

JAVA & GAMES

A rivalrous case-study from porting Doom 3



Nothing is true, Everything is permitted

PROLOGUE

INTRO

What is...djoom3?

- ✘ Cool “*temporary*” name
 - <https://github.com/blackbeard334/djoom3>
- ✘ Why?
 - Java...because?
- ✘ Lustrum
- ✘ Ingredients:
 - Java
 - OpenGL/OpenAL(LWJGL)
- ✘ Questions/remarks/heckles
 - [@blackbeard0x14e](#)

INTRO

What is the Java?

- ✗ Interpre-piled-ish©
 - ✗ Open source-ish
 - ✗ Signed math
 - ✗ Pass by (reference) value :(ul> - Supports Null Pointer Exceptions ;)
- ✗ Operator Overloading not supported
- ✗ final is like const, except not really

wtbob on Aug 14, 2016 | parent | favorite | on: 135M messages a second between processes in Java (...)

> The JVM is a treasure just sitting there waiting to be rediscovered.

It's the result of man-centuries (man-millennia?) of work, yes, and as a result is really, really impressive. But imagine if that much work had been put into something fundamentally great, like Smalltalk or Lisp, rather than something fundamentally okay like Java.

> It really is a shame that there is so much noise and unnecessary complexity around using it.

Very true. Java itself is not a terrible language (hence why I wrote 'fundamentally okay' above); it's the arcane, rococo, lunatic levels of ritual which surround it. Every time I look at Java code I'm reminded of some insane fantastic court in which one has to plead with the Minister of Small Affairs, make a sacrifice to the God of Bureaucracy, pay for a Token of Token-Paying, appeal to the good graces of the Wise Undersecretary of Vice-Small Affairs and finally spend a weekend climbing an Escher Staircase before an audience with the King, all just to get a scrap of toilet paper.

INTRO

Seriously though...what is the Java?

- ✗ JLS - Spec
- ✗ JDK - Language
- ✗ JVM
 - GC
 - JIT
 - JMM(middleware)

C++

VS

JAVA



Light it up

Ah, light it up

Another hit erases all the pain

ENVIRONMENT SETUP

- ✗ OpenGL dll/linker/macro bullshite
 - 64bit vs 32bit
- ✗ Visual studio project compatibility
- ✗ 6 pages [\[doom3.gpl\] Compiling Doom 3/idtech 4 source code](#)
- ✗ 19 pages [DOOM3 COMPILATION INSTRUCTIONS FOR MAC OS X.](#)
- ✗ Money money money...must be funny...in the rich man's world!
- ✗ Scene Scons fiasco...T_T
 - Or chromium...

The original release from TTimo compiles well with Visual Studio 2010 Professional. Unfortunately Visual Studio 2010 "Express" lacks MFC and hence cannot be used. This was disappointing upon release but some people have since removed the dependencies.



PHASE 1

PHASE 2

PHASE 3

IDE
(JDK)
(MAVEN)

?

Profit



ENVIRONMENT SETUP

- ✗ Wizardry
- ✗ Open source based

- ✗ Paths...bloody paths
- ✗ Subtle 32bit vs 64bit
 - Especially for native code

BUILD TOOLS

Maven vs xmake

- ✘ Single pom of failure
 - Dependencies
 - Profiles
 - Testing

BUILD TOOLS

- ✘ Project version
 - SNAPSHOT
- ✘ Dependencies
 - Transitive dependencies yay!
- ✘ Natives
- ✘ Testing
- ✘ Ecosystem
- ✘ Build servers

COMPILE TIMES

Clean & Build:

✗ VS12 – Win 7	25 minutes?
✗ VS12 – Win 10	10 minutes
✗ VS12 – Win 10 /MP	3.5 minutes(100% cpu)
✗ GCC 7.4	10.5 minutes
✗ GCC 7.4 -O2	13 minutes error
✗ GCC 7.4 -O2 redux	12.7 minutes?
✗ GCC 7.4 -O3	13.5 minutes
✗ Java compile time \<0>/	25 seconds

START-UP TIMES

Jvm warmup + load vs native load
Pre-warmup?

00:03:27.63



4 00:01:32.07
00:03:23.71
3 00:00:43.08
00:01:51.64

2 00:00:48.21
00:01:08.56

1 00:00:20.34
00:00:20.34

00:03:32.46



4 00:01:35.11
00:03:26.94
3 00:00:39.81
00:01:51.83

2 00:00:42.72
00:01:12.02

1 00:00:29.29
00:00:29.29

LOADING TIMES

1. Warmup + intro
2. Loading till video
3. Start second intro
4. Play!

00:03:27.63

4 00:01:32.07

00:03:23.71

3 00:00:43.08

00:01:51.64

2 00:00:48.21

00:01:08.56

1 00:00:20.34

00:00:20.34

00:03:32.46

4 00:01:35.11

00:03:26.94

3 00:00:39.81

00:01:51.83

2 00:00:42.72

00:01:12.02

1 00:00:29.29

00:00:29.29



MULTITASKING AT ITS FINEST



CPU

- ✗ CPU threading bonanza
- ✗ Threading is hard
- ✗ Thread Safety is expensive(think null checks everywhere)
 - Usually safe/unsafe flavors
 - Atomicity
- ✗ The bla bla bla question
 - Do games need threads?
 - Amdahl vs Moore
 - Who knows...maybe we'll get better at programming...again



Tim Sweeney

@TimSweeneyEpic



It's interesting that many games can afford a constant 10x interpretation overhead for scripts, but not a spikey 1% for garbage collection.

4:03 AM · Jun 30, 2017 · [Twitter for iPhone](#)



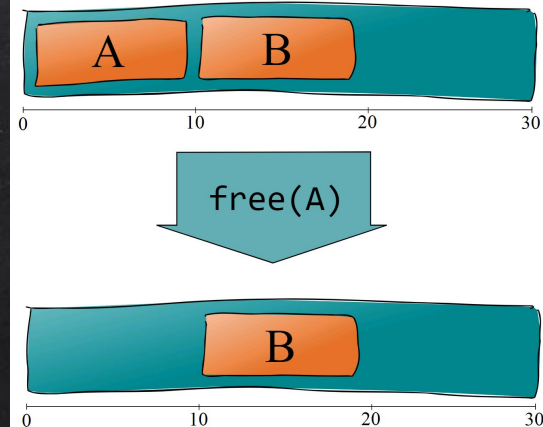
Filmed at
QCon San Francisco 2018
Brought to you by
InfoQ!

Systems software in the 2010s



- Systems programmers began pining for something different: the performance of C, but with more powerful constructs as enjoyed in other languages
- High-performance JavaScript runtimes allowed for a surprising use in node.js — but otherwise left much to be desired
- Bell Labs refugees at Google developed Go, which solves some problems, but with many idiosyncrasies
- Go, JavaScript and others are **garbage collected**, making interacting with C either impossible or excruciatingly slow

GARBAGE COLLECTION



- ✗ Is GC evil?
 - Well...you kind of already do it manually delete/free
 - Memory fragmentation vs virtual memory?
- ✗ Unity/Unreal/MK...etc
- ✗ Embrace the GC...[Is It Time to Rewrite the Operating System in Rust?](#)
- ✗ Concurrency is hard without GC.
- ✗ Manual memory management in the GC?
 - If you're gonna do it anyways.... Wouldn't you rather get moar bang for your buck?

MEMORY FOOTPRINT(THUS FAR)



MEMORY FOOTPRINT(THUS FAR)

- x CPU overhead is negligible
- x Memory overhead...~~is unavoidable~~ could be better
 - o Depends on the GC algorithm

CORE LANGUAGE FEATURES(E.G. POINTERS)

Pointers

Macros

Operator overloading T_T

Type safety

STANDARD LIBS

Java vs STL

Intrinsics FTW!

Thread safety

Instrumentation API

DEBUGGABILITY

Conditional bp C++(fast) /data bp

Perfmon/Valgrind

Instrumentation redux

WORA

Write Once...~~now~~ Run Arsehole Anywhere

Caveat(s):

LWJGL = win + mac + linux

~CONSOLE

None...

~ALTHOUGH...



WHAT ELSE?

- ✘ Dev involvement in core language
 - JSR
 - JEP
- ✘ Once you go JVM, you never go...
- ✘ Untapped potential
 - Easy, but not simple problems(R. Hickey)

WE HAVE TIME FOR 1
QUESTION...

Other questions may be directed at [@blackbeard0x14e](https://twitter.com/blackbeard0x14e)