Don’t Let Ephemeral CI Kill Your Developer Productivity

Louis Jacomet - Gradle

Devoxx UK 2024

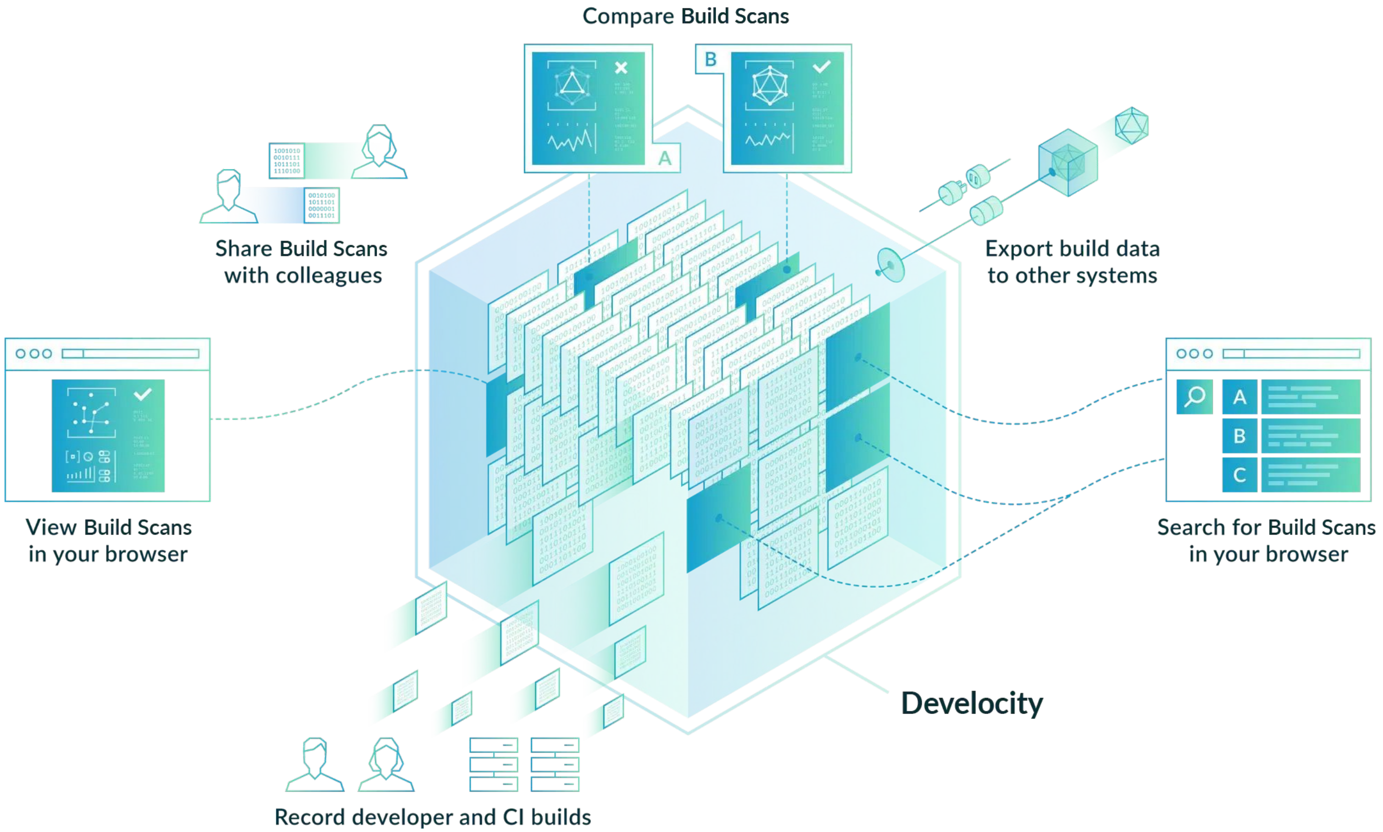
Louis Jacomet

```
speaker {
   company = "Gradle"
   joined = 2018
   position = "Support Team Lead and more ..."
   previously = "Dependency Management, JVM plugins"
   past = listOf(
      "Terracotta / Ehcache" in 2013,
      "Devoxx Belgium Committee" in 2012,
      "Contractor" in 2002,
      "Java 'Hello, World!'" in 1997
   )
   failures = generateSequence(code) { bugs }
   social = listOf("@ljacomet@foojay.social”, “@ljacomet")
   github = "ljacomet"
   web = "https://jacomet.dev"
   extra = "Not fully figured out how to stay out of
management !?!"
}
```

Gradle Build Tool

- Apache 2.0 licensed build tool
- JVM based
- Kotlin and Groovy configuration DSLs
- 49+ millions downloads / month
- Extensive plugin ecosystem

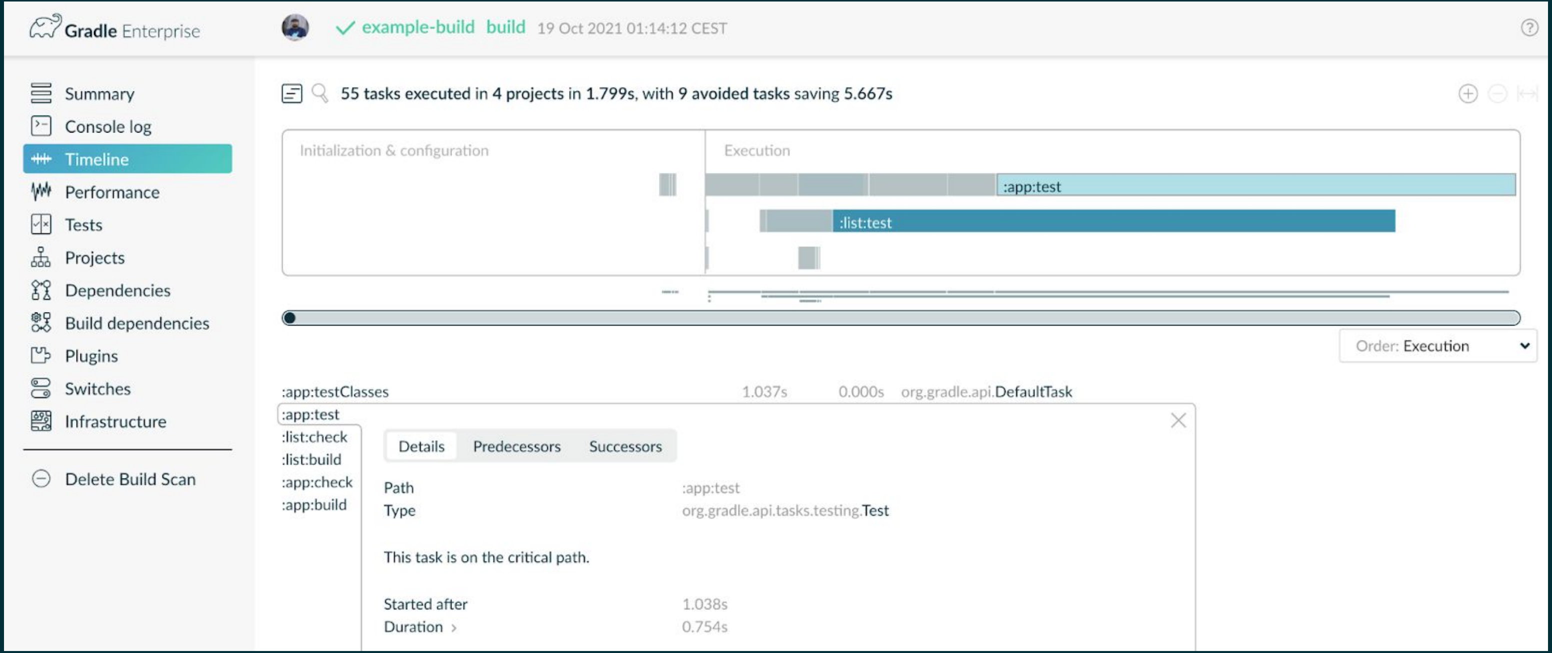
DEVELOCITY



Compare Build Scans
A
B
Share Build Scans with colleagues
Export build data to other systems
View Build Scans in your browser
Search for Build Scans in your browser
A
B
C
Develocity
Record developer and CI builds

- Gradle
- Maven
- Bazel
- Sbt

Build scans



✓ example-build build 19 Oct 2021 01:14:12 CEST

55 tasks executed in 4 projects in 1.799s, with 9 avoided tasks saving 5.667s

:app:testClasses 1.037s 0.000s org.gradle.api.DefaultTask
:app:test
:list:check
:list:build
:app:check
:app:build

Path	:app:test
Type	org.gradle.api.tasks.testing.Test

This task is on the critical path.

Started after	1.038s
Duration ›	0.754s

Permanent record of a build execution

Table of Contents

Problem statement

- Gradle Build Tool performance

  vs.

- Ephemeral environments trend

Developer productivity and build performance?

- Only one aspect …

- But “Fast build” is not the goal

- A build that is “as fast as possible” is the goal at Gradle

Gradle Build Tool performance

- Enable parallel execution
- Enable the Gradle daemon
- Enable the configuration cache
- Enable incremental build for custom tasks
- Enable the build cache
- Create build for specific developer workflows
- Increase the heap size
- Optimize configuration
- Optimize dependency resolution
- Optimize [Java|Android] projects

Ephemeral environments

- Industry trend
- Isolation → no state problems
- Short lived → no clean up jobs

Gradle Build Tool performance

● Enable parallel execution	✅
● Enable the Gradle daemon	❓
● Enable the configuration cache	❓
● Enable incremental build for custom tasks	❌
● Enable the build cache	✅
● Create build for specific developer workflows	✅
● Increase the heap size	✅
● Optimize configuration	✅
● Optimize dependency resolution	❌
● Optimize [Java|Android] projects	❓

Key Gradle Build Tool performance elements

- Caches
    - Dependency cache
    - Task cache
    - …
- Incrementality
    - Execution history
- Parallelism
    - Tasks
    - Tests

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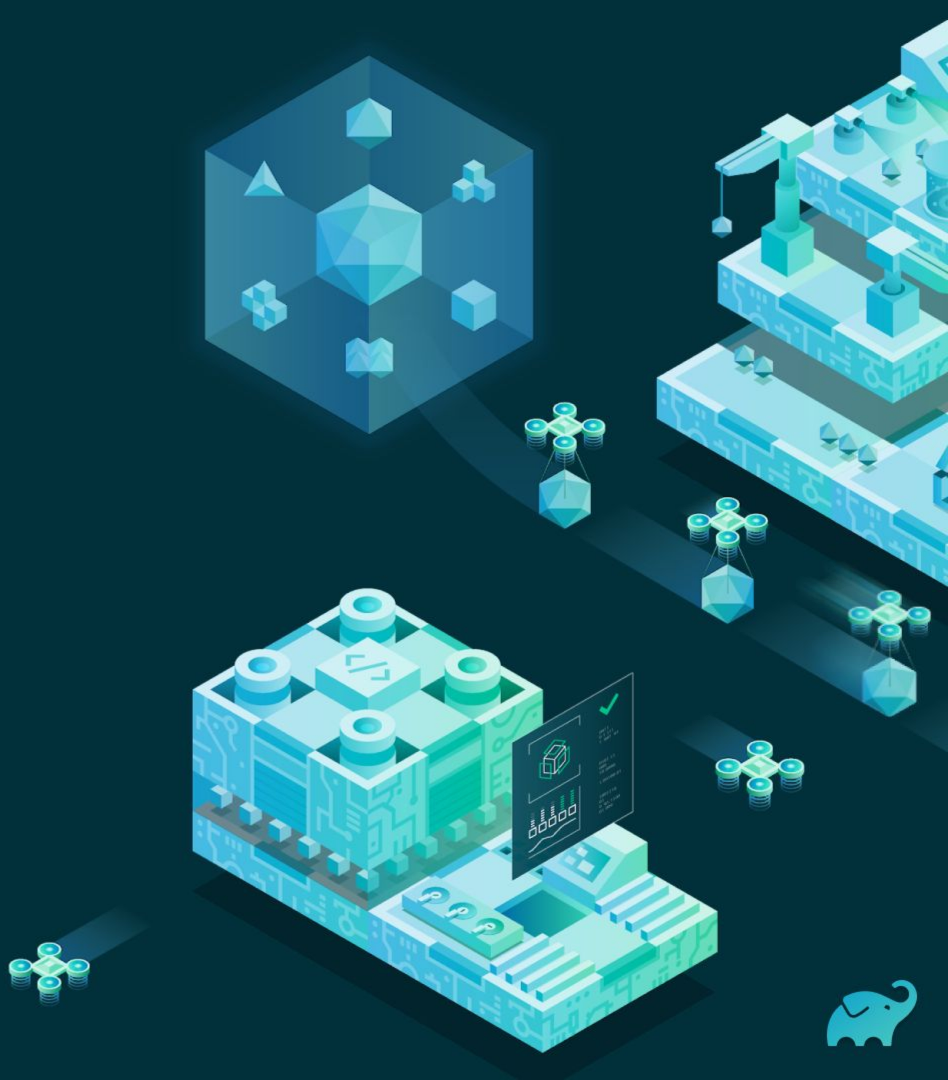
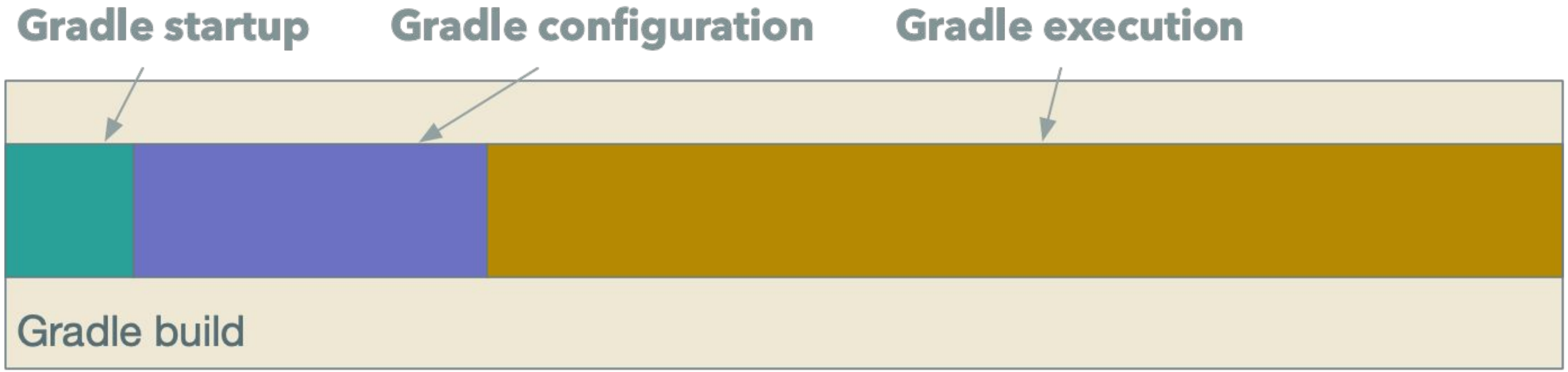
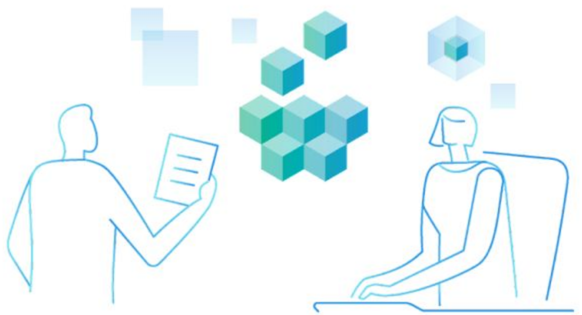
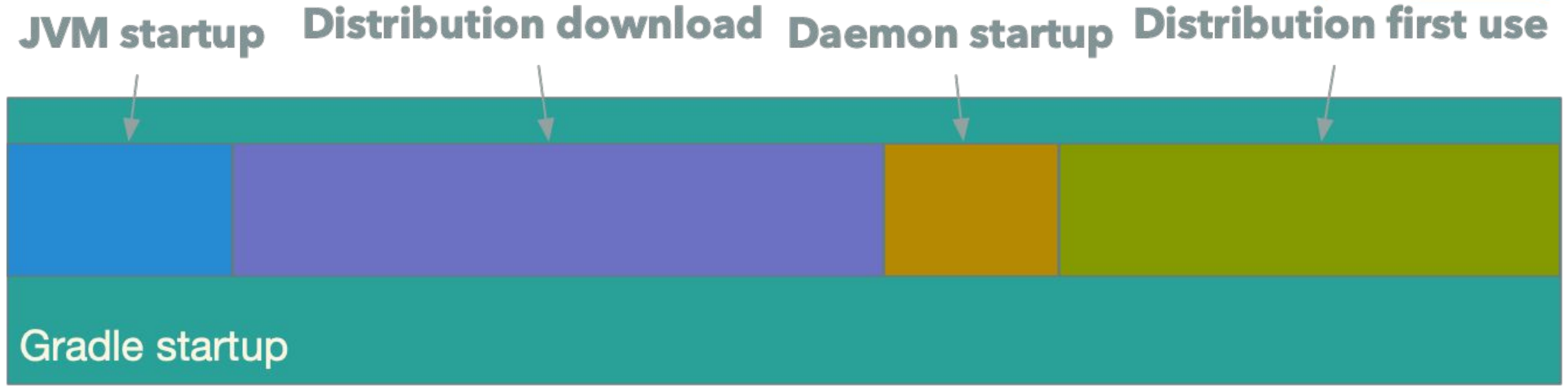
Gradle Build profile



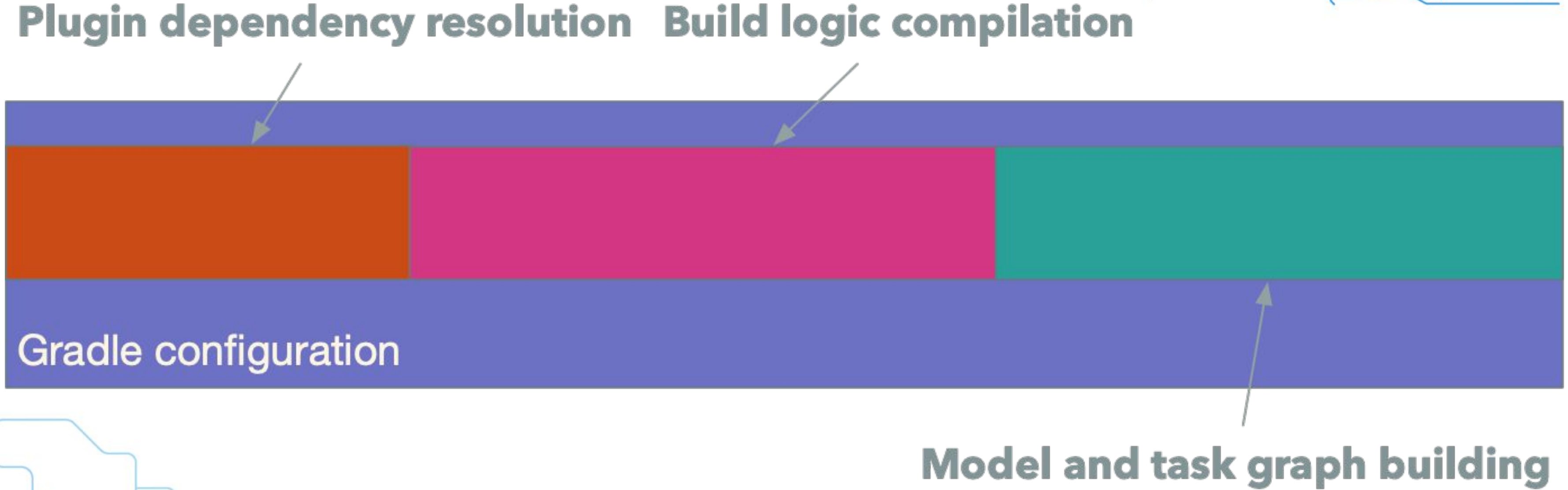


Bars not at scale

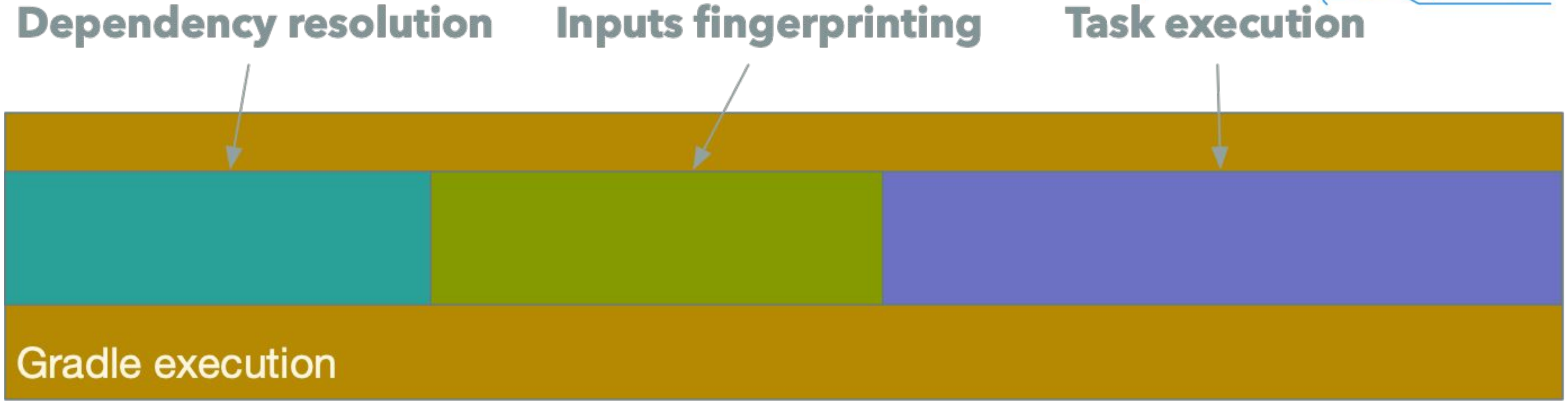




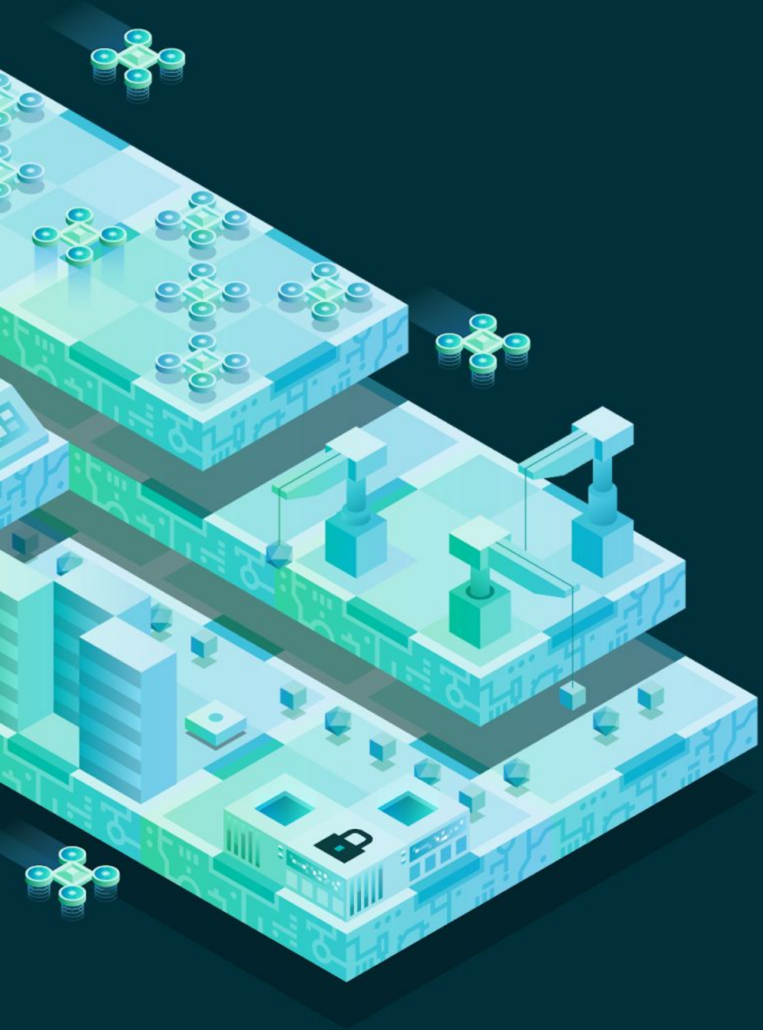
Bars not at scale



Bars not at scale



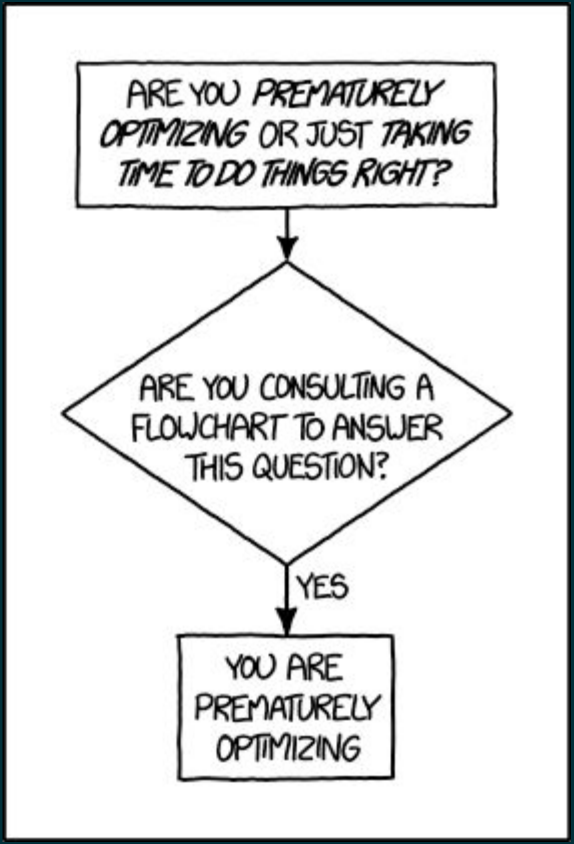
Bars not at scale



Possible actions

Dealing with performance

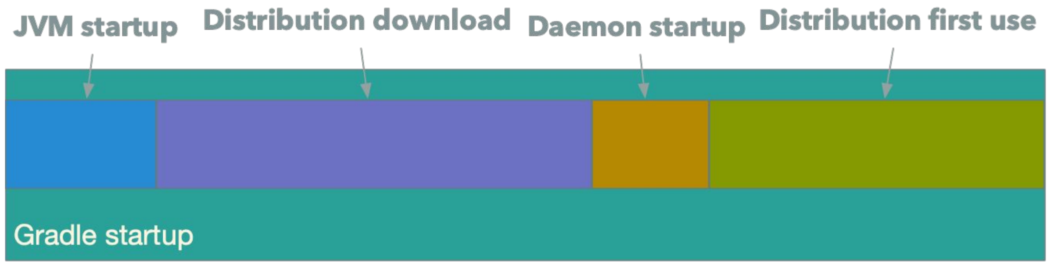
- Measure
- Change
- Measure
- Compare


ARE YOU PREMATURELY OPTIMIZING OR JUST TAKING TIME TO DO THINGS RIGHT?
ARE YOU CONSULTING A FLOWCHART TO ANSWER THIS QUESTION?
YES
YOU ARE PREMATURELY OPTIMIZING

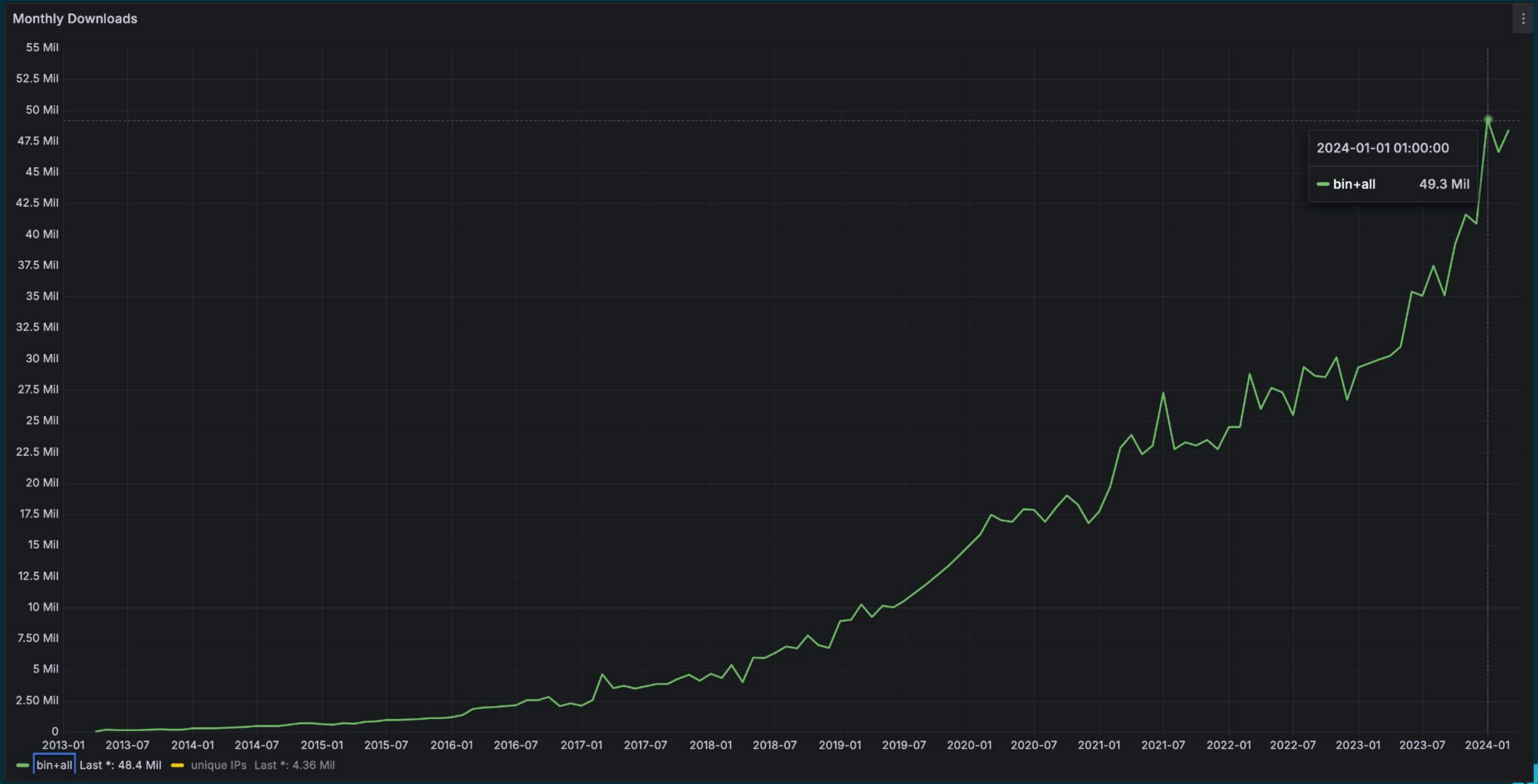
https://xkcd.com/1691/

Optimize Gradle startup

- Distribution availability
  - Always use the `-bin` one
  - Already in the image / docker file / …
  - OR Downloaded from a closer location
  - OR Save and restore `<GUH>/wrapper/dists`
- Prime distribution
  - Run it once to have the first use elements
  - OR Save and restore `<GUH>/caches/<version>/generated-gradle-jars`

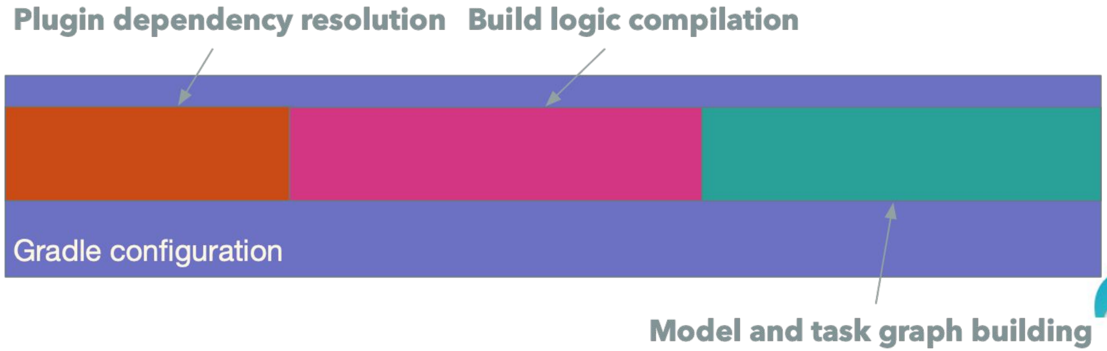


Gradle distribution downloads over time



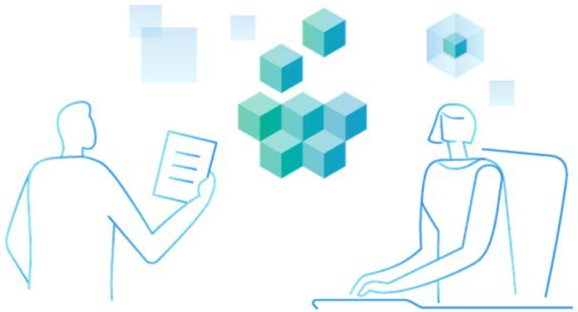
Optimize Gradle configuration

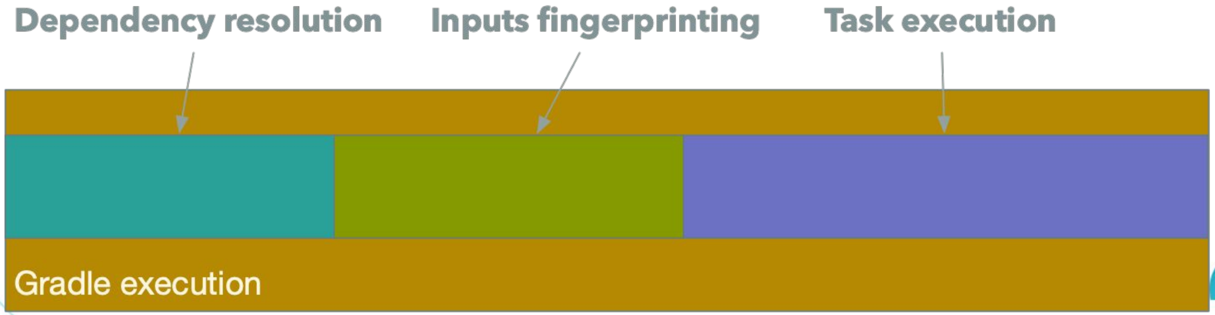
- Dependency cache
  - Read-only cache feature
  - OR save and restore `<GUH>/caches/modules-2`
- Script compilation cache
  - Remote build cache
  - OR save and restore `<GUH>/caches/<version>/kotlin-dsl`, `<GUH>/caches/<version>/scripts` and `<GUH>/caches/jars-9`

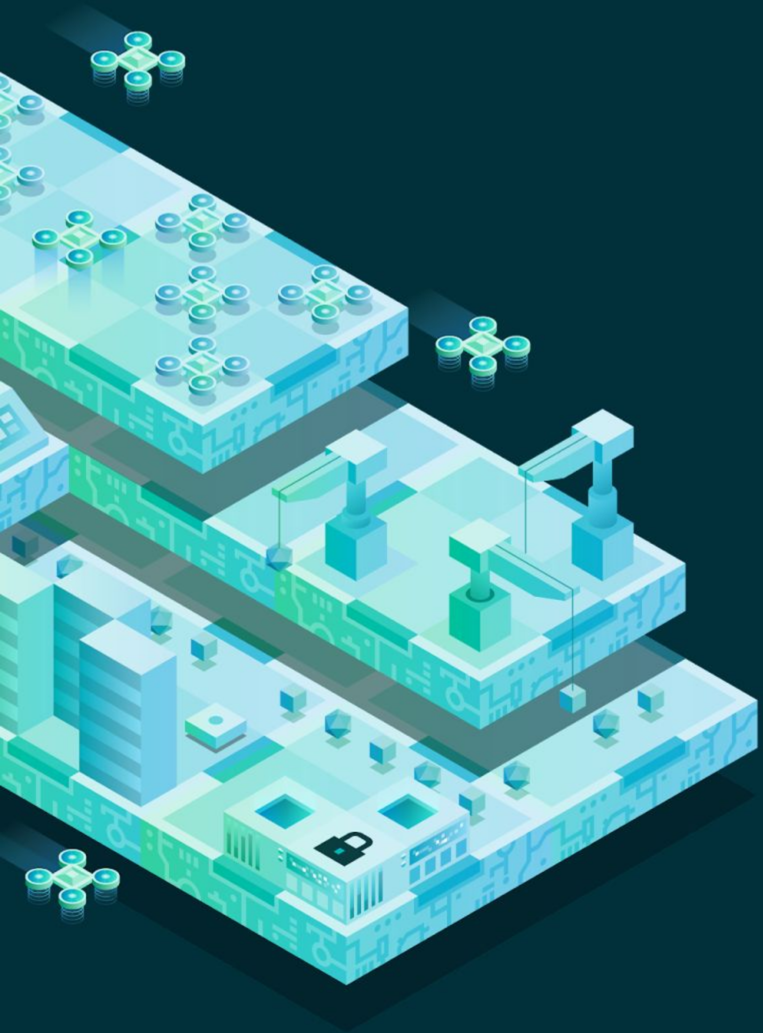


Optimize Gradle execution

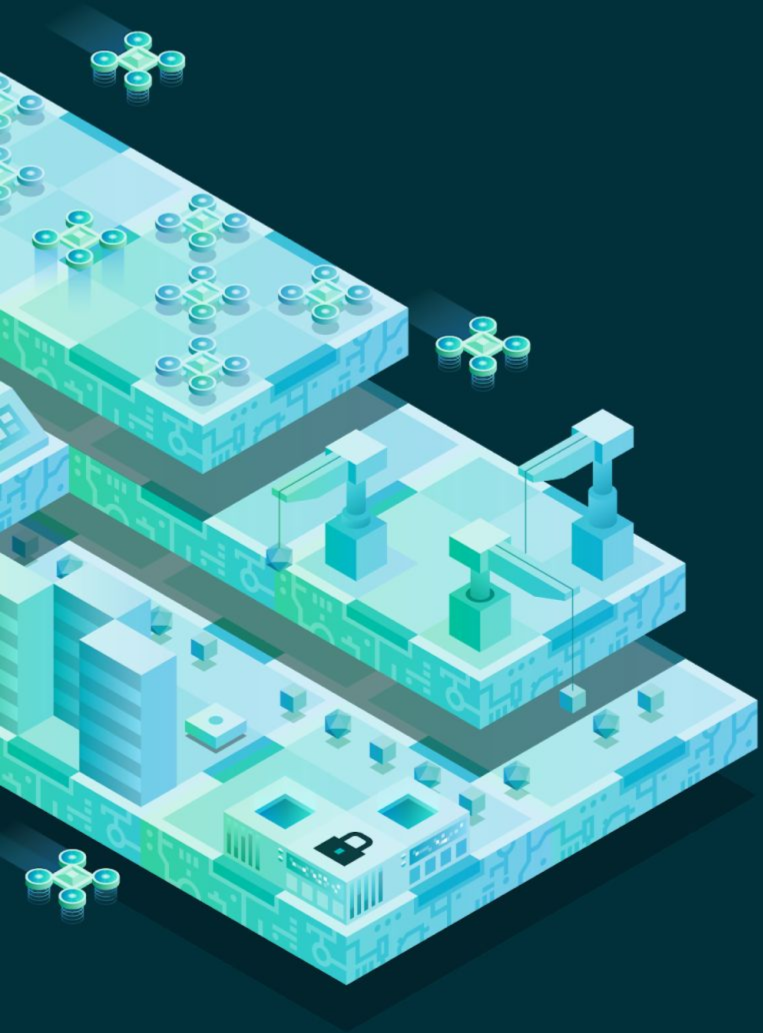
- *Dependency cache*
- Task execution cache
  - Remote build cache
  - OR save and restore `<GUH>/caches/build-cache-1`
  - (Android mostly) save and restore `<GUH>/caches/transforms-3`
- Provisioned toolchains cache
  - Save and restore `<GUH>/jdks`



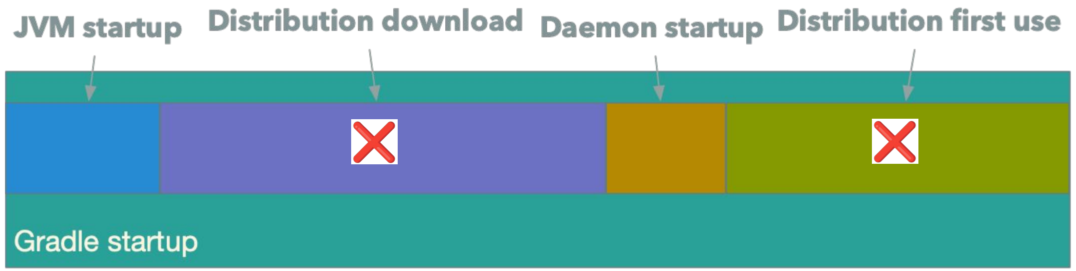


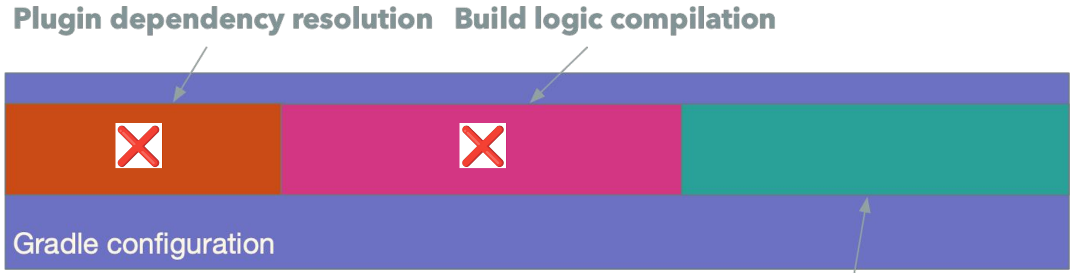


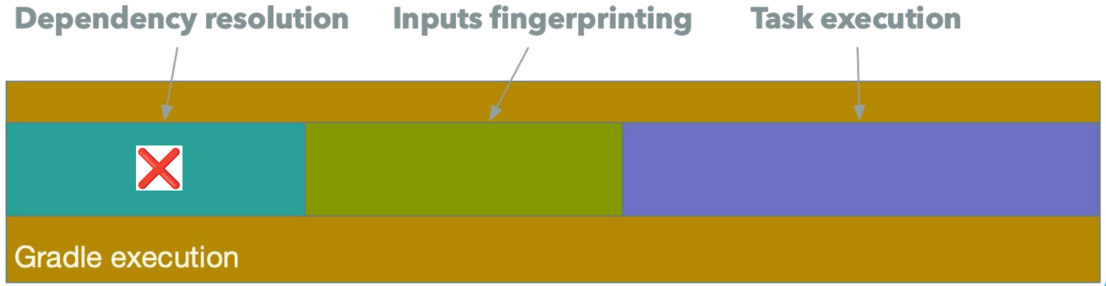
In practice



Conclusion


JVM startup
Distribution download
Daemon startup
Distribution first use
Gradle startup


Plugin dependency resolution
Build logic compilation
Gradle configuration
Model and task graph building


Dependency resolution
Inputs fingerprinting
Task execution
Gradle execution

Thank you!