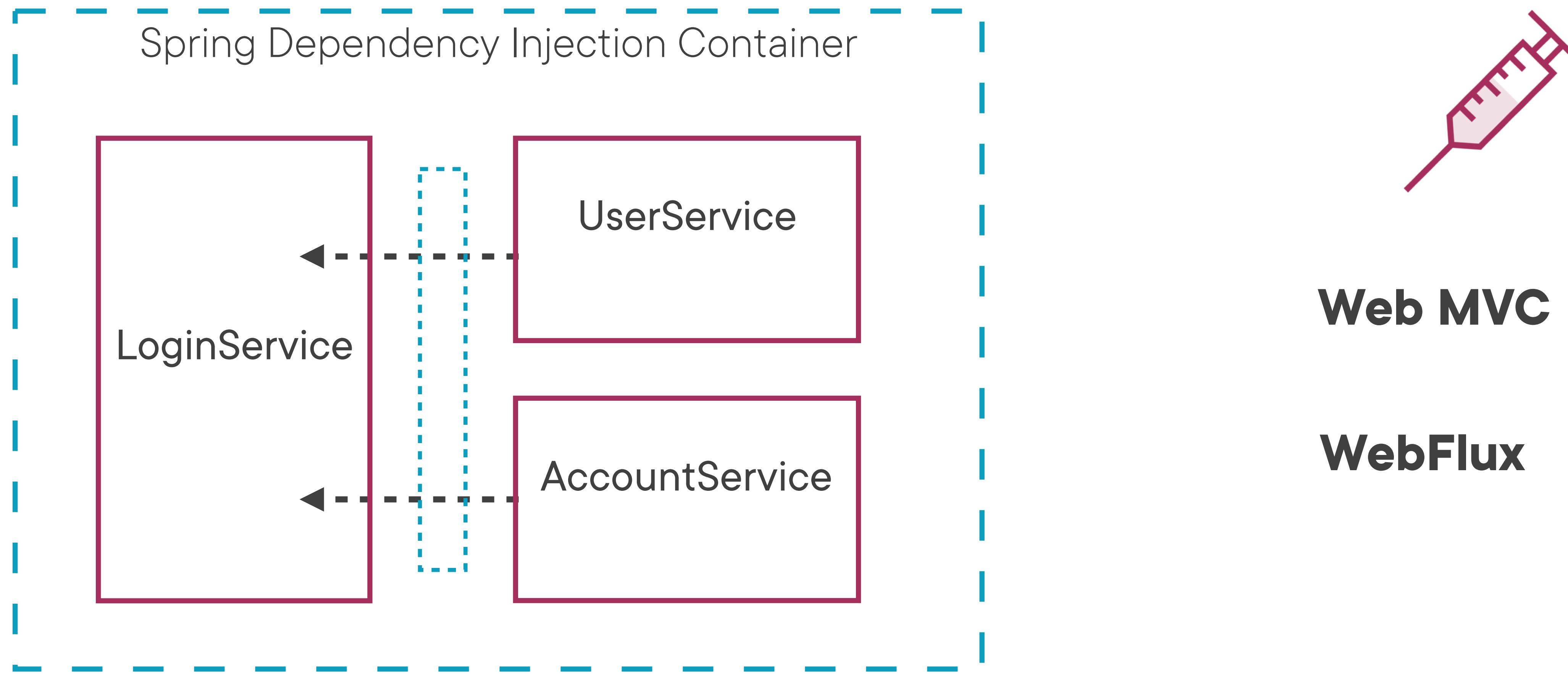
Spring: Dependency Injection



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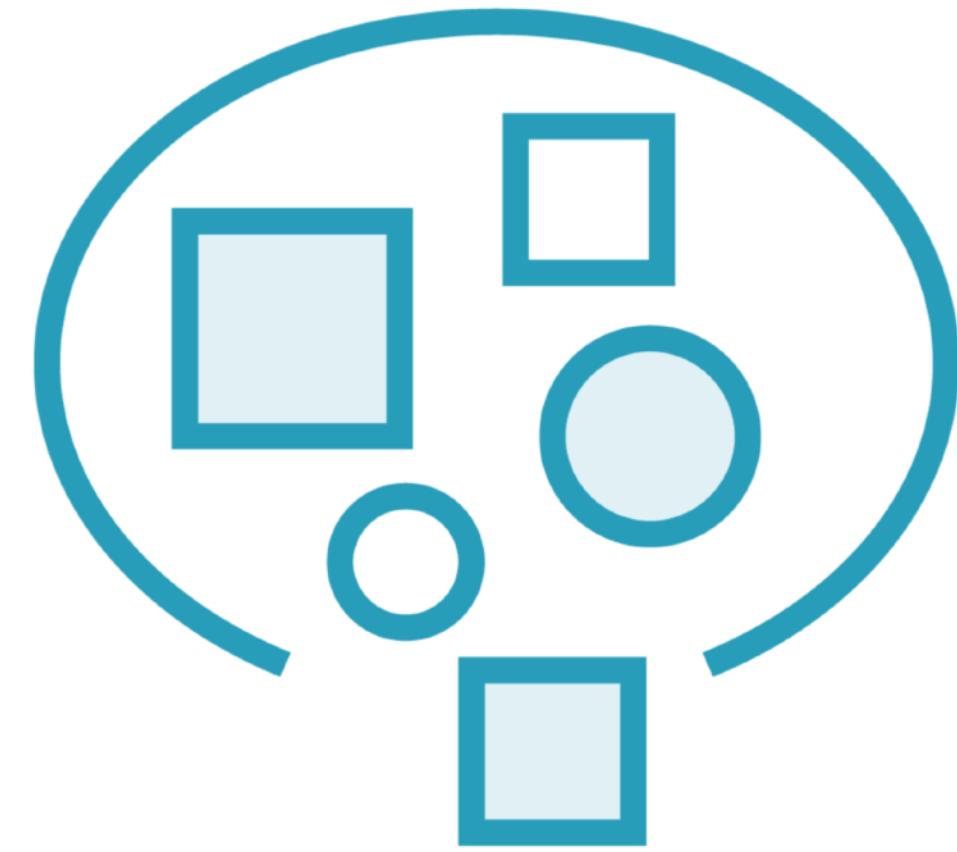


Spring: Dependency Injection



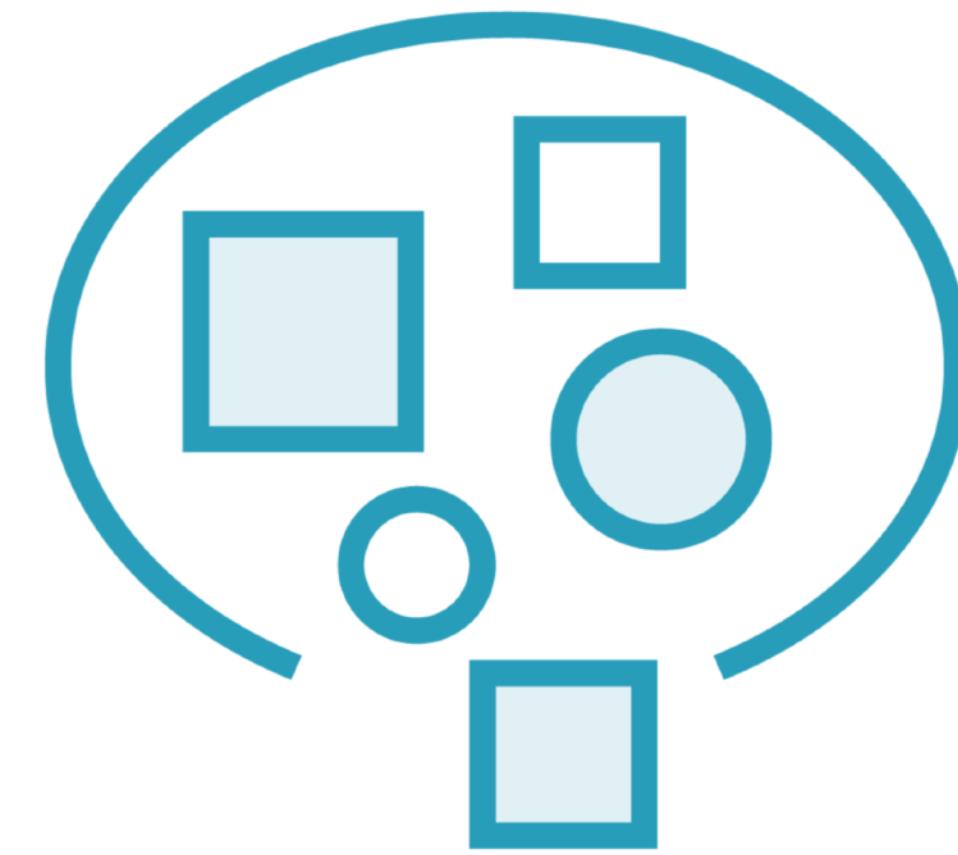
Other Popular Java Libraries

Other Popular Java Libraries

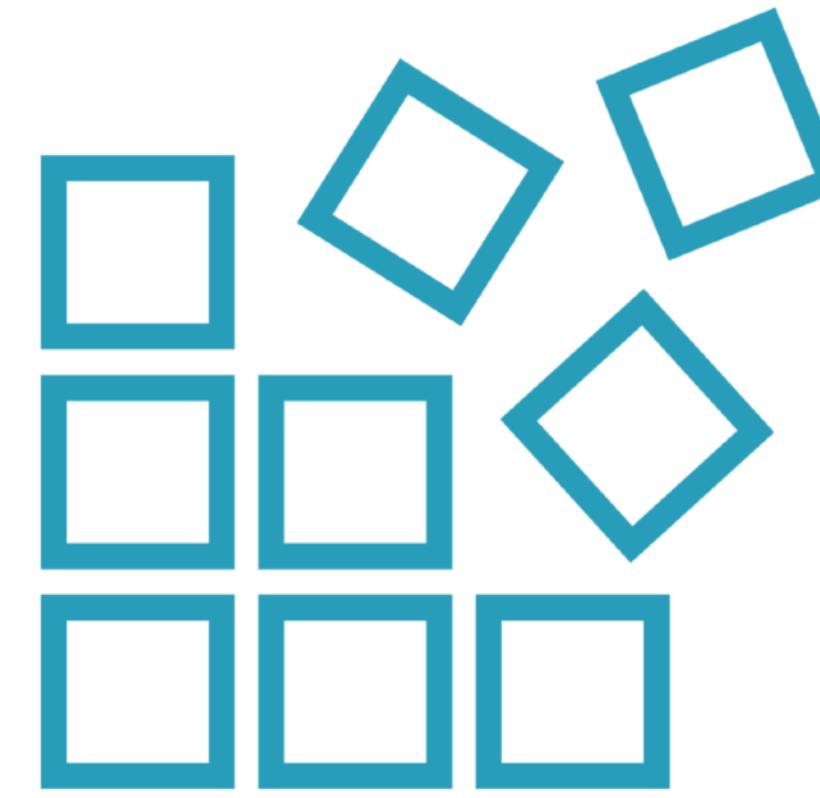


Framework

Other Popular Java Libraries



Framework



Libraries

Test Libraries

Test Libraries

JUnit

Test Libraries

JUnit

CalculatorTest.java

```
public class CalculatorTest {  
  
    @Test  
    public void testAddition(){  
  
    }  
  
}
```

Test Libraries

JUnit

CalculatorTest.java

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Test Libraries

JUnit

CalculatorTest.java

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        int calculatedAnswer = calc.add(1, 2);  
  
    }  
  
}
```

Test Libraries

JUnit

CalculatorTest.java

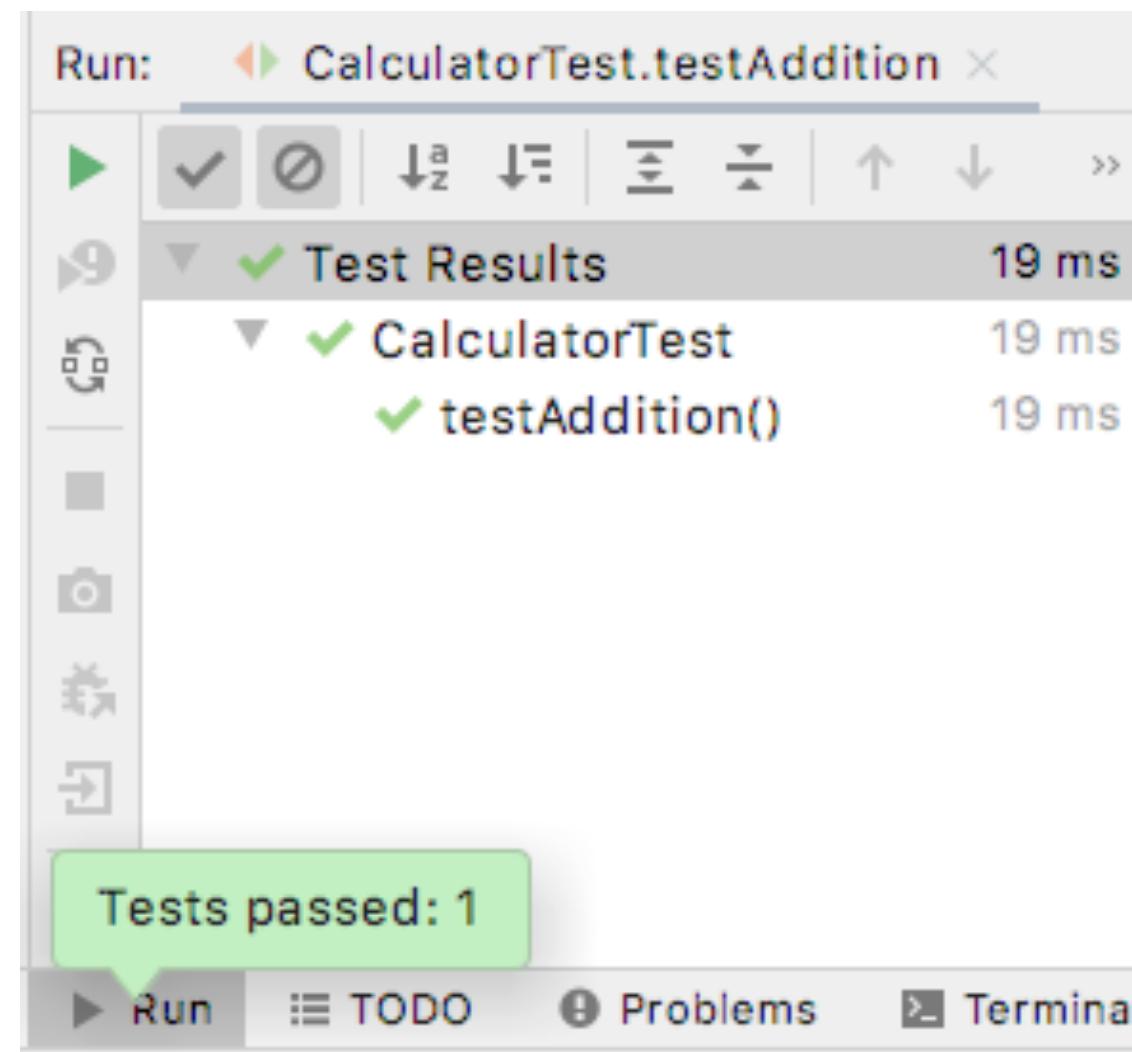
```
public class CalculatorTest {  
  
    @Test  
    public void testAddition(){  
        Calculator calc = new Calculator();  
        int calculatedAnswer = calc.add(1, 2);  
        assertEquals(3, calculatedAnswer);  
    }  
  
}
```

Test Libraries

JUnit

CalculatorTest.java

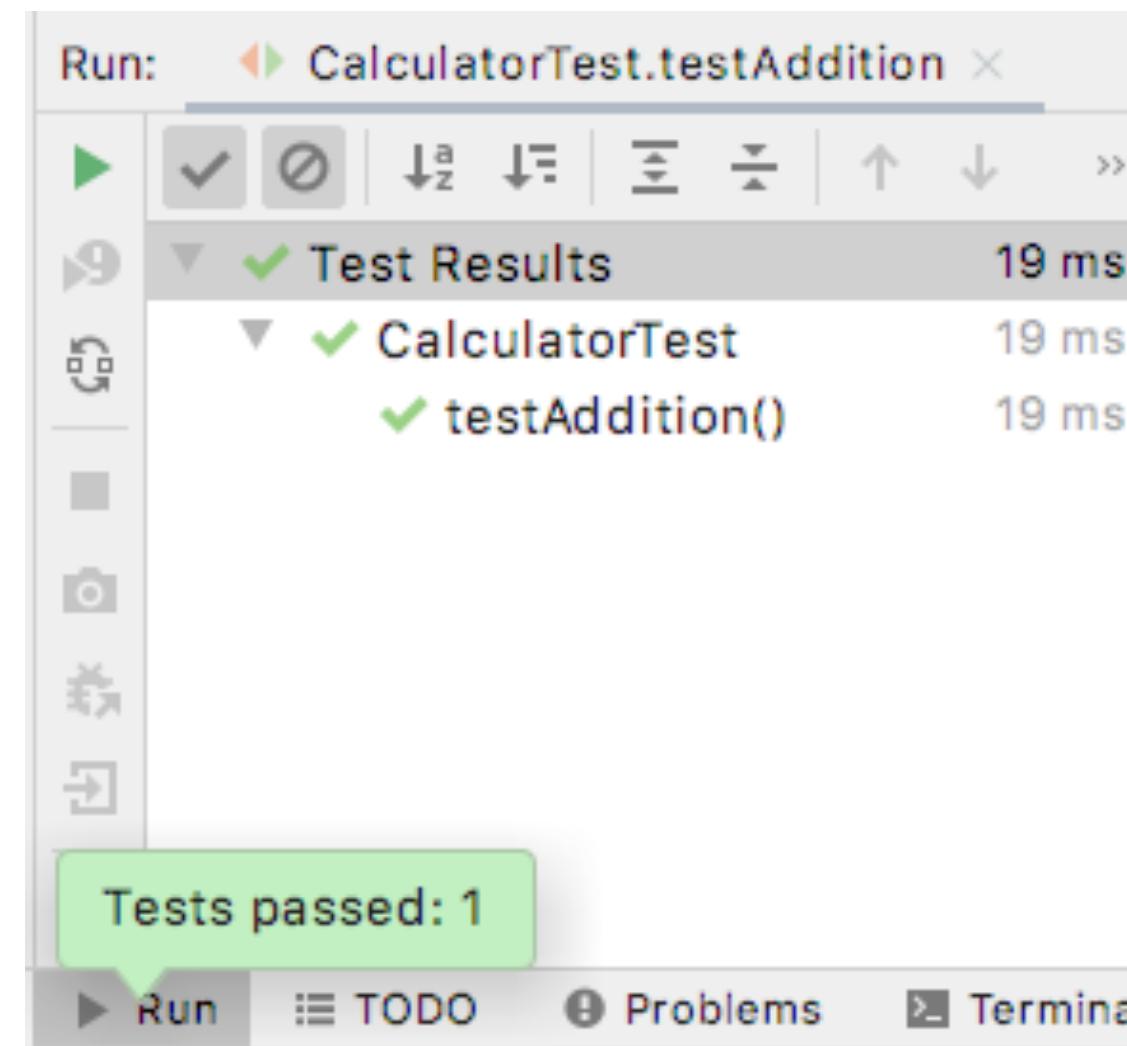
```
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Test Libraries

JUnit

Mockito



CalculatorTest.java

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    }  
}
```

Data Persistence

Data Persistence

Hibernate

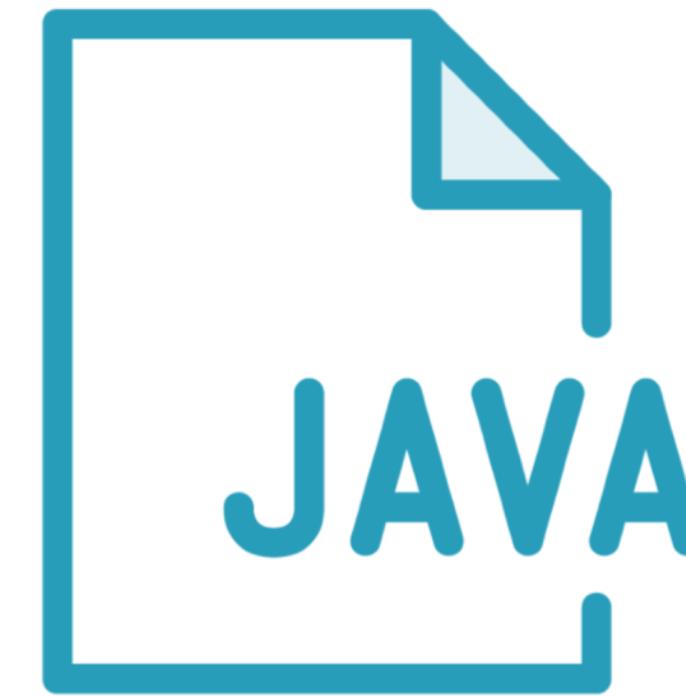
Data Persistence



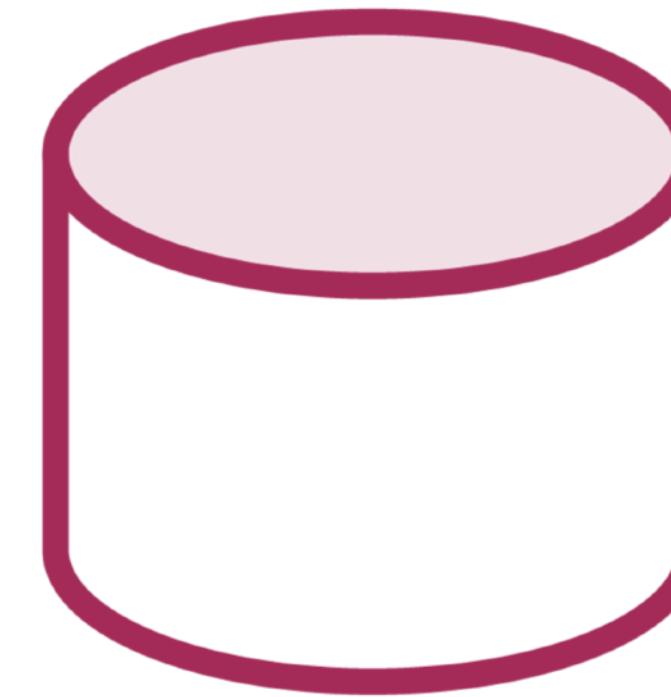
Object

Hibernate

Data Persistence



Object



Relational Database

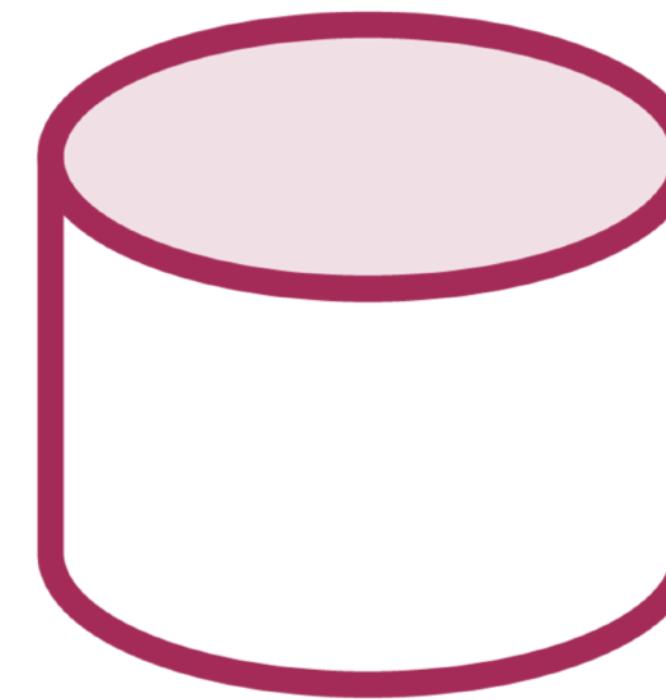
Hibernate

Data Persistence



Object

→
Object-Relational
Mapping (ORM)



Relational Database

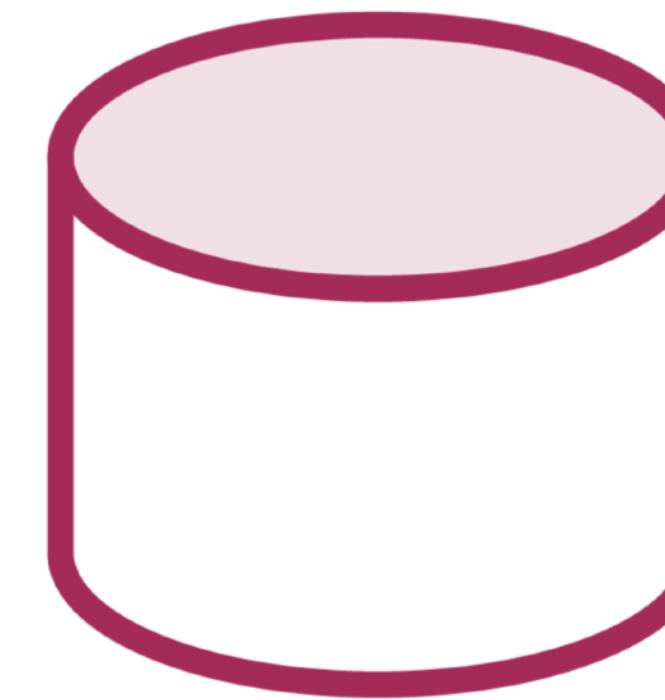
Hibernate

Data Persistence



Object

→
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Relational Database

Hibernate

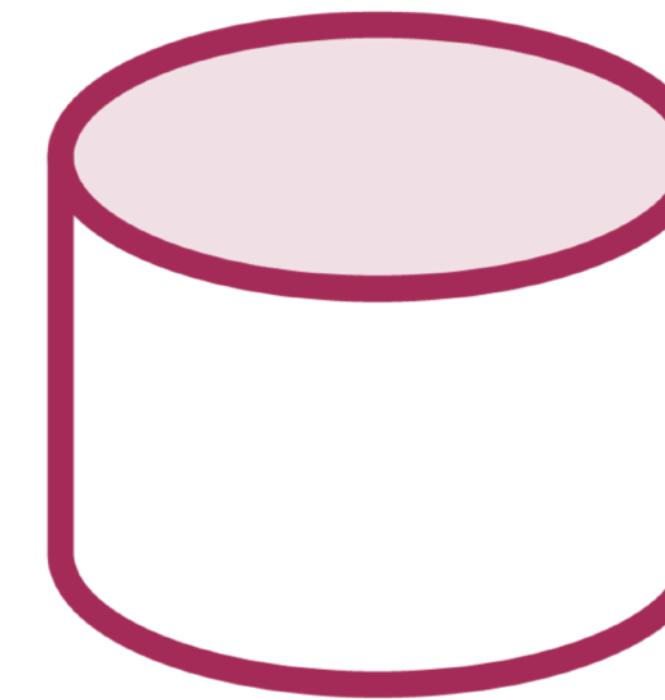
Java Database Connectivity (JDBC)

Data Persistence



Object

→
Object-Relational
Mapping (ORM)



Relational Database

Hibernate (JPA implementation)

Java Database Connectivity (JDBC)

JSON Processing

JSON Processing



Object

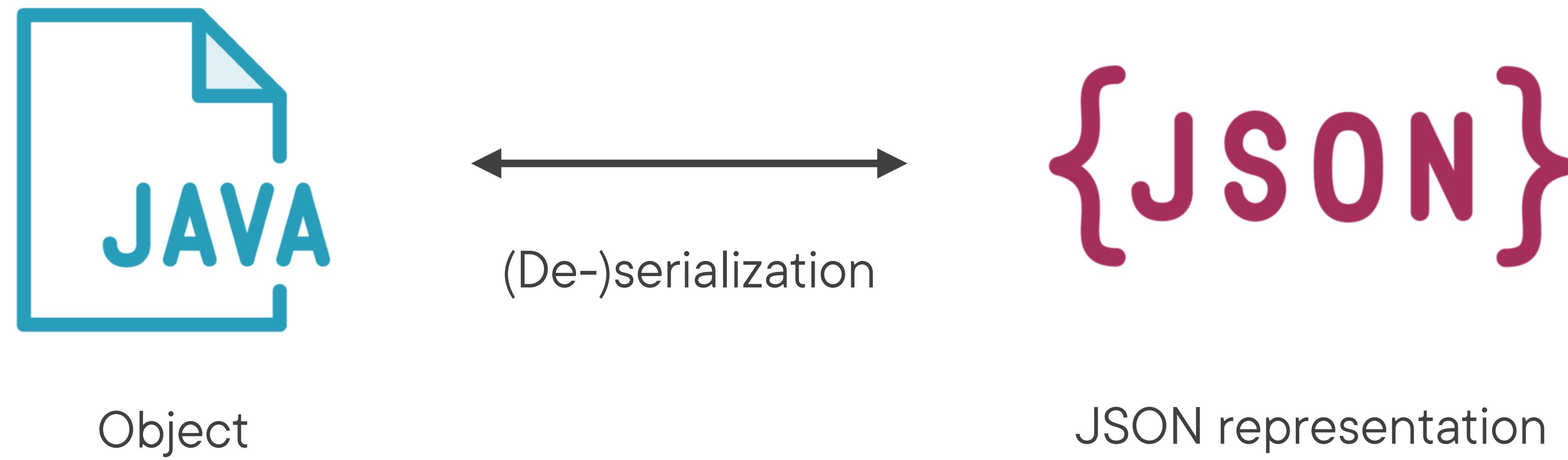


(De-)serialization

{JSON}

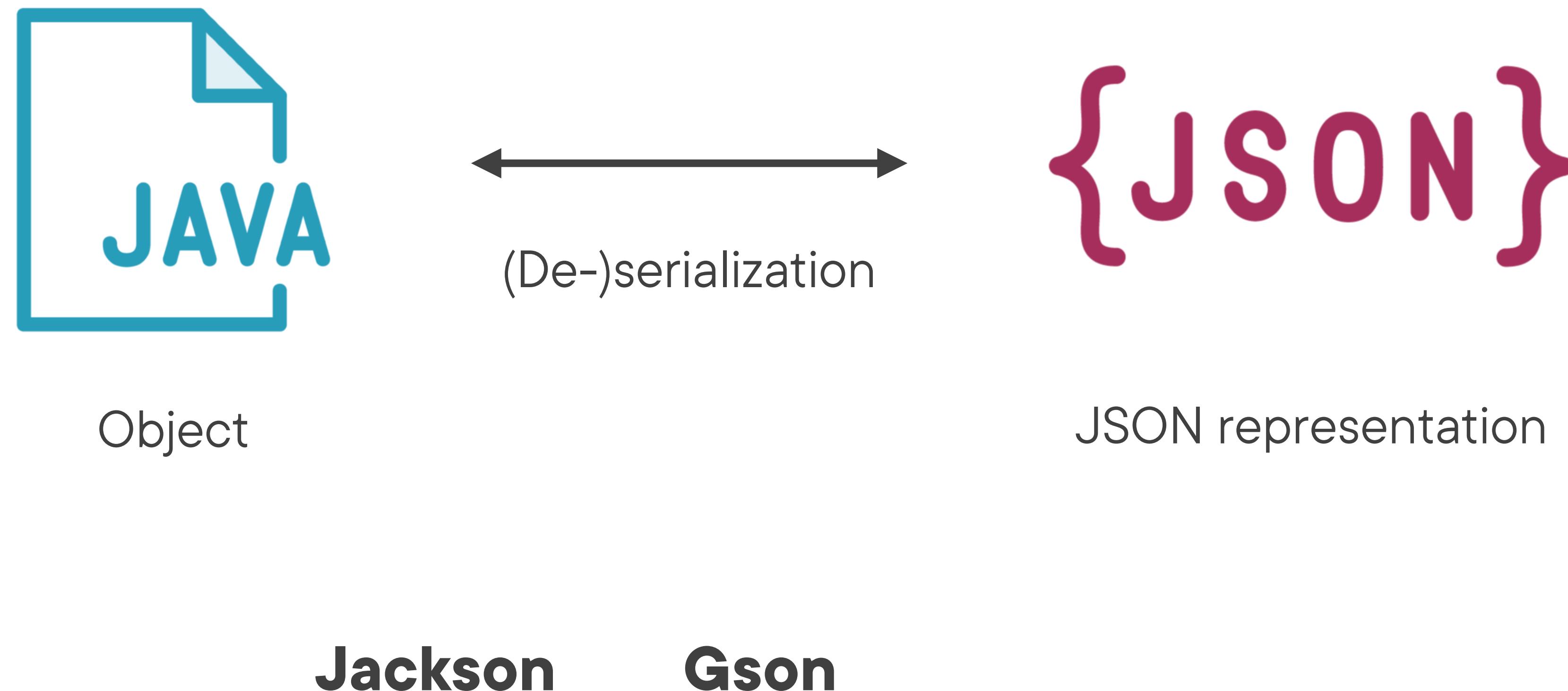
JSON representation

JSON Processing



Jackson

JSON Processing



JSON Processing



Object



(De-)serialization

{JSON}

JSON representation

Jackson

Gson

JSON-B(inding)

Apache Commons

Apache Commons



<https://apache.org>

Apache Commons



Commons CLI

<https://apache.org>

Apache Commons



Commons CLI
Commons IO

<https://apache.org>

Apache Commons



Commons CLI

Commons IO

Commons CSV

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Apache Commons



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Commons CLI

Commons IO

Commons CSV

Commons ...

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Apache Commons



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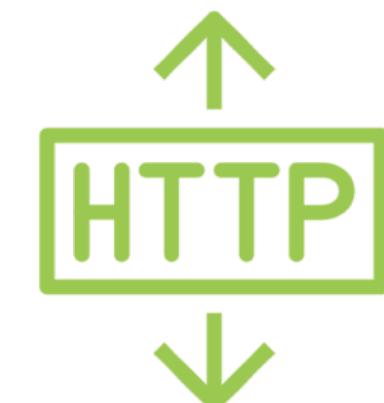
Commons CLI

Commons IO

Commons CSV

Commons ...

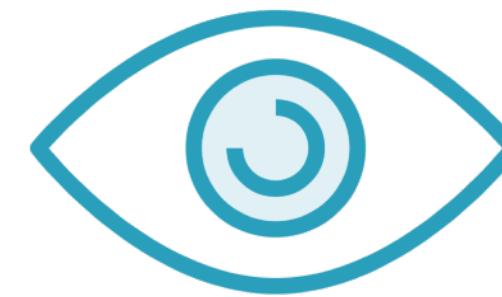
<https://commons.apache.org>



Apache HTTP Client

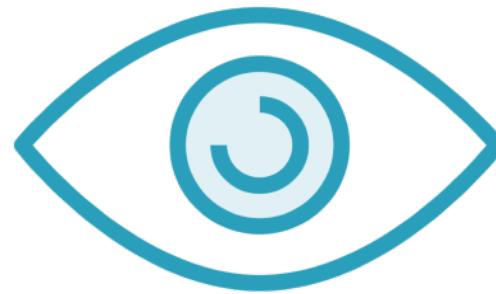
Logging

Logging



Monitoring and troubleshooting
through application logging

Logging



Monitoring and troubleshooting
through application logging

Logback

Logging

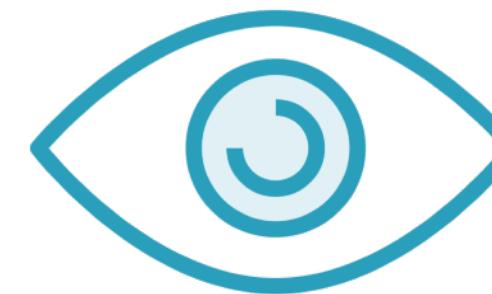


Monitoring and troubleshooting
through application logging

Logback

Log4J

Logging



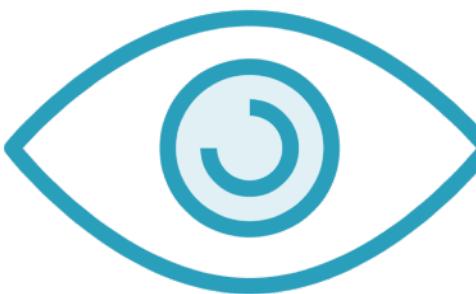
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Commons Logging

Logging



Monitoring and troubleshooting
through application logging

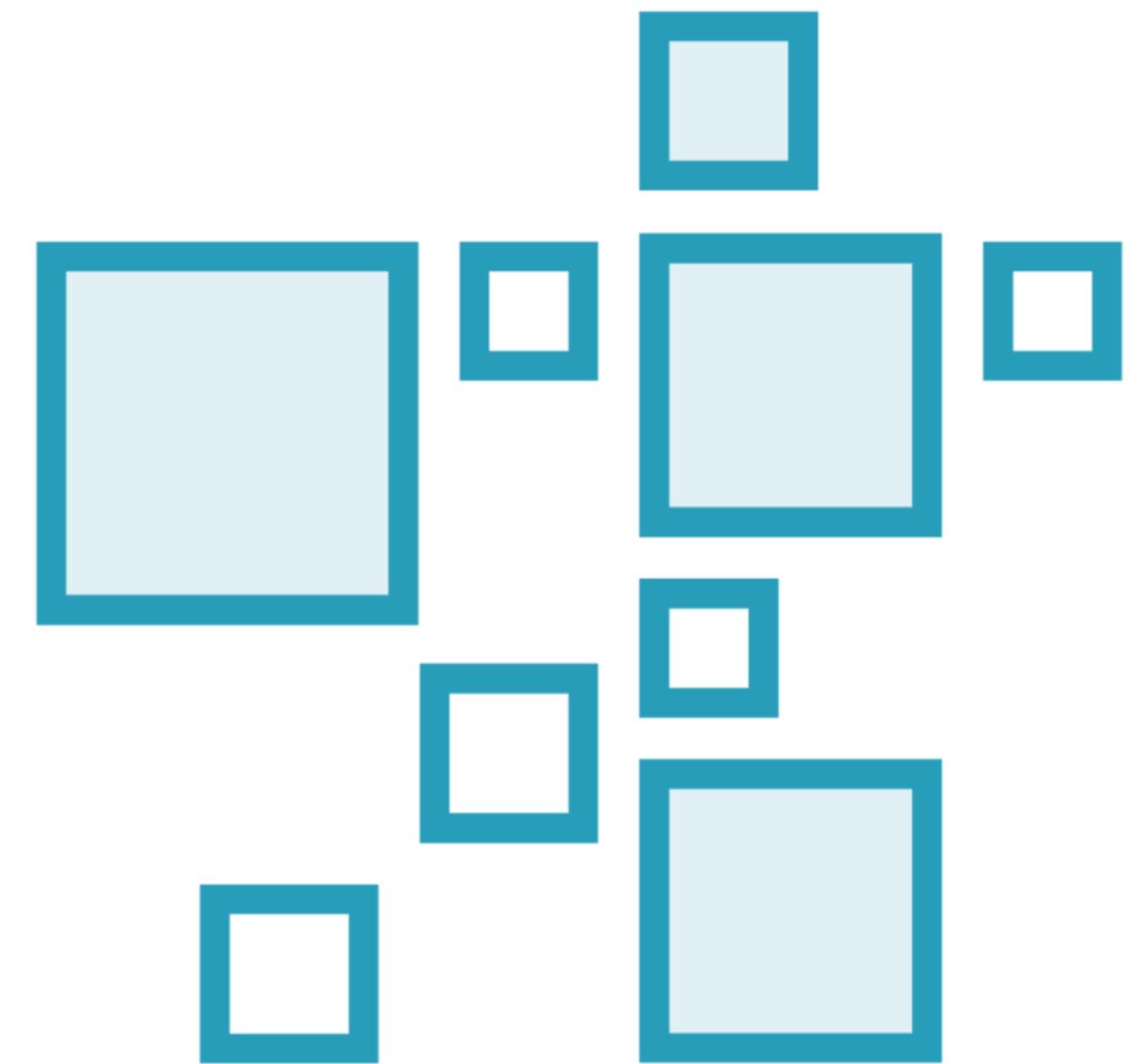
Simple Logging Facade for Java (SLF4J)

Logback

Log4J

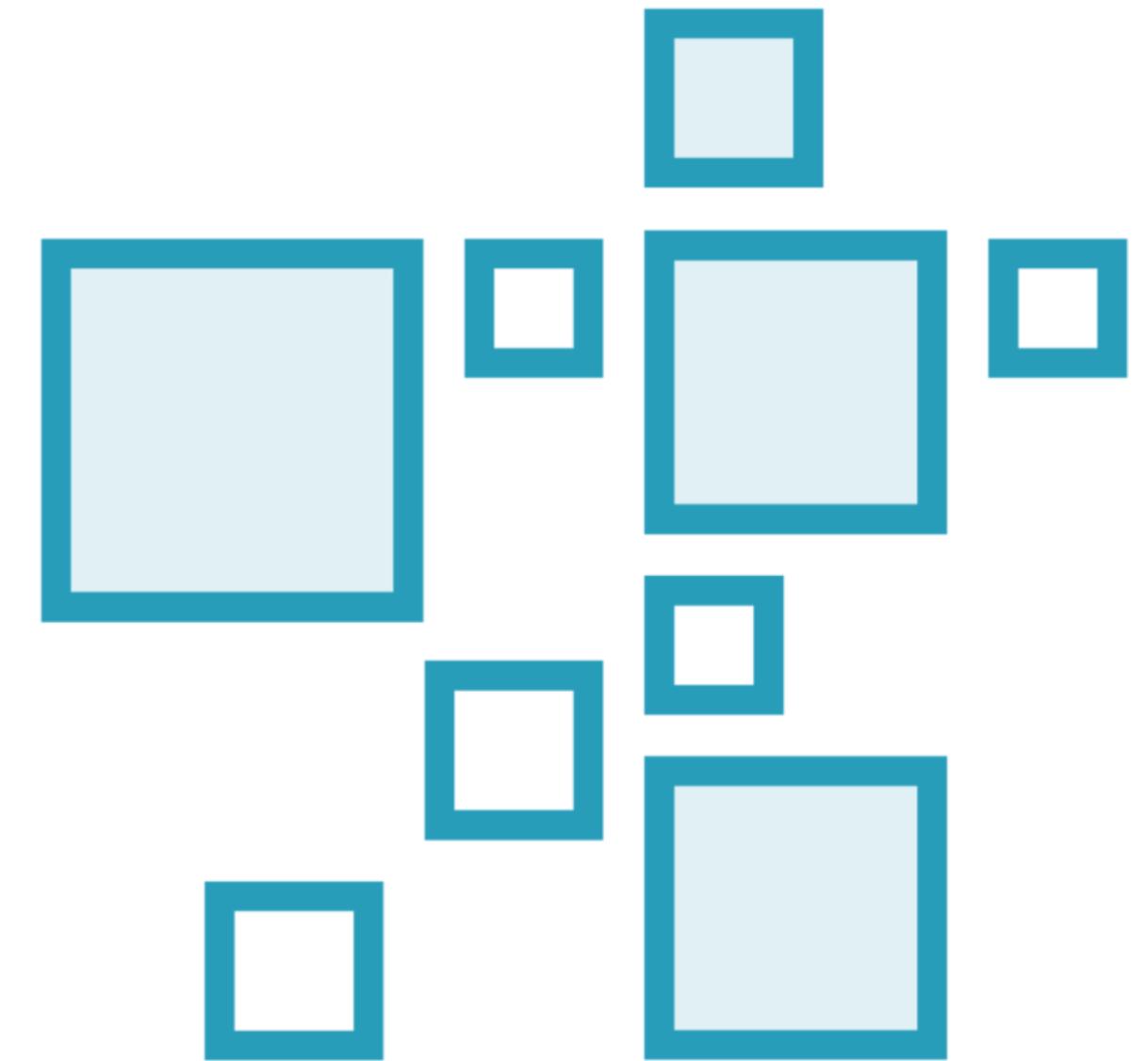
Commons Logging

Other Libraries



Other Libraries

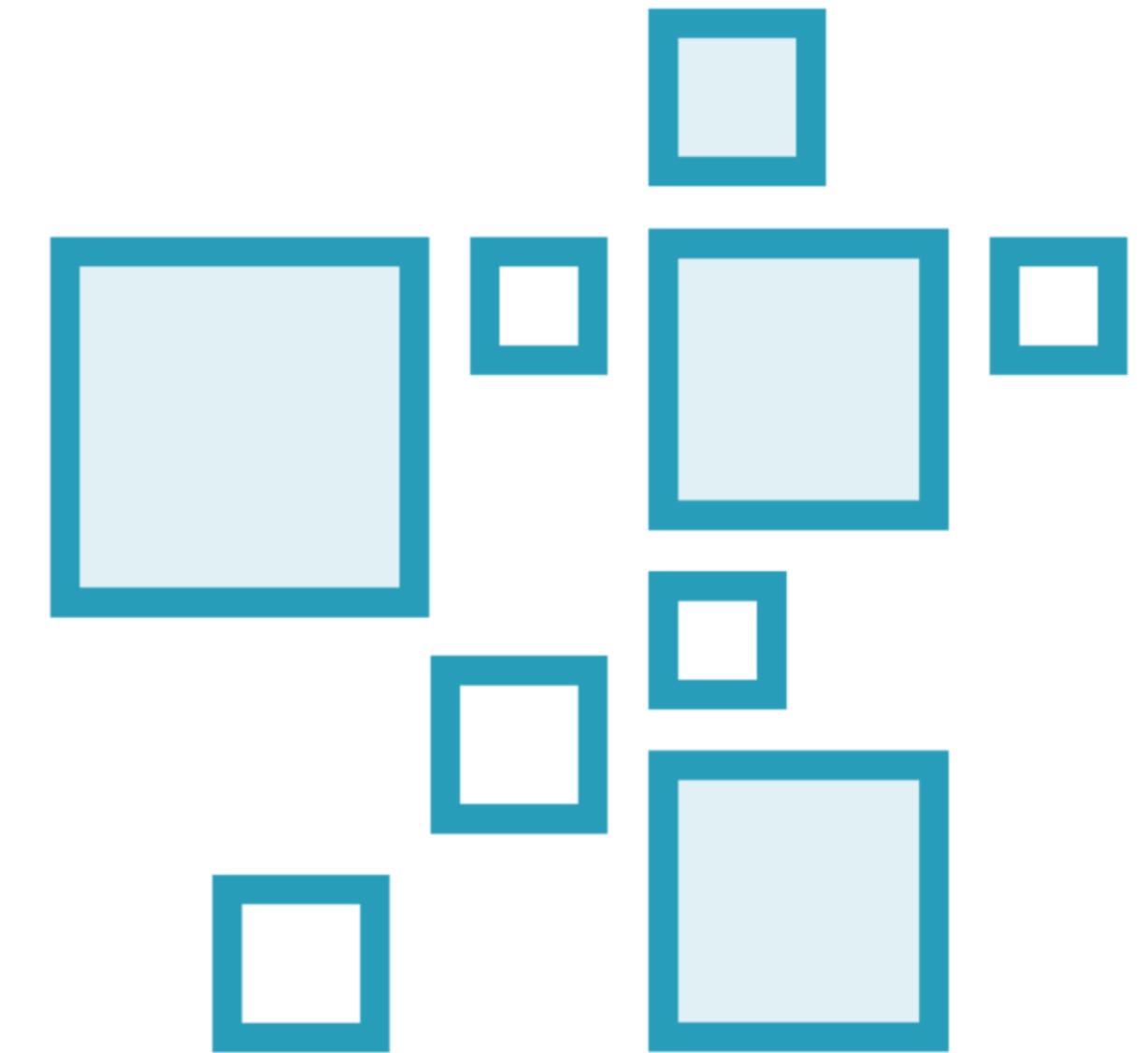
Reactive programming: Project Reactor, Akka



Other Libraries

Reactive programming: Project Reactor, Akka

High-performance networking: Netty

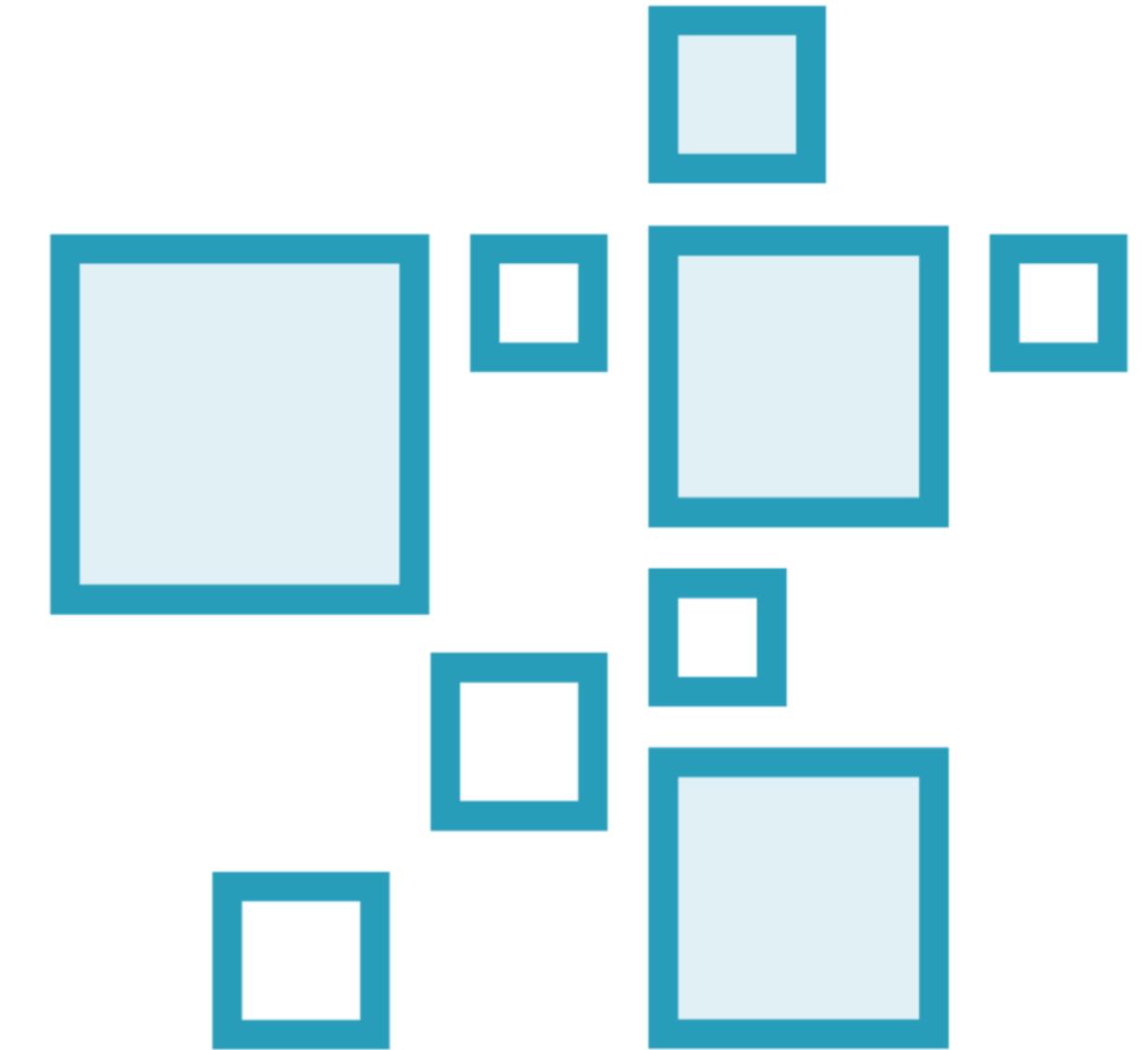


Other Libraries

Reactive programming: Project Reactor, Akka

High-performance networking: Netty

Caching: Caffeine, Hazelcast, Ehcache



Tools

Tools

Integrated Development Environment

Tools

```
7  public class CalculatorTest {  
8  
9      @Test  
10     public void testAddition() {  
11         Calculator calc = new Calculator();  
12         int calculatedAnswer = calc.add( 1, 2);  
13         assertEquals( expected: 3, calculatedAnswer);  
14     }  
15 }
```

Syntax highlighting

Integrated Development Environment

Tools

```
7 public class CalculatorTest {  
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14    }  
15}
```

Syntax highlighting

```
int calculatedAnswer = calc. |  
m add(int i, int j) int  
m hashCode() int  
cast ((SomeType) expr)  
m equals(Object obj) boolean  
arg functionCall(expr)  
m toString() String  
m getClass() Class<? extends Calculator>  
m notify() void  
m notifyAll() void  
m wait() void  
m wait(long timeoutMillis) void  
m wait(long timeoutMillis, int nanos) void  
Press ⌘ to insert, ⌘+ to replace
```

Auto-completion

Integrated Development Environment

Tools

```
7 public class CalculatorTest {  
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9     @Test  
10    public void testAddition() {  
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Syntax highlighting

```
int calculatedAnswer = calc. |
```

m add(int i, int j)	int
m hashCode()	int
m cast	((SomeType) expr)
m equals(Object obj)	boolean
m arg	functionCall(expr)
m toString()	String
m getClass()	Class<? extends Calculator>
m notify()	void
m notifyAll()	void
m wait()	void
m wait(long timeoutMillis)	void
m wait(long timeoutMillis, int nanos)	void

Press ⌘ to insert, ⌘+ to replace

Auto-completion

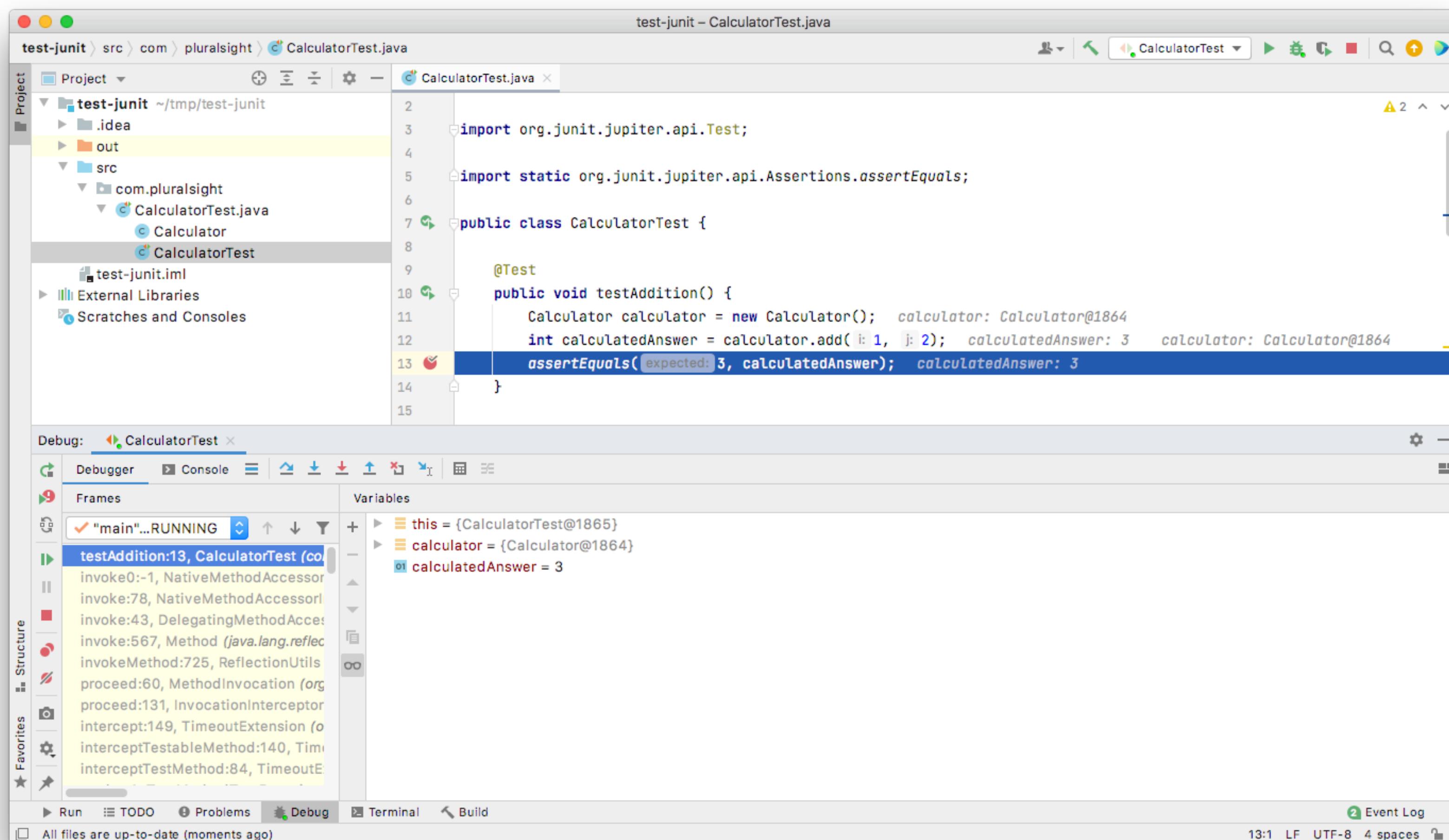
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}
```

Refactoring

Integrated Development Environment

Tools: IDEs

Compiling, running,
and debugging



Integrated Development Environment

Tools: IDEs

Compiling, running,
and debugging

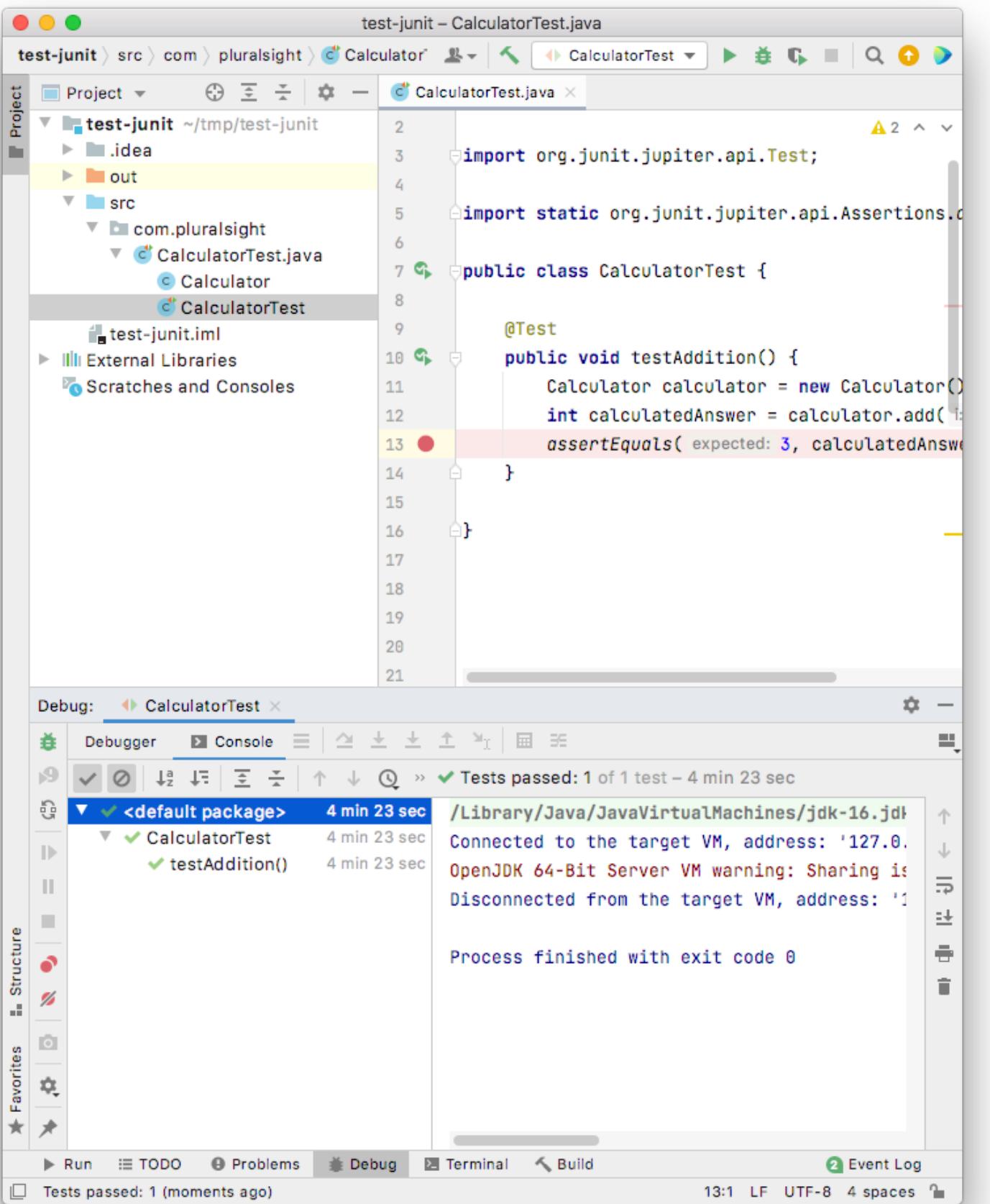
The screenshot shows an IDE interface with the following components:

- Project View:** Shows the project structure with a yellow highlight on the "test-junit" folder.
- Code Editor:** Displays `CalculatorTest.java` containing JUnit test code. A red box highlights the line `assertEquals(3, calculatedAnswer);`.
- Debug View:** Shows the current stack trace under "Frames" and the local variables under "Variables". A red box highlights the "Variables" section, which lists `this`, `calculator`, and `calculatedAnswer`.
- Bottom Bar:** Includes tabs for Run, TODO, Problems, Debug, Terminal, Build, and Event Log, along with status information like file status and encoding.

Integrated Development Environment

Tools: IDEs

Tools: IDEs



**IntelliJ IDEA
(Community Edition)**

Tools: IDEs

The screenshot shows the IntelliJ IDEA interface. The top window title is "test-junit - CalculatorTest.java". The code editor displays a JUnit test class named "CalculatorTest". A red circle highlights the 13th line of code, which contains an assertion error. The bottom window title is "eclipse-workspace - helloworld/src/com/pluralsight/Main.java - Eclipse IDE". The code editor shows a simple "Hello World" application. The "Debug" tool window at the bottom shows a successful run of the test, indicating 1 test passed in 4 minutes and 23 seconds.

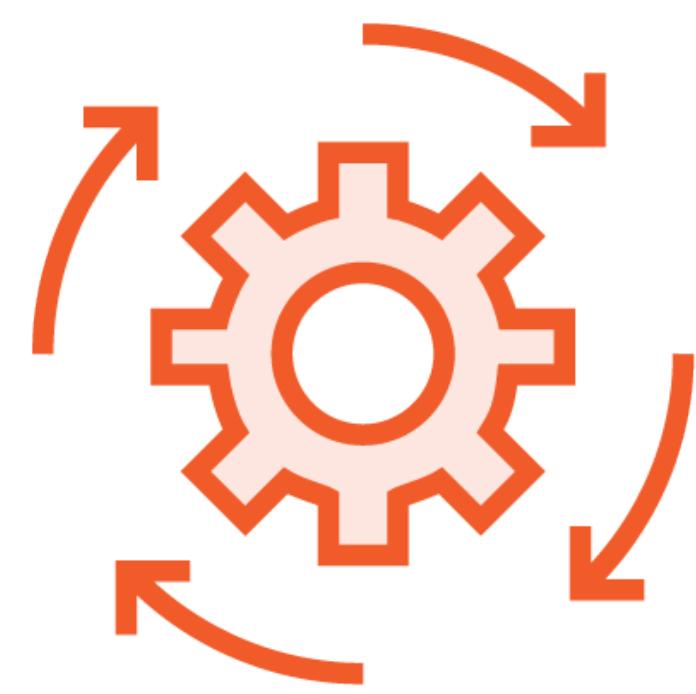
The screenshot shows the Eclipse IDE interface. The top window title is "eclipse-workspace - helloworld/src/com/pluralsight/Main.java - Eclipse IDE". The code editor displays the same "Hello World" application as the IntelliJ screenshot. The bottom window title is "eclipse-workspace - helloworld/src/com/pluralsight/Main.java - Eclipse IDE". The code editor shows the same Java code. The "Console" tab in the bottom right shows the application output: "Hello Pluralsight!".

**IntelliJ IDEA
(Community Edition)**

Eclipse

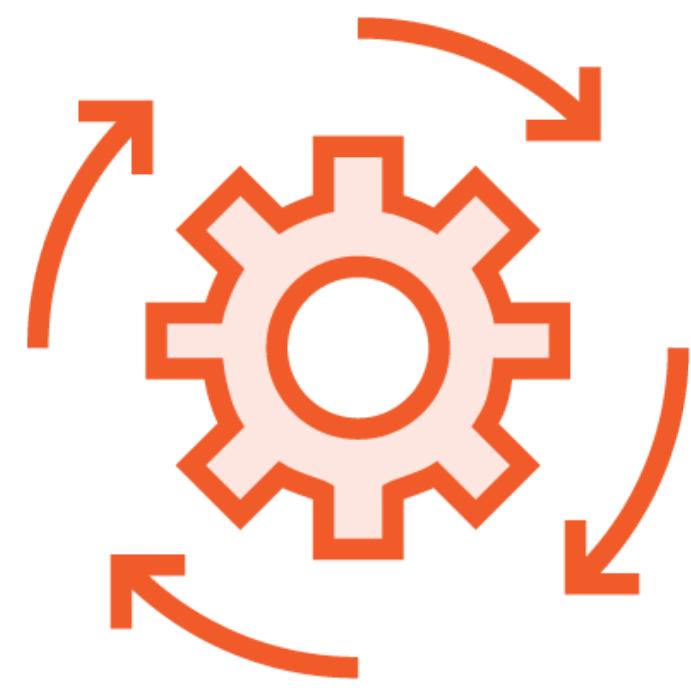
Build Tools

Build Tools



Build Tools

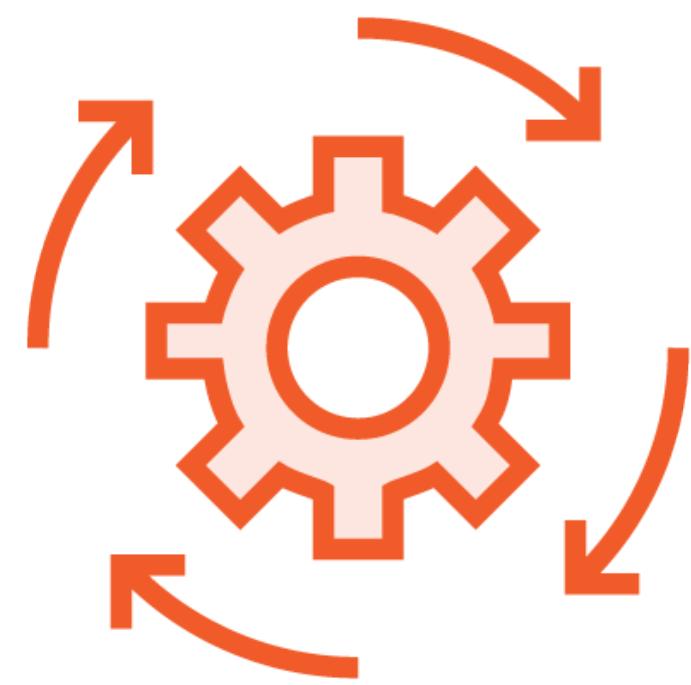
Repeatable builds:



Build Tools

Repeatable builds:

Compile

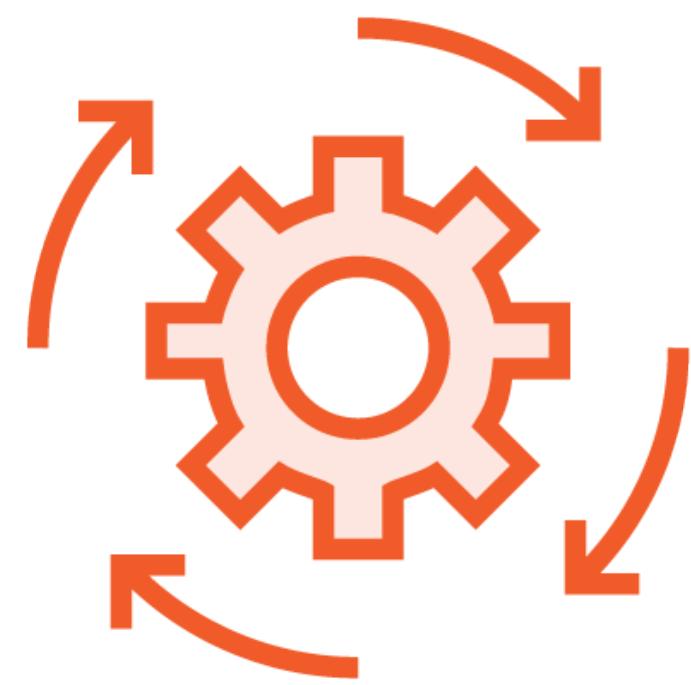


Build Tools

Repeatable builds:

Compile

Test



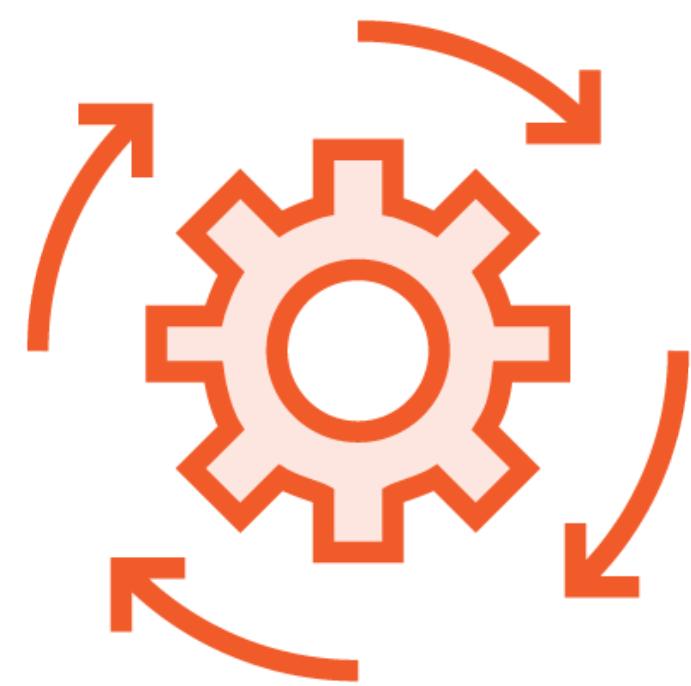
Build Tools

Repeatable builds:

Compile

Test

Package



Build Tools

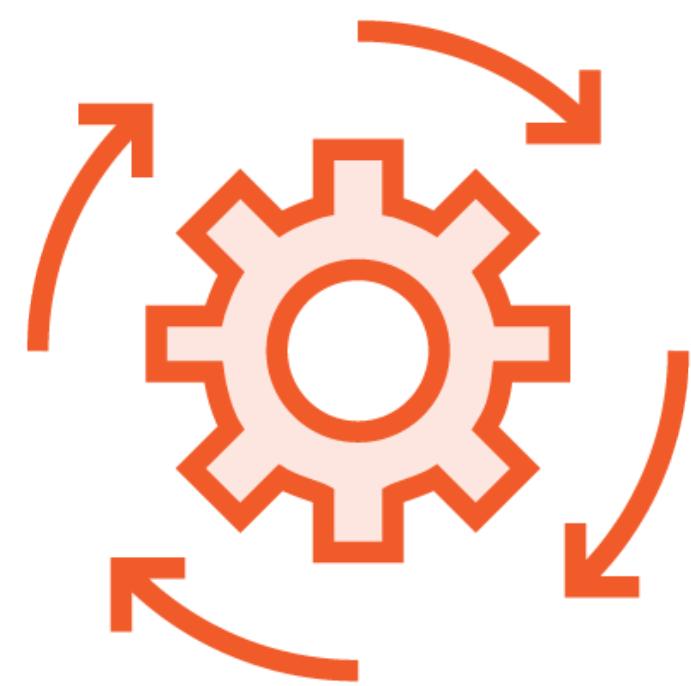
Repeatable builds:

Compile

Test

Package

Managing multiple modules



Build Tools

Repeatable builds:

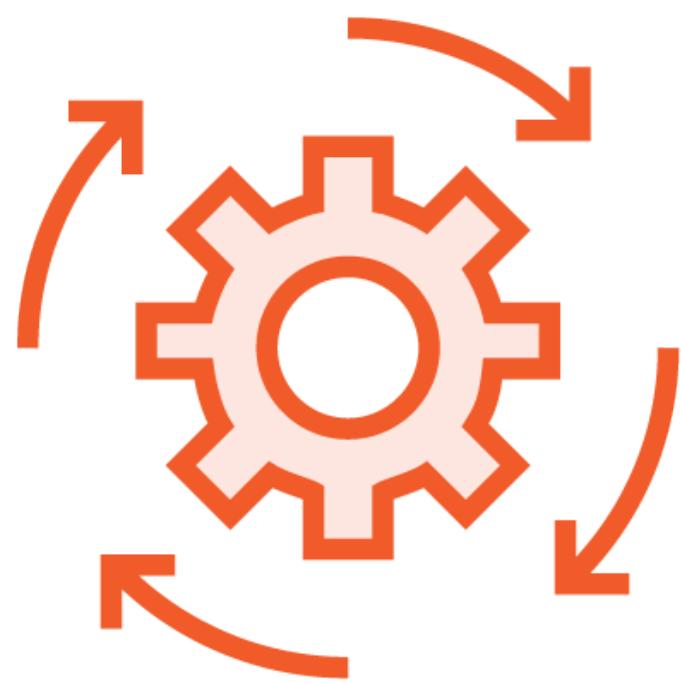
Compile

Test

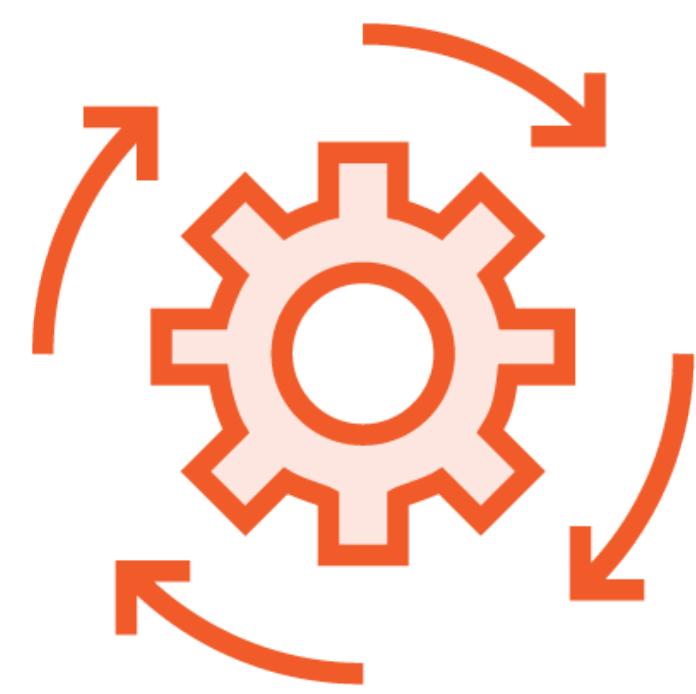
Package

Managing multiple modules

Manage external dependencies

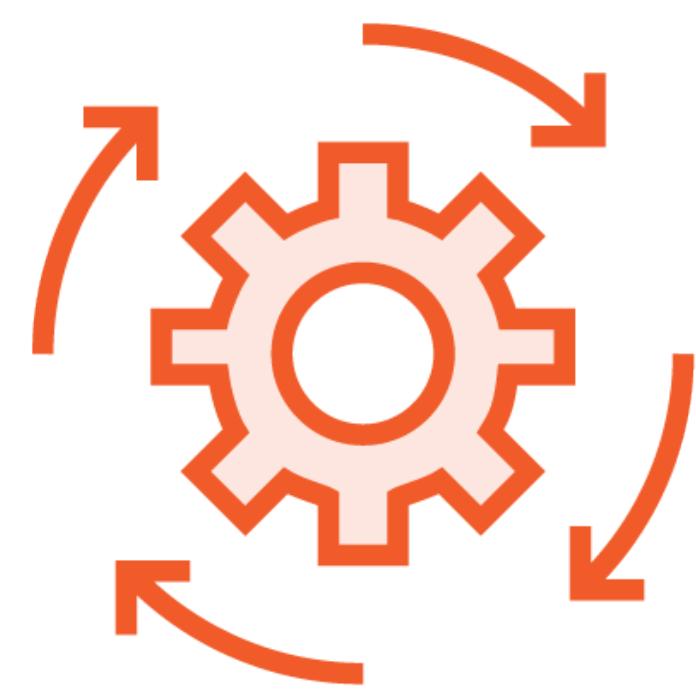


Build Tools



Build Tools

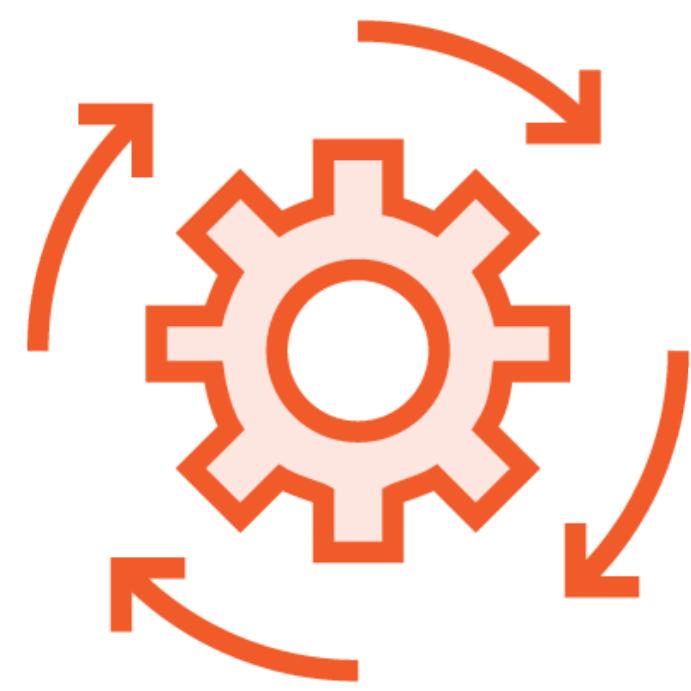
Maven



Build Tools

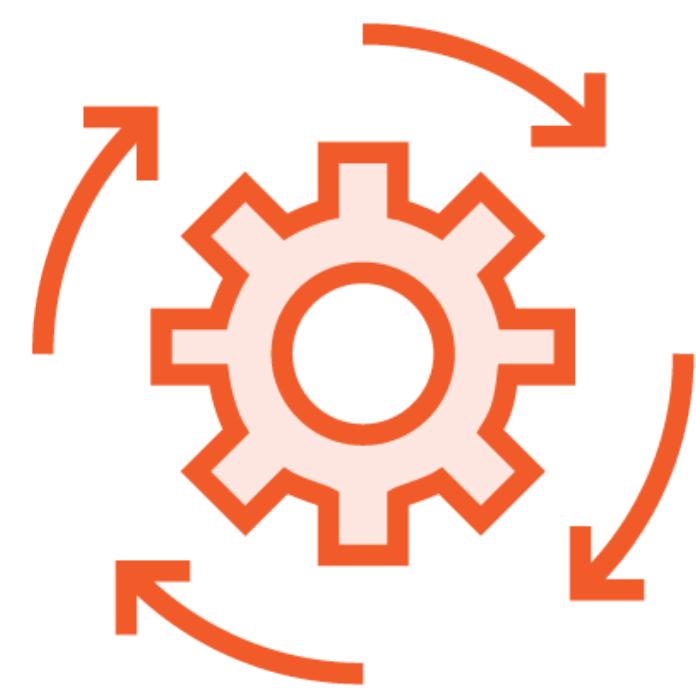
Maven

Gradle



Build Tools

Maven



Build Tools

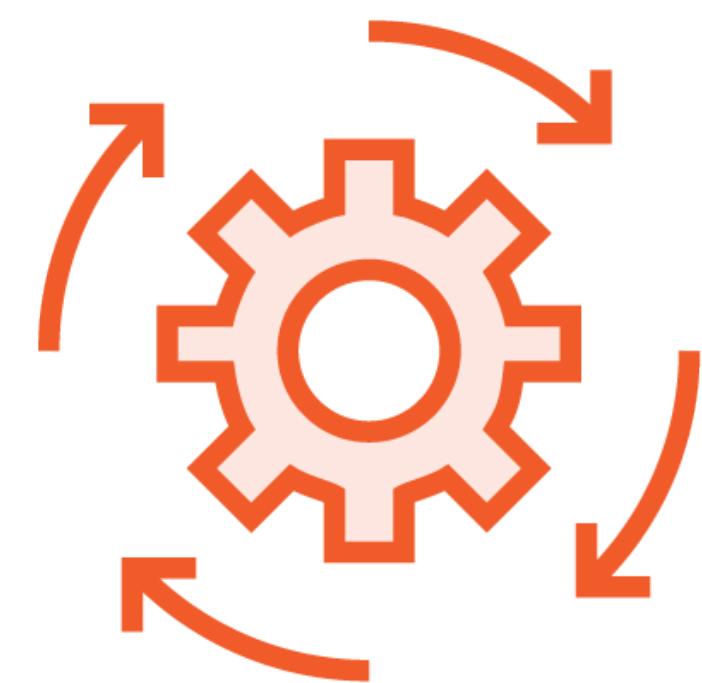
Maven

pom.xml

```
<project>
  <modelVersion>4.0.0</modelVersion>

  <groupId>com.mycompany.app</groupId>
  <artifactId>my-app</artifactId>
  <version>1.0</version>

  <dependencies>
    ...
  </dependencies>
</project>
```



Build Tools

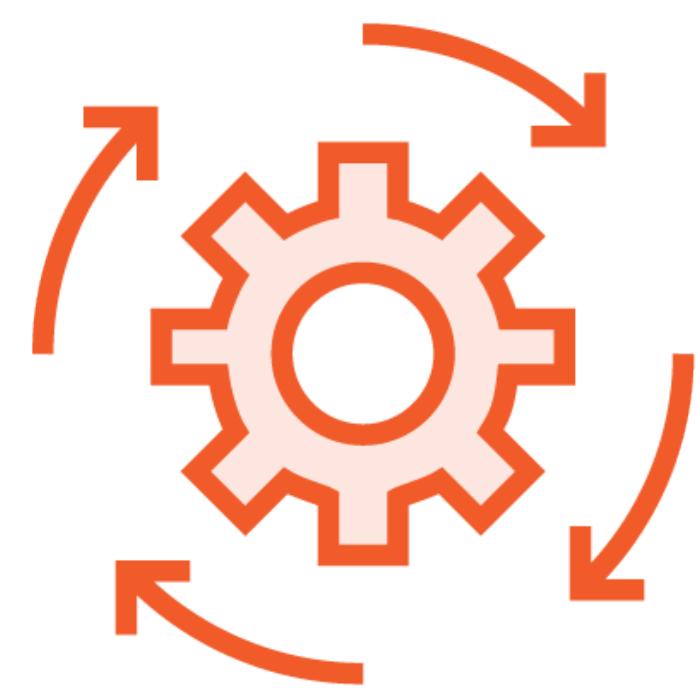
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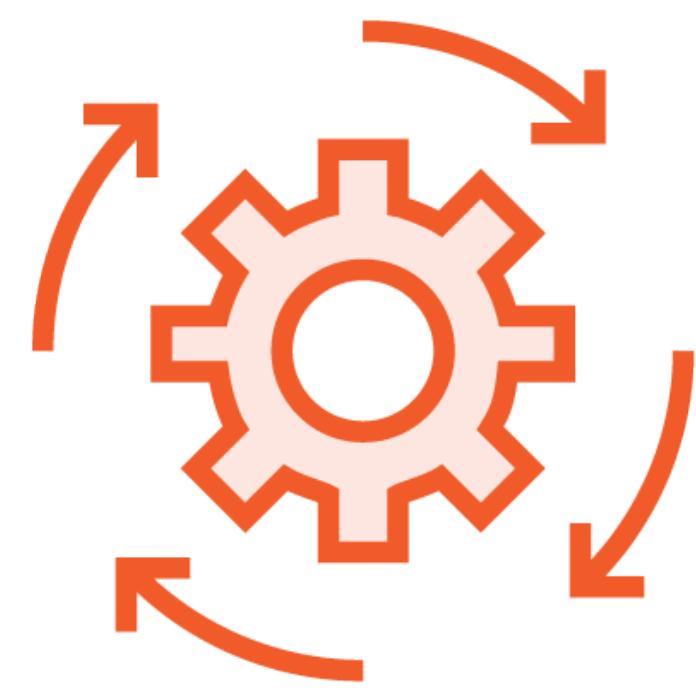
```
src/
  main/
    java/
      ...
  test/
    java/
      ...
      ...
      ...
```

Build Tools



Build Tools

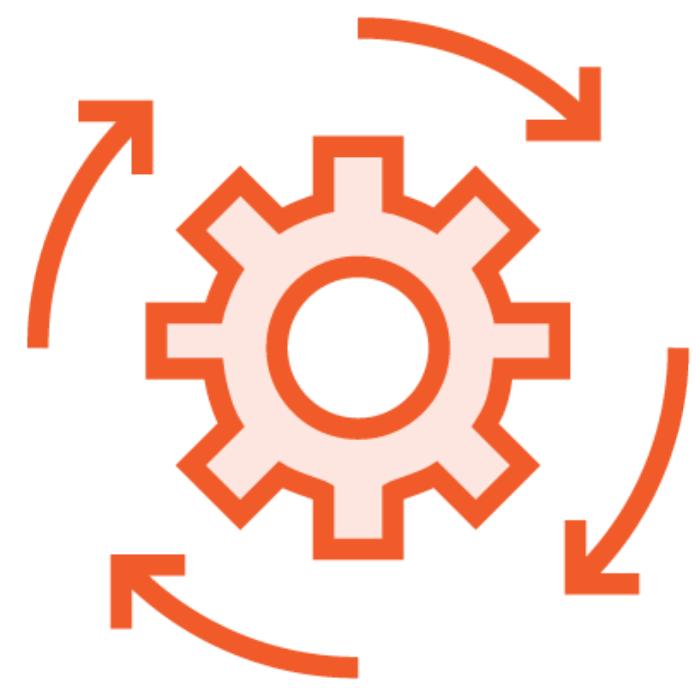
Gradle



Build Tools

Gradle

Groovy build script

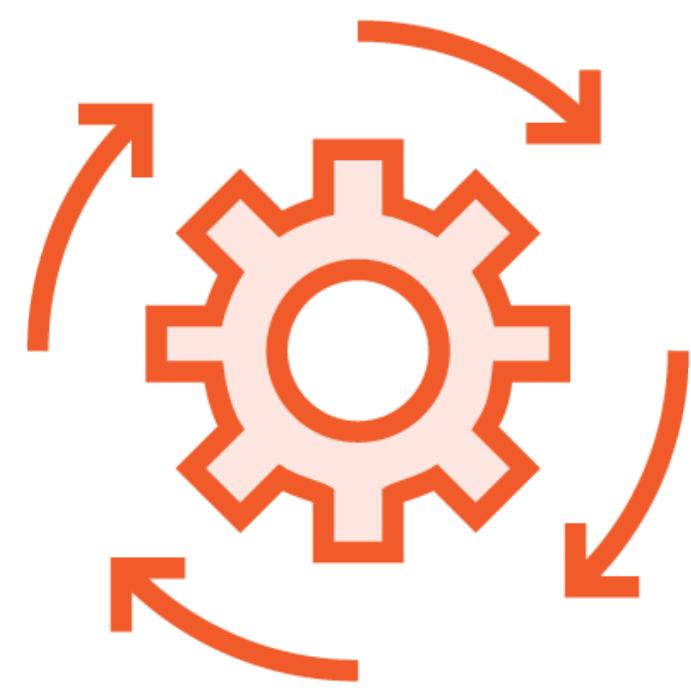


Build Tools

Gradle

Groovy build script

Flexible, but less uniform



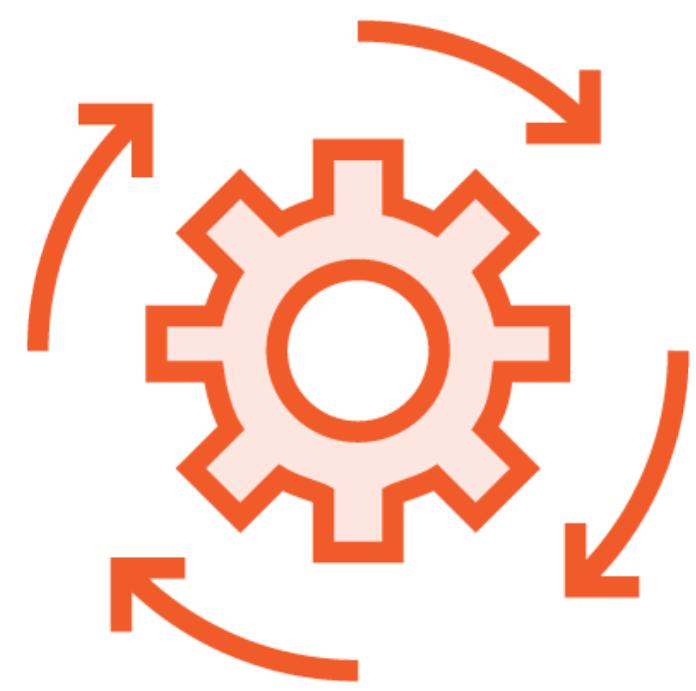
Build Tools

Gradle

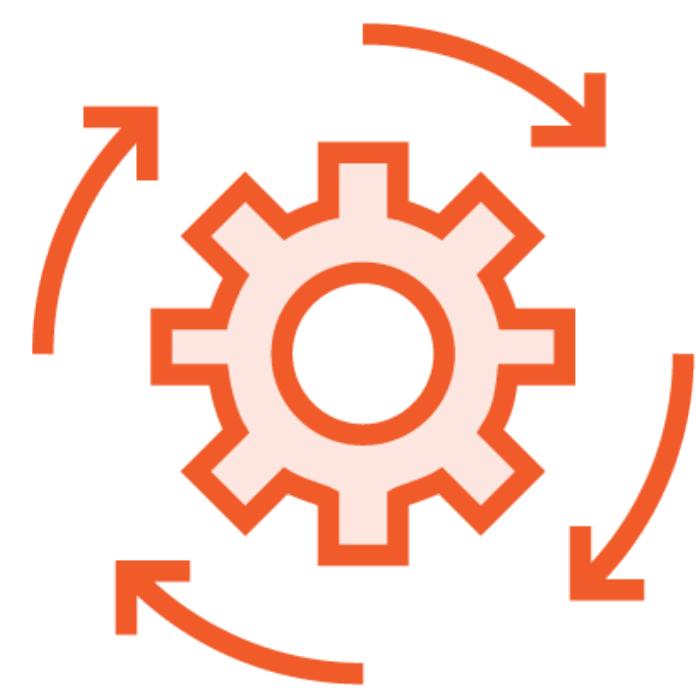
Groovy build script

Flexible, but less uniform

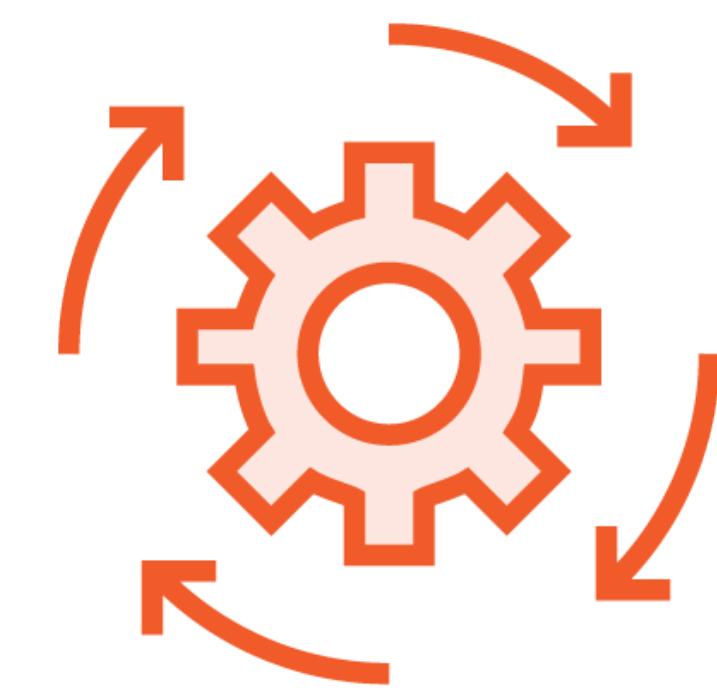
Incremental builds



Build Tools



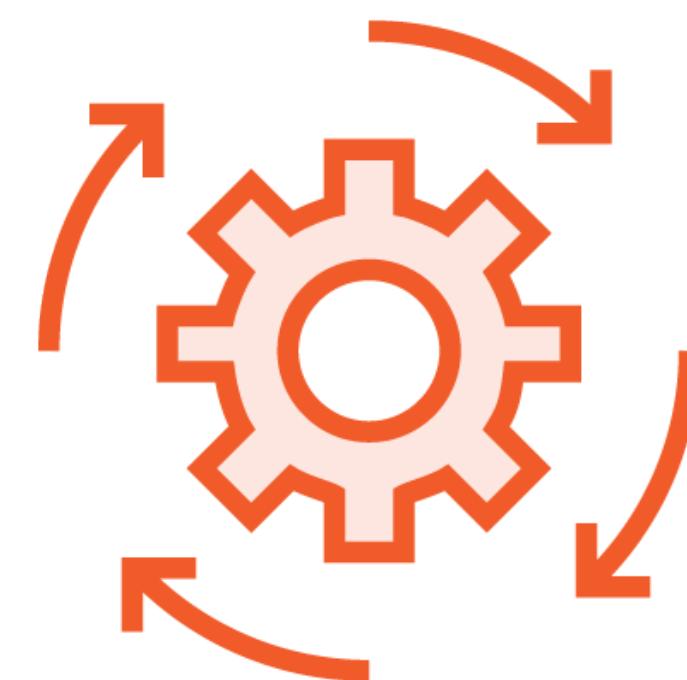
Build Tools



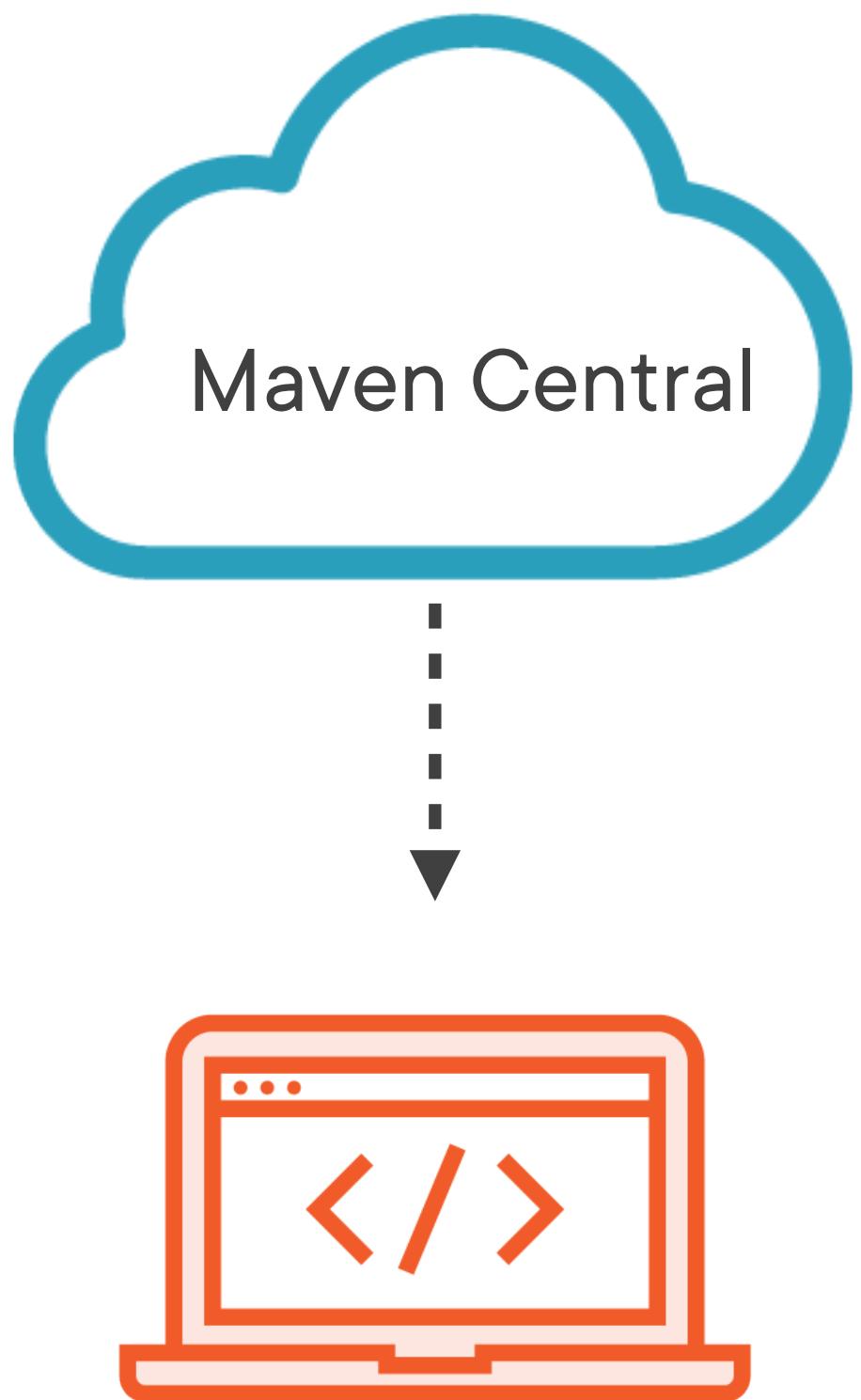
Build Tools



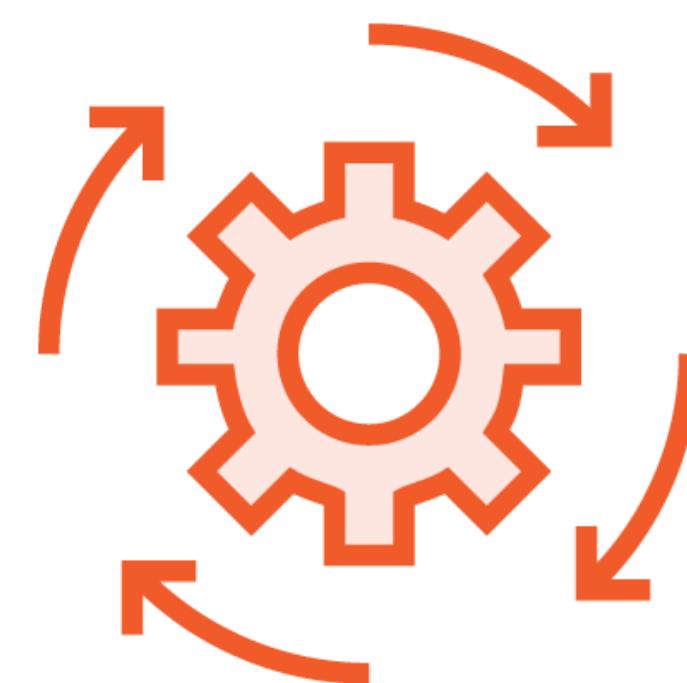
```
<dependency>
    <groupId>io.netty</groupId>
    <artifactId>netty-all</artifactId>
    <version>4.1.30</version>
</dependency>
```



Build Tools



```
<dependency>
    <groupId>io.netty</groupId>
    <artifactId>netty-all</artifactId>
    <version>4.1.30</version>
</dependency>
```



Alternative JVM Languages

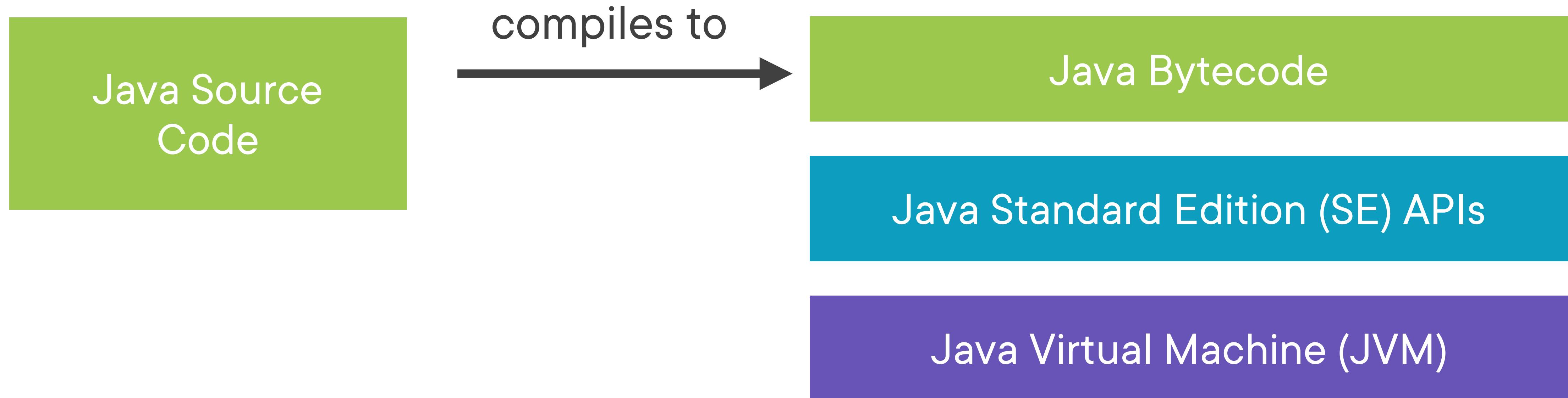
Alternative JVM Languages

Java Bytecode

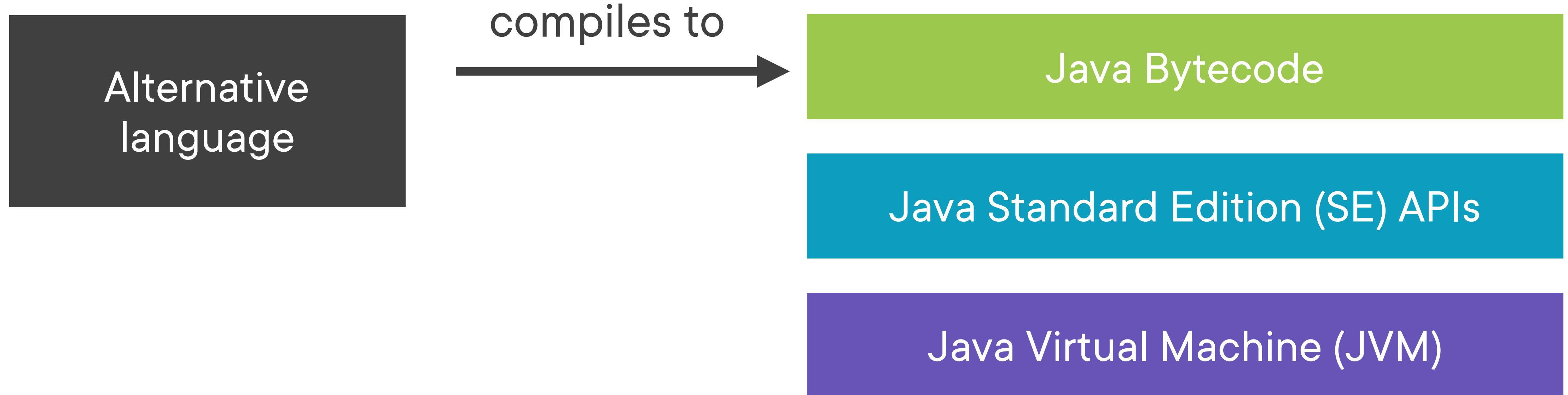
Java Standard Edition (SE) APIs

Java Virtual Machine (JVM)

Alternative JVM Languages



Alternative JVM Languages



Alternative JVM Languages



Alternative JVM Languages



Productivity

Alternative JVM Languages



Productivity

No backward compatibility constraints

Alternative JVM Languages



Productivity

No backward compatibility constraints

Different programming paradigms

Scala

The Scala Programming Language

Scala combines object-oriented and functional programming in one concise, high-level language. Scala's static types help avoid bugs in complex applications, and its JVM and JavaScript runtimes let you build high-performance systems with easy access to huge ecosystems of libraries.

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<https://scala-lang.org>

Extensive type system

Scala



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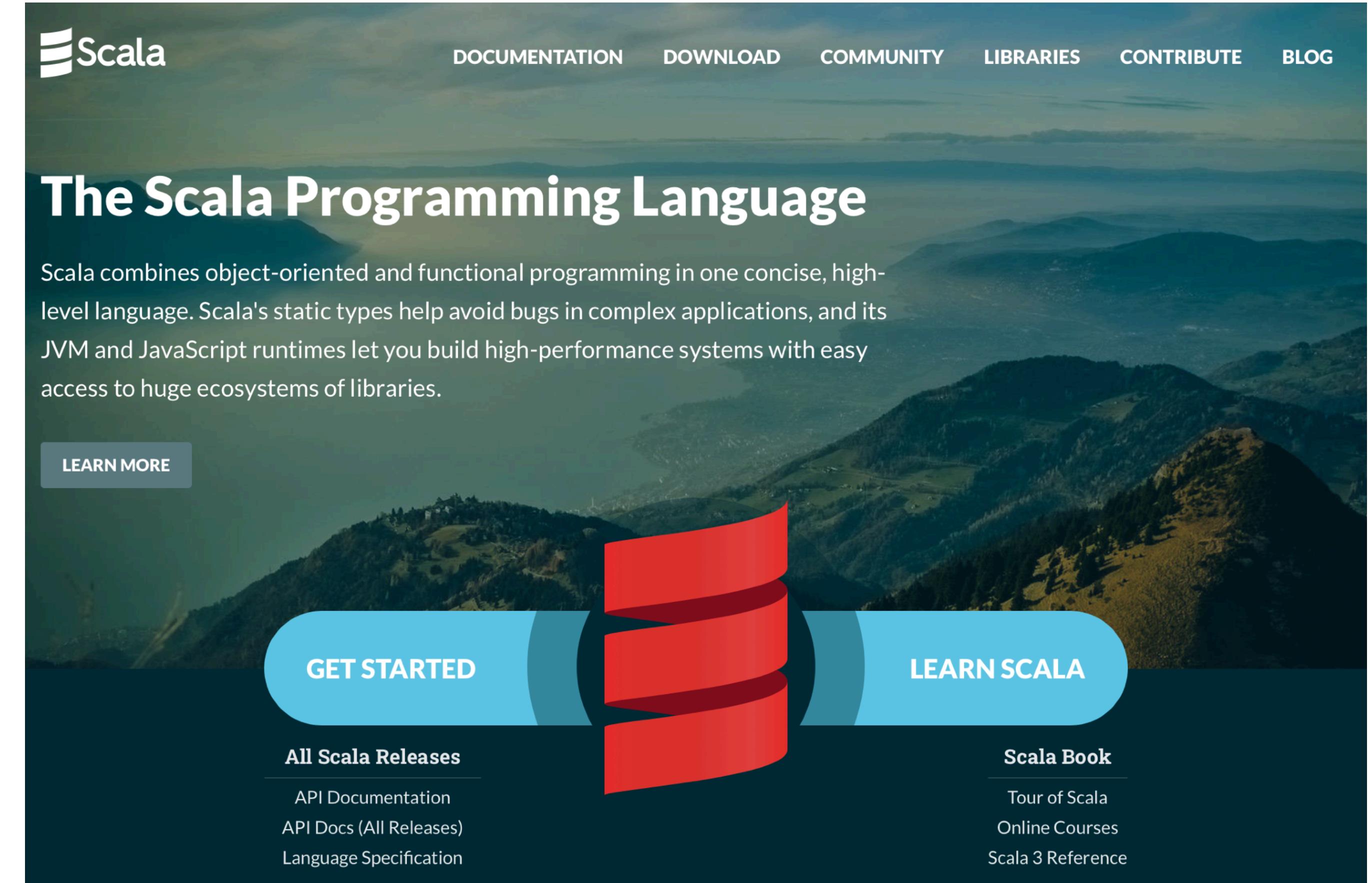
- Tour of Scala
- Online Courses
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<https://scala-lang.org>

Extensive type system

OO & functional features

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<https://scala-lang.org>

Extensive type system

OO & functional features

Steep learning curve

Scala



<https://scala-lang.org>

Kotlin

The screenshot shows the official Kotlin website with a dark theme. At the top, there's a navigation bar with the Kotlin logo, followed by links for Solutions, Docs, Community, Teach, Play, and a search icon. The main headline reads "A modern programming language that makes developers happier." Below it are four cards: "Multiplatform Mobile" (with a smartphone icon), "Server-side" (with a server icon), "Web Frontend" (with a globe icon), and "Android" (with an Android robot icon). Each card has a brief description and a "Get started" button.

Kotlin

Solutions Docs Community Teach Play

A modern programming language that makes developers happier.

Get started Why Kotlin Developed by [JetBrains](#) & Open-source [Contributors](#)

Multiplatform Mobile
Share the logic of your Android and iOS apps while keeping UX native

Server-side
Modern development experience with familiar JVM technology

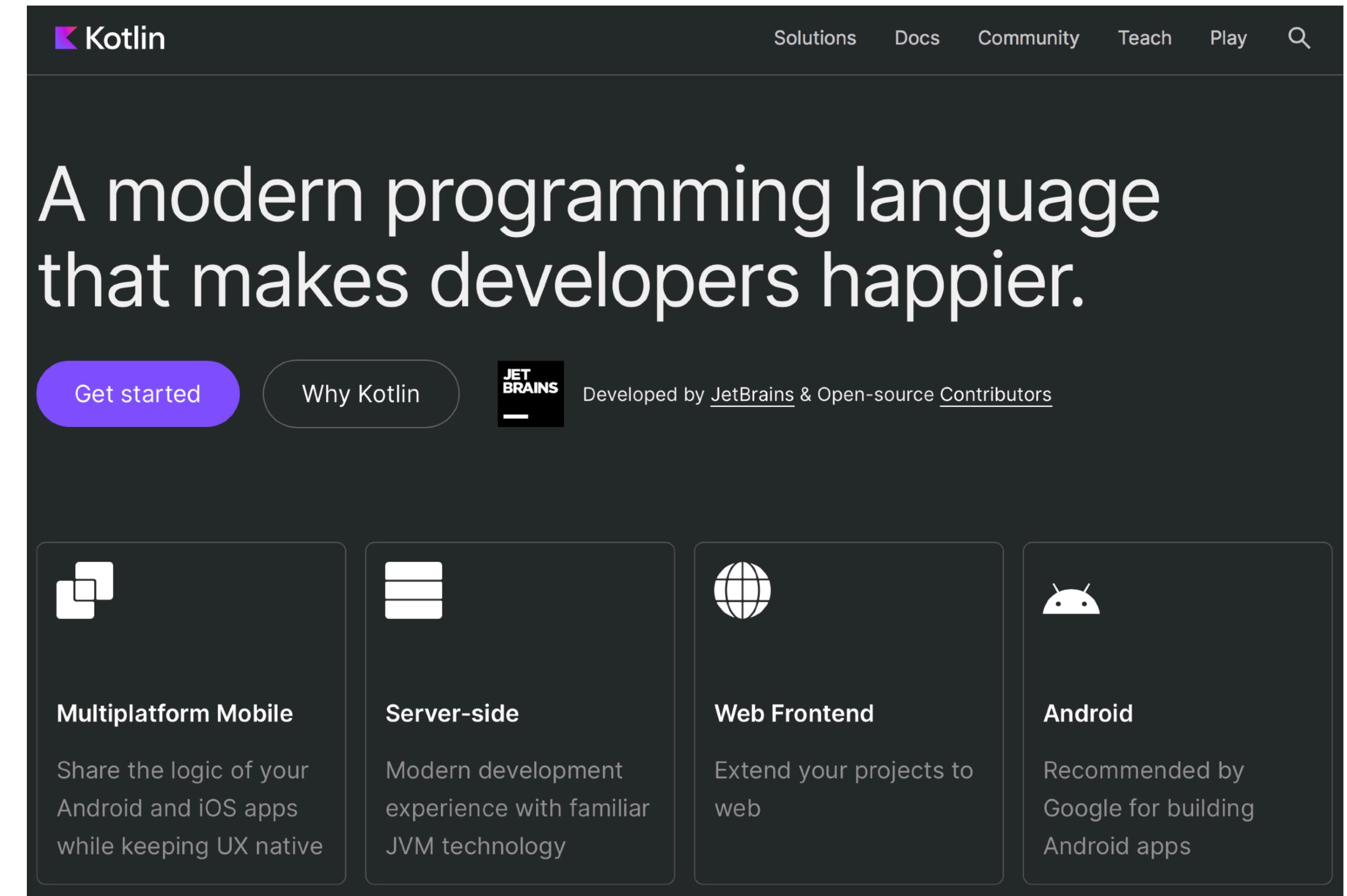
Web Frontend
Extend your projects to web

Android
Recommended by Google for building Android apps

<https://kotlinlang.org>

Created by JetBrains

Kotlin



The screenshot shows the official Kotlin website homepage. At the top, there's a navigation bar with the Kotlin logo, a search icon, and links for Solutions, Docs, Community, Teach, Play, and a magnifying glass icon. The main headline reads "A modern programming language that makes developers happier." Below the headline are two buttons: "Get started" (highlighted in purple) and "Why Kotlin". To the right of these buttons is the Jet Brains logo and the text "Developed by [JetBrains](#) & Open-source [Contributors](#)". The page features four main sections with icons and descriptions: "Multiplatform Mobile" (represented by a smartphone icon), "Server-side" (represented by a server icon), "Web Frontend" (represented by a globe icon), and "Android" (represented by an Android robot icon). Each section includes a brief description and a "Read more" link.

Kotlin

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Get started Why Kotlin

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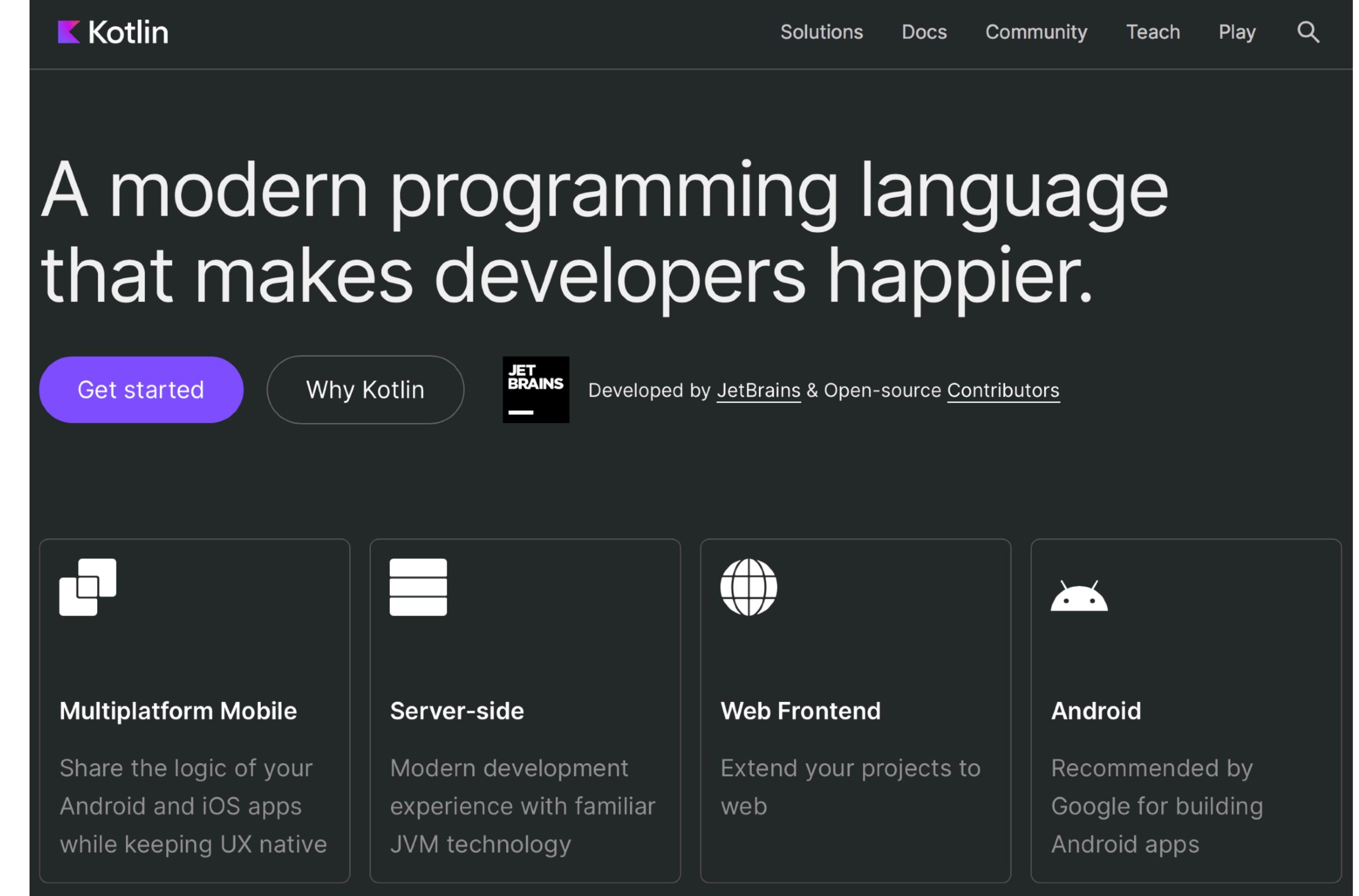
Android
Recommended by Google for building Android apps

<https://kotlinlang.org>

Created by JetBrains

Java interoperability

Kotlin



The image shows the official Kotlin website homepage. The header features the Kotlin logo and navigation links for Solutions, Docs, Community, Teach, Play, and a search icon. The main headline reads "A modern programming language that makes developers happier." Below the headline are four cards: "Multiplatform Mobile" (Share the logic of your Android and iOS apps while keeping UX native), "Server-side" (Modern development experience with familiar JVM technology), "Web Frontend" (Extend your projects to web), and "Android" (Recommended by Google for building Android apps). The "Get started" button is highlighted in purple.

Kotlin

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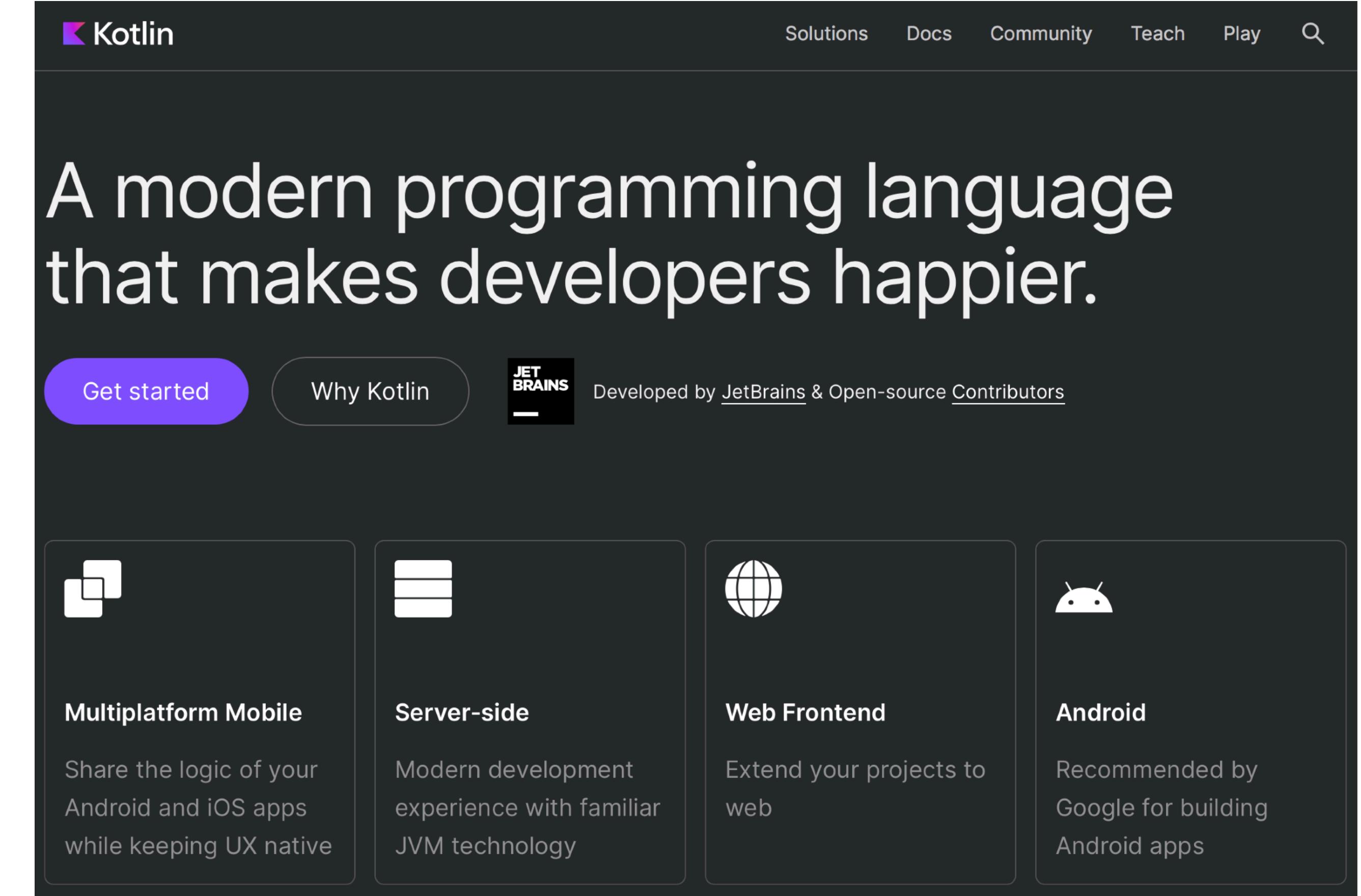
<https://kotlinlang.org>

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Java interoperability

Official language for Android

Kotlin



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Kotlin

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Get started Why Kotlin

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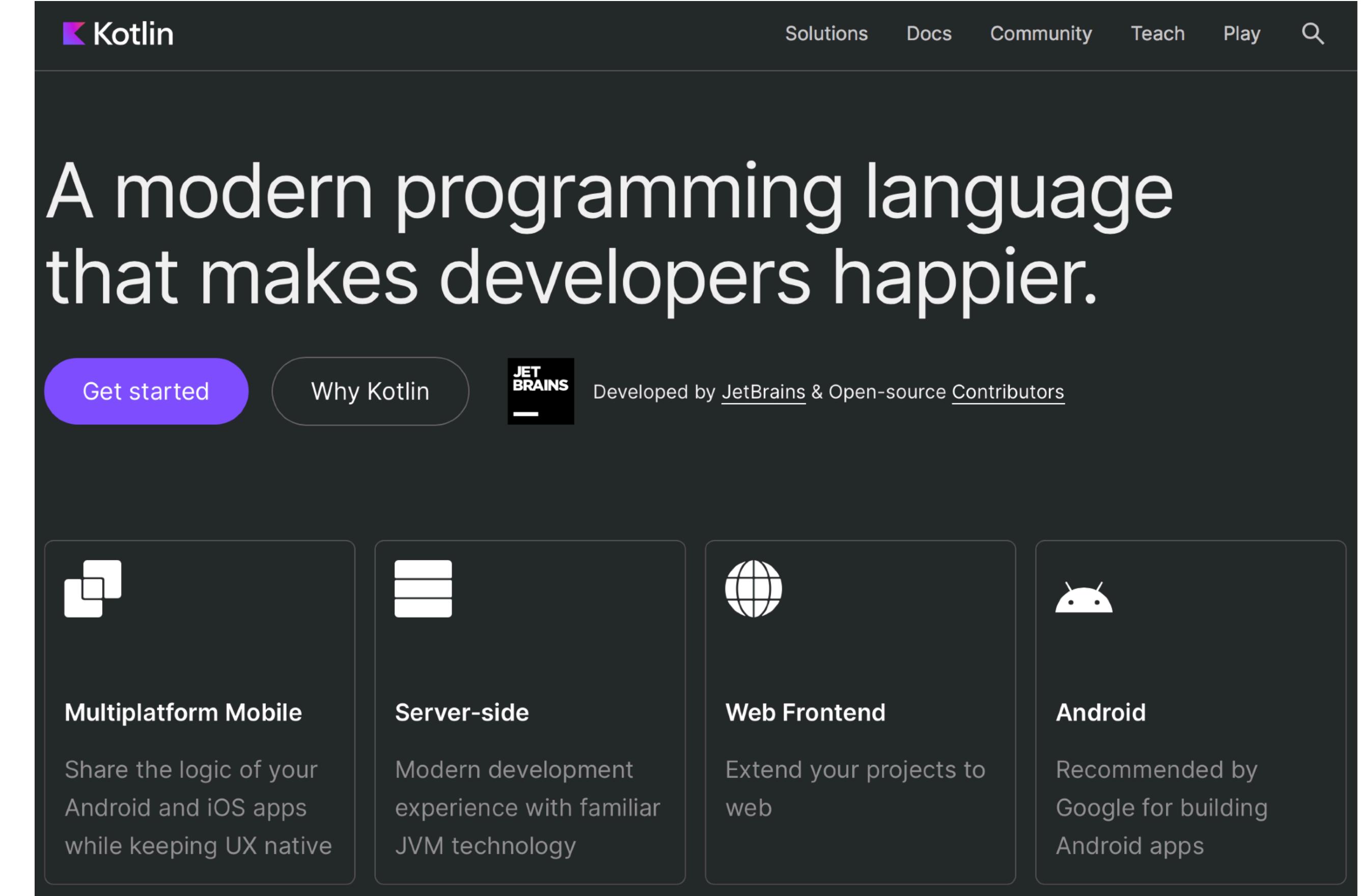
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Java interoperability

Official language for Android

Multiple platforms

Kotlin



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Kotlin

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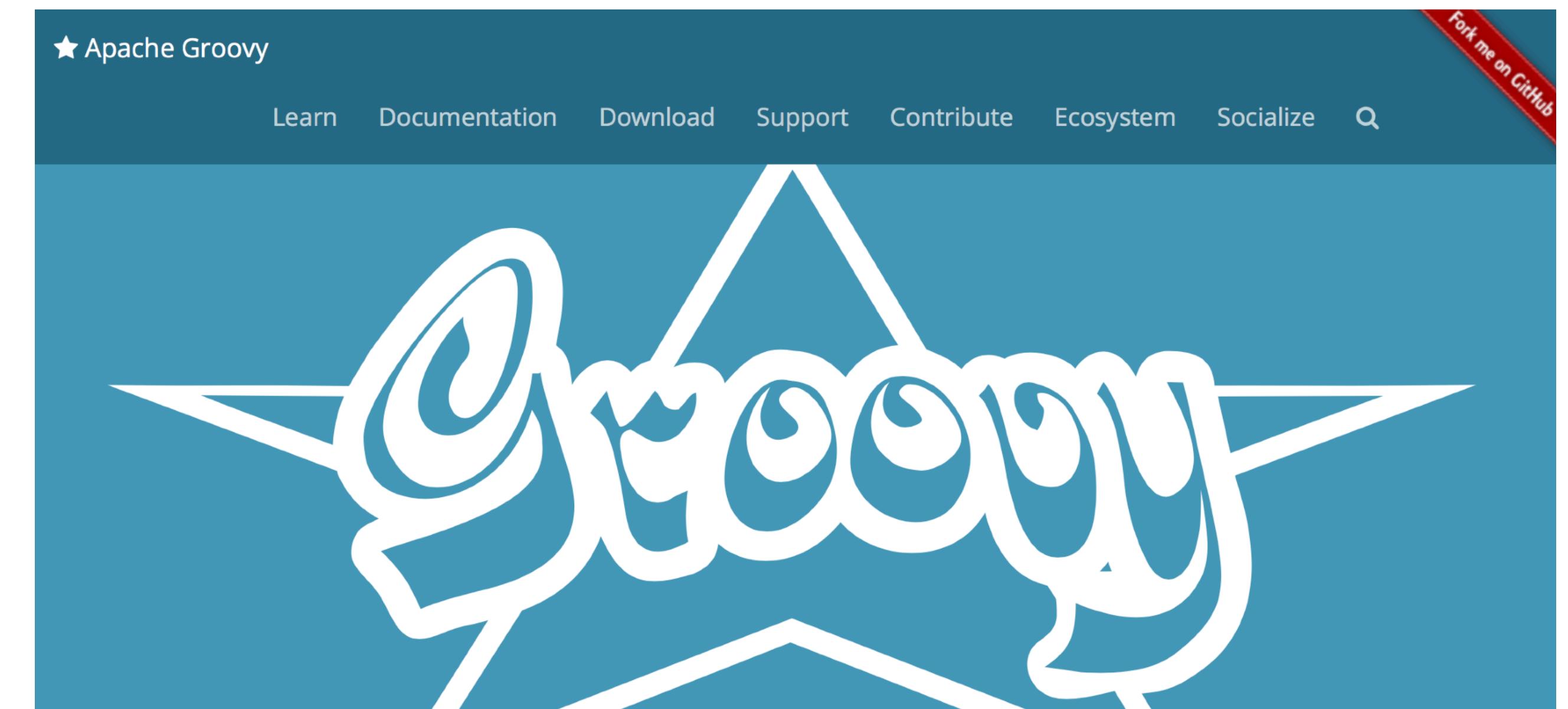
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<https://kotlinlang.org>

Groovy



A multi-faceted language for the Java platform

<https://groovy-lang.org>

Groovy

Interpreted language



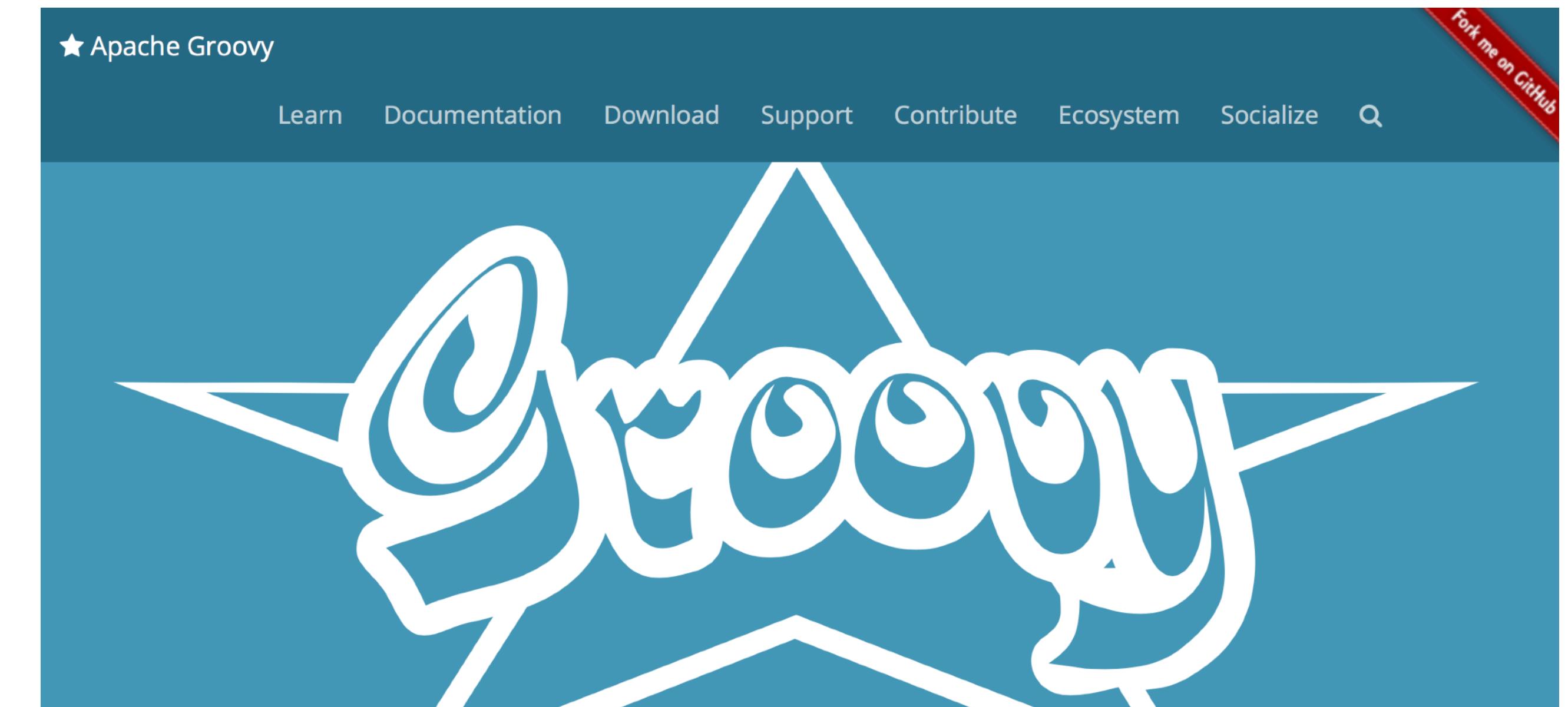
A multi-faceted language for the Java platform

<https://groovy-lang.org>

Groovy

Interpreted language

Dynamic typing



A multi-faceted language for the Java platform

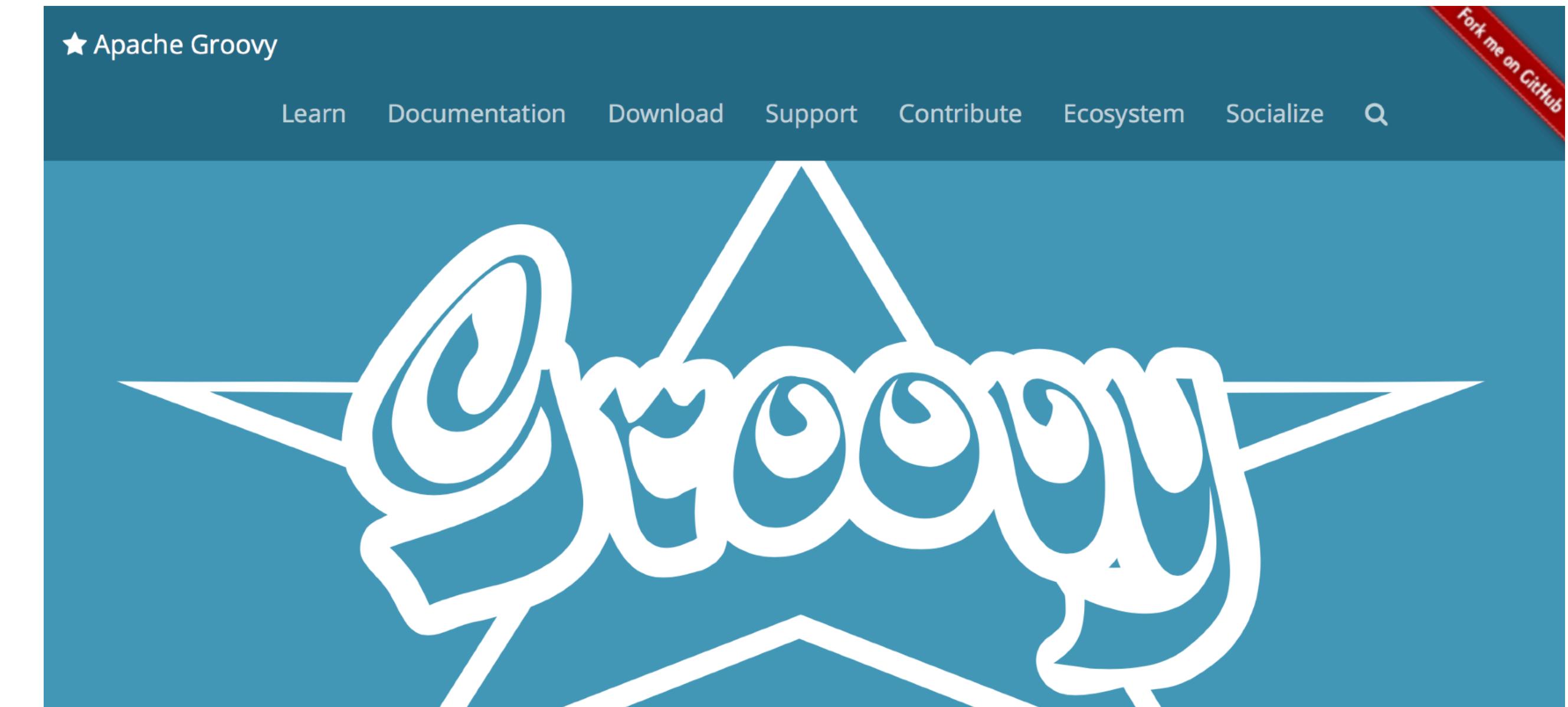
<https://groovy-lang.org>

Groovy

Interpreted language

Dynamic typing

Optional typing & compilation



A multi-faceted language for the Java platform

<https://groovy-lang.org>

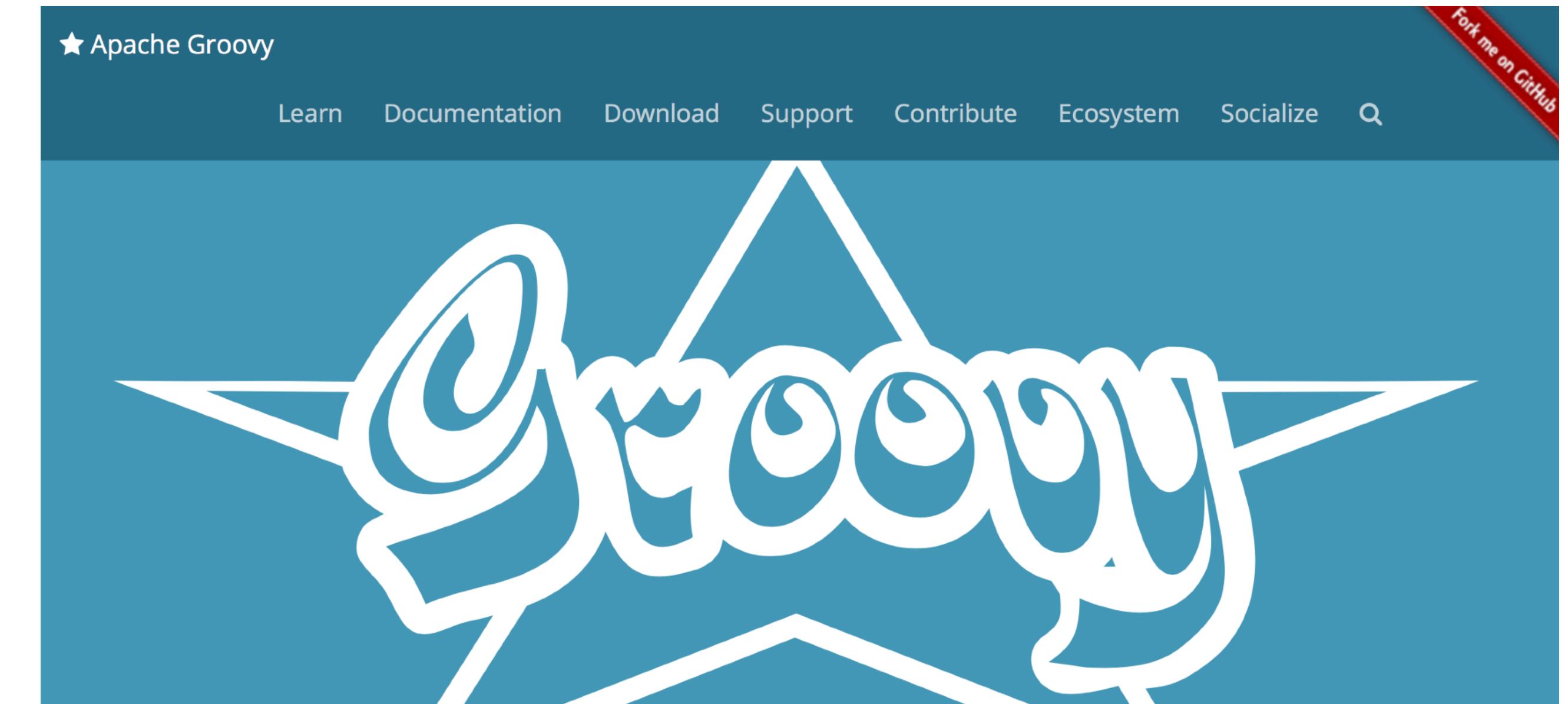
Groovy

Interpreted language

Dynamic typing

Optional typing & compilation

Mix with Java code



A multi-faceted language for the Java platform

<https://groovy-lang.org>

Course Wrap-up

Course Wrap-up



Introducing the
Java Platform

Course Wrap-up

**Introducing the
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**Adopting
Java 17**

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Java 17**

**Working with
Java 17**

**The Wider Java
Ecosystem**

Recommended Resources

Recommended Resources

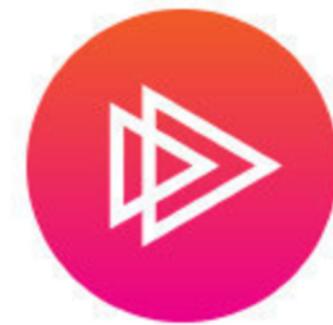


Java SE 17 Path

Recommended Resources



Java SE 17 Path



Java SE 17 Fundamentals

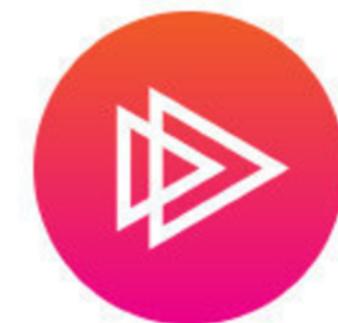
Recommended Resources



Java SE 17 Path



Java SE 17 Fundamentals



Spring/Jakarta EE Big Picture

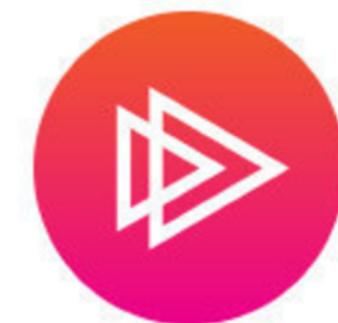
Recommended Resources



Java SE 17 Path



Java SE 17 Fundamentals



Spring/Jakarta EE Big Picture



What's New in Java {9 .. 16}

Additional Resources

Additional Resources

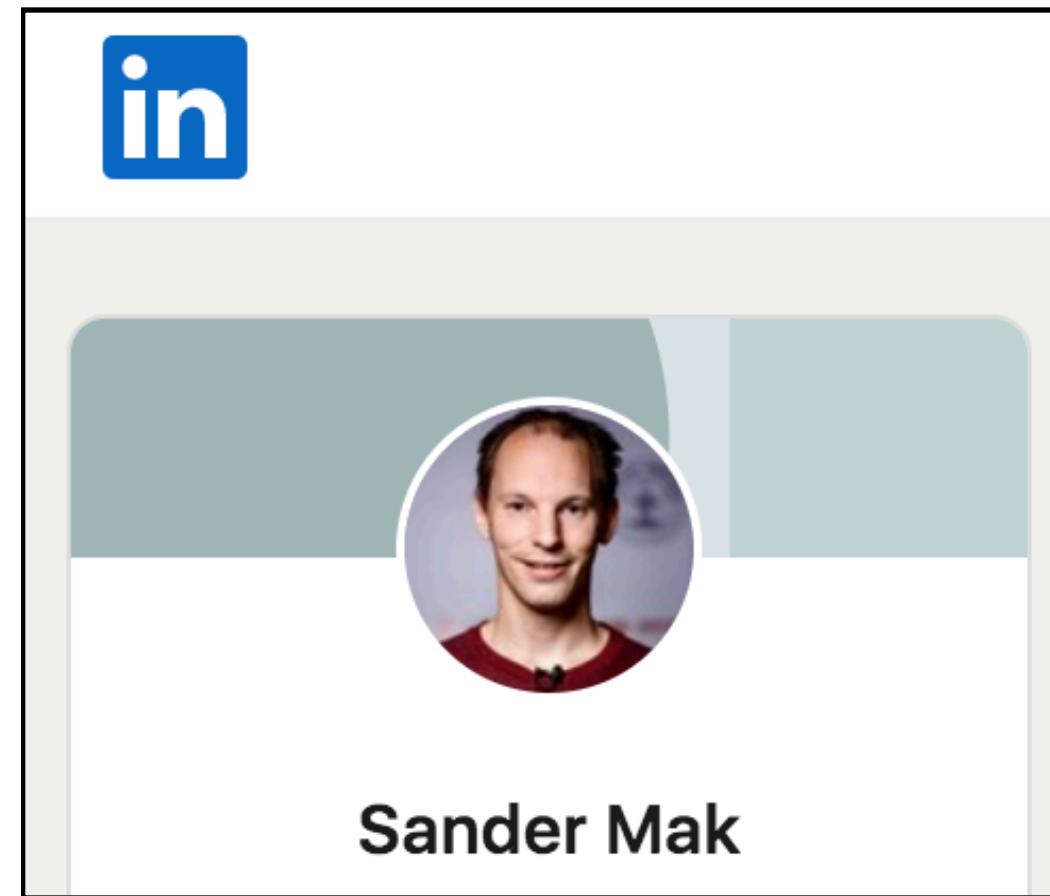


Twitter

Additional Resources



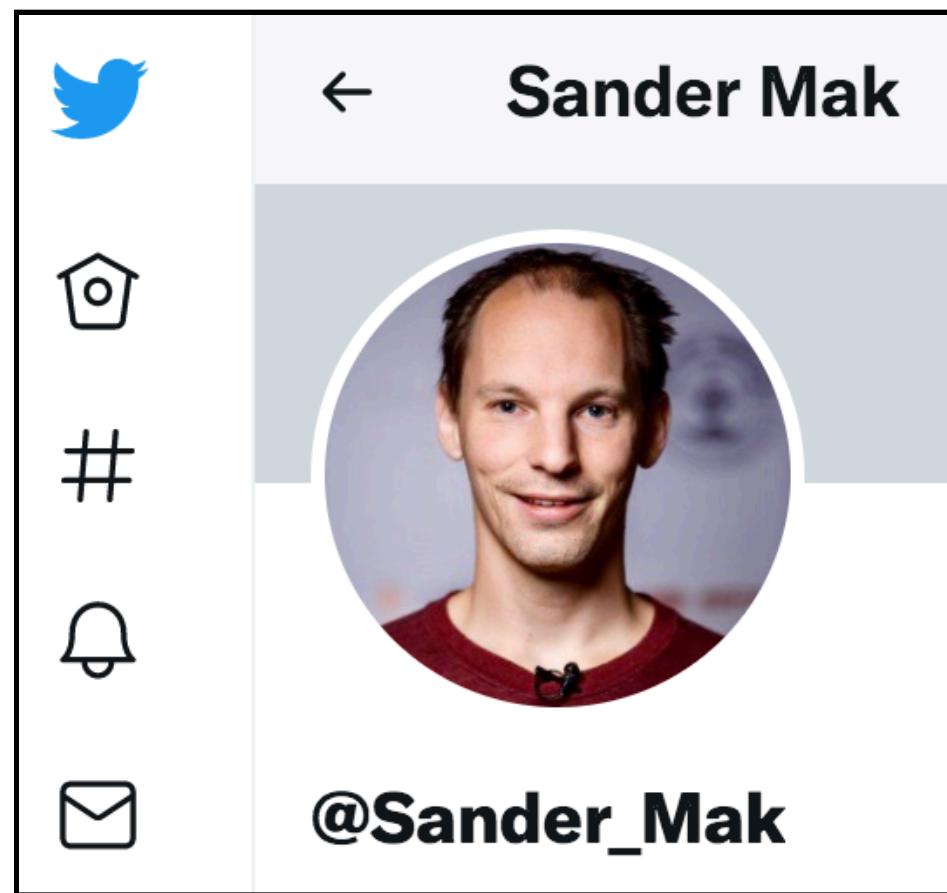
Twitter



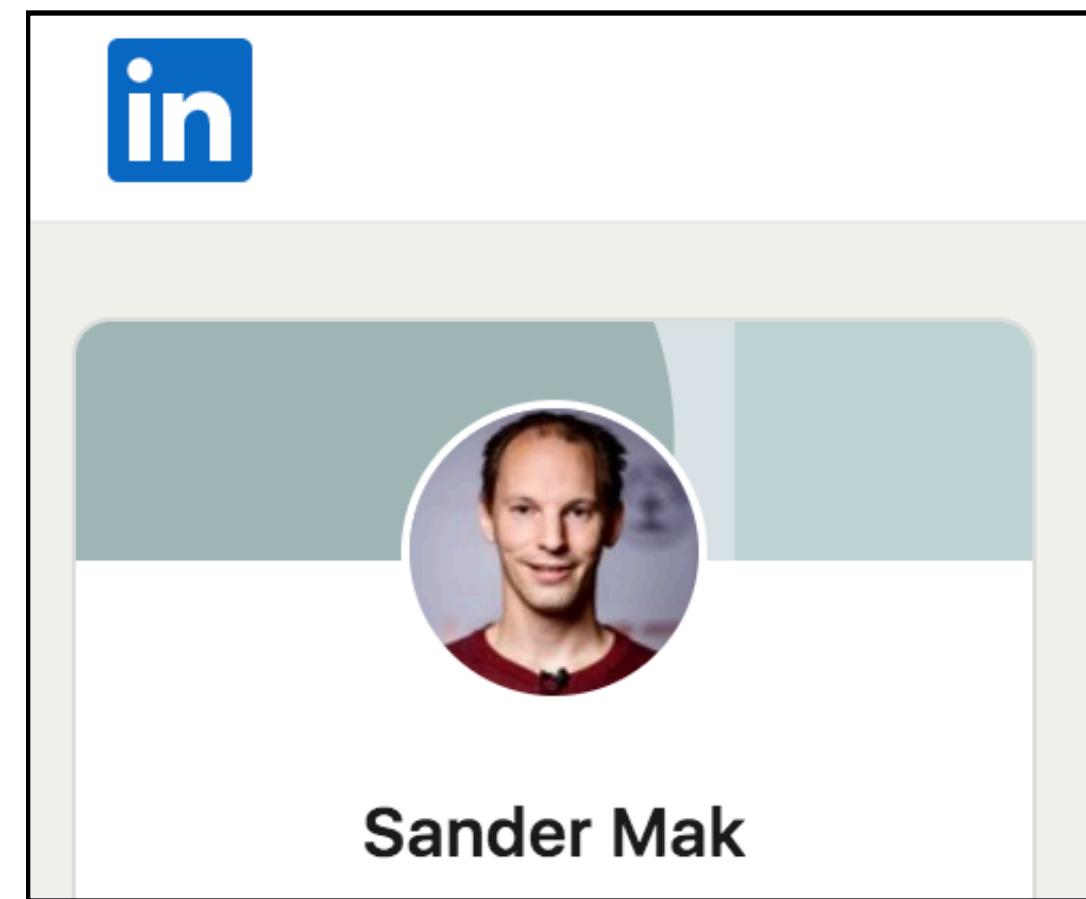
LinkedIn

Additional Resources

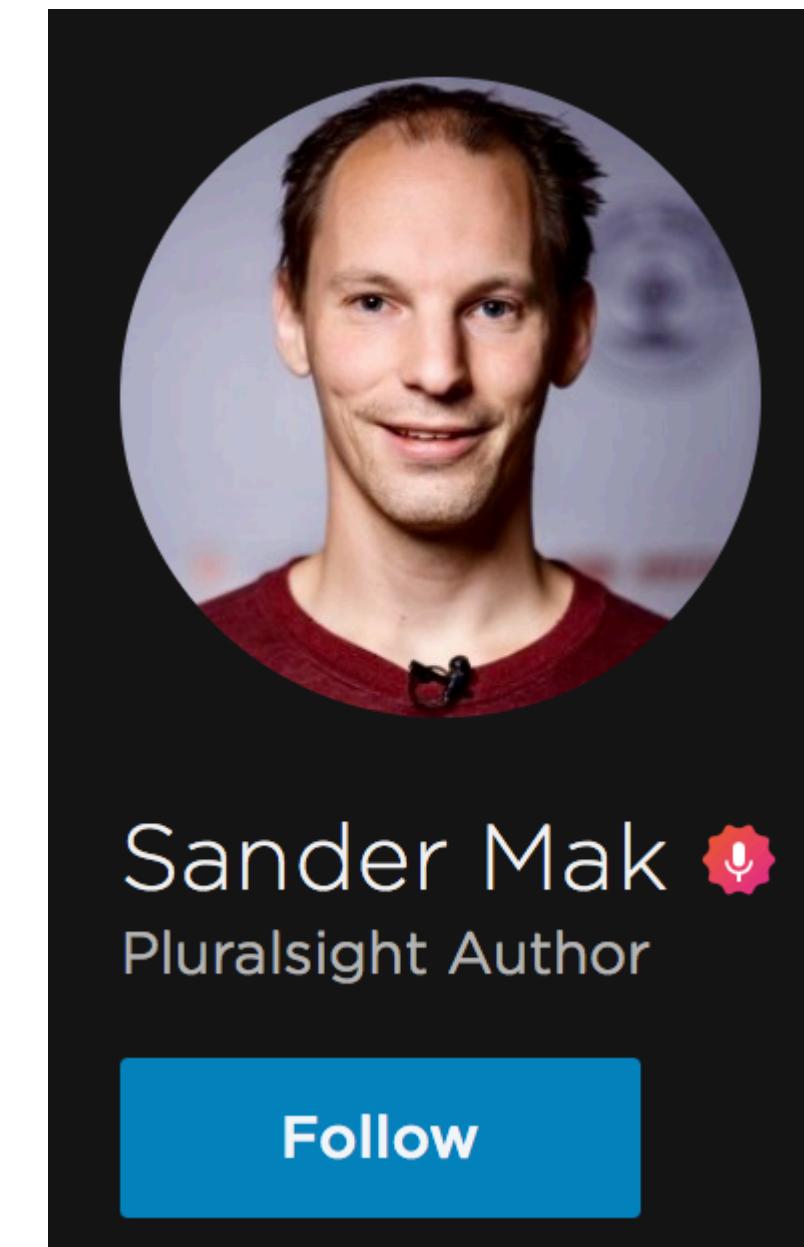
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