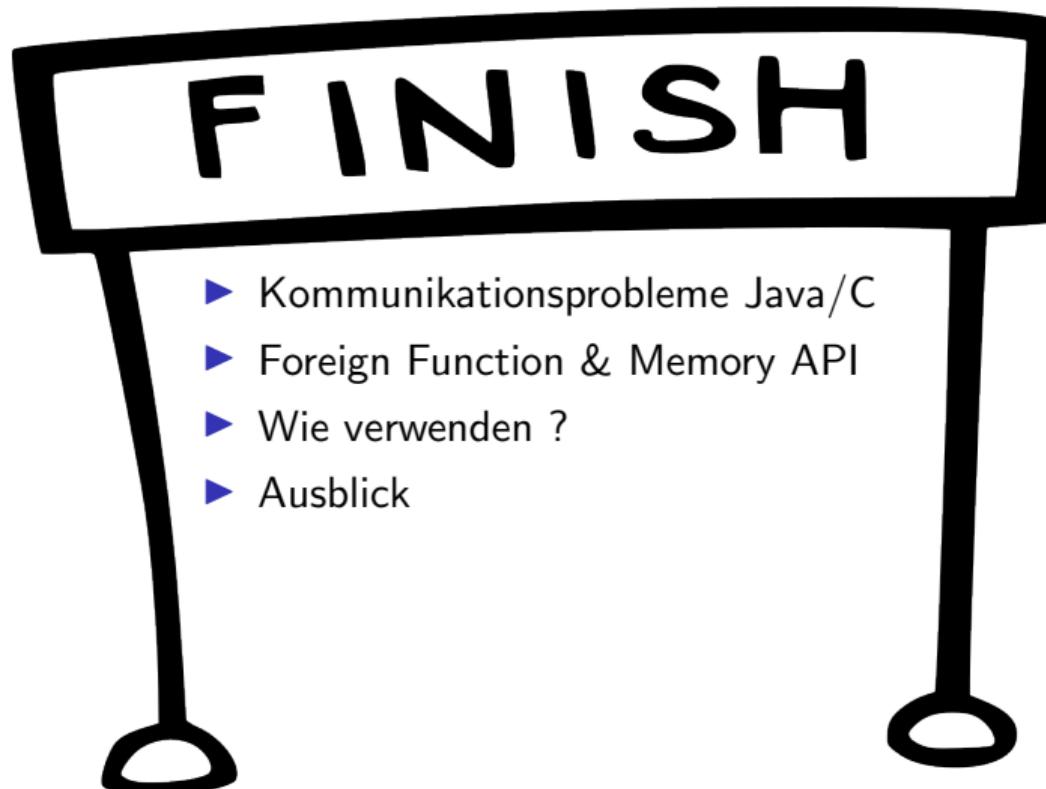


Javas neue Gesprächskultur – ganz wie in Panama –

Bernd Müller
Ostfalia





Vorstellung Referent

- ▶ Prof. Informatik (Ostfalia, HS Braunschweig/Wolfenbüttel)
- ▶ Buchautor (JSF, JPA, Seam, ...)

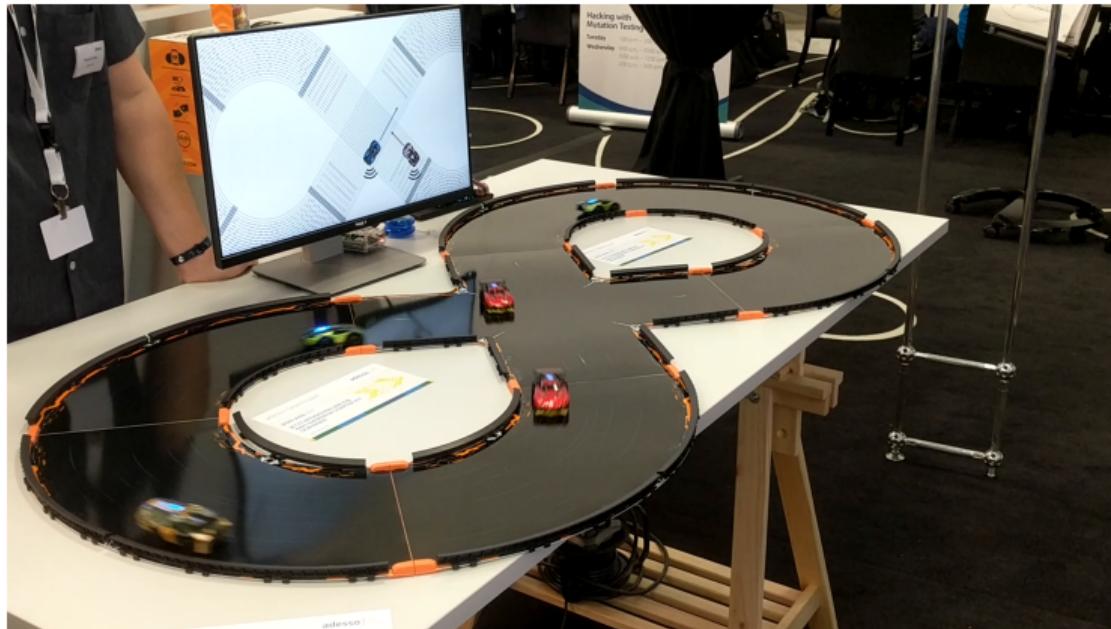


- ▶ Mitglied EGs JSR 344 (JSF 2.2) und JSR 338 (JPA 2.1)
- ▶ Geschäftsführer PMST GmbH
- ▶ JUG Ostfalen (Mitorganisator)
- ▶ Beirat der Java aktuell
- ▶ bernd.mueller@ostfalia.de
- ▶ @berndmuller @berndmuller@fosstodon.org

 BerndMuller

Motivation

JavaLand 2017, Adesso-Stand



GitHub: adessoAG/anki-drive-java

[adessoAG / anki-drive-java](#) Public

Watch 7 Fork 27 Star 16

Code Issues 3 Pull requests 1 Actions Projects Wiki Security Insights

master 1 branch 1 tag Go to file Add file Code

File	Description	Commit
yeckey	Support automated builds via Travis CI (#19) ...	✓ 9a61631 on 4 Apr 2017 15 commits
gradle/wrapper	Initial commit	5 years ago
src/main	Make methods from anki-connector package private (#12)	5 years ago
.gitignore	#13: Make the library accessible through a Maven repository ...	5 years ago
.travis.yml	Support automated builds via Travis CI (#19)	5 years ago
LICENSE	Initial commit	5 years ago
README.md	Fix link in README (#16)	5 years ago
build.gradle	Initial commit	5 years ago
gradlew	Support automated builds via Travis CI (#19)	5 years ago
gradlew.bat	Initial commit	5 years ago
nakane ison	Initial commit	5 years ago

About

A Java port of the Anki Drive SDK

java vehicle java-library anki
anki-drive drive-sdk anki-vehicles

Readme MIT License

16 stars 7 watching 27 forks

Releases 1

First official release Latest on 4 Apr 2017

GitHub: adessoAG/anki-drive-java

[Code](#) [Issues 3](#) [Pull requests 1](#) [Actions](#) [Projects](#) [Wiki](#)

[master](#) [1 branch](#) [1 tag](#)

[yeckey](#) Support automated builds via Travis CI (#10) [Commits](#)

[gradle/wrapper](#) 5 years ago

[src/main](#) 5 years ago

[.gitignore](#) 5 years ago

[.travis.yml](#) Unfortunately, there is currently no cross-platform Java library to interface with Bluetooth LE devices. This project therefore requires a Node.js gateway service to handle low-level communication with the Anki vehicles. All data processing and message parsing is carried out in Java code. 5 years ago

[build.gradle](#) through a Maven repository ... 5 years ago

[gradlew](#) Commit via Travis CI (#19) 5 years ago

[gradlew.bat](#) Initial commit 5 years ago

[gradlew.w](#) Fix link in README (#16) 5 years ago

[packane.json](#) Initial commit 5 years ago

[README.md](#) Initial commit 5 years ago

A Java port of the Anki Drive SDK

java vehicle java-library anki
anki-drive drive-sdk anki-vehicles

[Readme](#) [MIT License](#) [16 stars](#) [7 watching](#) [27 forks](#)

Releases 1

[First official release](#) Latest on 4 Apr 2017

JSR 82: Review Ballot 2000, FR3 2010



JSR-000082 Java(TM) APIs for Bluetooth 1.1.1 Final Release 3

JSRs

- » JSRs by Platform
- » JSRs by Technology
- » JSRs by Stage
- » JSRs by Committee
- » List of All JSRs

JCP Info

- » Updates
- » About JCP
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Thank you for accepting the Software License Agreement; you may now download this software.

Download Instruction: Click the product name or the file name to start the download.

Required Files

File Description and Name	Size
JSR-000082 Bluetooth 1.1.1 Final Release 3 blueooth-1.1.1-mrel2-javadoc.zip	480.28 KB

If you need assistance with downloads, please contact Customer Service. For all other JCP related questions, please see our Frequently Asked Questions (FAQ).

JSR 82: Review Ballot 2000, FR3 2010

The screenshot shows the Java Community Process website with a red oval highlighting the central content area. The main navigation menu includes 'Java Community Process', 'Community Development of Java Technology Specifications', 'Get Java Here', 'JSRs' (selected), 'JSRs by Platform', 'JSRs by Technology', 'JSRs by Stage', 'JSRs by Committee', 'List of All JSRs', 'JCP Info' (selected), 'About JCP', 'FAQ', 'Contact', 'Participation', 'Community Resources', and 'Community News'. The highlighted section displays the title 'JSR-000082 Java(TM) ME for Bluetooth 1.1.1 Final Release 3' and a message: 'Thank you for accepting the software license agreement; you may now download the software.' Below this is a table titled 'Required Files' with one entry: 'File Description and Name' (JSR-000082_Bluetooth 1.1.1 Final Release 3) and 'Size' (480.28 KB). At the bottom, there is a note: 'If you need assistance with downloads, please contact Customer Service. For all other JCP related questions, please see our Frequently Asked Questions (FAQ).'

JAnki

The screenshot shows a GitHub repository page for the user BerndMuller named "JAnki". The repository is public and has 33 commits. A red oval highlights the "About" section, which contains the description: "A simple library to use Anki Overdrive with Java".

About

A simple library to use Anki Overdrive with Java

Code

master · 1 branch · 0 tags

Go to file · Add file · Code

BerndMuller · Minor cleanups · d440d00 · 13 Jan 2021 · 33 commits

File	Description	Time Ago
lib	Minor cleanups	13 months ago
src	Minor cleanups	13 months ago
.gitignore	notifications refactored to package notifications, added C...	4 years ago
LICENSE.txt	license added	4 years ago
README.md	license added	4 years ago
backlog.txt	Minor cleanups	13 months ago
pom.xml	Minor cleanups	13 months ago
run-cli.sh	tracking added	4 years ago
run-tracking.sh	tracking added	4 years ago

Readme

MIT License

4 stars

3 watching

0 forks

Releases

No releases published
Create a new release

Packages

TinyB von Intel

The screenshot shows the GitHub repository page for `intel-iot-devkit / tinyb`. The repository is public and has 33 watchers, 105 forks, and 229 stars. The main navigation tabs include Code, Issues (82), Pull requests (4), Actions, Projects, Wiki, Security, and three more options. Below the tabs, there's a dropdown for the branch (master) and buttons for Go to file, Add file, and Code. A red oval highlights the About section, which contains a brief description of the project: "TinyB exposes the BLE GATT API for C++, Java and other languages, using BlueZ over DBus." To the right of the About section are links to Readme, MIT License, stars (229), watching (33), forks (105), and releases. The Releases section shows one entry for v0.5.1 (Latest, on 19 Jan 2018). On the left, a list of recent commits is shown, each with a file icon, author, commit message, and timestamp.

Author	Commit Message	Timestamp
vkolotov and petreetime	Implementing discovery filter...	on 14 Oct 2017
api	Implementing a generic method to set discover fi...	4 years ago
cmake	Add additional version information, including in j...	6 years ago
examples	examples: list_mfg also lists advertised service ...	5 years ago
include	Adding support for setting RSSI discovery filter	4 years ago
java	Implementing discovery filter by UUIDs (java) an...	4 years ago
src	Implementing discovery filter by UUIDs (java) an...	4 years ago
.gitignore	.gitignore: Now all build* directories are excluded	6 years ago
.travis.yml	Add checkinit which tests if library loads ok and ...	6 years ago

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Selbst ist der Mann
und das Ergebnis ist immer ein Erlebnis ;-)



Selbst ist der Mann
und das Ergebnis ist immer ein Erlebnis ;-)



Ziel: Keine Bibliothek, nur JDK + BlueZ

Verallgemeinerung

Keine Bibliothek, nur JDK + <your choice>

Das Problem

Das Problem – und hoffentlich die Lösung

- ▶ Manchmal genügt JDBC, HTTP, NIO, UNIX-Domain-Sockets, ... nicht
- ▶ Sogenannter *Off-Heap-Speicher* (außerhalb JVM) soll direkt zugegriffen werden
- ▶ Machen z.B. Tensorflow, Ignite, Lucene, Netty und vielen andere
- ▶ Es gibt: JNI, Byte-Buffer-API, sun.misc.Unsafe, ...
- ▶ Macht aber auf Dauer nicht glücklich ...

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- ▶ JEPs 191, 370, 383, 389, 393, 412, 419, 424, 434
- ▶ Mit **Project Panama: Interconnecting JVM and native code**

JEP 419: Foreign Function & Memory API

OpenJDK

[OpenJDK FAQ](#)
[Installing](#)
[Contributing](#)
[Sponsoring](#)
[Developers' Guide](#)
[Vulnerabilities](#)
[JDK GA/EA Builds](#)
[Mailing lists](#)
[Wiki -IRC](#)
[Bylaws - Census](#)
[Legal](#)

JEP Process

[Source code](#)

[Mercurial](#)
[GitHub](#)

Tools

[Mercurial](#)
[Git](#)
[jtreg harness](#)

Groups

[\(overview\)](#)
[Adoption](#)
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[Client Libraries](#)
[Compatibility & Specification Review](#)
[Compiler](#)
[Conformance](#)
[Core Libraries](#)
[Governance Board](#)

JEP 419: Foreign Function & Memory API (Second Incubator)

Owner Maurizio Cimadamore

Type Feature

Scope JDK

Status Closed / Delivered

Release 18

Component core-libs

Discussion [panama dash dev at openjdk dot java dot net](#)

Relates to [JEP 412: Foreign Function & Memory API \(Incubator\)](#)

Reviewed by Jim Laskey, Paul Sandoz

Created 2021/09/21 11:56

Updated 2022/01/18 23:13

Issue 8274073

Summary

Introduce an API by which Java programs can interoperate with code and data outside of the Java runtime. By efficiently invoking foreign functions (i.e., code outside the JVM), and by safely accessing foreign memory (i.e., memory not managed by the JVM), the API enables Java programs to call native libraries and process native data without the brittleness and danger of JNI.

JEP 419: Foreign Function & Memory API



OpenJDK FAQ
Installing
Contributing
...
...

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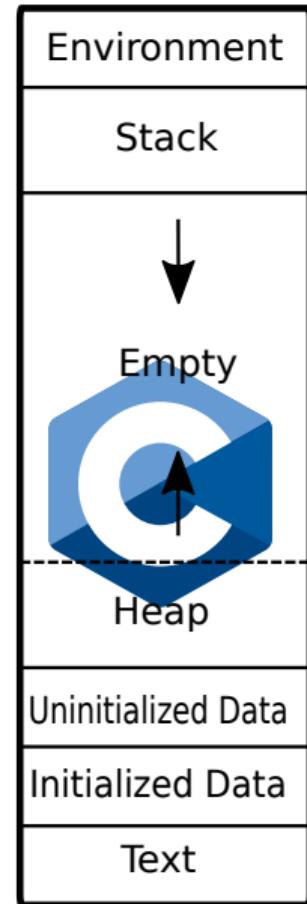
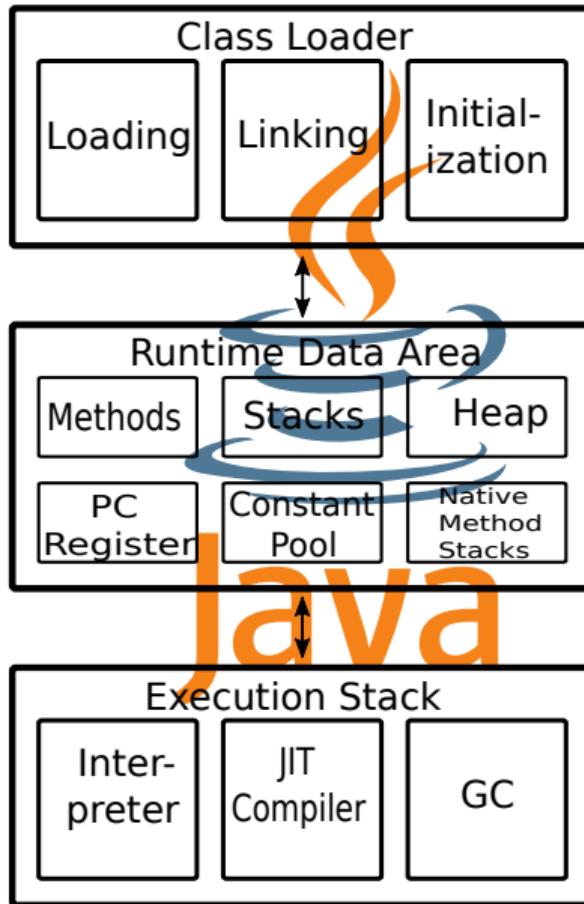
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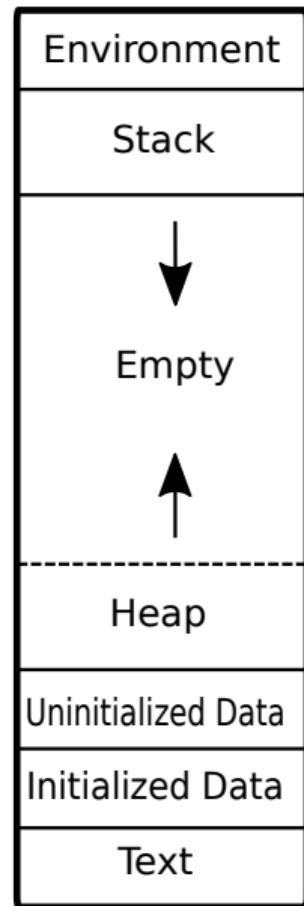
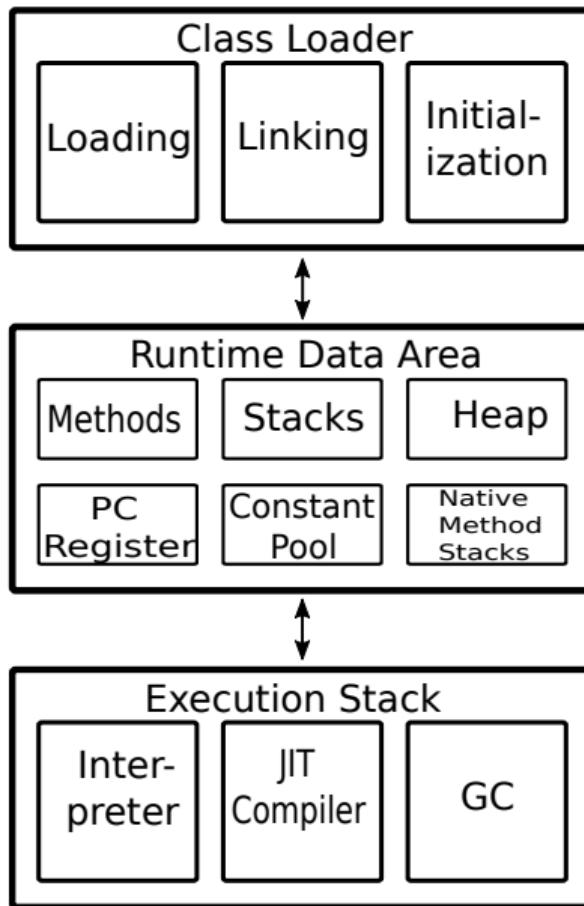
Groups
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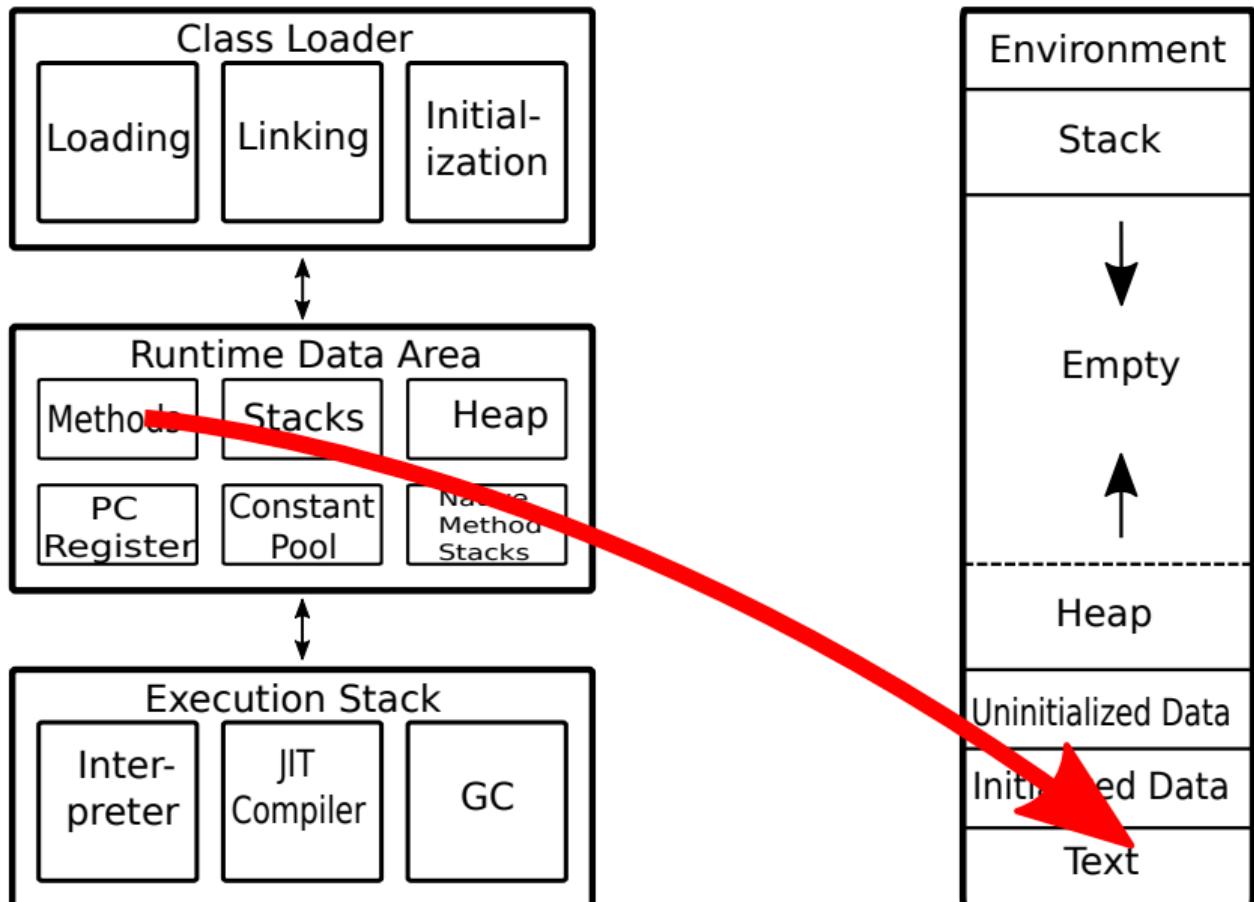
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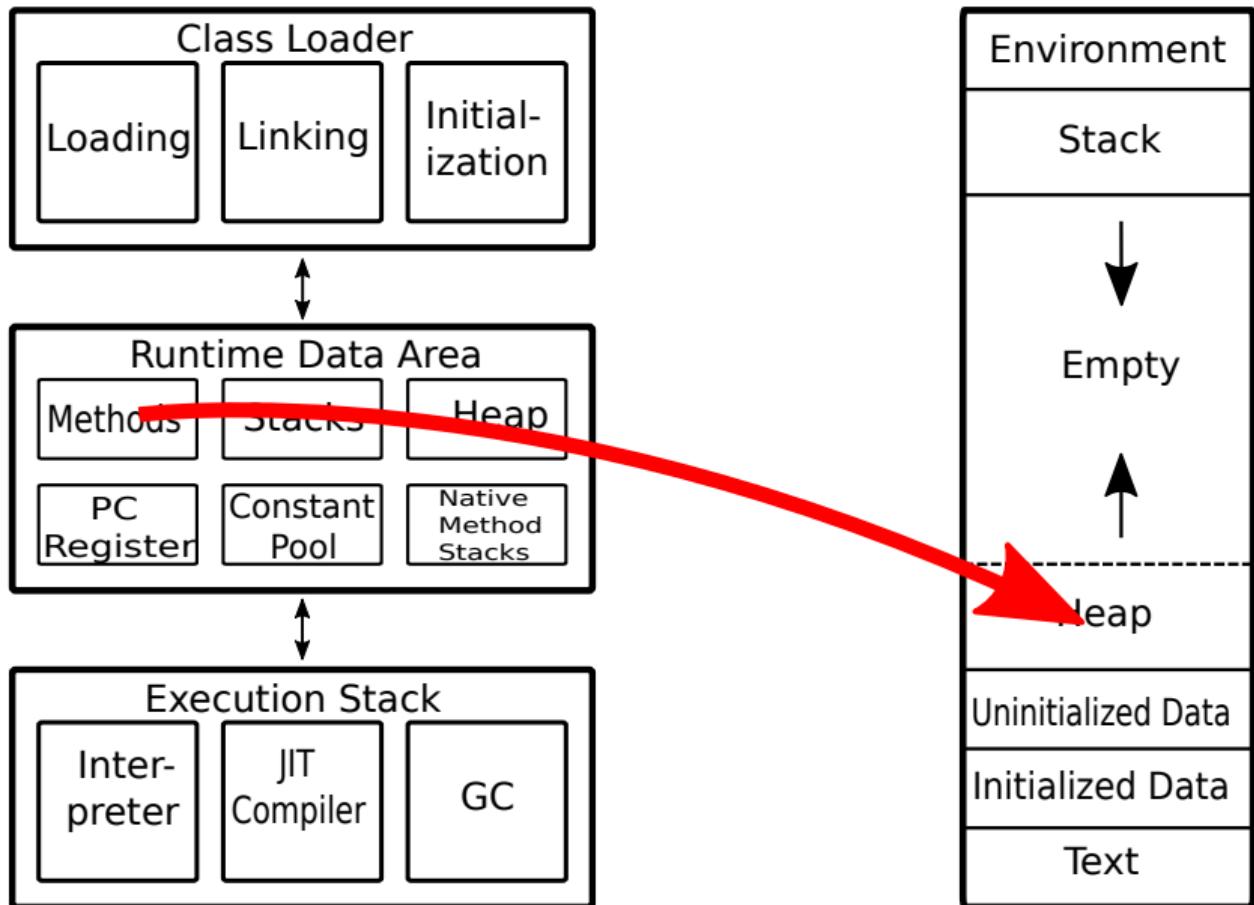
Native Method Interface + Libraries



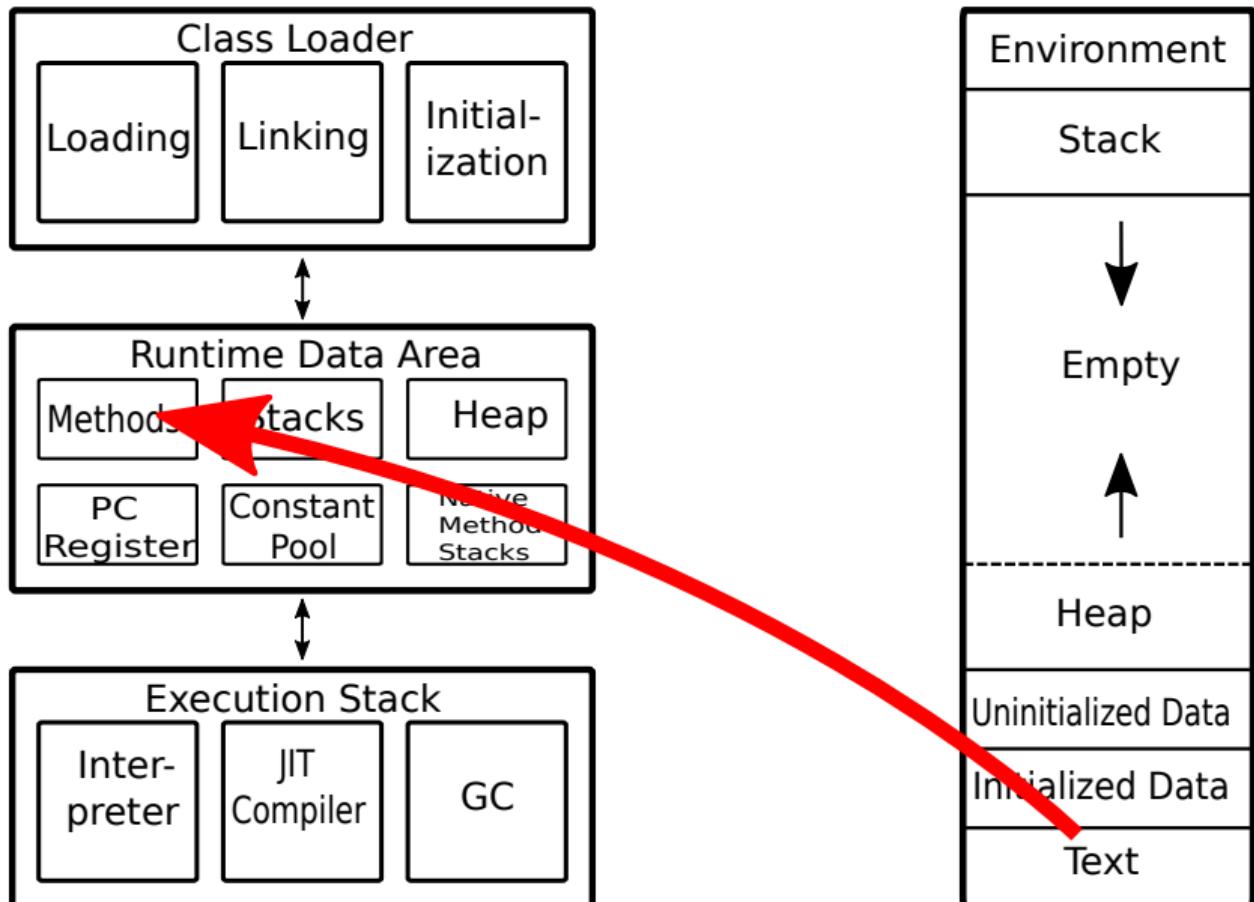
Native Method Interface + Libraries



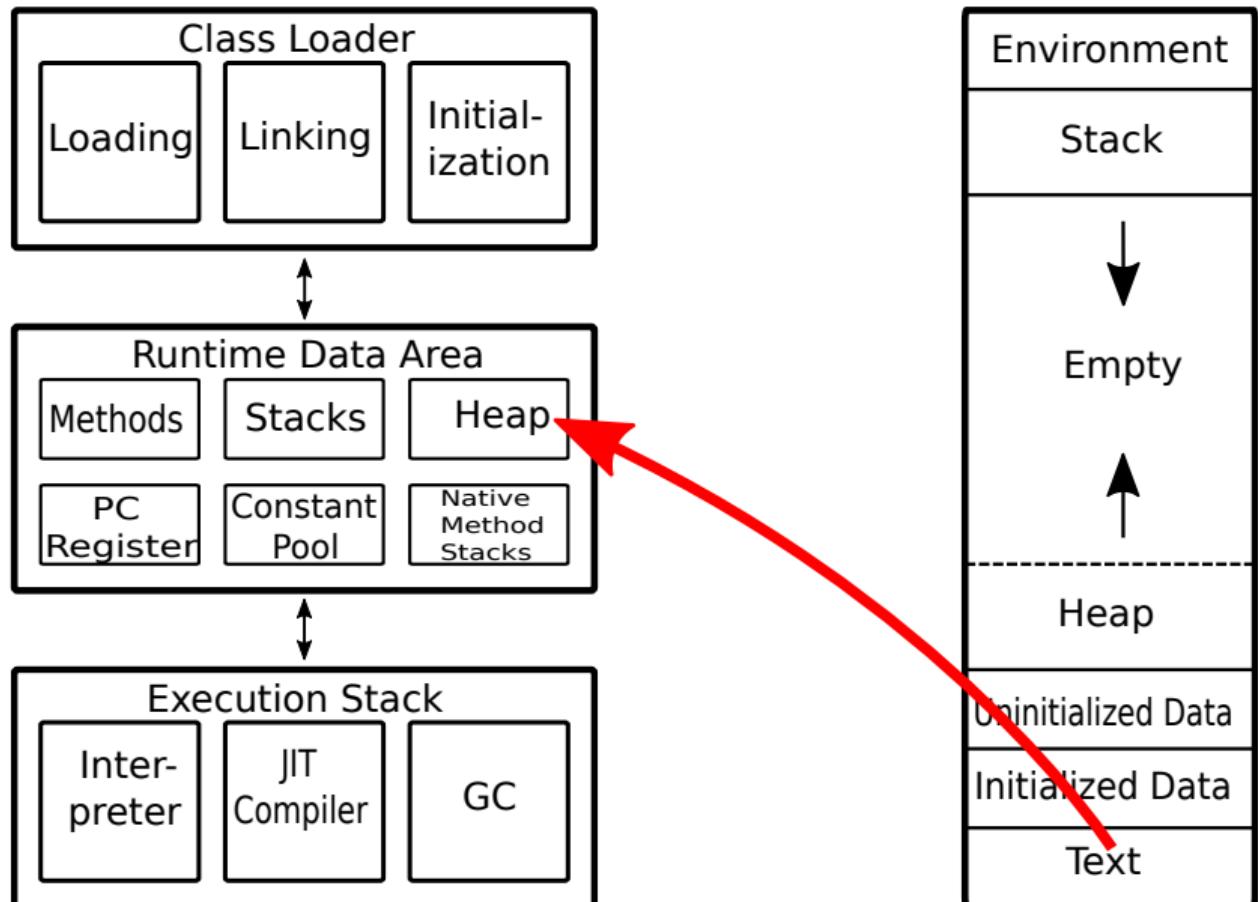
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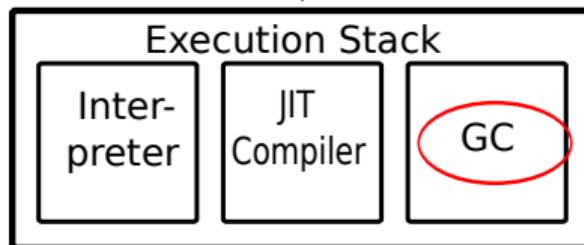
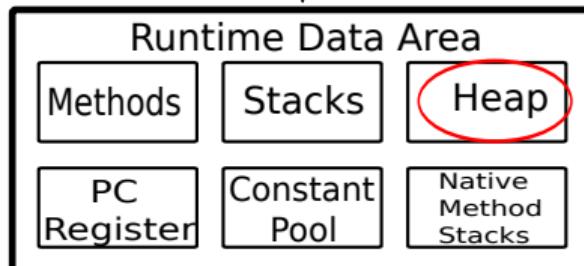
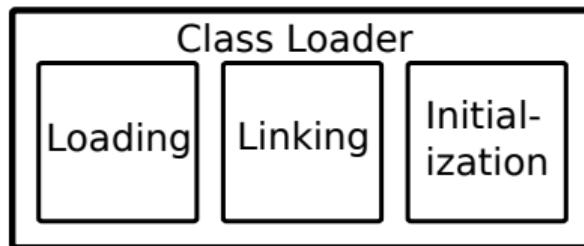
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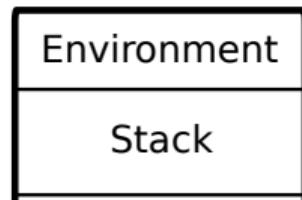
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Native Method Interface + Libraries



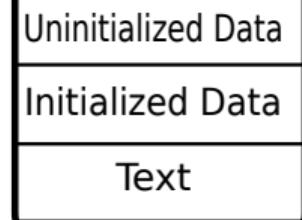
`new Object()`



Empty



`malloc()
free()`



Native Method Interface + Libraries

Lösungsversuch FFM: Konzepte und Klassen (Java 20)

- ▶ Allokation von Speicher
MemorySegment, SegmentAllocator, ...

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MemoryLayout, VarHandle (java.lang.invoke), ...

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SegmentScope
- ▶ Finden und Aufruf von Funktionen
Linker

Beispiel Memory Segment

- ▶ Zusammenhängender Speicherbereich
- ▶ On- oder Off-Heap
- ▶ Nativ, mapped (mmap), Array oder Buffer
- ▶ Garantien für räumliche, zeitliche sowie Thread-bezogene Beschränkungen
- ▶ ...

Beispiele

Prozess-Id (C)

Prozess-Id des Prozesses: keine Parameter, Integer-Rückgabe (jps-Clone)

```
#include <unistd.h>

pid_t getpid(void);
```

Prozess-Id (Java)

```
MethodHandle getpid = Linker.nativeLinker().downcallHandle(  
    Linker.nativeLinker().defaultLookup().find("getpid").get(),  
    FunctionDescriptor.of(JAVA_INT));  
  
System.out.println("Process Id: " + (int) getpid.invokeExact());
```

Quicksort

```
#include <stdlib.h>

void qsort(void *base, size_t nmemb, size_t size,
           int (*compar)(const void *, const void *));
```

Vergleichsmethode/-klasse (à la Comparator#compare())

```
static class IntComparator {  
  
    static int compare(MemorySegment addr1, MemorySegment addr2) {  
        return addr1.get(JAVA_INT, 0) - addr2.get(JAVA_INT, 0);  
    }  
  
}
```

Method-Handle auf qsort

```
MethodHandle qsort = Linker.nativeLinker().downcallHandle(  
    Linker.nativeLinker().defaultLookup().find("qsort").get(),  
    FunctionDescriptor.ofVoid(ADDRESS, JAVA_LONG, JAVA_LONG, ADDRESS)  
) ;
```

Method-Handle auf Vergleichsmethode

```
FunctionDescriptor compareDescriptor =
    FunctionDescriptor.of(JAVA_INT, ADDRESS.asUnbounded(),
                         ADDRESS.asUnbounded());  
  
MethodHandle compareHandle =
    MethodHandles.lookup().findStatic(IntComparator.class,
                                       "compare",
                                       compareDescriptor.toMethodType());
```

Allokation des Arrays und eigentlicher Aufruf

```
try (Arena arena = Arena.openConfined()) {
    MemorySegment comparFunc = Linker.nativeLinker().upcallStub(
        compareHandle, compareDescriptor, arena.scope());

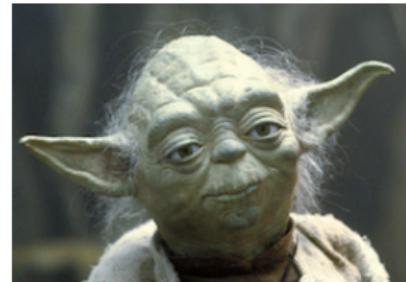
    MemorySegment array = arena.allocateArray(JAVA_INT,
        new int[] { 0, 9, 3, 4, 6, 5, 1, 8, 2, 7 });

    qsort.invokeExact(array, 10L, 4L, comparFunc);

    int[] sorted = array.toArray(JAVA_INT);

    ...
}
```

Demo Time



Sleepy from slides, we are !

Werkzeugunterstützung

JExtract

- ▶ Reduktion des Overheads durch
 - ▶ Analyse einer Include-Datei
 - ▶ und Generierung der entsprechenden Methoden und Typen für den Aufruf

JExtract

- ▶ Reduktion des Overheads durch
 - ▶ Analyse einer Include-Datei
 - ▶ und Generierung der entsprechenden Methoden und Typen für den Aufruf
- ▶ Nicht im JDK, evtl. später separat verfügbar

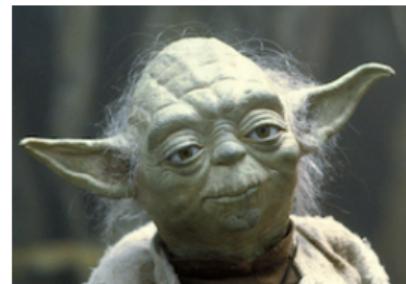
getpid ohne jextract

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```

getpid mit jextract

```
System.out.println("Process Id: " + getpid());
```

Demo Time



Sleepy from slides, we are !

Es entwickelt sich ... immer noch ...

Quicksort mit Java 17 (Ausschnitt)

```
MethodHandle qsort = CLinker.getInstance().downcallHandle(
    CLinker.systemLookup().lookup("qsort").get(),
    MethodType.methodType(void.class, MemoryAddress.class,
                          long.class, long.class, MemoryAddress.class),
    FunctionDescriptor.ofVoid(C_POINTER, C_LONG, C_LONG, C_POINTER)
);
```

Quicksort mit Java 18 (Ausschnitt)

```
MethodHandle qsort = CLinker.systemCLinker().downcallHandle(  
    CLinker.systemCLinker().lookup("qsort").get(),  
    FunctionDescriptor.ofVoid(ADDRESS, JAVA_LONG, JAVA_LONG, ADDRESS)  
) ;
```

Quicksort mit Java 19 (Ausschnitt)

```
MethodHandle qsort = Linker.nativeLinker().downcallHandle(  
    Linker.nativeLinker().defaultLookup().lookup("qsort").get(),  
    FunctionDescriptor.ofVoid(ADDRESS, JAVA_LONG, JAVA_LONG, ADDRESS)  
) ;
```

Quicksort mit Java 20 (Ausschnitt)

```
MethodHandle qsort = Linker.nativeLinker().downcallHandle(  
    Linker.nativeLinker().defaultLookup().find("qsort").get(),  
    FunctionDescriptor.ofVoid(ADDRESS, JAVA_LONG, JAVA_LONG, ADDRESS)  
) ;
```

Fazit und Ausblick

Persönliche – und damit subjektive – Einschätzung

- ▶ Eine wirklich gute Idee
- ▶ Versuche JAnki zu migrieren. Schwierigkeit: Komplexität des D-Bus-Interface und eigene Unzulänglichkeiten ;-)
- ▶ Dominik Martens hat es geschafft (in Master-Arbeit)
- ▶ Wenn GraalVMs Native-Image-Erzeugung FFM unterstützt: ☺

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- ▶ Wenn GraalVMs Native-Image-Erzeugung FFM unterstützt: ☺
- ▶ und was machen andere ?

Tomcat SSL

Tomcat 9.0.55 (remm)

2021-11-10

Coyote

① Improve performance of Connector shutdown - primarily to reduce the time it takes to run the test suite. (markt)

🔧 Refactor the APR/native connector shutdown to reduce the possibility of a JVM crash during the connector shutdown. (markt)

🔧 [#457](#): Add a `toString()` method to `MimeHeader` to aid debugging. (dblevins)

🔧 Add experimental OpenSSL support through the Panama API incubating in Java 17, with support for OpenSSL 1.1. This no longer requires tomcat-native or APR. Please refer to the `openssl-java17` module from the `main` branch for more details. (remm)

🔧 Fix APR connector stop so it correctly waits for the sendfile thread, if any, to exit. (markt)

🔧 Do not ignore the error condition if the APR connector is not able to open a server socket as continuing in this case will trigger a JVM crash. (markt)

Elasticsearch

Some scattered feedback on the Foreign Linker API

Chris Hegarty chegar999@gmail.com

Wed Dec 22 09:19:40 UTC 2021

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Hi,

As part of a recent prototyping effort, we evaluated replacing the usage of JNA in the core of the Elasticsearch server with the incubating Foreign Linker API.

TL;DR things just worked, perf improved and we really like the restricted native access.

Our usage (at least in this particular case) is not really performance sensitive, in that we reach into native to setup syscall filtering and check resource limits - but hey, faster is always better! We measured approximate perf improvements between 8 and 20 times faster for simple downcalls. The reason the numbers vary so much is more to do with JNA rather than Panama since the Panama times from our to our tests

Fragen und Anmerkungen



Vortrag und Code

<https://github.com/BerndMuller/panama-javaland-2023>

