

GRAAL: HOW TO USE THE NEW JVM JIT COMPILER IN REAL LIFE



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 - Is it save to use it? How do I use it? Where do I get it?
- Sometimes they send me emails
 - Mostly complaining about benchmark numbers
 - ...and that it SUCKS!



WANNA KNOW MORE ABOUT SAVING MONEY?

- Lots of details in my talk:

**TWITTER'S QUEST FOR A
WHOLLY GRAAL RUNTIME**



TWITTER'S QUEST FOR A WHOLLY GRAAL RUNTIME



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WHAT IS GRAAL?

- Java Virtual Machine Just-in-Time (JIT) compiler
- Actively developed by Oracle Labs
 - <http://openjdk.java.net/projects/graal/>
 - <https://github.com/oracle/graal>
- Uses JVMCI (JEP 243)
- Written in Java





WRITTEN IN JAVA!!!



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WHERE DO I GET IT?



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WHERE DO I GET IT?

- As always...





IT DEPENDS!



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WHERE DO I GET IT?

- JEP 295: Ahead-of-Time Compilation
- <http://openjdk.java.net/jeps/295>



WHERE DO I GET IT?

- JEP 295: Ahead-of-Time Compilation
 - <http://openjdk.java.net/jeps/295>
- 8172670: AOT Platform Support for Windows and Mac OS X x64
 - <https://bugs.openjdk.java.net/browse/JDK-8172670>



WHERE DO I GET IT?

- JDK with JVMCI and AOT required (JEP 243 + JEP 295)
 - Linux-x64: ≥ 9
 - macOS, Windows: ≥ 10
- JDK 9: <http://jdk.java.net/9>
- JDK 10 EA: <http://jdk.java.net/10>



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Get it demo

<https://cloud.oracle.com>



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ABOUT ME...

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- Working on JVMs for over 13 years
- Sun Microsystems/Oracle HotSpot compiler team
- JSR 292: Supporting Dynamically Typed Languages on the Java™ Platform
- JEP 243: Java-Level JVM Compiler Interface
- JEP 295: Ahead-of-Time Compilation
- Twitter VM team



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Back to demo



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HOW DO I USE IT?

- Get a JDK with JVMCI and AOT



HOW DO I USE IT?

- Get a JDK with JVMCI and AOT 



HOW DO I USE IT?

- Get a JDK with JVMCI and AOT 
- Turn it on!



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Use it demo



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WHAT IS BOOTSTRAPPING?

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WHAT IS BOOTSTRAPPING?

- Graal is just another Java application running in your JVM
 - It loads Java classes
 - Has Java methods
 - Which (at some point) need to be compiled, obviously



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Bootstrap demo



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WHAT WE LEARNED

- Bootstrapping compiles a lot of methods
 - tiered: about 2,500
 - non-tiered: about 4,800
- Either upfront or on-demand during runtime
 - By default on-demand compiles Graal with C1 only
 - Explicit bootstrap compiles with Graal too!



JAVA HEAP USAGE

- Graal is...





WRITTEN IN JAVA!!!



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JAVA HEAP USAGE

- Compiling application methods will use Java heap memory
- Graal methods possibly too
 - Remember `CompileGraalWithC1Only?`



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Java heap demo



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WHAT WE LEARNED

- Graal uses Java heap memory
 - There is no heap isolation (yet)
- Most memory usage during startup
 - Usually when application isn't fully up yet
- Memory is used anyway
 - Either malloc or Java heap



RUNNING BLEEDING EDGE

- Get Graal from GitHub
 - <https://github.com/oracle/graal>
 - <https://github.com/graalvm/mx>



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Build Graal demo



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RUNNING IN PRODUCTION

- The bootstrapping overhead is usually negligible
 - Additional time (mostly) disappears in the startup noise
 - Free CPU cores are used for compilation



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Production demo



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Scala demo



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SUMMARY



`-XX:+UnlockExperimentalVMOptions -XX:+EnableJVMCI -XX:+UseJVMCICompiler`



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