CodeMash 2019

Gradle + Ketchup

Presenter: David Lucas

LSE

Gradle + Kotlin

Presenter: David Lucas

LSE

Who am I ?

- Over 25 years in software industry
- Working with Java since 1998
- IntelliJ / JetBrains introduced me to Kotlin
- Google made me realize …
  Kotlin is now the new Java
- I am a Kotlin Enthusiast
- Extensive production deployments
- Experience with Make, Ant, Maven, and new to Gradle

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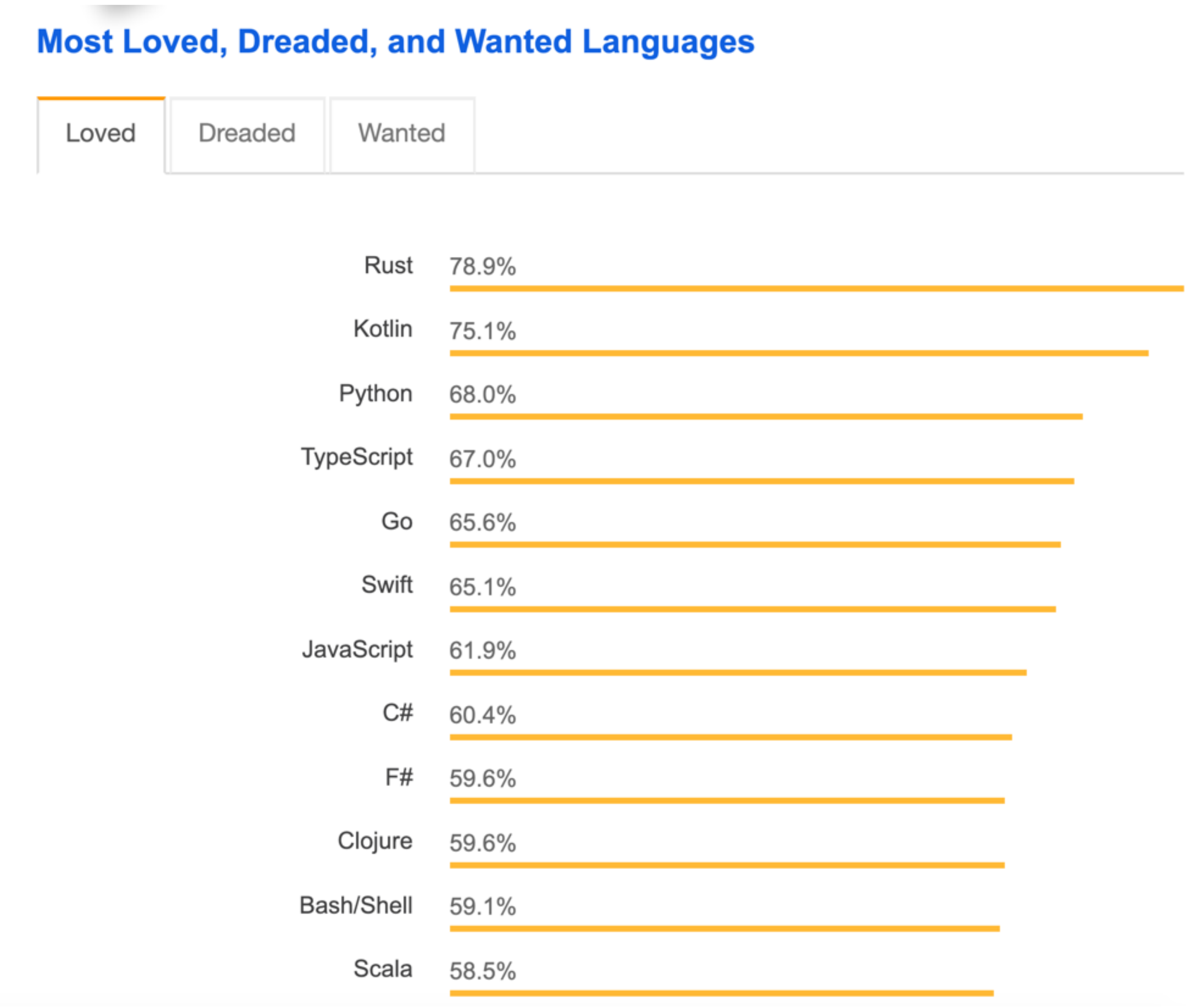
@DavidDLucas

Goals

- Introduce Gradle
- Introduce Kotlin DSL
- Review Performance Features
- DEMOs

Kotlin Stats



Rust	78.9%
Kotlin	75.1%
Python	68.0%
TypeScript	67.0%
Go	65.6%
Swift	65.1%
JavaScript	61.9%
C#	60.4%
F#	59.6%
Clojure	59.6%
Bash/Shell	59.1%
Scala	58.5%

2018

MAKE

In the beginning…
there was Make…
and build tools seemed to be

targets: dependences
commands

[sad, I could not find an image for Make]

Note: Ask me later about evil white space.

<APACHE ANT>

tasks, mostly Java Centric

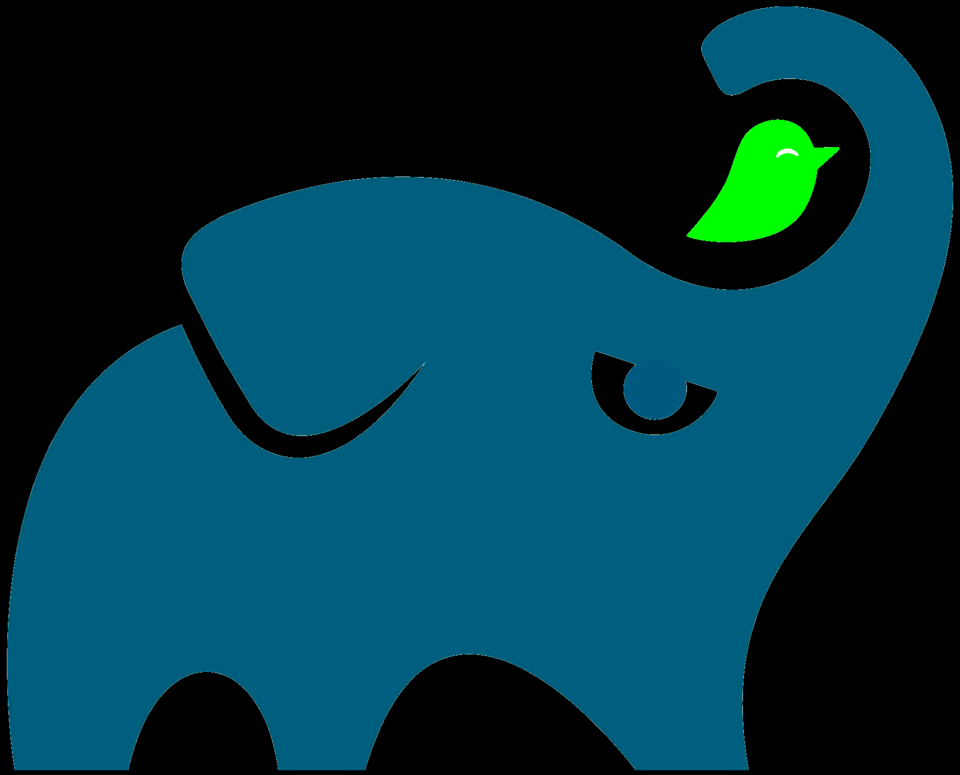
Maven

dependencies, lifecycle, plugins,
Java Centric

[rigid]

dependencies, tasks, Java Centric

[ant + ivy]



Gradle

dependencies, tasks,
plugins, cache, multi-platform
targets

[flexible]

Gradle Intro

- Created in 2007 as an alternative to ant / maven
- Gradle Inc. founded by Hans Dockter
- Goal: allow build authors to write fully declarative models
- Build by convention, avoid XML
- JVM Based Command Line Tool
- Google selected Gradle as Official Build Tool for Android Development

https://gradle.org

Gradle Intro

- Ecosystem:
  - JVM: Java, Kotlin, Groovy, Scala, Clojure…
  - Native: C, C++ Swift, Rust, …
  - Mobile: Android, iOS
  - Other: Go, Python, JavaScript, …

https://gradle.org

Gradle Intro

- Write Groovy or Kotlin “build scripts”
- Leverage Gradle Tasks and Plugins
- Command line executes tasks
- Tasks are made up of
  - dependencies
  - configuration
  - code
- Code is used to create tasks or plugins

https://gradle.org

Gradle Intro

- Plugins
  - Core (java, jacoco, maven-publish, …)
  - Community (kotlin, android, golang, …)
  - Contribute Reusable Tasks
  - Configurable Model
  - Configure via Build Script

https://gradle.org

Gradle Features 5.x

- Requires JDK 8 or higher
- Support Groovy 2.5
- Support Kotlin 1.3.11
- Support JUnit 5.x
- Support JDK 11.x
- Support found in multiple IDEs

https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

- Improved Incremental Compilation
- Improved Dependency Management
- Signing artifacts
  - Maven Publish
  - IVY Publish
- Properties (Global or By Project)
- Config Avoidance
- Custom Command Line Arguments

https://docs.gradle.org/current/release-notes.html

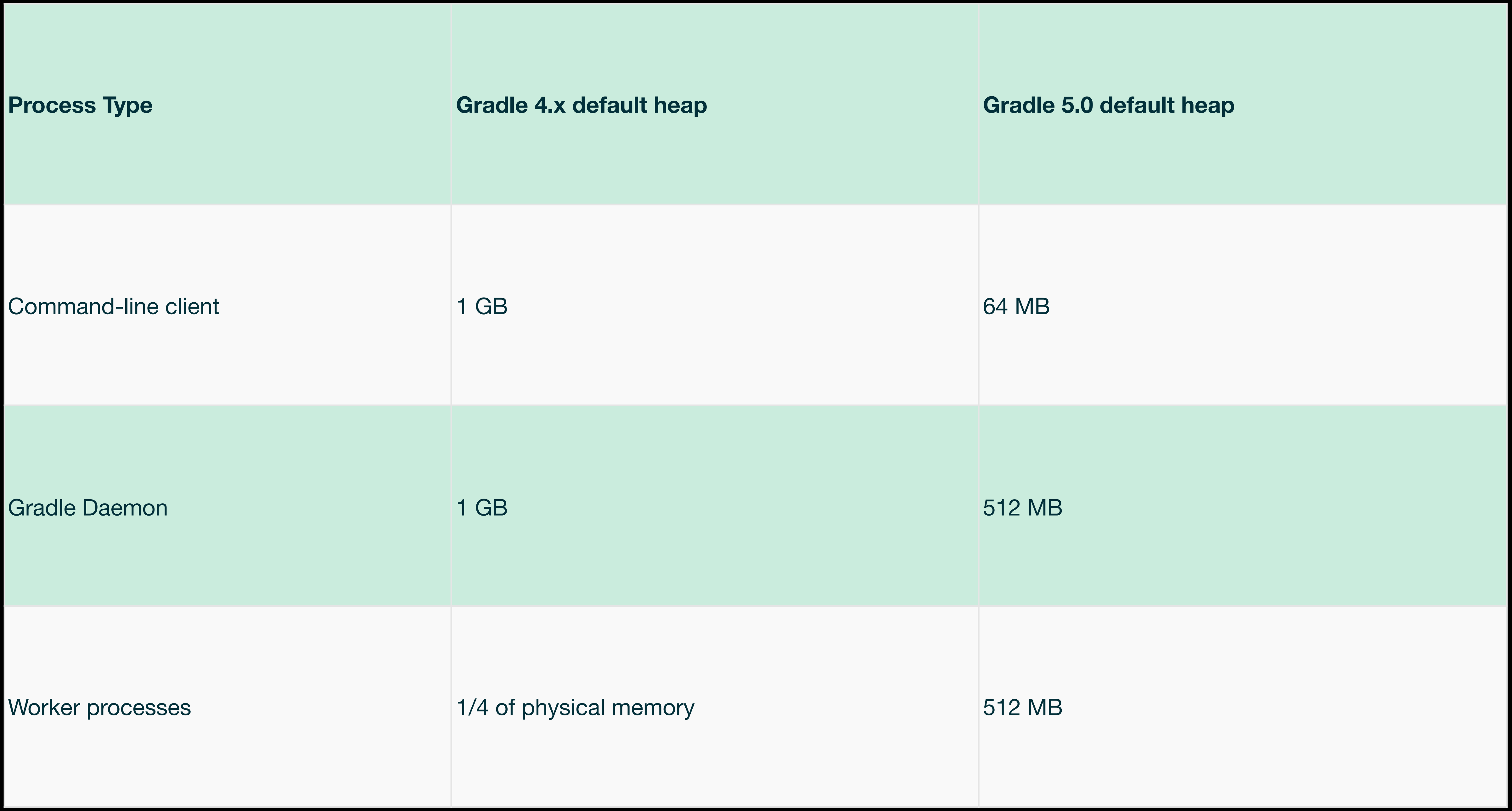
Gradle Features 5.x

- Fail Fast Testing
  gradle --fail-fast test # since 4.6
  # stops on first failure
  # runs failure first
- Parallel
- Worker API
- Interactive gradle init

https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

Process Resource Improvements



Process Type	Gradle 4.x default heap	Gradle 5.0 default heap
Command-line client	1 GB	64 MB
Gradle Daemon	1 GB	512 MB
Worker processes	1/4 of physical memory	512 MB

https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

- Task Timeouts

```
val helloTask by tasks.registering(Test::class) {
    group = "greeting"
    description = "hello greeting"
    doLast {
        println("Hello World!")
    }
    timeout.set(Duration.ofMinutes(5))
}
```

https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

- Test Grouping

```
tasks.test {
    useJUnitPlatform {
        excludeTags("slow")
        includeEngines("junit-vintage")
        failFast = true
    }
}
```

https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

- Dependency Constraints

```
dependencies {
    implementation("org.apache.httpcomponents:httpclient")
    constraints {
        add(“implementation",
            "org.apache.httpcomponents:httpclient:4.5.3")
        {
            because("previous versions bug impacts application")
        }
        add("implementation", "commons-codec:commons-codec:1.11")
        {
            because("version 1.9, pulled from httpclient, has bugs")
        }
    }
}
```

https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

- Dependency Version Alignment

```
open class JacksonAlignmentRule: ComponentMetadataRule {
  override fun execute(ctx: ComponentMetadataContext) {
    ctx.details.run {
      if (id.group.startsWith("com.fasterxml.jackson")) {
        belongsTo("com.fasterxml.jackson:jackson-platform:${id.version}")
      }
    }
  }
}

dependencies {
    components.all(JacksonAlignmentRule::class.java)
}
```

https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

- Bill Of Materials (BOM) Support

```
dependencies {
    // import a BOM
    implementation(
       platform(“org.springframework.boot:spring-boot-dependencies:1.5.8.RELEASE")
    )
    // define dependencies without versions
    implementation("com.google.code.gson:gson")
    implementation("dom4j:dom4j")
}
```

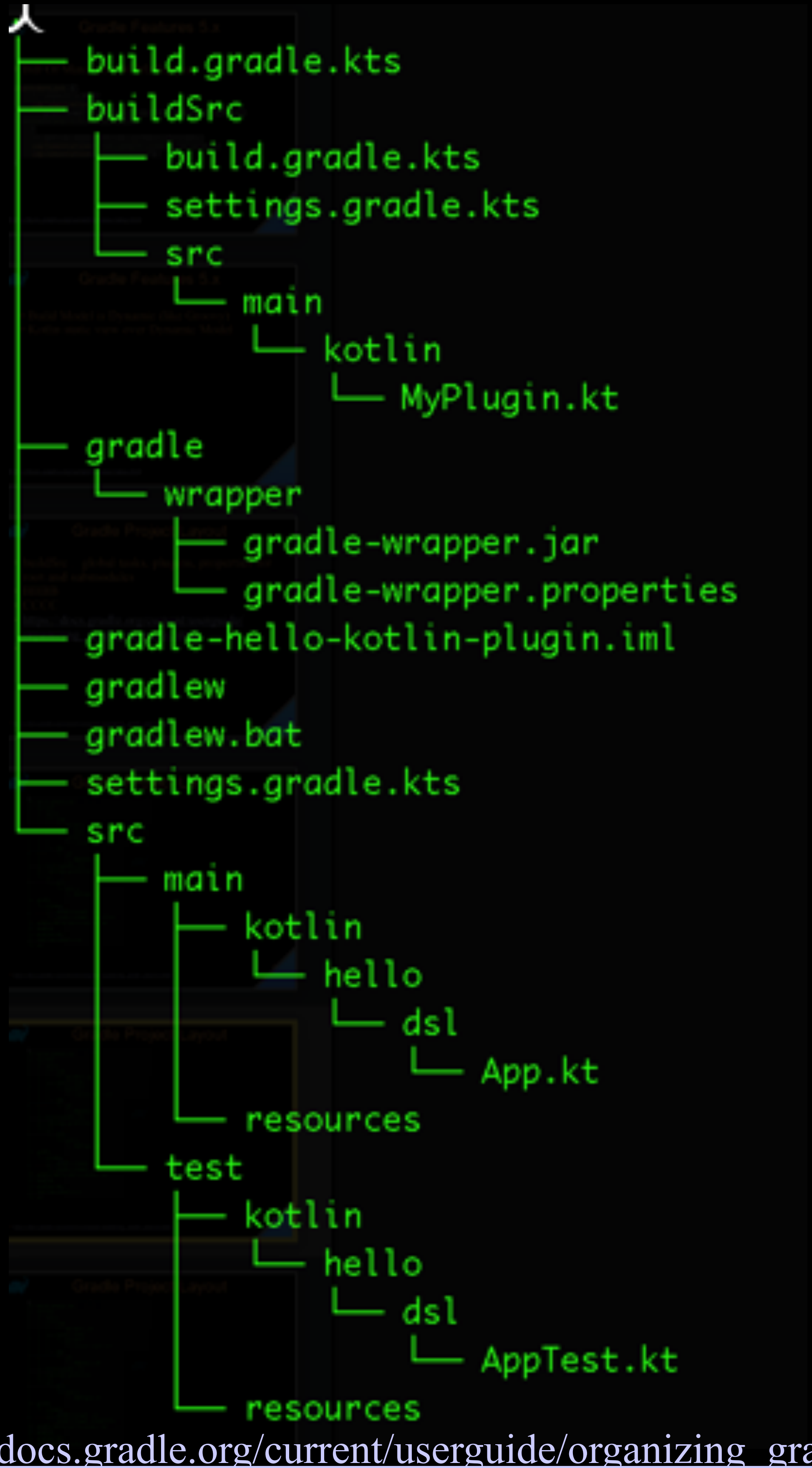
https://docs.gradle.org/current/release-notes.html

Gradle Features 5.x

- Build Model is Dynamic (like Groovy)
- Kotlin static view over Dynamic Model

https://docs.gradle.org/current/release-notes.html

Gradle Project Layout



```
├── build.gradle.kts
├── buildSrc
│   ├── build.gradle.kts
│   ├── settings.gradle.kts
│   └── src
│       └── main
│           └── kotlin
│               └── MyPlugin.kt
├── gradle
│   └── wrapper
│       ├── gradle-wrapper.jar
│       └── gradle-wrapper.properties
├── gradle-hello-kotlin-plugin.iml
├── gradlew
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    │   │       └── dsl
    │   │           └── App.kt
    │   └── resources
    └── test
        ├── kotlin
        │   └── hello
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```
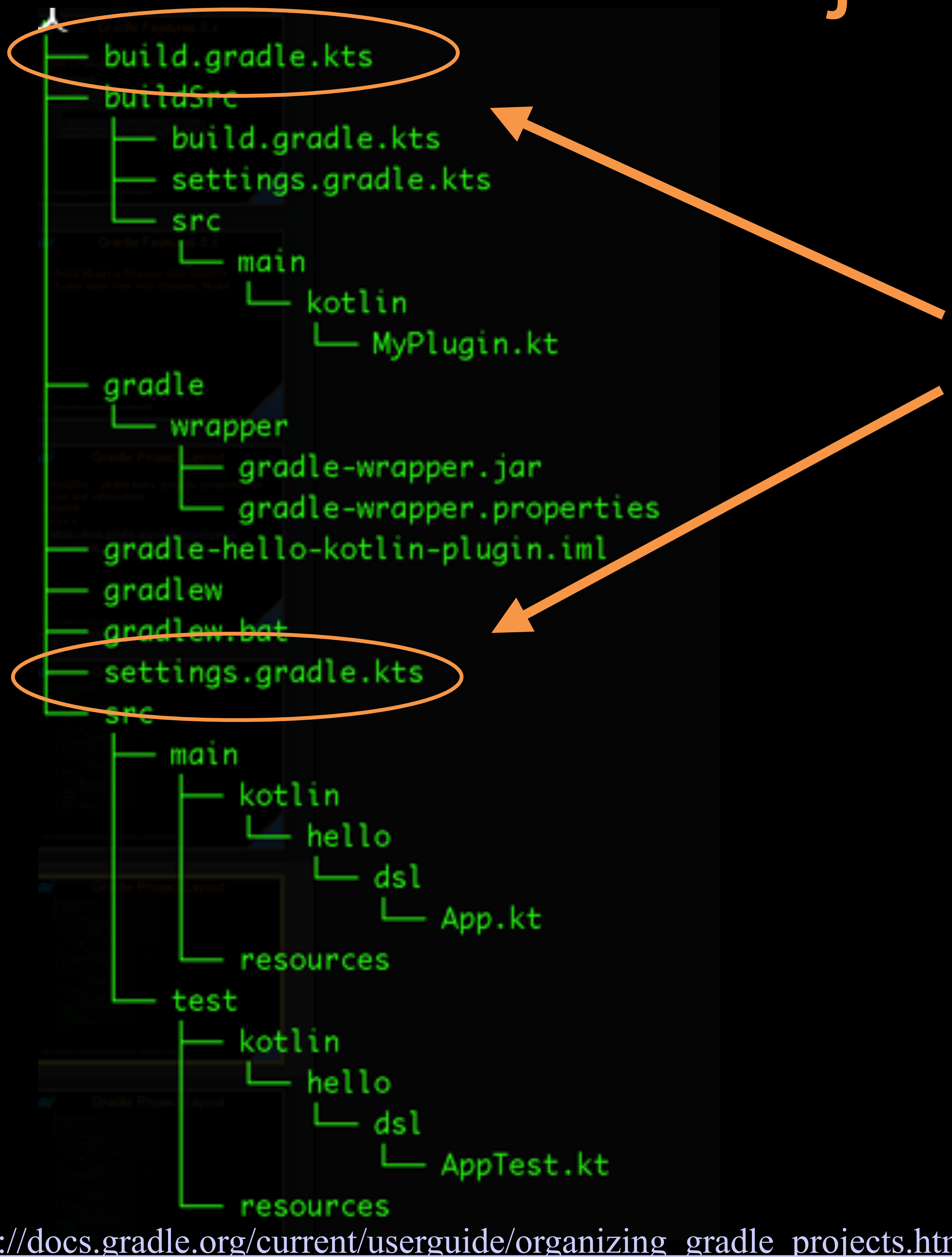

Kotlin Project

- https://docs.gradle.org/current/userguide/organizing_gradle_projects.html

Gradle Project Layout



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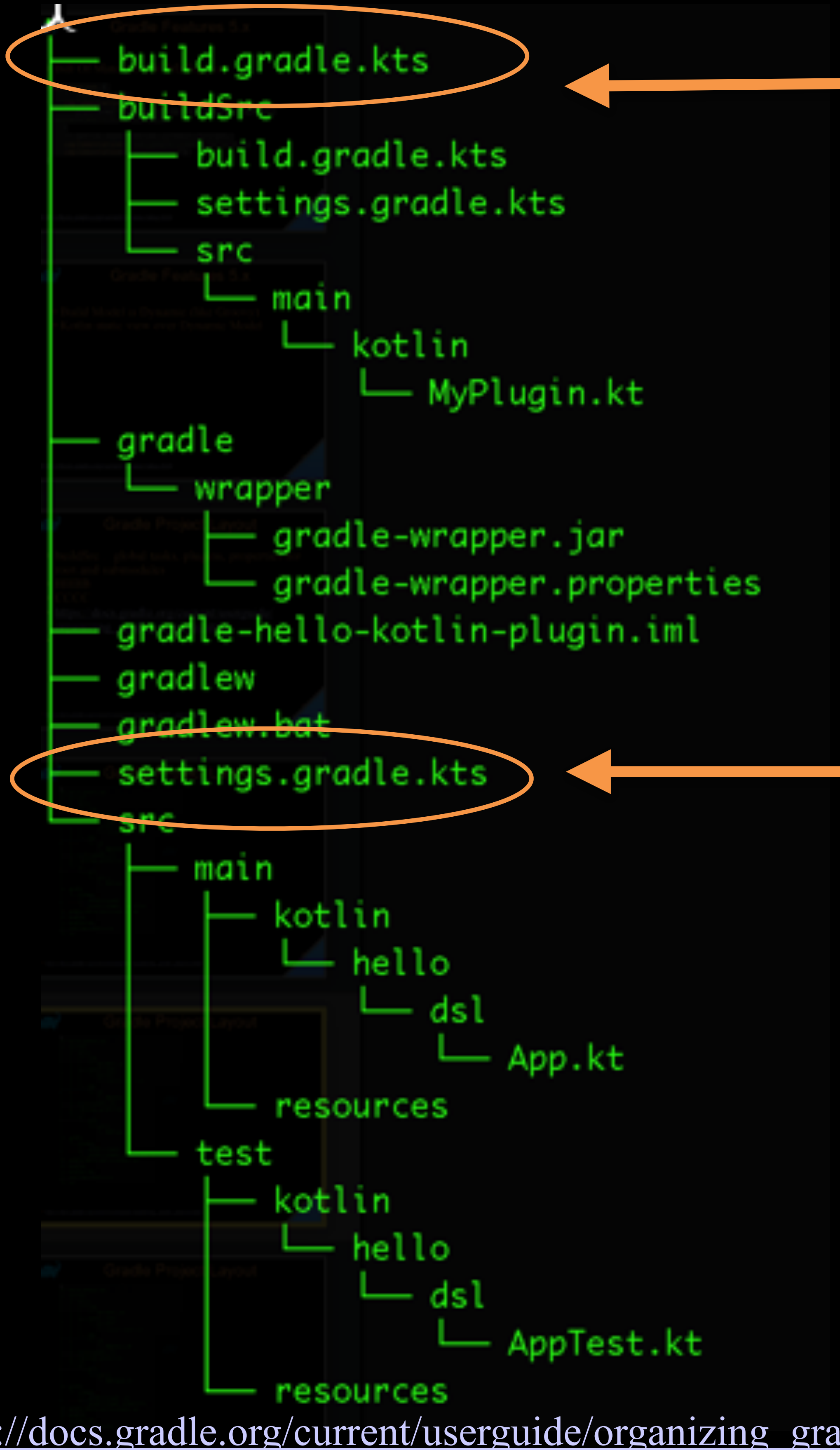
Root Kotlin DSL Scripts

- https://docs.gradle.org/current/userguide/organizing_gradle_projects.html

Gradle Project Layout



```
├── build.gradle.kts
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        └── resources
```
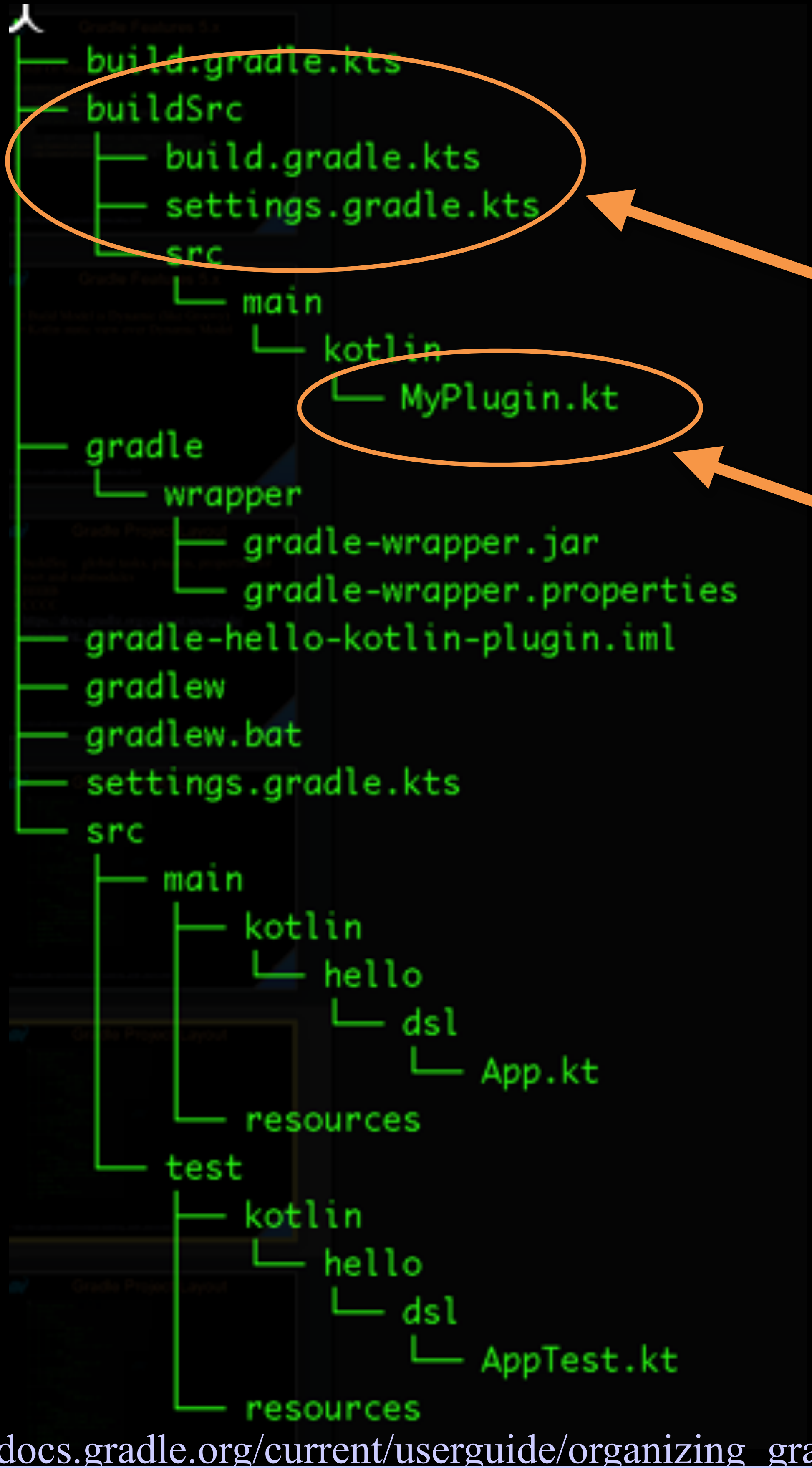

Project Object

Settings Object

- https://docs.gradle.org/current/userguide/organizing_gradle_projects.html

Gradle Project Layout



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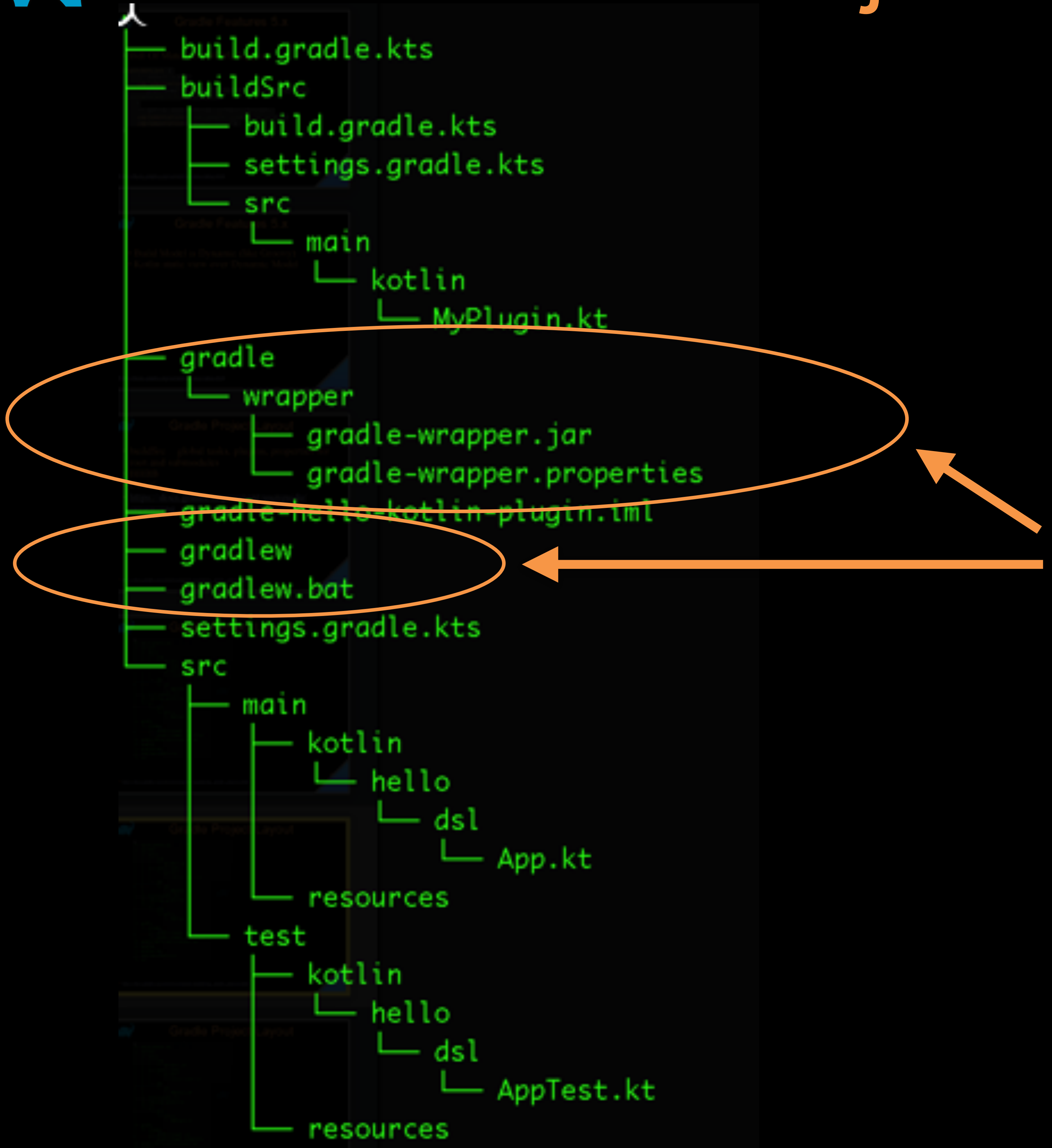
```

Global Kotlin DSL Scripts

Global Plugin Source

- https://docs.gradle.org/current/userguide/organizing_gradle_projects.html

Gradle Project Layout



```
.
├── build.gradle.kts
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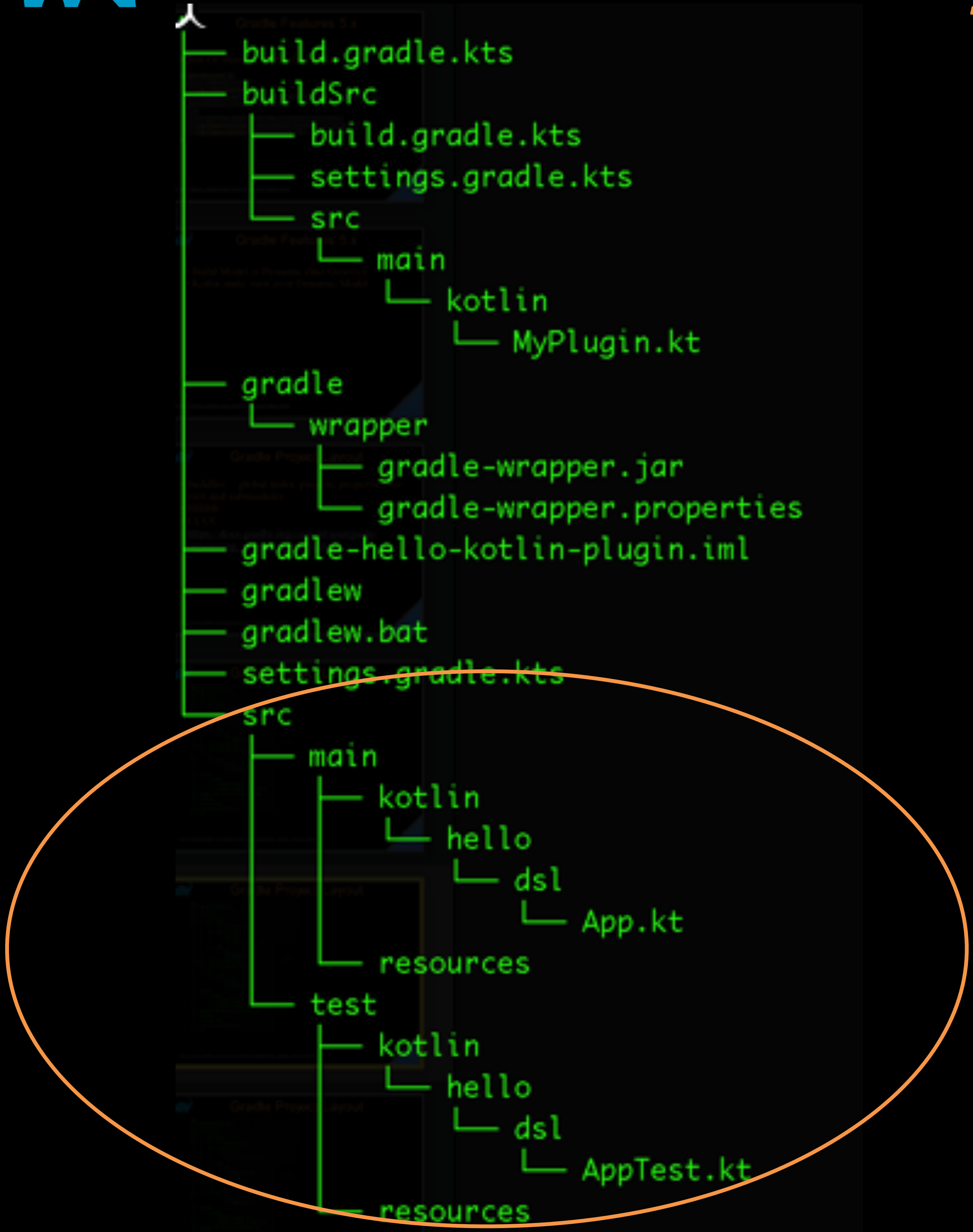
```

Gradle Wrapper

- https://docs.gradle.org/current/userguide/organizing_gradle_projects.html

Gradle Project Layout



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        └── resources
```

Project Source

- https://docs.gradle.org/current/userguide/organizing_gradle_projects.html

Gradle Upgrading to 5.x

- Follow migration guide
- Minimum of JDK 1.8
- gradle help --scan   # report shows deprecation
- Upgrade wrappers to latest
  gradle wrapper --gradle-version 5.1.1

https://docs.gradle.org/5.1/userguide/upgrading_version_4.html#upgrading_version_4

Gradle Upgrading to 5.x

- Plugins most likely need upgraded
  - Shadow plugin at least 2.x or higher
  - Some plugins are now part of Core
  - Checkstyle Plugin now uses 8.12 by default
  - CodeNarc Plugin now uses 1.2.1 by default.
  - JaCoCo Plugin now uses 0.8.2 by default.
  - PMD Plugin now uses 6.8.0 by default.

https://docs.gradle.org/5.1/userguide/upgrading_version_4.html#upgrading_version_4

Gradle Upgrading to 5.x

- Groovy now 2.5.4.
- Ant now 1.9.13.
- Ivy has been upgraded from 2.2.0 to 2.3.0.
- Maven/Ivy Repository Access
  - AWS SDK now 1.11.407.
  - Google Cloud Storage JSON API Client now v1-rev136-1.25.0.
  - Maven Wagon now 3.0.0.

https://docs.gradle.org/5.1/userguide/upgrading_version_4.html#upgrading_version_4

Gradle Upgrading to 5.x

- BND library used by the OSGi Plugin now 4.0.0.
- JUnit Platform now 1.3.1.
- SLF4J now 1.7.25.

https://docs.gradle.org/5.1/userguide/upgrading_version_4.html#upgrading_version_4

Gradle Command Line

- gradle --help
- gradle init help
- gradle tasks --all
- gradle clean build
- gradle test deploy
- gradle dist --exclude-task test
- gradle test --rerun-tasks
- gradle projects
- gradle dependencies
- gradle properties

https://gradle.org

Gradle Groovy DSL

- Dynamic
- By-passes boilerplate code (get/set)

- https://docs.gradle.org/current/dsl/index.html

https://docs.gradle.org/current/dsl/index.html

Gradle Kotlin DSL

- Kotlin DSL 1.1
- Type Safety
  - Improved Build Logic
  - Improved Troubleshooting Build Issues
- File Extensions
  - .kt = kotlin compiler code
  - .kts = kotlin scripting
  - .gradle.kts = Gradle Kotlin DSL script
  - .gradle = Gradle Groovy DSL script

https://docs.gradle.org/current/userguide/kotlin_dsl.html

Gradle Kotlin DSL

- Improved experience with tooling (IDE)
  - Static Typed Language
  - Code Completion
  - Error Highlighting
  - Quick Documentation
  - Refactoring

https://docs.gradle.org/current/userguide/kotlin_dsl.html

Gradle Kotlin DSL IDE Support

Build import	Syntax highlighting [1]	Semantic editor [2]	
IntelliJ IDEA	✓	✓	✓
Android Studio	✓	✓	✓
Eclipse IDE	✓	✓	✖
CLion	✓	✓	✖
Apache Netbeans	✓	✓	✖
Visual Studio Code (LSP)	✓	✓	✖
Visual Studio	✓	✖	✖

[1] Kotlin syntax highlighting in DSL scripts

[2] Code completion, jump to source, documentation, refactoring in DSL

https://docs.gradle.org/current/userguide/kotlin_dsl.html

Gradle Kotlin DSL

- Less Runtime Surprises
- Faster feedback loop
- Dynamism at runtime has a cost
- Extensions to Gradle API for Kotlin
  - KClass<T>
  - reified<T>()
  - Delegated properties
- Kotlin was the missing link. — Hans Dockter

https://docs.gradle.org/current/userguide/kotlin_dsl.html

Gradle Kotlin DSL

- https://docs.gradle.org/current/userguide/kotlin_dsl.html
- https://blog.gradle.org/kotlin-meets-gradle

- https://try.kotlinlang.org
- https://kotlinlang.org/docs/tutorials/koans.html
- https://kotlinlang.org/docs/tutorials/edu-tools-learner.html

https://docs.gradle.org/current/userguide/kotlin_dsl.html

Groovy to Kotlin DSL

- Convert single quote to double quote
- Move plugins into plugins block
- Methods: replace space with parenthesis
- Make implicit conversions explicit

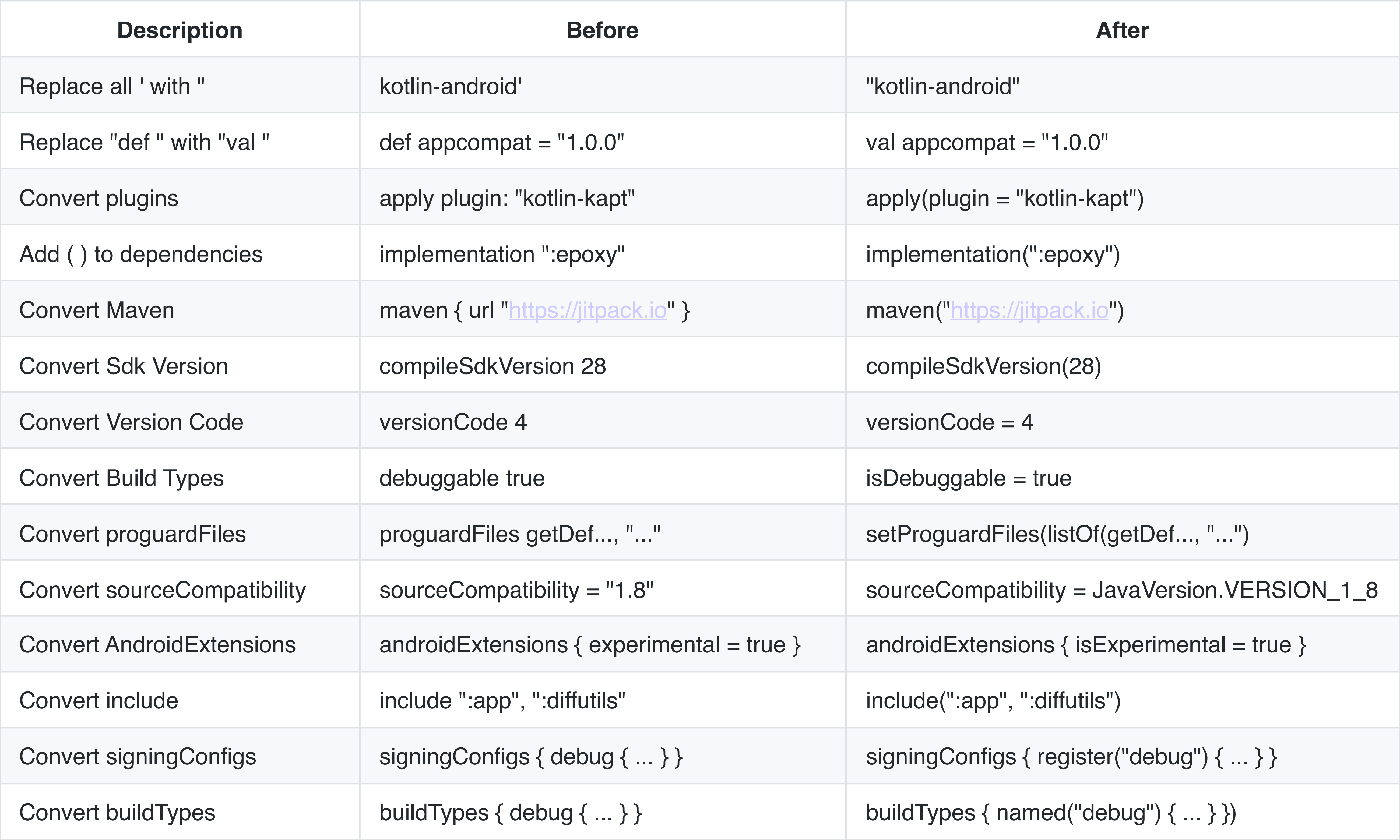
  maven { *url* = uri("http://….") }
- Use withType for mapping into project tasks

```
tasks.withType<JavaCompile> {
    options.encoding = "UTF-8"
}
```

- https://guides.gradle.org/migrating-build-logic-from-groovy-to-kotlin/

https://docs.gradle.org/current/userguide/kotlin_dsl.html

Groovy to Kotlin DSL



Description	Before	After
Replace all ' with "	kotlin-android'	"kotlin-android"
Replace "def " with "val "	def appcompat = "1.0.0"	val appcompat = "1.0.0"
Convert plugins	apply plugin: "kotlin-kapt"	apply(plugin = "kotlin-kapt")
Add ( ) to dependencies	implementation ":epoxy"	implementation(":epoxy")
Convert Maven	maven { url "https://jitpack.io" }	maven("https://jitpack.io")
Convert Sdk Version	compileSdkVersion 28	compileSdkVersion(28)
Convert Version Code	versionCode 4	versionCode = 4
Convert Build Types	debuggable true	isDebuggable = true
Convert proguardFiles	proguardFiles getDef..., "..."	setProguardFiles(listOf(getDef..., "...")
Convert sourceCompatibility	sourceCompatibility = "1.8"	sourceCompatibility = JavaVersion.VERSION_1_8
Convert AndroidExtensions	androidExtensions { experimental = true }	androidExtensions { isExperimental = true }
Convert include	include ":app", ":diffutils"	include(":app", ":diffutils")
Convert signingConfigs	signingConfigs { debug { ... } }	signingConfigs { register("debug") { ... } }
Convert buildTypes	buildTypes { debug { ... } }	buildTypes { named("debug") { ... } })

https://github.com/bernaferrari/GradleKotlinConverter

Gradle From Scratch: DEMO

- https://gradle.org/install
- add to Path
- mkdir hello-world
- cd hello-world
- git init help

https://docs.gradle.org/current/userguide/build_init_plugin.html

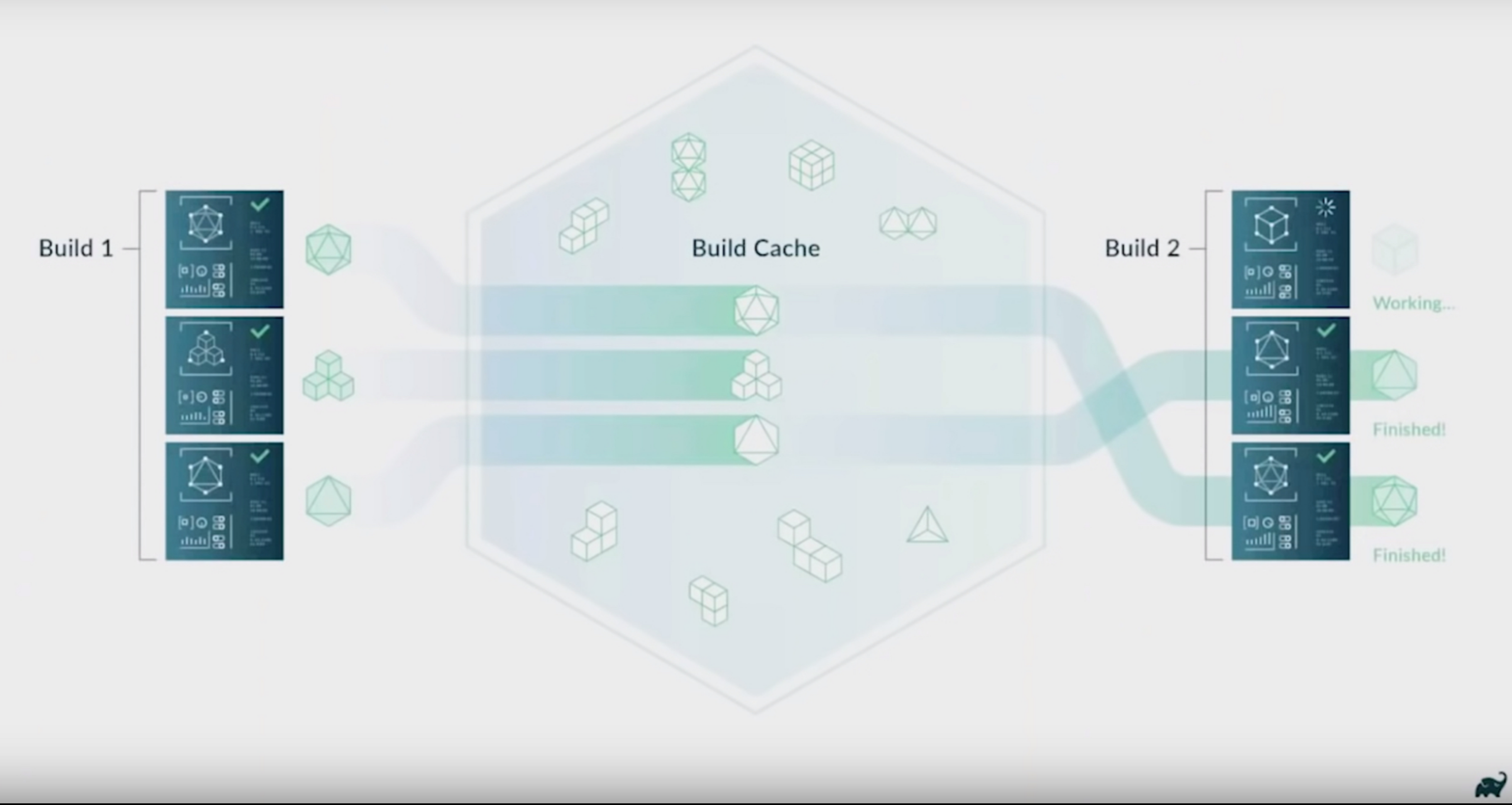
Gradle Plugins: DEMO

- Plugins can be loaded from jars or classpath
- buildSrc
  - root gradle source code folder
  - properties, tasks, and plugins defined here
  - visable to all submodules

Gradle From Maven: DEMO

- https://gradle.org/maven-vs-gradle
- gradle init   # converts maven to groovy dsl
- plugins may be missing, will need to check
- ./gradlew build   # compiles, tests, and packages

Gradle Build Cache



Gradle Build Cache

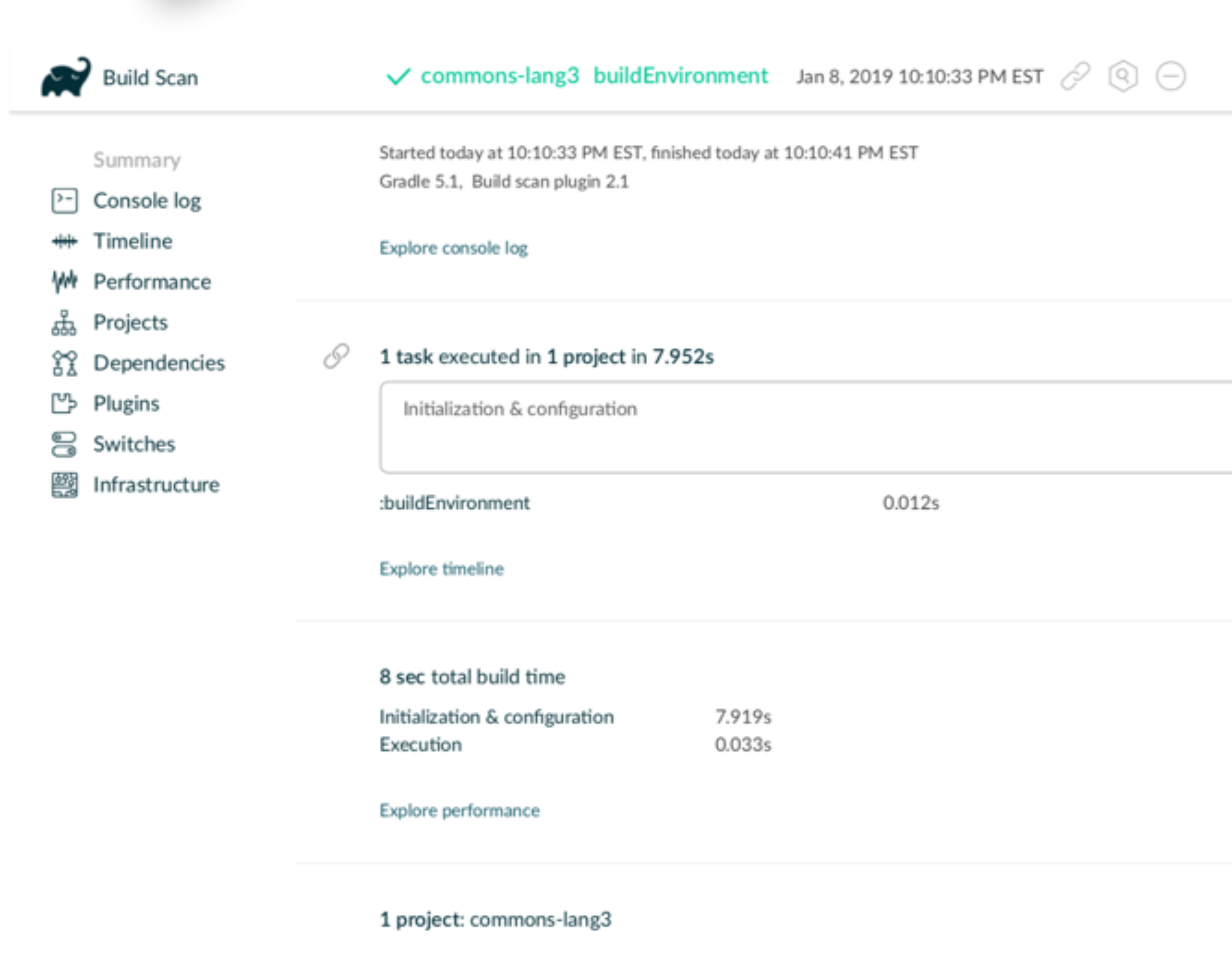
- Lager the build, the bigger potential of improvement
- Cache improves incremental builds
- Cache of inputs and outputs of Tasks

- Build Cache
  - Basic (free) is File Based Cache
  - Enterprise (pay) is Remote Server Cache w/extras
  - Plugin speed will improve, like Docker
  - Enterprise tracks performance history

Gradle Build Cache

- File Cache (local) on by default
- Shared Cache (remote) uses Hazelcast
- Plugins are opting in to cache (Checkstyle, etc)
- https://docs.gradle.org/current/userguide/build_cache.html
- P.S. Guess what is coming to Maven? https://gradle.org/training/maven-builds-with-gradle-enterprise/?time_value=maven-builds-with-gradle-enterprise-2019-01-23

Gradle Build Scans



Build Scan

✓ commons-lang3 buildEnvironment Jan 8, 2019 10:10:33 PM EST

Started today at 10:10:33 PM EST, finished today at 10:10:41 PM EST
Gradle 5.1, Build scan plugin 2.1

Explore console log

1 task executed in 1 project in 7.952s

Initialization & configuration

:buildEnvironment	0.012s

Explore timeline

8 sec total build time

Initialization & configuration	7.919s
Execution	0.033s

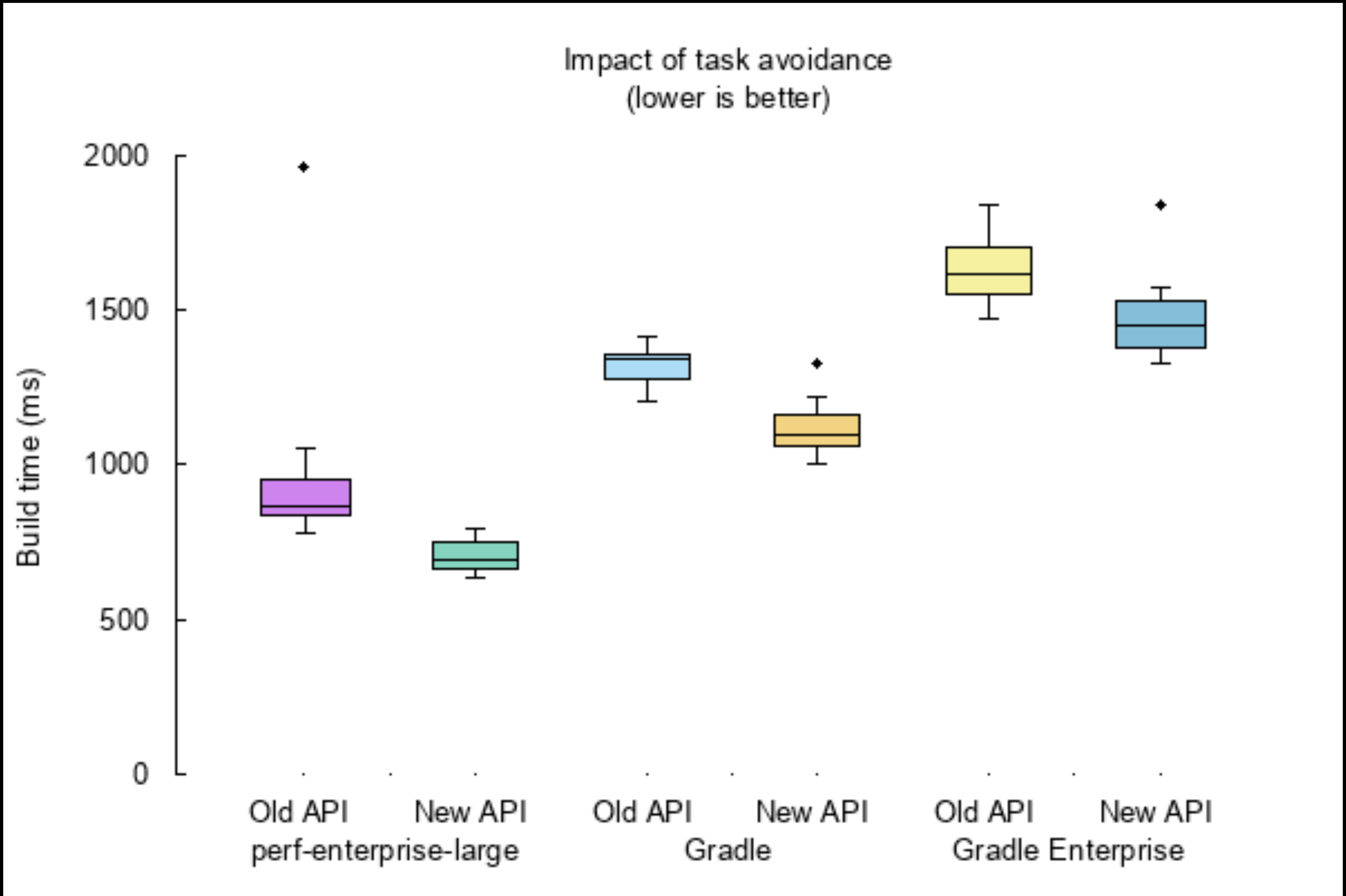
Explore performance

1 project: commons-lang3

Gradle Build Scans

- https://scans.gradle.com
- Cloud based performance report
- Example: https://scans.gradle.com/s/n4mvpcjm4ms4k/

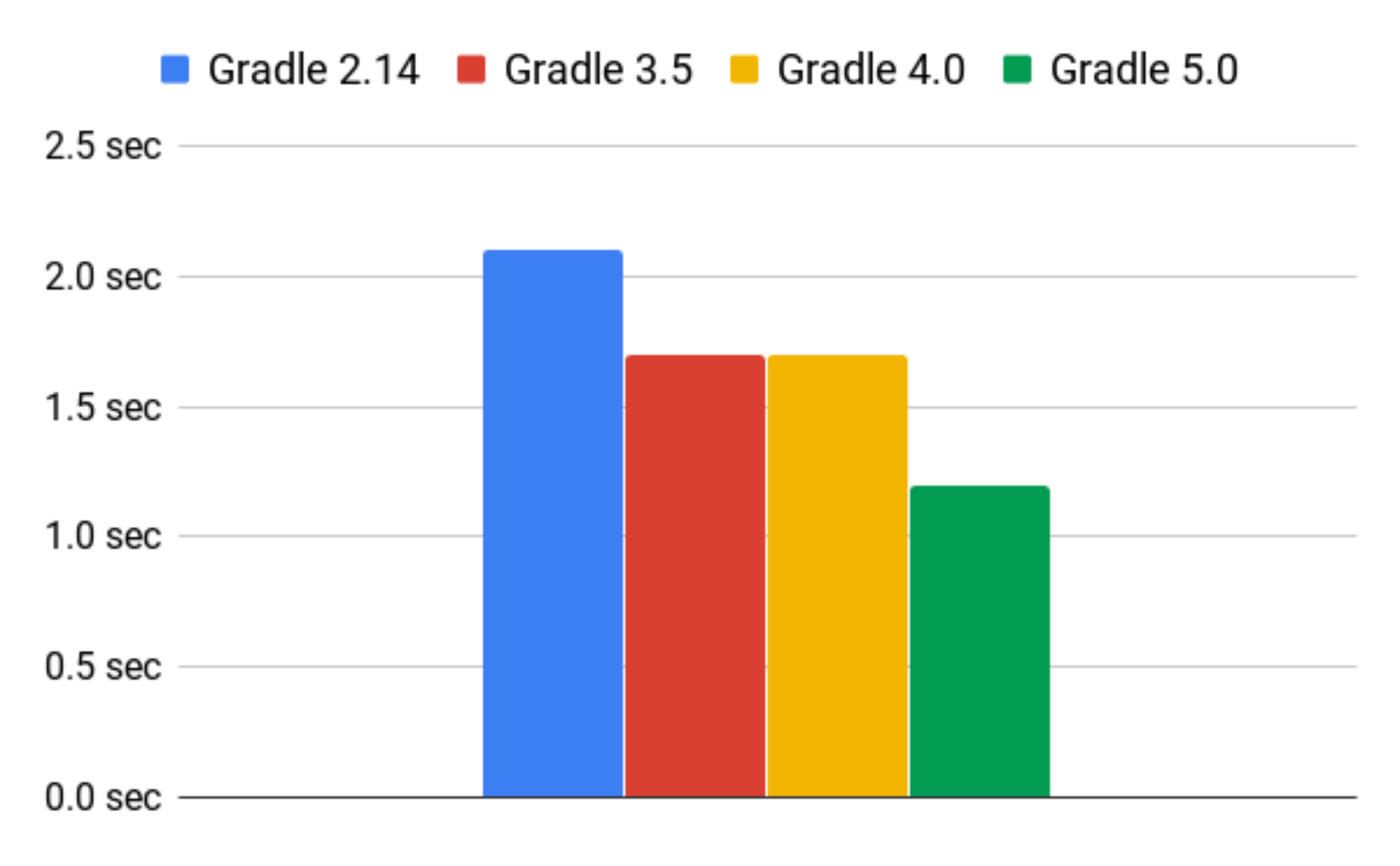
Gradle Performance



Configuration Avoidance

https://gradle.org/whats-new/gradle-5/#new-gradle-in

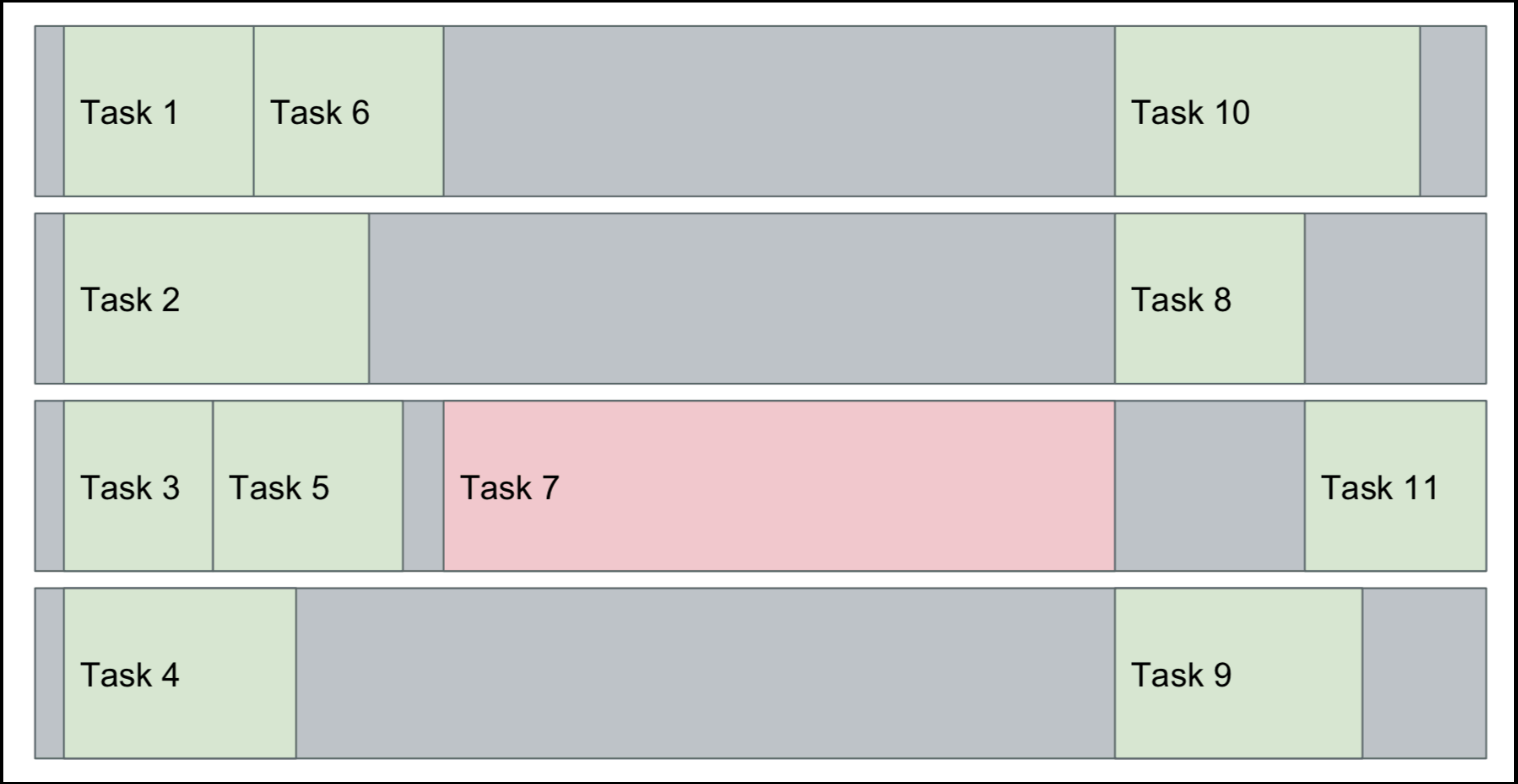
Gradle Performance



Incremental Compile 1000 module Java Project

https://gradle.org/whats-new/gradle-5/#new-gradle-in

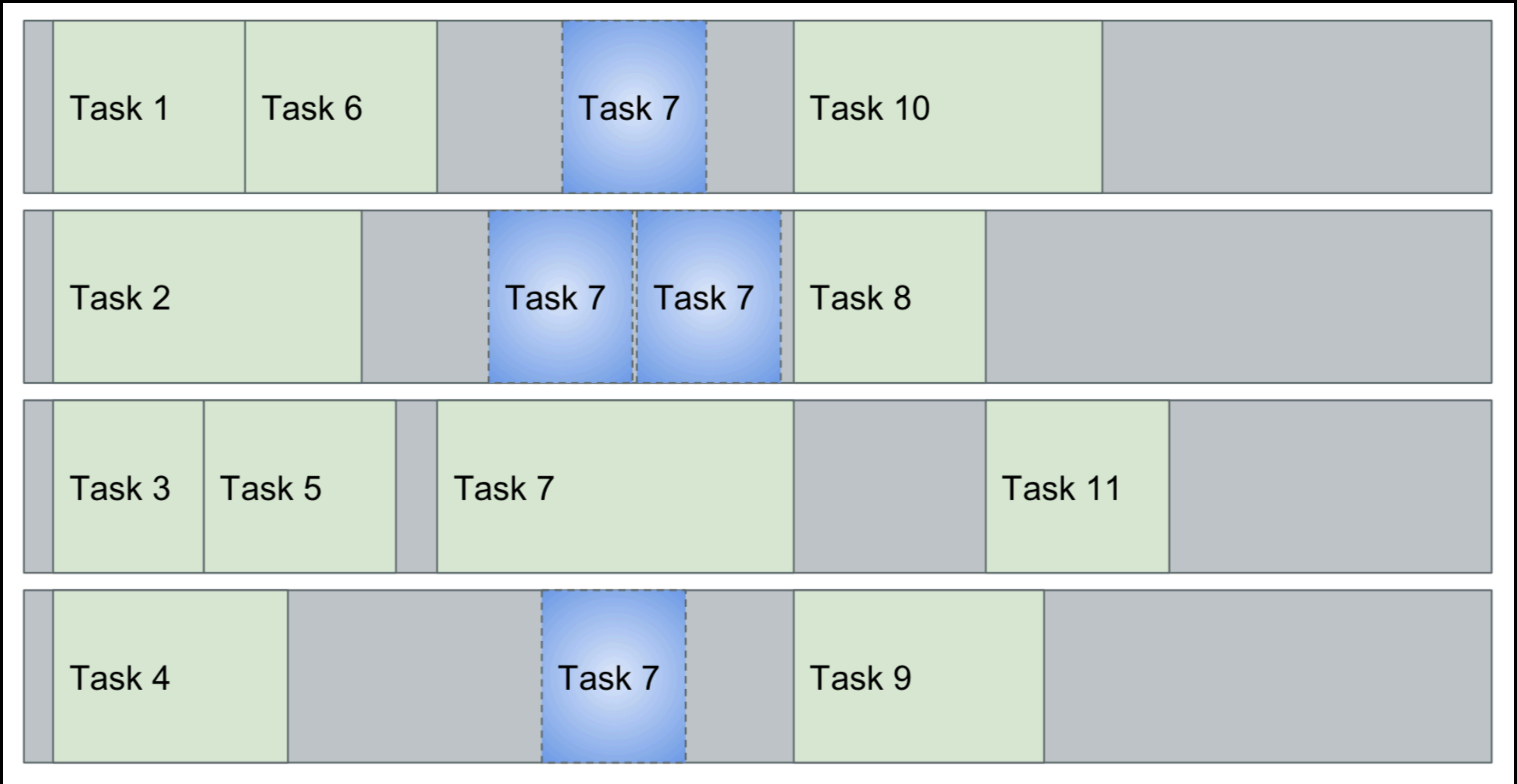
Gradle Performance



Without Worker API

https://gradle.org/whats-new/gradle-5/#new-gradle-in

Gradle Performance



With Worker API

https://gradle.org/whats-new/gradle-5/#new-gradle-in

Gradle Performance: DEMO

- Build Cache
- Profile
- Scans
- https://gradle.org/whats-new/gradle-5/#new-gradle-invocation-options

Gradle Summary

- Time is money, waiting is deferred feedback
- Multi-platform support
- Extensible
- Flexible
- Open Source
- I get to use Kotlin more
- Enterprise Edition provides even more

Gradle Resources

- http://gradle.org
- http://gradle.org/guides
- https://gradle.org/training
- https://gradle.org/maven-vs-gradle/
- https://bmuschko.com/blog/jenkins-build-pipeline/
- https://container-solutions.com/how-to-build-docker-images-with-gradle/

Gradle Kotlin DSL Resources

- https://docs.gradle.org/current/userguide/kotlin_dsl.html
- https://blog.gradle.org/kotlin-meets-gradle
- https://try.kotlinlang.org
- https://kotlinlang.org/docs/tutorials/koans.html
- https://kotlinlang.org/docs/tutorials/edu-tools-learner.html

https://docs.gradle.org/current/userguide/kotlin_dsl.html

Questions ?

https://github.com/lseinc/gradle-ketchup-cm19.git

Don’t forget to fill
out the survey!

Thank You !

https://github.com/lseinc/gradle-ketchup-cm19.git

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