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[HTTPS://BPF.LI](https://bpf.li)

ECLIPSE OPENJ9: MEMORY DIET FOR YOUR JVM APPLICATIONS

DO YOU CARE HOW MUCH MEMORY YOUR JVM APPLICATIONS USE?

AND CAN YOU PICK YOUR JVM?

ECLIPSE OPENJ9

LESS CONTAINER MEMORY

LOWER COST

IBM had an in-house JVM called "J9"

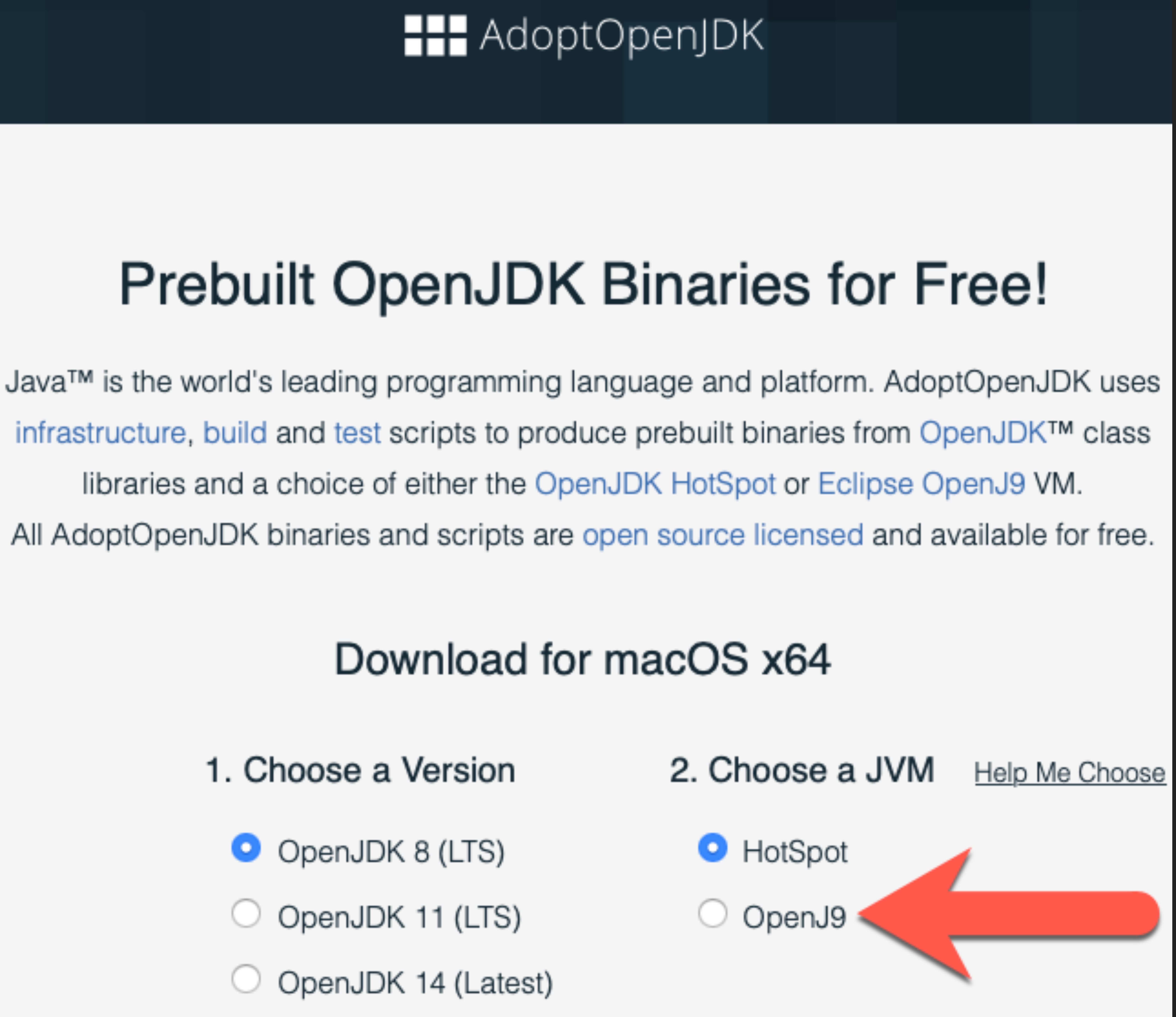
It powered IBMs Java products for many years

In 2017, IBM donated J9 to Eclipse as "OpenJ9"

OpenJ9 is drop-in replacement for Oracle HotSpot JDK…

…but not all HotSpot JVM options and not all tools work with OpenJ9!

Get OpenJ9 at AdoptOpenJDK



AdoptOpenJDK

Prebuilt OpenJDK Binaries for Free!

Java™ is the world's leading programming language and platform. AdoptOpenJDK uses infrastructure, build and test scripts to produce prebuilt binaries from OpenJDK™ class libraries and a choice of either the OpenJDK HotSpot or Eclipse OpenJ9 VM.

All AdoptOpenJDK binaries and scripts are open source licensed and available for free.

Download for macOS x64

1. Choose a Version

[✓ OpenJDK 8 (LTS)]
OpenJDK 11 (LTS)
OpenJDK 14 (Latest)

2. Choose a JVM

Help Me Choose

[✓ HotSpot]
OpenJ9

AdoptOpenJDK Docker Images

- Java 8
- Java 11
- Java 14

BENCHMARKS, PLEASE!

Ran on my MacBook Pro

Benchmarks used Docker Compose

Java Container limited to 2 CPU cores & 2 GB RAM

Java options: `-Xmx1024m -Xms256m`

Additional OpenJ9 option `-Xtune:virtualized`: lower CPU & memory usage, but also less throughput

Measured CPU & memory with `docker stats`

THESE ARE NOT SCIENTIFIC BENCHMARKS!

THAT'S WHY YOU CAN RUN & TWEAK THEM YOURSELVES FOR YOUR NEEDS!

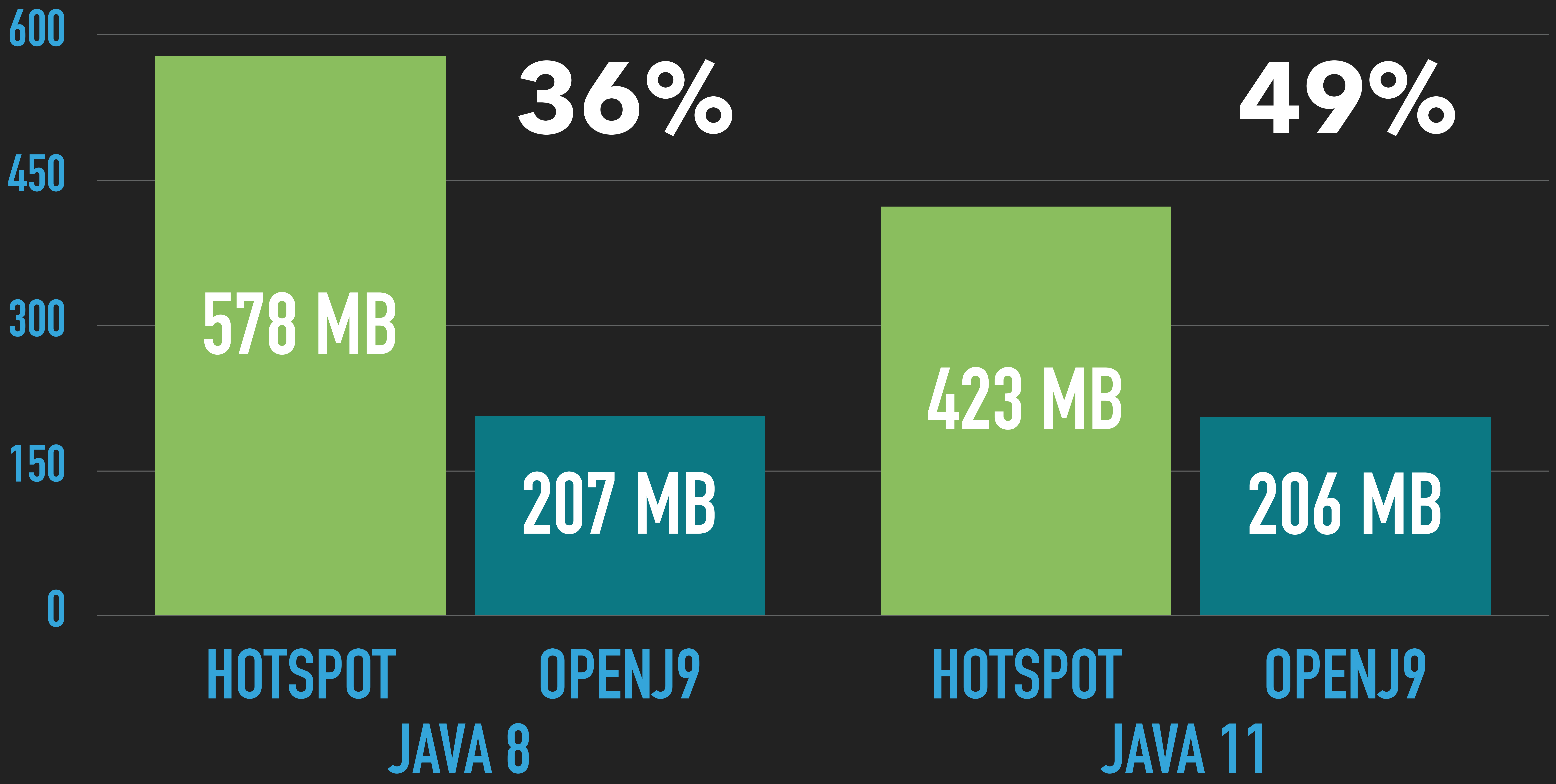
BENCHMARK 1: WEB APPLICATION

Generated with JHipster

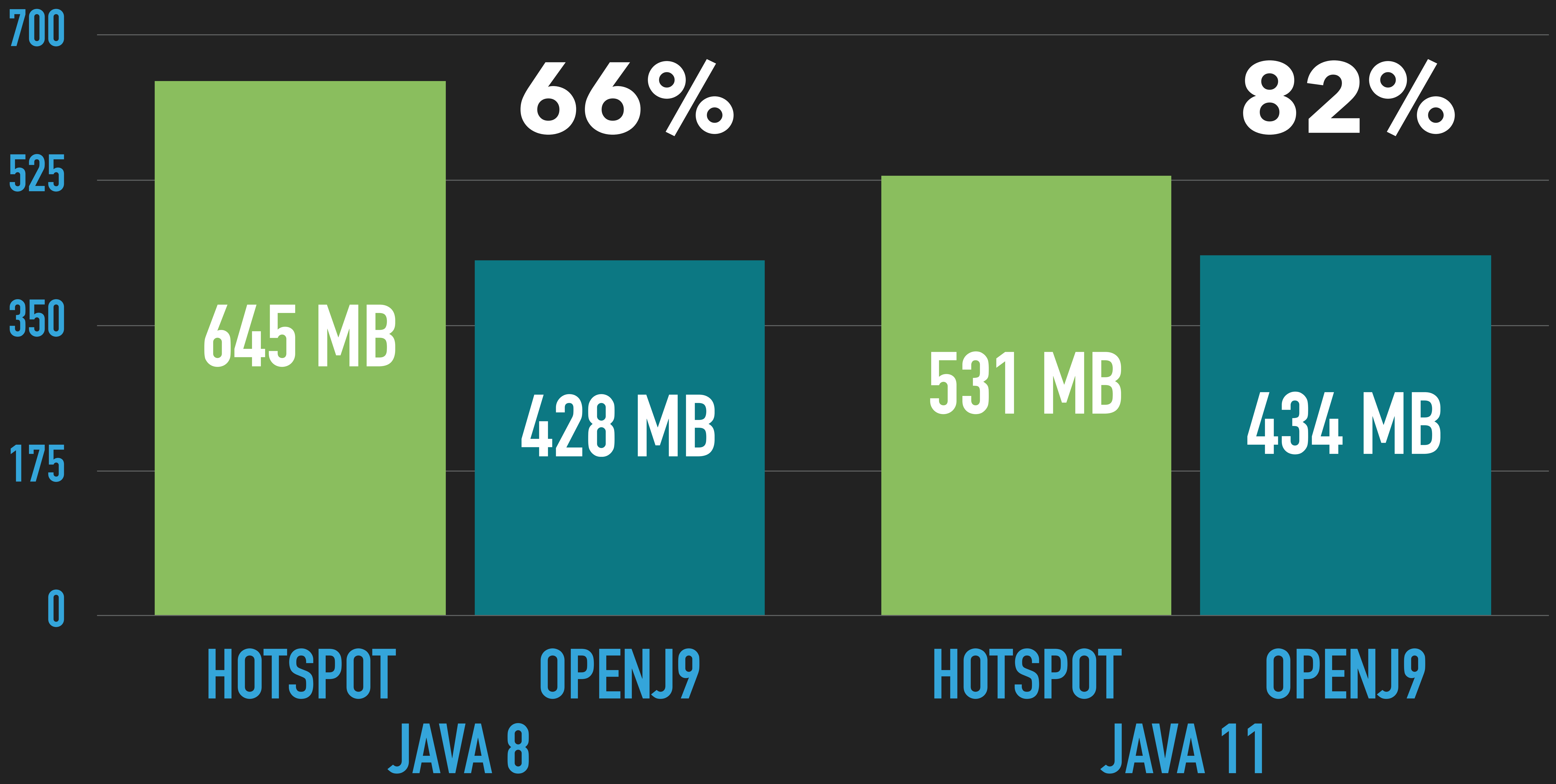
- Spring Boot 2.2
- Spring Data JPA with PostgreSQL
- Angular 9
- 5 Entity screens, 6 Admin screens

Started & used application 3 times

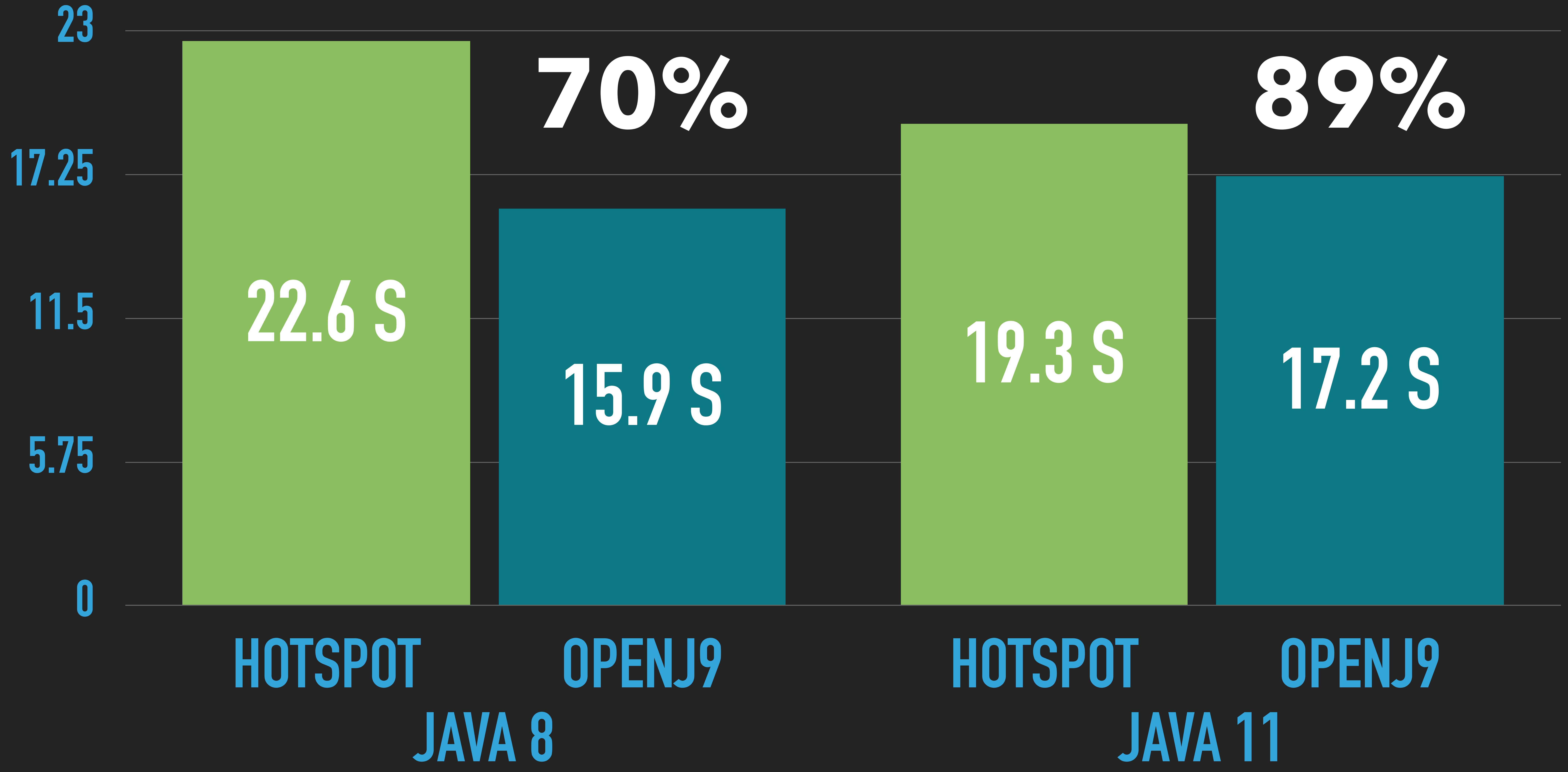
MEMORY CONSUMPTION AFTER START-UP



MEMORY CONSUMPTION AFTER USE



START-UP TIME (SELF-REPORTED, IN SECONDS)



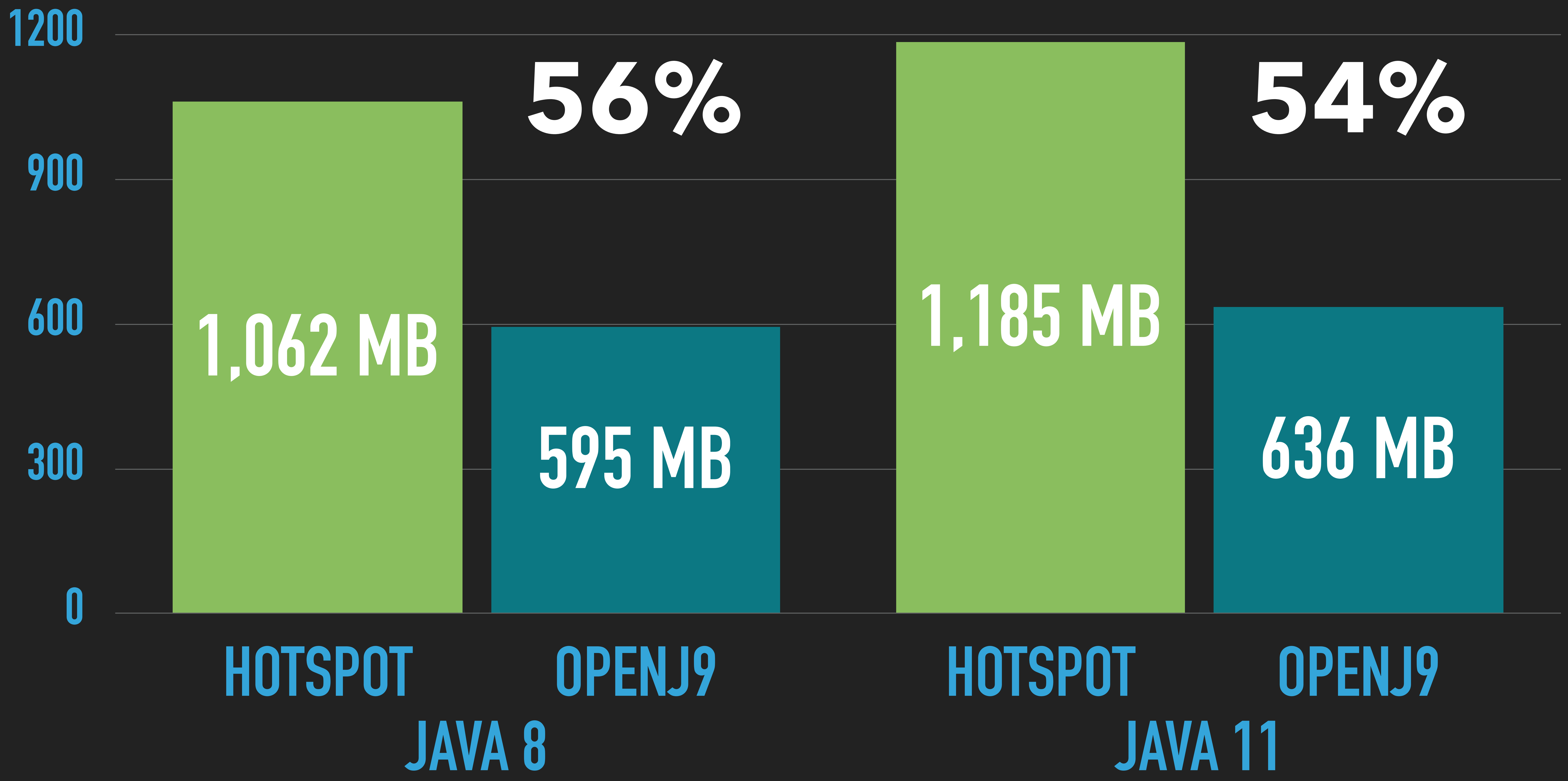
BENCHMARK 2: NUMBER CRUNCHING

Used open source benchmark Renaissance Suite

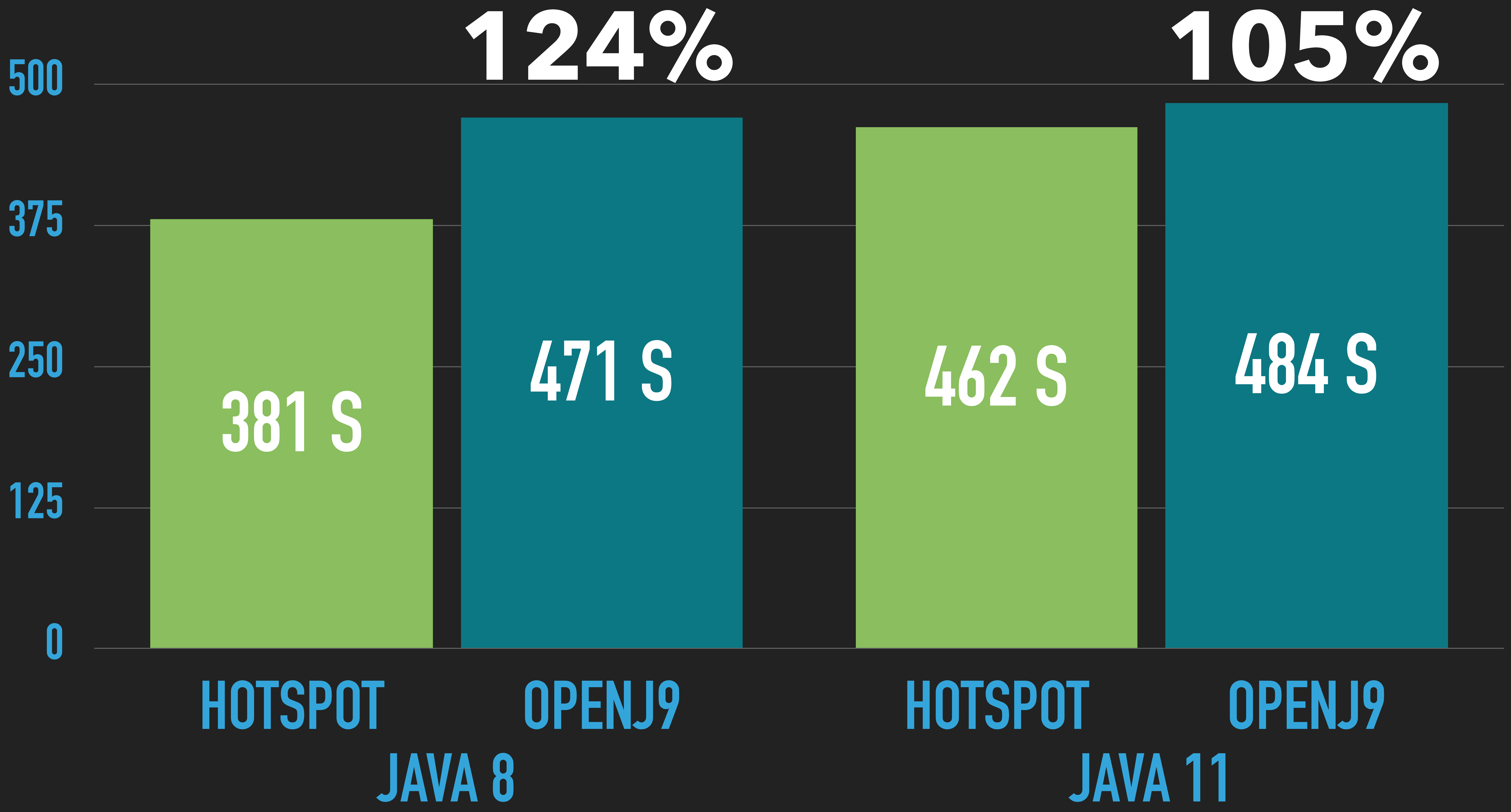
- Pure Java/Scala code
- No external database, no web requests

Picked 7 benchmarks, ran them 5 times each

AVERAGE MEMORY USAGE



TOTAL CPU TIME (TIME COMMAND, IN SECONDS)



OPENJ9 USES JUST 40-80% OF HOTSPOT'S MEMORY

OPENJ9 STARTS FASTER, BUT IS SLOWER IN NUMBER CRUNCHING

WHEN CAN YOU NOT USE OPENJ9?

Your tool chain requires another JVM

Your licensing model doesn’t allow for OpenJ9

OpenJ9 is too slow

ECLIPSE OPENJ9

LESS CONTAINER MEMORY

LOWER COST

SLIDES & SOURCE CODE

HTTPS://BPF.LI/POJM

APPENDIX

HOW DO I START WITH OPENJ9?

See this Eclipse help page to get started

- See this page and this one for command line options
- Read about garbage collection
- Read about diagnostics tools

Tips & Tricks

- Use `-Xtune:virtualized` when running in Docker
- Class Data Sharing and the Ahead-of-time (AOT) compiler will reduce start-up time (also helps local development)

For Java 8 (only?), you can also get OpenJ9 as “IBM Java”

- For desktop (but not macOS)
- Docker
- On mainframes, you have to use IBM Java 8 because OpenJDK 8 doesn’t have a JIT compiler there

Stability

- In fall of 2018, OpenJ9 8 on my Mac crashed a lot
- Had no problems on my Mac with OpenJ9 11 since 2019