Elegant Builds at Scale

Etienne Studer
VP of Product Tooling, Gradle Inc.

Gradle

Hans Dockter
CEO and Founder, Gradle

Hans Dockter
VP of Product Tooling, Gradle

Gradle

New company

Gradleware Inc. —> Gradle, Inc.

Gradle

New Twitter handle

@gradleware —> @gradle

Gradle

New domain

gradle.com

Gradle

Gradle

Build Happiness.

End Code Freeze

Gradle

Build Happiness.

End Bug Regressions

Gradle

Build Happiness.

End Build Script Chaos

Gradle

Build Happiness.

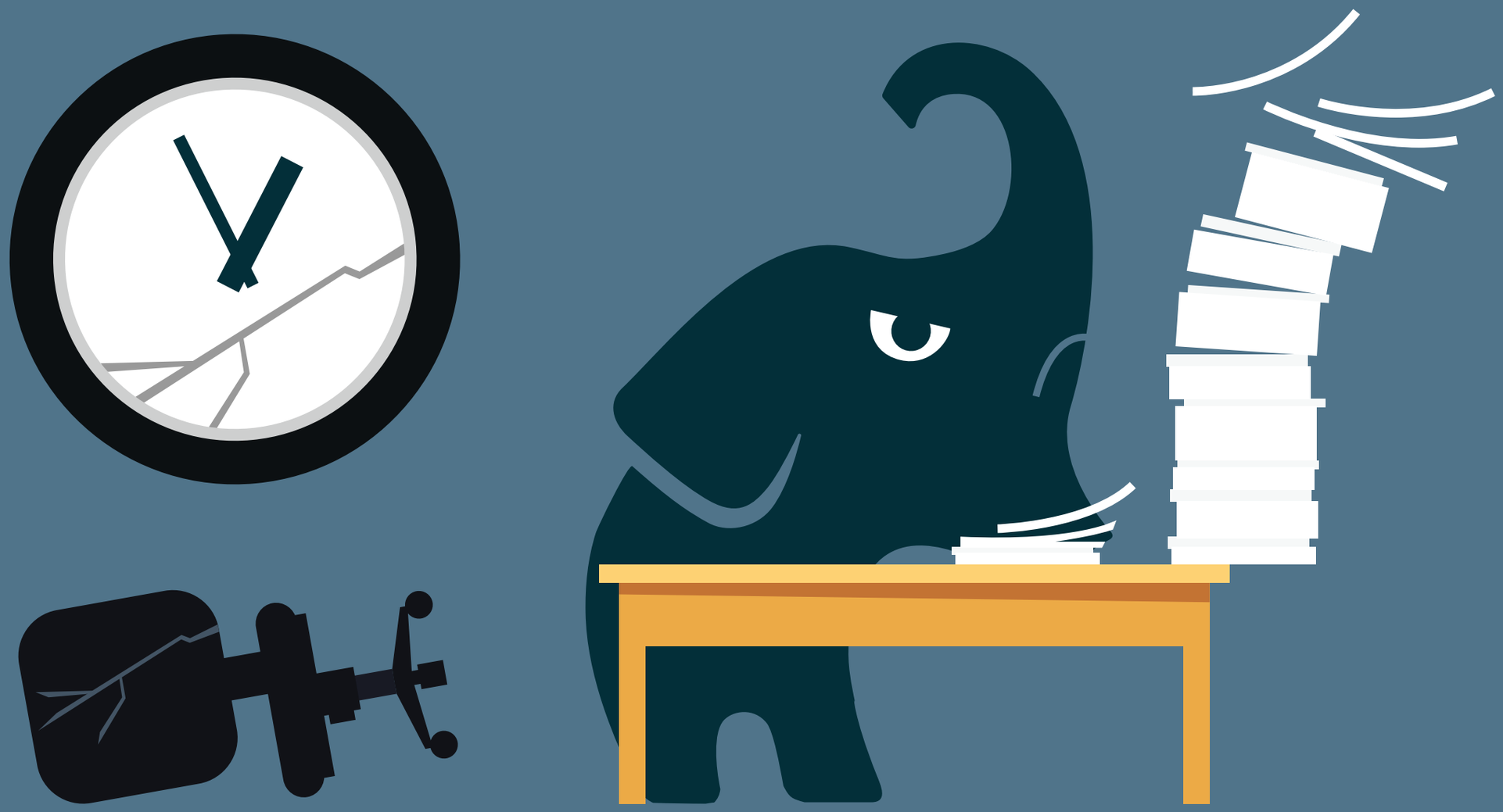
End Deathmarches

Gradle

Build Happiness.

End Long Build Times

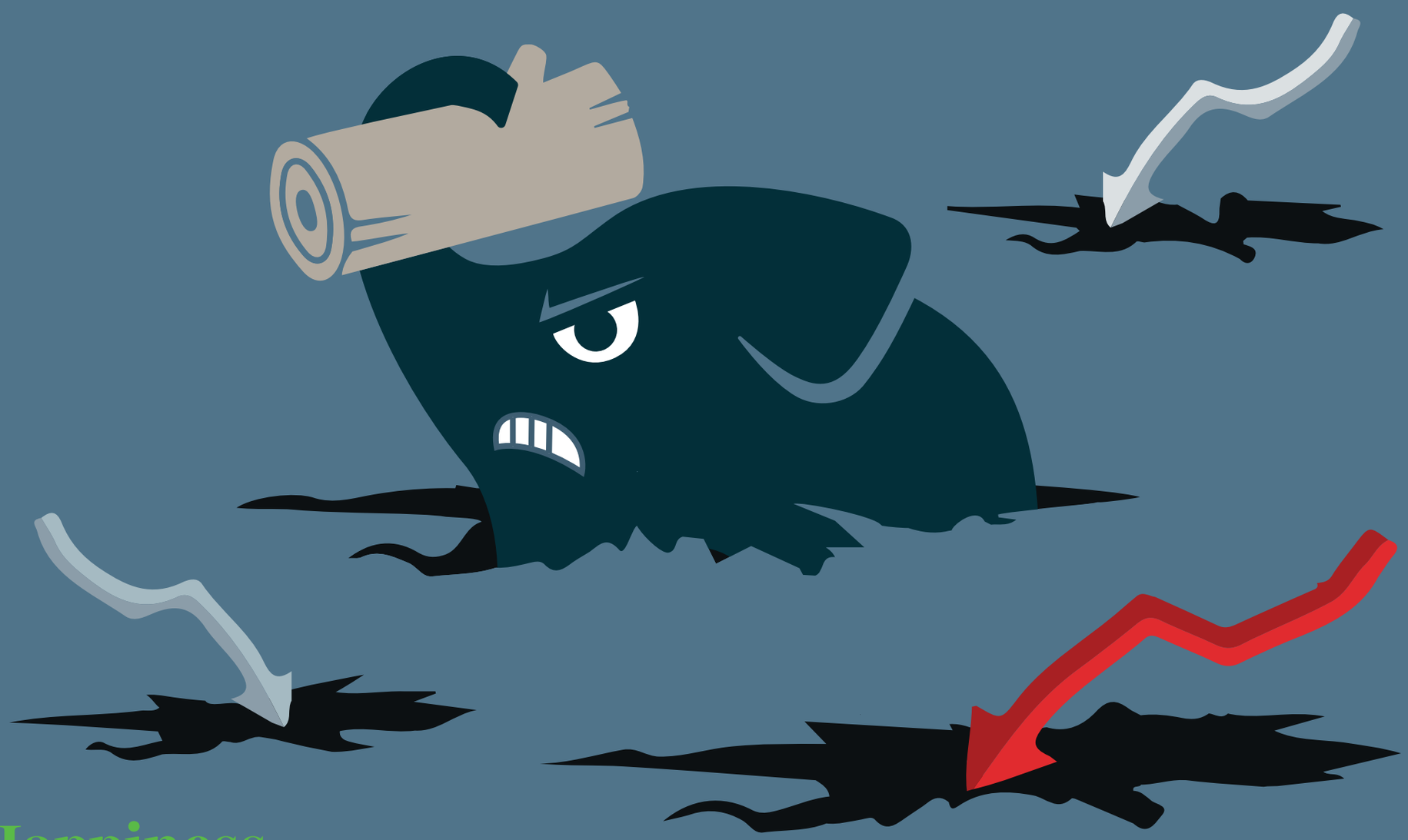
Gradle



Build Happiness.

End Broken Release Processes

Gradle



Build Happiness.

Gradle

Downloads

5,400,000 in 2014

800,000 in May 2015

>1,000,000/m since October

Gradle

Build Infrastructure

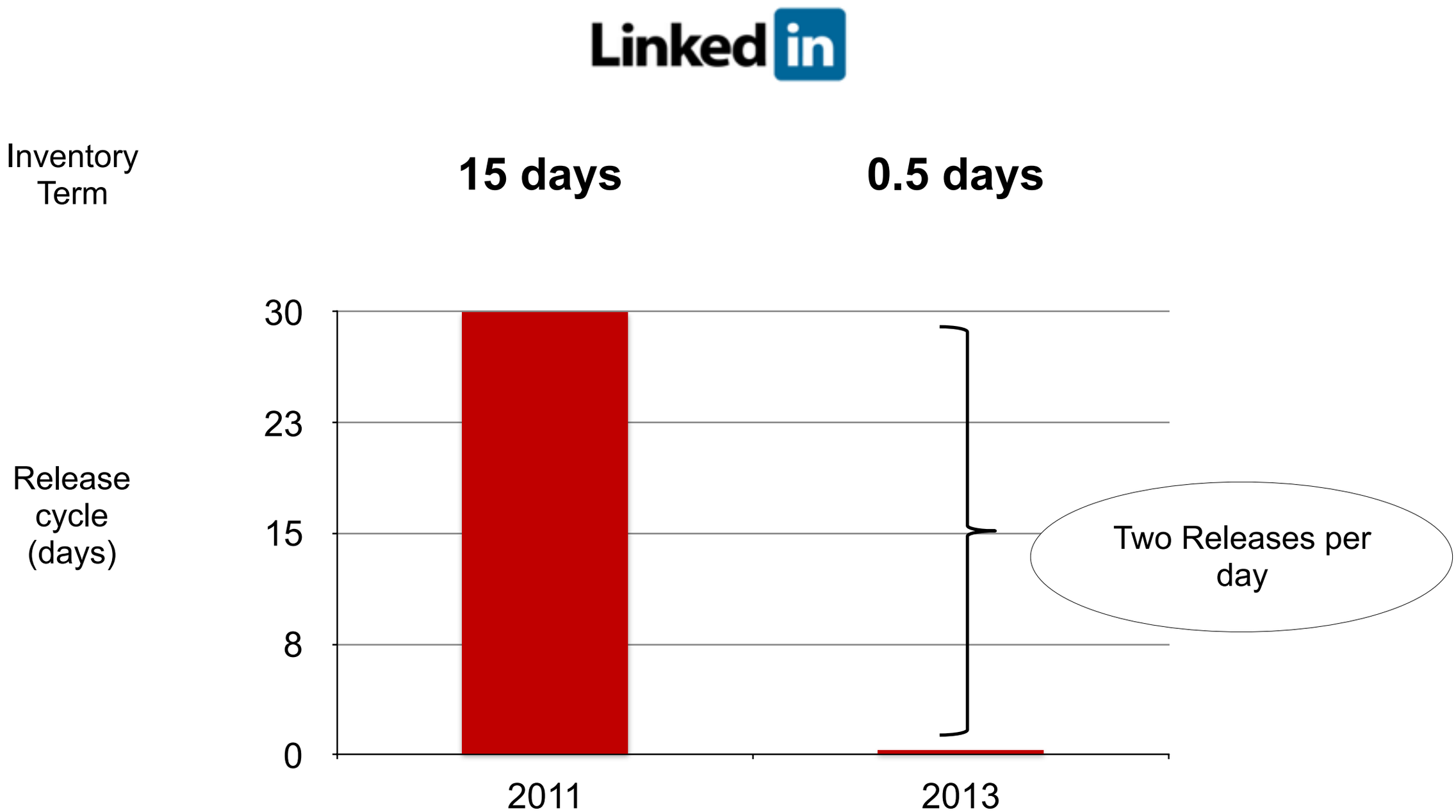

I Must Be Dead

Gradle

XXXL

Gradle

Complexity


Inventory Term
15 days
0.5 days
Release cycle (days)
30
23
15
8
0
2011
2013
Two Releases per day

Gradle

LinkedIn™

in 2,000

Active Gradle Using Developers

2,000

Software Components

300,000

Gradle Executions Per Week

1,000

Release Builds per Day

Gradle

Performance

Gradle

Goal

Minimize the build time while
using as little memory as needed.

Gradle

Observation

Typically, not much changes in the build between consecutive invocations of the build.

When little changes in the build, little work should be done by the build.

Gradle

Approach

Performance enhancements are achieved through evolutionary improvements and revolutionary changes.

Gradle

Apply

- Fix hotspots
- Cache and reuse
- Work in parallel
- Work in background

To

- Build configuration
- Dependency resolution
- Task Execution

Gradle

Daemon

Gradle

- ~/.gradle/gradle.properties

```
org.gradle.daemon=true
```

- GRADLE_OPTS

```
-Dorg.gradle.daemon=true
```

- Command Line

```
gradlew tasks --daemon (--no-daemon)
```

http://www.gradle.org/docs/current/userguide/gradle_daemon.html

Gradle

Incremental build

Gradle

Do not execute a given task if both its input and its output have not changed since the previous run.

Inputs —> Task —> Outputs

Optimize file change detection using file size, modification time, and content hash.

Continuous Mode

./gradlew build -t

```
Starting 3rd build in daemon [uptime: 26.37 secs, performance: 98%, memory: 8% of 3.8 GB]
Continuous build is an incubating feature.
:compileJava UP-TO-DATE
:processResources UP-TO-DATE
:classes UP-TO-DATE
:compileTestJava UP-TO-DATE
:processTestResources UP-TO-DATE
:testClasses UP-TO-DATE
:test UP-TO-DATE

BUILD SUCCESSFUL

Total time: 1.191 secs

Waiting for changes to input files of tasks... (ctrl-d to exit)
```

Gradle

Gradle

Project Substitution

Gradle

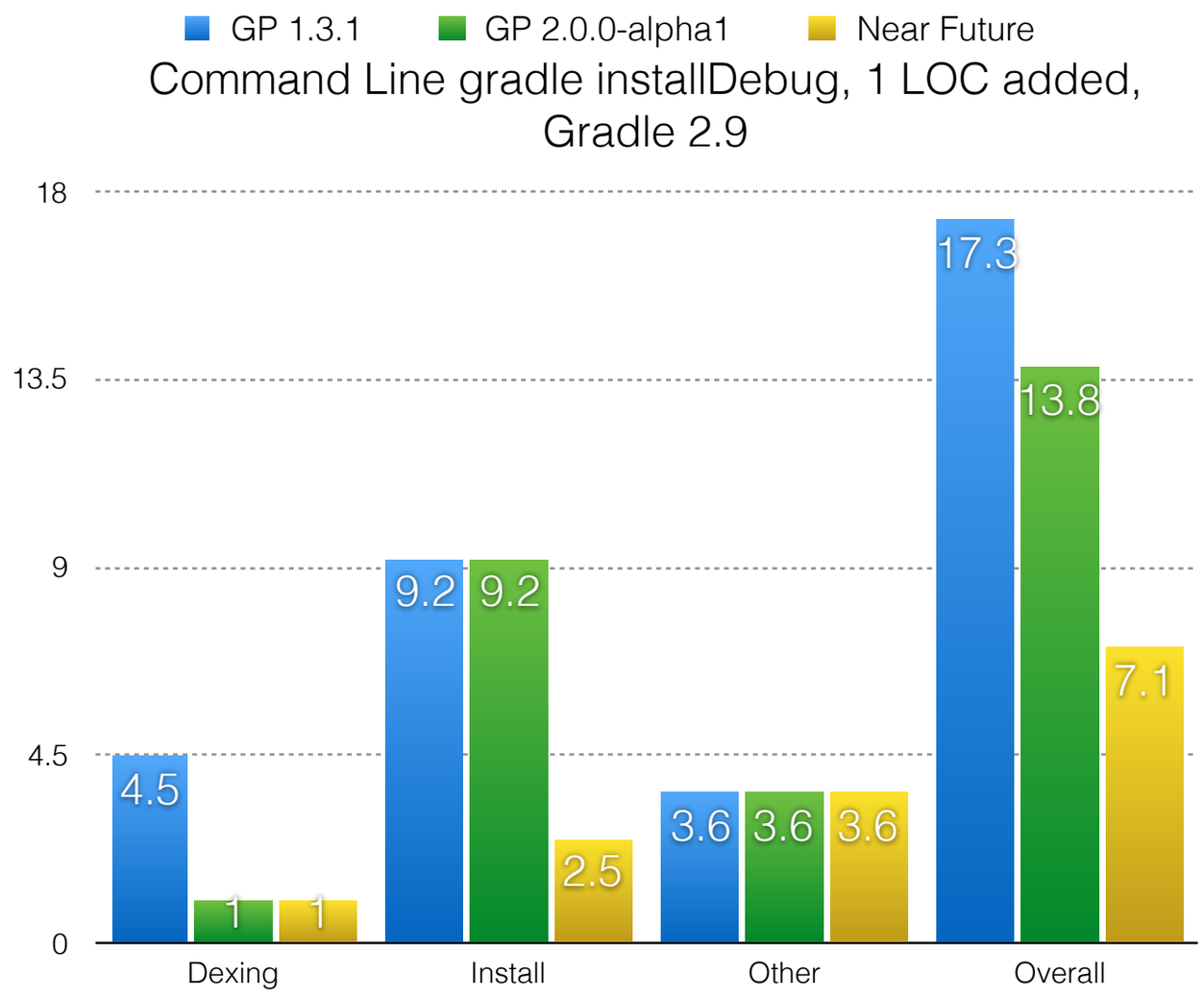
```
configurations.all {
  resolutionStrategy.dependencySubstitution {
    substitute module("org.utils:api") with project(":api")
    substitute project(":impl") with module("org.utils:impl:1.3")
  }
}
```

https://docs.gradle.org/current/userguide/dependency_management.html#client-modules

Gradle

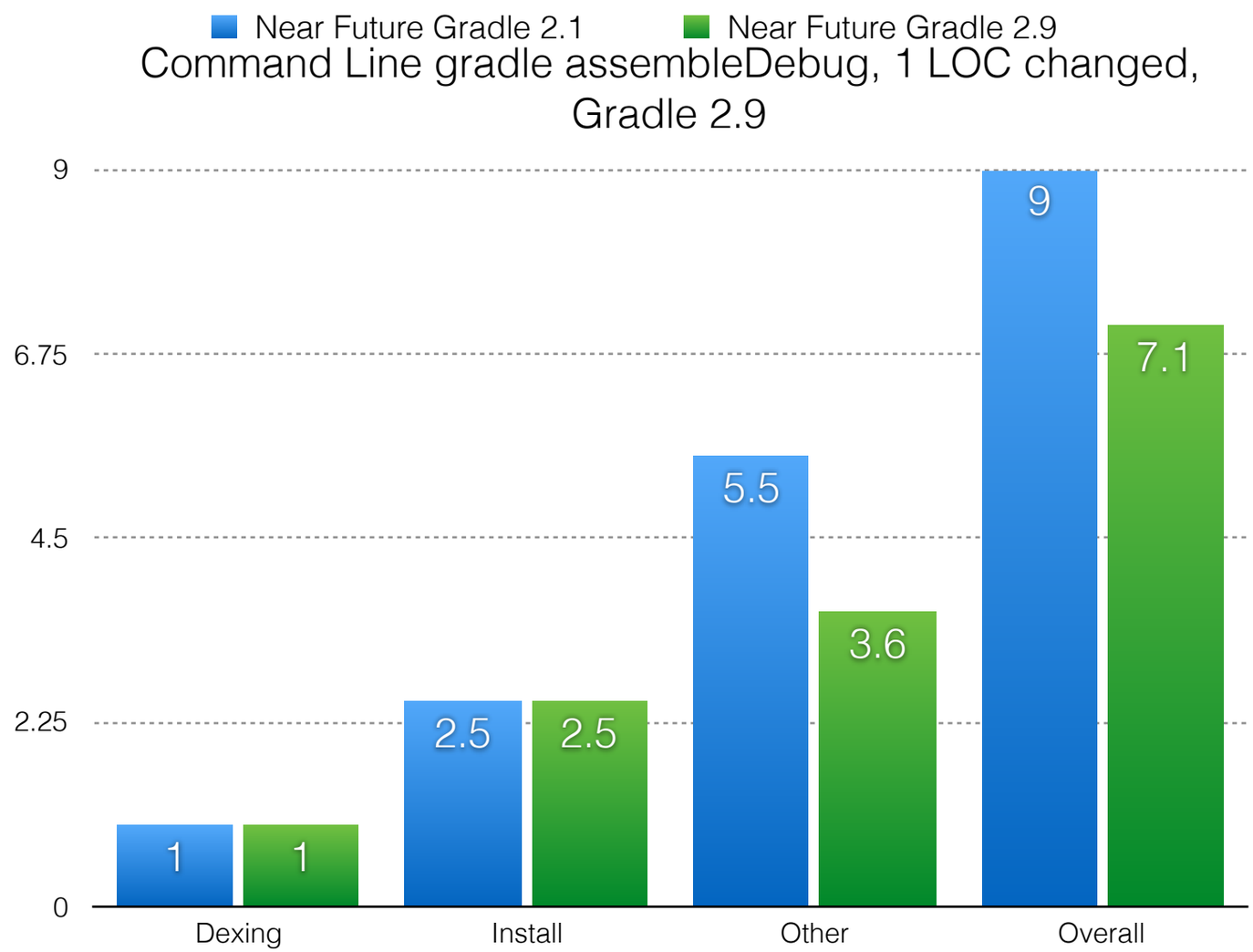
Android Studio 2.0

Android Studio post-2.0



Estimate for Cold Swap & Emulator 2 Install

Gradle performance



Without Improvements 30% slower

New Configuration Model

Goal

Apply the concepts already available in the Execution phase to the Configuration phase.

Describe what the model should look like and Gradle will provide the implementation.

Managed types

```
@Managed
interface Picture {

  String getName()
  void setName(String name)

  List<String> getTags()

}
```

Gradle

Plugin

```
class PicturesPlugin extends RuleSource {

  @Model
  void createPicture(Picture picture) {}

  @Mutate
  void configurePicture(Picture picture) {
    picture.name = 'mypic.jpg'
    picture.tags.addAll(['nature', 'night'])
  }

}
```

Gradle

DSL

```
model {
  picture(Picture) {
    name = 'mypic.jpg'
    tags.addAll(['night', 'moon'])
  }
}
```

Report

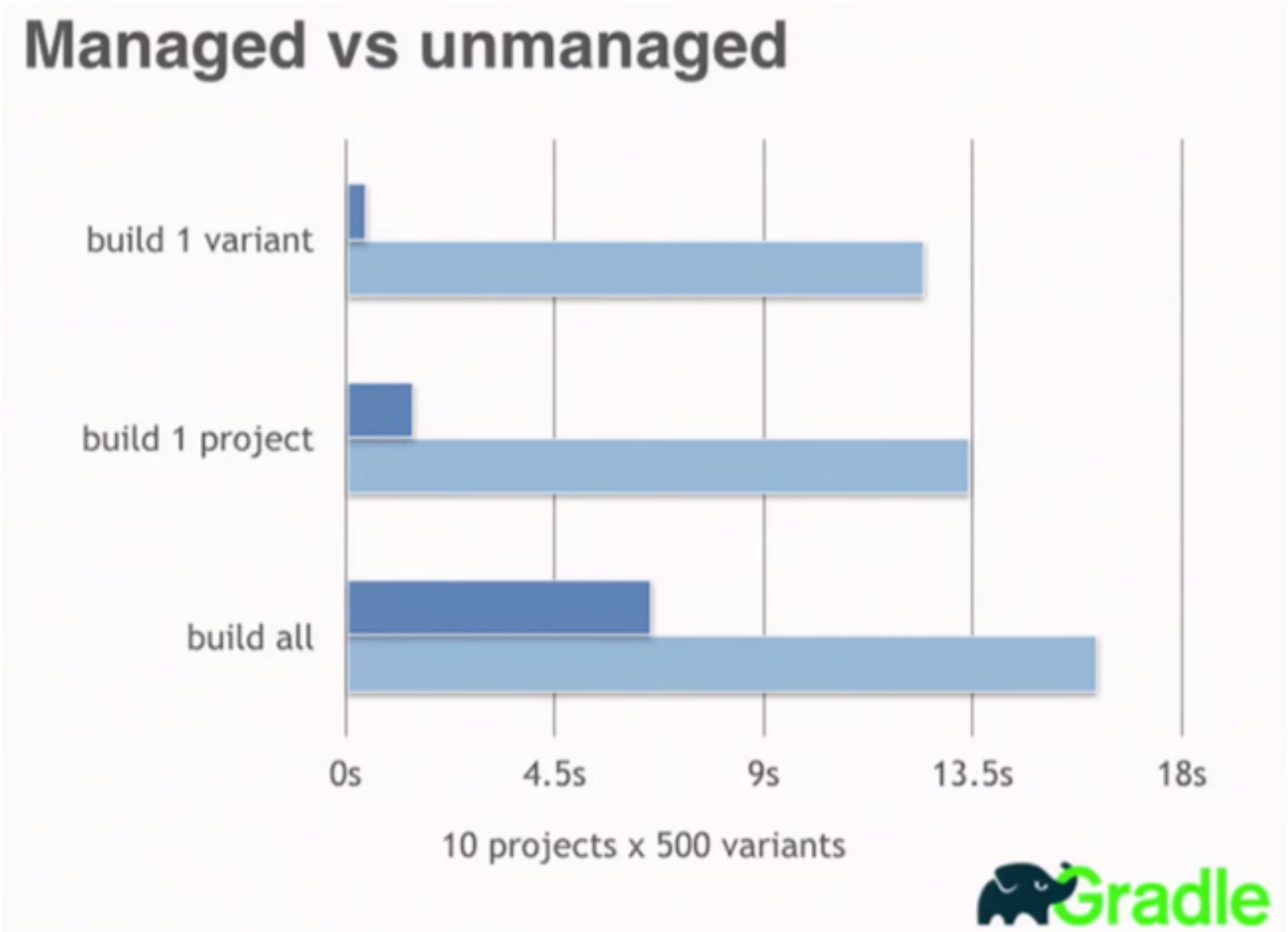
```
+ createPicture
      | Type:          Picture
      | Creator:       PicturesPlugin#createPicture
      | Rules:
        ↳ PicturesPlugin#configurePicture
    + name
        | Type:        java.lang.String
        | Value:       mypic.jpg
        | Creator:     PicturesPlugin#createPicture
    + tags
        | Type:        java.util.List<java.lang.String>
        | Value:       [nature, night, moon]
        | Creator:     PicturesPlugin#createPicture
```

Gradle

Modeling

- Richer modeling
- Cleaner modeling
- Collaborative modeling
- Comprehensible model

Performance



Gradle

Modeling

Gradle

JVM Software Model

Gradle

Service

```
model {
  components {
    service(JvmLibrarySpec) {
      sources {
        java {
          source.srcDir 'src/service/java'
          dependencies {
            library 'org.eclipse.jetty:jetty-servlet:
                     9.3.5.v20151012' exported(true)
            library 'org.apache.httpcomponents:httpclient:
                     4.5.1'
          }
        }
      }
      api {
        exports 'org.gradle.example.service'
      }
      targetPlatform 'java7'
      targetPlatform 'java8'
    }
  }
}
```

Gradle

Client

```
model {
  components {
    client(JvmLibrarySpec) {
      sources {
        java {
          source.srcDir 'src/client/java'
          dependencies {
            project ':service' library 'service'
          }
        }
      }
      targetPlatform 'java6'
      targetPlatform 'java7'
      targetPlatform 'java8'
      targetPlatform ‘java9'
    }
  }
}
```

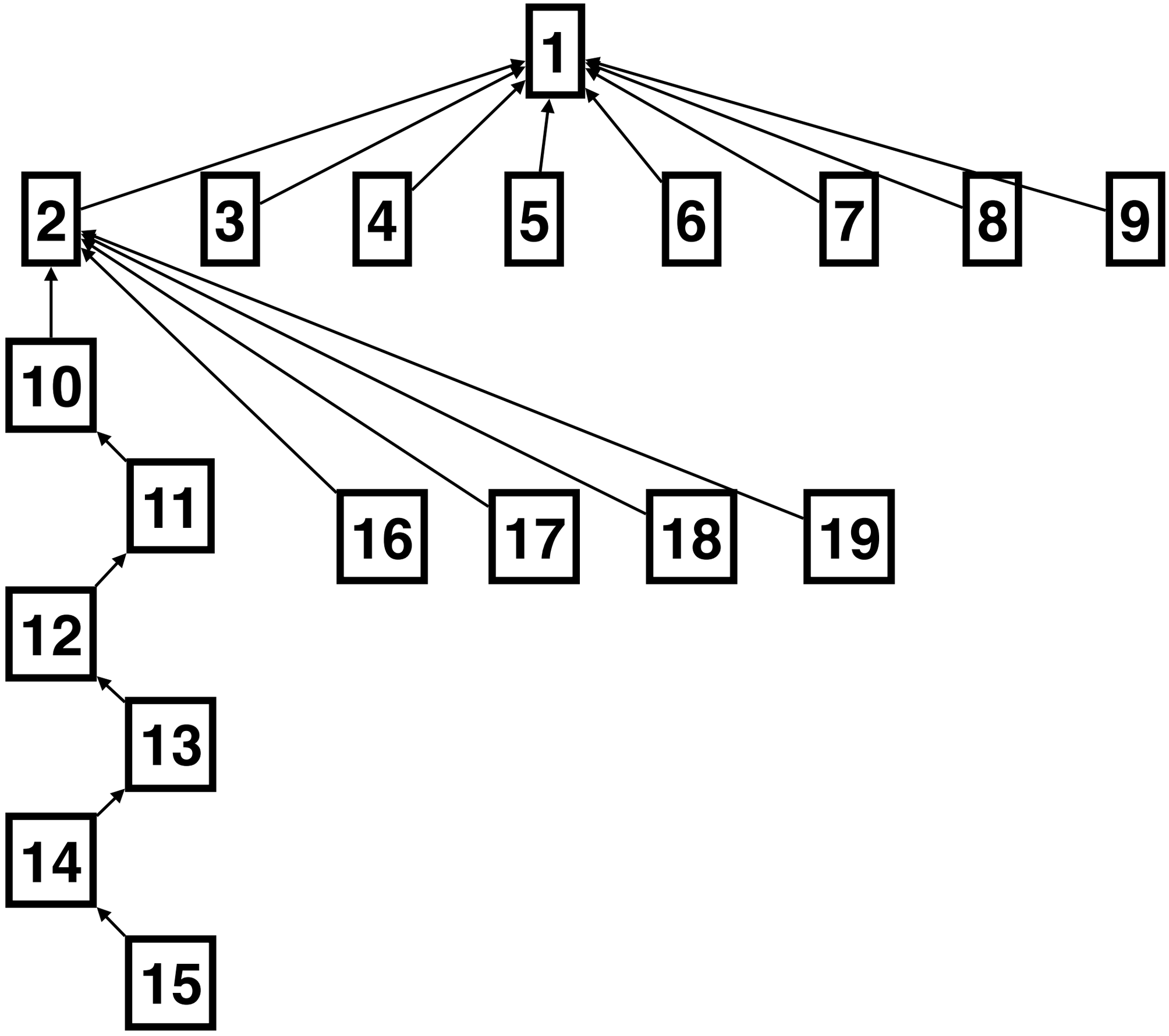
```
apply plugin: 'cpp'

model {
    platforms {
        x86 {
            architecture "x86"
        }
        x64 {
            architecture "x86_64"
        }
        itanium {
            architecture "ia-64"
        }
    }
}

model {
    buildTypes {
        debug
        release
    }
}

model {
    components {
        hello(NativeLibrarySpec) {
            targetPlatform "x86"
            targetPlatform "x64"
```

Gradle

Variant-aware dependency mgmt.

Gradle

Compiler Avoidance


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

```
hans:mediumNewJava$
```

Gradle

Company Standards

Gradle

High-level DSL

Gradle

```
products {
   product('foo) {
      europe {
        host = 'alpha'
      }
      asia {
        host = 'beta'
    }
  }
}
```

Gradle

Dependency Management

```
apply plugin: 'java'
apply plugin: 'project-report'

repositories {
    mavenCentral()
}

dependencies {
    compile 'com.googlecode.jsontoken:jsontoken:1.0'
    compile 'com.github.tomakehurst:wiremock:1.18'
}
```

```
dependencies {
    compile 'org.hibernate:hibernate-validator:+'
}
```

```
apply plugin: 'java'
apply plugin: 'project-report'

repositories {
    mavenCentral()
}

configurations.all {
    resolutionStrategy {
        componentSelection {
            all { ComponentSelection selection ->
                if (selection.candidate.version.contains('Alpha') ||
                        selection.candidate.version.contains('Beta')) {
                    selection.reject("rejecting non-final")
                }
            }
            withModule("org.hibernate:hibernate-validator") { selection ->
                if (selection.candidate.version == "5.1.3.Final") {
                    selection.reject("known bad version")
                }
            }
        }
    }
}
```

Policies

Gradle

```
gradle.taskGraph.whenReady {
    allprojects { Project project ->
        def androidExtension = project.extensions.findByName('android')
        if (androidExtension) {
            def release = androidExtension.buildTypes.find { def buildType ->
                buildType.name == 'release'
            }
            if(!release?.runProguard){
               def msg = "Build type '$release.name' must run proGuard."
               throw new IllegalStateException(msg)
            }
        }
    }
}
```

http://www.gradle.org/docs/current/userguide/init_scripts.html

Custom Gradle Distribution

Gradle

```
GRADLE_HOME/init.d/*.gradle
```

http://www.gradle.org/docs/current/userguide/init_scripts.html

Wrapping Gradle

IDE Integration

Buildship: Eclipse Plug-ins for Gradle

Buildship

Buildship is a collection of Eclipse plug-ins that provide support for building software using Gradle.

Licenses:
Eclipse Public License 1.0

Active Member Companies:
Member companies supporting this project over the last three months.

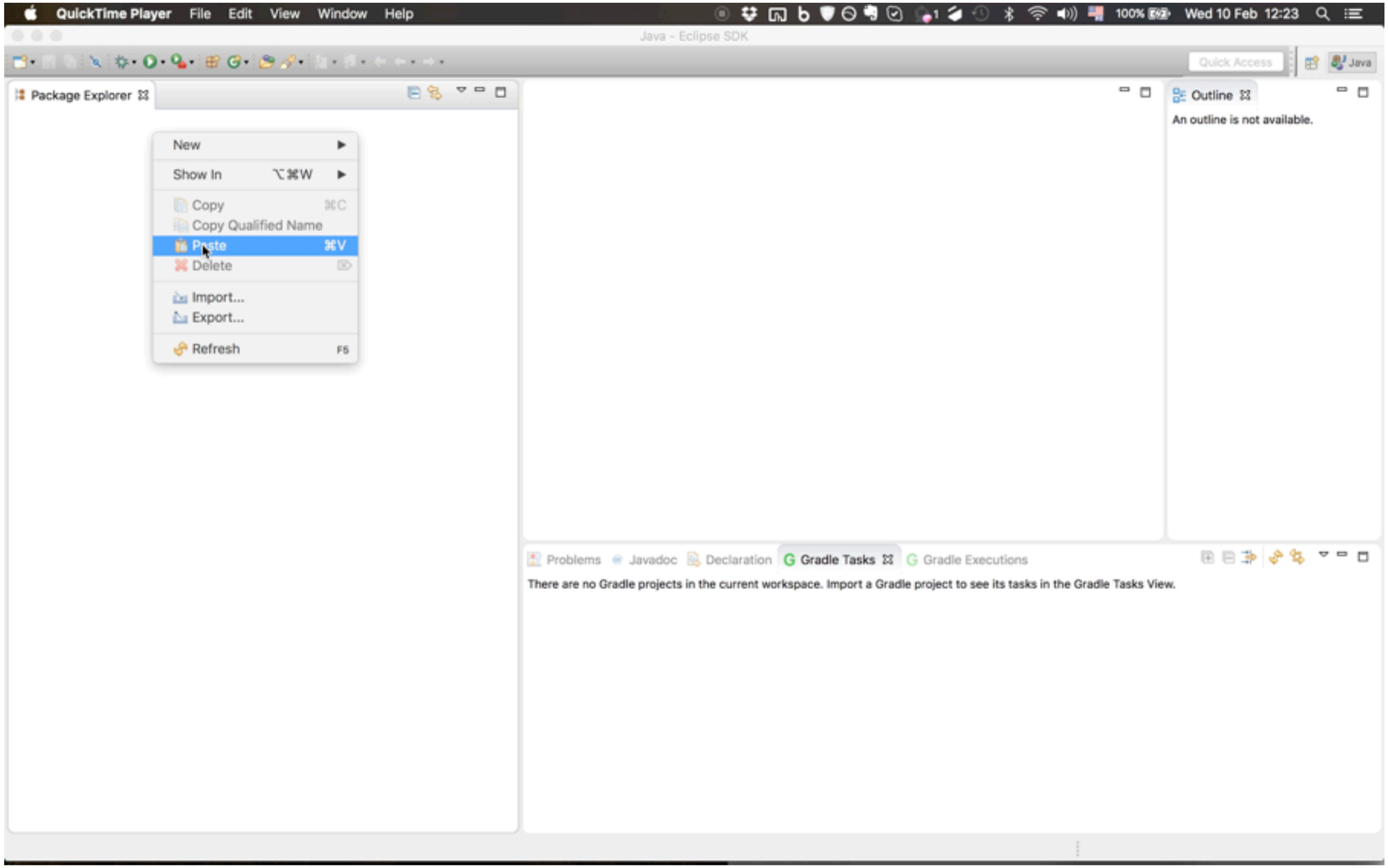
Contribution Activity:
Commits on this project (last 12 months).

Gradle

Custom Build Environment

Gradle

Composite Builds


QuickTime Player File Edit View Window Help
Wed 10 Feb 12:23
Java - Eclipse SDK
Quick Access
Java
Package Explorer
New
Show In ⌥⌘W
Copy ⌘C
Copy Qualified Name
Paste ⌘V
Delete
Import...
Export...
Refresh F5
Outline
An outline is not available.
Problems
Javadoc
Declaration
Gradle Tasks
Gradle Executions
There are no Gradle projects in the current workspace. Import a Gradle project to see its tasks in the Gradle Tasks View.

Gradle

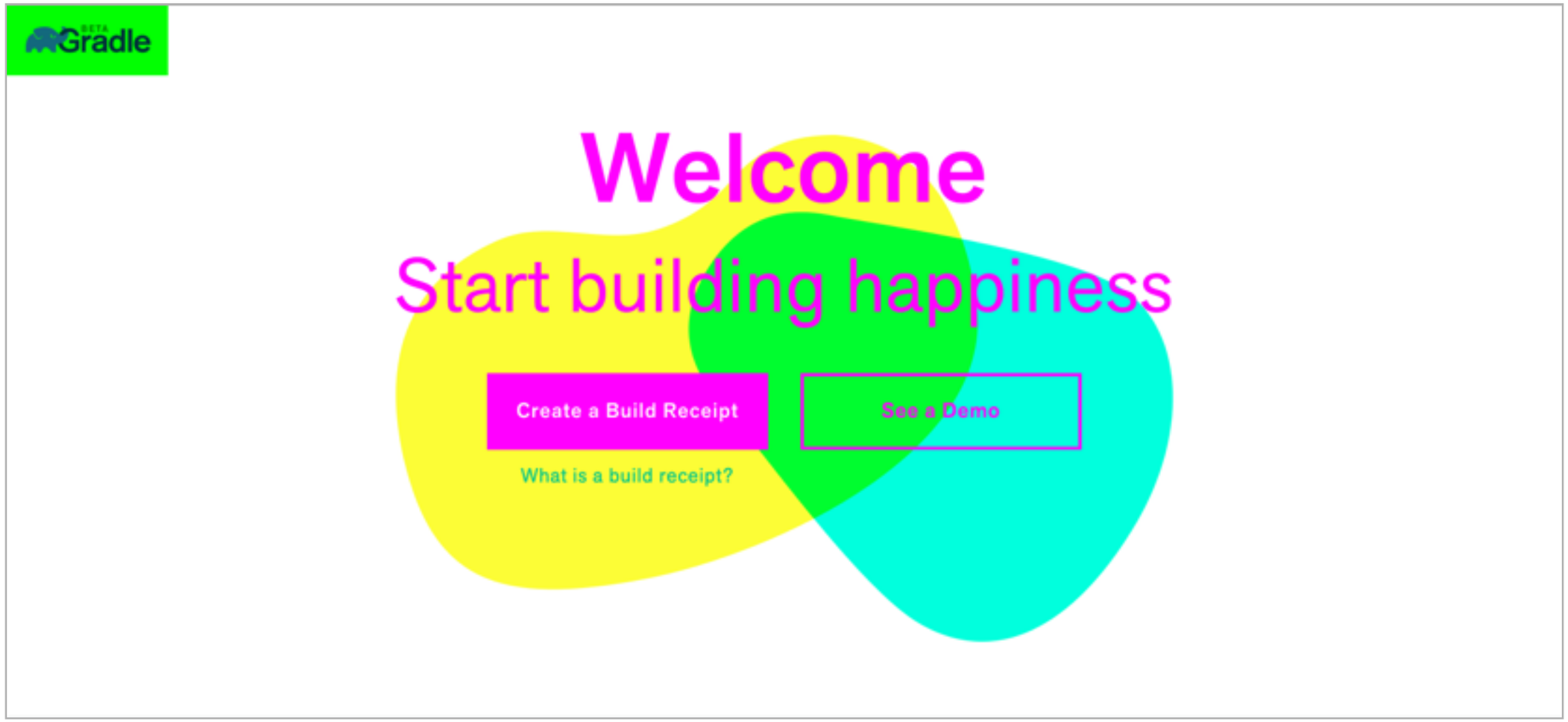
Coming son

Gradle

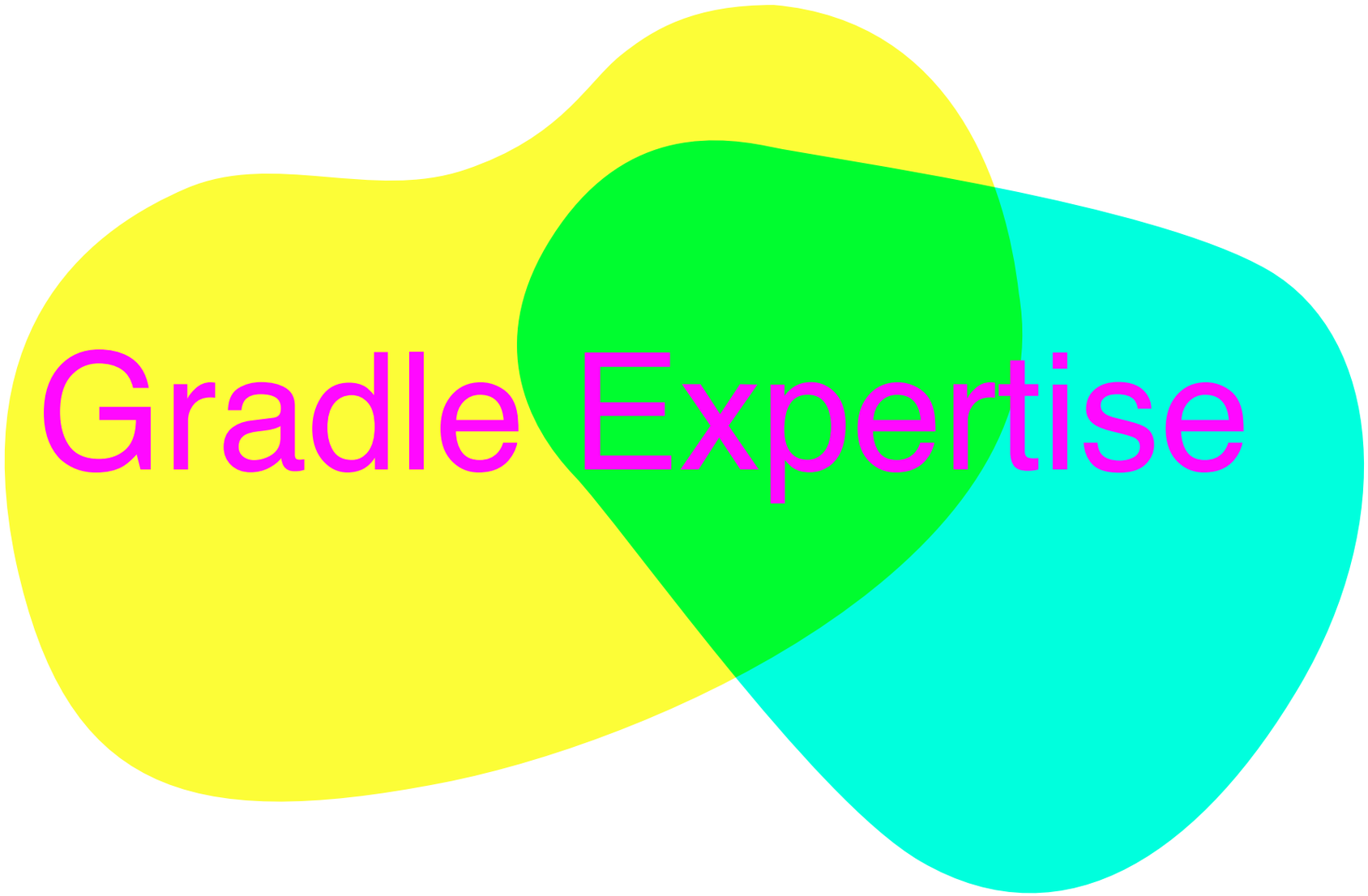
Distributed Cache/ Builds

Gradle

Gradle Saas


Gradle
Welcome
Start building happiness
Create a Build Receipt
See a Demo
What is a build receipt?

Gradle



Gradle for Android and Java

Build Better Apps Through Automation

Intermediate

Approx. 6 weeks

Assumes 6hr/wk (work at your own pace)

Join 2,735 Students

Built by gradle Google

Course Summary

This course explores how the Gradle build tool compiles and packages apps, and you'll learn to customize the build process. The first half of this course is for anyone interested in Gradle, build automation, and continuous delivery of software.

The latter half of the course reveals the magic that happens after you hit the "Run" button in Android Studio. You'll also explore advanced Android topics, learning to configure free vs paid app flavors, create and integrate Android libraries, test your app, and prepare your app for the Play Store.

Start Free Course

Start free course

Free

You get

- Instructor videos
- Learn by doing exercises

Introductory & Intermediate
Introduction to Gradle
Gradle for Android
Gradle C/C++ Workshop
Advanced Gradle Fundamentals

Advanced
Extending Gradle
Mastering Dependencies and Multi-project Builds
Standardizing Enterprise Builds
Continuous Delivery with Gradle

Gradle

Home Speakers Contact Us Members Register

Gradle Summit

June 23 - 24, 2016 • Palo Alto

Seating is Limited - Register Now!

We are busy planning a great event. Schedule details will be announced in early 2016.

Call for Papers is Open »

Elegant Builds at Scale

Etienne Studer
VP of Product Tooling, Gradle Inc.