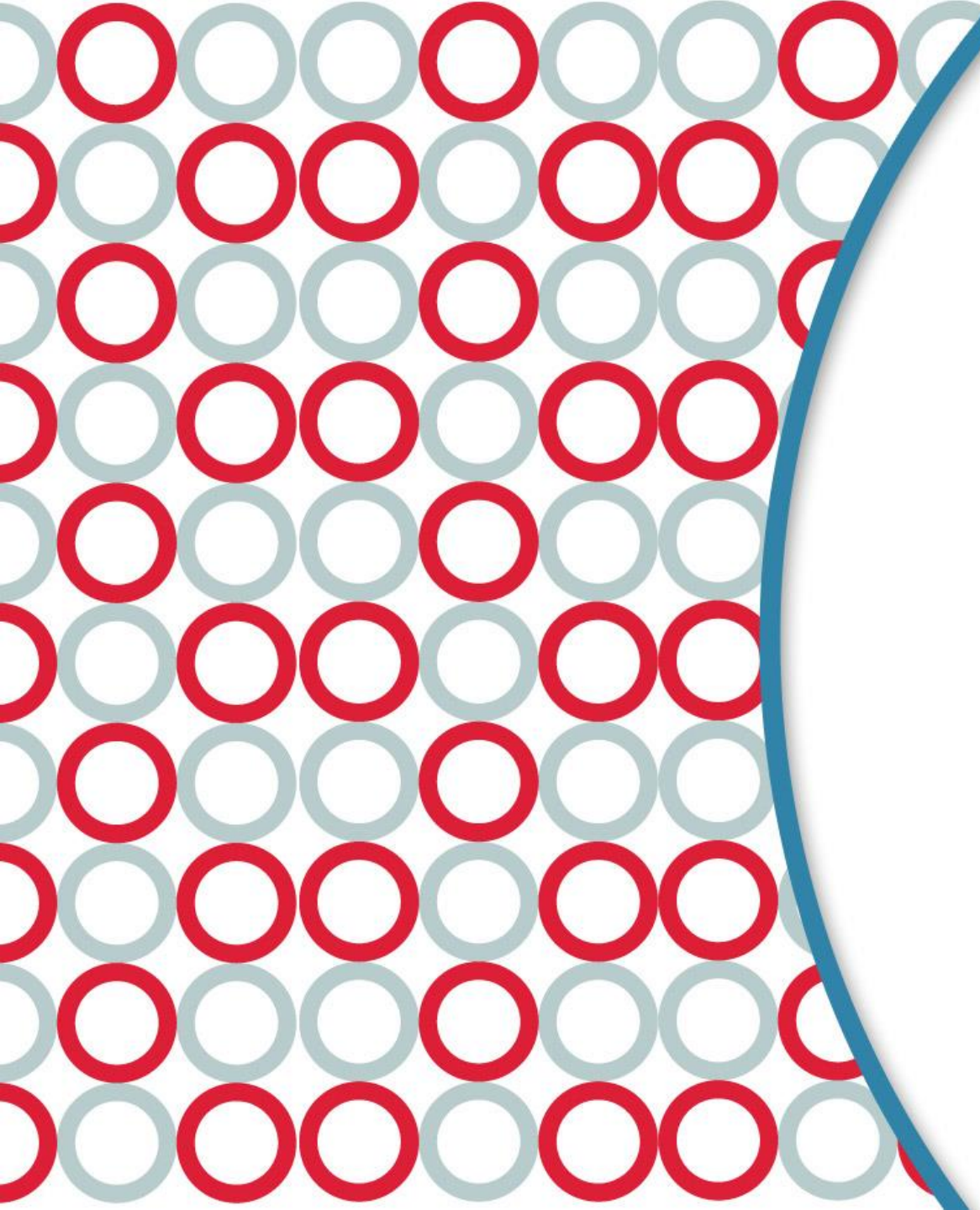

September 2020,
Programming in Java

Programming in Java

Trayan Iliev

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About me

Trayan Iliev

– CEO of IPT – Intellectual Products & Technologies

– Oracle® certified programmer 15+ Y

– end-to-end reactive fullstack apps with Java, ES6/7, TypeScript, Angular, React and Vue.js

– 12+ years IT trainer

– Voxxed Days, jPrime, jProfessionals, BGOUG, BGJUG, DEV.BG speaker

– Organizer RoboLearn hackathons and IoT enthusiast

What Will You Learn?

1. Java classes and objects – 4h
2. Core data structures & generics – 3h
3. OOP principles – Abstraction, Encapsulation, Inheritance, Understanding Polymorphism, SOLID principles – 4h
4. Exception handling – 2h
5. Core Java classes – String, StringBuilder, functional programming, Stream API, Java Date/Time API, NIO2 API, JDBC – 8h
6. Creating Java Application – 2h
7. Debugging – 1h
8. Web basics – 4h

Course Schedule

- Block 1: 13:40 – 15:10
- Pause: 15:10 – 15:20
- Block 2: 15:20 – 16:50
- Lunch: 16:50 – 17:00
- Block 3: 17:00 – 19:00 (18:00 on 14.09 and 17.09)

- Dates: 09 (Wed), 10 (Thu), 14 (Mon), 15 (Tue), 17 (Thu), 18 (Fri) September, 2020
- Project demonstrations: 23.09, 30.09, 18:00 - 19:30h

Where to Find the Code?

Java Web Development projects and examples are available @ GitHub:

https://github.com/iproduct/course-java-fd

Agenda for This Session

- Java Class structure – package, imports, fields, methods, access modifiers;
- Creating objects – constructors, order of initialization, static members, keyword this, constructors overloading;
- Working with methods – designing methods, arguments and return values, overloading, static methods, access modifiers;
- Define the scope of variables – class(static), local, instance variables;
- Apply encapsulation principles to a class;
- Understand objects equality – the difference between “==” and equals();
- Wrapper Classes;
- Distinguish between Object reference and primitive variables, type casting; Methods reference and primitive arguments;
- Enumerations;
- Object lifecycle – destroying objects, garbage collection – finalize();

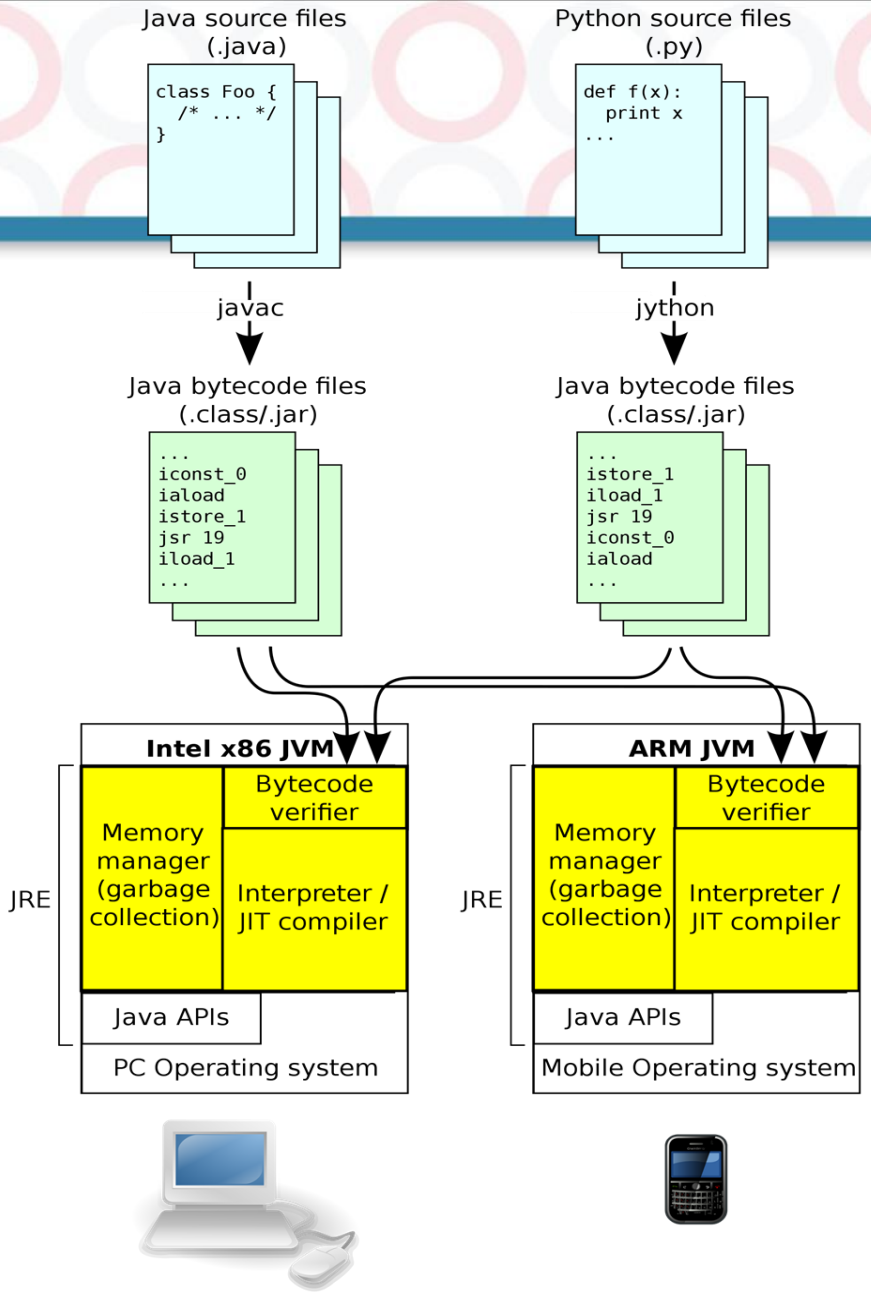
Key Features of Java Language

- Single base hierarchy - inheritance from only one parent class, with the possibility of implementation of multiple interfaces
- Garbage Collector – portability and platform independence, fewer errors
- Secure Code – separation of business logic from the error handling and exceptions
- Multithreading - easy realization of parallel processing
- Persistence – Java Database Connectivity (JDBC) and Java Persistence API (JPA)

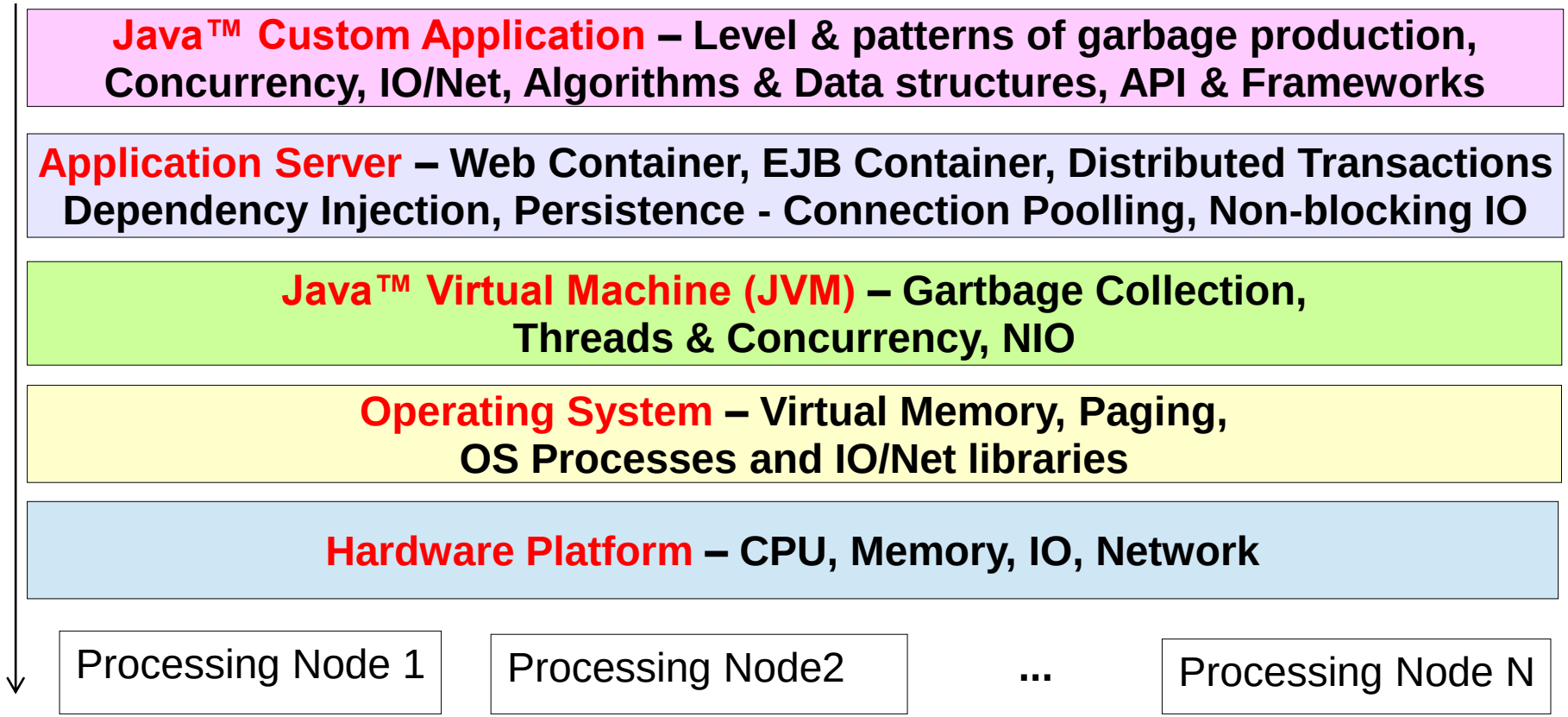
Integrated Development Environments for Java Applications

- Java™ development environment types:
- JavaSE, JavaEE, JavaME, JavaFX
- JavaSE: Java Development Kit (JDK) and Java Runtime Environment (JRE)
- Java™ compiler - javac
- Java Virtual Machine (JVM) - java
- Sourse code → Byte code
- Installing JDK 8+
- Compile and run programs from the command line
- IDEs: IntelliJ IDEA, Eclipse

Java Virtual Machine (JVM)



Java Application Stack



Classes, Objects and References

- Class - set of objects that share a common structure, behaviour and possible links to objects of other classes = objects type
  - ✓ structure = attributes, properties, member variables
  - ✓ behaviour = methods, operations, member functions, messages
  - ✓ relations between classes: association, inheritance, aggregation, composition – modeled as attributes (references to objects from the connected class)
- Objects are instances of the class, which is their addition:
  - ✓ own state
  - ✓ unique identifier = reference pointing towards object

Object (Reference) Data Types

- Creating a class (a new data type)

```
class MyClass { /* attributes and methods of the class */ }
```

- Create an object (instance) from the class MyClass :

```
MyClass myObject = new MyClass();
```

- Declaration and initialization of attributes:

```
class Person {
        String name = “Anonimous”;
        int age;
}
```

- Access to attribute: `Person p1 = new Person();`

```
p1.name = “Ivan Petrov”;        p1.age = 28;
```

Creating Objects

- Class String – modeling string of characters:

– declaration:

```
String s;
```

– initialization (on separate line):

```
s = new String("Hello Java World");
```

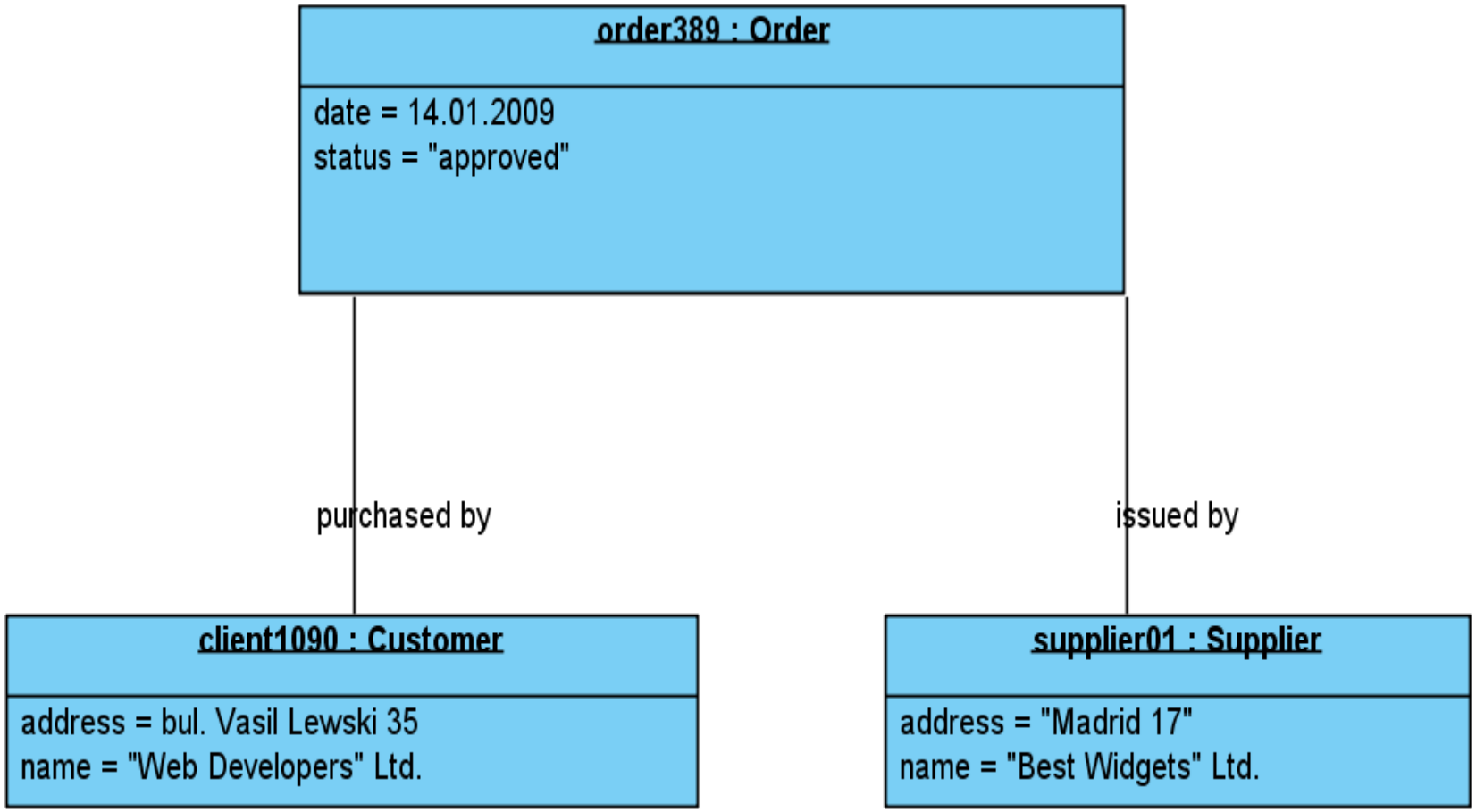
– declaration + initialization:

```
String s = new String("Hello Java World");
```

– declaration + initialization (shorter form, applies only to the class String):

```
String s = "Hello Java World";
```

Object Diagram



Packages and Access Specifiers

- Packages and directories
- Importing packages – import
- Access specifiers
  - **public**
  - **private**
  - **protected**
  - Friendly access – by default within the package

Primitive and Object Data Types

- Primitive data types, object wrapper types and default values for attributes of primitive type
  - boolean --> Boolean — false
  - char --> Character — '\u0000'
  - byte --> Byte — (byte) 0
  - short --> Short — (short) 0
  - int --> Integer — 0
  - long --> Long — 0L
  - float --> Float — 0.0F
  - double --> Double — 0.0D
  - void --> Void

❖BigInteger and BigDecimal - higher-precision numbers

Primitive Type Literals

- in decimal notation:
  int: 145, 2147483647, -2147483648
  long: 145L, -1l, 9223372036854775807L
  float: 145F, -1f, 42E-12F, 42e12f
  double: 145D, -1d, 42E-12D, 42e12d
- in hexadecimal notation: 0x7ff, 0x7FF, 0X7ff, 0X7FF
- in octal notation: 0177
- in binary notation: 0b11100101, 0B11100101

Object (Reference) Data Types

- Initialization with default values
- Value of uninitialized reference = null
- Declaring class methods

```
class Person {
    String name;
    int age;
    String changeNameAndAge (String aName, int anAge) {
        name = aName;
        age = anAge;
        return “Name: “ + name + “Age: “ + age;
    }
}
```

Method Name

Arguments

Return Type

Method Body

Returning Value

Object Constructors in Java

- Initialization of objects with constructors
- Overloading of constructors and other methods
- Default constructors
- Reference to the current object – **this**

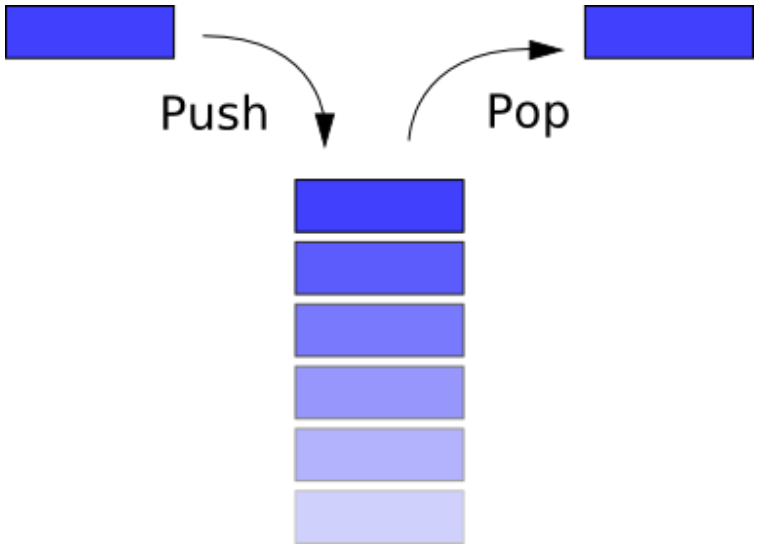
Objects Initialization. Array initialization

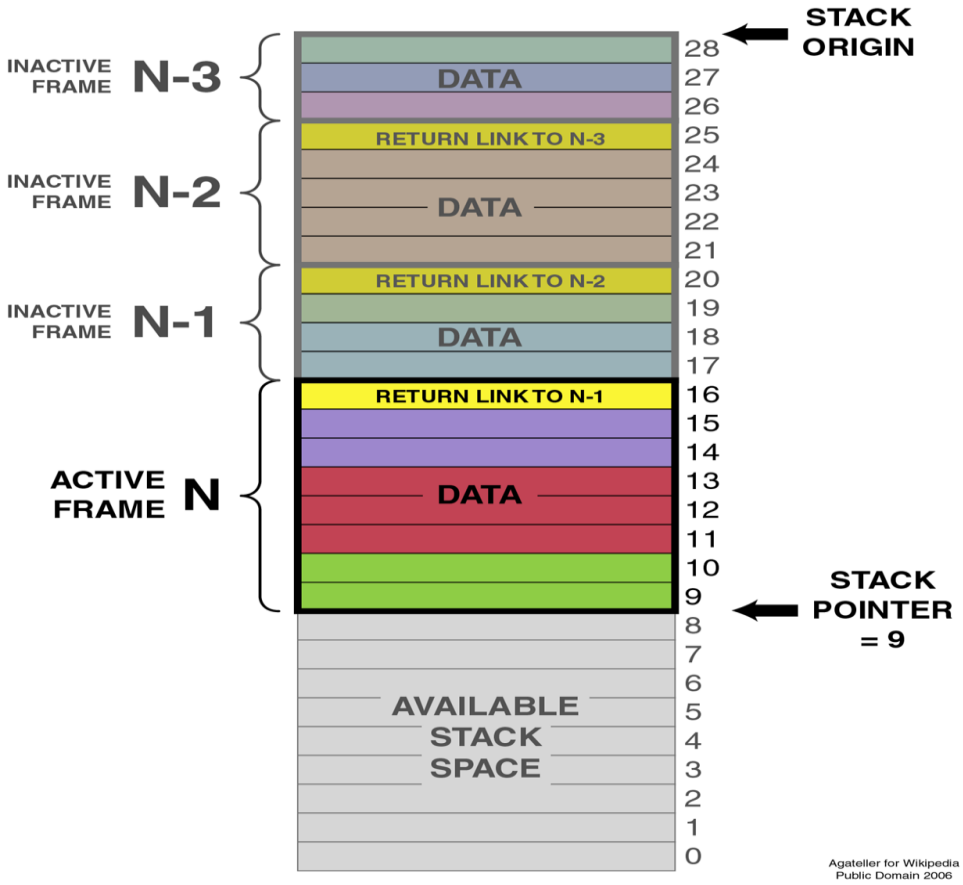
- Initialization in declaration
- Initialization in constructor
- „Lazy“ initialization
- Initialization of static class members
- One-dimensional and multi-dimensional arrays
- Array initialization

Memory Types

- Register memory - CPU registers, fast, small numbers stored operand instructions just before treatment
- Program Stack = Last In, First Out (LIFO) – Keep primitive data types and references to objects during program execution
- Dynamically allocated memory – Heap – can store different sized objects for different periods of time, can create new objects dynamically and to be released – Garbage Collector
  - Young generation – objects that exist for short period
  - Old generation – objects that exist longer
  - ~~Permanent Generation = class definitions.~~ Java 8+ Metaspace
- Constant storage, non-RAM storage (external memory)

Program Stack





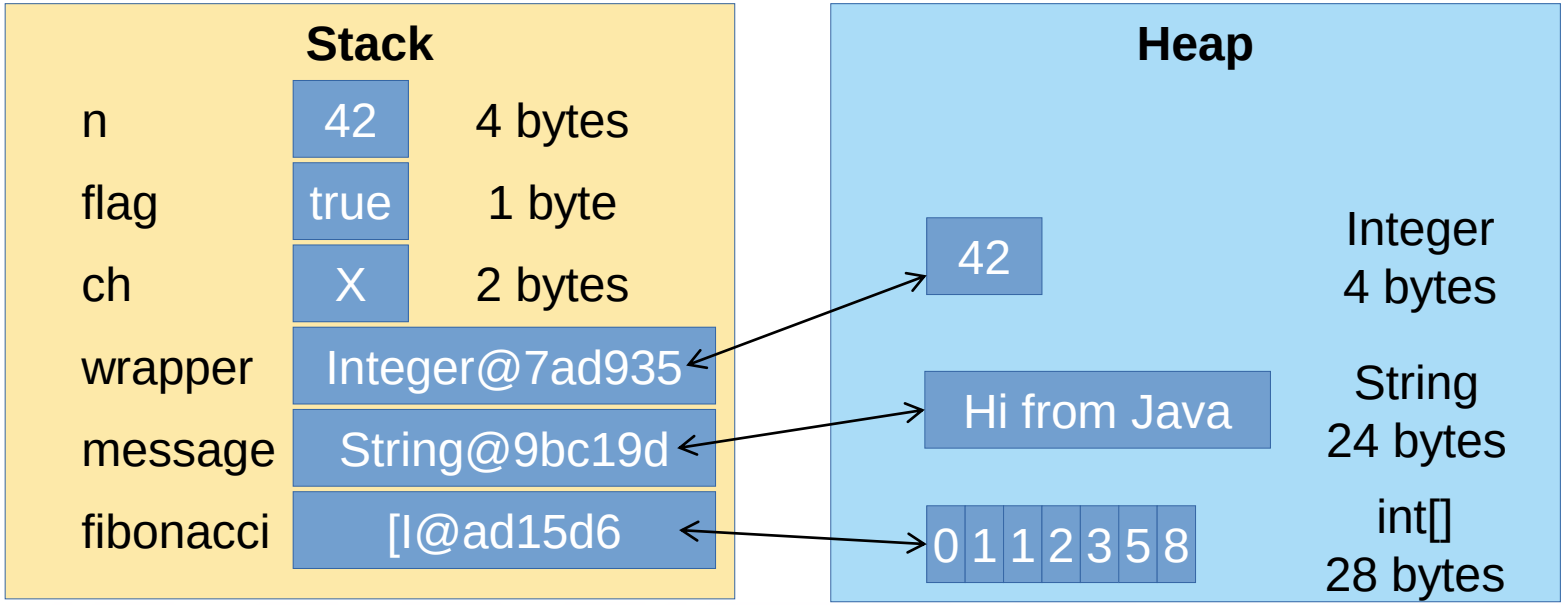
Source: http://en.wikipedia.org/wiki/File:ProgramCallStack2.png

C:\Windows\system32\cmd.exe

```
c:\CourseAdvancedJavaVerint\Temp>jstack 1612
2015-07-16 15:52:18
Full thread dump Java HotSpot(TM) 64-Bit Server VM (25.45-b02 mixed mode):

"DestroyJavaVM" #21 prio=5 os_prio=0 tid=0x0000000024b8000 nid=0x1f04 waiting on condition [0x0000000000000000]
   java.lang.Thread.State: RUNNABLE

"Thread-9" #20 prio=5 os_prio=0 tid=0x000000000bea7000 nid=0x2348 waiting for monitor entry [0x000000000d14f000]
   java.lang.Thread.State: BLOCKED (on object monitor)
        at simpletest.TwoThreadsSynchronizedCounter.lambda$0(TwoThreadsSynchronizedCounter.java:14)
        - waiting to lock <0x00000000d5e660a0> (a java.lang.Object)
        at simpletest.TwoThreadsSynchronizedCounter$$Lambda$1/424058530.run(Unknown Source)
        at java.lang.Thread.run(Thread.java:745)

"Thread-8" #19 prio=5 os_prio=0 tid=0x000000000bea5800 nid=0x6ac waiting for monitor entry [0x000000000ca2e000]
   java.lang.Thread.State: BLOCKED (on object monitor)
        at simpletest.TwoThreadsSynchronizedCounter.lambda$0(TwoThreadsSynchronizedCounter.java:14)
        - waiting to lock <0x00000000d5e660a0> (a java.lang.Object)
        at simpletest.TwoThreadsSynchronizedCounter$$Lambda$1/424058530.run(Unknown Source)
        at java.lang.Thread.run(Thread.java:745)

"Thread-7" #18 prio=5 os_prio=0 tid=0x000000000bea5000 nid=0x1ffc waiting for monitor entry [0x000000000cfcf000]
   java.lang.Thread.State: BLOCKED (on object monitor)
        at simpletest.TwoThreadsSynchronizedCounter.lambda$0(TwoThreadsSynchronizedCounter.java:14)
        - waiting to lock <0x00000000d5e660a0> (a java.lang.Object)
        at simpletest.TwoThreadsSynchronizedCounter$$Lambda$1/424058530.run(Unknown Source)
        at java.lang.Thread.run(Thread.java:745)

"Thread-6" #17 prio=5 os_prio=0 tid=0x000000000bea2000 nid=0x40c waiting for monitor entry [0x000000000cd5f000]
   java.lang.Thread.State: BLOCKED (on object monitor)
        at simpletest.TwoThreadsSynchronizedCounter.lambda$0(TwoThreadsSynchronizedCounter.java:14)
        - waiting to lock <0x00000000d5e660a0> (a java.lang.Object)
        at simpletest.TwoThreadsSynchronizedCounter$$Lambda$1/424058530.run(Unknown Source)
        at java.lang.Thread.run(Thread.java:745)

"Thread-5" #16 prio=5 os_prio=0 tid=0x000000000bea0800 nid=0x1708 waiting for monitor entry [0x000000000ceae000]
   java.lang.Thread.State: BLOCKED (on object monitor)
        at simpletest.TwoThreadsSynchronizedCounter.lambda$0(TwoThreadsSynchronizedCounter.java:14)
        - waiting to lock <0x00000000d5e660a0> (a java.lang.Object)
        at simpletest.TwoThreadsSynchronizedCounter$$Lambda$1/424058530.run(Unknown Source)
        at java.lang.Thread.run(Thread.java:745)

"Thread-4" #15 prio=5 os_prio=0 tid=0x000000000be9d000 nid=0xc0c waiting for monitor entry [0x000000000c7df000]
   java.lang.Thread.State: BLOCKED (on object monitor)
        at simpletest.TwoThreadsSynchronizedCounter.lambda$0(TwoThreadsSynchronizedCounter.java:14)
        - waiting to lock <0x00000000d5e660a0> (a java.lang.Object)
        at simpletest.TwoThreadsSynchronizedCounter$$Lambda$1/424058530.run(Unknown Source)
        at java.lang.Thread.run(Thread.java:745)

"Thread-3" #14 prio=5 os_prio=0 tid=0x000000000be9c800 nid=0x2394 waiting for monitor entry [0x000000000cc2f000]
   java.lang.Thread.State: BLOCKED (on object monitor)
```

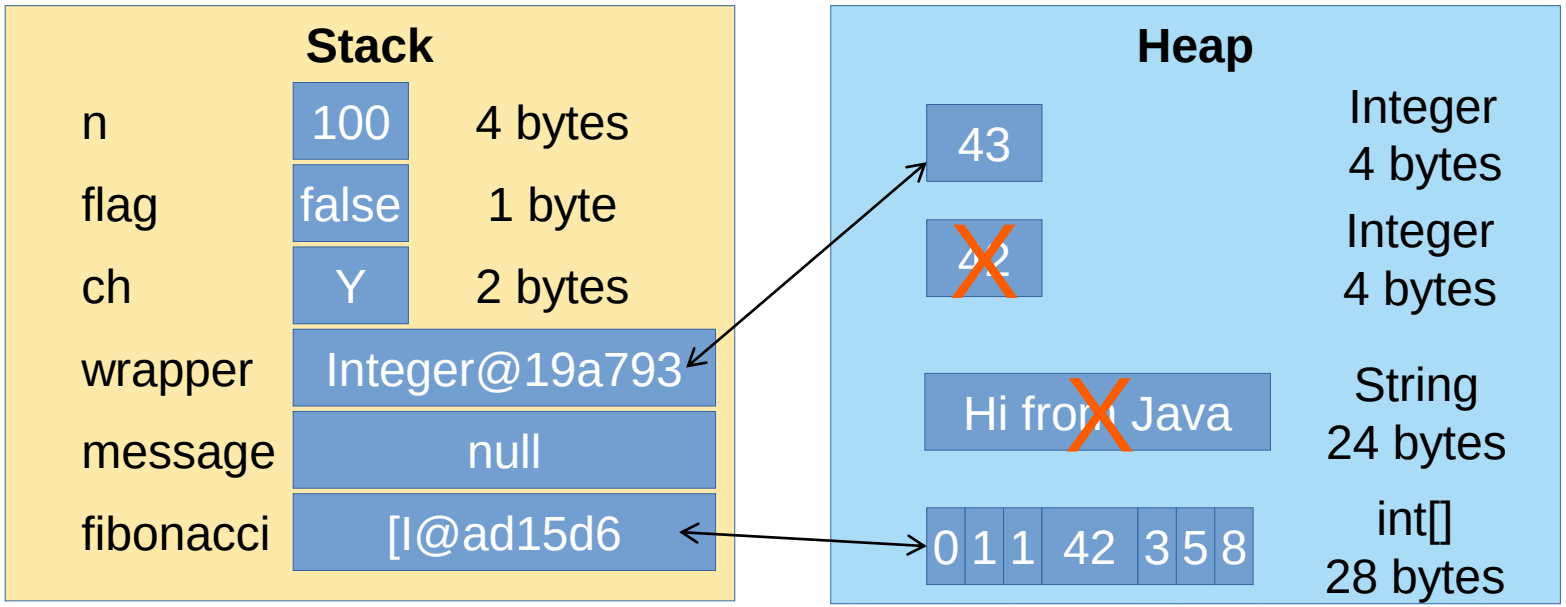
Stack and Heap (Quick Review)

```
int n = 42;
boolean flag = true;
char ch = 'X';
Integer wrapper = n;
String message = "Hi from Java!";
int[] fibonacci = { 0, 1, 1, 2, 3, 5, 8 };
```



Stack and Heap (Quick Review)

```
n = 100;
flag = !flag;
h = ++ch;
wrapper = ++wrapper;
message = null;
fibonacci[3] = 42;
```



Variable Scopes

```
public class VarScopes {
    static int s1 = 25;
    int i1 = 350;
    public static void main(String[] args) {
      if(s1 > 10){
          int a = 42;
          // Only a available
         {
             int b = 108;// Both a & b are available
         }
          // Only a available, b is out of scope
      }
      // a & b are out of scope
   }
}
```

Operators in Java - I

- Assignment operator
- Mathematical operators
- Relational operators
- Logical operators
- Bitwise operators
- String operators
- Operators for type conversion
- Priorities of operators

Operators in Java - II

- Each operator has priority and associativity - for example, + and – have a lower priority from * and /
- The priority can be set clearly using brackets (and) - for example (y – 1) / (2 + x)
- According associativity operators are left-associative, right-associative and non-associative: For example: x + y + z => (x + y) + z, because the operator + is left-associative
- if it was right associative, the result would be x + (y + z)

Operators in Java - III

- Assignment operator: **=**
  - is not symmetrical – i.e. **x = 42** is OK, **42 = x** is NOT
  - to the left always stands a variable of a certain type, and to the right an expression from the same type or type, which can be automatically converted to present

- Mathematical operators:
  - with one argument (unary): **-, ++, --**
  - with two arguments (binary): **+, -, *, /, %** (remainder)

- Combined: **+=, -=, *=, /=, %=**

For example: **a += 2** <=> **a = a + 2**

Send Arguments by Reference or by Value

- Formal and actual arguments - Example:

Static method - no **this**

Formal Argument
- copies the actual value

```
public static void incrementAgeBy10(Person p){
    p.age = p.age + 10;
}

Person p2 = new Person(23434345435L, "Petar Georgiev",
"Plovdiv", 39);
incrementAgeBy10(p2);
System.out.println(p2);
```

Actual Argument

Send Arguments by Reference and Value

- Case A: When the argument is a primitive type, the formal argument copies the actual value
- Case B: When the argument is a object type**,** the formal argument copies reference to the actual value
- Cases A & B: Changes in the copy (formal argument) does not reflect the actual argument
- However, if formal and actual argument point to the same object (Case B) – then **changes in properties (attribute values) of this object are available from the calling method** – i.e. we can return value from this argument

Operators in Java - IV

- Relational operators (comparison): **==, !=, <=, >=**
- Logical operators: **&&** (AND), **||** (OR) and **!** (NOT)

the expression is calculated from left to right only when it's necessary for determining the final outcome

- Bitwise operators: **&** (AND), **|** (OR) and **~** (NOT), **^** (XOR), **&=**, **|=**, **^=**
- Bitwise shift: **<<**, **>>** (preserves character), **>>>** (always inserts ziros left – does not preserve character), **<<=**, **>>=**, **>>>=**

Operators in Java - V

- Triple **if-then-else** operator:

<boolean-expr> ? <then-value> : <else-value>

- String concatenation operator: **+**

- Operators for type conversion (type casting):

(byte), **(short)**, **(char)**, **(int)**, **(long)**, **(float)** ...

- Priorities of operators:

unary > binary arithmetical > relational > logical > three-argumentative operator **if-then-else** > operators to assign a value

Controlling Program Flow - I

- Conditional operator - **if-else**
- Returning Value – **return**
- Operators organizing cycle - **while, do while, for, break, continue**
- Operator to select one from many options - **switch**

Controlling Program Flow - II

- Conditional operator **if-else**:

```
if(<boolean-expr>)
   <then-statement>
```

or

```
if(<boolean-expr>)
   <then-statement>
else
    <else-statement>
```

Controlling Program Flow - III

- Returning value to exit the method: **return;** or **return <value>;**
- Operator to organize cycle **while**:

```
while(<boolean-expr>)
    <body-statement>
```

- Operator to organize cycle **do-while**:

```
do <body-statement>
while(<boolean-expr>);
```

Controlling Program Flow - IV

- Operator to organize cycle **for**:

```
for(<initialization>; <boolean-expr>; <step>)
<body-statement>
```

- Operator to organize cycle **foreach**:

```
for(<value-type> x : <collection-of-values>)
<body-statement-using-x>
```

Ex.:
```
for(Point p : pointsArray)
    System.out.println("(" +p.x + ", " + p.y + ")");
```

Controlling Program Flow - V

- Operators to exit block (cycle) **break** and to exit iteration cycle **continue**:

```
<loop-iteration> {
//do some work
continue;  // goes directly to next loop iteration
//do more work
    break;  // leaves the loop
    //do more work
}
```

Controlling Program Flow - VI

- Use of labels with **break** and **continue**:

```
outer_label:
<outer-loop> {
    <inner-loop> {
        //do some work
      continue; // continues inner-loop
        //do more work
        break outer_label; // breaks outer-loop
        //do more work
        continue outer_label;  // continues outer-loop
   }
}
```

Controlling Program Flow - VII

❖Selecting one of several options **switch**:

```
switch(<selector-expr>) {
  case <value1> : <statement1>; break;
  case <value2> : <statement2>; break;
  case <value3> : <statement3>; break;
  case <value4> : <statement4>; break;
  // more cases here …
  default: <default-statement>;
}
```

Enumeration Types

```
public class MyEnumeration {
  public enum InvoiceType { SIMPLE, VAT }
  public static void main(String[] args) {
    for(InvoiceType it : InvoiceType.values())
        System.out.println(it);
    }
}
```

Резултат: SIMPLE
VAT

Garbage Collection – Main Concepts

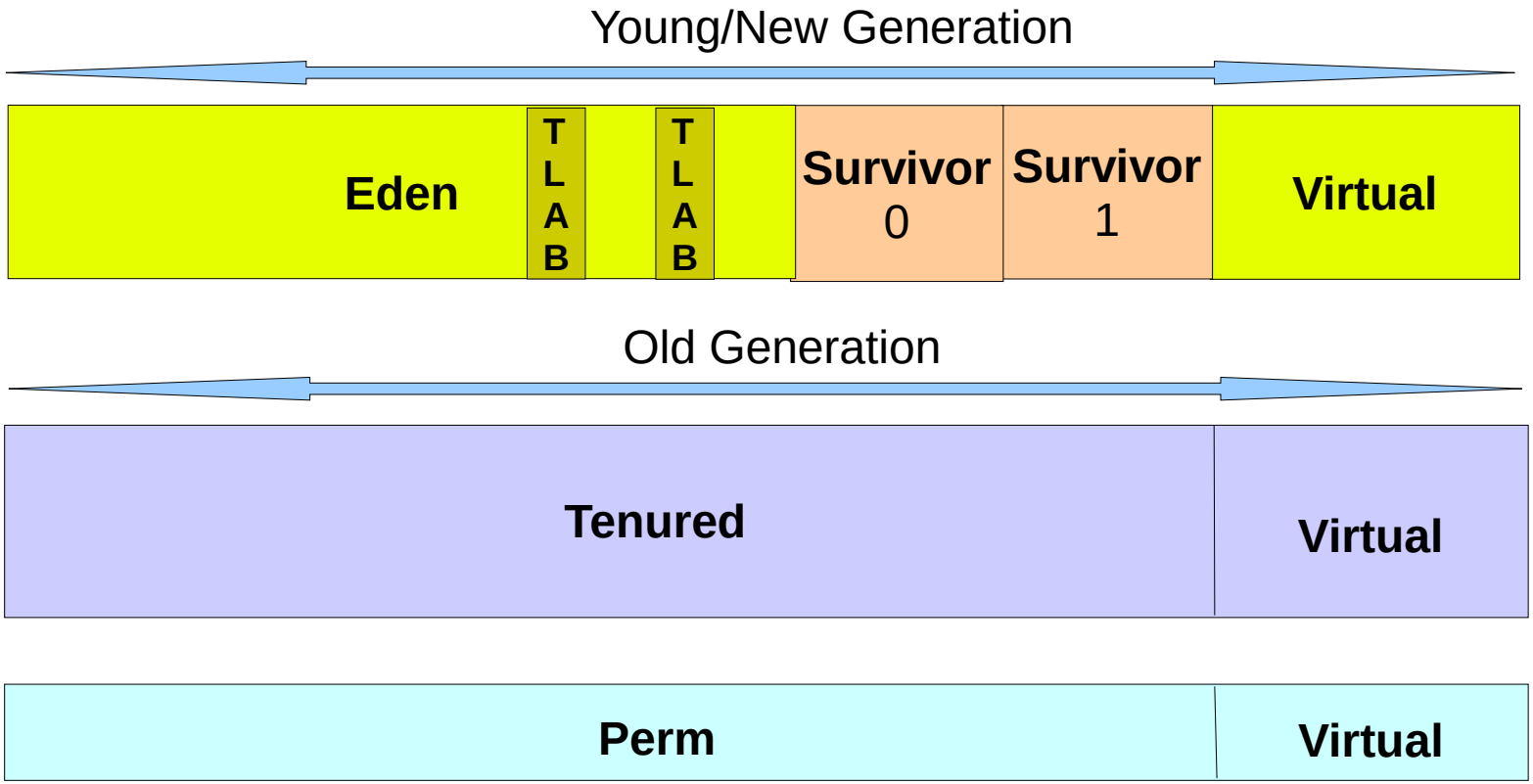
- Garbage collaction and finalization – method finalize()
- Client and Server VMs (≠ JIT Compiliers & Defaults), x86, x64
- Generational Garbage Collection – Young, Old & Permanent (in Java 8 → Metaspace) – Weak generational hypothesis:
  - Most of the objects become unreachable soon;
  - Small number of references exist from old to young objects.
- Tuning for Higher Throughput:

java -d64 -server -XX:+AggressiveOpts -XX:+UseLargePages -Xmn10g -Xms26g -Xmx26g

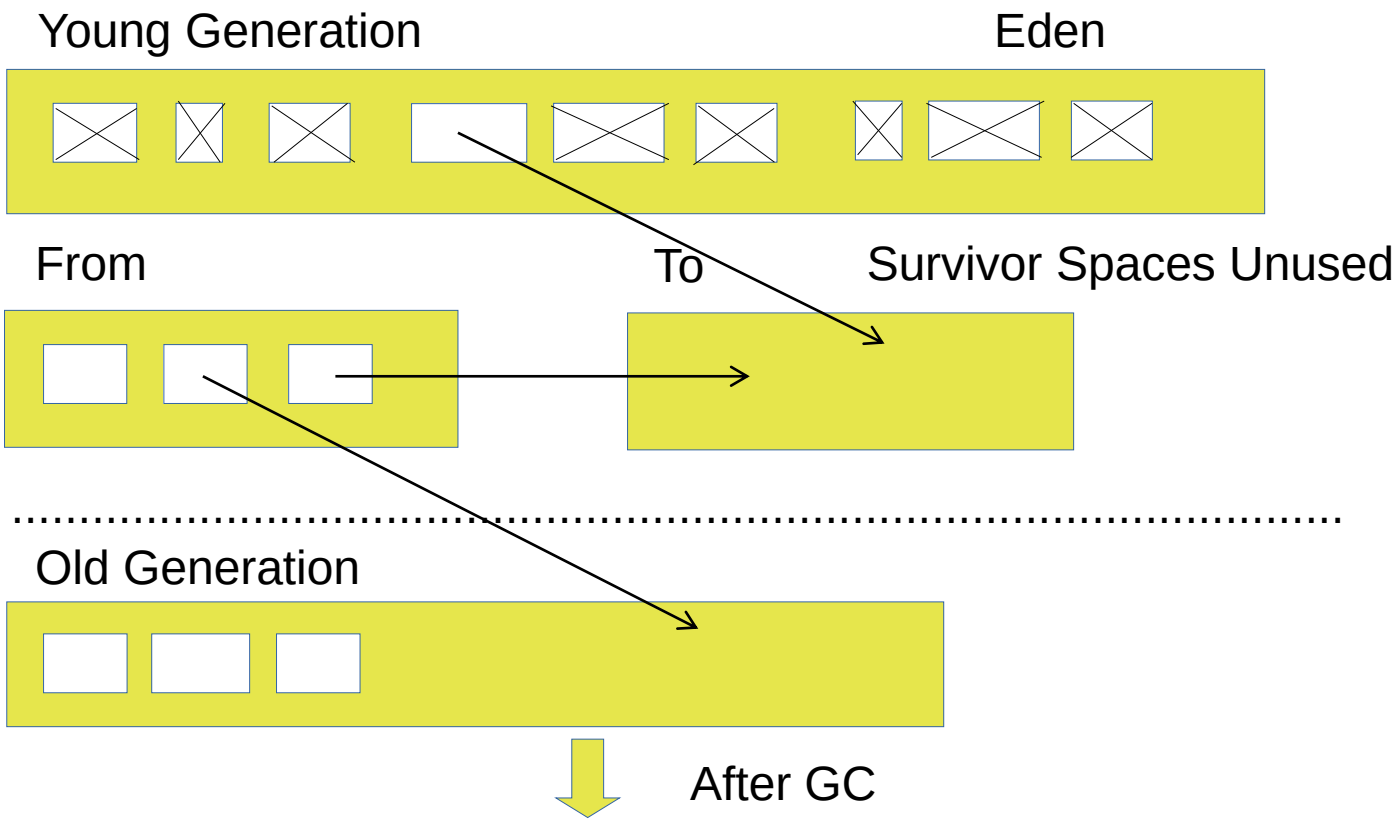
- Tuning for Lower Latency

java -d64 -XX:+UseG1GC -Xms26g Xmx26g -XX:MaxGCPauseMillis=500 -XX:+PrintGCTimeStamp

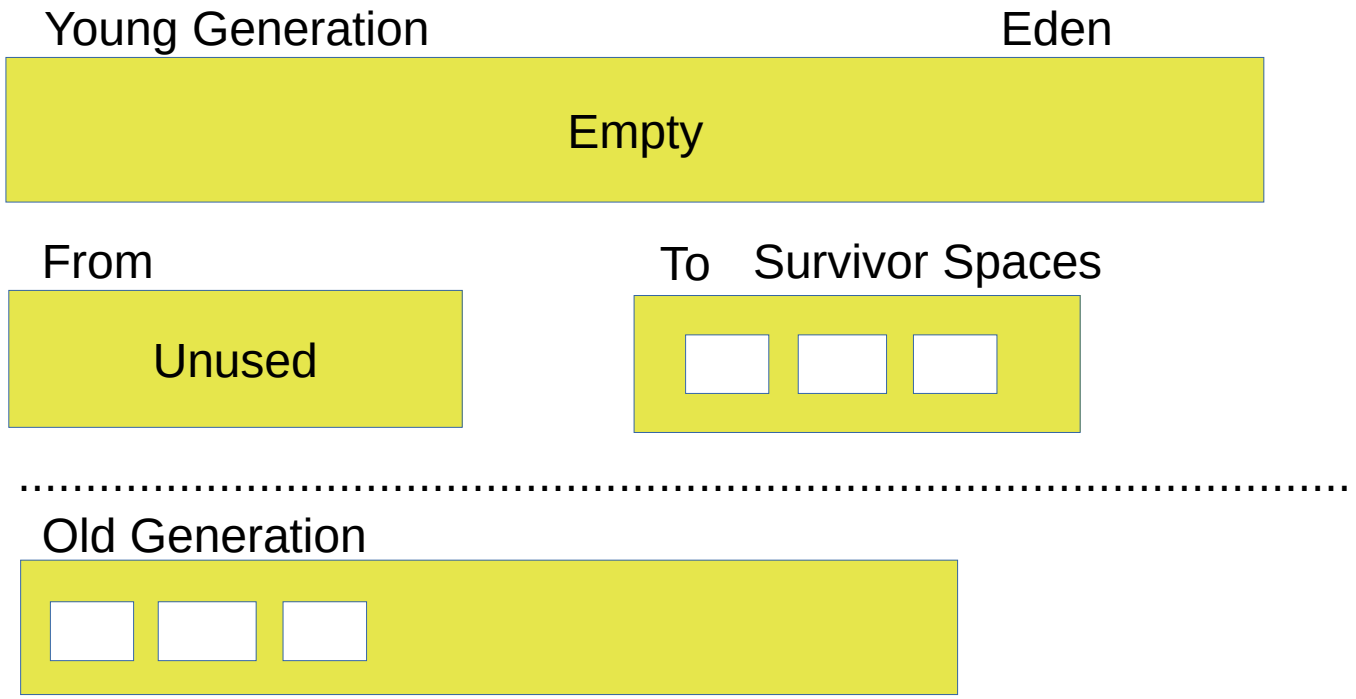
Garbage Collection – Main Concepts



Before GC



After GC



Garbage Collection – Basic Settings

-Xms – Heap area size when starting JVM

-Xmx – Maximum heap area size

-Xmn, -XX:NewSize – размер на young generation (nursery)

-XX:MinHeapFreeRatio=<N> **-XX:MaxHeapFreeRatio=<N>**

-XX:NewRatio – Ratio of New area and Old area

-XX:NewSize **-XX:MaxNewSize** – New area size <= Max

-XX:SurvivorRatio – Ratio of Eden area and Survivor area

-XX:+PrintTenuringDistribution – treshold and ages of New generation

-XX:+PrintGCDetails

-XX:+PrintGCTimeStamps

GC Strategies and Settings

Serial GC **-XX:+UseSerialGC**

Parallel GC **-XX:+UseParallelGC**

-XX:ParallelGCThreads=<N>

Parallel Compacting GC **-XX:+UseParallelOldGC**

Conc. Mark Sweep CMS GC **-XX:+UseConcMarkSweepGC**

-XX:+UseParNewGC

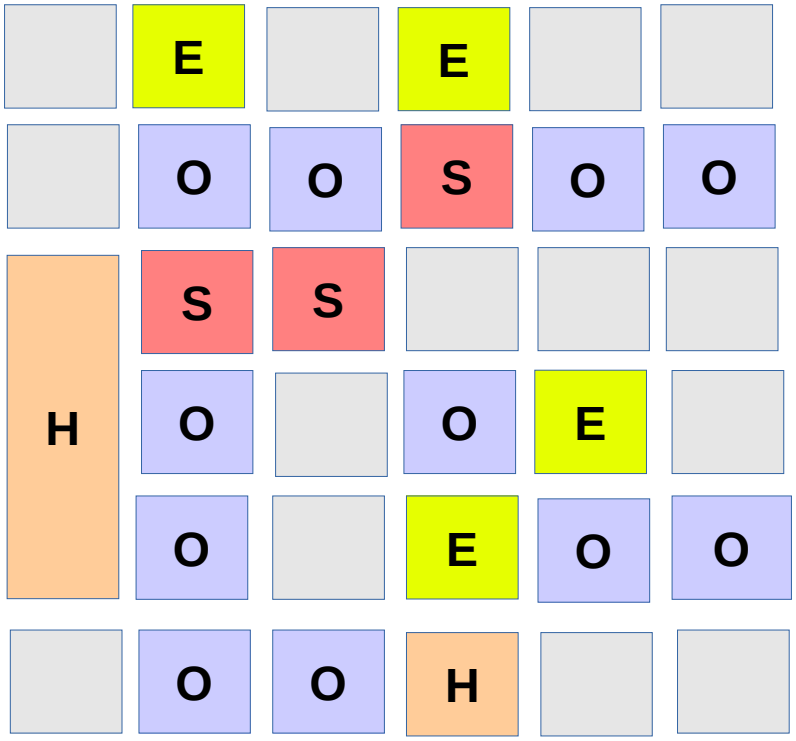
-XX:+CMSParallelRemarkEnabled

-XX:CMSInitiatingOccupancyFraction=<N>

-XX:+UseCMSInitiatingOccupancyOnly

G1 **-XX:+UseG1GC**

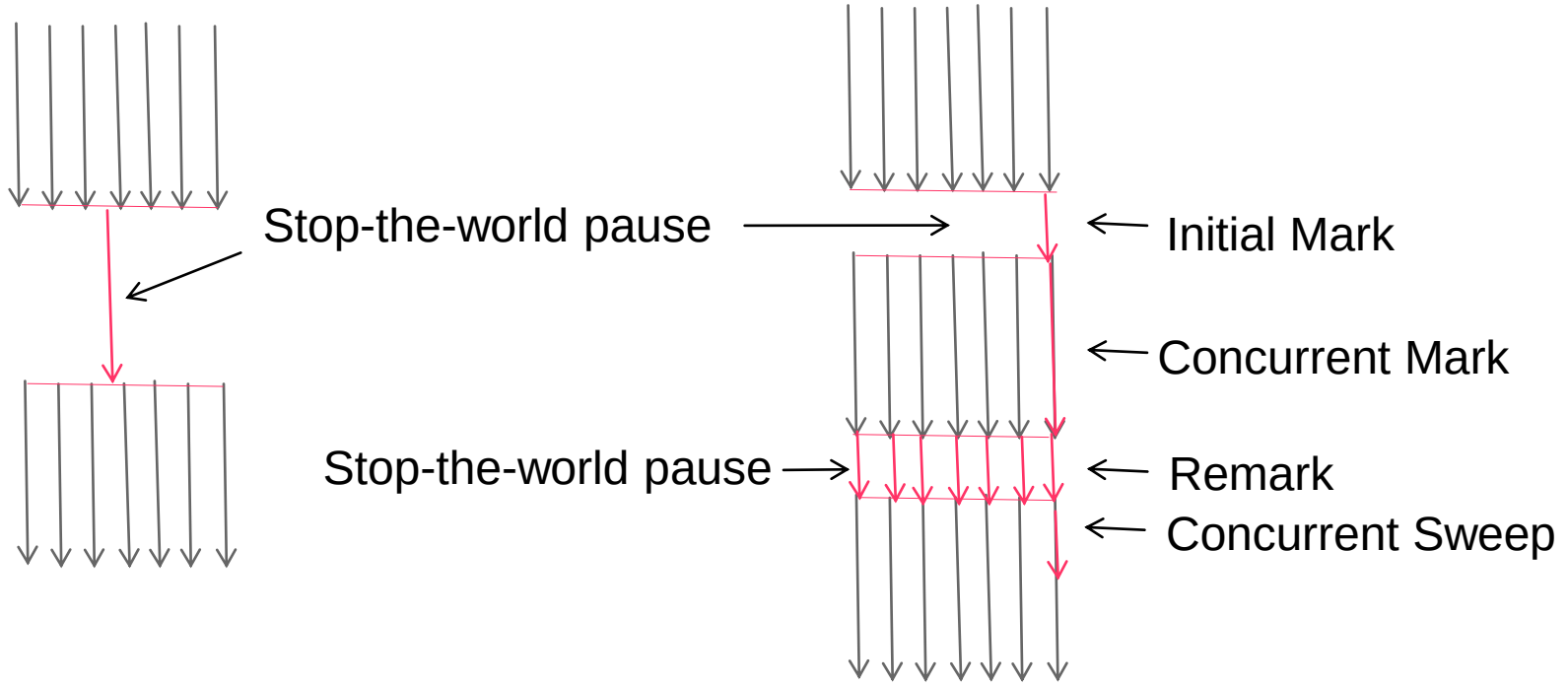
Garbage First G1 Partially Concurrent Collector



CMS GC (-XX:+UseConcMarkSweepGC)

Serial Mark-Sweep-Compact Collector

Concurrent Mark-Sweep Collector



Profiling Recommendations: GC

- **Garbage Collection** – be sure to minimize the GC interference by calling **System.gc()** several times before benchmark start. Call **System.runFinalization()** also. GC activity can be monitored using **-verbose:gc** JVM command. Another way to minimize GC interference is to use serial garbage collector using **-XX:+UseSerialGC** and same value for **-Xmx** and **-Xms**, as well as explicitly setting **-Xnm** flags.
- Use more precise **System.nanoTime()**, but be aware that the time can be reported with varying degree of accuracy in different JVM implementations.

Java Command Line Monitoring/Tuning Tools - I

jps – reports the local VM identifier (**lvmid** - typically the process identifier - **PID** for the JVM process), for each instrumented JVM found on the target system.

jcmd – reports class, thread and VM information for a java process: **jcmd <PID> <command> <optional arguments>**

jinfo – provides information about current system properties of the JVM and for some properties allows to be set dynamically:

jinfo -sysprops <PID>

jinfo -flags <PID>

jinfo -flag PrintGCDetails <PID>

jinfo -flag -PrintGCDetails <PID> - sets -XX:-PrintGCDetails

Java Command Line Monitoring/Tuning Tools -II

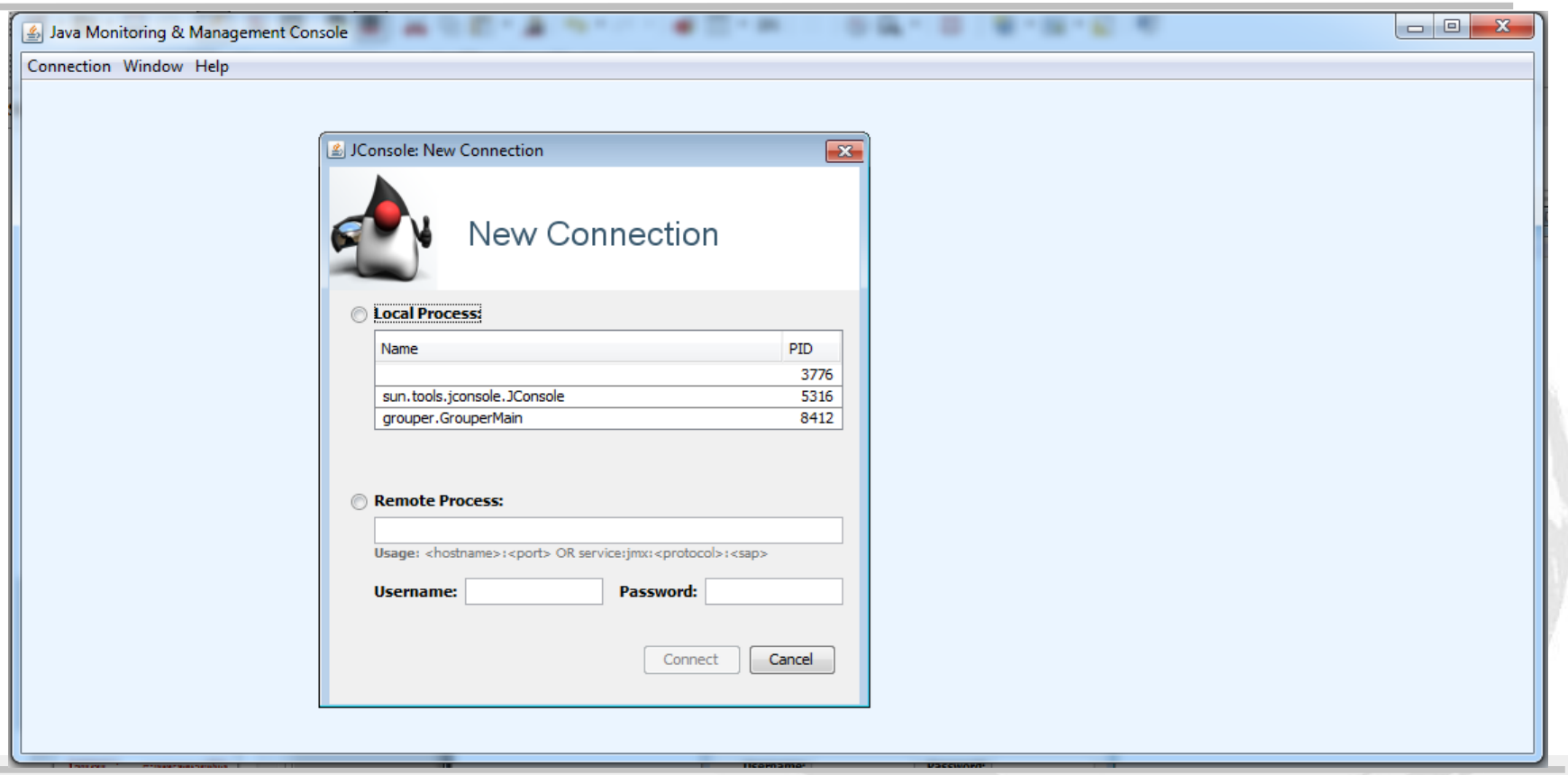
- **jstat & jstatd** – provide information about GC and class loading activities, useful for automated scripting (jstatd = RMI deamon):

jstat [generalOption | outputOptions vmid [interval[s|ms] [count]]] Ex: **jstat -gc -t -h20 4572 2s**

- Statistics options (part of outputOptions):

-class - statistics on the behavior of the class loader;
-compiler - behavior of the HotSpot Just-in-Time compiler;
-gc - statistics of the behavior of the garbage collected heap;
-gccapacity - capacities of the generations and their spaces;
-gccause, -gcutil - summary of garbage collection statistics/causes;
-gcnew, -gcnewcapacity, -gcold, -gcoldcapacity, -gcpermcapacity – Young/Old/Permanent genration stats
-printcompilation - HotSpot compilation method statistics

Java GUI tools – JConsole



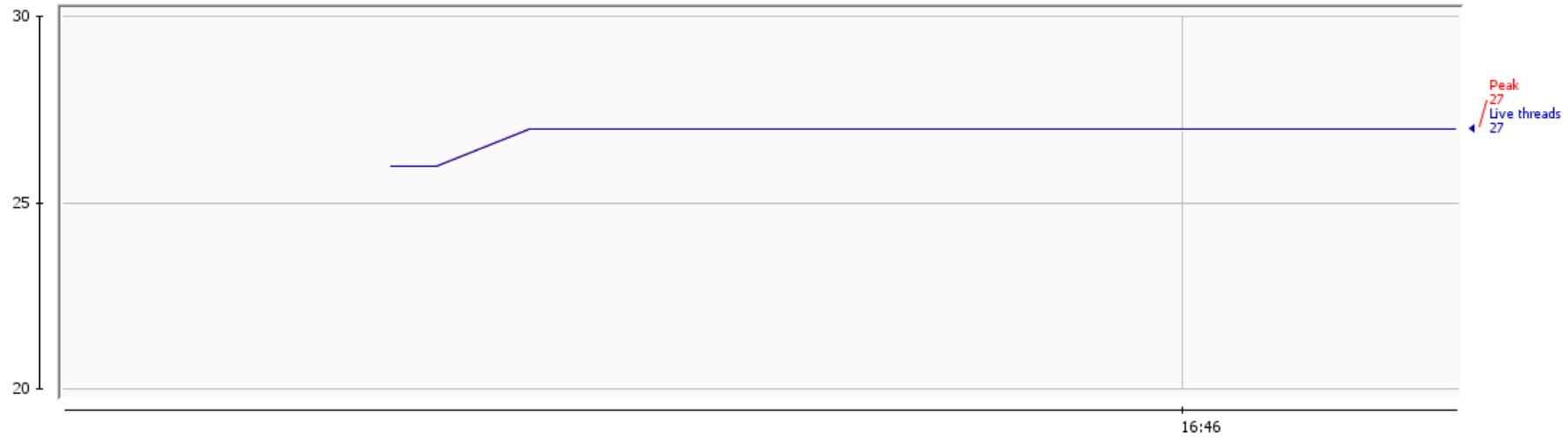
Java Monitoring & Management Console - pid: 8412 grouper.GrouperMain

Connection Window Help

Overview | Memory | Threads | Classes | VM Summary | MBeans

Time Range: All

Number of Threads



Threads

Signal Dispatcher
Attach Listener
pool-1-thread-1
pool-1-thread-2
pool-1-thread-3
pool-1-thread-4
pool-1-thread-5
pool-1-thread-6
pool-1-thread-7
pool-1-thread-8
ForkJoinPool.commonPool-worker-1
ForkJoinPool.commonPool-worker-4
ForkJoinPool.commonPool-worker-5
ForkJoinPool.commonPool-worker-6
ForkJoinPool.commonPool-worker-3
ForkJoinPool.commonPool-worker-2
ForkJoinPool.commonPool-worker-7
RMI TCP Accept-0
RMI TCP Connection(1)-192.168.56.1

```
Name: pool-1-thread-1
State: RUNNABLE
Total blocked: 143,586  Total waited: 143,672

Stack trace:
java.lang.Object.wait(Native Method)
java.util.concurrent.ForkJoinTask.externalAwaitDone(ForkJoinTask.java:334)
java.util.concurrent.ForkJoinTask.doInvoke(ForkJoinTask.java:405)
java.util.concurrent.ForkJoinTask.invoke(ForkJoinTask.java:734)
java.util.Arrays.parallelSort(Arrays.java:1119)
java.util.stream.SortedOps$OfRef.opEvaluateParallel(SortedOps.java:158)
java.util.stream.AbstractPipeline.opEvaluateParallelLazy(AbstractPipeline.java:735)
java.util.stream.AbstractPipeline.sourceSpliterator(AbstractPipeline.java:471)
java.util.stream.AbstractPipeline.evaluate(AbstractPipeline.java:233)
java.util.stream.ReferencePipeline.collect(ReferencePipeline.java:499)
grouper.controller.impl.inmemory.VehicleControllerConcurentHashMapImpl.get(VehicleControllerConcurentHashMapImpl.java:93)
grouper.task.VehicleTask.call(VehicleTask.java:76)
grouper.task.VehicleTask.call(VehicleTask.java:1)
java.util.concurrent.FutureTask.run(FutureTask.java:266)
java.util.concurrent.Executors$RunnableAdapter.call(Executors.java:511)
java.util.concurrent.FutureTask.run(FutureTask.java:266)
java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1142)
java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:617)
java.lang.Thread.run(Thread.java:745)
```

Filter

Detect Deadlock

No deadlock detected

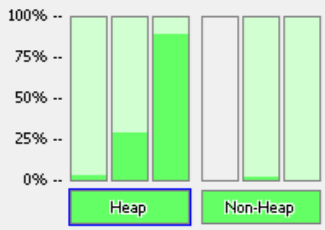
Connection Window Help

Overview | Memory | Threads | Classes | VM Summary | MBeans

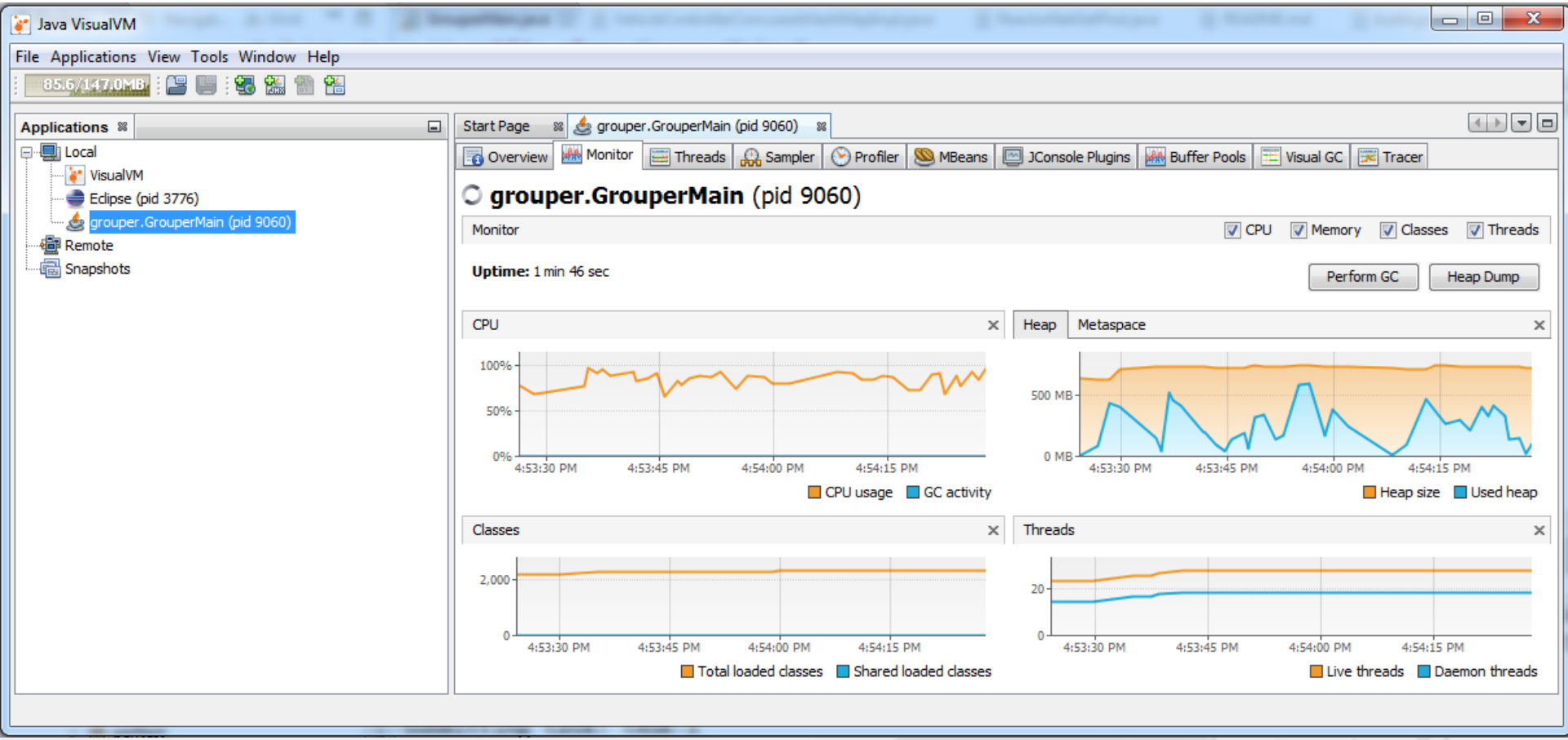
Chart: Heap Memory Usage Time Range: All Perform GC

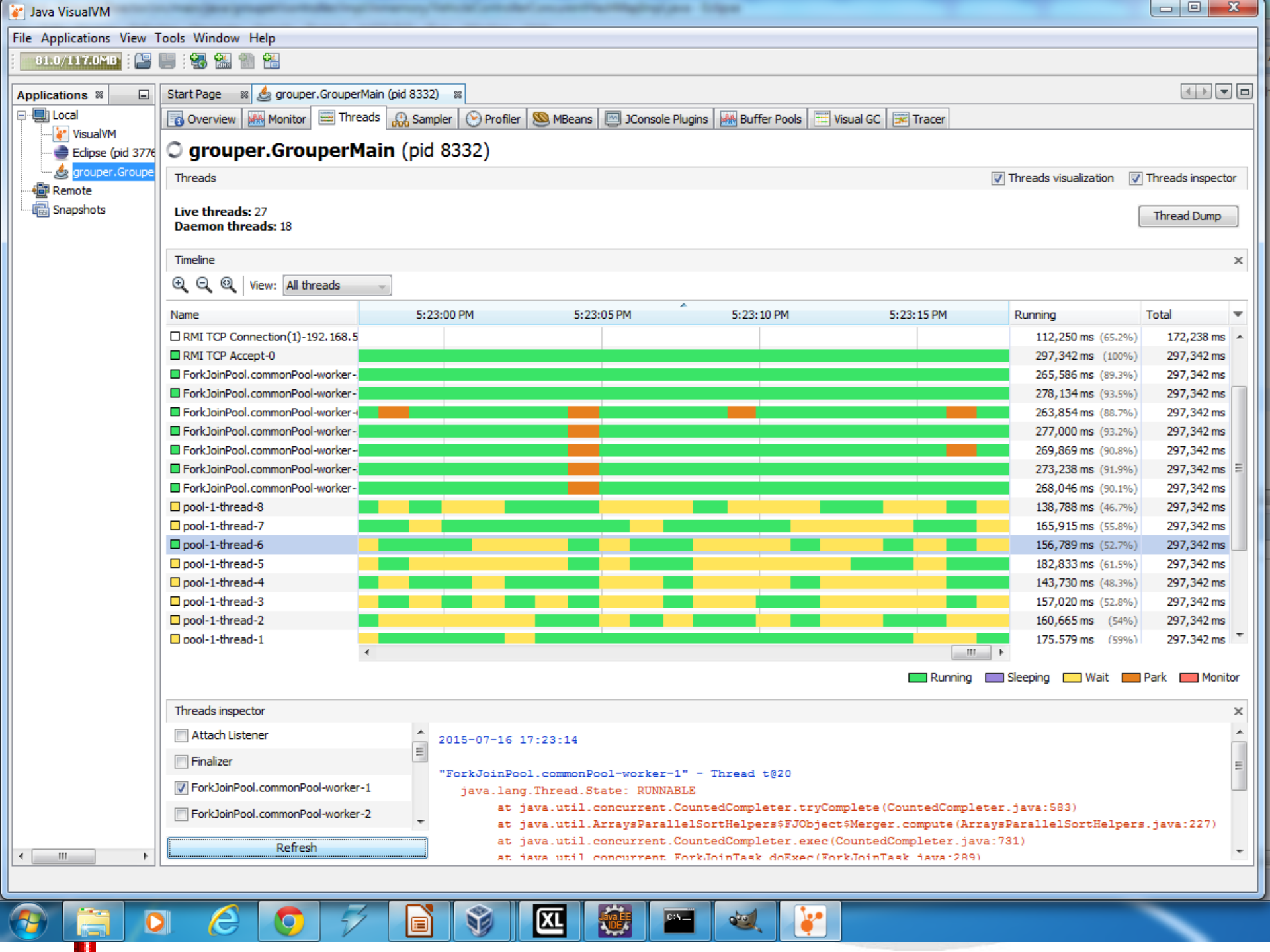
Details

Time: 2015-07-16 16:49:30
Used: 295,252 kbytes
Committed: 474,624 kbytes
Max: 1,840,640 kbytes
GC time: 0.000 seconds on PS MarkSweep (0 collections)
1.143 seconds on PS Scavenge (455 collections)



Java GUI tools – jvisualvm




Java VisualVM
File Applications View Tools Window Help
81.0/117.0MB
Applications
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VisualVM
Eclipse (pid 3776
grouper.Groupe
Remote
Snapshots
Start Page
grouper.GrouperMain (pid 8332)
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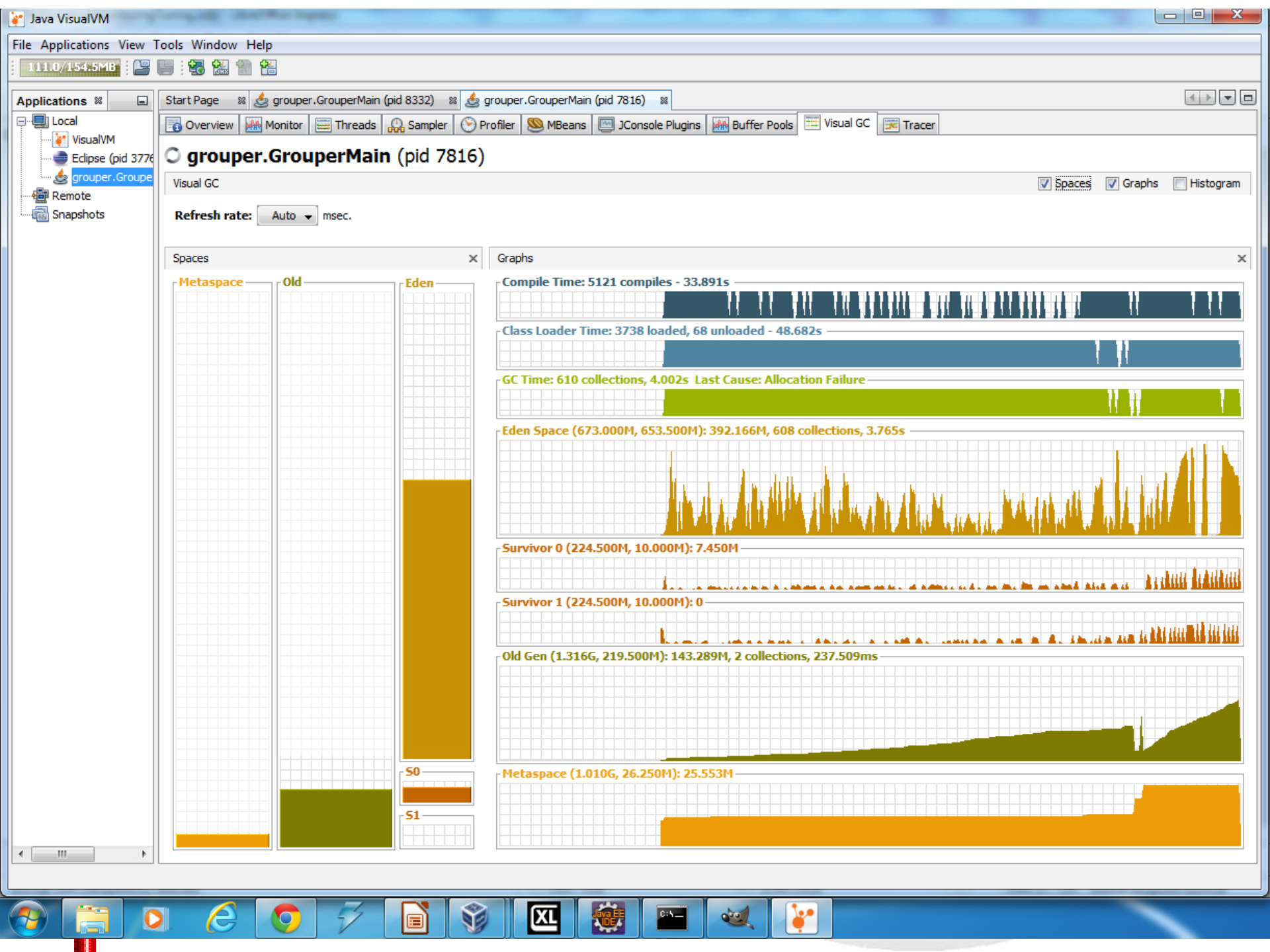
grouper.GrouperMain (pid 8332)
Threads
Threads visualization
Threads inspector
Live threads: 27
Daemon threads: 18
Thread Dump
Timeline
View: All threads
Name
5:23:00 PM
5:23:05 PM
5:23:10 PM
5:23:15 PM
Running
Total
RMI TCP Connection(1)-192.168.5
RMI TCP Accept-0
ForkJoinPool.commonPool-worker-
ForkJoinPool.commonPool-worker-
ForkJoinPool.commonPool-worker-
ForkJoinPool.commonPool-worker-
ForkJoinPool.commonPool-worker-
ForkJoinPool.commonPool-worker-
ForkJoinPool.commonPool-worker-
pool-1-thread-8
pool-1-thread-7
pool-1-thread-6
pool-1-thread-5
pool-1-thread-4
pool-1-thread-3
pool-1-thread-2
pool-1-thread-1
112,250 ms (65.2%) 172,238 ms
297,342 ms (100%) 297,342 ms
265,586 ms (89.3%) 297,342 ms
278,134 ms (93.5%) 297,342 ms
263,854 ms (88.7%) 297,342 ms
277,000 ms (93.2%) 297,342 ms
269,869 ms (90.8%) 297,342 ms
273,238 ms (91.9%) 297,342 ms
268,046 ms (90.1%) 297,342 ms
138,788 ms (46.7%) 297,342 ms
165,915 ms (55.8%) 297,342 ms
156,789 ms (52.7%) 297,342 ms
182,833 ms (61.5%) 297,342 ms
143,730 ms (48.3%) 297,342 ms
157,020 ms (52.8%) 297,342 ms
160,665 ms (54%) 297,342 ms
175.579 ms (59%) 297.342 ms
Running
Sleeping
Wait
Park
Monitor
Threads inspector
Attach Listener
Finalizer
ForkJoinPool.commonPool-worker-1
ForkJoinPool.commonPool-worker-2
Refresh
2015-07-16 17:23:14
"ForkJoinPool.commonPool-worker-1" - Thread t@20
java.lang.Thread.State: RUNNABLE
at java.util.concurrent.CountedCompleter.tryComplete(CountedCompleter.java:583)
at java.util.ArraysParallelSortHelpers$FJObject$Merger.compute(ArraysParallelSortHelpers.java:227)
at java.util.concurrent.CountedCompleter.exec(CountedCompleter.java:731)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grouper.GrouperMain (pid 7816)
Visual GC
Spaces
Graphs
Histogram
Refresh rate:
Auto
msec.
Spaces
Metaspace
Old
Eden
S0
S1
Graphs
Compile Time: 5121 compiles - 33.891s
Class Loader Time: 3738 loaded, 68 unloaded - 48.682s
GC Time: 610 collections, 4.002s Last Cause: Allocation Failure
Eden Space (673.000M, 653.500M): 392.166M, 608 collections, 3.765s
Survivor 0 (224.500M, 10.000M): 7.450M
Survivor 1 (224.500M, 10.000M): 0
Old Gen (1.316G, 219.500M): 143.289M, 2 collections, 237.509ms
Metaspace (1.010G, 26.250M): 25.553M

Thank's for Your Attention!

Trayan Iliev

CEO of IPT – Intellectual Products & Technologies

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