Java Deep Dive - Tajniki Profilowania

Mateusz Grużewski

Architekt, Asseco Data Systems

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Agenda

- Kilka słów o mnie
- Co to jest profilowanie?
- Narzędzia profilujące
- Techniki profilowania
- Optymalizacja aplikacji
- Studium przypadków

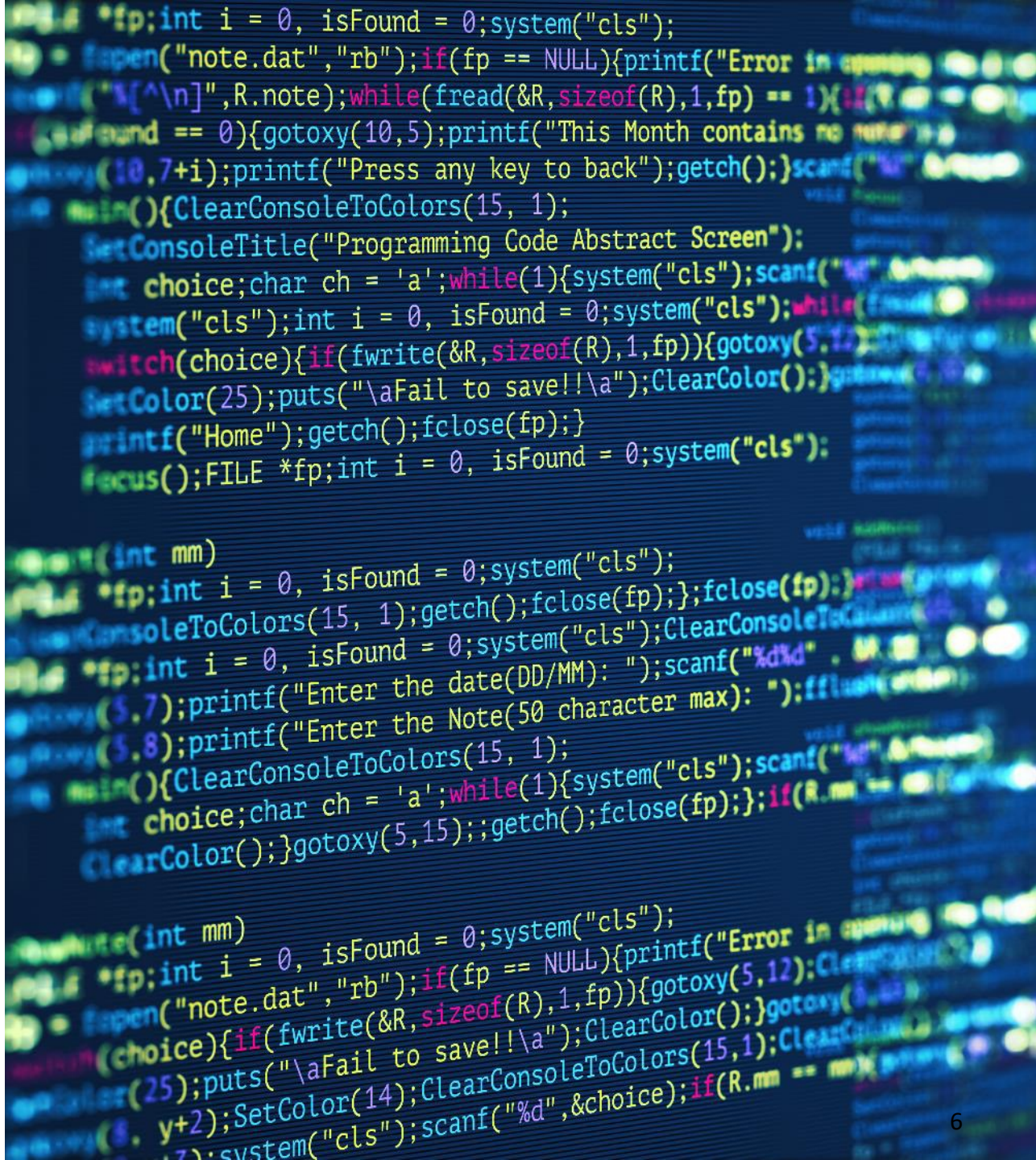
O mnie

- lshadown
- MatGruzewski
- gruzewski.dev
- mateuszgruzewski

asseco DATA SYSTEMS

Co to jest profilowanie?

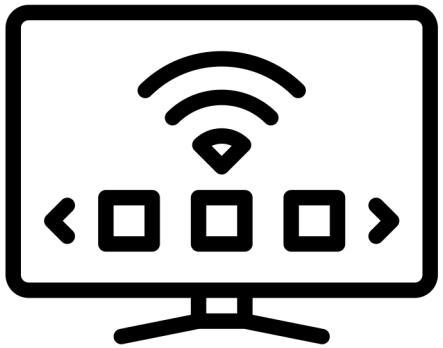
Kiedy profilować aplikacje?

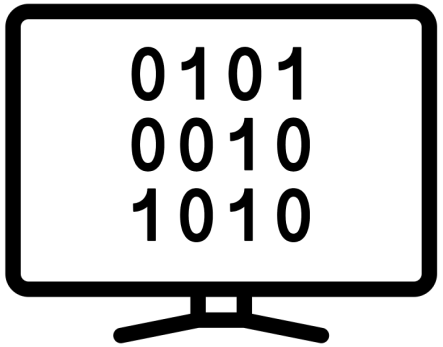


Profilowanie

- Metryki(Micrometer)
- Logi (ELK)
- Tracing (Zipkin)
- Profilowanie JVM

Tryby profilowania

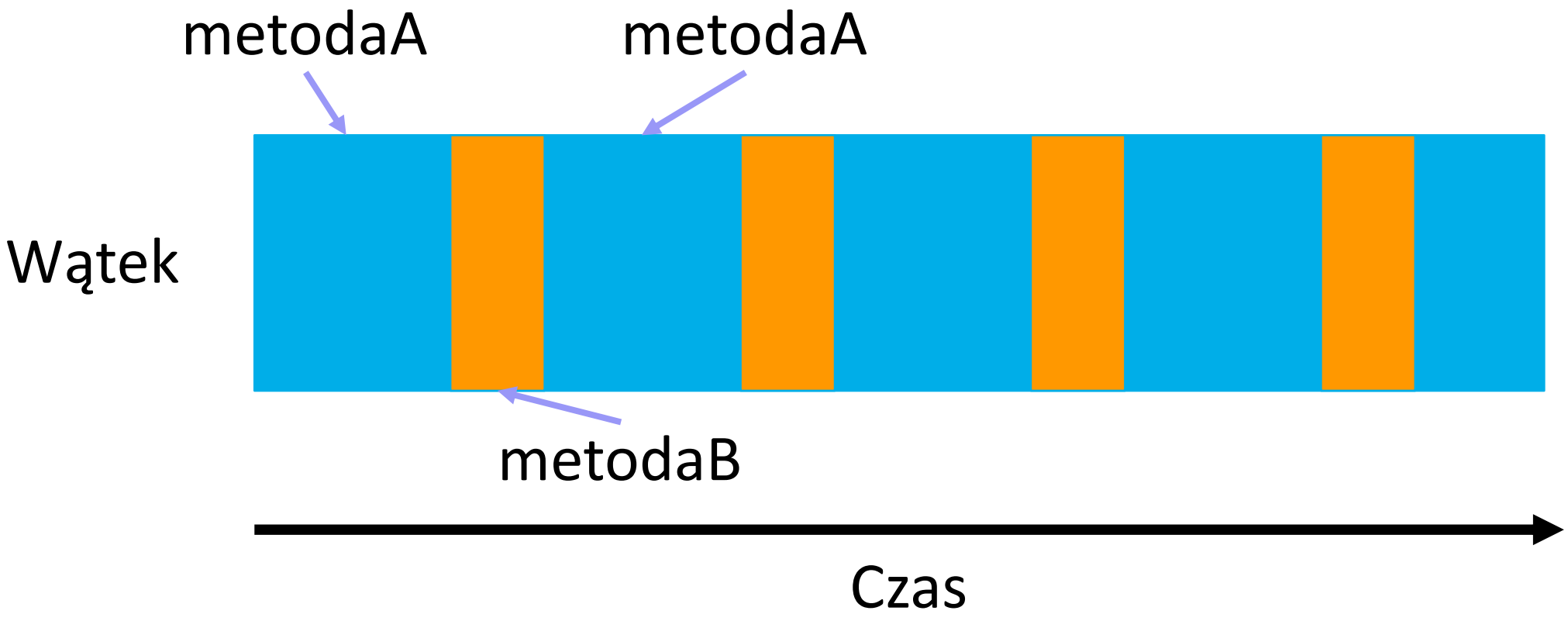




sampling profiling

instrumentation profiling

Sampling profiling


metodaA
metodaA
Wątek
metodaB
Czas

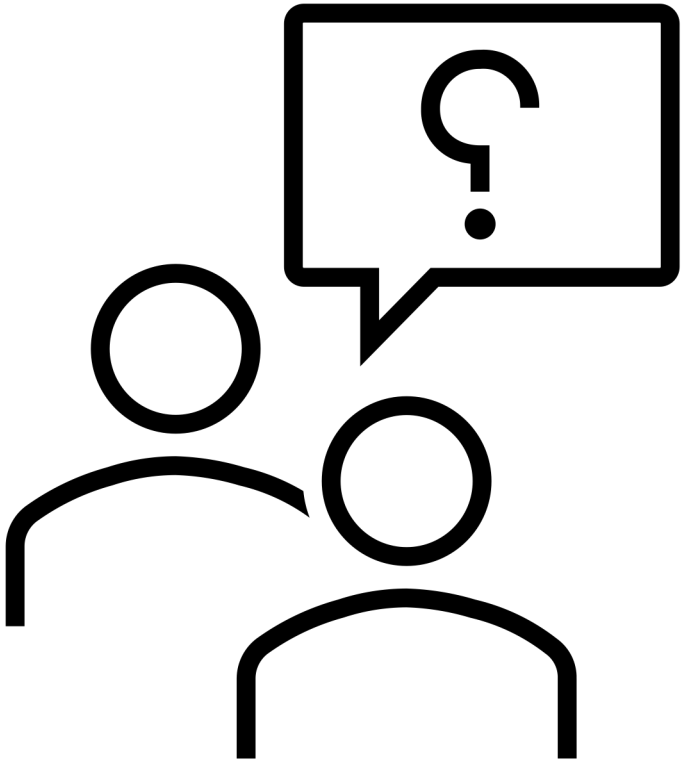
Safepoint bias

Punkty bezpieczeństwa

- Wstrzymane działanie spowodowane synchronizacją
- Oczekiwanie na zakończenie operacji IO
- Oczekiwanie na narzędzie monitorujące
- Wykonanie kodu JNI
- Wątek jest zaparkowany

AsyncGetCallTrace

Instrumentation profiling

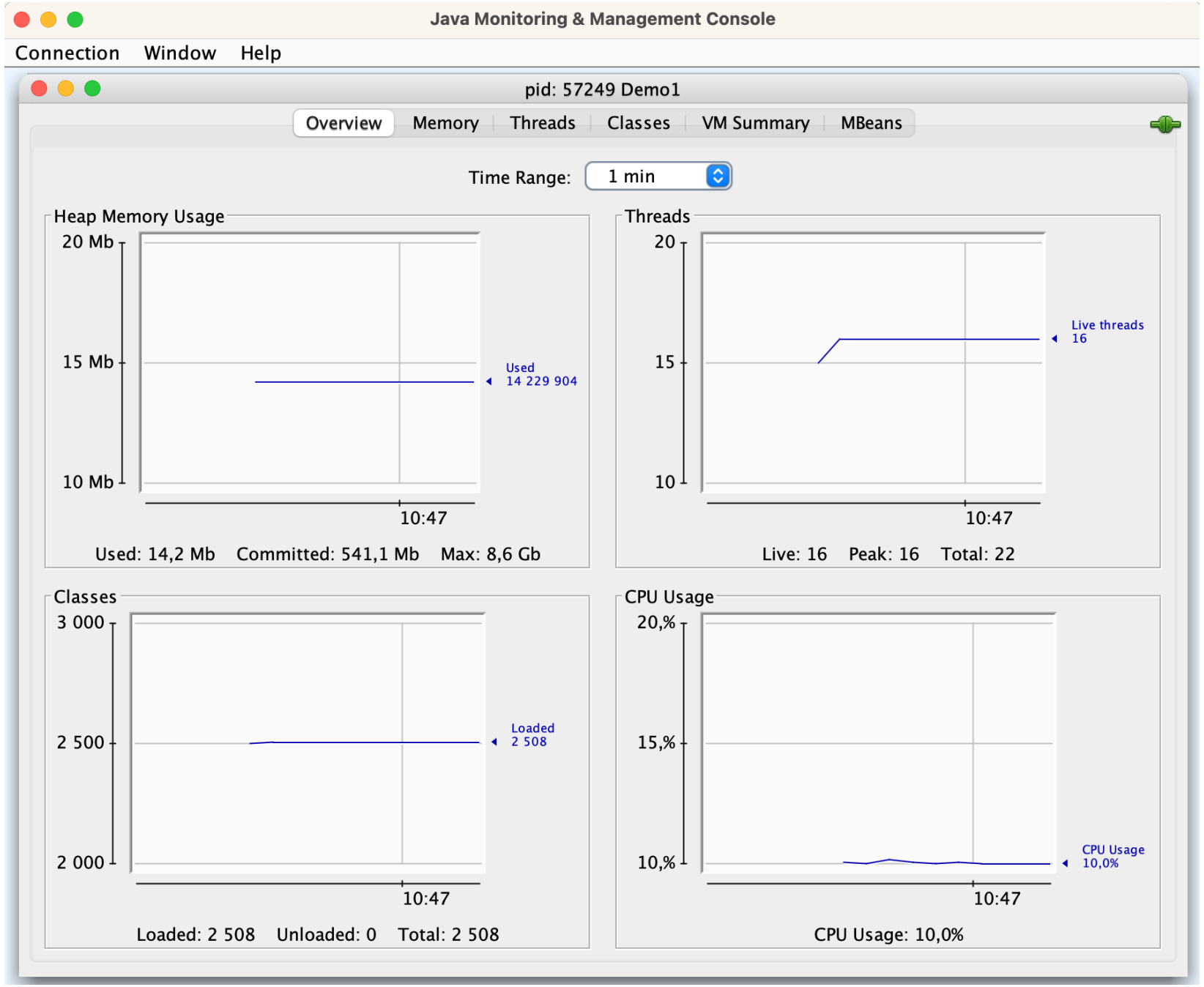


Który tryb kiedy używać?

Narzędzia do profilowania

Darmowe narzędzia do monitorowania

- JConsole
- Jstat


Java Monitoring & Management Console
Connection
Window
Help
pid: 57249 Demo1
Overview
Memory
Threads
Classes
VM Summary
MBeans
Time Range:
1 min
Heap Memory Usage
20 Mb
15 Mb
10 Mb
Used
14 229 904
10:47
Used: 14,2 Mb
Committed: 541,1 Mb
Max: 8,6 Gb
Threads
20
15
10
Live threads
16
10:47
Live: 16
Peak: 16
Total: 22
Classes
3 000
2 500
2 000
Loaded
2 508
10:47
Loaded: 2 508
Unloaded: 0
Total: 2 508
CPU Usage
20,%
15,%
10,%
CPU Usage
10,0%
10:47
CPU Usage: 10,0%

Jstat

Przełączniki

- -class
- -compiler
- -gcutil
- -printcompilation
- I wiele innych

Wykorzystanie

jstat OPCJE_STATYSTYK PID INTERWAŁ

Przełącznik

-class

```
➜  ~ jstat -class 57249 1000
Loaded  Bytes  Unloaded  Bytes     Time
  2517  5136,2        0     0,0     0,08
  2517  5136,2        0     0,0     0,08
  2517  5136,2        0     0,0     0,08
  2517  5136,2        0     0,0     0,08
```

Przełącznik

-gcutil

```
➜  ~ jstat -gcutil 57249 1000
  S0     S1     E      O      M     CCS    YGC     YGCT    FGC    FGCT    CGC    CGCT     GCT
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
   - 100,00  55,56   0,33  97,06  85,75      1    0,003      0    0,000      0    0,000    0,003
```

Przełącznik
-compiler

```
[→  ~ jstat -compiler 57249
 Compiled Failed Invalid   Time   FailedType FailedMethod
     1888      0       0     0,99          0
```

Przełącznik
-printcompilation

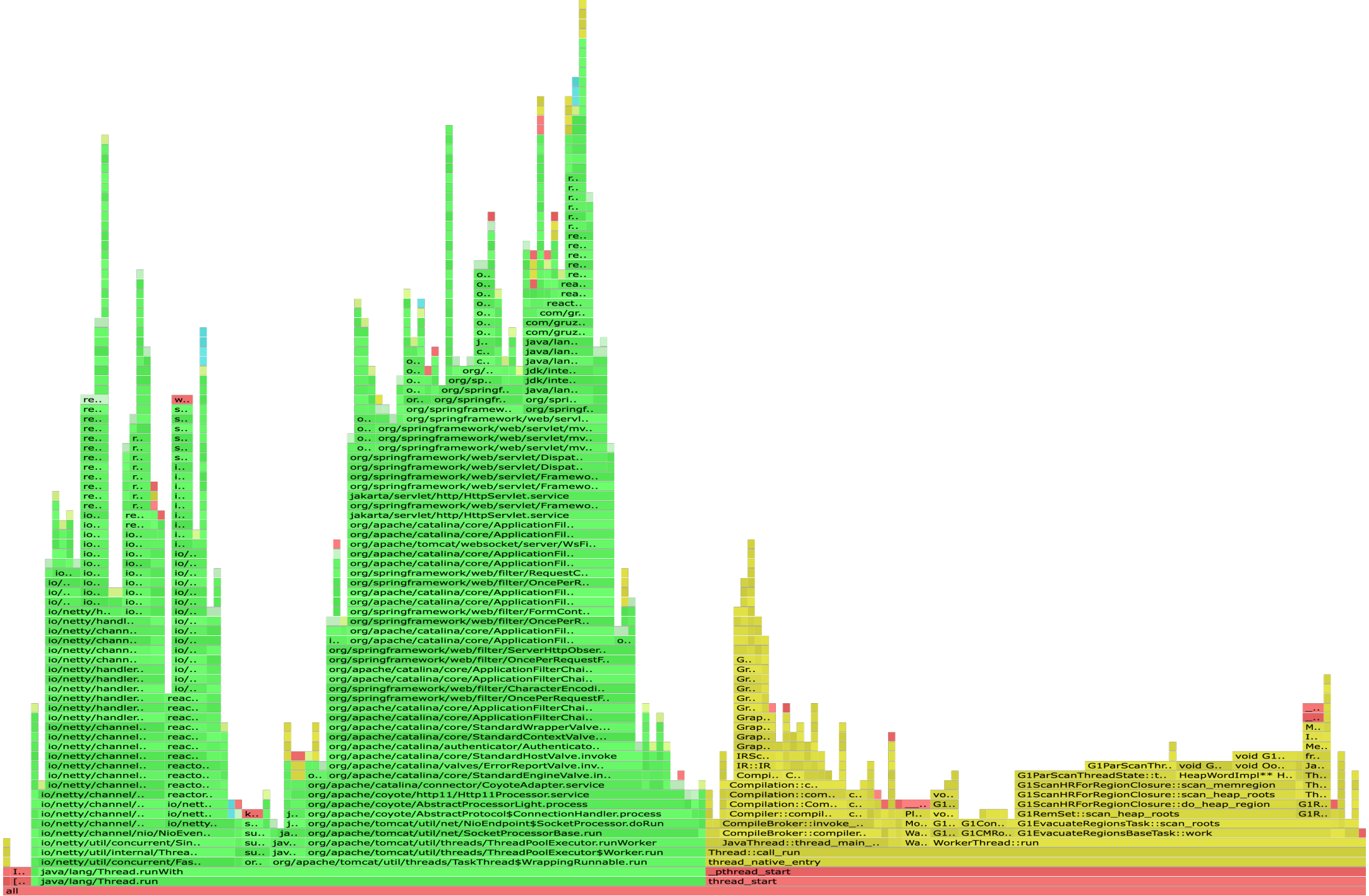
```
[→  ~ jstat -printcompilation 57249 1000
 Compiled  Size  Type Method
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
     1888    10    1 java/util/Collections$UnmodifiableCollection$1 hasNext
```

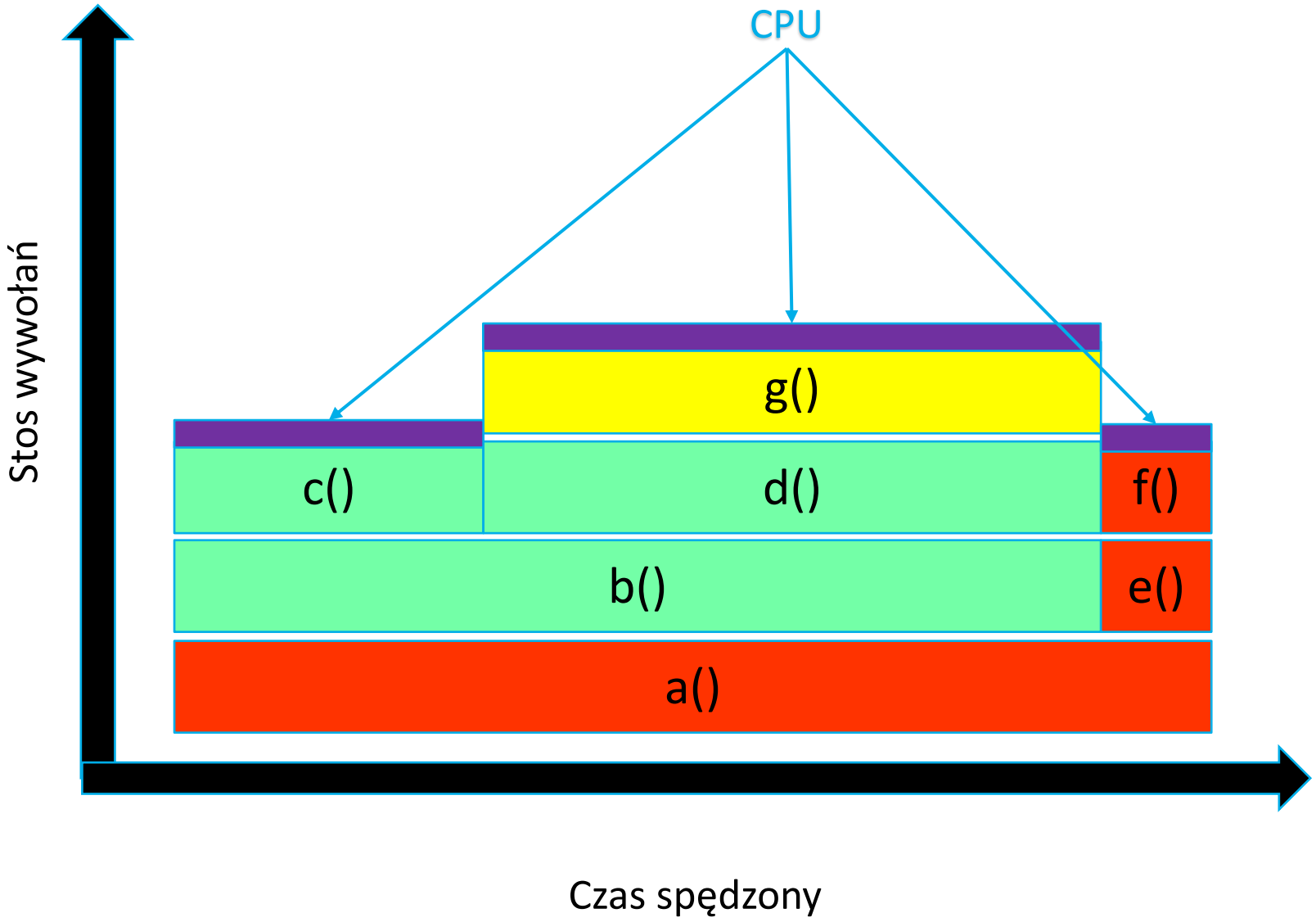
Narzędzia do profilowania

- Jprofiler, YourKit Java Profiler
- JMC, VisualVM
- Async-Profiler

Async-Profiler

Flame Graph


org/springframework/web/servlet/Dispat..
org/springframework/web/servlet/Dispat..
org/springframework/web/servlet/Framewo..
org/springframework/web/servlet/Framewo..
jakarta/servlet/http/HttpServlet.service
org/springframework/web/servlet/Framewo..
jakarta/servlet/http/HttpServlet.service
org/apache/catalina/core/ApplicationFil..
org/apache/catalina/core/ApplicationFil..
org/apache/tomcat/websocket/server/WsFi..
org/apache/catalina/core/ApplicationFil..
org/apache/catalina/core/ApplicationFil..
org/springframework/web/filter/RequestC..
org/springframework/web/filter/OncePerR..
org/apache/catalina/core/ApplicationFil..
org/apache/catalina/core/ApplicationFil..
org/springframework/web/filter/FormCont..
org/springframework/web/filter/OncePerR..
org/apache/catalina/core/ApplicationFil..
org/springframework/web/filter/ServerHttpObser..
org/springframework/web/filter/OncePerRequestF..
org/apache/catalina/core/ApplicationFilterChai..
org/apache/catalina/core/ApplicationFilterChai..
org/springframework/web/filter/CharacterEncodi..
org/springframework/web/filter/OncePerRequestF..
org/apache/catalina/core/ApplicationFilterChai..
org/apache/catalina/core/ApplicationFilterChai..
org/apache/catalina/core/StandardWrapperValve...
org/apache/catalina/core/StandardContextValve...
org/apache/catalina/authenticator/Authenticato..
org/apache/catalina/core/StandardHostValve.invoke
org/apache/catalina/valves/ErrorReportValve.inv..
org/apache/catalina/core/StandardEngineValve.in..
org/apache/catalina/connector/CoyoteAdapter.service
org/apache/coyote/http11/Http11Processor.service
org/apache/coyote/AbstractProcessorLight.process
org/apache/coyote/AbstractProtocol$ConnectionHandler.process
org/apache/tomcat/util/net/NioEndpoint$SocketProcessor.doRun
org/apache/tomcat/util/net/SocketProcessorBase.run
org/apache/tomcat/util/threads/ThreadPoolExecutor.runWorker
org/apache/tomcat/util/threads/ThreadPoolExecutor$Worker.run
org/apache/tomcat/util/threads/TaskThread$WrappingRunnable.run
java/lang/Thread.runWith
java/lang/Thread.run
Compilation::c..
Compilation::com..
Compilation::Com..
Compiler::compil..
CompileBroker::invoke_..
CompileBroker::compiler..
JavaThread::thread_main_..
Thread::call_run
thread_native_entry
_pthread_start
thread_start
G1ParScanThreadState::t..
G1ScanHRForRegionClosure::scan_memregion
G1ScanHRForRegionClosure::scan_heap_roots
G1ScanHRForRegionClosure::do_heap_region
G1RemSet::scan_heap_roots
G1EvacuateRegionsTask::scan_roots
G1EvacuateRegionsBaseTask::work
WorkerThread::run
all


CPU
Stos wywołań
g()
c()
d()
f()
b()
e()
a()
Czas spędzony

Live

Materiały

- [async-profiler]
- [Książka] Java Performance - Scott Oaks
- [JIT - co każdy developer powinien o nim wiedzieć]
- [https://gruzewski.dev/]

Dziękuję za uwagę

Mateusz Grużewski

Architekt, Asseco Data Systems

mateusz.gruzewski@assecods.pl

Ankieta

lshadown

MatGruzewski

gruzewski.dev

mateuszgruzewski

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