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GraalVM™



GraalVM & Spring Boot

Rainer Hahnekamp
15. Mai 2023

About me...



Rainer Hahnekamp



SOFTWARE
ARCHITECT

- Full-Stack Development in
 - Spring
 - Angular
- Consultant & Trainer
- Community/Open Source
 - <https://www.youtube.com/c/RainerHahnekamp>
 - <https://www.youtube.com/c/ng-news>
 - <https://github.com/softarc-consulting/sheriff>



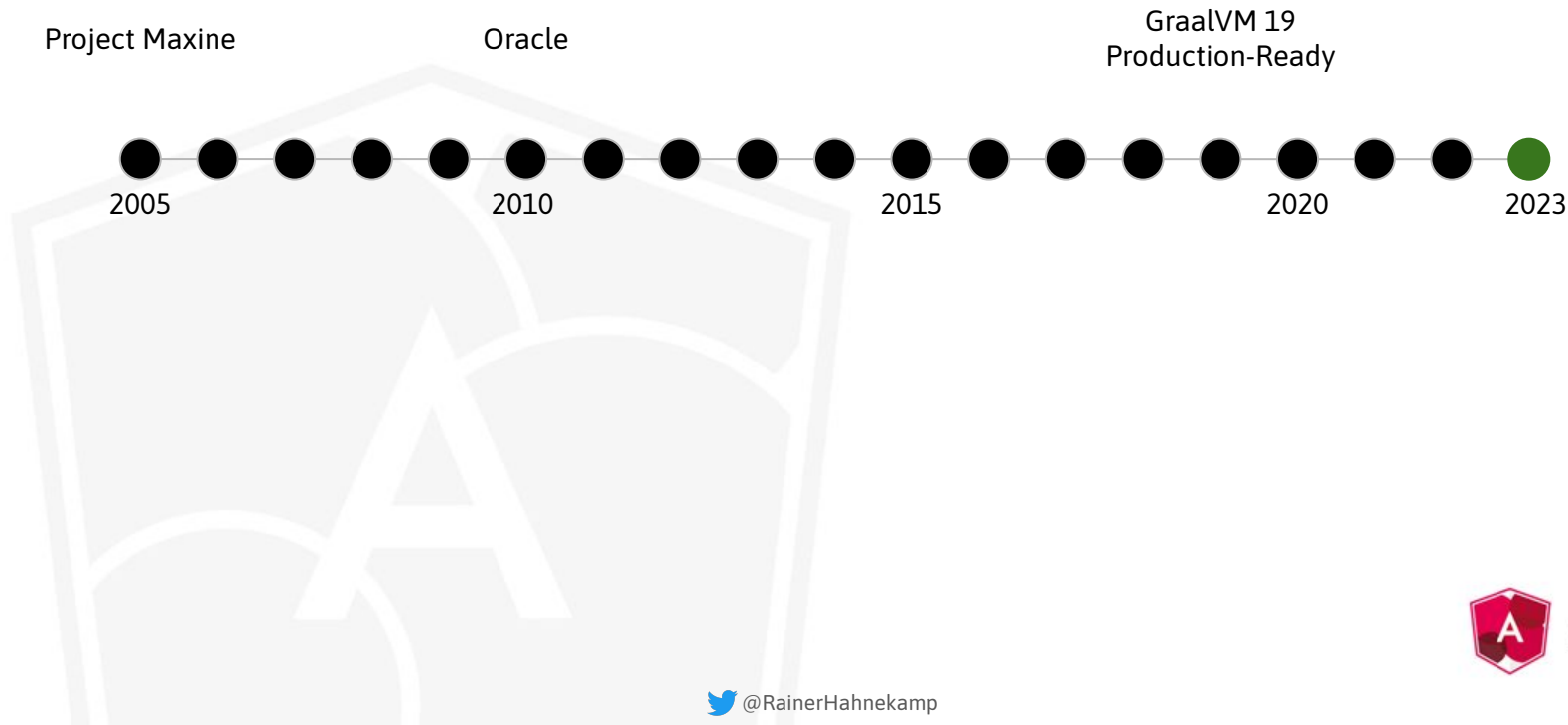
Agenda

- History
- GraalVM
- Basic Usage
- Spring
 - AoT
 - Metadata Repo
 - Build

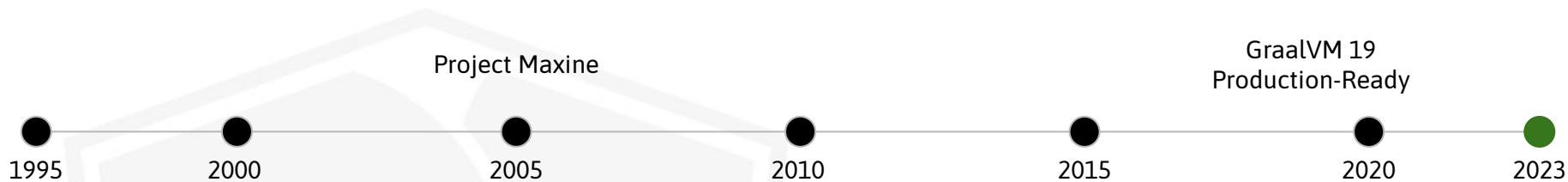
Caution: Live Coding Ahead



History & Milestones



History & Milestones



GraalVM Editions

Download GraalVM



GraalVM 22.3

GraalVM 21.3

GraalVM 20.3

Developer Builds

GraalVM Community 22.3

Community supported open source build

[Release notes](#)

Download the latest GraalVM JDK in **one line**:

```
bash <(curl -sL https://get.graalvm.org/jdk)
```

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Download



GraalVM Enterprise 22.3

Oracle 24x7 supported commercial build

[Release notes](#)

Download the latest GraalVM Enterprise JDK in **two lines**:

```
bash <(curl -sL https://get.graalvm.org/ee-token)
bash <(curl -sL https://get.graalvm.org/jdk)
```

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Download



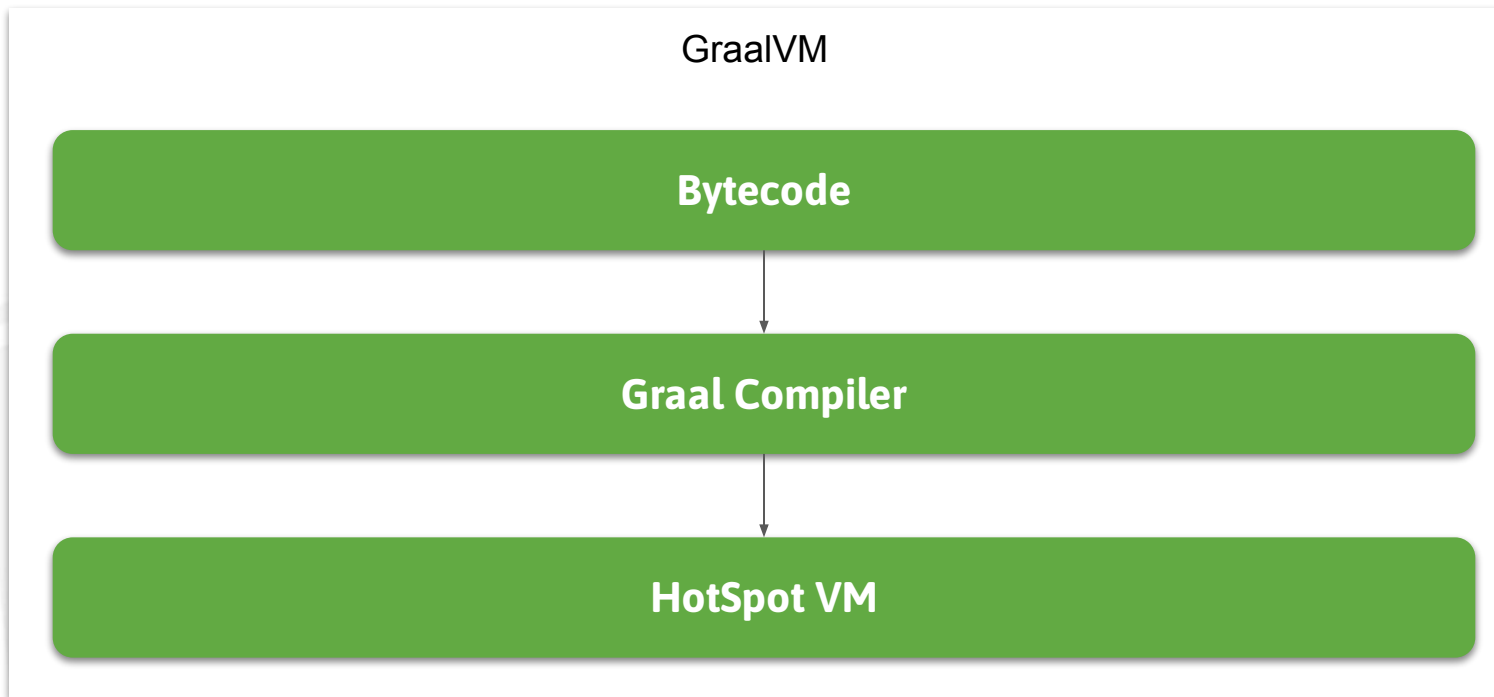
Main Parts of GraalVM

Compiler

Truffle

Native Image

Compiler



Truffle



Language Implementation Framework

GraalVM Compiler

Java HotSpot VM



ANGULAR
ARCHITECTS
INSIDE KNOWLEDGE

Native Image

- Ahead-of-Time Compilation
- Closed-World Principle
 - Reachability Check during Build
 - Issues with Dynamic Class Loading, Reflection,...
 - Manual Configuration necessary
- No "Run Anywhere"





Coding Time

Metadata Configuration

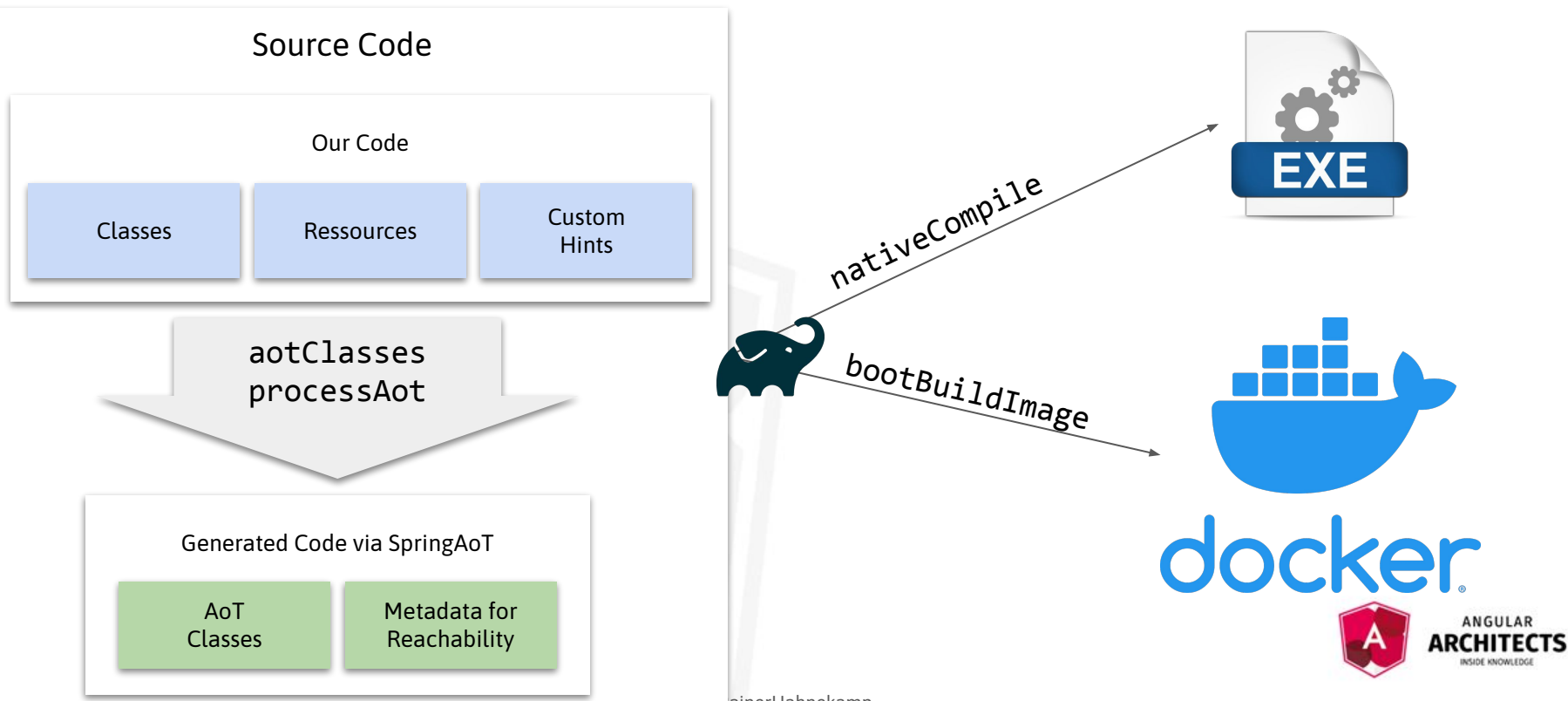
- Small Projects
 - `--no-fallback`
 - `-H:ReflectionConfigurationFiles`
- Large Projects
 - Agent: `java -agentlib:native-image-agent=config-merge-dir=META-INF/native-image Main Blender`
 - GraalVM Reachability Metadata Repository:
<https://github.com/oracle/graalvm-reachability-metadata>



Coding Time



Spring Boot AoT & GraalVM



Adding Metadata

```
@Configuration(proxyBeanMethods = false)
@ImportRuntimeHints(Config.RegistryHint.class)
public class Config {
    public static class RegistryHint implements RuntimeHintsRegistrar {
        @Override
        public void registerHints(RuntimeHints hints, ClassLoader classLoader) {
            hints.reflection().registerConstructor(
                BlenderImpl.class.getDeclaredConstructors()[0],
                ExecutableMode.INVOKE);
        }
    }
}
```


Coding Time



Benchmarks



Why GraalVM?

- Optimal (Cheaper) for Cloud Services
 - Less memory footprint
 - Faster Startup
 - Faster Execution



Alternatives

- Project Leyden
- Project CRaC



Thanks!!!



Further Reading

- General
 - [Keynote: Introducing Spring Framework 6](#)
- History
 - GraalVM 19 Release:
<https://blogs.oracle.com/java/post/for-building-programs-that-run-faster-anywhere-oracle-graalvm-enterprise-edition>
 - From Maxwell over Maxine to Graal VM, SubstrateVM and Truffle:
https://airhacks.fm/#episode_78
 -



Contact Data



<https://www.rainerhahnekamp.com>

<https://www.angulararchitects.io>



<https://www.youtube.com/@RainerHahnekamp>



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<https://www.youtube.com/@ng-news>



<https://github.com/softarc-consulting/sheriff>

 @RainerHahnekamp



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