gradleware

Building Software with Gradle - An Introduction

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Gradle

The Enterprise Build System

Highly tested frameworks

Multi-dimensional build variants

Thousands of dependent modules

Poll

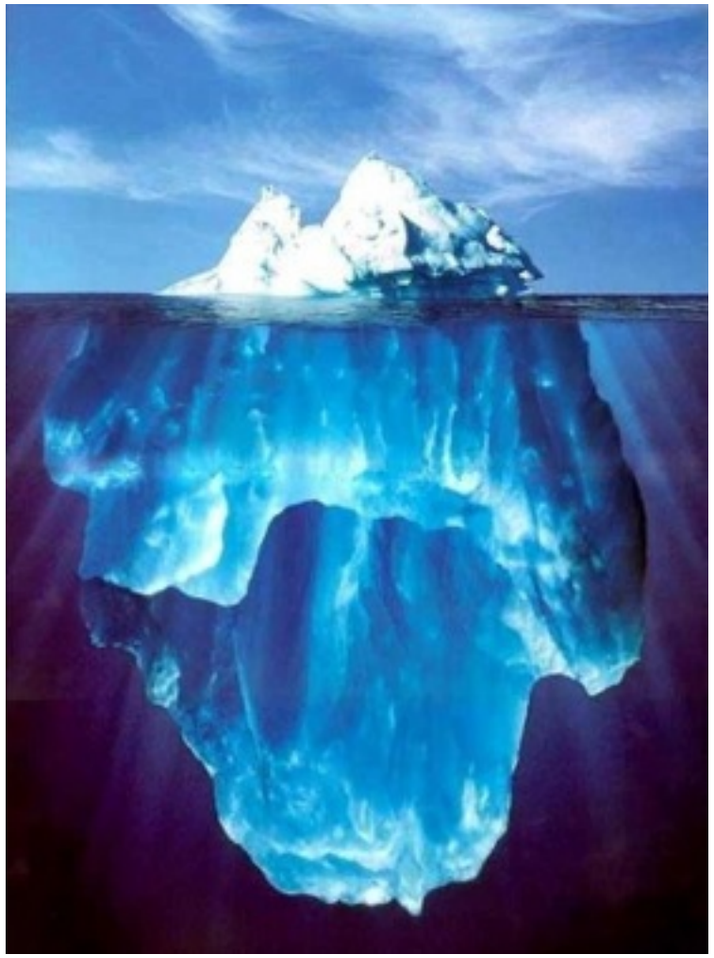
Using Gradle?

Build Pain Points

- Build is difficult to read, maintain, and extend
- Weak support to model project dependencies
- Build system dictates project layout
- Slow build performance
- Incompatible build system versions
- Build system restricts project automation

Core Concepts

- Deeply model the domain
- Provide declarative domain-specific language



Core Gradle Objects

- Task
- Project
- Plugin
- Dependency
- Component

Tasks

- Unit of work
- Declarativ
- Typed

```
task testClassesJar(type: Jar) {
  from ‘build/classes/test’
  classifier = 'test'
  manifest.attributes provider: 'Gradle'
}
```

Task Dependencies

- Directed
- Acyclic

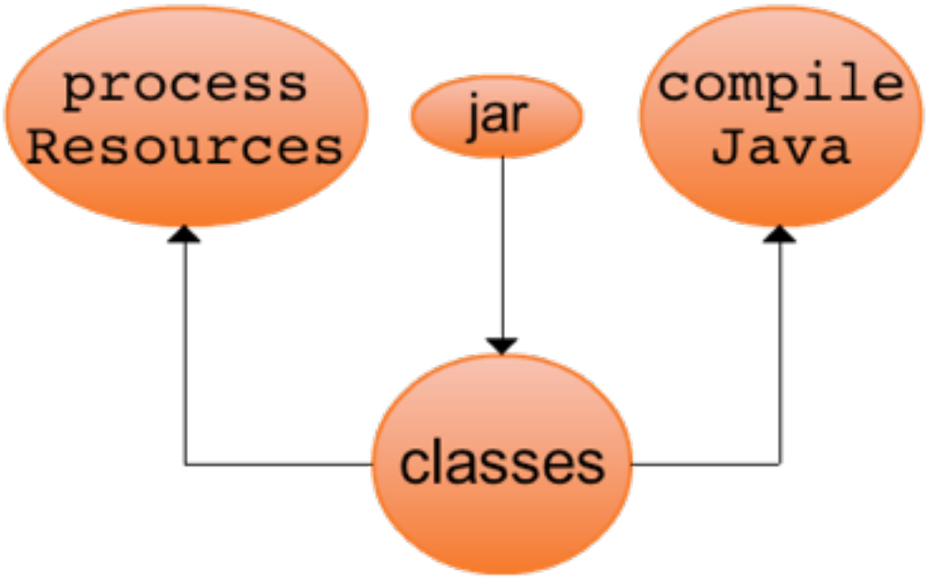
```
assemble.dependsOn testClassesJar

assemble.dependsOn ‘sourcesJar’

task sourcesJar(type: Jar) {
  from sourceSets.main.java
  classifier = ‘sources'
}
```

Task Graph (DAG)

- Each task to be executed is a node
- The *dependsOn* relations define directed edges
- Each task executed once and only once
- Execution order is against the edge directions



Plugins

- Provide tasks
- Provide task types
- Configure tasks of other plugins
- Register build listeners

```
apply plugin: ‘java’
apply plugin: ‘application’
```

External Plugins

- Can be applied from any local/remote M2 repository

```
buildscript {
  repositories {
    jcenter()
  }
  dependencies {
    classpath ‘nu.studer:gradle-jooq-plugin:1.0.5'
  }
}

apply plugin: ‘nu.studer.jooq'
```

Projects

- Have plugins applied
- Contain child projects
- Contain tasks
- Contain configurations

Project Dependencies

- Project dependencies and external dep. declared in configurations
  - Configurations provided by plugin or defined in script

```
repositories {
  maven {
    url ‘https://my.repo.org’
      credentials {
        username ‘user‘
        password ‘password‘
      }
  }
}

dependencies {
  compile project(‘api’)
  testCompile ‘junit:junit:4.8.1‘
}
```

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

Demo

Gradle Object Model

- Object graph can be traversed

```
allprojects {
  repositories {
    jcenter()
  }
}

allprojects {
  def zipTasks = tasks.withType(Zip)
  def imgZipTasks = zipTasks.matching { it.name.startsWith('images') }
  imgZipTasks.all {
    classifier = 'IMAGES'
  }
}

task imagesJar(type: Jar) {
  from 'images'
}
```

Implicit Task Dependencies

- Model the input of tasks as the output of other tasks so Gradle can build the correct task graph

```
task docsZip(type: Zip) {
  into('java') {
    from project(':SUB1').javadoc
  }
  into('scala') {
    from scaladoc
  }
}
```

Task uptodate checks

Inputs —> Task —> Outputs

Only run task if its input or output has changed since the previous run

Define inputs and outputs on your custom tasks!

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

Demo

Multi-Project Build

- Gradle project structure defined in *settings.gradle*
- Arbitrary mapping from physical to logical structure
- Partial builds supported
  - Gradle tasks *buildDependents* and *buildNeeded*

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

Dependency Management

- Most powerful dependency management today
- Many options for version conflict resolution

```
repositories {
  jcenter()
  mavenCenter()
  mavenLocal()
  maven { url ‘http://myrepo.org' }
  flatDir { dirs ‘lib' }
}

configurations.compile ‘com.google.guava:guava:17.0’
```

DSL

Custom **Domain-Specific** Language

Android-Specific Language

```
android {
  compileSdkVersion 21
  buildToolsVersion ’21.0.2’

  defaultConfig {
      applicationId ‘ch.example.android.foo’
      minSdkVersion 15
      targetSdkVersion 21
  }
  buildTypes {
      release {
          runProguard false
          proguardFiles getDefaultProguardFile(‘proguard-android.txt')
      }
  }
}
```

Hidden build complexity

Gradle Plugin Portal

gradle

Search Gradle Plugins

android

Want to include your Gradle plugin here?

Plugin	Latest Version
me.champeau.gradle.groovy-android Adds support for the Groovy language to Android builds #groovy #android	0.3.3 (29 October 2014)
se.centril.robospock gradle plugin for configuring robospock (gradle + spock + roboelectric) easily. #robospock #spock #unit-testing #android #roboelectric	0.2.1 (28 October 2014)

http://plugins.gradle.org

Custom plugins

- Reusable build logic
- Plain Java / Groovy project
- Package in .jar file with plugin descriptor
- Upload to repository (JCenter, MavenC, private)

plugindev plugin simplifies bundling & publishing

https://github.com/etiennestuder/gradle-plugindev-plugin

http://plugins.gradle.org/submit

Policies

- Enforce company policies through init scripts

```
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 && !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

Gradle Wrapper

- No setup on CI/Dev machines required
- Different versions of Gradle for different projects
- Gradle version persisted in version control system

```
├── gradle
│   └── wrapper
│       ├── gradle-wrapper.jar
│       └── gradle-wrapper.properties
├── gradlew
├── gradlew.bat
```

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

Gradle Daemon

- Reuse JVM with same settings between builds
  - ~/.gradle/gradle.properties

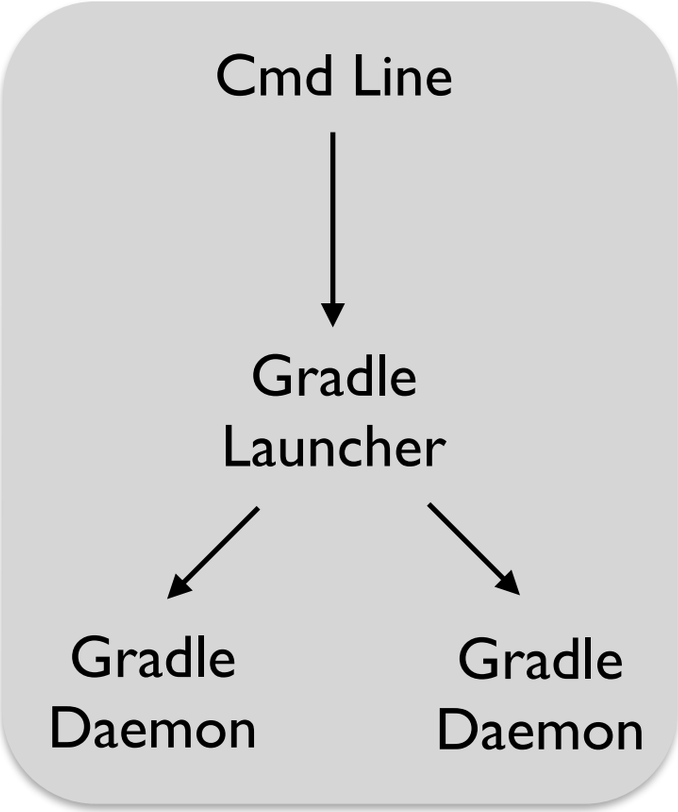
    ```
    org.gradle.daemon=true
    ```

  - GRADLE_OPTS

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

  - Command Line

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



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

Tooling API

- Proxy for embedding Gradle
- Extension mechanism to provide custom models
- Forward and backward compatible

Client VM
with gradle-tooling-api.jar

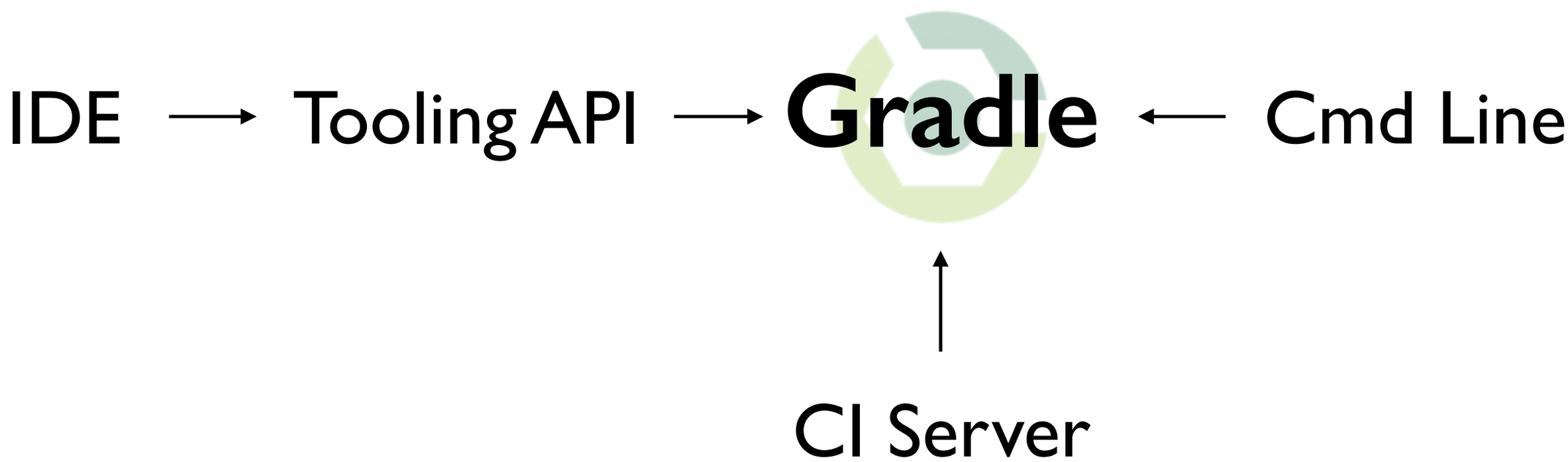
get build models →
invoke build tasks

Gradle Daemon
for Gradle build

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

Unified Build

- Gradle as the single source of build logic



Demo

Coming soon

- Parallel task execution
- Configuration phase enhancements
- New JVM language plugins

Summary

Gradle is
an *extensible build language* that targets
usability, maintainability, extensibility, and performance
fo*r complex builds*.

Resources

- Gradle Userguide

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

- Gradle Reference Guide

  http://www.gradle.org/docs/current/dsl/

- Gradle Forum

  http://forums.gradle.org/gradle

Conferences

- EclipseCon 2015

  https://www.eclipsecon.org/na2015

- Gradle Summit June 2015

  http://www.gradlesummit.com

Gradleware

- Gradle development
  - Open-Source
- Gradle training
  - Virtual training, On-site training
- Services and consulting
  - Gradle, Automation, Continuous Integration & Delivery

https://www.gradleware.com/

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