Vývoj Aplikácií s Viacvrstvovou Architektúrou

9. Modularita a Modulárne Aplikácie

IT ACADEMY

STU FIIT

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Kontakt: miroslav.reiter@it-academy.sk

Čo nás čaká a neminie...

1. časť

- Úvod do Javy
- Štruktúra platformy
- Vývojové technológie
- Kolekcie
- Logovanie
- Lokalizácia

2. časť

- NIO.2, IO, XML
- Regulárne výrazy
- Modularita
- JDBC
- Bezpečnosť
- Prehľad JEE a .NET

Best practices | Faily | Fuckupy

Modulárny návrh (Modular design)

- Modulárny dizajn alebo modularita v dizajne je princíp dizajnu, ktorý **rozdeľuje systém na menšie časti** nazývané **moduly** (ako sú modulárne procesné časti), ktoré **možno nezávisle vytvárať**, **upravovať**, **nahrádzať** alebo **vymieňať** s **inými modulmi** alebo **medzi rôznymi systémami**.

Kde všade je modulárny návrh?

- Autá, výťahy, nábytok, tkáčske stavy
- Solárne panely, veterné turbíny
- Železničné signalizačné systémy, telefónne ústredne
- Modulárne budovy, potrubné systémy, rozvody elekt. energie
- Počítače HW (USB), **informačné systémy**, procesné systémy

Kde všade je modulárny návrh v IT?

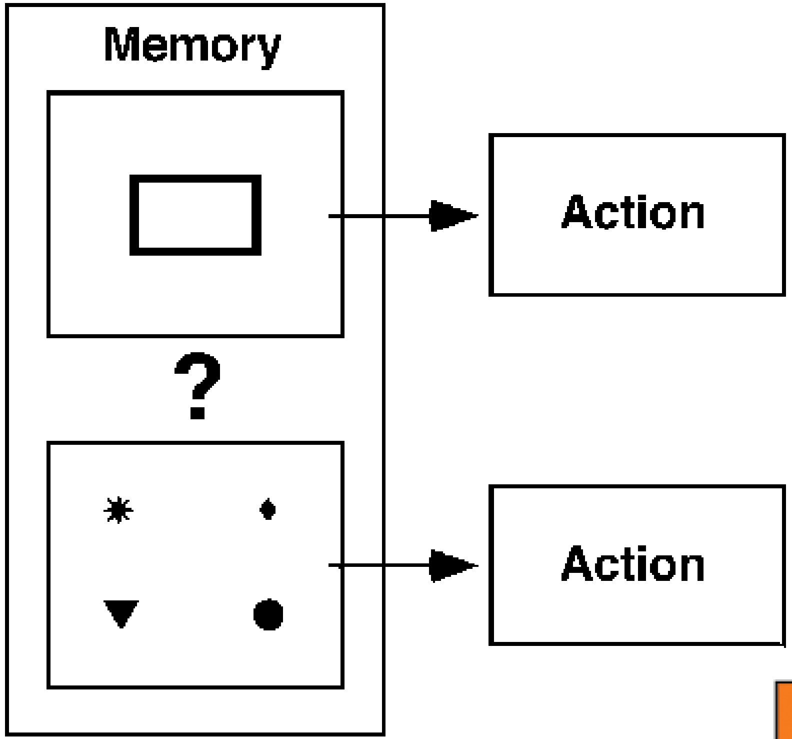
- Servisne orientovaná architektúra (SOA)
- Mikroslužby (MSA/MSOA)
- Rozšírenia a doplnky (Add-ons / Extensions / Widgets)
- Moduly a knižnice
- Trh mobilných aplikácií

Modulárne dokumentové systémy

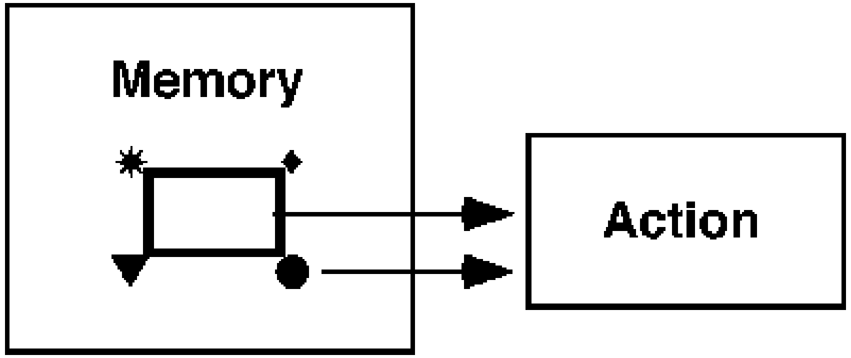
- EDM/CA - Electronic Document Management System/Contract Administration
- EBIS - Electronic Buying Information System
- EDCS - Electronic Document Control System
- EDSS - Electronic Document Storage System
- EDSS - Electronic Document Submission System
- EDES - Electronic Document Encryption System
- EDLS - Electronic Document Labeling System
- EDIS - Electronic Document Information System
- EDOCS - Electronic Document Management System
- EDMS - Electronic Document Management System
- EDMS - Electronic Document Marking System
- MOLIS - Modular Open Laboratory Information System
- DIS - Document Information System
- EDDS - Electronic Document Delivery System
- EDAS - Electronic Document Approval System
- EDAS - Electronic Document Archive System
- EDMS - Electronic Document Managment System
- MITIS - Modular Integrated Transplant Information System edds –
- MEDIS - Modular Engineering Document Imaging System

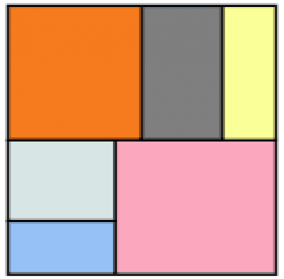
Moduly vs Monolity

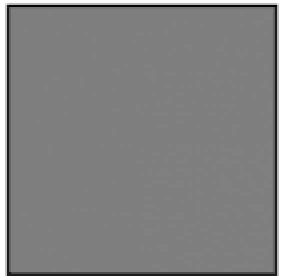
Modulárne systémy



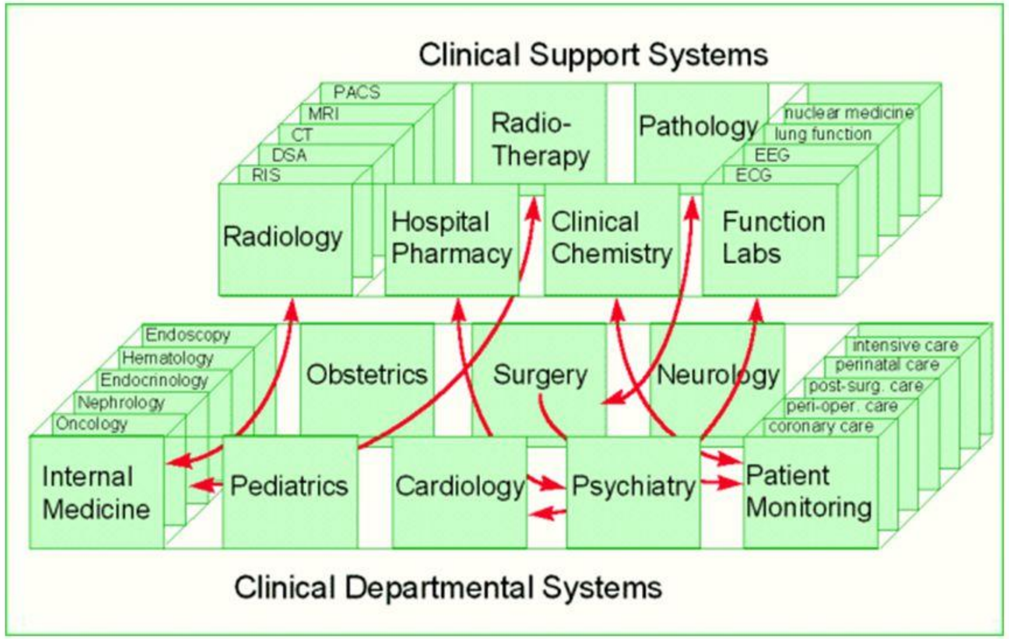
Monolitické (unifikované) systémy

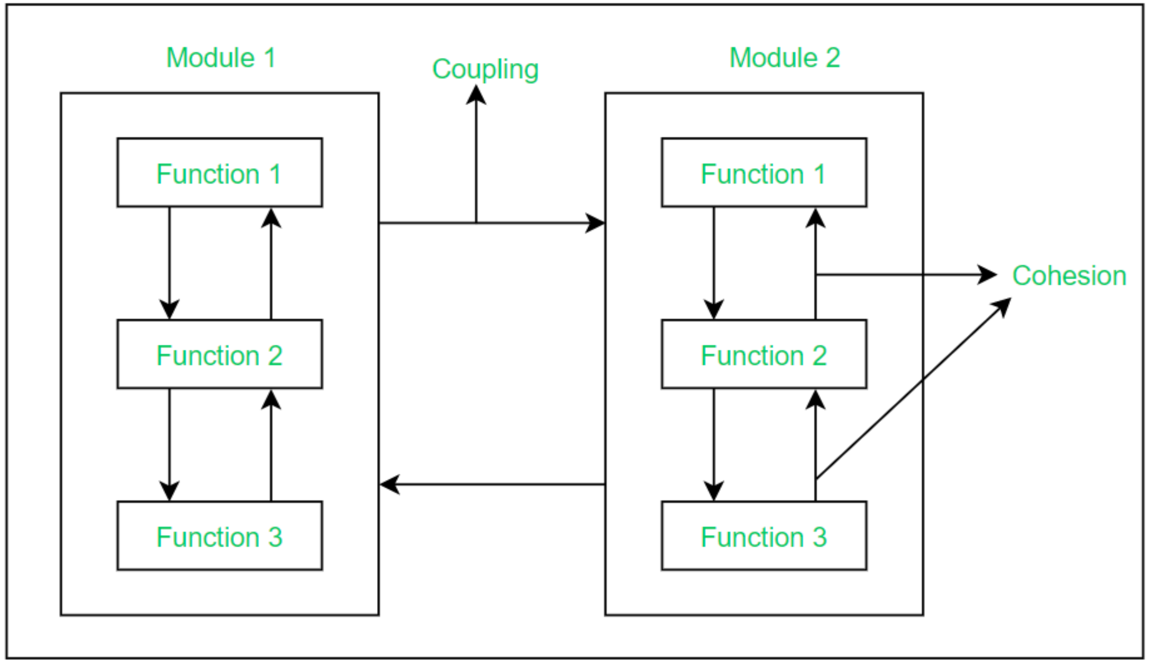






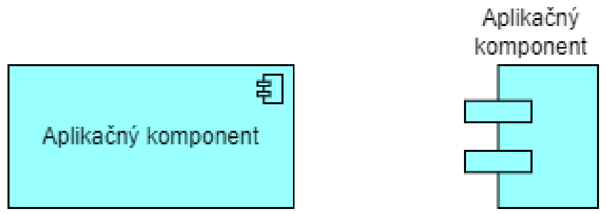
Príklady modularity



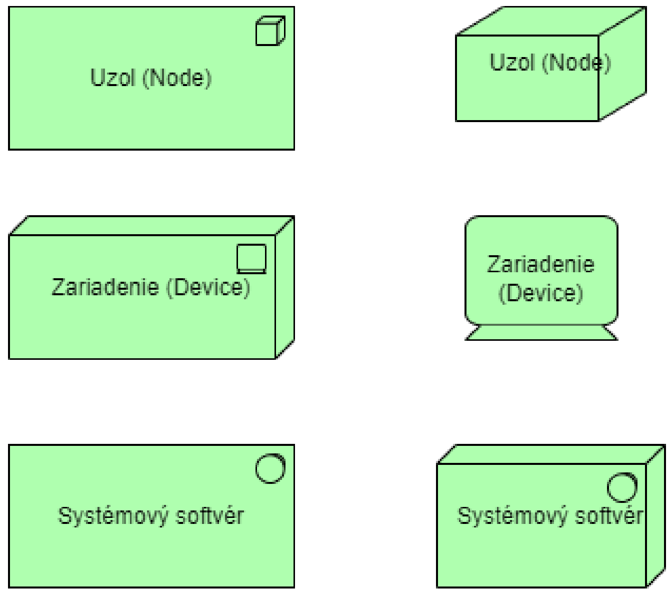


ArchiMate (Enterprise architektúra)

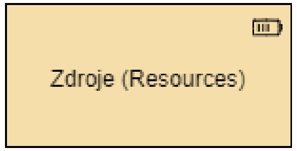
Aplikačná vrstva



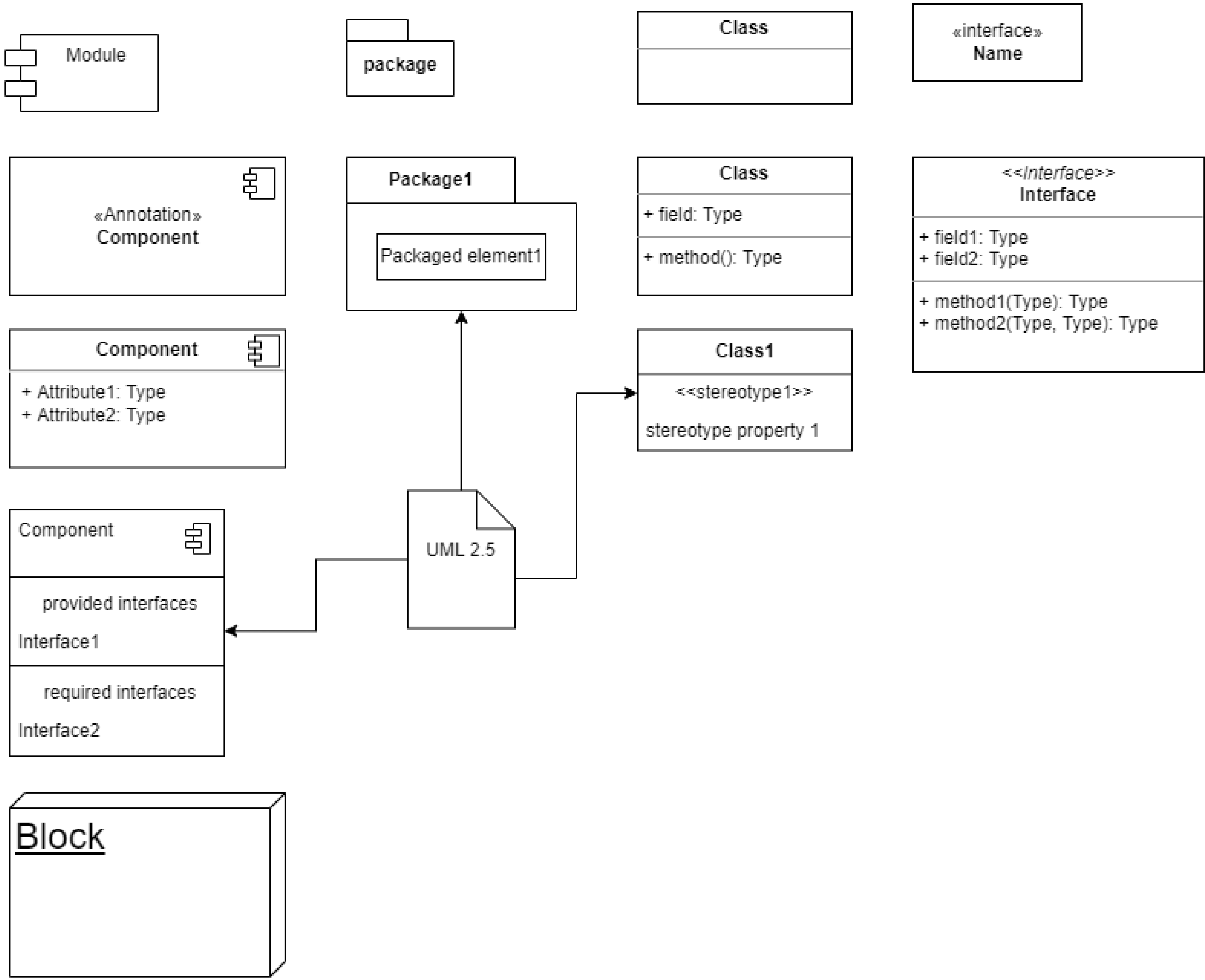
Technologická vrstva



Strategická vrstva



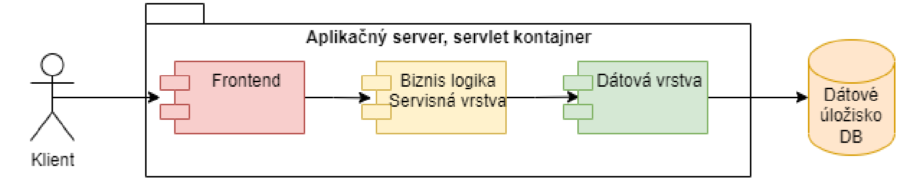
UML (2.0/2.5)



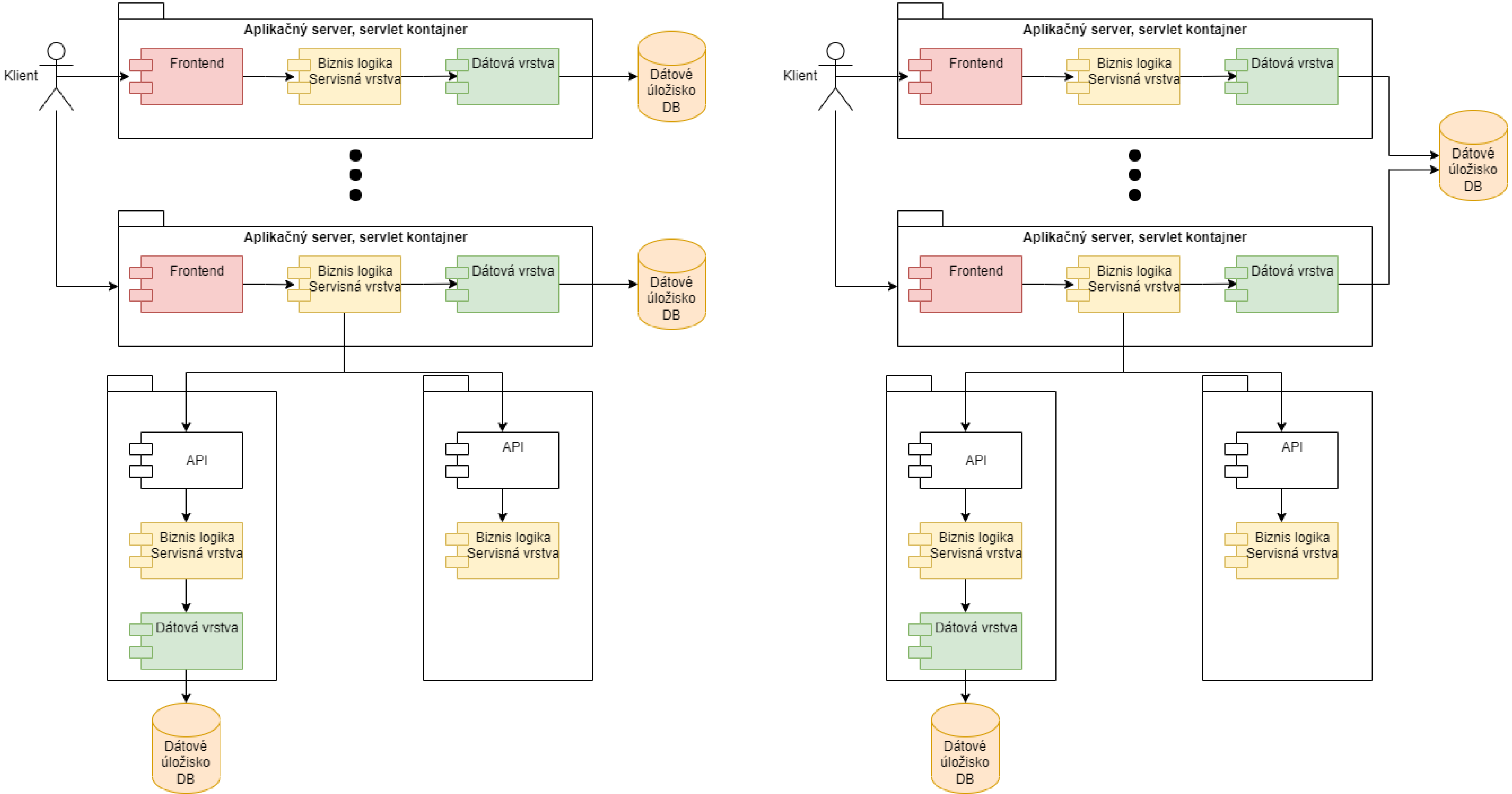
Write programs that do one thing and do it well. Write programs to work together. Write programs to handle text streams, because that is a universal interface.

-- **Doug McIlroy** (This is the Unix philosophy)

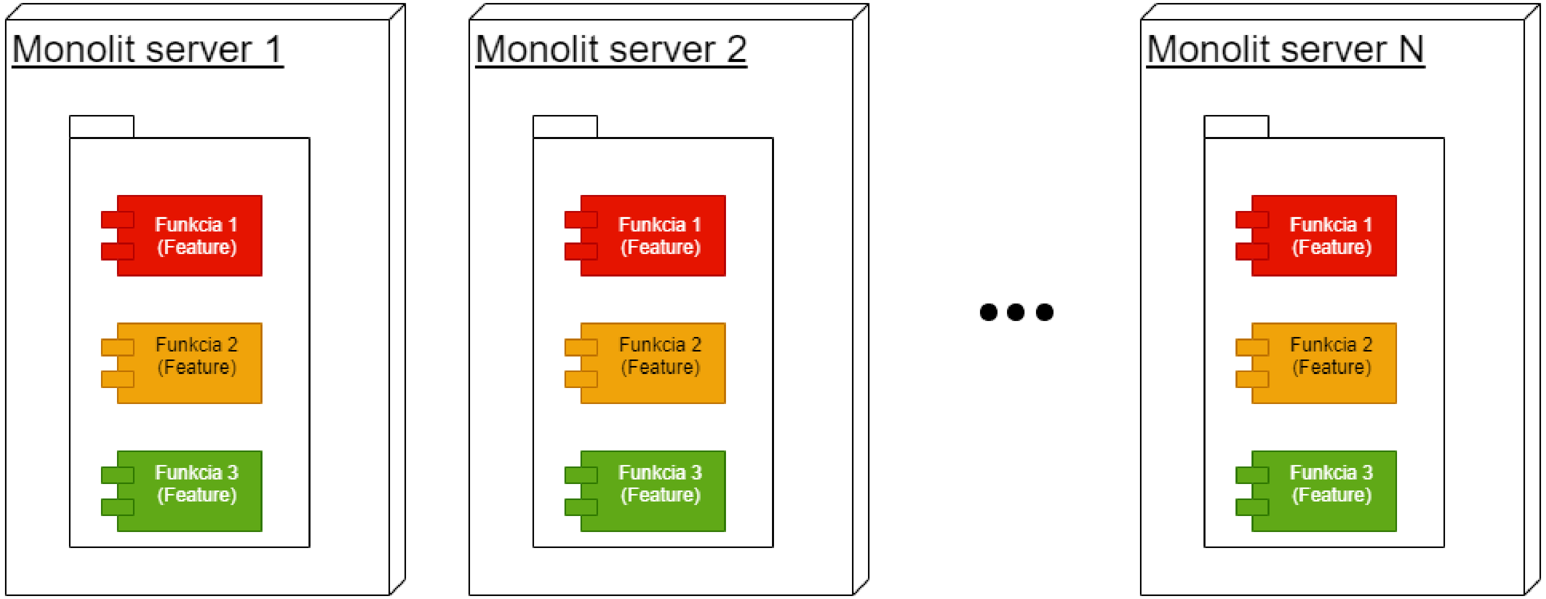
Architektúra monolitickej aplikácie (trojvrstvová architektúra)



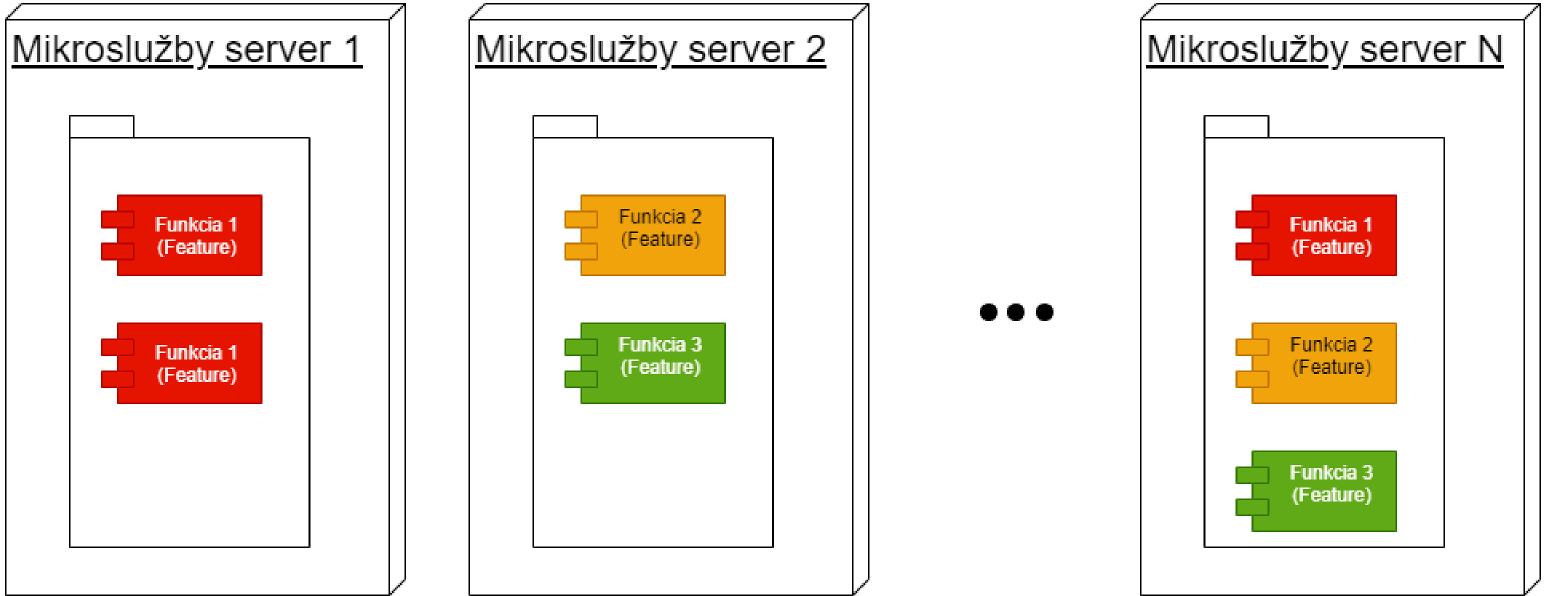
Architektúra aplikácie využívajúcej mikroslužby



Škálovanie monolitickej aplikácie



Škálovanie aplikácie využívajúcej mikroslužby



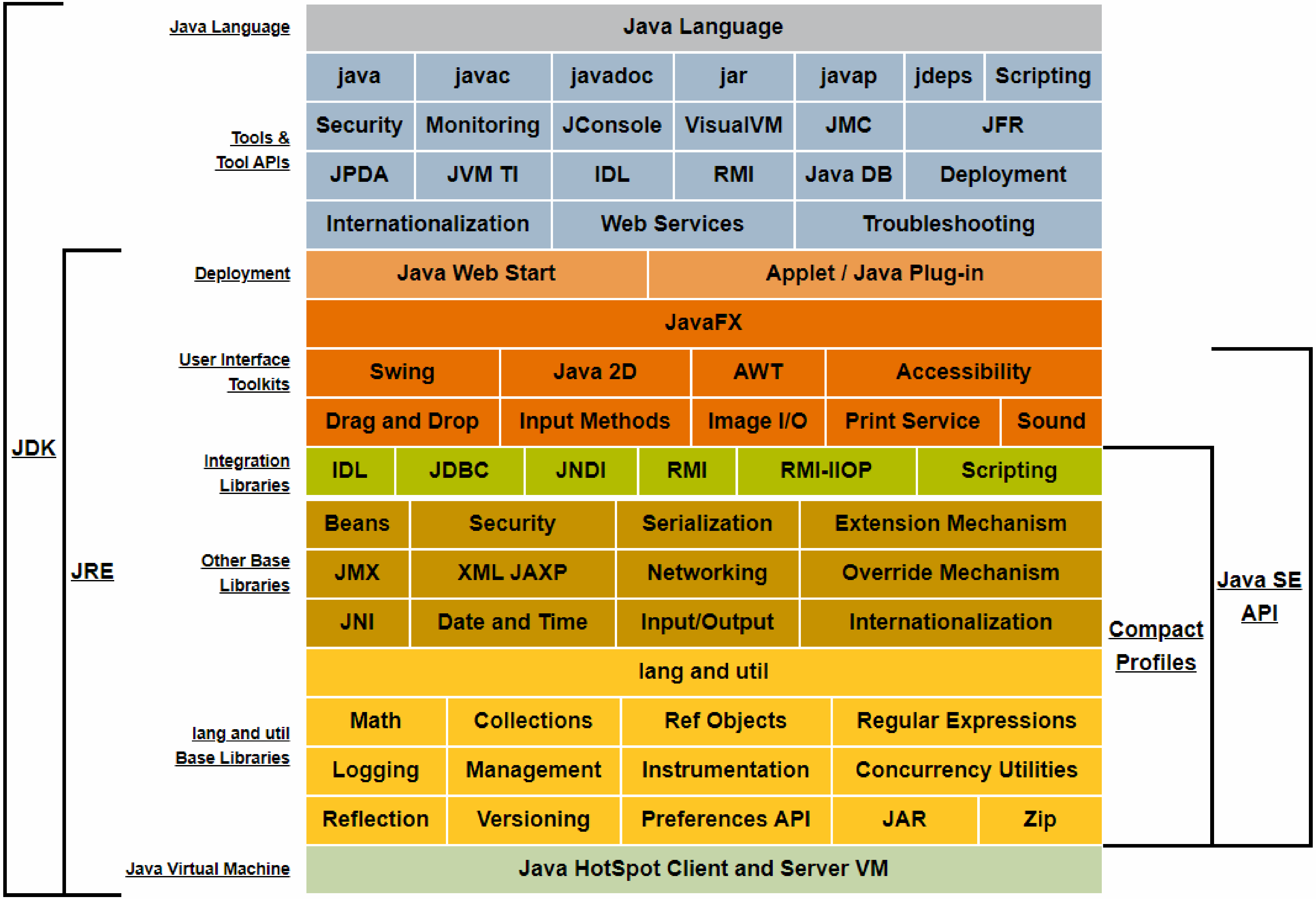
Rozdiely v prístupe konceptov

SOA (Servisne orientovaná architektúra)

1. Skôr hrubšia granularita služieb („mikromonolity“)
2. Zameranie na štandardizáciu procesov, nástrojov a pod.
3. Použitie ESB (Enterprise Service Bus)
4. Podpora väčšieho množstva protokolov na prenos správ
5. Založené na jednom programovacom jazyku a sade knižníc
6. Beh vo viacerých vláknach
7. Služby delené podľa business požiadaviek
8. Jediná databáza pre celú aplikáciu
9. Požiadavka na zmenu: úprava (mikro)monolitu

MSA/MSOA (Microservice Architecture)

1. Jemnejšia granularita služieb
2. Zameranie na spoluprácu ľudí a možnosť slobodného výberu technológií
3. Jednoduché systémy na posielanie správ
4. Zameranie na použitie jednoduchých protokolov (HTTP, STOMP, ...)
5. Voľnosť výberu jazyka i knižníc podľa potreby
6. Typicky beh v jednom vlákne s non-locking I/O, použitie zelených vlákien
7. Delenie skôr podľa kontextu
8. Každá mikroslužba používa vlastné dátové úložisko
9. Požiadavka na zmenu: vytvorenie novej mikroslužby



JDK

JRE

Java Language
- Java Language

Tools & Tool APIs
- java | javac | javadoc | jar | javap | jdeps | Scripting
- Security | Monitoring | JConsole | VisualVM | JMC | JFR
- JPDA | JVM TI | IDL | RMI | Java DB | Deployment
- Internationalization | Web Services | Troubleshooting

Deployment
- Java Web Start | Applet / Java Plug-in

User Interface Toolkits
- JavaFX
- Swing | Java 2D | AWT | Accessibility
- Drag and Drop | Input Methods | Image I/O | Print Service | Sound

Integration Libraries
- IDL | JDBC | JNDI | RMI | RMI-IIOP | Scripting

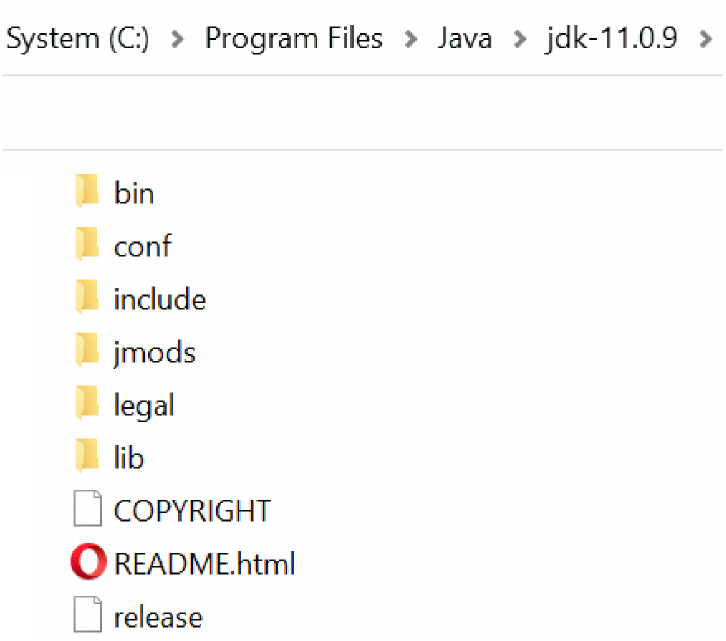
Other Base Libraries
- Beans | Security | Serialization | Extension Mechanism
- JMX | XML JAXP | Networking | Override Mechanism
- JNI | Date and Time | Input/Output | Internationalization

lang and util Base Libraries
- lang and util
- Math | Collections | Ref Objects | Regular Expressions
- Logging | Management | Instrumentation | Concurrency Utilities
- Reflection | Versioning | Preferences API | JAR | Zip

Java Virtual Machine
- Java HotSpot Client and Server VM

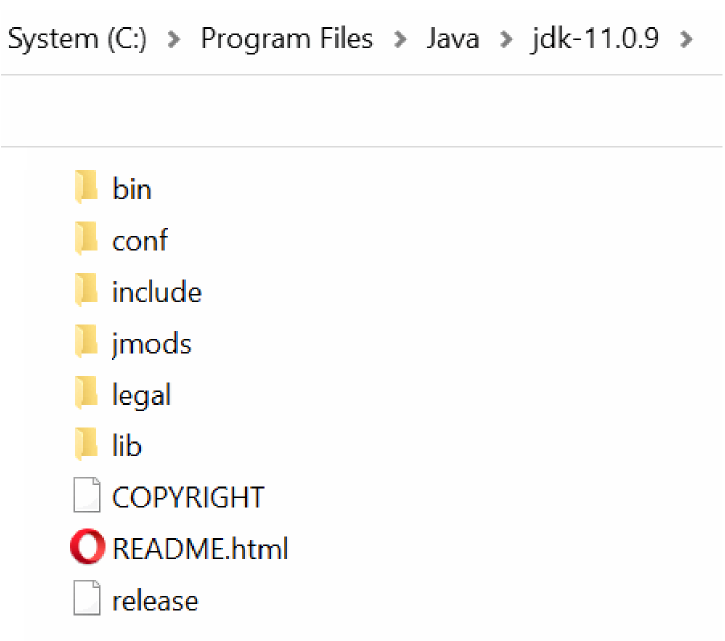
Compact Profiles

Java SE API



System (C:) › Program Files › Java › jdk-11.0.9 ›

bin
conf
include
jmods
legal
lib
COPYRIGHT
README.html
release



System (C:) › Program Files › Java › jdk-11.0.9 ›

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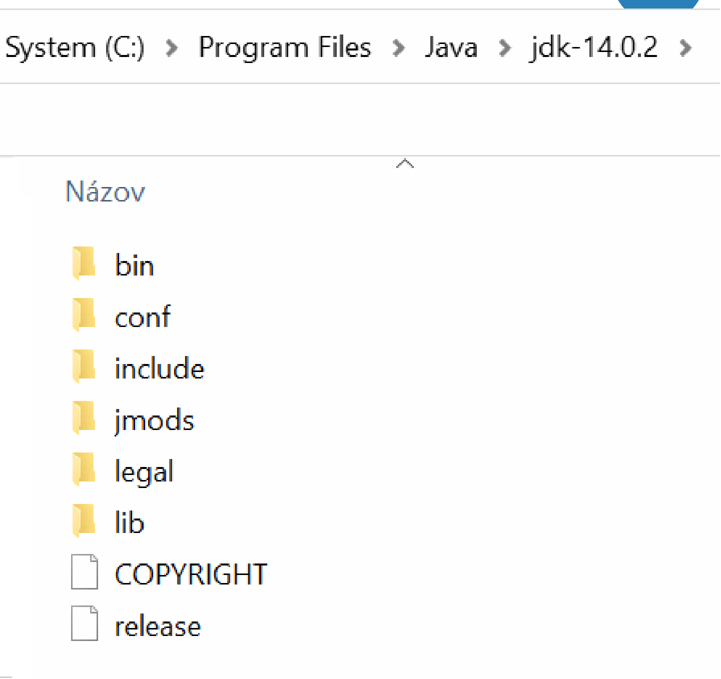
README.html
release



System (C:) › Program Files › Java › jdk-14.0.2 ›

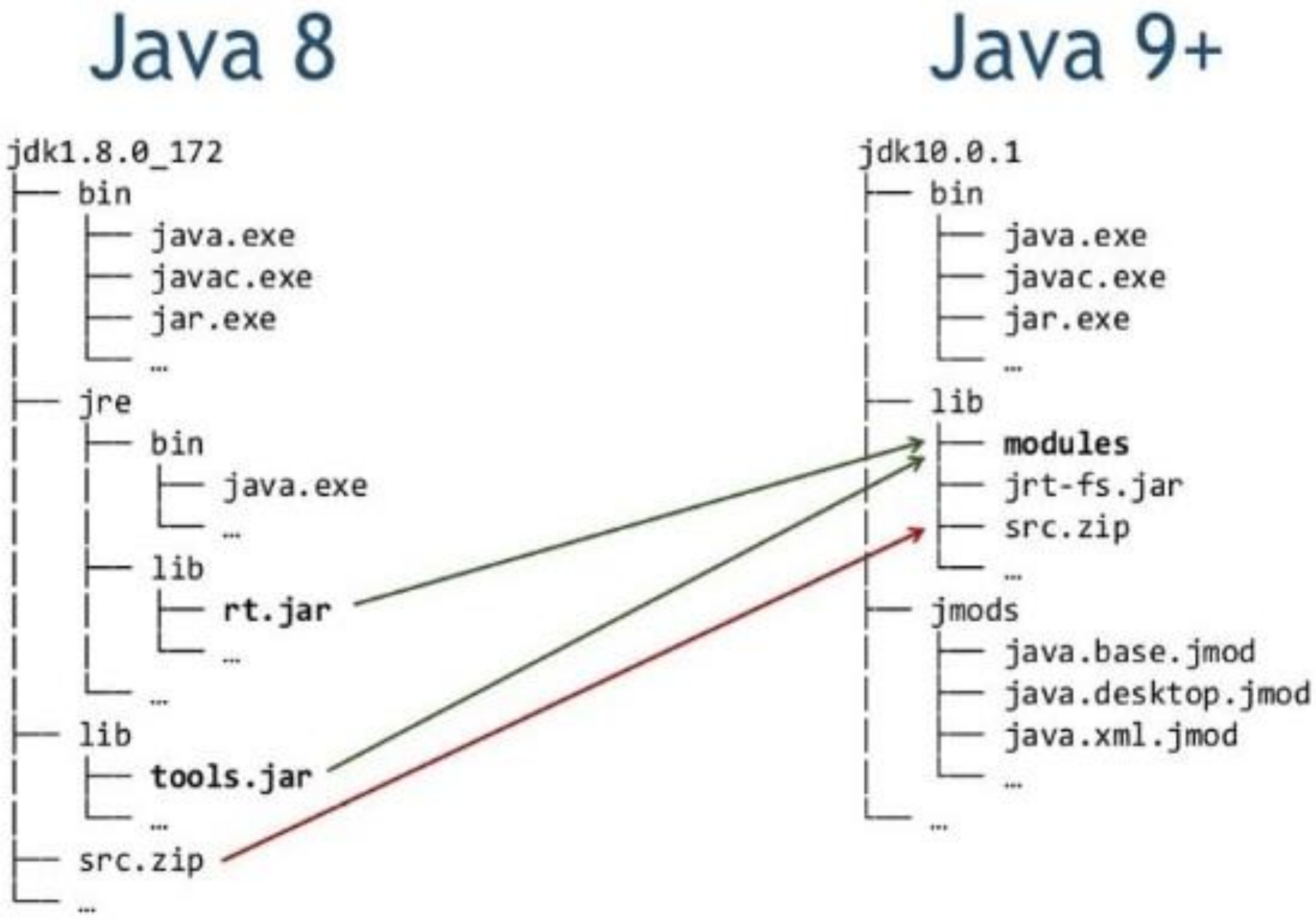
Názov

bin
conf
include
jmods
legal
lib
COPYRIGHT
release

Správne nastavenie premennej prostredia JAVA_HOME

Nájdite 1 dôležitý rozdiel (Nie Readme)

Zavedenie modulov

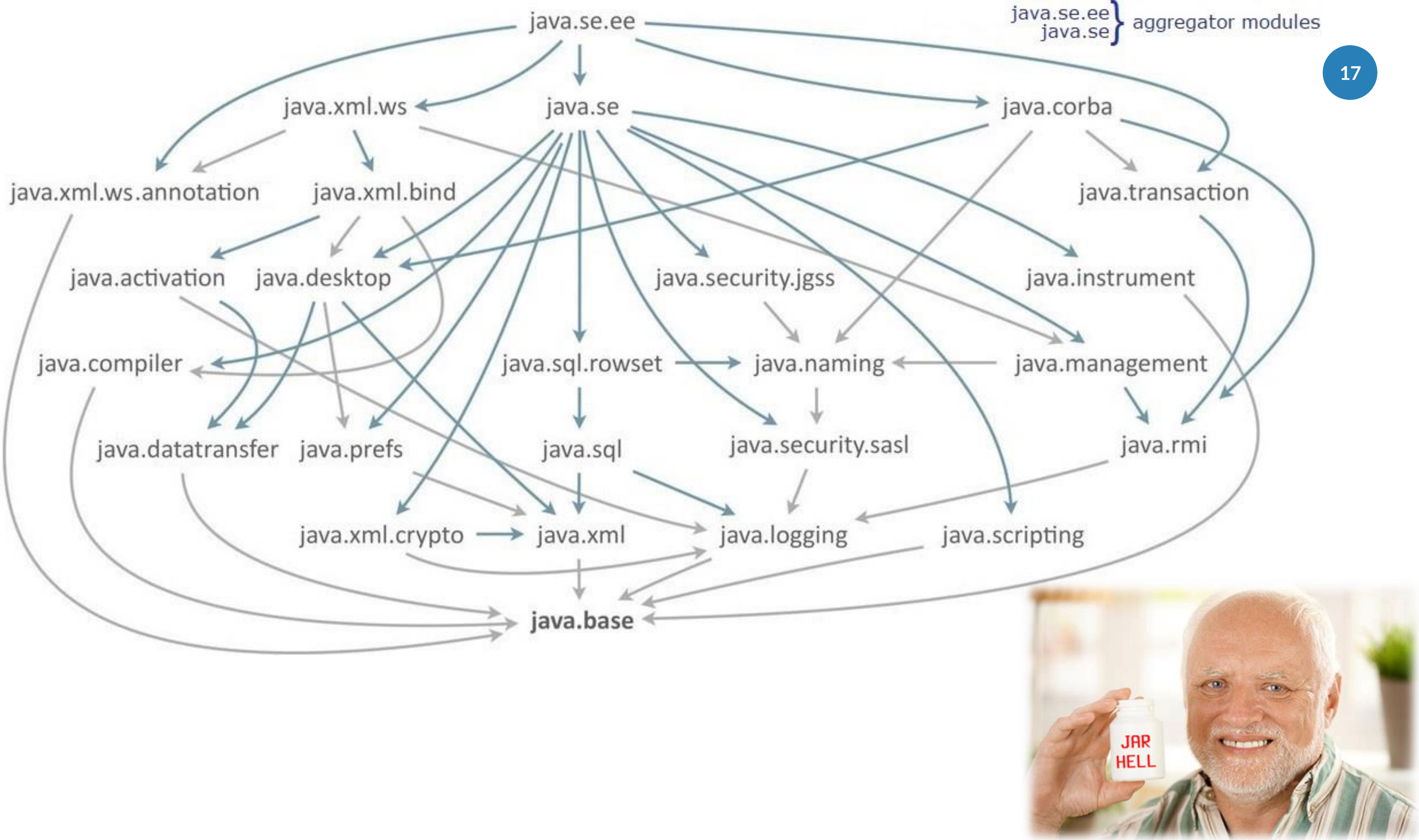


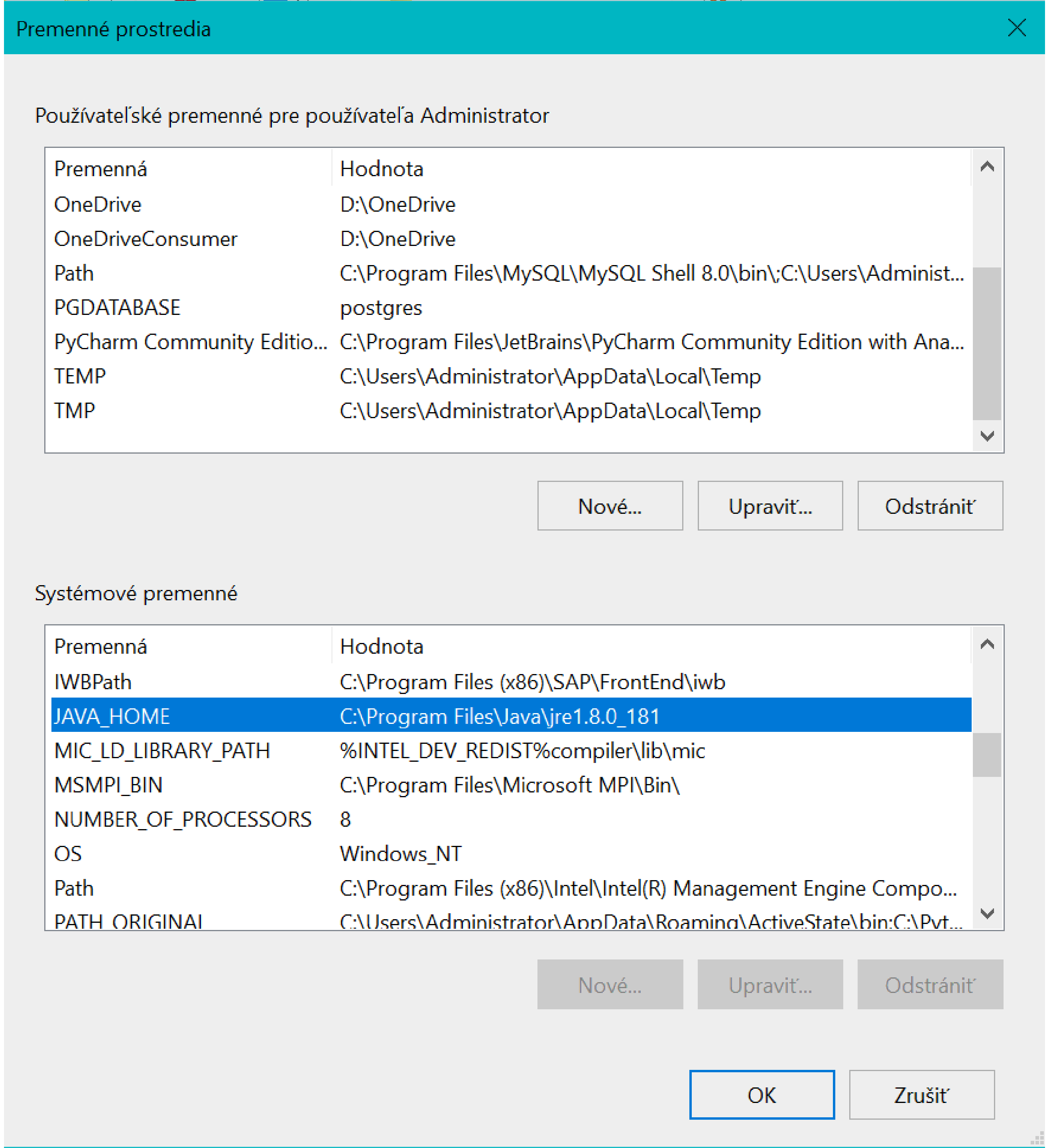
Java 8

```
jdk1.8.0_172
├── bin
│   ├── java.exe
│   ├── javac.exe
│   ├── jar.exe
│   └── …
├── jre
│   ├── bin
│   │   ├── java.exe
│   │   └── …
│   ├── lib
│   │   ├── rt.jar
│   │   └── …
│   └── …
├── lib
│   ├── tools.jar
│   └── …
├── src.zip
└── …
```

Java 9+

```
jdk10.0.1
├── bin
│   ├── java.exe
│   ├── javac.exe
│   ├── jar.exe
│   └── …
├── lib
│   ├── modules
│   ├── jrt-fs.jar
│   ├── src.zip
│   └── …
├── jmods
│   ├── java.base.jmod
│   ├── java.desktop.jmod
│   ├── java.xml.jmod
│   └── …
└── …
```


java.se.ee
java.se
aggregator modules
java.se.ee
java.xml.ws
java.se
java.corba
java.xml.ws.annotation
java.xml.bind
java.transaction
java.activation
java.desktop
java.security.jgss
java.instrument
java.compiler
java.sql.rowset
java.naming
java.management
java.datatransfer
java.prefs
java.sql
java.security.sasl
java.rmi
java.xml.crypto
java.xml
java.logging
java.scripting
java.base
JAR
HELL



Premenné prostredia

Používateľské premenné pre používateľa Administrator

Premenná	Hodnota
OneDrive	D:\OneDrive
OneDriveConsumer	D:\OneDrive
Path	C:\Program Files\MySQL\MySQL Shell 8.0\bin\;C:\Users\Administ...
PGDATABASE	postgres
PyCharm Community Editio...	C:\Program Files\JetBrains\PyCharm Community Edition with Ana...
TEMP	C:\Users\Administrator\AppData\Local\Temp
TMP	C:\Users\Administrator\AppData\Local\Temp

Systémové premenné

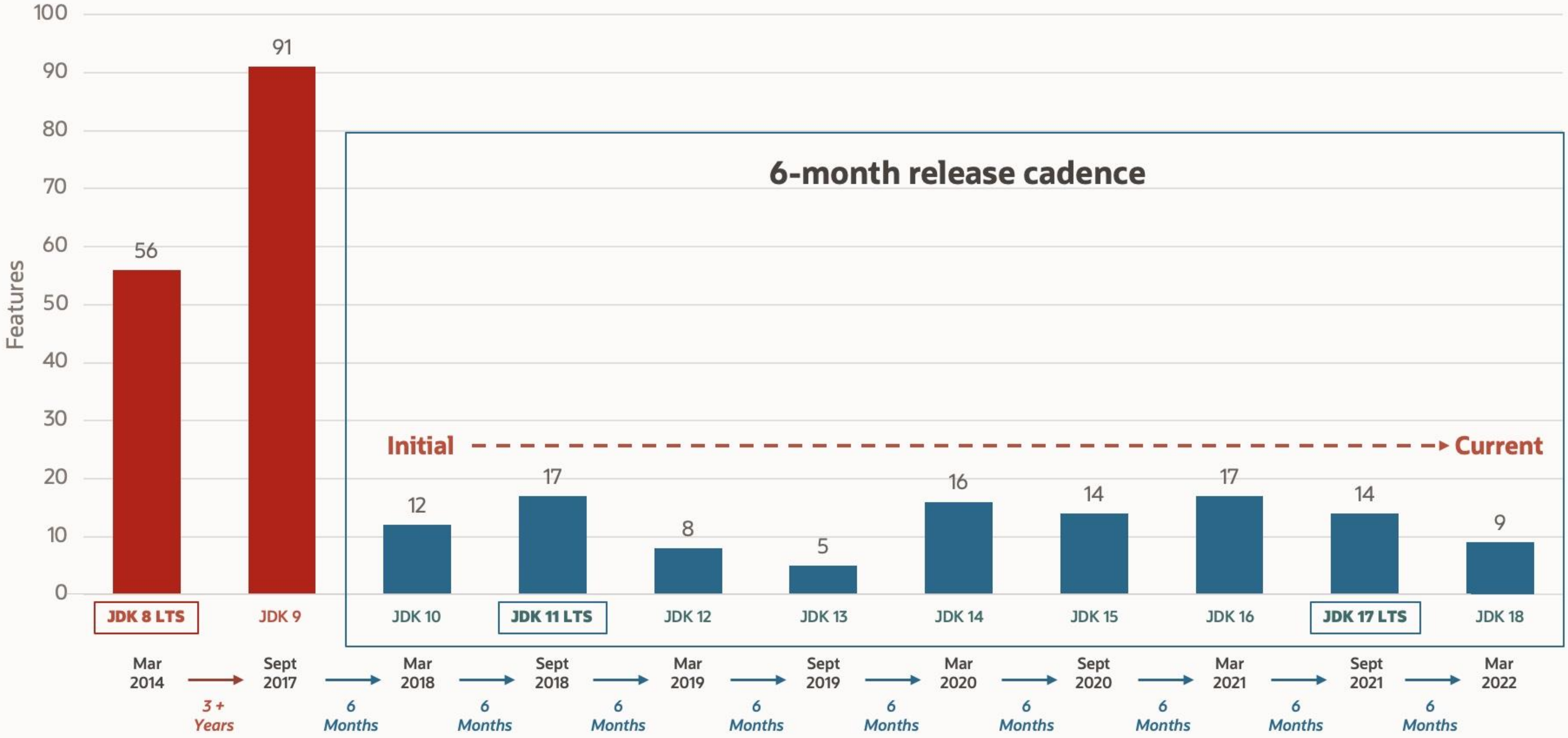
Premenná	Hodnota
IWBPath	C:\Program Files (x86)\SAP\FrontEnd\iwb
JAVA_HOME	C:\Program Files\Java\jre1.8.0_181
MIC_LD_LIBRARY_PATH	%INTEL_DEV_REDIST%compiler\lib\mic
MSMPI_BIN	C:\Program Files\Microsoft MPI\Bin\
NUMBER_OF_PROCESSORS	8
OS	Windows_NT
Path	C:\Program Files (x86)\Intel\Intel(R) Management Engine Compo...
PATH_ORIGINAL	C:\Users\Administrator\AppData\Roaming\ActiveState\bin;C:\Pyt...

Java LTS

- Java 7 až do roku 2022
- **Java 8 minimálne do roku 2030**
- **Java 11 až 2026**
- Java 17 minimálne do roku 2029

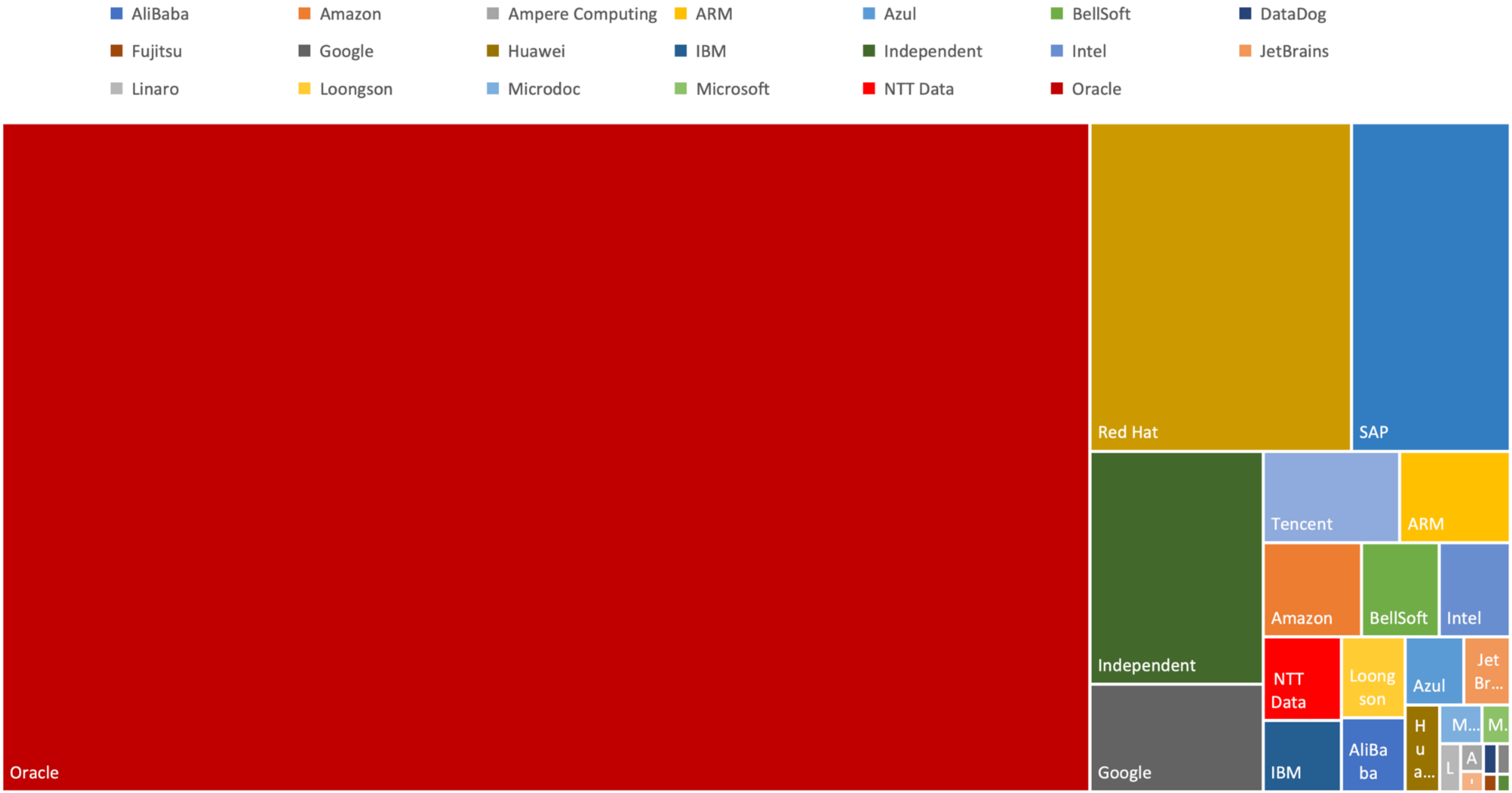
- **Najnovšia Java 18** (Nie LTS/**non LTS**)
- Budúca **Java 21** (**Bude LTS, 09-2023**)

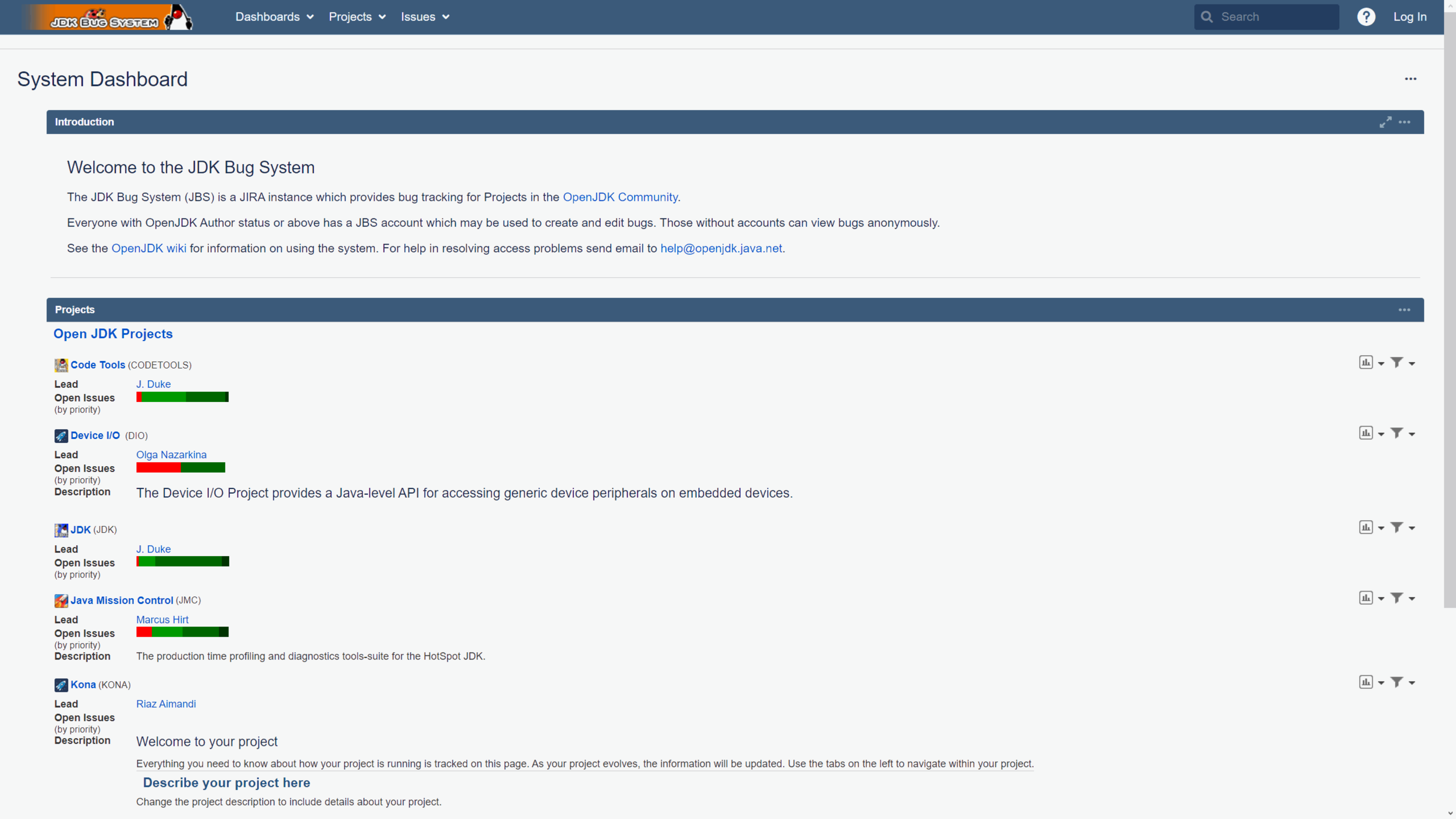
The 6-month feature-release model



Features
100
90
80
70
60
50
40
30
20
10
0
6-month release cadence
Initial
Current
56
91
12
17
8
5
16
14
17
14
9
JDK 8 LTS
JDK 9
JDK 10
JDK 11 LTS
JDK 12
JDK 13
JDK 14
JDK 15
JDK 16
JDK 17 LTS
JDK 18
Mar 2014
Sept 2017
Mar 2018
Sept 2018
Mar 2019
Sept 2019
Mar 2020
Sept 2020
Mar 2021
Sept 2021
Mar 2022
3 + Years
6 Months
6 Months
6 Months
6 Months
6 Months
6 Months
6 Months
6 Months
6 Months

Issues fixed in JDK 11-JDK 18 per organization





System Dashboard

Introduction

Welcome to the JDK Bug System

The JDK Bug System (JBS) is a JIRA instance which provides bug tracking for Projects in the OpenJDK Community.

Everyone with OpenJDK Author status or above has a JBS account which may be used to create and edit bugs. Those without accounts can view bugs anonymously.

See the OpenJDK wiki for information on using the system. For help in resolving access problems send email to help@openjdk.java.net.

Projects

Open JDK Projects

Code Tools (CODETOOLS)

Lead J. Duke
Open Issues (by priority)

Device I/O (DIO)

Lead Olga Nazarkina
Open Issues (by priority)
Description The Device I/O Project provides a Java-level API for accessing generic device peripherals on embedded devices.

JDK (JDK)

Lead J. Duke
Open Issues (by priority)

Java Mission Control (JMC)

Lead Marcus Hirt
Open Issues (by priority)
Description The production time profiling and diagnostics tools-suite for the HotSpot JDK.

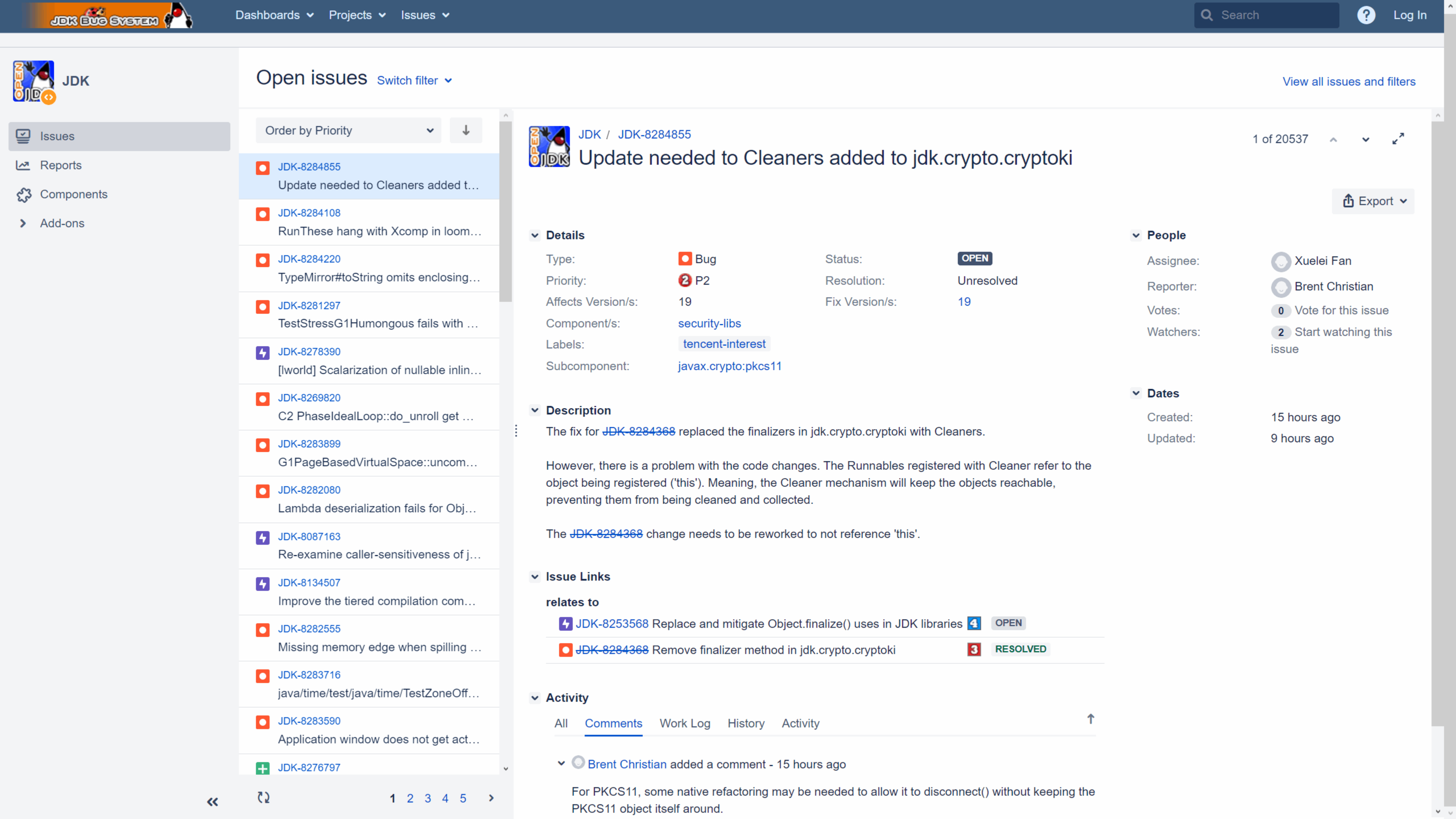
Kona (KONA)

Lead Riaz Aimandi
Open Issues (by priority)
Description Welcome to your project

Everything you need to know about how your project is running is tracked on this page. As your project evolves, the information will be updated. Use the tabs on the left to navigate within your project.

Describe your project here

Change the project description to include details about your project.



Open issues

- JDK-8284855 Update needed to Cleaners added t…
- JDK-8284108 RunThese hang with Xcomp in loom…
- JDK-8284220 TypeMirror#toString omits enclosing…
- JDK-8281297 TestStressG1Humongous fails with …
- JDK-8278390 [lworld] Scalarization of nullable inlin…
- JDK-8269820 C2 PhaseIdealLoop::do_unroll get …
- JDK-8283899 G1PageBasedVirtualSpace::uncom…
- JDK-8282080 Lambda deserialization fails for Obj…
- JDK-8087163 Re-examine caller-sensitiveness of j…
- JDK-8134507 Improve the tiered compilation com…
- JDK-8282555 Missing memory edge when spilling …
- JDK-8283716 java/time/test/java/time/TestZoneOff…
- JDK-8283590 Application window does not get act…
- JDK-8276797

JDK / JDK-8284855

Update needed to Cleaners added to jdk.crypto.cryptoki

Details

Type:	Bug	Status:	OPEN
Priority:	P2	Resolution:	Unresolved
Affects Version/s:	19	Fix Version/s:	19
Component/s:	security-libs		
Labels:	tencent-interest		
Subcomponent:	javax.crypto:pkcs11		

People

Assignee:	Xuelei Fan
Reporter:	Brent Christian
Votes:	0 Vote for this issue
Watchers:	2 Start watching this issue

Dates

Created:	15 hours ago
Updated:	9 hours ago

Description

The fix for ~~JDK-8284368~~ replaced the finalizers in jdk.crypto.cryptoki with Cleaners.

However, there is a problem with the code changes. The Runnables registered with Cleaner refer to the object being registered ('this'). Meaning, the Cleaner mechanism will keep the objects reachable, preventing them from being cleaned and collected.

The ~~JDK-8284368~~ change needs to be reworked to not reference 'this'.

Issue Links

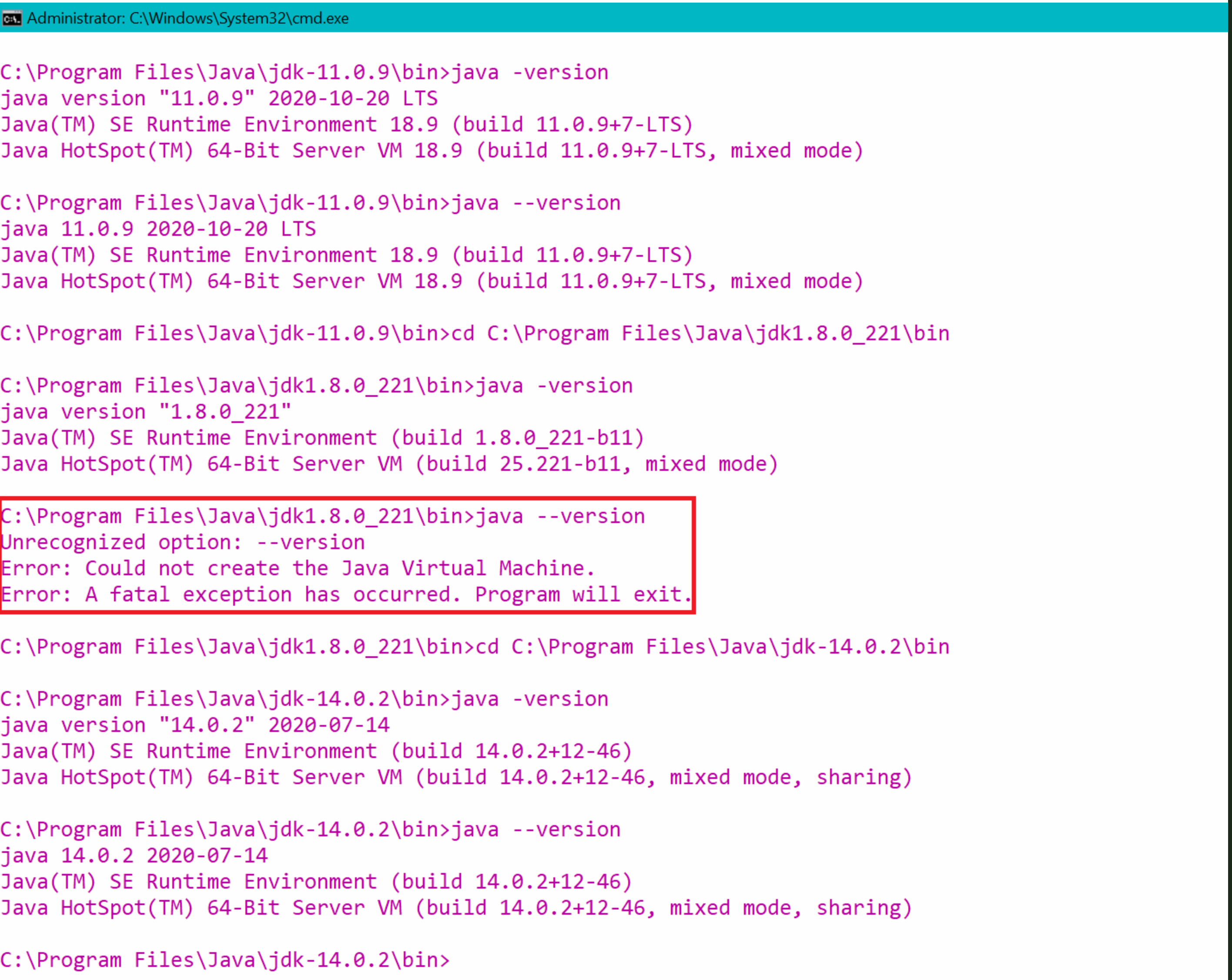
relates to

- JDK-8253568 Replace and mitigate Object.finalize() uses in JDK libraries 4 OPEN
- ~~JDK-8284368~~ Remove finalizer method in jdk.crypto.cryptoki 3 RESOLVED

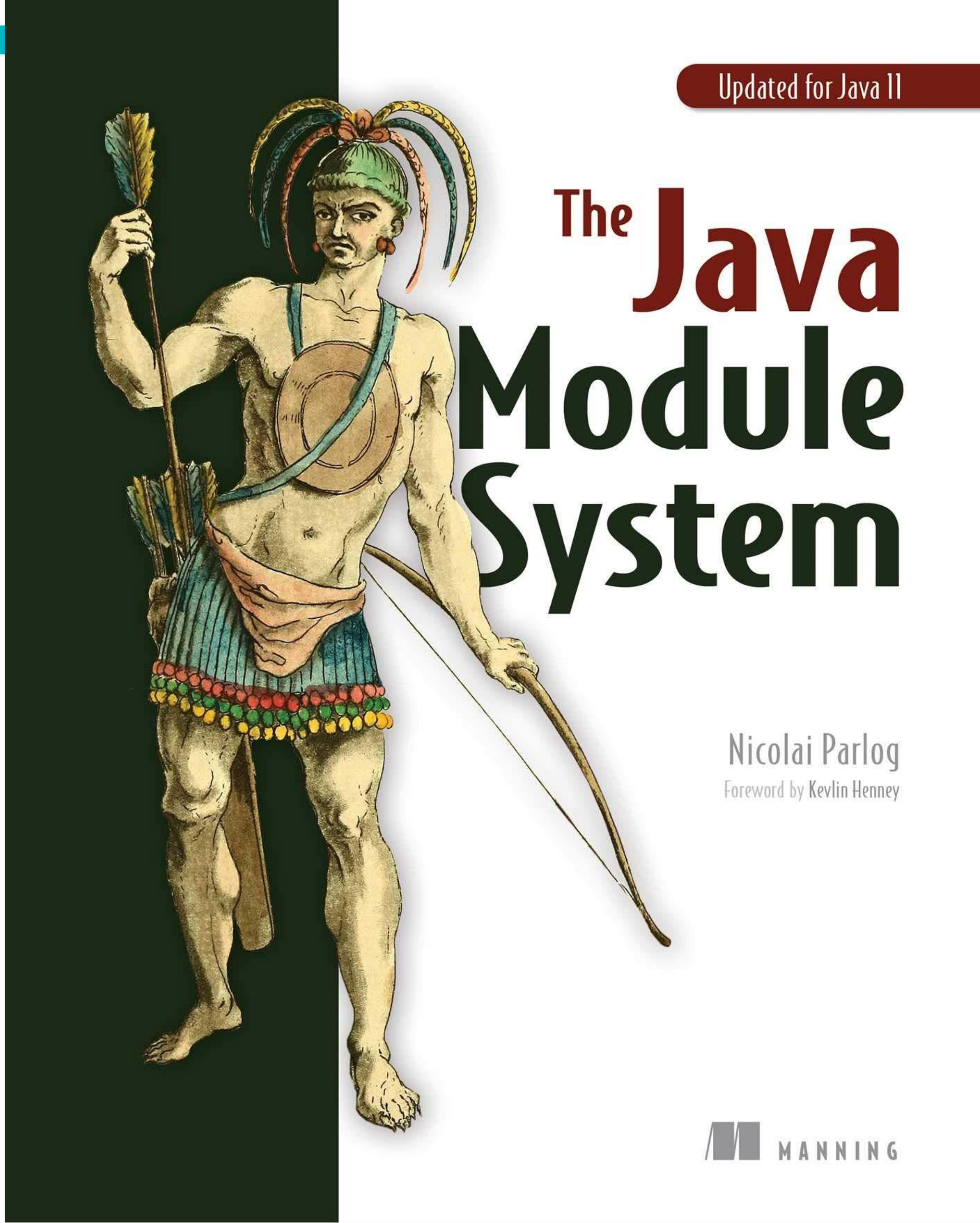
Activity

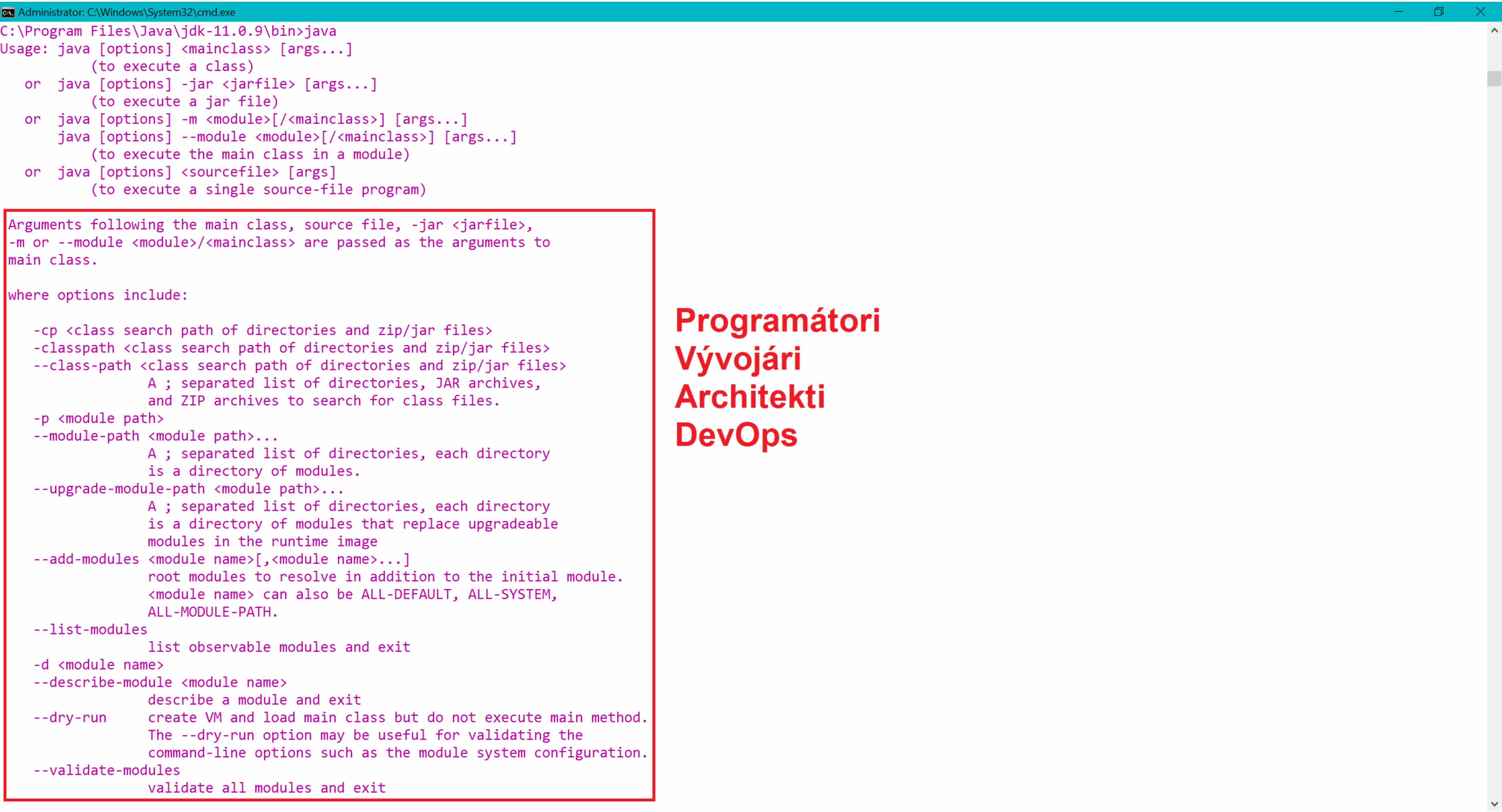
Brent Christian added a comment - 15 hours ago

For PKCS11, some native refactoring may be needed to allow it to disconnect() without keeping the PKCS11 object itself around.



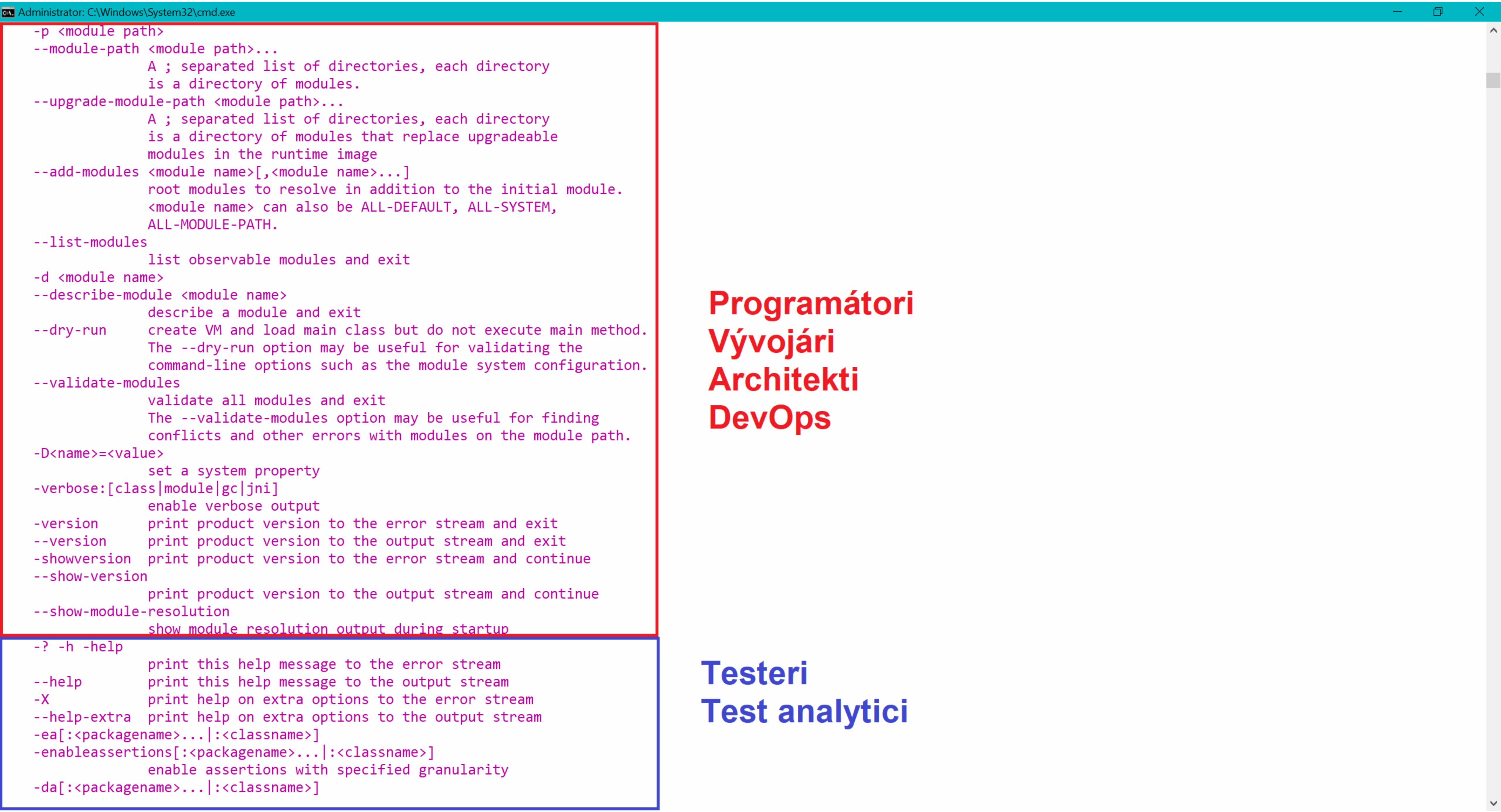
```
C:\Program Files\Java\jdk-11.0.9\bin>java -version
java version "11.0.9" 2020-10-20 LTS
Java(TM) SE Runtime Environment 18.9 (build 11.0.9+7-LTS)
Java HotSpot(TM) 64-Bit Server VM 18.9 (build 11.0.9+7-LTS, mixed mode)

C:\Program Files\Java\jdk-11.0.9\bin>java --version
java 11.0.9 2020-10-20 LTS
Java(TM) SE Runtime Environment 18.9 (build 11.0.9+7-LTS)
Java HotSpot(TM) 64-Bit Server VM 18.9 (build 11.0.9+7-LTS, mixed mode)

C:\Program Files\Java\jdk-11.0.9\bin>cd C:\Program Files\Java\jdk1.8.0_221\bin

C:\Program Files\Java\jdk1.8.0_221\bin>java -version
java version "1.8.0_221"
Java(TM) SE Runtime Environment (build 1.8.0_221-b11)
Java HotSpot(TM) 64-Bit Server VM (build 25.221-b11, mixed mode)

C:\Program Files\Java\jdk1.8.0_221\bin>java --version
Unrecognized option: --version
Error: Could not create the Java Virtual Machine.
Error: A fatal exception has occurred. Program will exit.

C:\Program Files\Java\jdk1.8.0_221\bin>cd C:\Program Files\Java\jdk-14.0.2\bin

C:\Program Files\Java\jdk-14.0.2\bin>java -version
java version "14.0.2" 2020-07-14
Java(TM) SE Runtime Environment (build 14.0.2+12-46)
Java HotSpot(TM) 64-Bit Server VM (build 14.0.2+12-46, mixed mode, sharing)

C:\Program Files\Java\jdk-14.0.2\bin>java --version
java 14.0.2 2020-07-14
Java(TM) SE Runtime Environment (build 14.0.2+12-46)
Java HotSpot(TM) 64-Bit Server VM (build 14.0.2+12-46, mixed mode, sharing)

C:\Program Files\Java\jdk-14.0.2\bin>
```





```
C:\Program Files\Java\jdk-11.0.9\bin>java
Usage: java [options] <mainclass> [args...]
           (to execute a class)
   or  java [options] -jar <jarfile> [args...]
           (to execute a jar file)
   or  java [options] -m <module>[/<mainclass>] [args...]
       java [options] --module <module>[/<mainclass>] [args...]
           (to execute the main class in a module)
   or  java [options] <sourcefile> [args]
           (to execute a single source-file program)

 Arguments following the main class, source file, -jar <jarfile>,
 -m or --module <module>/<mainclass> are passed as the arguments to
 main class.

 where options include:

    -cp <class search path of directories and zip/jar files>
    -classpath <class search path of directories and zip/jar files>
    --class-path <class search path of directories and zip/jar files>
                  A ; separated list of directories, JAR archives,
                  and ZIP archives to search for class files.
    -p <module path>
    --module-path <module path>...
                  A ; separated list of directories, each directory
                  is a directory of modules.
    --upgrade-module-path <module path>...
                  A ; separated list of directories, each directory
                  is a directory of modules that replace upgradeable
                  modules in the runtime image
    --add-modules <module name>[,<module name>...]
                  root modules to resolve in addition to the initial module.
                  <module name> can also be ALL-DEFAULT, ALL-SYSTEM,
                  ALL-MODULE-PATH.
    --list-modules
                  list observable modules and exit
    -d <module name>
    --describe-module <module name>
                  describe a module and exit
    --dry-run     create VM and load main class but do not execute main method.
                  The --dry-run option may be useful for validating the
                  command-line options such as the module system configuration.
    --validate-modules
                  validate all modules and exit
```

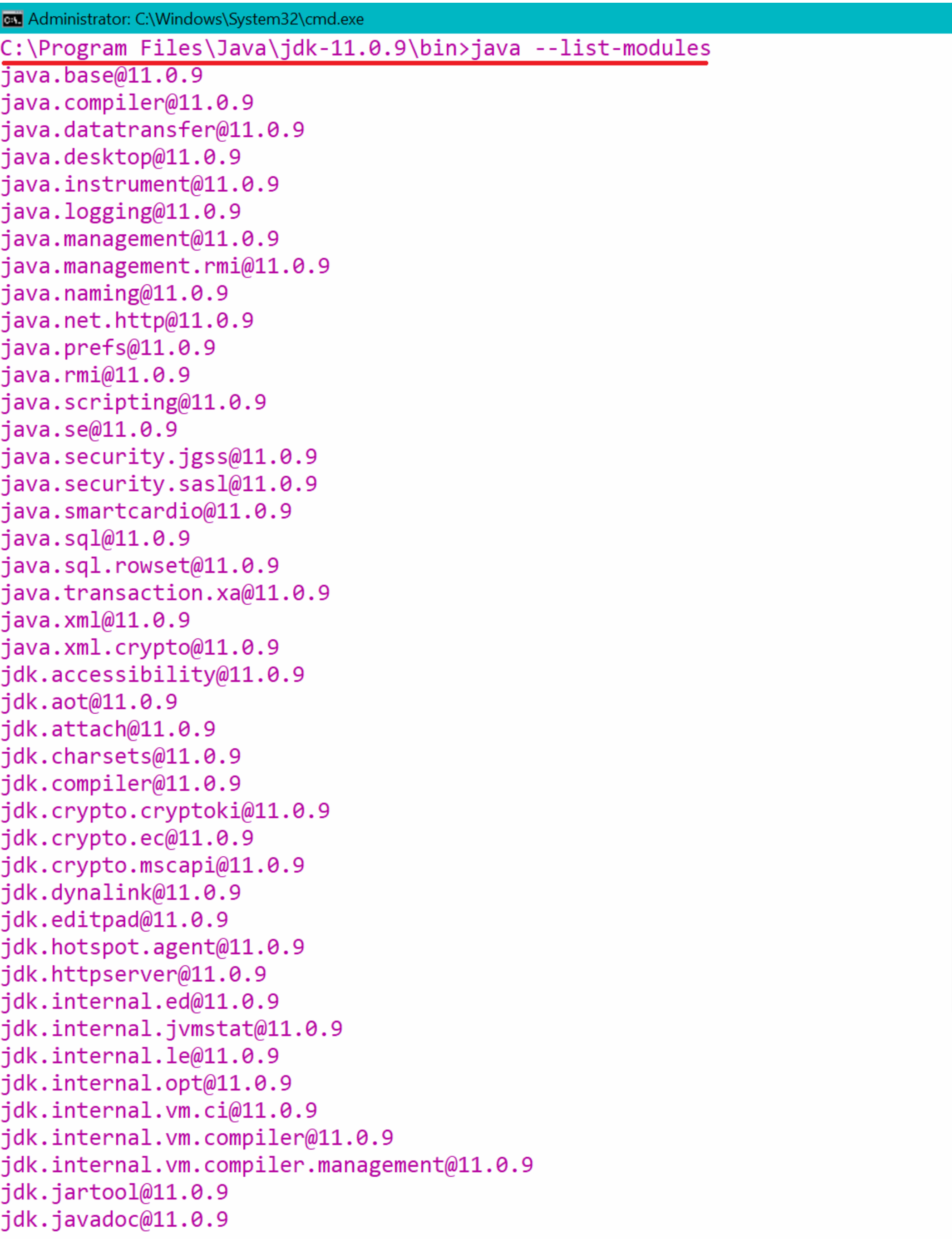
Programátori
Vývojári
Architekti
DevOps



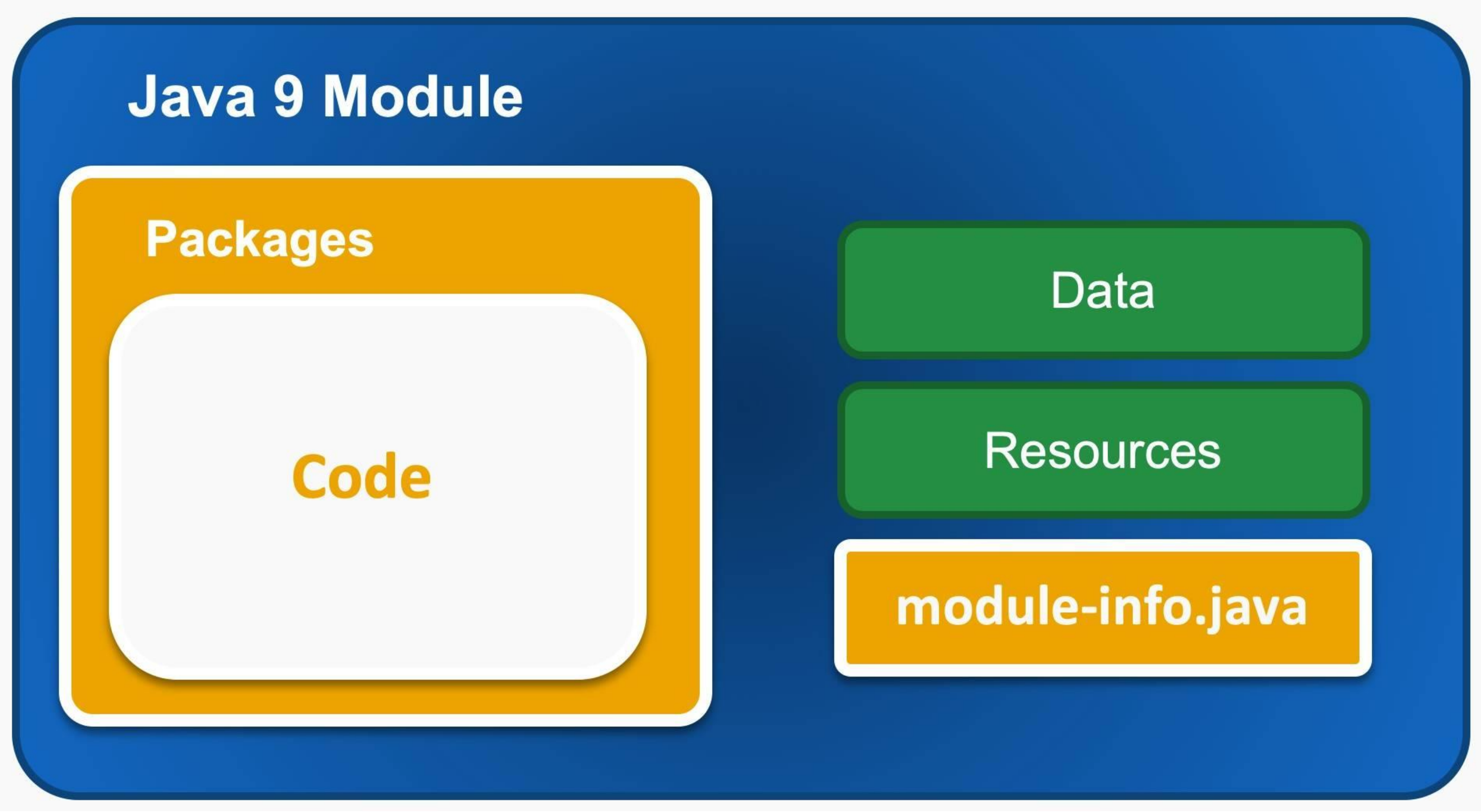
```
    -p <module path>
    --module-path <module path>...
                  A ; separated list of directories, each directory
                  is a directory of modules.
    --upgrade-module-path <module path>...
                  A ; separated list of directories, each directory
                  is a directory of modules that replace upgradeable
                  modules in the runtime image
    --add-modules <module name>[,<module name>...]
                  root modules to resolve in addition to the initial module.
                  <module name> can also be ALL-DEFAULT, ALL-SYSTEM,
                  ALL-MODULE-PATH.
    --list-modules
                  list observable modules and exit
    -d <module name>
    --describe-module <module name>
                  describe a module and exit
    --dry-run     create VM and load main class but do not execute main method.
                  The --dry-run option may be useful for validating the
                  command-line options such as the module system configuration.
    --validate-modules
                  validate all modules and exit
                  The --validate-modules option may be useful for finding
                  conflicts and other errors with modules on the module path.
    -D<name>=<value>
                  set a system property
    -verbose:[class|module|gc|jni]
                  enable verbose output
    -version      print product version to the error stream and exit
    --version     print product version to the output stream and exit
    -showversion  print product version to the error stream and continue
    --show-version
                  print product version to the output stream and continue
    --show-module-resolution
                  show module resolution output during startup
    -? -h -help
                  print this help message to the error stream
    --help        print this help message to the output stream
    -X            print help on extra options to the error stream
    --help-extra  print help on extra options to the output stream
    -ea[:<packagename>...|:<classname>]
    -enableassertions[:<packagename>...|:<classname>]
                  enable assertions with specified granularity
    -da[:<packagename>...|:<classname>]
```

Programátori
Vývojári
Architekti
DevOps

Testeri
Test analytici



```
C:\Program Files\Java\jdk-11.0.9\bin>java --list-modules
java.base@11.0.9
java.compiler@11.0.9
java.datatransfer@11.0.9
java.desktop@11.0.9
java.instrument@11.0.9
java.logging@11.0.9
java.management@11.0.9
java.management.rmi@11.0.9
java.naming@11.0.9
java.net.http@11.0.9
java.prefs@11.0.9
java.rmi@11.0.9
java.scripting@11.0.9
java.se@11.0.9
java.security.jgss@11.0.9
java.security.sasl@11.0.9
java.smartcardio@11.0.9
java.sql@11.0.9
java.sql.rowset@11.0.9
java.transaction.xa@11.0.9
java.xml@11.0.9
java.xml.crypto@11.0.9
jdk.accessibility@11.0.9
jdk.aot@11.0.9
jdk.attach@11.0.9
jdk.charsets@11.0.9
jdk.compiler@11.0.9
jdk.crypto.cryptoki@11.0.9
jdk.crypto.ec@11.0.9
jdk.crypto.mscapi@11.0.9
jdk.dynalink@11.0.9
jdk.editpad@11.0.9
jdk.hotspot.agent@11.0.9
jdk.httpserver@11.0.9
jdk.internal.ed@11.0.9
jdk.internal.jvmstat@11.0.9
jdk.internal.le@11.0.9
jdk.internal.opt@11.0.9
jdk.internal.vm.ci@11.0.9
jdk.internal.vm.compiler@11.0.9
jdk.internal.vm.compiler.management@11.0.9
jdk.jartool@11.0.9
jdk.javadoc@11.0.9
```


Java 9 Module

Packages

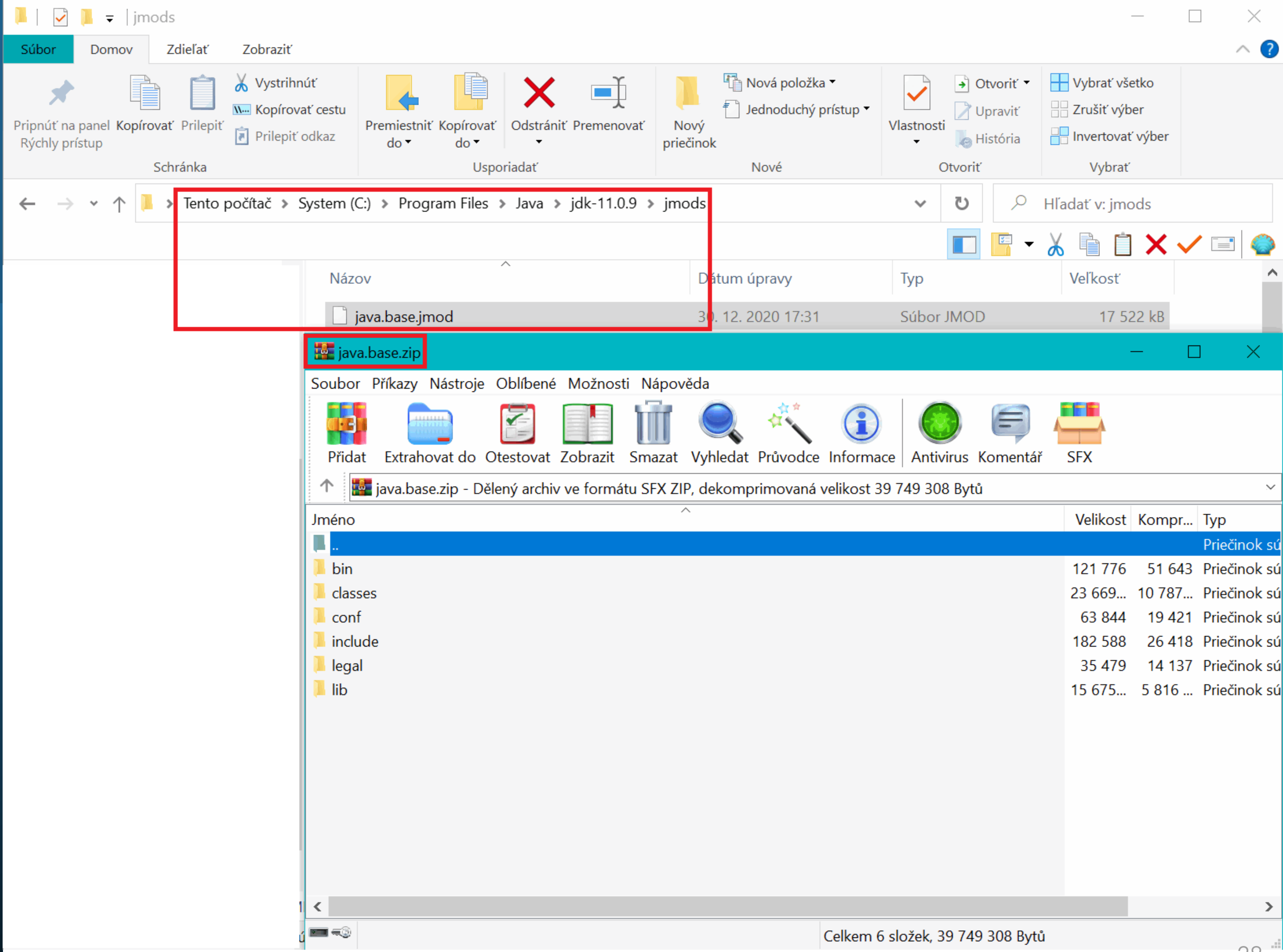
Code

Data

Resources

module-info.java

Jmods (Zip súbory) podobne ako Jar



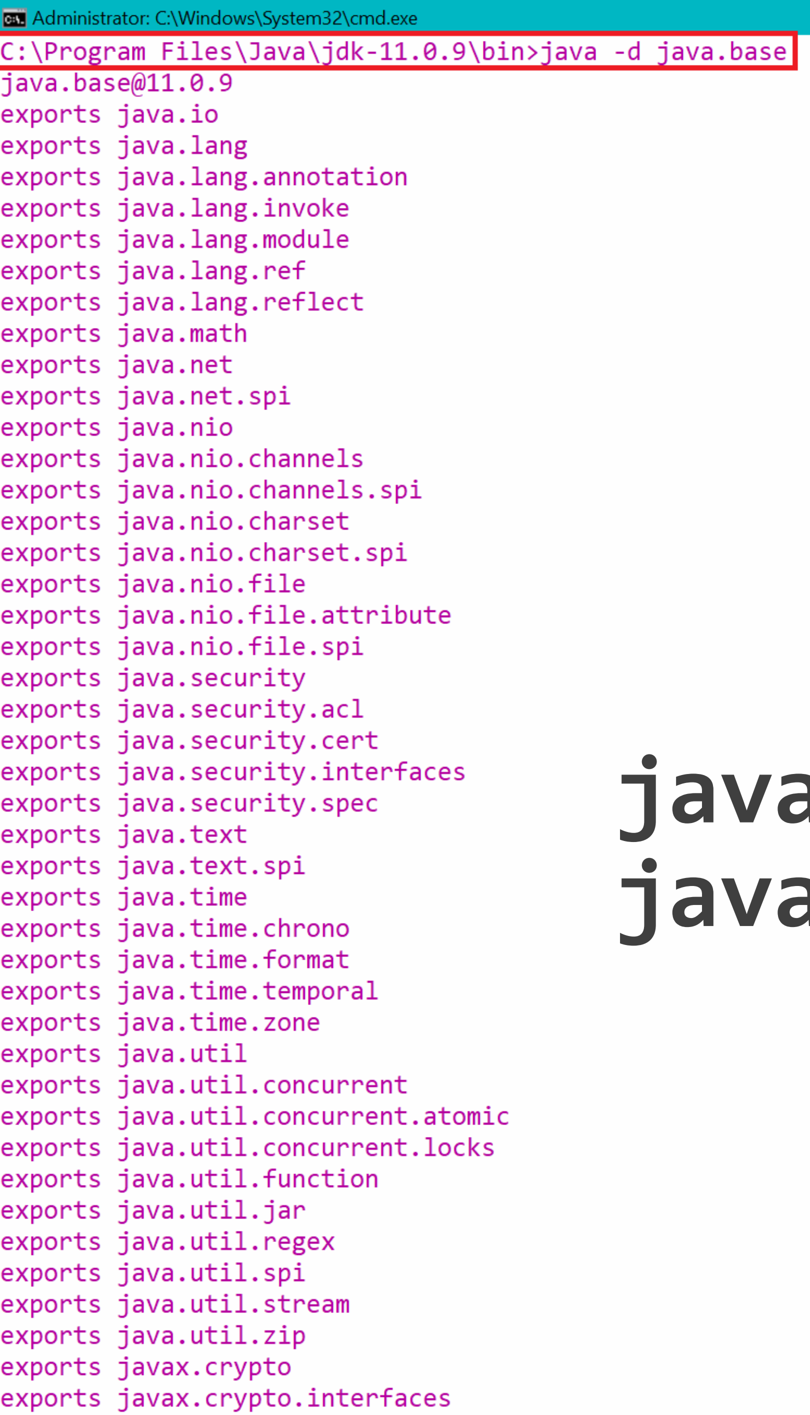
Tento počítač > System (C:) > Program Files > Java > jdk-11.0.9 > jmods

Názov	Dátum úpravy	Typ	Veľkosť
java.base.jmod	30. 12. 2020 17:31	Súbor JMOD	17 522 kB

java.base.zip - Dělený archiv ve formátu SFX ZIP, dekomprimovaná velikost 39 749 308 Bytů

Jméno	Velikost	Kompr...	Typ
..			Priečinok sú
bin	121 776	51 643	Priečinok sú
classes	23 669...	10 787...	Priečinok sú
conf	63 844	19 421	Priečinok sú
include	182 588	26 418	Priečinok sú
legal	35 479	14 137	Priečinok sú
lib	15 675...	5 816 ...	Priečinok sú

Celkem 6 složek, 39 749 308 Bytů



```
C:\Program Files\Java\jdk-11.0.9\bin>java -d java.base
java.base@11.0.9
exports java.io
exports java.lang
exports java.lang.annotation
exports java.lang.invoke
exports java.lang.module
exports java.lang.ref
exports java.lang.reflect
exports java.math
exports java.net
exports java.net.spi
exports java.nio
exports java.nio.channels
exports java.nio.channels.spi
exports java.nio.charset
exports java.nio.charset.spi
exports java.nio.file
exports java.nio.file.attribute
exports java.nio.file.spi
exports java.security
exports java.security.acl
exports java.security.cert
exports java.security.interfaces
exports java.security.spec
exports java.text
exports java.text.spi
exports java.time
exports java.time.chrono
exports java.time.format
exports java.time.temporal
exports java.time.zone
exports java.util
exports java.util.concurrent
exports java.util.concurrent.atomic
exports java.util.concurrent.locks
exports java.util.function
exports java.util.jar
exports java.util.regex
exports java.util.spi
exports java.util.stream
exports java.util.zip
exports javax.crypto
exports javax.crypto.interfaces
```

```
java --describe-module <module name>
java --describe-module java.base
```

Prehľad modulov

Typy modulov

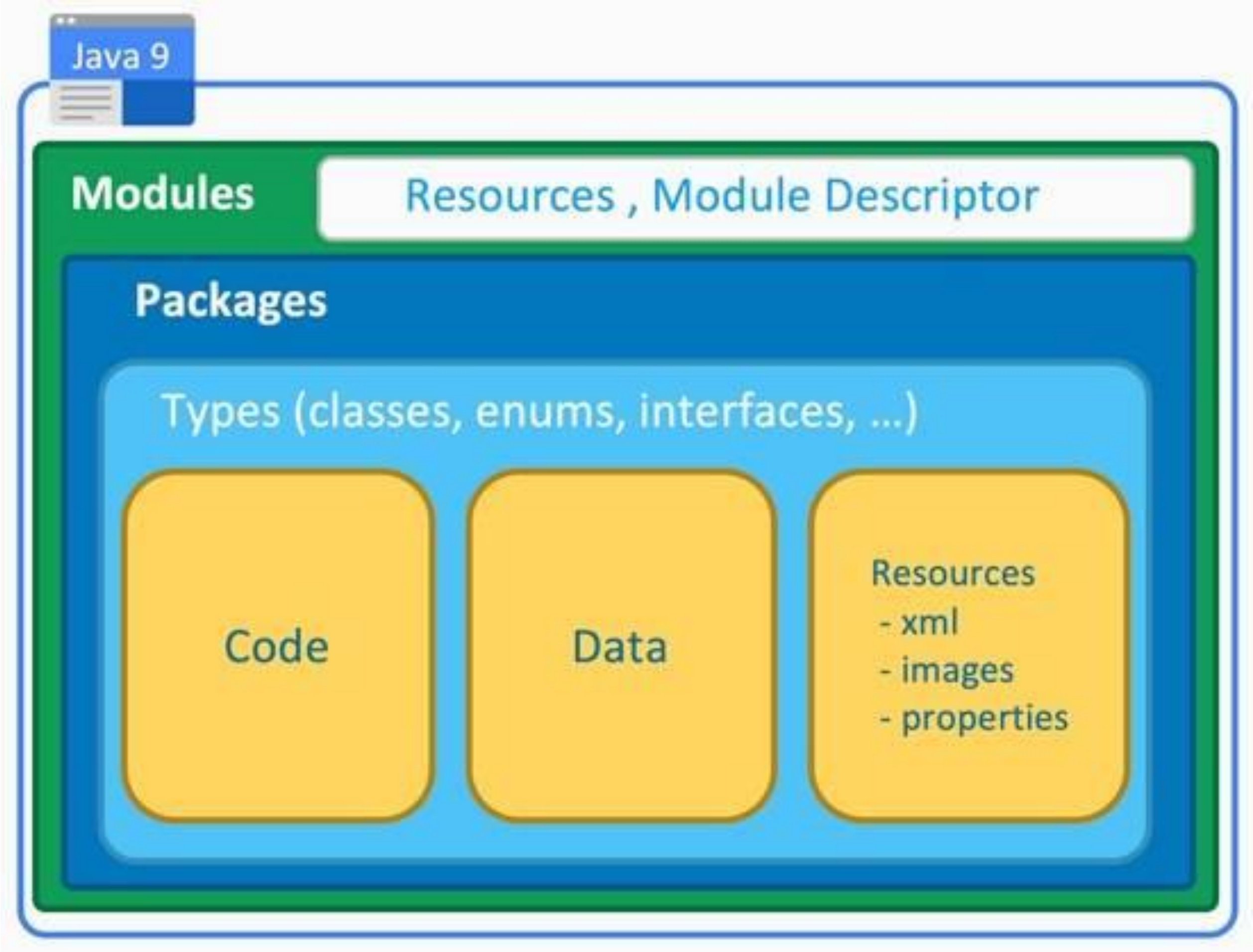
1. **Systemové moduly** - **Java SE a JDK moduly**. Tu máme umiestnené všetky už default poskytované moduly.
2. **Aplikačné moduly** - sú **moduly, ktoré chceme vytvárať**, keď sa rozhodneme, že chceme používať moduly.
3. **Automatické moduly** - **vytvoria sa, keď pridávame JAR súbory na path modulu**. Názov modulu sa preberie z názvu jar súboru. Tieto automatické moduly **majú plný prístup na čítanie do všetkých ostatných modulov načítaných na path**.
4. **Nepomenovaný modul** - **ak sa na path** (nie na module path) **načítajú nejaké triedy alebo jar** súbory, tak tieto triedy a jar súbory sú automaticky pridané do tohto nepomenovaného modulu. Slúži na **spätnú kompatibilitu s predchádzajúcim starším javovským kódom.**

Distribúcia

- **Modul má byť zbalený ako jar súbor** – **1 jar** súbor má obsahovať **max 1 modul.**
- Keď robíme build projektu, **musíme si dať pozor, aby sme zabalili každý modul** v našom projekte ako **samostatný jar.**
- **Každý modul**, ktorý vytvoríme, bude **používať implicitne java.base modul.** Použitie iných modulov bude dostupné po konugurácii.
- Modul **vznikne**, ak **zadefinujeme** v **roote zdrojového kódu modulu súbor module-info.java**.
- **Moduly sa navzájom nevidia** – **nemajú prístup jeden do druhého a do tretieho** a tak ďalej.

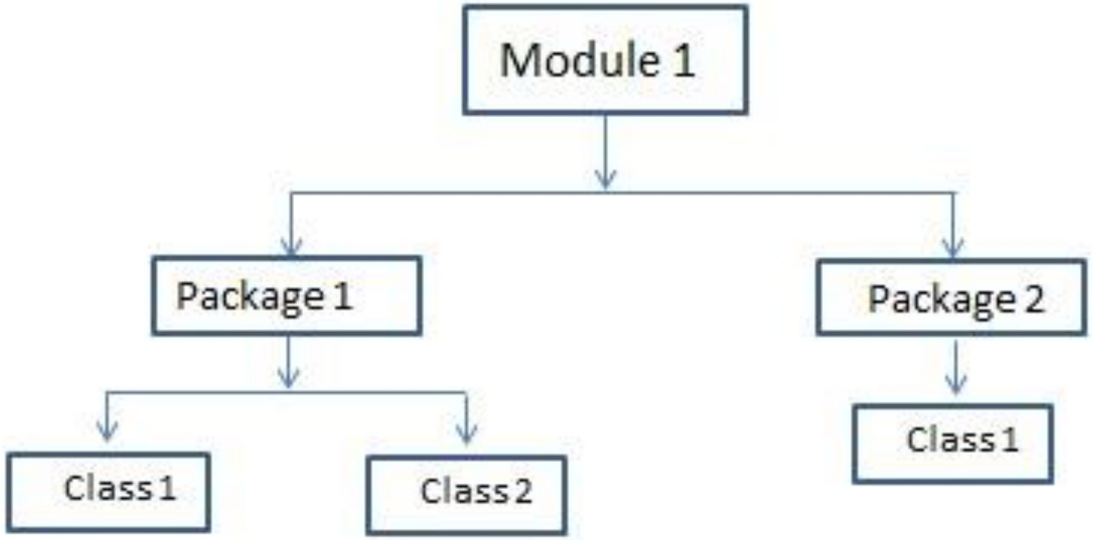
Výhoda modulov

1. Silné zapuzdrenie je hlavnou výhodou modulového systému. Keďže „public“ už nie je prístupný každému. S modulovým systémom môžeme povoliť, aby bola obmedzená množina balíkov prístupná pre vonkajšie aplikácie.
2. Vďaka tomu je vaša aplikacia "odľahčená", takže ju možno spustiť na väčšom počte zariadení.
3. Keďže je odhľahčená, zlepšuje výkon aplikácie.
4. Architektúra, ktorá vám umožňuje rozdeliť vašu aplikáciu do externých balíkov a skrytých balíkov, a teda ľahko dodržiavať princíp oddelenia záujmu (separation of concern principle).
5. Niektoré interné triedy v balíkoch ako sun.security.* , com.sun.crypto.* už nie sú prístupné, pretože tieto balíky sú teraz skryté, čím sa zvyšuje bezpečnosť.


Java 9
Modules
Resources , Module Descriptor
Packages
Types (classes, enums, interfaces, ...)
Code
Data
Resources
- xml
- images
- properties

Príklad modulu

```
//src/java.sql/module-info.java
module java.sql  {
    requires transitive java.logging;
    requires transitive java.xml;
    exports java.sql;
    exports javax.sql;
    exports javax.transaction.xa;
    uses java.sql.Driver;
}
```



Ako vytvoriť a používať moduly

```
\---module-demo
    \---src
        +---sk.stu.kalkulacka
        |   |   module-info.java
        |   |
        |   \---sk
        |       \---stu
        |           \---kalkulacka
        |                   Main.java
        |
        \---sk.stu.matematicka_analyza
            |   module-info.java
            |
            \---sk
                \---stu
                    \--- matematicka_analyza
                            Mocnina.java
```

```
module sk.stu.matematicka_analyza {
    exports sk.stu.matematicka_analyza;
}
```

```
package sk.stu.matematicka_analyza;
public class Mocnina {
 public static double power(double a, double b) {
    double vysledok = Math.pow(a, b);
    System.out.println("Mocnina: " + vysledok);
    return vysledok;
    }
}
```

```
module sk.stu.kalkulacka {
        requires sk.stu.matematicka_analyza;
}
```

Ako vytvoriť a používať moduly

```
package sk.stu.kalkulacka;

import
sk.stu.matematicka_analyza.Mocnina;

public class Main {
public static void main(String[] args)
{
   Mocnina.umocni(Integer.parseInt(args
[0]), Integer.parseInt(args[1]));
   }
}
```

```
>javac -d mods/sk.stu.matematicka_analyza
src/ sk.stu.matematicka_analyza/module-
info.java
src/sk.stu.matematicka_analyza/sk/stu/
matematicka_analyza/Mocnina.java

>javac --module-path mods -d mods/
sk.stu.kalkulacka
src/sk.stu.kalkulacka/module-info.java src/
sk.stu.kalkulacka
/sk/stu/kalkulacka/Main.java

>java --module-path mods -m
sk.stu.kalkulacka / sk.stu.kalkulacka.Main
2 5
Mocnina: 32
```

Java Platform Module System Cheat Sheet

module-info.java file contents

`module module.name` - declares `module.name`

`requires module.name` - this module depends on module `module.name`

`requires transitive module.name` - this means that any module that reads your module implicitly also reads the transitive module or module specifically referenced.

`exports pkg.name` - this module exports public members in package `pkg.name`

`exports pkg.name to module.name` - this module allows the target module to access public members in package `pkg.name`

`uses class.name` - this module declares itself as a consumer for service `class.name`

`provides class.name with class.name.impl` - provides an implementation of a service for others to consume

`opens pkg.name` - allows reflective access to the private members of package `pkg.name`

`opens pkg.name to module.name` - opens private members of package `pkg.name` to the given module

Manifest attributes

`Automatic-Module-Name: module.name` - declares stable module name for non-modularized jar

`Add-Exports: <module>/<package>` - exports the package to all unnamed modules

`Add-Opens: <module>/<package>` - opens the package to all unnamed modules

Java command line options

`--module-path or (-p)` is the module path; its value is one or more directories that contain modules.

`--add-reads src.module=target.module` - a command-line form of a `requires` clause in a module declaration.

`--add-exports src.module/pkg.name=target.module` - a command line form of an exports clause.

`--add-opens src.module/pkg.name=target.module` - a command line form of the open clause in a module description.

`--add-modules` - adds the indicated modules to the default set of root modules.

`--list-modules` - displays the names and version strings of the observable modules.

`--patch-module` - adds or overrides classes in a module. Replaces `-Xbootclasspath/p`.

`--illegal-access=permit|warn|deny` - relaxes strong encapsulation of the module system; Java 9 default is `permit`.

Mechanism	Compile Access	Reflection Access
Export	all code → public	all code → public
Qualified Export	**specified modules → public**	**specified modules → public**
Open Package	none 🚫	all code → private
Qualified Open Package	none 🚫	**specified modules → private**
Open Module	none 🚫	all code → private
Default	none 🚫	none 🚫

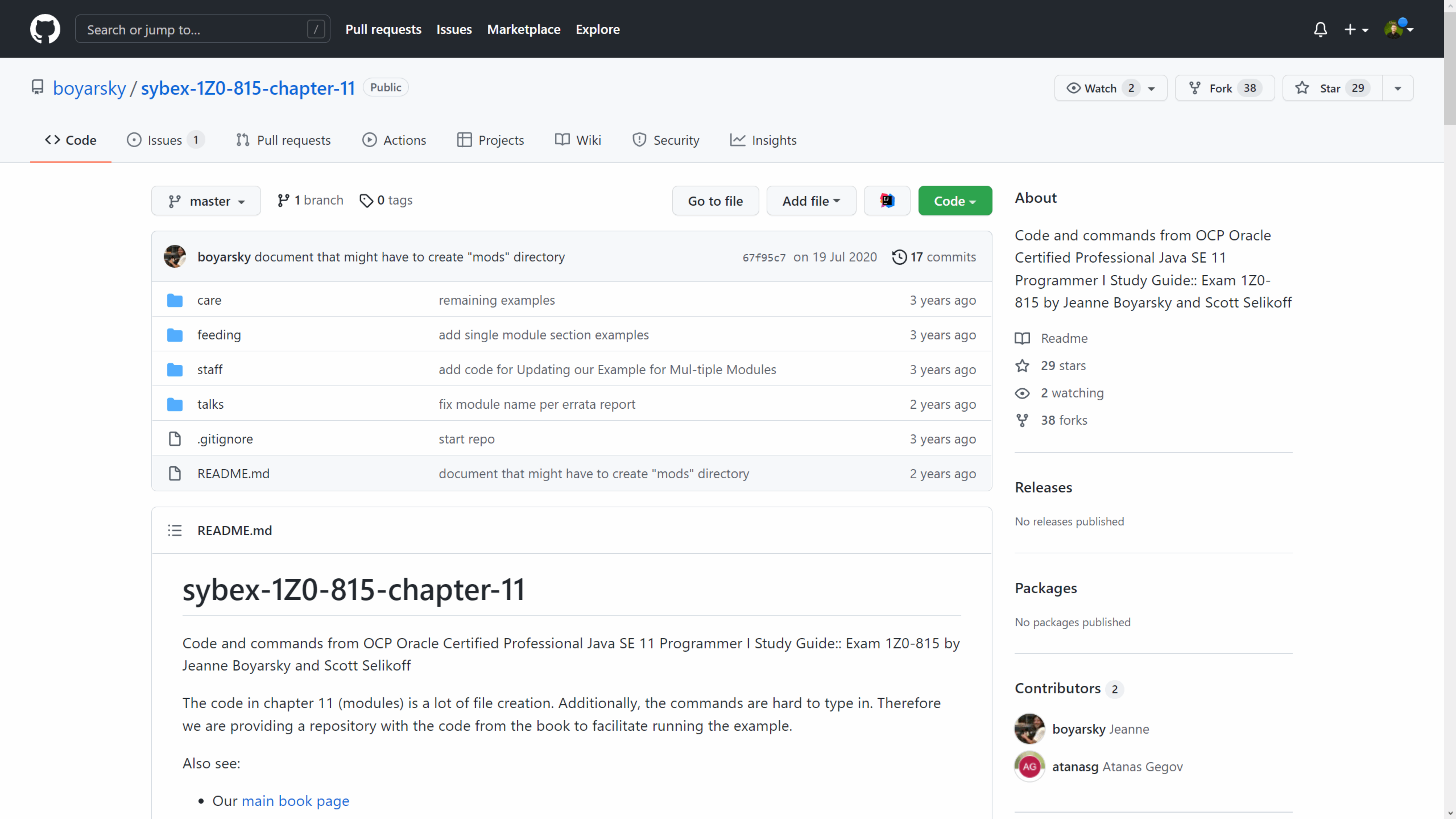
Module types

`Java SE and JDK modules` - modules provided by JDK: `java.base, java.xml`, etc.

`Named application module` - your application modules; contains `module-info.class`; explicitly exports packages; can't read the unnamed module.

`Automatic module` - non-modular jar on the module-path; exports all packages; name derived from the **`Automatic-Module-Name`** `MANIFEST.MF` entry or the filename; can read all modules.

`Unnamed module` - all jars/classes on the classpath; can read all modules.



boyarsky / sybex-1Z0-815-chapter-11 Public

boyarsky document that might have to create "mods" directory 67f95c7 on 19 Jul 2020 17 commits

care	remaining examples	3 years ago
feeding	add single module section examples	3 years ago
staff	add code for Updating our Example for Mul-tiple Modules	3 years ago
talks	fix module name per errata report	2 years ago
.gitignore	start repo	3 years ago
README.md	document that might have to create "mods" directory	2 years ago

README.md

sybex-1Z0-815-chapter-11

Code and commands from OCP Oracle Certified Professional Java SE 11 Programmer I Study Guide:: Exam 1Z0-815 by Jeanne Boyarsky and Scott Selikoff

The code in chapter 11 (modules) is a lot of file creation. Additionally, the commands are hard to type in. Therefore we are providing a repository with the code from the book to facilitate running the example.

Also see:

- Our main book page

About

Code and commands from OCP Oracle Certified Professional Java SE 11 Programmer I Study Guide:: Exam 1Z0-815 by Jeanne Boyarsky and Scott Selikoff

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Packages

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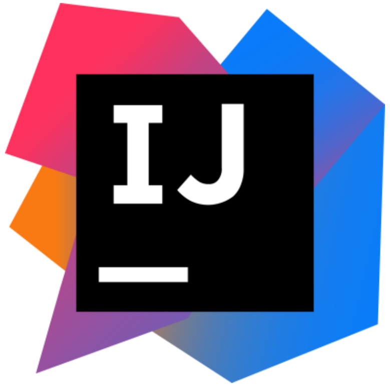
atanasg Atanas Gegov

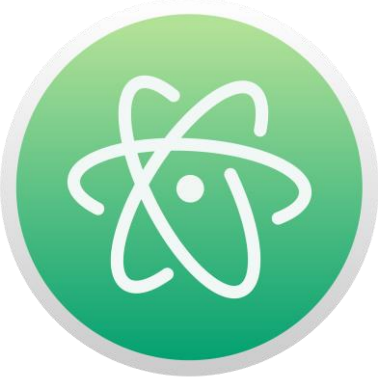
Aké IDE mám použiť?



Integrated development environment

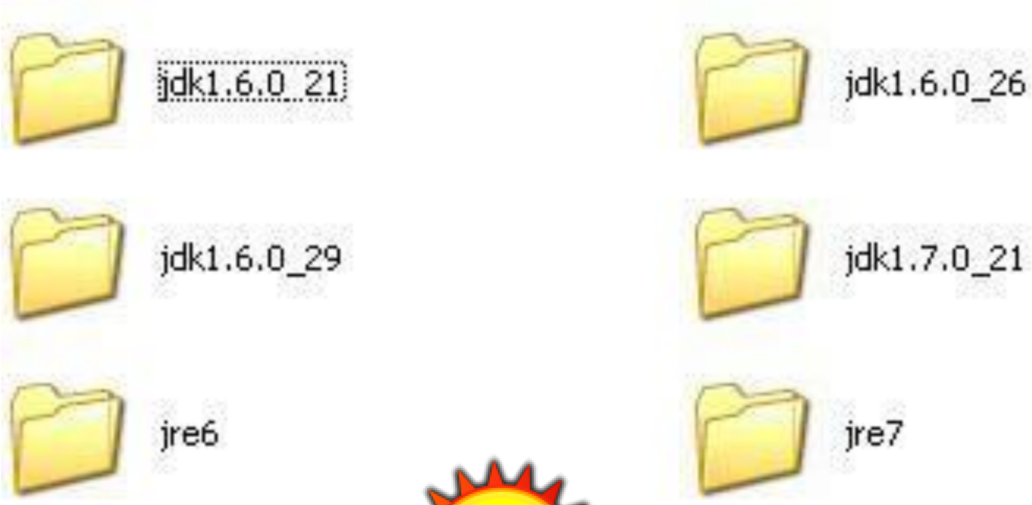
Aký editor mám použiť?

```
                :::
  iLE88Dj.    :jD88888Dj:
.LGitE888D.f8GjjjL8888E;
iE   :8888Et.      .G8888.
;i    E888,         ,8888,
      D888,         :8888:
      D888,         :8888:
      D888,         :8888:
      D888,         :8888:
      888W,         :8888:
      W88W,         :8888:
      W88W:         :8888:
      DGGD:         :8888:
                    :8888:
                    :W888:
                    :8888:
                     E888i
                     tW88D
```



IDE ≠ editor

Updaty a aktualizácie



JavaRa

Java Developers never RIP,
they just get Garbage Collected.

- ilike.nitty-witty.com

Čo sa oplatí prečítať?

Slovensko a Česko

- Albatrosmedia
- Kopp
- Grada
- Wolters Kluwer
- BEN
- Veda

Zahraničie

- O'Reilly
- Manning
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- Apress
- Wiley
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YouTube tutorialy

Packt Publishing

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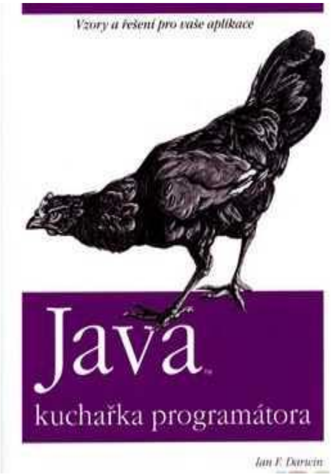
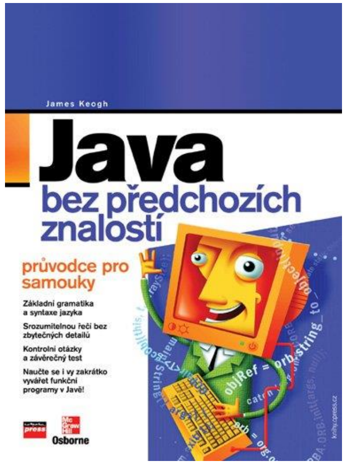
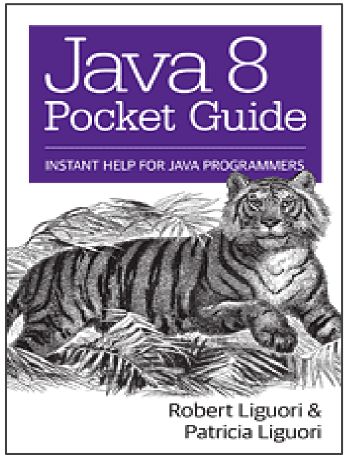
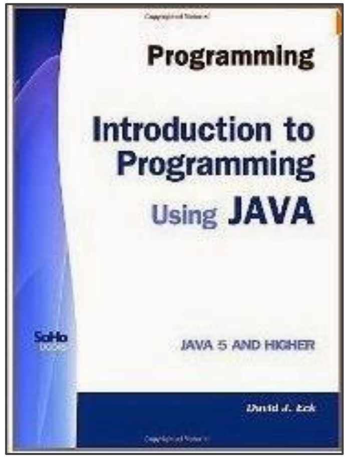


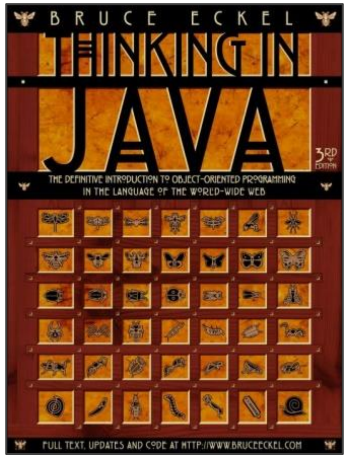

James Keogh
Java
bez předchozích znalostí
průvodce pro samouky
Základní gramatika a syntaxe jazyka
Srozumitelnou řečí bez zbytečných detailů
Kontrolní otázky a závěrečný test
Naučte se i vy zakrátko vytvářet funkční programy v Javě!
Osborne

Mistrovství a Kuchárka

Čo sa oplatí/neoplatí prečítať EN



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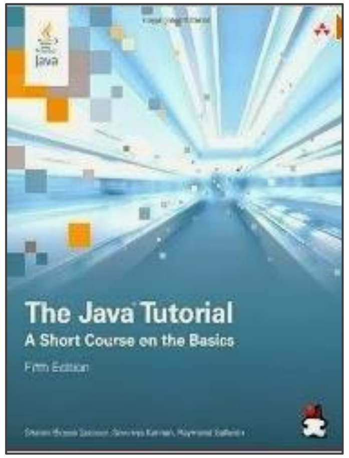
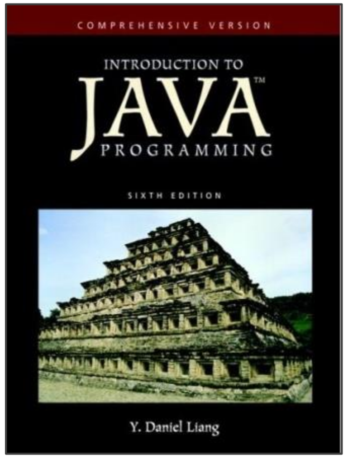
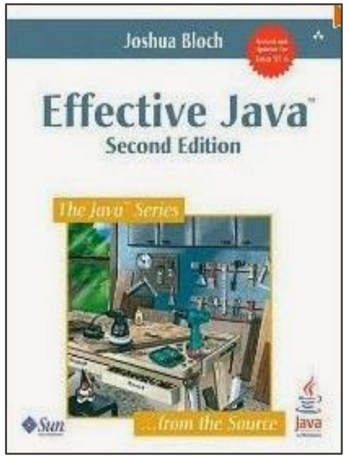
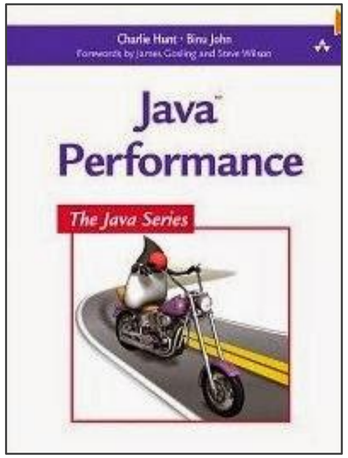
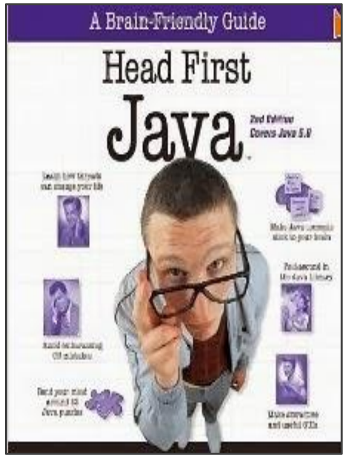
JAVA
3RD EDITION
THE DEFINITIVE INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING IN THE LANGUAGE OF THE WORLD-WIDE WEB
FULL TEXT, UPDATES AND CODE AT HTTP://WWW.BRUCEECKEL.COM



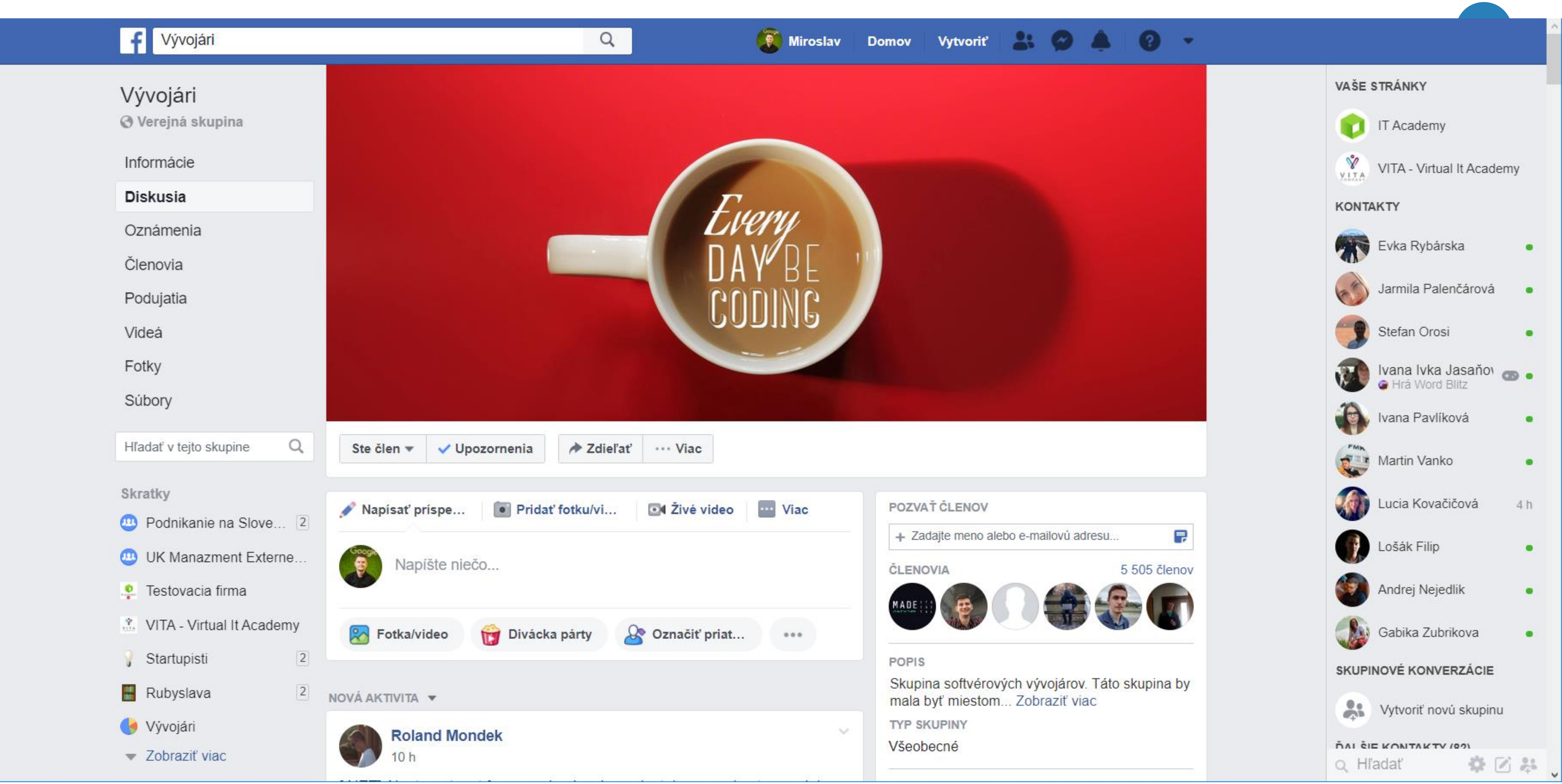








Head First



Vývojári

Verejná skupina

- Informácie
- **Diskusia**
- Oznámenia
- Členovia
- Podujatia
- Videá
- Fotky
- Súbory

Hľadať v tejto skupine

Skratky

Podnikanie na Slove...	2
UK Manazment Externe...	
Testovacia firma	
VITA - Virtual It Academy	
Startupisti	2
Rubyslava	2
Vývojári	

Zobraziť viac

Ste člen ▾ | ✓ Upozornenia | Zdieľať | ··· Viac

Napísať príspe... | Pridať fotku/vi... | Živé video | Viac

Napíšte niečo...

Fotka/video | Divácka párty | Označiť priat... | •••

NOVÁ AKTIVITA ▾

Roland Mondek
10 h

POZVAŤ ČLENOV

+ Zadajte meno alebo e-mailovú adresu...

ČLENOVIA 5 505 členov

POPIS

Skupina softvérových vývojárov. Tato skupina by mala byť miestom... Zobraziť viac

TYP SKUPINY

Všeobecné

VAŠE STRÁNKY

- IT Academy
- VITA - Virtual It Academy

KONTAKTY

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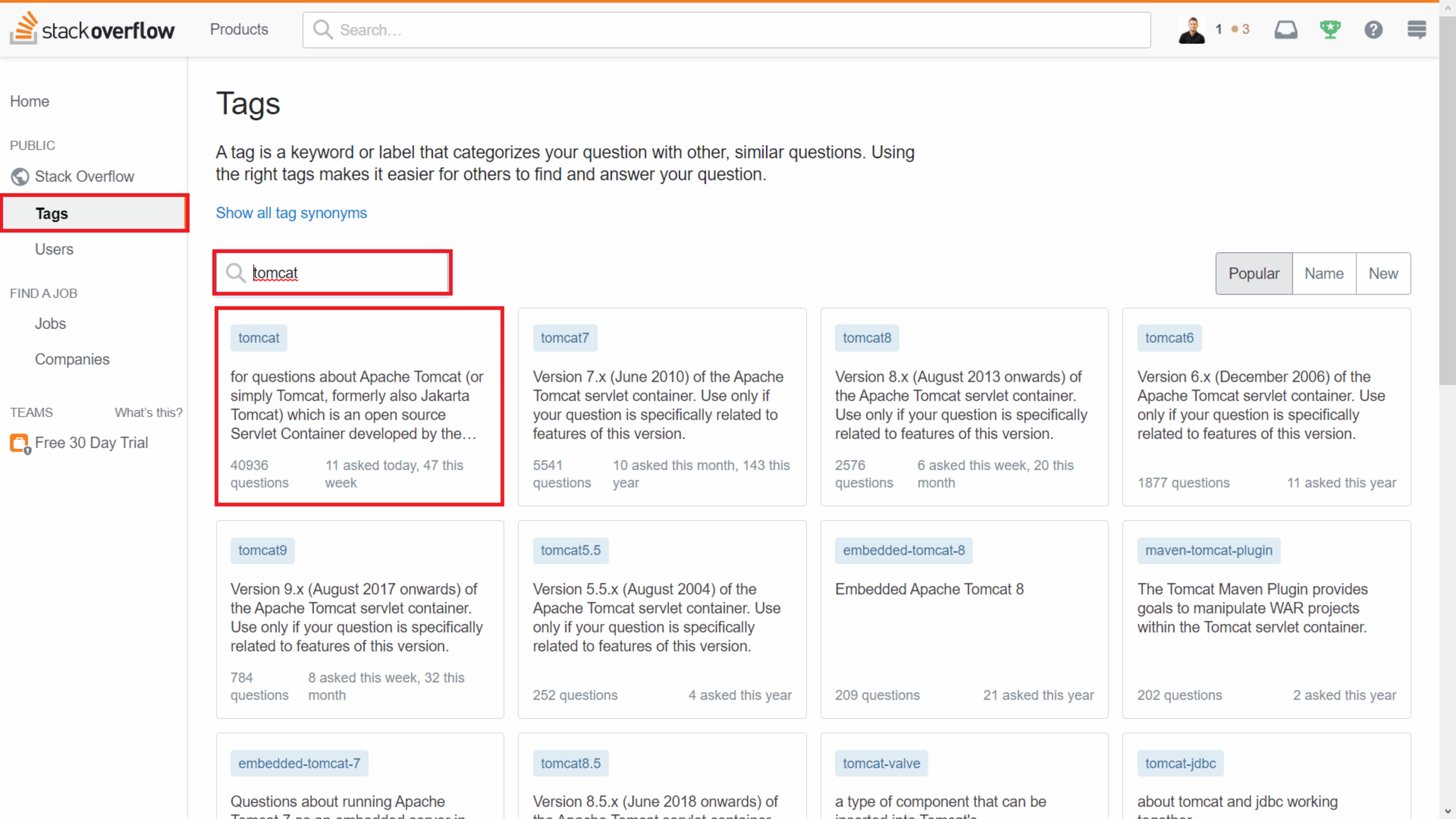
SKUPINOVÉ KONVERZÁCIE

Vytvoriť novú skupinu

ĎALŠIE KONTAKTY (82)

Hľadať



Tags

A tag is a keyword or label that categorizes your question with other, similar questions. Using the right tags makes it easier for others to find and answer your question.

Show all tag synonyms

tomcat

tomcat

for questions about Apache Tomcat (or simply Tomcat, formerly also Jakarta Tomcat) which is an open source Servlet Container developed by the…

40936 questions — 11 asked today, 47 this week

tomcat7

Version 7.x (June 2010) of the Apache Tomcat servlet container. Use only if your question is specifically related to features of this version.

5541 questions — 10 asked this month, 143 this year

tomcat8

Version 8.x (August 2013 onwards) of the Apache Tomcat servlet container. Use only if your question is specifically related to features of this version.

2576 questions — 6 asked this week, 20 this month

tomcat6

Version 6.x (December 2006) of the Apache Tomcat servlet container. Use only if your question is specifically related to features of this version.

1877 questions — 11 asked this year

tomcat9

Version 9.x (August 2017 onwards) of the Apache Tomcat servlet container. Use only if your question is specifically related to features of this version.

784 questions — 8 asked this week, 32 this month

tomcat5.5

Version 5.5.x (August 2004) of the Apache Tomcat servlet container. Use only if your question is specifically related to features of this version.

252 questions — 4 asked this year

embedded-tomcat-8

Embedded Apache Tomcat 8

209 questions — 21 asked this year

maven-tomcat-plugin

The Tomcat Maven Plugin provides goals to manipulate WAR projects within the Tomcat servlet container.

202 questions — 2 asked this year

embedded-tomcat-7

Questions about running Apache

tomcat8.5

Version 8.5.x (June 2018 onwards) of

tomcat-valve

a type of component that can be

tomcat-jdbc

about tomcat and jdbc working

Mrkni na náš YouTube kanál a daj odber

→ WWW.YOUTUBE.COM/C/IT-ACADEMYSK ←