Continuous Delivery with Grade

Hans Dockter
CEO Gradle Inc., Founder Gradle
Twitter: @gradle, @hans_d
hans@gradle.com

Gradle

New company

Gradleware Inc. -> Gradle, Inc.

Gradle

A new domain

gradle.com

New Twitter handle

@gradleware -> @gradle

New brand

Gradle

Build Happiness.

Gradle

Downloads

5,400,000 in 2014

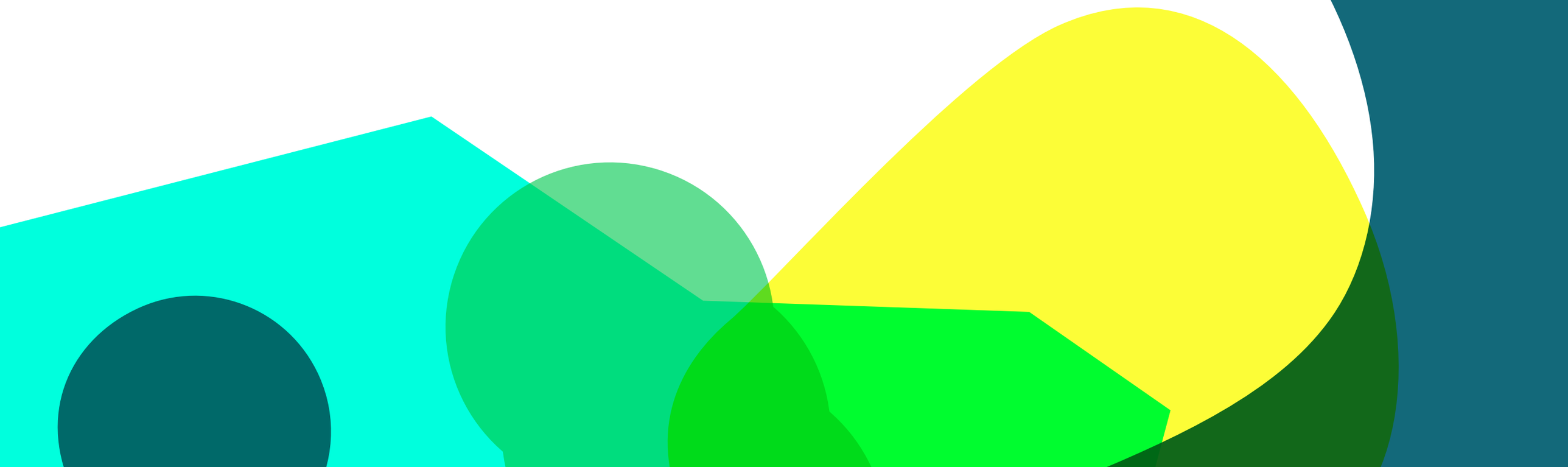
1,000,000 in May 2015

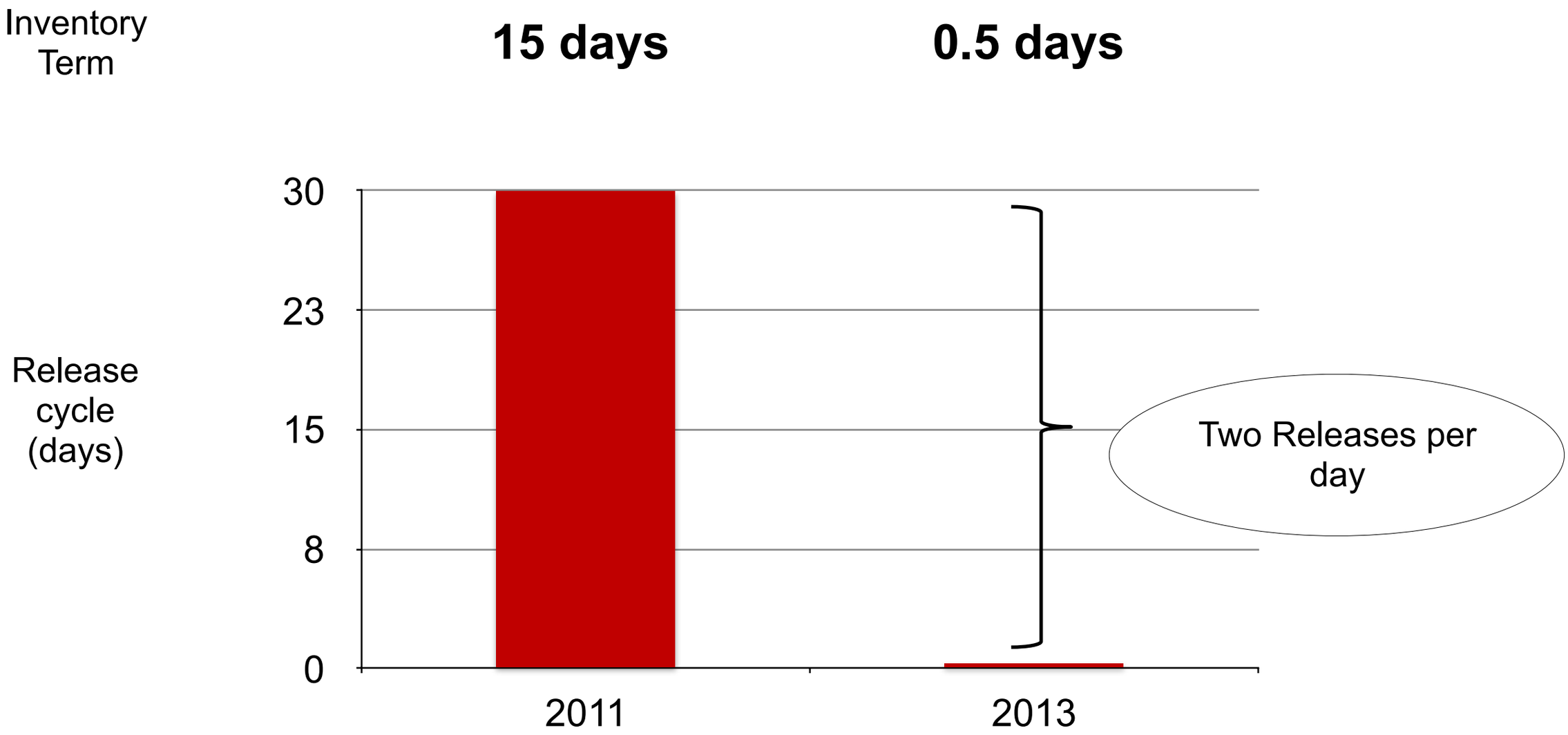

I Must Be Dead

XXXL

Gradle

“more complex”




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

Gradle

Dependency Management

Gradle

Replacement

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

repositories {
    mavenCentral()
}

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

Gradle

Dependency Selection Rules

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

repositories {
    mavenCentral()
}

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

Gradle

Project Substitution

```
hans:dependency-substitution$
```

Gradle

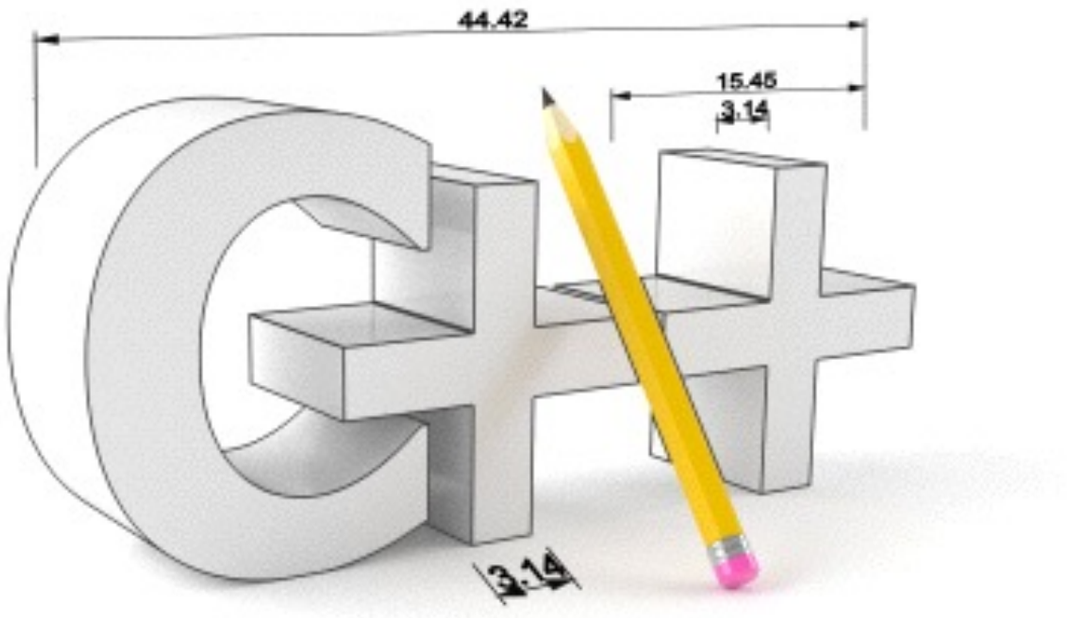
Community Plugins

Gradle

Variant Aware Dependency Management

Gradle

Components


44.42
15.45
3.14
3.14


Java


ANDROID

```
        ========== Initialize Properties ===================================

    -->
    <property name="build.dir" value="${basedir}/build"/>
    <property name="lib.dir" value="${basedir}/lib"/>
    <property name="src.dir" value="${basedir}/src"/>
    <property name="uimap.dir" value="${basedir}/src/com/core/uimap"/>
  - <target name="setClassPath">
    - <path id="classpath_jars">
        <pathelement path="${basedir}/"/>
        <fileset dir="${lib.dir}" includes="*.jar"/>
      </path>
    - <!--
        Convert jar collection from a given reference into one list, storing the result into a given property,
                        separated by colon
      -->
      <pathconvert pathsep=":" property="test.classpath" refid="classpath_jars"/>
    </target>
  - <target name="loadTestNG" depends="setClassPath">
      <!--Creating task definition for TestNG task-->
      <taskdef resource="testngtasks" classpath="${test.classpath}"/>
    </target>
  - <target name="init">
      <!--Creating build directory structure used by compile-->
      <mkdir dir="${build.dir}"/>
    </target>
  - <target name="clean">
      <echo message="deleting existing build directory"/>
      <delete dir="${build.dir}"/>
    </target>
  - <!--
      In compile target dependency is given over clean target followed by init,
              This order makes sure that build directory gets created before compile takes place
              This how clean compile is achieved.
    -->
  - <target name="compile" depends="clean, init, setClassPath, loadTestNG">
      <echo message="classpath: ${test.classpath}"/>
      <echo message="compiling..."/>
      <javac destdir="${build.dir}" srcdir="${src.dir}" classpath="${test.classpath}"/>
    - <!--
        Creating ui map directory which contains non java files
                and they have to be made available in build folder.
      -->
      <mkdir dir="${build.dir}/com/core/uimap"/>
```

Gradle

Android

BasicAndroid › app › build.gradle

Project

- BasicAndroid (~/gradle-project
  - .gradle
  - .idea
  - app
    - build
    - src
    - .gitignore
    - app.iml
    - build.gradle
    - build-1.gradle
    - build-2.gradle
    - proguard-rules.pro
  - build
  - gradle
  - .gitignore
  - BasicAndroid.iml
  - build.gradle
  - gradle.properties
  - gradlew
  - gradlew.bat
  - local.properties
  - settings.gradle
- External Libraries

app ×

```
apply plugin: 'com.android.application'

android {
    compileSdkVersion 20
    buildToolsVersion "20.0.0"
}
```

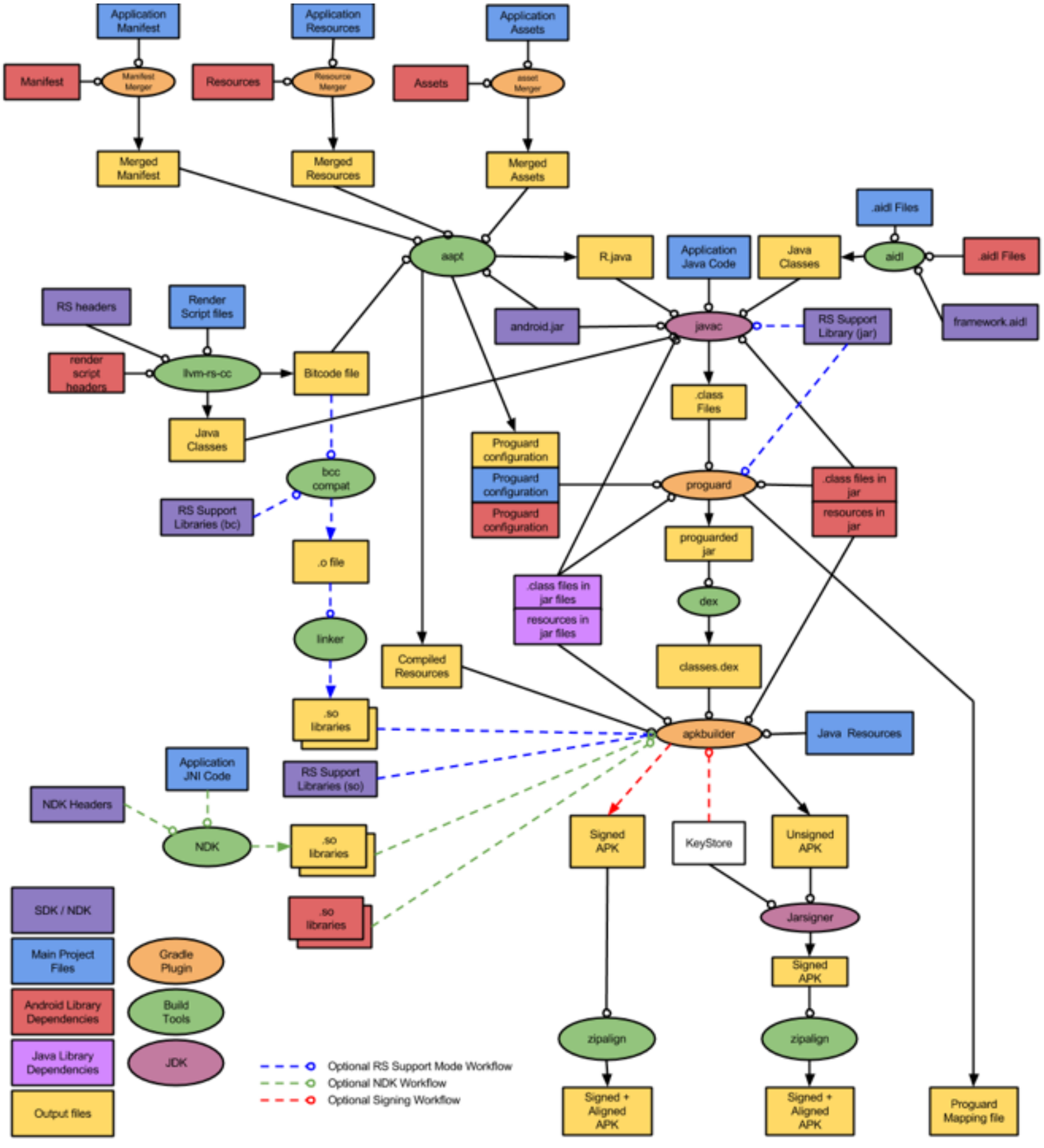
Gradle projects

- BasicAndroid

Run BasicAndroid:app [assembleDebug]

Captures | 1: Project | Z: Structure | 2: Favorites | Build Variants | Maven Projects | Gradle

Terminal | 6: Android | 0: Messages | 4: Run | TODO | Event Log | Gradle Console


Application Manifest
Application Resources
Application Assets
Manifest
Manifest Merger
Resources
Resource Merger
Assets
asset Merger
Merged Manifest
Merged Resources
Merged Assets
aapt
R.java
Application Java Code
Java Classes
.aidl Files
aidl
.aidl Files
framework.aidl
android.jar
javac
RS Support Library (jar)
RS headers
Render Script files
render script headers
llvm-rs-cc
Bitcode file
Java Classes
.class Files
Proguard configuration
Proguard configuration
Proguard configuration
proguard
.class files in jar
resources in jar
bcc compat
RS Support Libraries (bc)
.o file
proguarded jar
.class files in jar files
resources in jar files
dex
linker
Compiled Resources
classes.dex
.so libraries
apkbuilder
Java Resources
Application JNI Code
RS Support Libraries (so)
NDK Headers
NDK
.so libraries
.so libraries
Signed APK
KeyStore
Unsigned APK
Jarsigner
Signed APK
SDK / NDK
Main Project Files
Android Library Dependencies
Java Library Dependencies
Output files
Gradle Plugin
Build Tools
JDK
Optional RS Support Mode Workflow
Optional NDK Workflow
Optional Signing Workflow
zipalign
zipalign
Signed + Aligned APK
Signed + Aligned APK
Proguard Mapping file

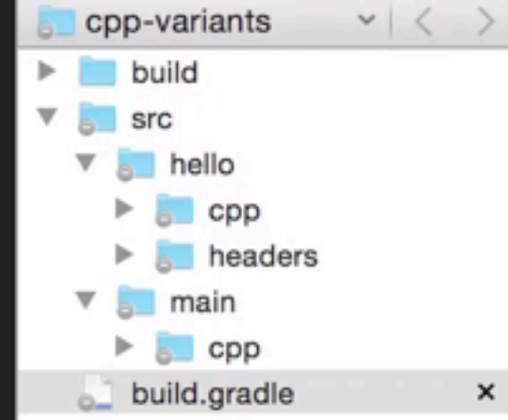
```
Android tasks
-------------
androidDependencies - Displays the Android dependencies of the project
signingReport - Displays the signing info for each variant

Build tasks
-----------
assemble - Assembles all variants of all applications and secondary packages. [assembleArmFree, assembleArmPaid, assembleDebug, assembleRelease, assembleX86Free, assembleX86Paid]
assembleArmFree - Assembles all builds for flavor ArmFree [assembleArmFreeDebug, assembleArmFreeRelease]
assembleArmFreeDebug - Assembles the Debug build for flavor ArmFree
    compileArmFreeDebugAidl
    compileArmFreeDebugRenderscript
    generateArmFreeDebugBuildConfig
    generateArmFreeDebugResValues
    generateArmFreeDebugResources
    mergeArmFreeDebugAssets
    mergeArmFreeDebugResources
    packageArmFreeDebug
    preparseArmFreeDebugDependencies
    processArmFreeDebugJarsRes
    processArmFreeDebugManifest
    processArmFreeDebugResources
    validateSetupSigning
assembleArmFreeRelease - Assembles the Release build for flavor ArmFree
    compileArmFreeReleaseAidl
    compileArmFreeReleaseRenderscript
    generateArmFreeReleaseBuildConfig
    generateArmFreeReleaseResValues
    generateArmFreeReleaseResources
    mergeArmFreeReleaseAssets
    mergeArmFreeReleaseResources
    packageArmFreeRelease
    preparseArmFreeReleaseDependencies
    processArmFreeReleaseJarsRes
    processArmFreeReleaseManifest
    processArmFreeReleaseResources
assembleArmFreeTest - Assembles the Test build for the ArmFreeDebug build
    compileArmFreeDebug
    compileArmFreeDebugAidl
    compileArmFreeDebugRenderscript
    compileArmFreeTest
    compileArmFreeTestAidl
    compileArmFreeTestRenderscript
    dexArmFreeTest
    generateArmFreeDebugBuildConfig
    generateArmFreeTestBuildConfig
    mergeArmFreeDebugAssets
    mergeArmFreeDebugResources
    mergeArmFreeTestAssets
    mergeArmFreeTestResources
    packageArmFreeTest
    preparseArmFreeDebugDependencies
    processArmFreeDebugManifest
    processArmFreeDebugResources
    processArmFreeTestJarsRes
    processArmFreeTestResources
    processArmFreeTestTestManifest
    validateSetupSigning
assembleArmPaid - Assembles all builds for flavor ArmPaid [assembleArmPaidDebug, assembleArmPaidRelease]
assembleArmPaidDebug - Assembles the Debug build for flavor ArmPaid
    compileArmPaidDebug
    compileArmPaidDebugAidl
    compileArmPaidDebugRenderscript
    dexArmPaidDebug
    generateArmPaidDebugBuildConfig
    generateArmPaidDebugResValues
    generateArmPaidDebugResources
    mergeArmPaidDebugAssets
    mergeArmPaidDebugResources
    packageArmPaidDebug
    preparseArmPaidDebugDependencies
    processArmPaidDebugJarsRes
    processArmPaidDebugManifest
    processArmPaidDebugResources
    validateSetupSigning
assembleArmPaidRelease - Assembles the Release build for flavor ArmPaid
    compileArmPaidRelease
    compileArmPaidReleaseAidl
    compileArmPaidReleaseRenderscript
    dexArmPaidRelease
    generateArmPaidReleaseBuildConfig
    generateArmPaidReleaseResValues
    generateArmPaidReleaseResources
    mergeArmPaidReleaseAssets
    mergeArmPaidReleaseResources
    packageArmPaidRelease
    preparseArmPaidReleaseDependencies
    processArmPaidReleaseJarsRes
    processArmPaidReleaseManifest
    processArmPaidReleaseResources
assembleArmPaidTest - Assembles the Test build for the ArmPaidDebug build
    compileArmPaidDebug
    compileArmPaidDebugAidl
    compileArmPaidDebugRenderscript
    compileArmPaidTest
    compileArmPaidTestAidl
    compileArmPaidTestRenderscript
    dexArmPaidTest
    generateArmPaidDebugBuildConfig
    generateArmPaidTestBuildConfig
    mergeArmPaidDebugAssets
    mergeArmPaidDebugResources
    mergeArmPaidTestAssets
    mergeArmPaidTestResources
    packageArmPaidTest
    preparseArmPaidDebugDependencies
    preparseArmPaidTestDependencies
    processArmPaidDebugManifest
    processArmPaidDebugResources
    processArmPaidTestJarsRes
    processArmPaidTestResources
    processArmPaidTestTestManifest
    validateSetupSigning
assembleDebug - Assembles all Debug builds [assembleArmFreeDebug, assembleArmPaidDebug, assembleX86FreeDebug, assembleX86PaidDebug]
assembleRelease - Assembles all Release builds [assembleArmFreeRelease, assembleArmPaidRelease, assembleX86FreeRelease, assembleX86PaidRelease]
assembleTest - Assembles all the Test applications [assembleArmFreeTest, assembleArmPaidTest, assembleX86FreeTest, assembleX86PaidTest]
assembleX86Free - Assembles all builds for flavor X86Free [assembleX86FreeDebug, assembleX86FreeRelease]
assembleX86FreeDebug - Assembles the Debug build for flavor X86Free
    compileX86FreeDebug
    compileX86FreeDebugAidl
    compileX86FreeDebugRenderscript
    dexX86FreeDebug
    generateX86FreeDebugBuildConfig
    mergeX86FreeDebugAssets
    mergeX86FreeDebugResources
    packageX86FreeDebug
    preparseX86FreeDebugDependencies
    processX86FreeDebugJarsRes
    processX86FreeDebugManifest
    processX86FreeDebugResources
    validateSetupSigning
assembleX86FreeRelease - Assembles the Release build for flavor X86Free
    compileX86FreeRelease
    compileX86FreeReleaseAidl
    compileX86FreeReleaseRenderscript
    dexX86FreeRelease
    generateX86FreeReleaseBuildConfig
    mergeX86FreeReleaseAssets
    mergeX86FreeReleaseResources
    packageX86FreeRelease
    preparseX86FreeReleaseDependencies
    processX86FreeReleaseJarsRes
    processX86FreeReleaseManifest
    processX86FreeReleaseResources
assembleX86FreeTest - Assembles the Test build for the X86FreeDebug build
    compileX86FreeDebug
    compileX86FreeDebugAidl
    compileX86FreeDebugRenderscript
    compileX86FreeTest
    compileX86FreeTestAidl
    compileX86FreeTestRenderscript
    dexX86FreeTest
    generateX86FreeDebugBuildConfig
    generateX86FreeTestBuildConfig
    mergeX86FreeDebugAssets
    mergeX86FreeDebugResources
    mergeX86FreeTestAssets
    mergeX86FreeTestResources
    packageX86FreeTest
    preparseX86FreeDebugDependencies
    preparseX86FreeTestDependencies
    processX86FreeDebugManifest
    processX86FreeDebugResources
    processX86FreeTestJarsRes
    processX86FreeTestResources
    processX86FreeTestTestManifest
    validateSetupSigning
assembleX86Paid - Assembles all builds for flavor X86Paid [assembleX86PaidDebug, assembleX86PaidRelease]
assembleX86PaidDebug - Assembles the Debug build for flavor X86Paid
    compileX86PaidDebug
    compileX86PaidDebugAidl
    compileX86PaidDebugRenderscript
    dexX86PaidDebug
    generateX86PaidDebugBuildConfig
    mergeX86PaidDebugAssets
    mergeX86PaidDebugResources
    packageX86PaidDebug
    preparseX86PaidDebugDependencies
    processX86PaidDebugJarsRes
    processX86PaidDebugManifest
    processX86PaidDebugResources
    validateSetupSigning
assembleX86PaidRelease - Assembles the Release build for flavor X86Paid
    compileX86PaidRelease
    compileX86PaidReleaseAidl
    compileX86PaidReleaseRenderscript
    dexX86PaidRelease
    generateX86PaidReleaseBuildConfig
    mergeX86PaidReleaseAssets
    mergeX86PaidReleaseResources
    packageX86PaidRelease
    preparseX86PaidReleaseDependencies
    processX86PaidReleaseJarsRes
    processX86PaidReleaseManifest
    processX86PaidReleaseResources
assembleX86PaidTest - Assembles the Test build for the X86PaidDebug build
    compileX86PaidDebug
    compileX86PaidDebugAidl
    compileX86PaidDebugRenderscript
    compileX86PaidTest
    compileX86PaidTestAidl
    compileX86PaidTestRenderscript
    dexX86PaidTest
    generateX86PaidDebugBuildConfig
    generateX86PaidTestBuildConfig
    mergeX86PaidDebugAssets
    mergeX86PaidDebugResources
    mergeX86PaidTestAssets
    mergeX86PaidTestResources
    packageX86PaidTest
    preparseX86PaidDebugDependencies
    preparseX86PaidTestDependencies
    processX86PaidDebugManifest
    processX86PaidDebugResources
    processX86PaidTestJarsRes
    processX86PaidTestResources
    processX86PaidTestTestManifest
    validateSetupSigning
build - Assembles and tests this project. [assemble, check]
buildDependents - Assembles and tests this project and all projects that depend on it. [build]
buildNeeded - Assembles and tests this project and all projects it depends on. [build]
clean - Deletes the build directory.

Help tasks
----------
dependencies - Displays all dependencies declared in root project 'flavors'.
dependencyInsight - Displays the insight into a specific dependency in root project 'flavors'.
help - Displays a help message.
projects - Displays the sub-projects of root project 'flavors'.
properties - Displays the properties of root project 'flavors'.
tasks - Displays the tasks runnable from root project 'flavors' (some of the displayed tasks may belong to subprojects).

Install tasks
-------------
installArmFreeDebug - Installs the Debug build for flavor ArmFree
    compileArmFreeDebug
    compileArmFreeDebugAidl
    compileArmFreeDebugRenderscript
    generateArmFreeDebugBuildConfig
    mergeArmFreeDebugAssets
    mergeArmFreeDebugResources
    packageArmFreeDebug
    preparseArmFreeDebugDependencies
    processArmFreeDebugJarsRes
    processArmFreeDebugManifest
    processArmFreeDebugResources
    validateSetupSigning
installArmFreeTest - Installs the Test build for the ArmFreeDebug build
    compileArmFreeDebug
    compileArmFreeDebugAidl
    compileArmFreeDebugRenderscript
    compileArmFreeTest
    compileArmFreeTestAidl
    compileArmFreeTestRenderscript
    dexArmFreeTest
    generateArmFreeDebugBuildConfig
    generateArmFreeTestBuildConfig
    mergeArmFreeDebugAssets
    mergeArmFreeDebugResources
    mergeArmFreeTestAssets
    mergeArmFreeTestResources
    packageArmFreeTest
    preparseArmFreeDebugDependencies
    preparseArmFreeTestDependencies
    processArmFreeDebugManifest
    processArmFreeDebugResources
    processArmFreeTestJarsRes
    processArmFreeTestResources
    processArmFreeTestTestManifest
    validateSetupSigning
installArmPaidDebug - Installs the Debug build for flavor ArmPaid
    compileArmPaidDebug
    compileArmPaidDebugAidl
    compileArmPaidDebugRenderscript
    dexArmPaidDebug
    generateArmPaidDebugBuildConfig
    generateArmPaidDebugResValues
    generateArmPaidDebugResources
    mergeArmPaidDebugAssets
    mergeArmPaidDebugResources
    packageArmPaidDebug
    preparseArmPaidDebugDependencies
    processArmPaidDebugJarsRes
    processArmPaidDebugManifest
    processArmPaidDebugResources
    validateSetupSigning
installArmPaidDebugTest - Installs the Test build for the ArmPaidDebug build
    compileArmPaidDebug
    compileArmPaidDebugAidl
    compileArmPaidDebugRenderscript
    compileArmPaidTest
    compileArmPaidTestAidl
    compileArmPaidTestRenderscript
    dexArmPaidTest
    generateArmPaidDebugBuildConfig
    generateArmPaidTestBuildConfig
    mergeArmPaidDebugAssets
    mergeArmPaidDebugResources
    mergeArmPaidTestAssets
    mergeArmPaidTestResources
    packageArmPaidTest
    preparseArmPaidDebugDependencies
    preparseArmPaidTestDependencies
    processArmPaidDebugManifest
    processArmPaidDebugResources
    processArmPaidTestJarsRes
    processArmPaidTestResources
    processArmPaidTestTestManifest
    validateSetupSigning
installX86FreeDebug - Installs the Debug build for flavor X86Free
    compileX86FreeDebug
    compileX86FreeDebugAidl
    compileX86FreeDebugRenderscript
    dexX86FreeDebug
    generateX86FreeDebugBuildConfig
    mergeX86FreeDebugAssets
    mergeX86FreeDebugResources
    packageX86FreeDebug
    preparseX86FreeDebugDependencies
    processX86FreeDebugJarsRes
    processX86FreeDebugManifest
    processX86FreeDebugResources
    validateSetupSigning
installX86FreeTest - Installs the Test build for the X86FreeDebug build
    compileX86FreeDebug
    compileX86FreeDebugAidl
    compileX86FreeDebugRenderscript
    compileX86FreeTest
    compileX86FreeTestAidl
    compileX86FreeTestRenderscript
    dexX86FreeTest
    generateX86FreeDebugBuildConfig
    generateX86FreeTestBuildConfig
    mergeX86FreeDebugAssets
    mergeX86FreeDebugResources
    mergeX86FreeTestAssets
    mergeX86FreeTestResources
    packageX86FreeTest
    preparseX86FreeDebugDependencies
    preparseX86FreeTestDependencies
    processX86FreeDebugManifest
    processX86FreeDebugResources
    processX86FreeTestJarsRes
    processX86FreeTestResources
    processX86FreeTestTestManifest
    validateSetupSigning
installX86PaidDebug - Installs the Debug build for flavor X86Paid
    compileX86PaidDebug
    compileX86PaidDebugAidl
    compileX86PaidDebugRenderscript
    dexX86PaidDebug
    generateX86PaidDebugBuildConfig
    mergeX86PaidDebugAssets
    mergeX86PaidDebugResources
    packageX86PaidDebug
    preparseX86PaidDebugDependencies
    processX86PaidDebugJarsRes
    processX86PaidDebugManifest
    processX86PaidDebugResources
    validateSetupSigning
installX86PaidDebugTest - Installs the Test build for the X86PaidDebug build
    compileX86PaidDebug
    compileX86PaidDebugAidl
    compileX86PaidDebugRenderscript
    compileX86PaidTest
    compileX86PaidTestAidl
    compileX86PaidTestRenderscript
    dexX86PaidTest
    generateX86PaidDebugBuildConfig
    generateX86PaidTestBuildConfig
    mergeX86PaidDebugAssets
    mergeX86PaidDebugResources
    mergeX86PaidTestAssets
    mergeX86PaidTestResources
    packageX86PaidTest
    preparseX86PaidDebugDependencies
    preparseX86PaidTestDependencies
    processX86PaidDebugManifest
    processX86PaidDebugResources
    processX86PaidTestJarsRes
    processX86PaidTestResources
    processX86PaidTestTestManifest
    validateSetupSigning
uninstallAll - Uninstall all applications. [uninstallArmFreeDebug, uninstallArmFreeRelease, uninstallArmFreeTest, uninstallArmPaidDebug, uninstallArmPaidRelease, uninstallArmPaidTest,
uninstallArmFreeDebug, uninstallArmFreeRelease, uninstallArmFreeTest, uninstallArmPaidDebug, uninstallArmPaidRelease, uninstallArmPaidTest]
uninstallArmFreeDebug - Uninstalls the Debug build for flavor ArmFree
```

> 300 Tasks

Gradle

C/C++

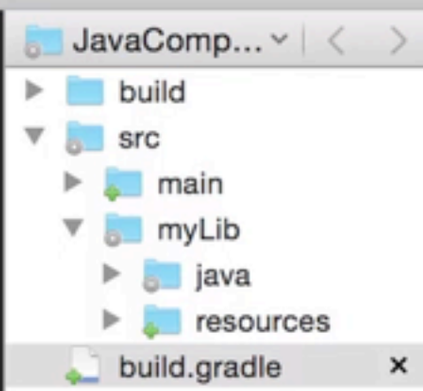
```
apply plugin: 'cpp'

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

Java

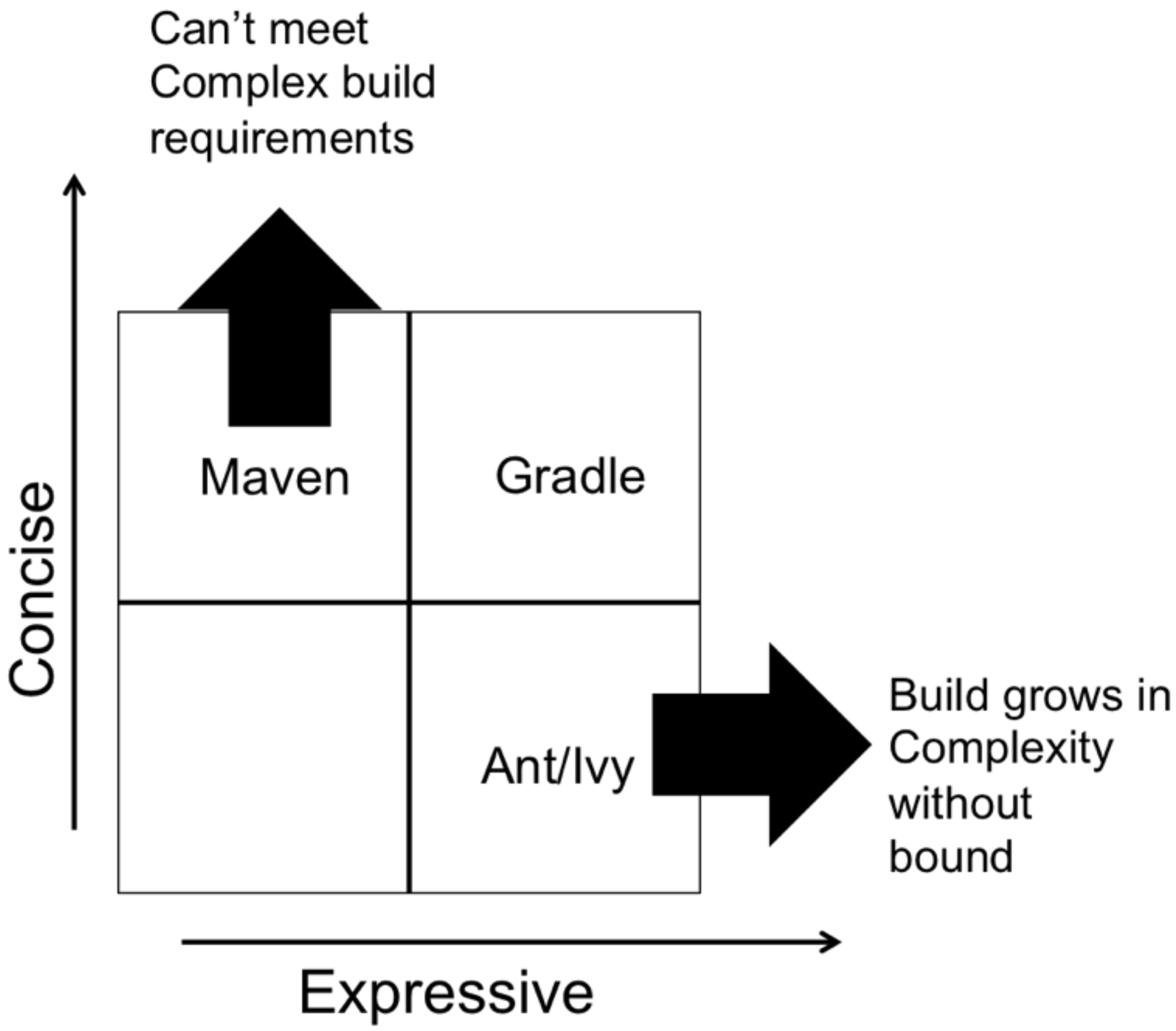
```
plugins {
    id 'jvm-component'
    id 'java-lang'
}

model {
    components {
        myLib(JvmLibrarySpec) {
            targetPlatform "java6"
            targetPlatform "java8"
        }
    }
}
```



Other Component Types

Gradle

The Age of Continuous Delivery


Can’t meet
Complex build
requirements
Maven
Gradle
Ant/Ivy
Build grows in
Complexity
without
bound
Concise
Expressive

https://gradle.org/maven_vs_gradle/

http://gradle.org/open-source-build-system-evaluation-in-the-age-of-continuous-delivery-part-1/

Gradle

Developer Support

Gradle

Continuous Mode

1. bash

```
hans:asciidoc-to-html-example$
```

Buildship: Eclipse Plug-ins for Gradle

Buildship

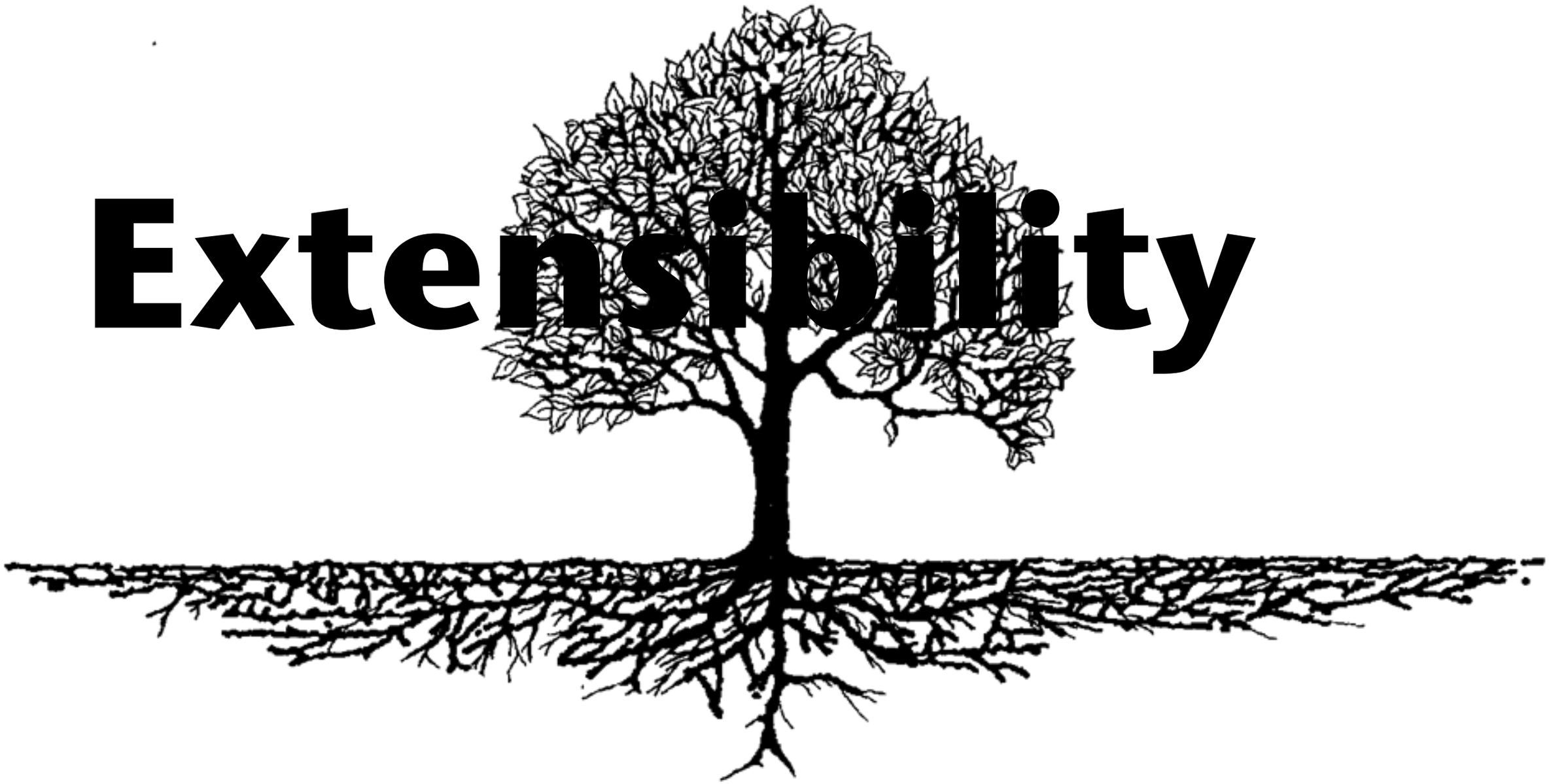
Buildship is a collection of Eclipse plug-ins that provide support for building software using Gradle.

Licenses:
Eclipse Public License 1.0

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

gradle

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



Extensibility

Gradle

Deep API

Gradle

600+ Community Plugins

Gradle

Performance

Gradle 2.4

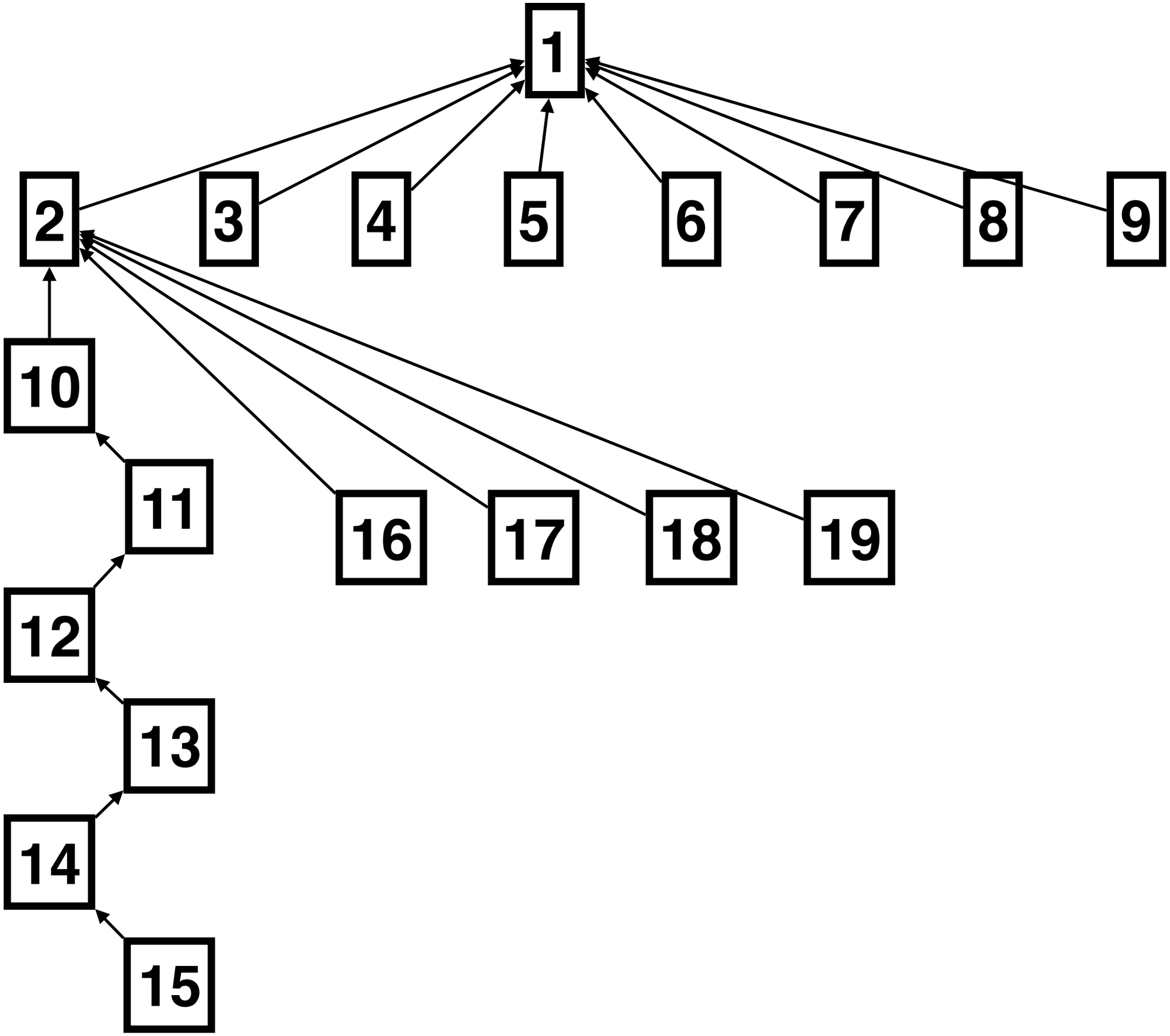
Gradle 2.9

Gradle

Incremental Builds

Gradle

Compile Avoidance


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

```
hans:mediumNewJava$
```

New Configuration Model

Gradle

Reusable Model

Gradle

Task Based Parallelization

Distributed Cache/ Builds

Gradle

Find out how we're building happiness.

Gradle.com is coming soon. Sign up for email updates.

Your email

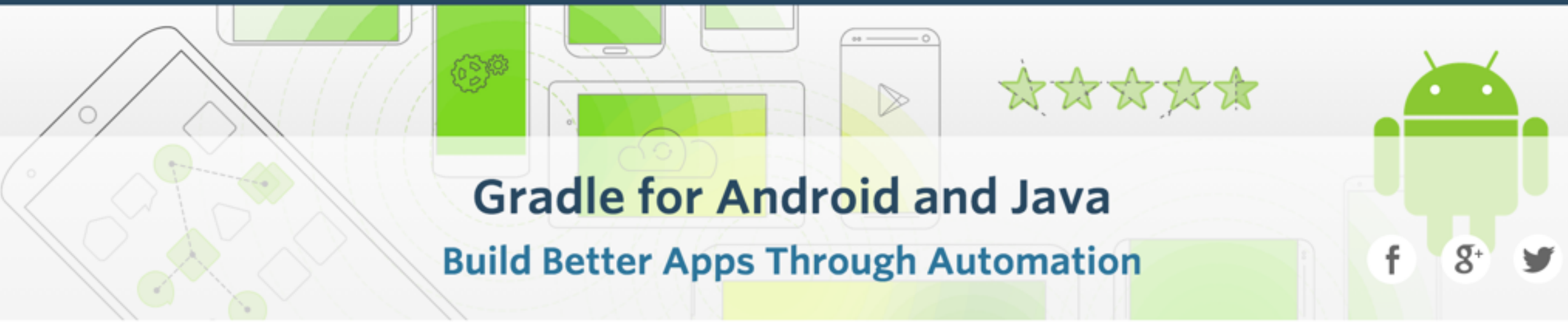
dev@gradlefan.com

Size of your team

Primary language

Your role

SUBMIT



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

Thank You!

Q & A

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