

Java DevOps

on a Budget

Christopher M. Judd



Christopher M. Judd

CTO and Partner at

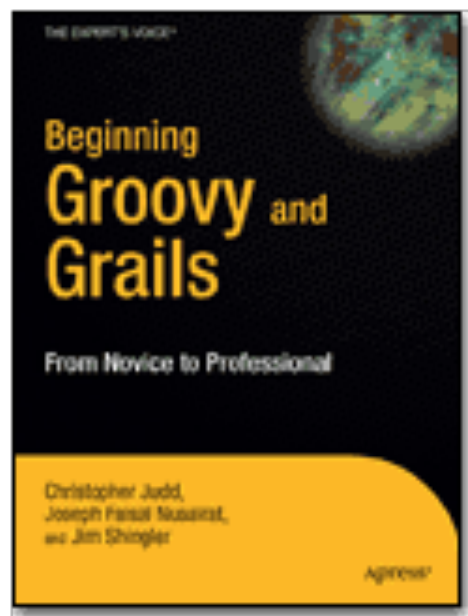


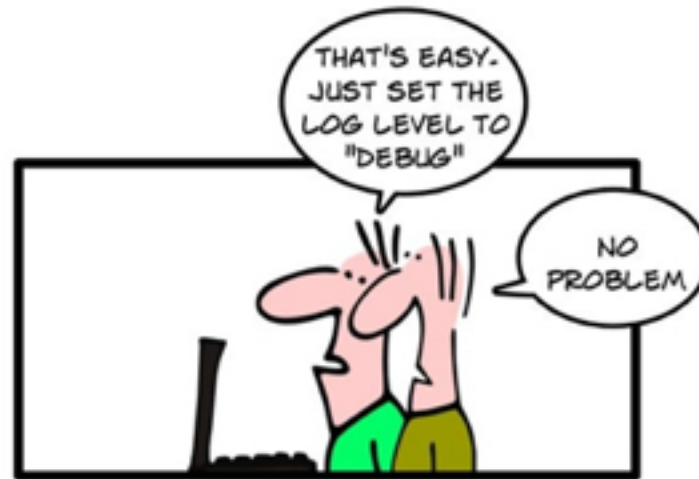
Central Ohio Java Users Group leader

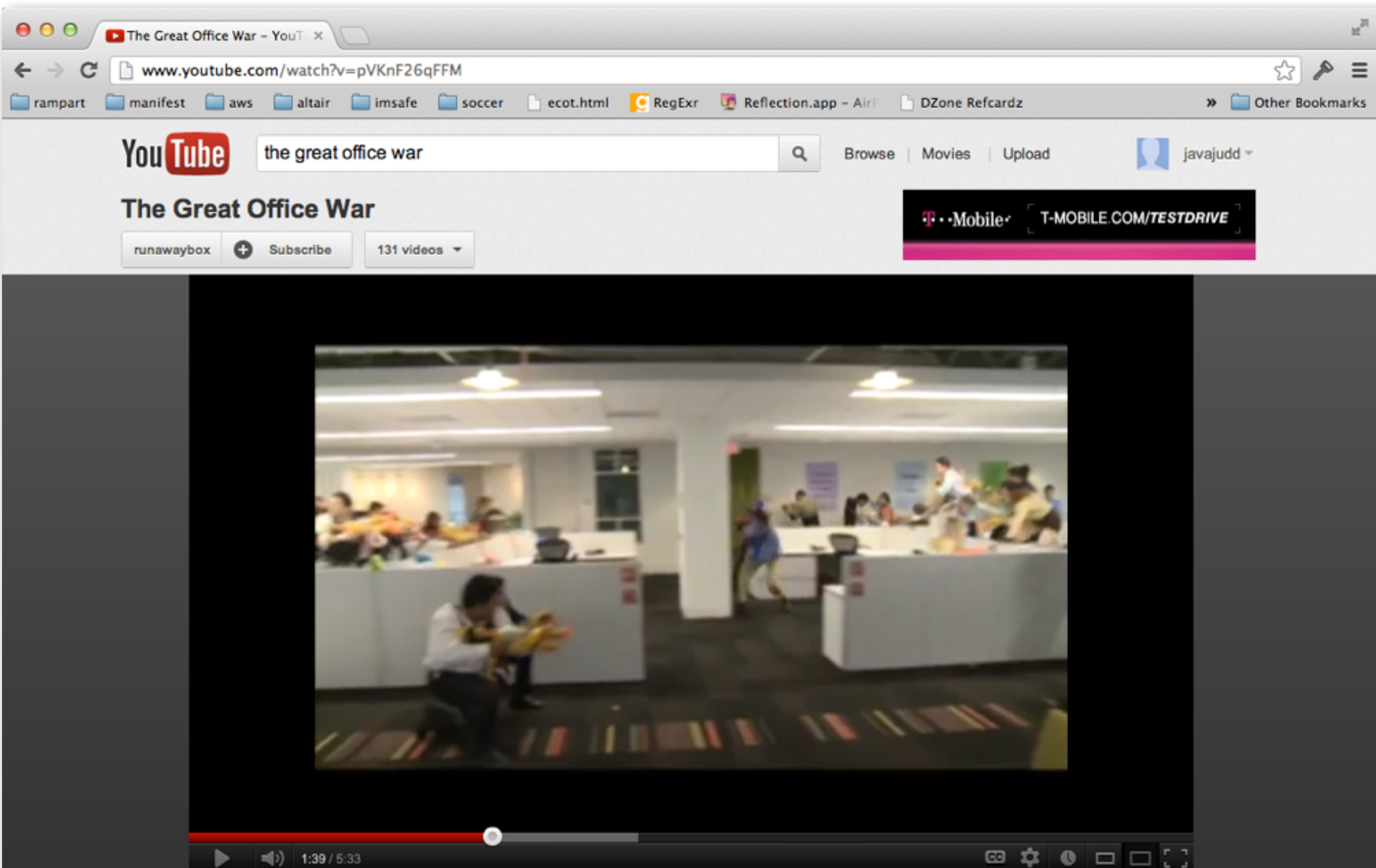
Columbus



Developer User Group (CIDUG)







<http://www.youtube.com/watch?v=pVKnF26qFFM>

App Server

Application

App Server

JVM

OS

Hypervisor

Hardware

App Server

Application

App Server

JVM

OS

Hypervisor

Hardware

App Server

Application

App Server

JVM

OS

Hypervisor

Hardware

App Server

Application

App Server

JVM

OS

Hypervisor

Hardware

Web Server

Web Server

OS

Hypervisor

Hardware

App Server

Application

App Server

JVM

OS

Hypervisor

Hardware

Database Server

Database Server

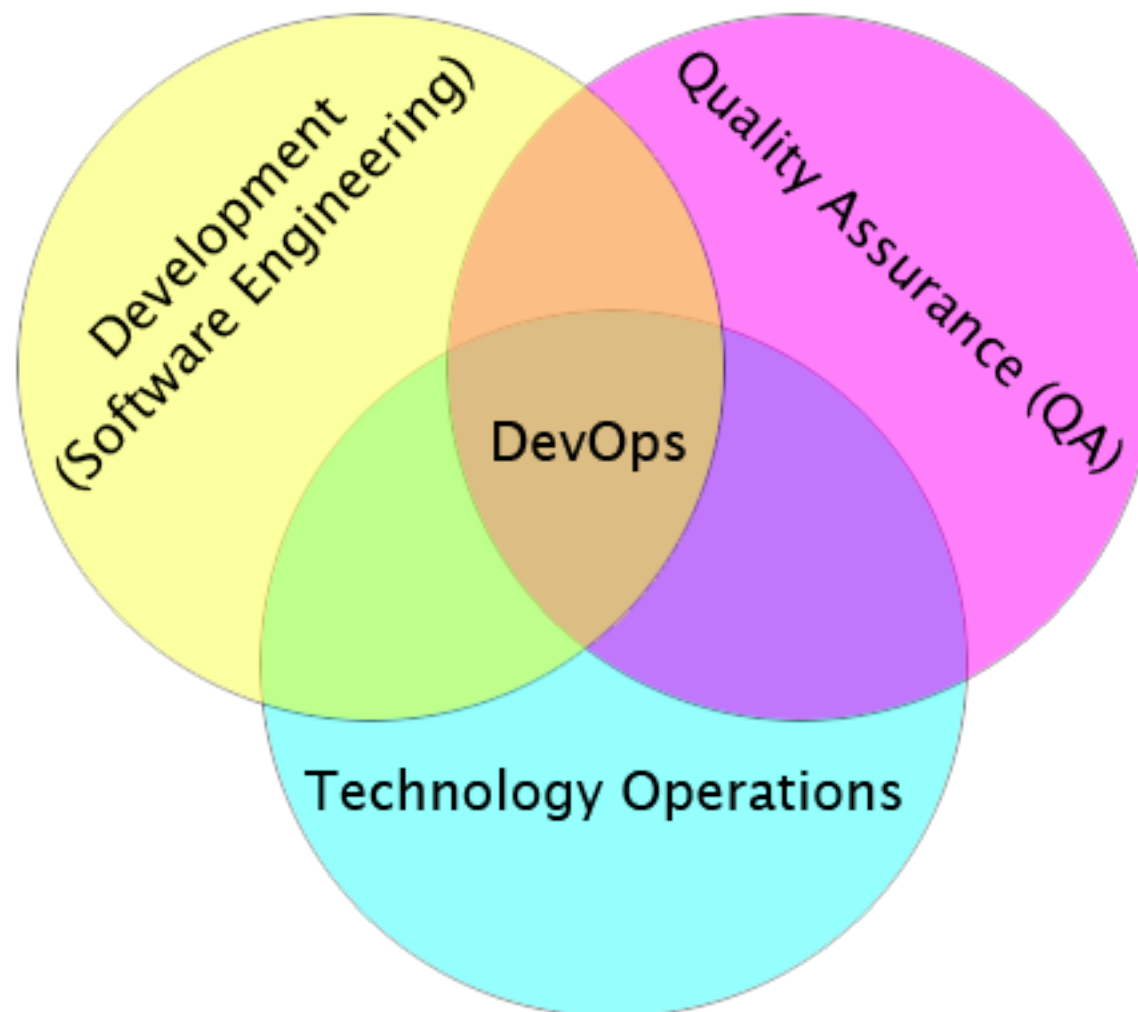
OS

Hypervisor

Hardware

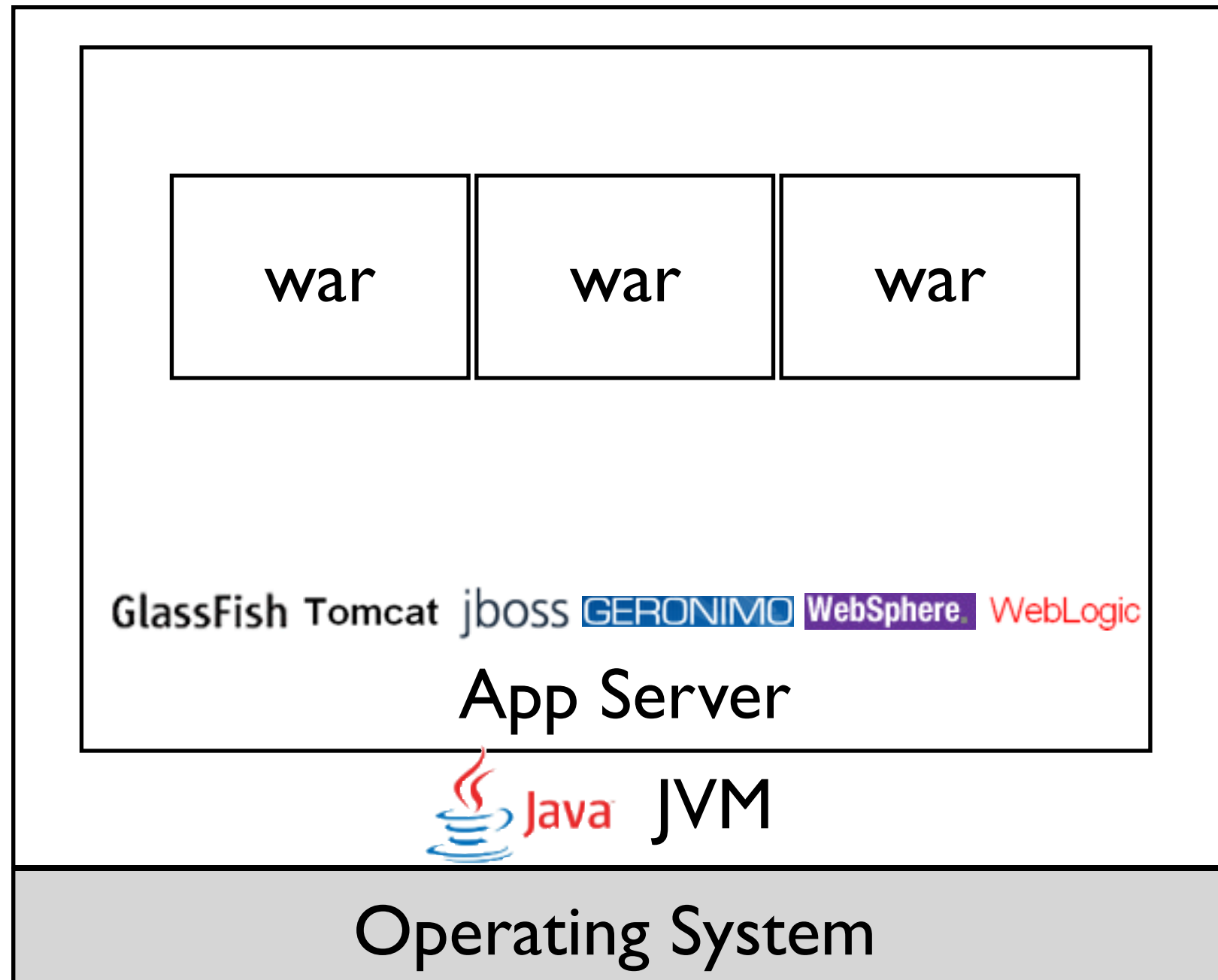
DevOps

an emerging set of principles, methods and practices for communication, collaboration and integration between [software development](#) (application/software engineering) and [IT operations](#) (systems administration/infrastructure) professionals. It has developed in response to the emerging understanding of the interdependence and importance of both the development and operations disciplines in meeting an organization's goal of rapidly producing [software](#) products and services.





Java Web Apps

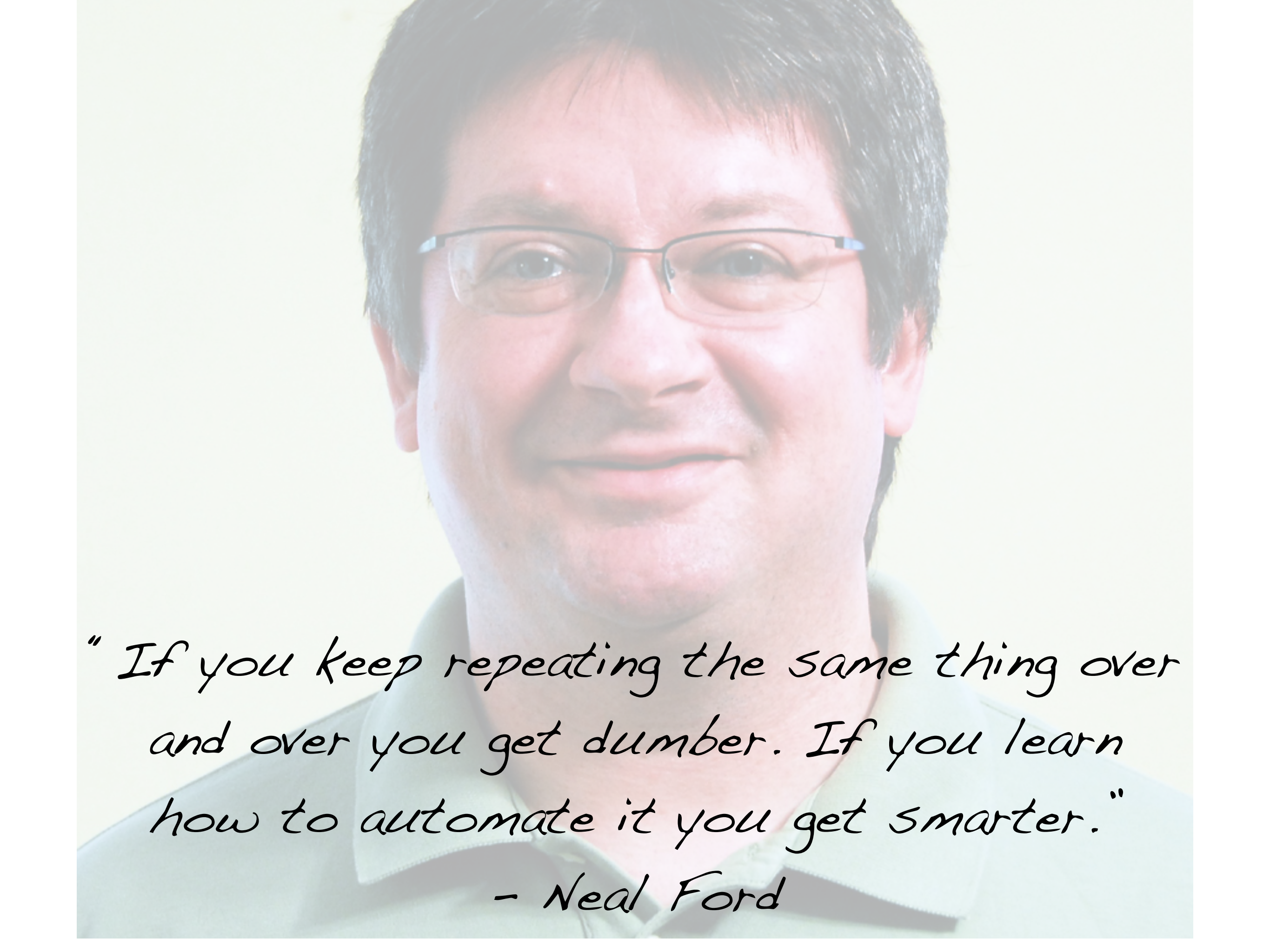


- Infrastructure
- Monitoring
- Triage

INFRASTRUCTURE

automate





"If you keep repeating the same thing over and over you get dumber. If you learn how to automate it you get smarter."

- Neal Ford



<http://www.puppetlabs.com/>



<http://www.opscode.com/>

treat infrastructure like
cattle not like pets




```
class tomcat {

  $tomcat_port = 735
  $tomcat_password = 'badwolf'

  notice("Establishing http://$hostname:$tomcat_port/")

  Package { # defaults
    ensure => installed,
  }

  package { 'tomcat6':
  }

  package { 'tomcat6-user':
    require => Package['tomcat6'],
  }

  package { 'tomcat6-admin':
    require => Package['tomcat6'],
  }

  file { ['/etc/tomcat6/tomcat-users.xml']:
    owner => 'root',
    require => Package['tomcat6'],
    notify => Service['tomcat6'],
    content => template('tomcat/tomcat-users.xml.erb')
  }

  file { ['/etc/tomcat6/server.xml']:
    owner => 'root',
    require => Package['tomcat6'],
    notify => Service['tomcat6'],
    content => template('tomcat/server.xml.erb'),
  }

  service { 'tomcat6':
    ensure => running,
    require => Package['tomcat6'],
  }

}
```

Infrastructure is code



git



MONITORING

HYPERIC

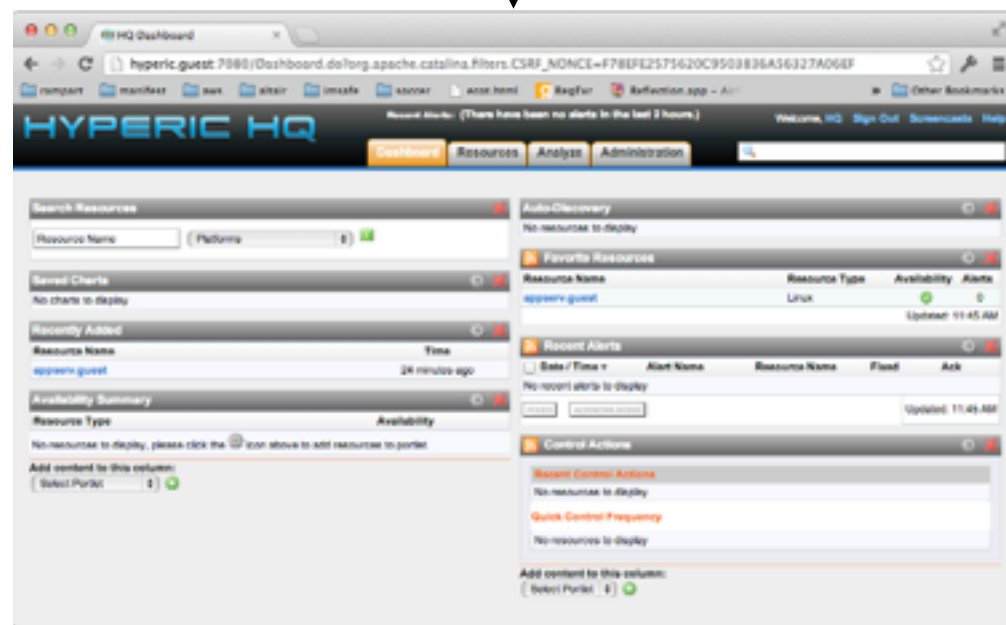
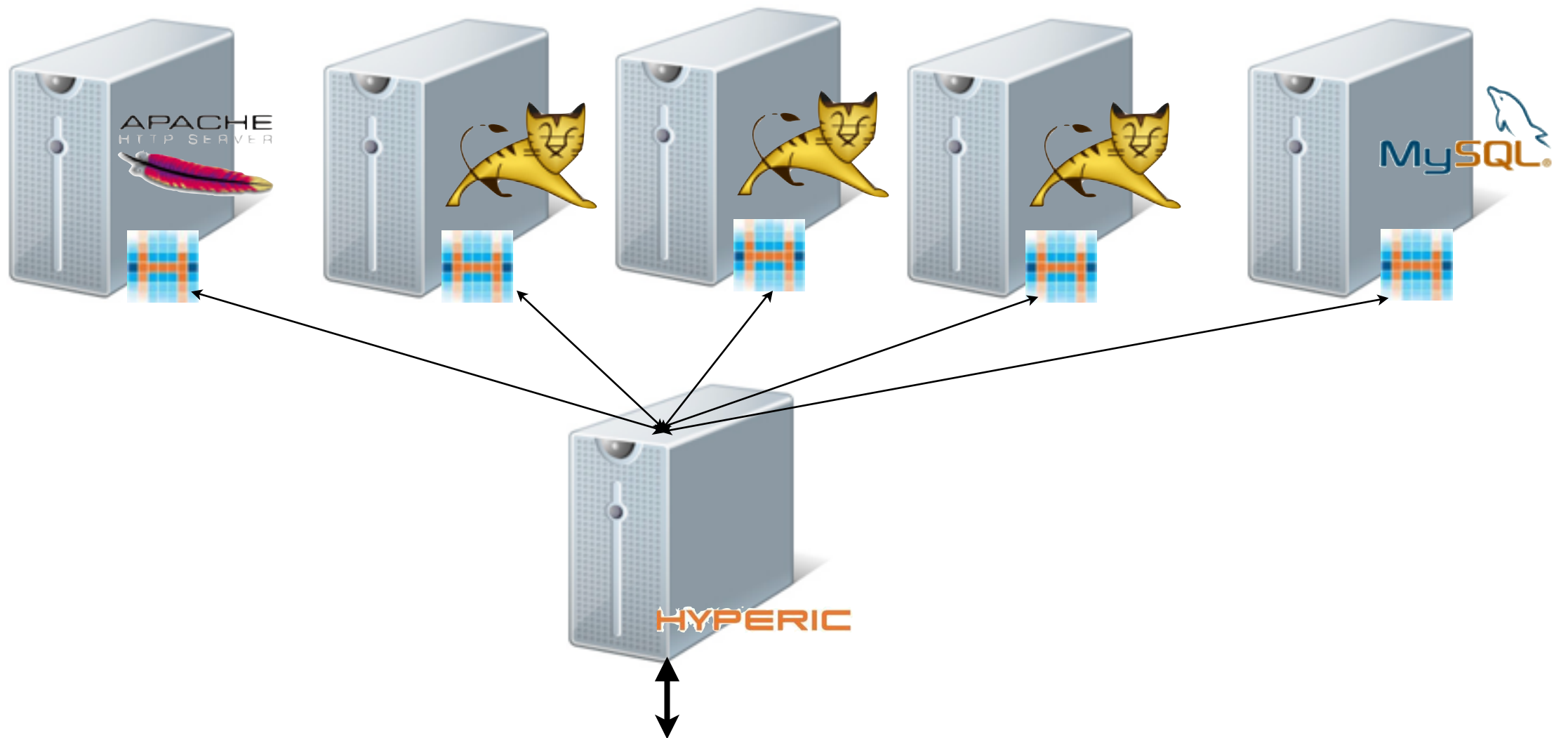
<http://www.hyperic.com/>

The logo for OpenNMS, featuring a green swoosh above the word "open" in a stylized font, followed by "NMS" in a bold, black, sans-serif font with a registered trademark symbol.

<http://www.opennms.org/>

Nagios[®]

<http://www.nagios.org/>



Dashboard

HQ Dashboard

hyperic.guest:7080/Dashboard.do?org.apache.catalina.filters.CSRF_NONCE=F78EFE2575620C9503836A56327A06EF

rampart

manifest

aws

altair

imsafe

soccer

ecot.html

RegExr

Reflection.app - AirP

»

Other Bookmarks

HYPERIC HQ

Recent Alerts: (There have been no alerts in the last 2 hours.)

Welcome, HQ

Sign Out

Screencasts

Help

Dashboard

Resources

Analyze

Administration

Search Resources

Resource Name

Platforms

Saved Charts

No charts to display

Recently Added

Resource Name	Time
appserv.guest	24 minutes ago

Availability Summary

Resource Type	Availability
No resources to display, please click the  icon above to add resources to portlet.	

Add content to this column:

Select Portlet

Auto-Discovery

No resources to display

Favorite Resources

Resource Name	Resource Type	Availability	Alerts
appserv.guest	Linux		0

Updated: 11:45 AM

Recent Alerts

☐ Date / Time

Alert Name

Resource Name

Fixed

Ack

No recent alerts to display

FIXED

ACKNOWLEDGE

Updated: 11:45 AM

Control Actions

Recent Control Actions

No resources to display

Quick Control Frequency

No resources to display

Add content to this column:

Select Portlet

Auto-Discovery

Auto-Discovery  			
Resource Name 		Status	Changes
☒ appserv.guest - CentOS 6.3		new	N/A
☒ HQ Agent 4.6.6	/home/hyperic/agent-4.6.6	new	N/A
☒ Apache Tomcat 7.0	/opt/tomcat/apache-tomcat-7.0.33	new	N/A
☐ localhost.localdomain - CentOS 6.3		new	N/A
☒ HQ Agent 4.6.6	/home/hyperic/agent-4.6.6	new	N/A
Add to Inventory		Skip Checked Resources	

Auto-Discovery

Auto-Discovery			
Resource Name		Status	Changes
☒ appserv.guest - CentOS 6.3		new	N/A
☒ HQ Agent 4.6.6	/home/hyperic/agent-4.6.6	new	N/A
☒ Apache Tomcat 7.0	/opt/tomcat/apache-tomcat-7.0.33	new	N/A
☐ localhost.localdomain - CentOS 6.3		new	N/A
☒ HQ Agent 4.6.6	/home/hyperic/agent-4.6.6	new	N/A
Add to Inventory		Skip Checked Resources	

Platforms (1) | Servers (2) | Services (7) | Compatible Groups/Clusters (0) | Mixed Groups (0) | Applications (0)

Show Chart View

Platform	Platform Type	Description	Availability
☐ ☒ M I A appserv.guest	Linux	CentOS 6.3	☒
GROUP DELETE ENABLE ALL ALERTS DISABLE ALL ALERTS			
Total: 1			Items Per Page: 15

Platforms (1) | Servers (2) | Services (7) | Compatible Groups/Clusters (0) | Mixed Groups (0) | Applications (0)

Show Chart View

Server	Server Type	Description	Availability
☐ ☒ M I A appserv.guest Apache Tomcat 7.0	Apache Tomcat 7.0		☐
☐ ☒ M I A appserv.guest HQ Agent 4.6.6	HQ Agent	Hyperic HQ monitor Agent	☒
GROUP DELETE ENABLE ALL ALERTS DISABLE ALL ALERTS			
Total: 2			Items Per Page: 15

Platforms (1) | Servers (2) | Services (7) | Compatible Groups/Clusters (0) | Mixed Groups (0) | Applications (0)

Show Chart View

Service	Service Type	Description	Availability
☐ ☒ M I A appserv.guest Linux CPU 1 (2199Mhz Intel Core(TM) i7-2720QM CPU @ 2.20GHz)	CPU		☒
☐ ☒ M I A appserv.guest Linux CPU 2 (2199Mhz Intel Core(TM) i7-2720QM CPU @ 2.20GHz)	CPU		☒
☐ ☒ M I A appserv.guest Linux File System /dev/sda1 mounted on /boot (local/ext4)	FileServer Mount		☒
☐ ☒ M I A appserv.guest Linux File System /dev/sda3 mounted on / (local/ext4)	FileServer Mount		☒
☐ ☒ M I A appserv.guest Linux Network Interface eth1 (ethernet)	NetworkServer Interface		☒
☐ ☒ M I A appserv.guest Linux Network Interface lo (loopback)	NetworkServer Interface		☒
☐ ☒ M I A appserv.guest Linux sshd Process	Process		☒
GROUP DELETE ENABLE ALL ALERTS DISABLE ALL ALERTS			
Total: 7			Items Per Page: 15

Browse > appserv.guest

Description: CentOS 6.3

Architecture : x86_64

OS Version : 2.6.32-279.el6.x86_64

RAM : 2048 MB

Owner: HQ Administrator (hqadmin) - Change...

CPU Speed : 2 @ 2199 MHz

Vendor Version : 6.3

IP Address : 192.168.248.129

Vendor : CentOS

Map

Tools Menu

Monitor

Inventory

Alert

Views

Metric Display Range: Last 8 Hours Advanced Settings

RESOURCES

- ☐ Platform Services Health Avail
- ☐ CPU
- ☐ FileServer Mount
- ☐ NetworkServer Interface
- ☐ appserv.guest Linux sshd Process
- ☐ Deployed Servers Health Avail
- ☐ appserv.guest Apache Tomcat 7.0
- ☐ appserv.guest HQ Agent 4.6.6

Select Resources above & click button to view metrics

View Metrics

All Metrics

- Free Memory
- Free Memory (+ buffers/cache)
- Load Average 5 Minutes
- Swap Used
- Availability

INDICATORS

METRIC DATA

Indicator Charts | Show Last 8 Hours

View: Update Default

Free Memory
(Linux)

LOW: 71.5 MB AVG: 124.7 MB PEAK: 245.6 MB

Free Memory (+ buffers/cache)
(Linux)

LOW: 1.2 GB AVG: 1.2 GB PEAK: 1.3 GB

Load Average 5 Minutes
(Linux)

LOW: 0.0 AVG: 0.4 PEAK: 6.8



Swap Used

11/25/2012 04:11 AM

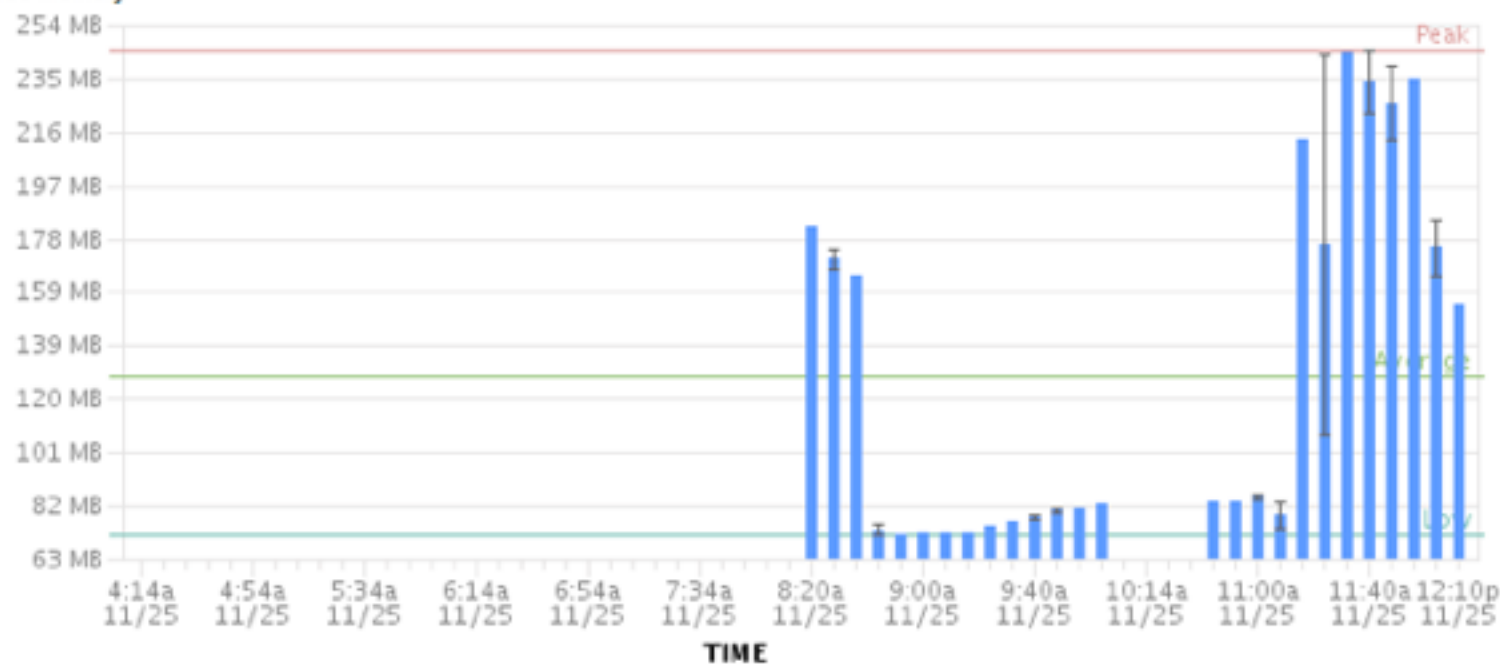
11/25/2012 12:03 PM

[Browse](#) > appserv.guest

Metric Chart

☒ Actual☒ Peak☒ Average☒ Low REDRAW[Define New Alert](#) 
[Save Chart to My Dashboard](#) 
[Back to Resource](#) 
[Export to CSV](#) 

Metric: Free Memory



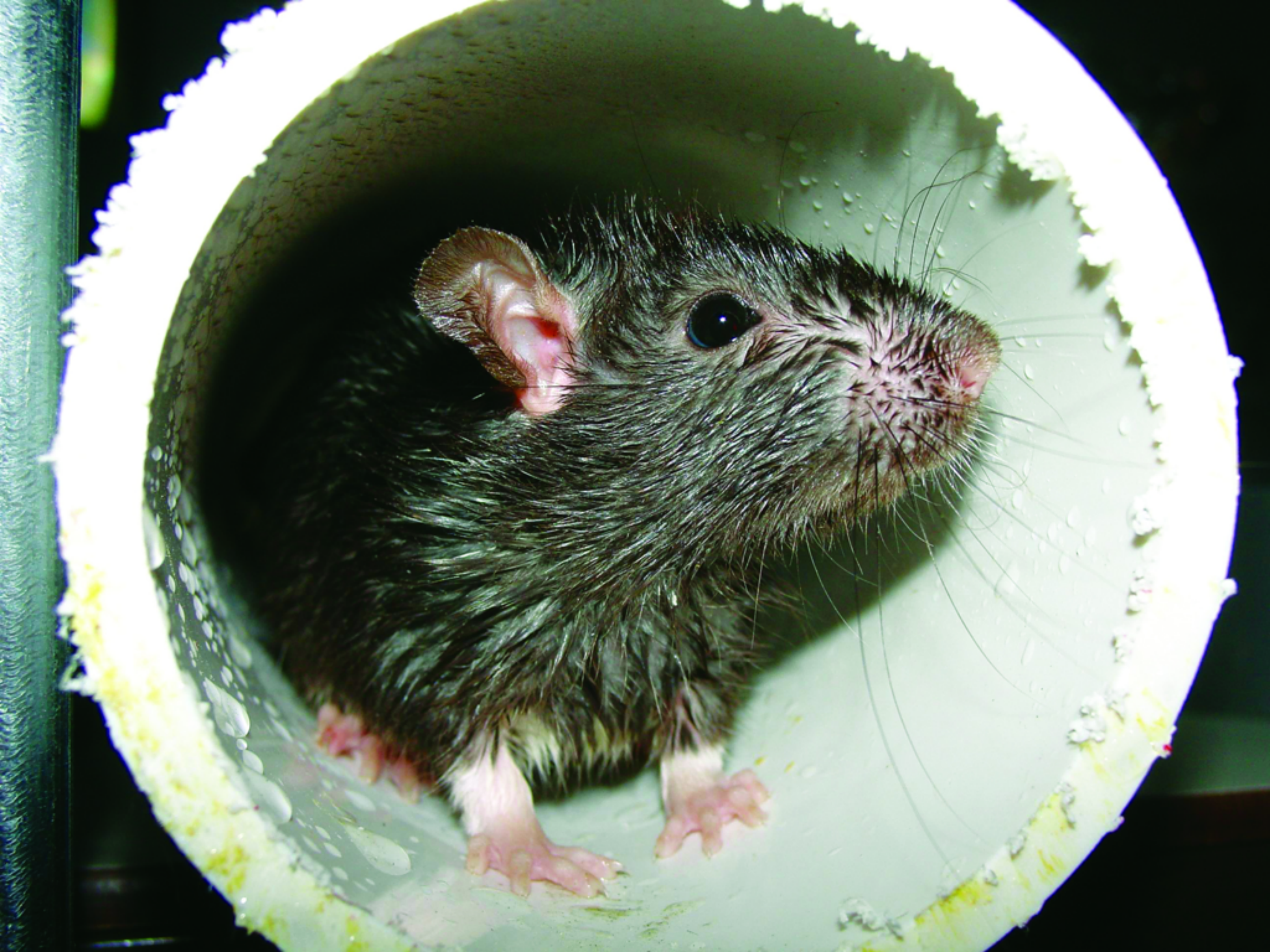
Resource & Control Action Key:

Resource:  appserv.guest 11/25/2012 04:14 AM to 11/25/2012 12:14 PM [Edit Range](#)

Participating Resources

Metric Name	Resource
Free Memory	appserv.guest

REDRAW SELECTED ON CHART



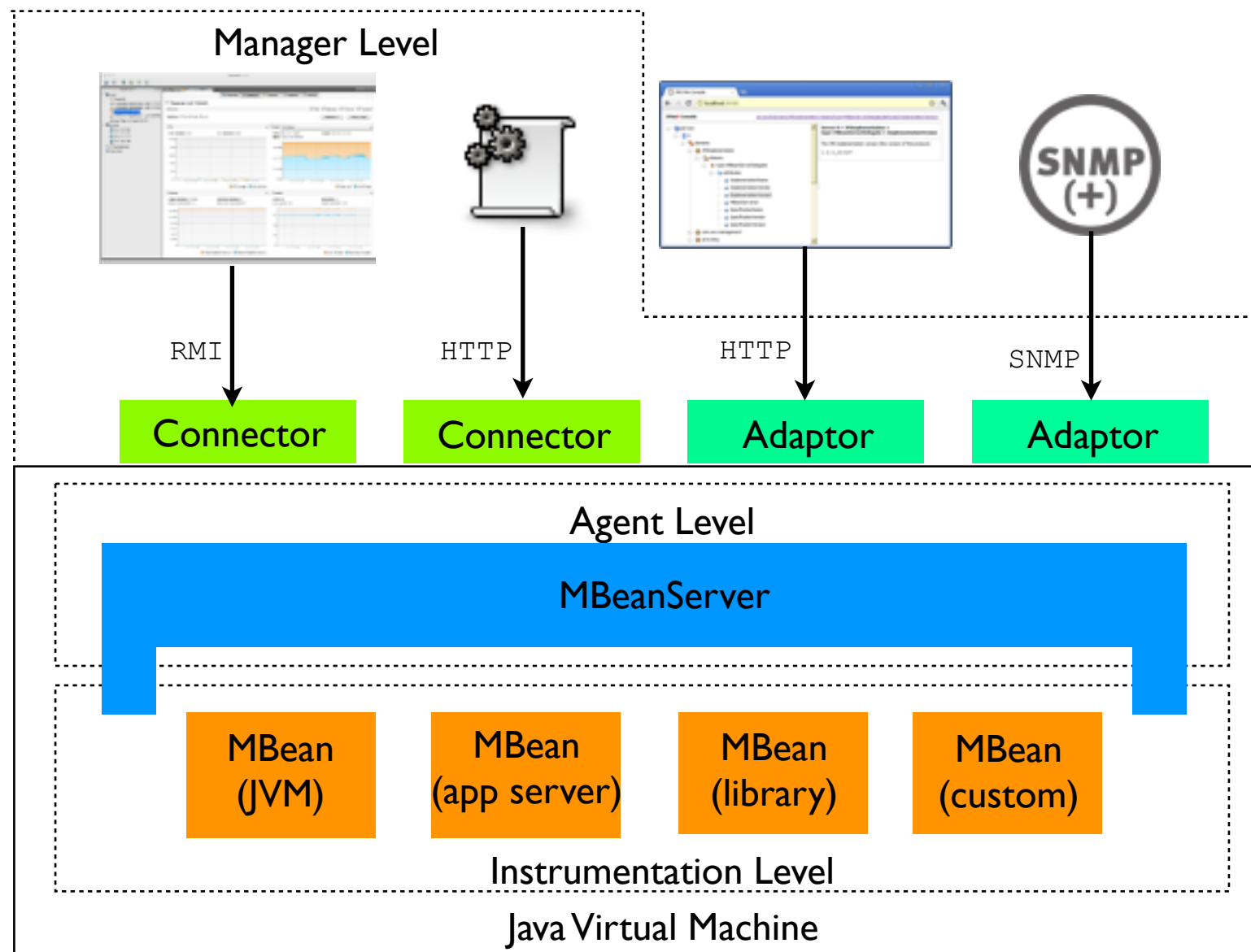
JMX

JMX

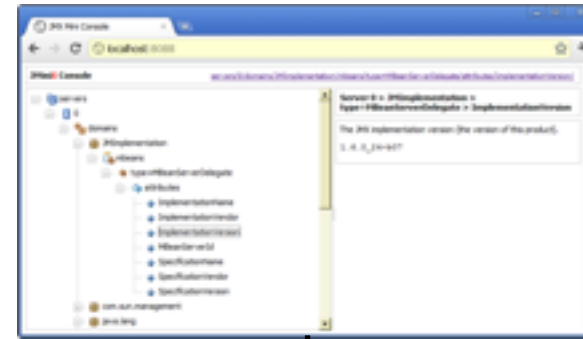
Java Management Extensions (JMX) is a [Java](#) technology that supplies tools for managing and monitoring [applications](#), system objects, devices (e. g. [printers](#)) and service oriented networks. Those resources are represented by objects called MBeans (for [Managed Bean](#)). In the API, [classes](#) can be dynamically loaded and instantiated. Managing and monitoring applications can be designed and developed using the [Java Dynamic Management Kit](#).



WIKIPEDIA
The Free Encyclopedia



Manager Level



RMI

HTTP

HTTP

SNMP

Connector

Connector

Adaptor

Adaptor

Agent Level

MBeanServer

MBean
(JVM)

MBean
(app server)

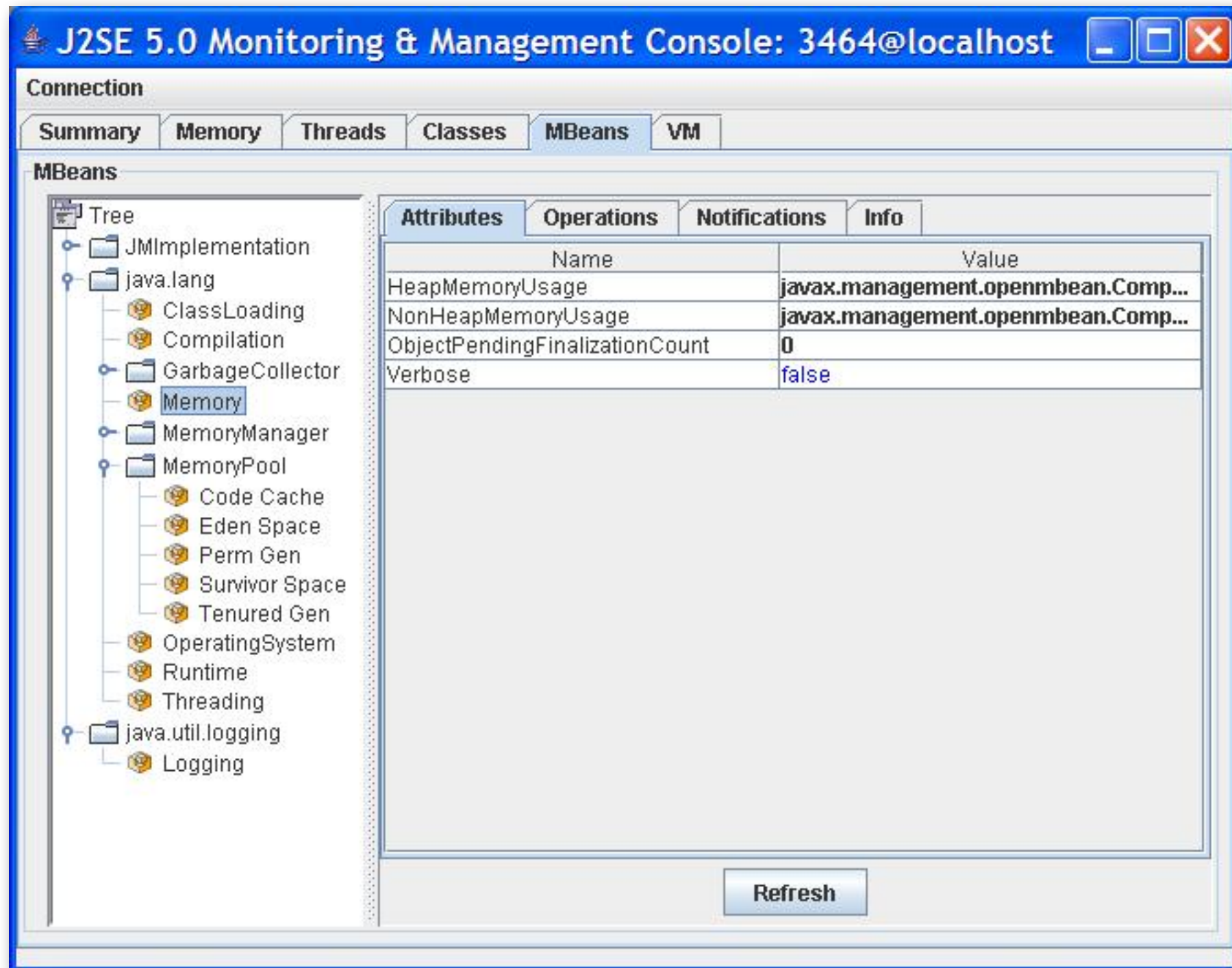
MBean
(library)

MBean
(custom)

Instrumentation Level

Java Virtual Machine

jconsole



Visual VM



jvisualvm

<http://visualvm.java.net/>

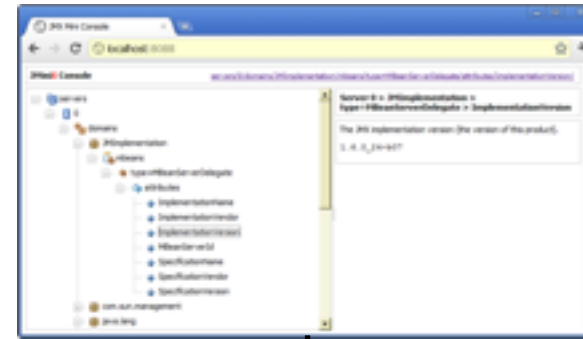
visualvm

VisualVM MBeans plug-in

The screenshot displays the VisualVM MBeans plug-in interface. The top bar shows tabs for Overview, Monitor, Threads, Sampler, and MBeans. The main title is "monitorRole@10.0.50.161:8999 (pid 7485)". Below this is the "MBeans Browser" section, which contains a tree view of MBeans. The tree shows a hierarchy starting with "Catalina", followed by "JQuery", "JMSImplementation", "Users", and "com.mchange.v2.c3p0". Under "com.mchange.v2.c3p0", there are several "PooledDataSource" objects. One of these, "PooledDataSource[2rw7tt8nhhku71dloq5[2698dd08]", is selected and highlighted in blue. To the right of the tree, there is a detailed view of the selected MBean. This view has tabs for "Attributes", "Operations", "Notifications", and "Metadata". The "Attributes" tab is active, showing a table of attribute values. The table has two columns: "Name" and "Value". The attributes listed include "acquireIncrement", "acquireRetryAttempts", "acquireRetryDelay", "allUsers", "autoCommitOnClose", "automaticTestTable", "breakAfterAcquireFailure", "checkoutTimeout", "connectionCustomizerClassName", "connectionTesterClassName", "dataSourceName", "debugUnreturnedConnectionStackTraces", "description", "driverClass", "effectivePropertyCycleDefaultUser", "factoryClassLocation", "forceIgnoreUnresolvedTransactions", "identityToken", "idleConnectionTestPeriod", "initialPoolSize", "jdbcUrl", "loginTimeout", "maxAdministrativeTaskTime", "maxConnectionAge", "maxIdleTime", "maxIdleTimeExcessConnections", "maxPoolSize", "maxStatements", "maxStatementsPerConnection", "minPoolSize", "numBusyConnections", "numBusyConnectionsAllUsers", "numBusyConnectionsDefaultUser", "numConnections", "numConnectionsAllUsers", "numConnectionsDefaultUser", "numFailedCheckinsDefaultUser", "numFailedCheckoutsDefaultUser", "numFailedIdleTestsDefaultUser", "numHelperThreads", "numIdleConnections", "numIdleConnectionsAllUsers", "numIdleConnectionsDefaultUser", "numThreadsAwaitingCheckoutDefaultUser", "numUnclosedOrphanedConnections", "numUnclosedOrphanedConnectionsAllUsers", "numUnclosedOrphanedConnectionsDefaultUser", "numUserPools", "overrideDefaultPassword", "overrideDefaultUser", "preferredTestQuery", and "propertyCycle". The values for these attributes are displayed in the "Value" column. At the bottom right of the detailed view, there is a "Refresh" button.

Name	Value
acquireIncrement	5
acquireRetryAttempts	120
acquireRetryDelay	1000
allUsers	[cls]
autoCommitOnClose	false
automaticTestTable	
breakAfterAcquireFailure	false
checkoutTimeout	0
connectionCustomizerClassName	
connectionTesterClassName	com.mchange.v2.c3p0.impl.DefaultConnectionTester
dataSourceName	2rw7tt8nhhku71dloq5[2698dd08]
debugUnreturnedConnectionStackTraces	false
description	
driverClass	com.mysql.jdbc.Driver
effectivePropertyCycleDefaultUser	0.0
factoryClassLocation	
forceIgnoreUnresolvedTransactions	false
identityToken	2rw7tt8nhhku71dloq5[2698dd08]
idleConnectionTestPeriod	120
initialPoolSize	3
jdbcUrl	jdbc:mysql://scg-qlr-igty-db-master:3306/cls?autoReconnect=true&useUnicode=true&ch...
loginTimeout	0
maxAdministrativeTaskTime	0
maxConnectionAge	0
maxIdleTime	0
maxIdleTimeExcessConnections	0
maxPoolSize	300
maxStatements	0
maxStatementsPerConnection	0
minPoolSize	15
numBusyConnections	85
numBusyConnectionsAllUsers	85
numBusyConnectionsDefaultUser	85
numConnections	300
numConnectionsAllUsers	300
numConnectionsDefaultUser	300
numFailedCheckinsDefaultUser	0
numFailedCheckoutsDefaultUser	0
numFailedIdleTestsDefaultUser	0
numHelperThreads	33
numIdleConnections	215
numIdleConnectionsAllUsers	215
numIdleConnectionsDefaultUser	215
numThreadsAwaitingCheckoutDefaultUser	0
numUnclosedOrphanedConnections	0
numUnclosedOrphanedConnectionsAllUsers	0
numUnclosedOrphanedConnectionsDefaultUser	0
numUserPools	1
overrideDefaultPassword	
overrideDefaultUser	
preferredTestQuery	select curdate()
propertyCycle	0

Manager Level



RMI

HTTP

HTTP

SNMP

Connector

Connector

Adaptor

Adaptor

Agent Level

MBeanServer

MBean
(JVM)

MBean
(app server)

MBean
(library)

MBean
(custom)

Instrumentation Level

Java Virtual Machine

MBeans Browser

MBeans

- ▶ Catalina
- ▶ JMImplementation
- ▶ Users
- ▶ com.sun.management
- ▼ java.lang
 - ClassLoading
 - Compilation
 - ▶ GarbageCollector
 - Memory
 - ▶ MemoryManager
 - ▶ MemoryPool
 - OperatingSystem
 - Runtime
 - Threading
- ▶ java.nio
- ▶ java.util.logging

Attributes

Operations | Notifications | Metadata

Attribute values

Name

Value



Tabular Navigation



Composite Navigation

HeapMemoryUsage

Name	Value
committed	87293952
init	30700992
max	438108160
used	48526352

NonHeapMemoryUsage

ObjectName

ObjectPendingFinalizationCount

Verbose

javax.management.openmbean.CompositeDataSup...

java.lang:type=Memory

0

false

Refresh

appserv.guest:6969 (pid 28434)

MBeans Browser

MBeans

- ▶ Catalina
- ▶ JMImplementation
- ▶ Users
- ▶ com.sun.management
- ▼ java.lang
 - ClassLoading
 - Compilation
 - ▶ GarbageCollector
 - Memory
 - ▶ MemoryManager
 - ▶ MemoryPool
 - OperatingSystem
 - Runtime
 - Threading
- ▶ java.nio
- ▶ java.util.logging

Attributes

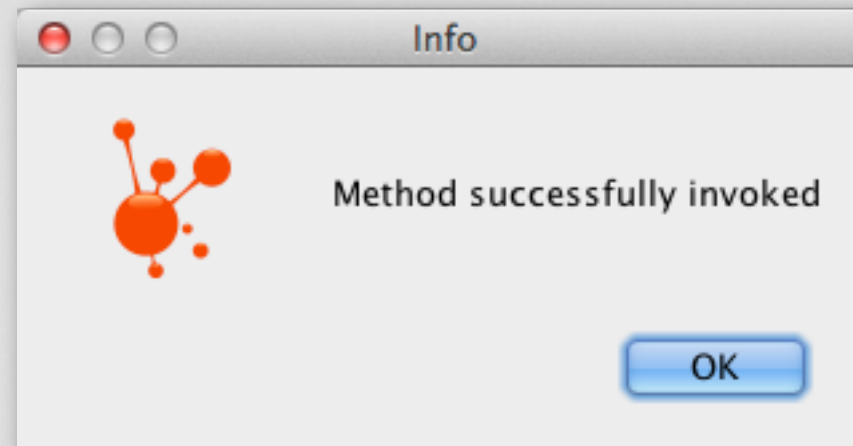
Operations

Notifications

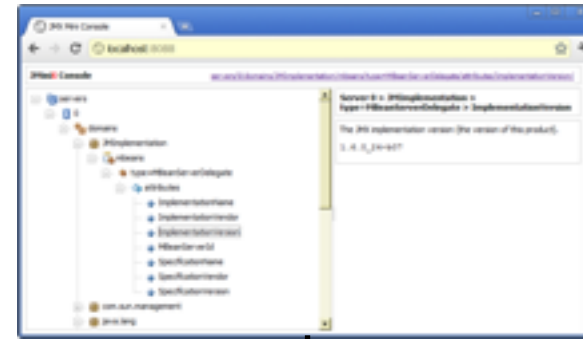
Metadata

Operation invocation

void gc ()



Manager Level



RMI

HTTP

HTTP

SNMP

Connector

Connector

Adaptor

Adaptor

Agent Level

MBeanServer

MBean
(JVM)

MBean
(app server)

MBean
(library)

MBean
(custom)

Instrumentation Level

Java Virtual Machine

Tomcat (pid 32415)

Overview Monitor Threads Sampler Profiler MBeans Visual GC

Tomcat (pid 32415)

MBeans Browser

MBeans

- ▼ Catalina
 - ▶ Cache
 - ▶ Connector
 - ▶ Deployer
 - ▶ Engine
 - ▶ GlobalRequestProcessor
 - ▶ Host
 - ▶ JspMonitor
 - ▶ Loader
 - ▶ MBeanFactory
 - ▼ Manager
 - ▶ /
 - ▼ /webperf
 - ▶ **localhost**
 - ▶ Mapper
 - ▶ NamingResources
 - ▶ ProtocolHandler
 - ▶ Realm
 - ▶ RequestProcessor
 - ▶ Resource
 - ▶ Server
 - ▶ ServerClassLoader
 - ▶ Service
 - ▶ Servlet
 - ▶ StringCache
 - ▶ ThreadPool
 - ▶ Valve
 - ▶ WebModule
 - ▶ WebappClassLoader
- ▶ JMImplementation
- ▶ Users
- ▶ com.sun.management
- ▶ java.lang
- ▶ java.util.logging

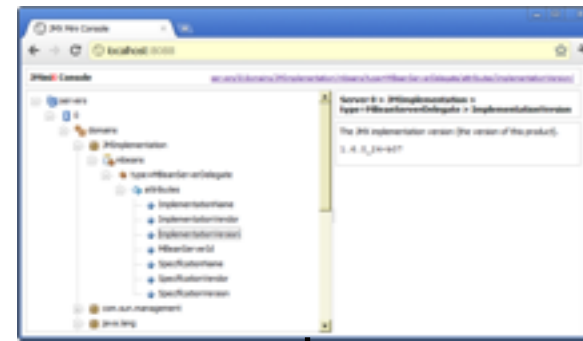
Attributes Operations Notifications Metadata

Attribute values

Name	Value
activeSessions	1
className	org.apache.catalina.session.StandardManager
distributable	false
duplicates	0
expiredSessions	0
jvmRoute	
maxActive	1
maxActiveSessions	-1
maxInactiveInterval	1800
modelerType	org.apache.catalina.session.StandardManager
name	StandardManager
pathname	SESSIONS.ser
processExpiresFrequency	6
processingTime	0
rejectedSessions	0
secureRandomAlgorithm	SHA1PRNG
secureRandomClass	
secureRandomProvider	
sessionAverageAliveTime	0
sessionCounter	1
sessionCreateRate	20
sessionExpireRate	0
sessionIdLength	16
sessionMaxAliveTime	0
stateName	STARTED

Refresh

Manager Level



RMI

HTTP

HTTP

SNMP

Connector

Connector

Adaptor

Adaptor

Agent Level

MBeanServer

MBean
(JVM)

MBean
(app server)

MBean
(library)

MBean
(custom)

Instrumentation Level

Java Virtual Machine



```
package com.manifestcorp.webperf;

import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.RequestMapping;

@Controller
public class IndexController {

    private static Logger log = LoggerFactory.getLogger(IndexController.class);

    @RequestMapping(value = "/")
    public String index() {
        System.out.println("HERE!!!");
        log.info("STILL HERE!!!");
        return "WEB-INF/jsp/index.jsp";
    }
}
```

HERE!!!

logback.xml



```
<configuration>  
  <jmxConfigurator />
```

```
  <appender name="STDOUT" class="ch.qos.logback.core.ConsoleAppender">  
    <encoder>  
      <pattern>%d{HH:mm:ss.SSS} [%thread] %-5level %logger{36} - %msg%n</pattern>  
    </encoder>  
  </appender>
```

```
  <root level="error">  
    <appender-ref ref="STDOUT" />  
  </root>  
</configuration>
```


Tomcat (pid 32512)

Overview | Monitor | Threads | Sampler | Profiler | MBeans | Visual GC

Tomcat (pid 32512)

MBeans Browser

MBeans

- ▶ Catalina
- ▶ JMImplementation
- ▶ Users
- ▼ ch.qos.logback.classic
 - ▼ default
 - ch.qos.logback.classic.jmx.JMXConfigurator
- ▶ com.sun.management
- ▶ java.lang
- ▶ java.util.logging

Attributes | Operations | Notifications | Metadata

Attribute values

Name	Value
	ROOT
	com
	com.manifestcorp
	com.manifestcorp.webperf
	com.manifestcorp.webperf.IndexController

LoggerList

Statuses

[INFO in ch.qos.logback.classic.LoggerContext[default] - C...

Refresh

Tomcat (pid 32512)

OverviewMonitorThreadsSamplerProfilerMBeansVisual GC

Tomcat (pid 32512)

MBeans Browser

MBeans

- Catalina
- JMImplementation
- Users
- ch.qos.logback.classic
 - default
 - ch.qos.logback.classic.jmx.JMXConfigurator
- com.sun.management
- java.lang
- java.util.logging

AttributesOperationsNotificationsMetadata

Operation invocation

java.lang.String

getLoggerLevel

(p1 erf.IndexController)

void

setLoggerLevel

(p1 erf.IndexController , p2 debug)

void

reloadDefaultConfiguration

()

void

reloadByFileName

(p1 String)

void

reloadByURL

(p1 URL)

java.lang.String

getLoggerEffectiveLevel

(p1 String)



```
package com.manifestcorp.webperf;

import org.slf4j.Logger;
import org.slf4j.LoggerFactory;
import org.springframework.stereotype.Controller;
import org.springframework.web.bind.annotation.RequestMapping;

@Controller
public class IndexController {

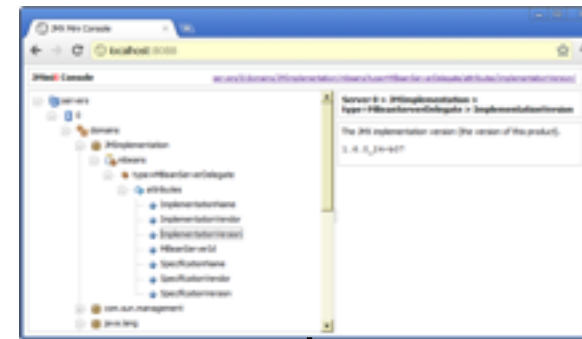
    private static Logger log = LoggerFactory.getLogger(IndexController.class);

    @RequestMapping(value = "/")
    public String index() {
        System.out.println("HERE!!!");
        log.info("STILL HERE!!!");
        return "WEB-INF/jsp/index.jsp";
    }
}
```

HERE!!!

23:53:03.556 [http-bio-8080-exec-8] INFO c.m.webperf.IndexController - STILL HERE!!!

Manager Level



RMI

HTTP

HTTP

SNMP

Connector

Connector

Adaptor

Adaptor

Agent Level

MBeanServer

MBean
(JVM)

MBean
(app server)

MBean
(library)

MBean
(custom)

Instrumentation Level

Java Virtual Machine

```
public interface IndexCounterMBean {  
    int getCount();  
    void reset();  
}
```




```
public class IndexCounter implements IndexCounterMBean {

    static Logger log = LoggerFactory.getLogger(IndexCounter.class);
    private AtomicInteger count = new AtomicInteger();
    private static IndexCounter instance;

    static {
        try {
            MBeanServer mbs = ManagementFactory.getPlatformMBeanServer();
            ObjectName name = new ObjectName("com.manifestcorp:type=IndexCounter");
            instance = new IndexCounter();
            mbs.registerMBean(instance, name);
        } catch (Exception ex) {
            log.error("Unable to register IndexCounter MBean", ex);
        }
    }

    private IndexCounter() {}

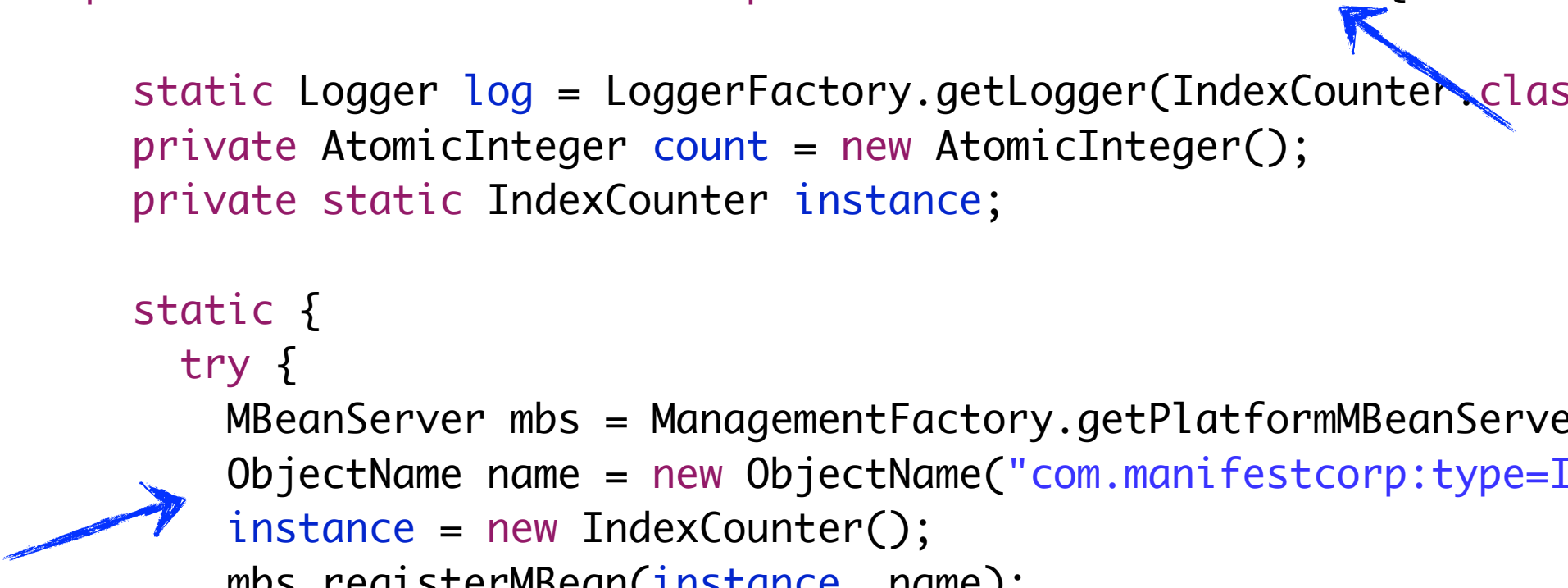
    public int getCount() { return count.get(); }

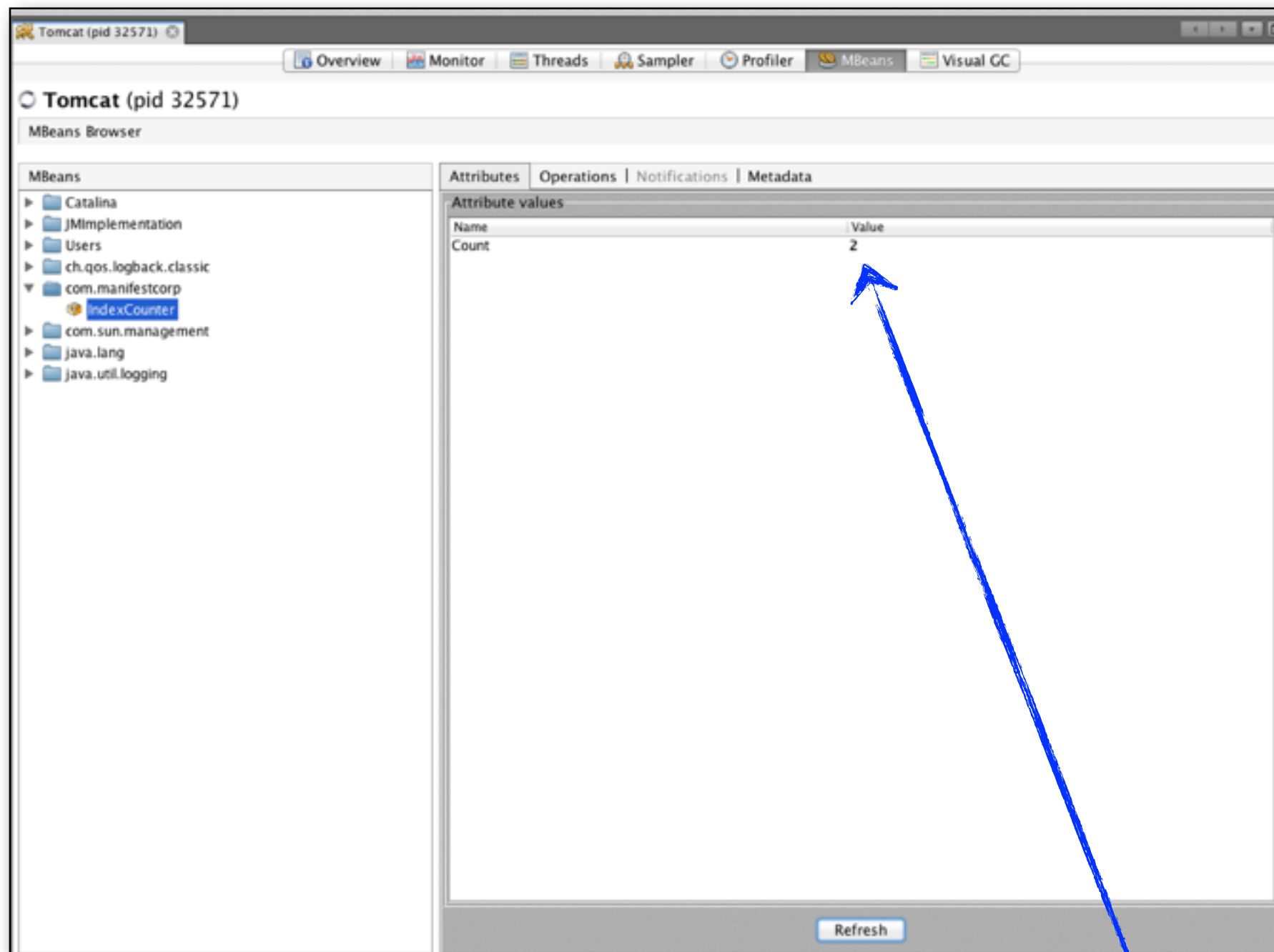
    public void increment() { count.incrementAndGet(); }

    public void reset() { count.set(0); }

    public static IndexCounter getInstance() {
        return instance;
    }

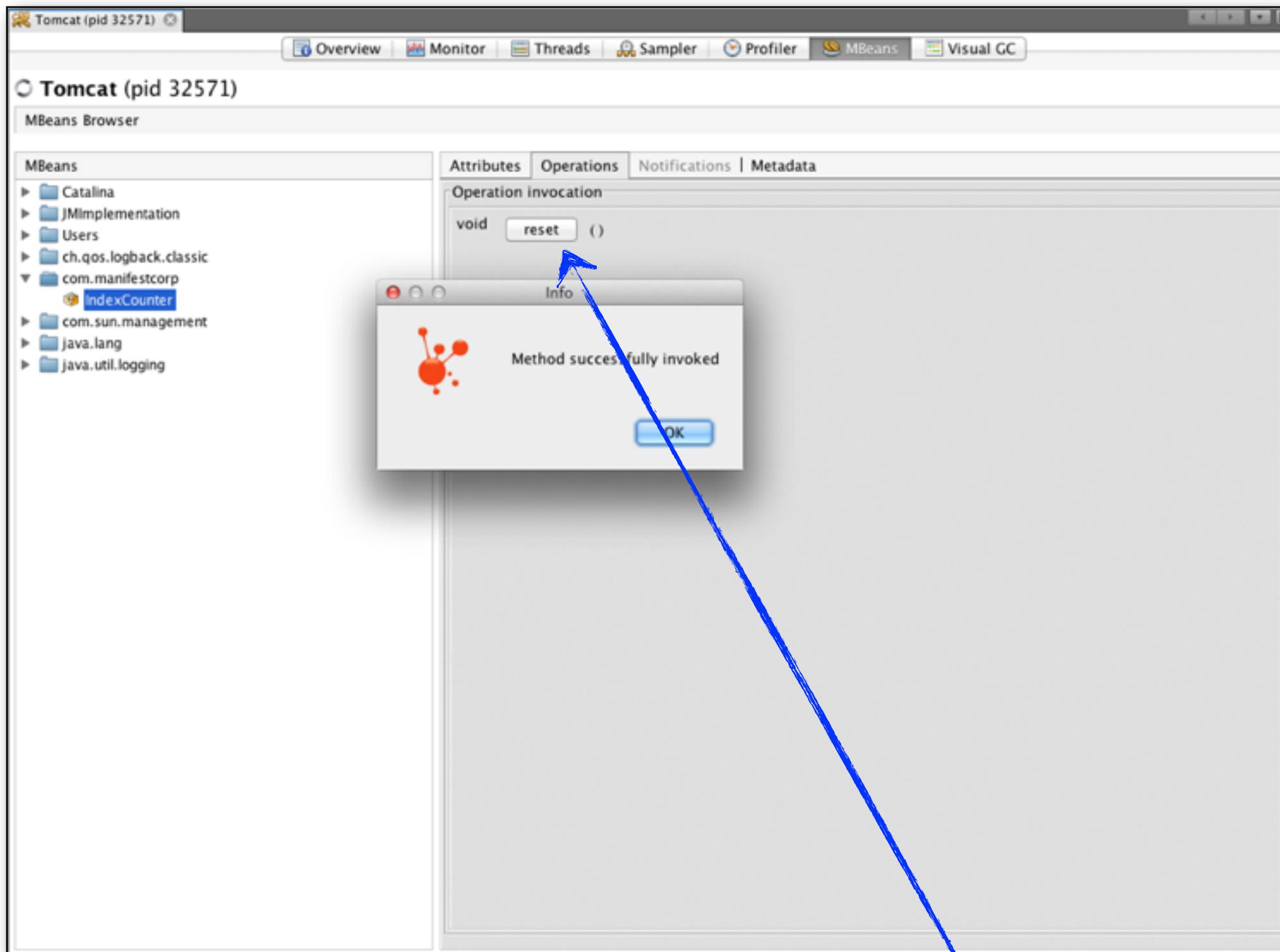
}
```





```
package com.manifestcorp.webperf;
```

```
public interface IndexCounterMBean {  
    int getCount();  
    void reset();  
}
```



```
package com.manifestcorp.webperf;
```

```
public interface IndexCounterMBean {  
    int getCount();  
    void reset();  
}
```



@Component



@ManagedResource(objectName="com.manifestcorp:type=AlternateCounter")

public class AlternateCounter {

static Logger log = LoggerFactory.getLogger(AlternateCounter.class);

private AtomicInteger count = new AtomicInteger();



@ManagedAttribute

public int getCount() { return count.get(); }

public void increment() { count.incrementAndGet(); }



@ManagedOperation

public void reset() { count.set(0); }

}


```
<?xml version="1.0" encoding="UTF-8"?>
<beans xmlns="http://www.springframework.org/schema/beans"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:mvc="http://www.springframework.org/schema/mvc"
  xmlns:context="http://www.springframework.org/schema/context"
  xsi:schemaLocation="
    http://www.springframework.org/schema/mvc http://www.springframework.org/schema/mvc/spring-mvc-3.0.xsd
    http://www.springframework.org/schema/beans http://www.springframework.org/schema/beans/spring-beans-3.0.xsd
    http://www.springframework.org/schema/context http://www.springframework.org/schema/context/spring-context-3.0.xsd"

  <context:component-scan base-package="com.manifestcorp" />
  <mvc:annotation-driven />

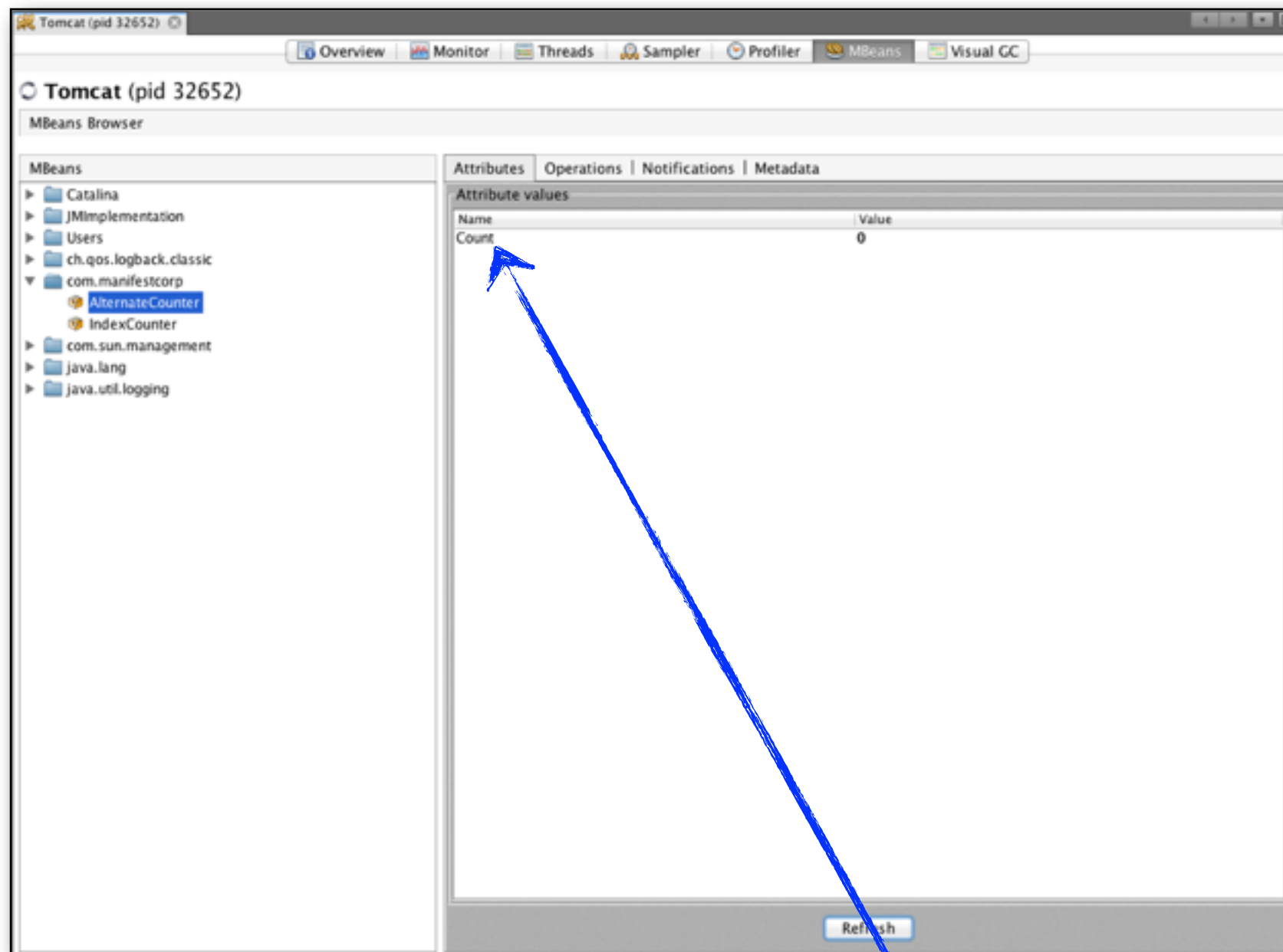
  → <bean id="exporter" class="org.springframework.jmx.export.MBeanExporter">
    <property name="assembler" ref="assembler"/>
    <property name="namingStrategy" ref="namingStrategy"/>
    <property name="autodetect" value="true"/>
  </bean>

  → <bean id="jmxAttributeSource"
    class="org.springframework.jmx.export.annotation.AnnotationJmxAttributeSource"/>

  <!-- will create management interface using annotation metadata -->
  → <bean id="assembler"
    class="org.springframework.jmx.export.assembler.MetadataMBeanInfoAssembler">
    <property name="attributeSource" ref="jmxAttributeSource"/>
  </bean>

  <!-- will pick up the ObjectName from the annotation -->
  → <bean id="namingStrategy"
    class="org.springframework.jmx.export.naming.MetadataNamingStrategy">
    <property name="attributeSource" ref="jmxAttributeSource"/>
  </bean>

</beans>
```



```
@Component
@ManagedResource(objectName="com.manifestcorp:type=AlternateCounter")
public class AlternateCounter {

    static Logger log = LoggerFactory.getLogger(AlternateCounter.class);

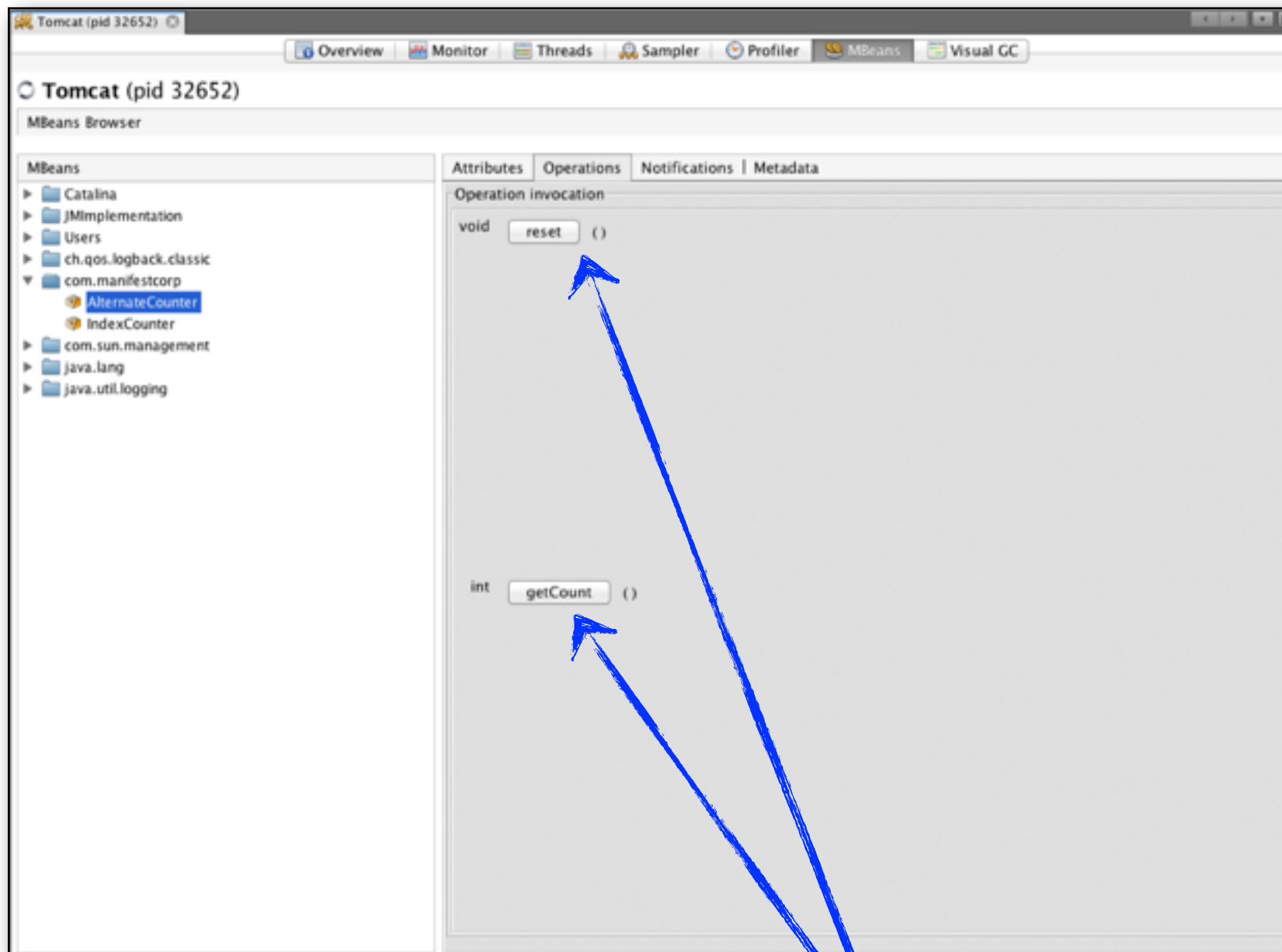
    private AtomicInteger count = new AtomicInteger();

    @ManagedAttribute
    public int getCount() { return count.get(); }

    public void increment() { count.incrementAndGet(); }

    @ManagedOperation
    public void reset() { count.set(0); }

}
```



```
@Component
@ManagedResource(objectName="com.manifestcorp:type=AlternateCounter")
public class AlternateCounter {

    static Logger log = LoggerFactory.getLogger(AlternateCounter.class);

    private AtomicInteger count = new AtomicInteger();

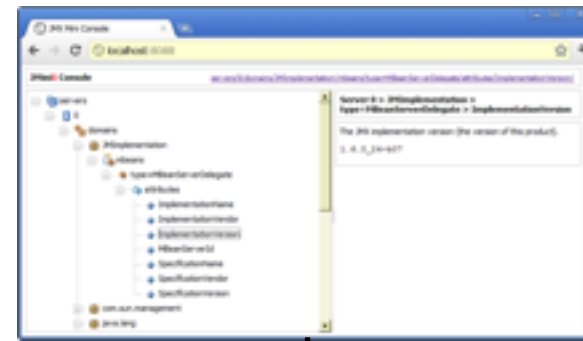
    @ManagedAttribute
    public int getCount() { return count.get(); }

    public void increment() { count.incrementAndGet(); }

    @ManagedOperation
    public void reset() { count.set(0); }

}
```

Manager Level



RMI

HTTP

HTTP

SNMP

Connector

Connector

Adaptor

Adaptor

Agent Level

MBeanServer

MBean
(JVM)

MBean
(app server)

MBean
(library)

MBean
(custom)

Instrumentation Level

Java Virtual Machine

```

import javax.management.remote.*

println "Starting..."

def serverList = args.length > 0 ? args : ['appserv.guest', '192.168.248.129']

serverList.each { serverName ->
    try {
        println "\nServer: $serverName"

        def url = "service:jmx:rmi:///jndi/rmi://$serverName:6969/jmxrmi"
        def connection = JMXConnectorFactory.connect(new JMXServiceURL(url))
        def server = connection.MBeanServerConnection
        def mbean = new GroovyMBean(server, 'java.lang:type=Memory')
        println String.format('%15s %7.2f/%7.2f (used/max)', 'heap',
                                inBytes(mbean.HeapMemoryUsage.used),
                                inBytes(mbean.HeapMemoryUsage.max))

    } catch (e) {
        println e
    }
}

println "Done..."

def inBytes(amount) {
    return amount/1000000
}

```

```

Starting...
Server: appserv.guest
        heap    19.74/ 438.11 (used/max)
Server: 192.168.248.129
        heap    20.09/ 438.11 (used/max)
Done...

```




back to our regularly scheduled
program...

Browse > appserv.guest > appserv.guest Apache Tomcat 7.0

Description:

Owner: HQ Administrator (hqadmin) - Change...

Map

Tools Menu

Monitor

Inventory

Alert

Control

Views

Metric Display Range: Last 8 Hours Advanced Settings

RESOURCES

☐ Services	Avail
☐ Apache Tomcat 7.0 Global Request Processor	
☐ Apache Tomcat 7.0 JSP Monitor	
☐ Apache Tomcat 7.0 Servlet Monitor	
☐ Apache Tomcat 7.0 Thread Pools	
☐ Apache Tomcat 7.0 Web Module Stats	
☐ Host Platform	Avail
☐ appserv.guest	

Select Resources above & click button to view metrics

View Metrics

All Metrics

Heap Memory Free	
Process Cpu Time per Minute	
UpTime	
Availability	

INDICATORS

METRIC DATA

Indicator Charts | Show Last 8 Hours

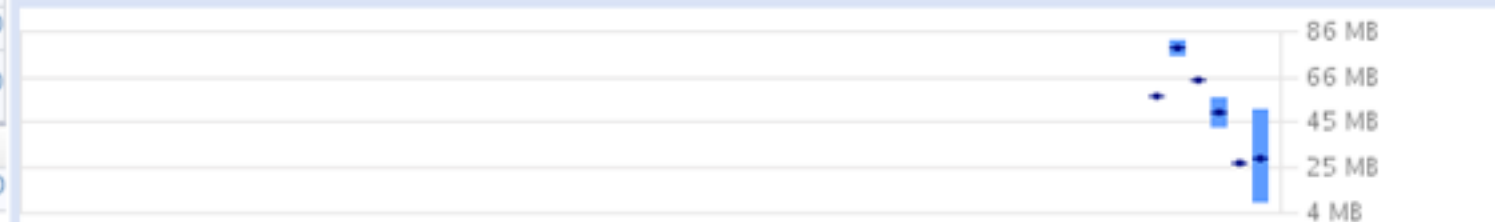
View: Update Default

100.0% — Availability

Heap Memory Free

(Apache Tomcat 7.0)

LOW: 8.2 MB AVG: 51.7 MB PEAK: 82.7 MB



Process Cpu Time per Minute

(Apache Tomcat 7.0)

LOW: 481.999ms AVG: 589.969ms PEAK: 957.846ms



UpTime

(Apache Tomcat 7.0)

LOW: 00:55:00.019 AVG: 01:04:00.013 PEAK: 01:13:00.007



11/25/2012 04:52 AM

11/25/2012 12:44 PM

Browse > appserv.guest

Description: CentOS 6.3
Architecture : x86_64
OS Version : 2.6.32-279.el6.x86_64
RAM : 2048 MB

Owner: HQ Administrator (hqadmin) - [Change...](#)
CPU Speed : 2 @ 2199 MHz
Vendor Version : 6.3

IP Address : 192.168.248.129
Vendor : CentOS

Map

Tools Menu

Monitor

Inventory

Alert

Views

Metric Display Range: Last 8 Hours Advanced Settings

RESOURCES

- ☐ Platform Services Health Avail
- ☐ CPU
- ☐ FileServer Mount
- ☐ NetworkServer Interface
- ☐ appserv.guest Linux sshd Process
- ☐ Deployed Servers Health Avail
- ☐ appserv.guest Apache Tomcat 7.0
- ☐ appserv.guest HQ Agent 4.6.6

Select Resources above &
click button to view metrics

View Metrics

All Metrics

- Free Memory
- Free Memory (+ buffers/cache)
- Load Average 5 Minutes
- Swap Used
- Availability

INDICATORS

METRIC DATA

Indicator Charts | Show Last 8 Hours

View: Update Default

98.4% — Availability

Free Memory (Linux) LOW: 71.5 MB AVG: 133.5 MB PEAK: 245.6 MB



Free Memory (+ buffers/cache) (Linux) LOW: 1.2 GB AVG: 1.2 GB PEAK: 1.3 GB



Load Average 5 Minutes (Linux) LOW: 0.0 AVG: 0.3 PEAK: 6.8



Swap Used

11/25/2012 05:14 AM 11/25/2012 01:06 PM



Edit appserv.guest Apache Tomcat 7.0: Tomcat Availability: Alert Condition Set

Condition Set

* If Condition: ☒ Metric: Availability☒ is < (Less than) 10,000.0% (absolute value)
☐ value changes☐ Events/Logs Level: Any and match substring (optional, 150 chars max):☐ Config changed and match file name (optional, 150 chars max):* Enable Action(s): ☒ Each time conditions are met☐ Once every times conditions are met within a time period of minutes☒ Generate one alert and then disable alert definition until fixed

Ok

Reset

Cancel

Recent Alerts   				
☐ Date / Time ▾	Alert Name	Resource Name	Fixed	Ack
☐ 11/25/2012 01:40 PM	Tomcat Availability	appserv.guest Apache To...	No	
☐ 11/25/2012 01:35 PM	Tomcat Availability	appserv.guest Apache To...	No	
☐ 11/25/2012 01:30 PM	Tomcat Availability	appserv.guest Apache To...	No	
FIXED ACKNOWLEDGE			Updated: 4:43 PM	



Recent Alerts: 01:45 PM - Tomcat Availability
01:40 PM - Tomcat Availability

Welcome, HQ
[Sign Out](#)
[Screencasts](#)
[Help](#)

[Dashboard](#)
[Resources](#)
[Analyze](#)
[Administration](#)

appserv.guest Apache Tomcat 7.0: Tomcat Availability: Alert Detail

[<< Resource Alert List](#)

Alert Properties

Name: [Tomcat Availability](#)
Resource: [appserv.guest Apache Tomcat 7.0](#)

Priority: !!! - High
Alert Date: 11/25/2012 01:45 PM
Alert Status:  NOT FIXED

Condition Set

If Condition: Availability < 10,000.0%
Actual Value: 0.0%
Enable Action(s): Each time conditions are met.
Generate one alert and then disable alert definition until fixed

Notification Actions

Notify HQ Users: hqadmin
Notify Other Recipients: cjudd@juddsolutions.com

Escalation

Escalation Name: Default Escalation
If the alert is acknowledged: Escalation continued without pausing
If the alert state has changed: Previously notified users are notified of the change
Escalation Scheme Actions: None
Escalation Action Logs:

Fix

Previous Fix: (Fixed by hqadmin) Tomcat crashed. Restarted.
Resolution for Fix:

Click the "Fixed" button to mark alert condition as fixed

[<< Resource Alert List](#)

SNMP

1.3.6.1.4.1.42.2.145.3.163.1.1.2.11

rather than

java.lang:type=Memory HeapMemoryUsage

Website Monitoring, Website x

← → ↺ https://www.site24x7.com

rampart

manifest

aws

altair

imsafe

soccer

ecot.html

RegExr

Reflection.app - AirP

DZone Refcardz

» Other Bookmarks

Site24x7

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Home

Features

Plans & Pricing

Tools

Support

SIGN UP

LOGIN

Server Performance Monitoring

Monitor your internal servers.

Track CPU, memory and disk utilization for Windows machines.

Plans, Pricing and Signup

15-day free trial, sign up in 30 seconds.

Disk Utilization

Memory Utilization

CPU Utilization

Today

Jan 16, 2012

Attribute

Disk

276.73 KB E
36.09 KB J:
7.04 KB WTI
3.97 KB CSI

276.73 KB E
36.09 KB J:
7.04 KB WTI
3.97 KB CSI

History Data for: Today Week Month

APP-WIN7-64-1

Type: SERVER

Availability 97.31%

CPU 4.83%

Memory

Time	Avg CPU Usage(%)	Max CPU Usage	Min CPU Usage
16/01/2012 00:00	4	100%	0%
16/01/2012 01:00	4		
16/01/2012 02:00	4		
16/01/2012 03:00	10		
16/01/2012 04:00	3		
16/01/2012 05:00	4		
16/01/2012 06:00	4		
16/01/2012 07:00	3		
16/01/2012 08:00	3		
16/01/2012 09:00	3		

Website Monitoring

Maximize your website uptime

End User Experience

Track webpage performance

Server Monitoring

Server Monitoring as SaaS

Instant Alerts

SMS,Email,Push Notification

SLA Management

Align IT & Business goals

<https://www.site24x7.com/>

TRIAGE



OpenJDK



Java™

What are the things that effect Java performance?



Memory



CPU



Threads

Command-line

List Java Processes

pid or process id



ps aux | grep java

```
501 17737    130    0    8:33.83 ??           38:01.79 /Users/cjudd/dev1/java/
sts-2.5.2.SR1/STS.app/Contents/MacOS/STS -psn_0_2876094
501 26644 17737    0    4:18.68 ??           10:03.41 /System/Library/Frameworks/
JavaVM.framework/Versions/1.6.0/Home/bin/java -
agentlib:jdwp=transport=dt_socket,suspend=y,address=localhost:60315 -Dcatalina.base=/
Users/cjudd/dev1/java/apache-tomcat-6.0.29 -Dcatalina.home=/Users/cjudd/dev1/java/
apache-tomcat-6.0.29 -Dwtp.deploy=/Users/cjudd/dev1/java/apache-tomcat-6.0.29/
wtpwebapps -Djava.endorsed.dirs=/Users/cjudd/dev1/java/apache-tomcat-6.0.29/endorsed -
Xms512m -Xmx1024m -XX:MaxPermSize=128m -Xshare:off -Dfile.encoding=UTF-8 -classpath /
Users/cjudd/dev1/java/apache-tomcat-6.0.29/bin/bootstrap.jar
org.apache.catalina.startup.Bootstrap start
501 33146 25845    0    0:00.01 ttys002    0:00.01 grep java
```

jps

```
26644 Bootstrap
17737
20294
33167 Jps
```

jps -l

full package names

```
33171 sun.tools.jps.Jps
26644 org.apache.catalina.startup.Bootstrap
17737
20294
```

jps -l -v

JVM Arguments

```
33186 sun.tools.jps.Jps -Dapplication.home=/System/Library/Java/JavaVirtualMachines/1.6.0.jdk/
Contents/Home -Xms8m
26644 org.apache.catalina.startup.Bootstrap -
agentlib:jdwp=transport=dt_socket,suspend=y,address=localhost:60315 -Dcatalina.base=/Users/cjudd/
dev1/java/apache-tomcat-6.0.29 -Dcatalina.home=/Users/cjudd/dev1/java/apache-tomcat-6.0.29 -
Dwtp.deploy=/Users/cjudd/dev1/java/apache-tomcat-6.0.29/wtpwebapps -Djava.endorsed.dirs=/Users/
cjudd/dev1/java/apache-tomcat-6.0.29/endorsed -Xms512m -Xmx1024m -XX:MaxPermSize=128m -Xshare:off
-Dfile.encoding=UTF-8
17737 -Dosgi.requiredJavaVersion=1.5 -Xms40m -Xmx768m -XX:MaxPermSize=256m -XstartOnFirstThread -
Dorg.eclipse.swt.internal.carbon.smallFonts
20294 -Xbootclasspath/a:/System/Library/PrivateFrameworks/JavaApplicationLauncher.framework/
Resources/LauncherSupport.jar -Dsun.security.ssl.allowUnsafeRenegotiation=true -Xms128m -Xmx1200m
-Dsoapui.ext.actions=/Applications/eviware/soapUI-3.6.1.app/Contents/Resources/app/bin/actions -
Dsoapui.properties=soapui.properties -Dsoapui.home=/Applications/eviware/soapUI-3.6.1.app/
Contents/Resources/app/bin -Dexe4j.moduleName=/Applications/eviware/soapUI-3.6.1.app -Dwsi.dir=/
Applications/eviware/soapUI-3.6.1.app/Contents/Resources/app/wsi-test-tools -Djava.library.path=/
Applications/eviware/soapUI-3.6.1.app/Contents/Resources/app/bin:/System/Library/
PrivateFrameworks/JavaApplicationLauncher.framework/Resources -Dsoapui.jxbrowser.disable=true -
Dsoapui.ext.listeners=/Applications/eviware/soapUI-3.6.1.app/Contents/Resources/app/bin/listeners
-Dsoapui.ext.libraries=/Applications/eviware/soapUI-3.6.1.app/Contents/Resources/app/bin/ext
```

jinfo

Attaching to process ID 7485, please wait...

Debugger attached successfully.

Server compiler detected.

JVM version is 17.1-b03

Java System Properties:

java.runtime.name = Java(TM) SE Runtime Environment

sun.boot.library.path = /usr/java/jdk1.6.0_22/jre/lib/amd64

java.vm.version = 17.1-b03

java.vm.vendor = Sun Microsystems Inc.

java.vm.name = Java HotSpot(TM) 64-Bit Server VM

com.sun.management.jmxremote.port = 8999

java.vm.specification.name = Java Virtual Machine Specification

user.dir = /usr/tomcat/apache-tomcat-6.0.29

java.runtime.version = 1.6.0_22-b04

java.vm.specification.vendor = Sun Microsystems Inc.

java.library.path = /usr/java/jdk1.6.0_22/jre/lib/amd64/server:/usr/java/jdk1.6.0_22/jre/lib/amd64:/usr/java

jdk1.6.0_22/jre/../../lib/amd64:/usr/java/packages/lib/amd64:/usr/lib64:/lib64:/lib:/usr/lib

java.specification.name = Java Platform API Specification

sun.management.compiler = HotSpot 64-Bit Server Compiler

os.version = 2.6.18-8.el5

com.sun.management.config.file = /usr/java/current/jre/lib/management/management.properties

java.specification.version = 1.6

catalina.home = /usr/tomcat/current

java.class.path = /usr/tomcat/current/bin/bootstrap.jar

user.name = tomcat

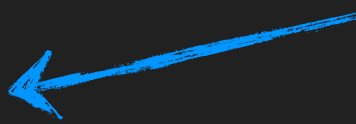
java.home = /usr/java/jdk1.6.0_22/jre

user.language = en

java.specification.vendor = Sun Microsystems Inc.

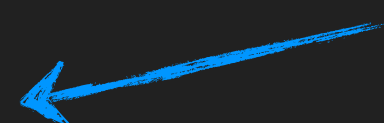
java.version = 1.6.0_22

properties



VM Flags:

vm flags



-Djava.util.logging.config.file=/usr/tomcat/current/conf/logging.properties -Xms2g -Xmx2g -Xss256k -XX:Perm

-XX:MaxPermSize=512m -XX:+UseConcMarkSweepGC -XX:-HeapDumpOnOutOfMemoryError -XX:HeapDumpPath=/usr/tomcat/c

logs/heap_dump.hprof -Dcom.sun.management.jmxremote.port=8999 -Dcom.sun.management.config.file=/usr/java/c

jre/lib/management/management.properties -Duser.home=/usr/tomcat/current -Dadk.home=/usr/tomcat/current -

Djava.util.logging.manager=org.apache.juli.ClassLoaderLogManager -Djava.endorsed.dirs=/usr/tomcat/current/e

Dcatalina.base=/usr/tomcat/current -Dcatalina.home=/usr/tomcat/current -Djava.io.tmpdir=/usr/tomcat/current

Stack Trace

jstack

```
Full thread dump Java HotSpot(TM) 64-Bit Server VM (20.1-b02-384 mixed mode):
```

```
"Attach Listener" daemon prio=9 tid=102958000 nid=0x11a307000 waiting on condition [00000000]  
  java.lang.Thread.State: RUNNABLE
```

```
"http-8080-6" daemon prio=5 tid=102d26000 nid=0x11a50d000 in Object.wait() [11a50c000]  
  java.lang.Thread.State: WAITING (on object monitor)  
    at java.lang.Object.wait(Native Method)  
    at java.lang.Object.wait(Object.java:485)  
    at org.apache.tomcat.util.net.JIoEndpoint$Worker.await(JIoEndpoint.java:458)  
    - locked <7c8961bf8> (a org.apache.tomcat.util.net.JIoEndpoint$Worker)  
    at org.apache.tomcat.util.net.JIoEndpoint$Worker.run(JIoEndpoint.java:484)  
    at java.lang.Thread.run(Thread.java:680)
```

```
"pool-1-thread-1" prio=5 tid=102f23000 nid=0x11a40a000 waiting on condition [11a409000]  
  java.lang.Thread.State: TIMED_WAITING (parking)  
    at sun.misc.Unsafe.park(Native Method)  
    - parking to wait for <7c5fdadb8> (a java.util.concurrent.locks.AbstractQueuedSynchronizer$ConditionObject)  
    at java.util.concurrent.locks.LockSupport.parkNanos(LockSupport.java:198)  
    at java.util.concurrent.locks.AbstractQueuedSynchronizer  
$ConditionObject.awaitNanos(AbstractQueuedSynchronizer.java:2025)  
    at java.util.concurrent.DelayQueue.take(DelayQueue.java:164)  
    at java.util.concurrent.ScheduledThreadPoolExecutor$DelayedWorkQueue.take(ScheduledThreadPoolExecutor.  
    at java.util.concurrent.ScheduledThreadPoolExecutor$DelayedWorkQueue.take(ScheduledThreadPoolExecutor.  
    at java.util.concurrent.ThreadPoolExecutor.getTask(ThreadPoolExecutor.java:947)  
    at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:907)  
    at java.lang.Thread.run(Thread.java:680)
```

```
kill -3 <pid>  
kill -QUIT <pid>
```


thread name

thread id



"TP-Processor195" daemon prio=10 tid=0x00002aab614b6800 nid=0x4009 runnable [0x0000000046905000]

java.lang.Thread.State: **RUNNABLE**
at com.mysql.jdbc.MysqlIO.unpackField(MysqlIO.java:765)
at com.mysql.jdbc.MysqlIO.getResultSet(MysqlIO.java:416)
at com.mysql.jdbc.ConnectionImpl.execSQL(ConnectionImpl.java:2568)
- locked <0x00002aab04914c60> (a java.lang.Object)
at com.mysql.jdbc.PreparedStatement.executeInternal(PreparedStatement.java:2113)
at com.mysql.jdbc.PreparedStatement.executeQuery(PreparedStatement.java:2275)
- locked <0x00002aab04914c60> (a java.lang.Object)
at com.mchange.v2.c3p0.impl.NewProxyPreparedStatement.executeQuery(NewProxyPreparedStatement.java:76)
at org.hibernate.hql.ast.QueryTranslatorImpl.list(QueryTranslatorImpl.java:363)
at org.hibernate.engine.query.HQLQueryPlan.performList(HQLQueryPlan.java:196)
at org.hibernate.impl.SessionImpl.list(SessionImpl.java:1258)
at org.hibernate.impl.QueryImpl.list(QueryImpl.java:102)
at com.mydoman.dao.impl.HibernateClassroomDAO\$4.doInHibernate(HibernateClassroomDAO.java:252)
at com.mydoman.common.framework.orm.hibernate.SimpleHibernateDAO.execute(SimpleHibernateDAO.java:31)
at com.mydoman.dao.impl.HibernateClassroomDAO.getClassroomUsersByRoleAndStatus(HibernateClassroomDAO.java:245)
at com.mydoman.manager.impl.DefaultClassroomManager.getClassroomUsersByRole(DefaultClassroomManager.java:676)
at com.mydoman.web.gradebook.ClazzScheduleController.getTeachers(ClazzScheduleController.java:181)
at com.mydoman.web.gradebook.ClazzScheduleController.showForm(ClazzScheduleController.java:272)
at com.mydoman.web.classroom.ClassroomClazzScheduleController.showForm(ClassroomClazzScheduleController.java:20)
at java.lang.Thread.run(Thread.java:662)

thread state



"TP-Processor194" daemon prio=10 tid=0x00002aab614b5000 nid=0x4008 in Object.wait() [0x0000000044b0f000]

java.lang.Thread.State: **BLOCKED** (on object monitor)
at java.lang.Object.wait(Native Method)
at com.mchange.v2.resourcepool.BasicResourcePool.awaitAvailable(BasicResourcePool.java:1315)
- locked <0x00002aaab4eb5218> (a com.mchange.v2.resourcepool.BasicResourcePool)
at com.mchange.v2.resourcepool.BasicResourcePool.checkoutResource(BasicResourcePool.java:477)
at org.hibernate.engine.query.HQLQueryPlan.performList(HQLQueryPlan.java:196)
at org.hibernate.impl.SessionImpl.list(SessionImpl.java:1258)
at org.hibernate.impl.QueryImpl.list(QueryImpl.java:102)
at com.mydoman.manager.impl.DefaultOrganizationManager.getRoot(DefaultOrganizationManager.java:524)
at com.mydoman.manager.impl.DefaultOrganizationManager.isRoot(DefaultOrganizationManager.java:529)
at sun.reflect.GeneratedMethodAccessor763.invoke(Unknown Source)
at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:25)
at java.lang.reflect.Method.invoke(Method.java:597)
at com.mydoman.web.homerom.announcements.AnnouncementsController.showForm(AnnouncementsController.java:150)
at java.lang.Thread.run(Thread.java:662)

"TP-Processor193" daemon prio=10 tid=0x00002aab605eb800 nid=0x4007 waiting on condition [0x0000000044371000]

java.lang.Thread.State: **WAITING** (parking)
at sun.misc.Unsafe.park(Native Method)
- parking to wait for <0x00002aaacc6775b8> (a java.util.concurrent.locks.AbstractQueuedSynchronizer\$ConditionObject)
at java.util.concurrent.locks.LockSupport.park(LockSupport.java:158)
at org.apache.activemq.ActiveMQSession.send(ActiveMQSession.java:1760)
- locked <0x00002aaace30bed8> (a java.lang.Object)
at org.apache.activemq.ActiveMQMessageProducer.send(ActiveMQMessageProducer.java:231)
at org.apache.activemq.ActiveMQMessageProducerSupport.send(ActiveMQMessageProducerSupport.java:241)
at com.mydoman.dao.BusApplicationEventDAO.create(BusApplicationEventDAO.java:329)
at com.mydoman.manager.impl.DefaultApplicationEventManager.create(DefaultApplicationEventManager.java:172)

Heap Dump

```
jmap -dump:format=b,file=<heap_dump.out>
```

```
jmap -F -dump:format=b,file=<heap_dump.out>
```



heap dump will equal jvm memory size

jhat -J-Xmx2048MB heapdump.hprof

Heap Histogram

localhost:7000/histo/

Class

[All Classes \(excluding platform\)](#)

Class	Instance Count	Total Size
class [C	5187759	305558528
class java.lang.String	5192640	103852800
class [I	20795	50646904
class [Ljava.lang.String;	23584	48058624
class [B	19633	22810538

Object Query Language (OQL) query

localhost:7000/oql/?query=select+cl%0D%0Afrom+instanceof+java.lang.ClassLoader...&key=...

[All Classes \(excluding platform\)](#) [OQL Help](#)

```
select cl
from instanceof java.lang.ClassLoader cl
where !classof(cl).name.startsWith("sun.reflect") && !classof(cl).name.startsWith("org.apache.jasper")
```

Execute

sun.misc.Launcher\$AppClassLoader@0x2aaab174ebf0
sun.misc.Launcher\$ExtClassLoader@0x2aaab174bca0
org.apache.catalina.loader.WebappClassLoader@0x2aaab199eba0
org.apache.catalina.loader.StandardClassLoader@0x2aaab17ce5d8
com.sun.jmx.remote.util.OrderClassLoaders@0x2aaad8401f60
com.sun.jmx.remote.util.OrderClassLoaders@0x2aaad8401fd0
com.sun.jmx.remote.util.OrderClassLoaders@0x2aaad8402120
com.sun.jmx.remote.util.OrderClassLoaders@0x2aaad8402190
com.sun.jmx.remote.util.OrderClassLoaders@0x2aaad8402040

Remote Access

- Dcom.sun.management.jmxremote
- Dcom.sun.management.jmxremote.port=6969
- Dcom.sun.management.jmxremote.ssl=false
- Dcom.sun.management.jmxremote.authenticate=false

- Dcom.sun.management.jmxremote
- Dcom.sun.management.jmxremote.port=6969
- Dcom.sun.management.jmxremote.ssl=false
- Dcom.sun.management.jmxremote.authenticate=true
- Dcom.sun.management.jmxremote.password.file=../conf/jmxremote.password \
- Dcom.sun.management.jmxremote.access.file=../conf/jmxremote.access \

`jmxremote.password` *(this file must be read-only for the user running app)*

`monitorRole QED`

`controlRole R&D`

`jmxremote.access`

`monitorRole readonly`

`controlRole readwrite`

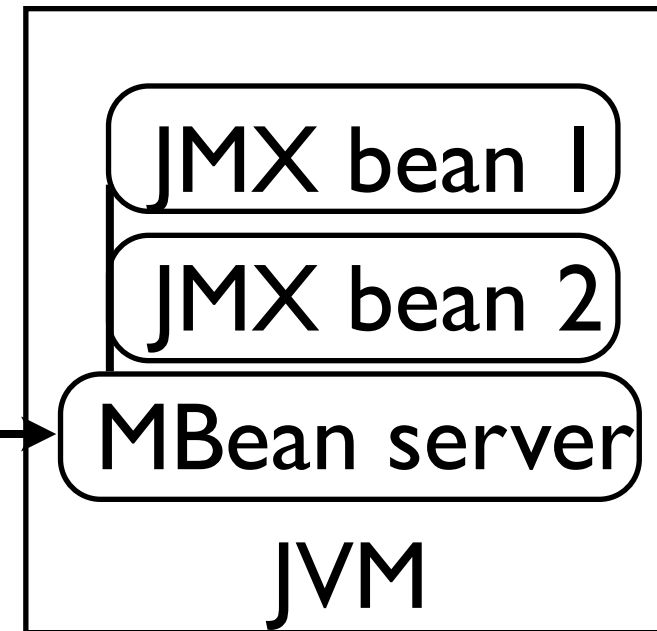
example files can be found at <java_home>/jre/lib/management

Remote Access

monitoring
tools

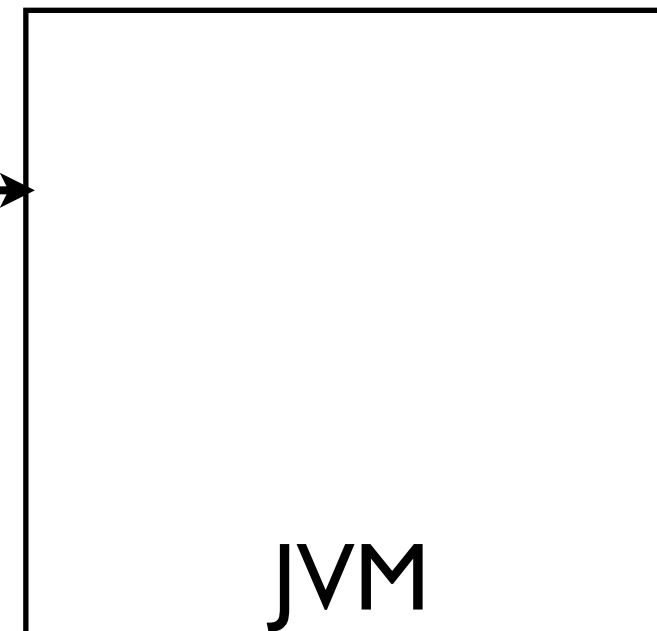


jvisualvm
jconsole



jps
jinfo
jmap
jstack
jvisualvm
jconsole

jstad



Remote Access

jstatd daemon

```
jstatd -J-Djava.security.policy=allowall.pol
```

```
jps 10.1.55.7
```

GUI

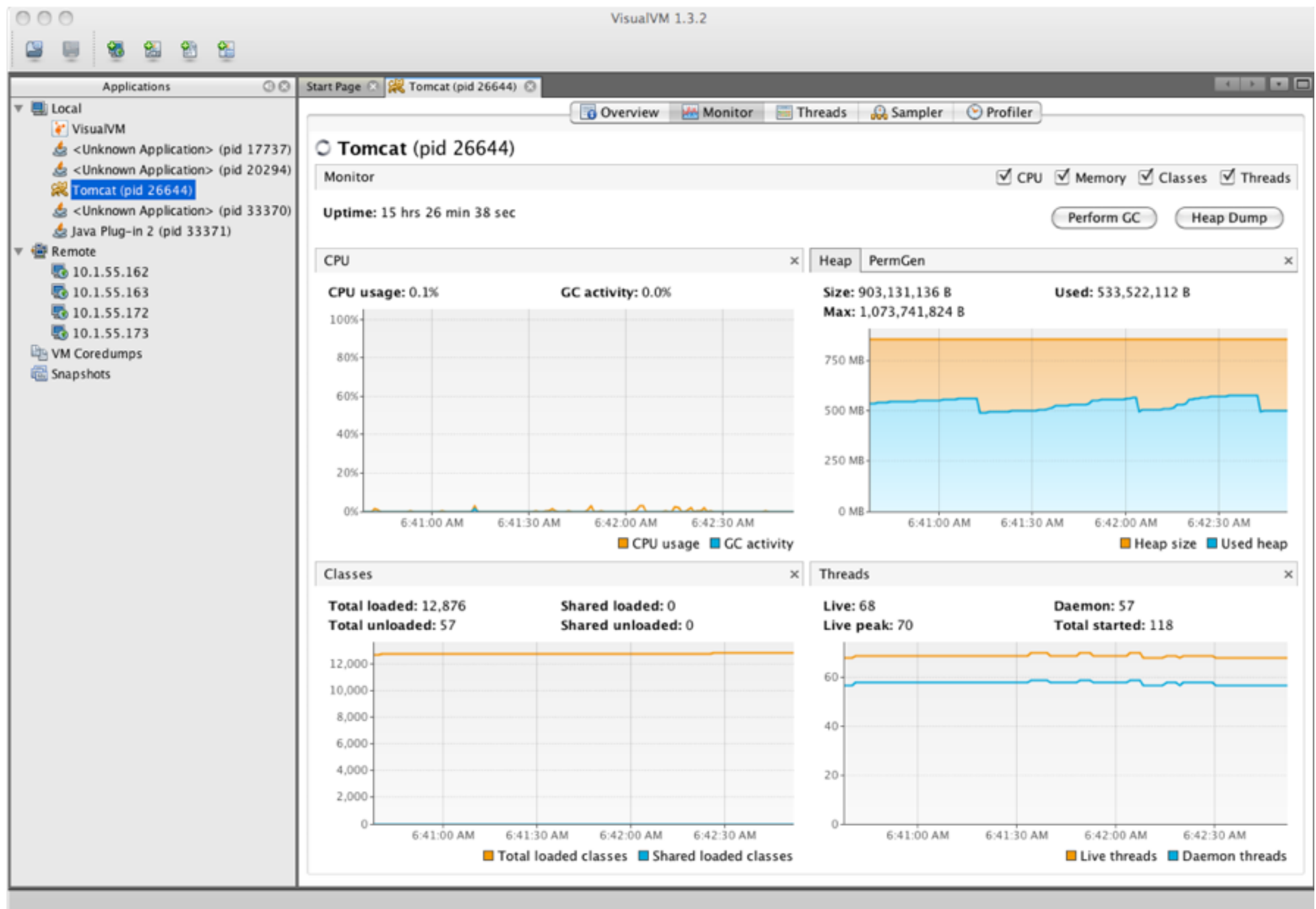
Visual VM



jvisualvm

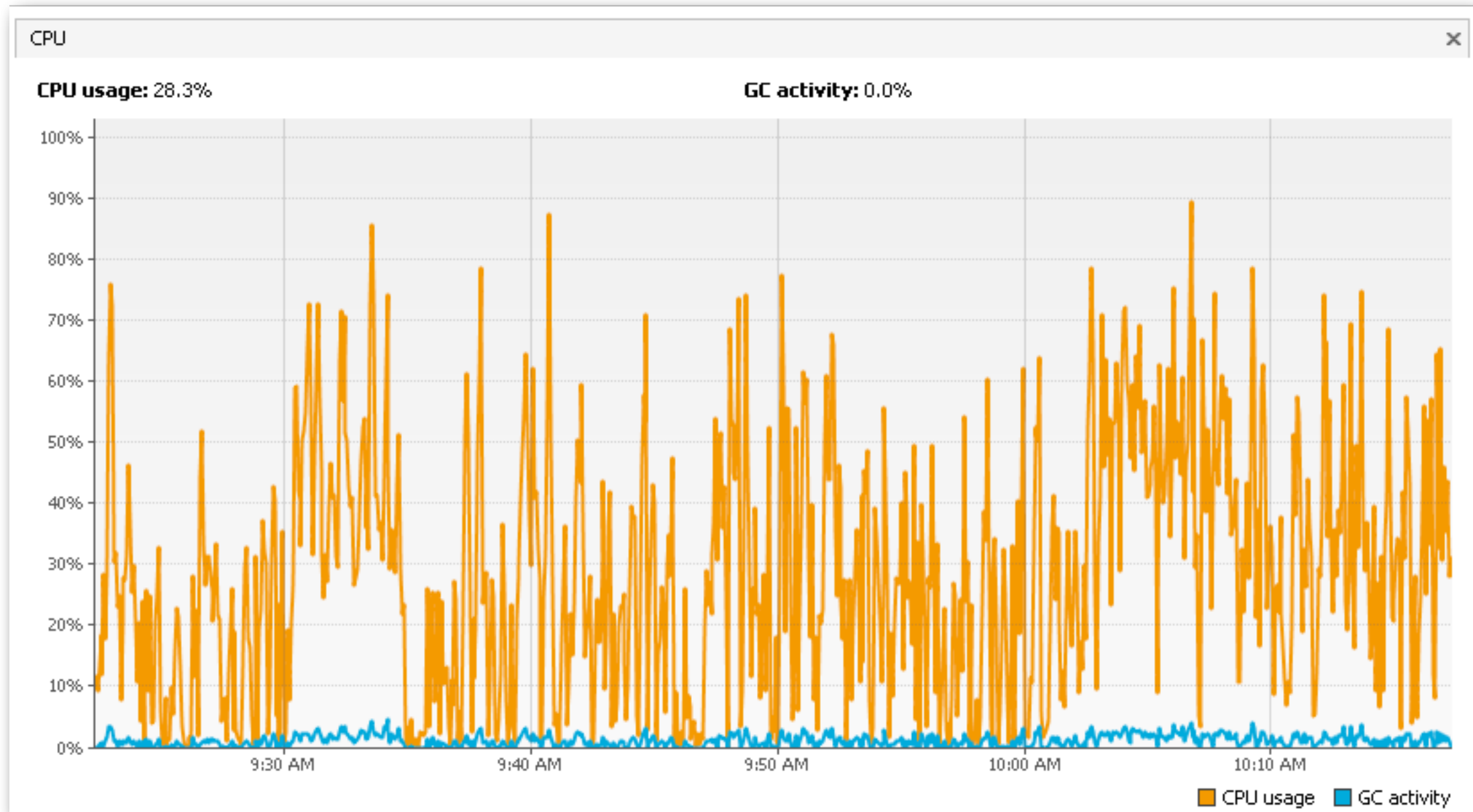
<http://visualvm.java.net/>

visualvm

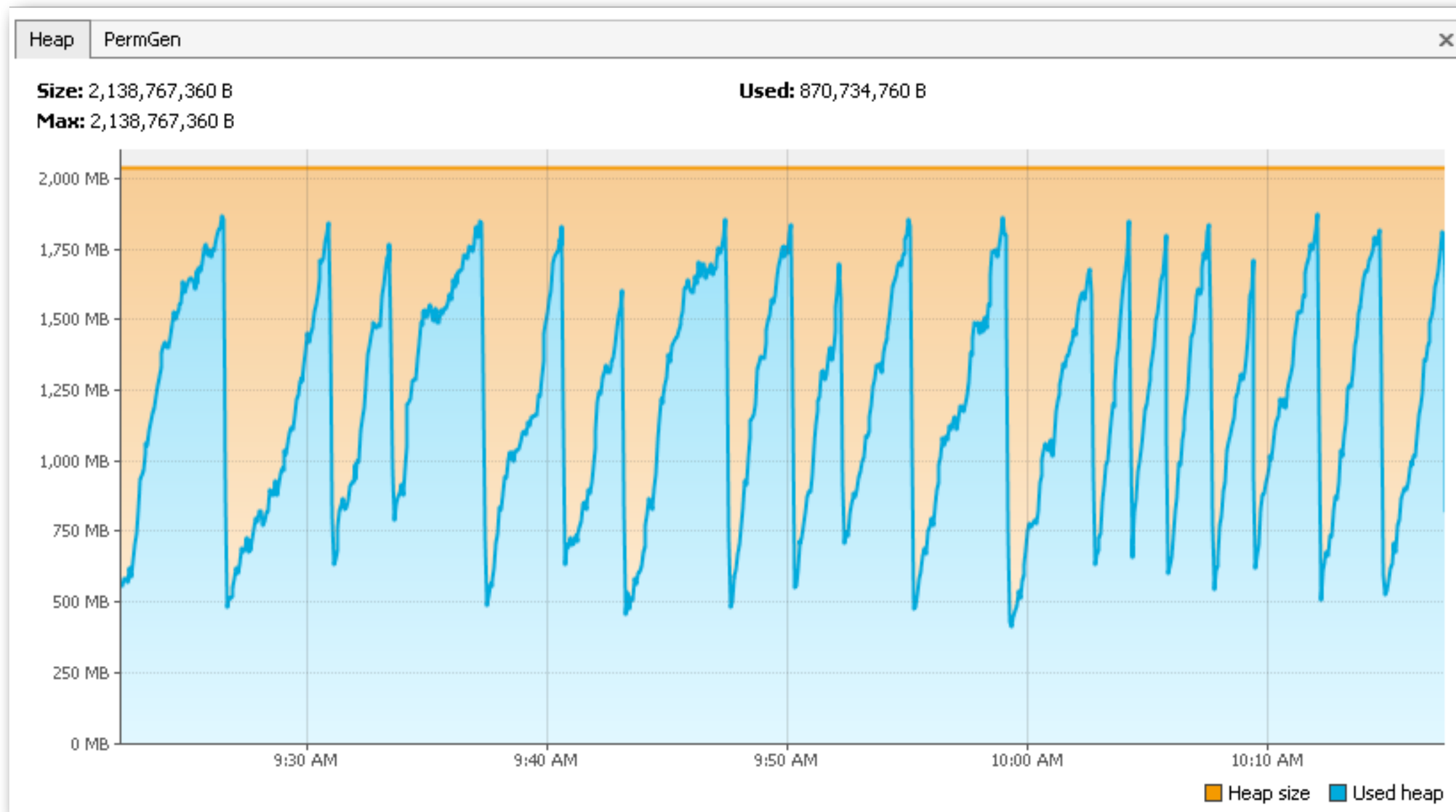


- Memory
- CPU
- Threads

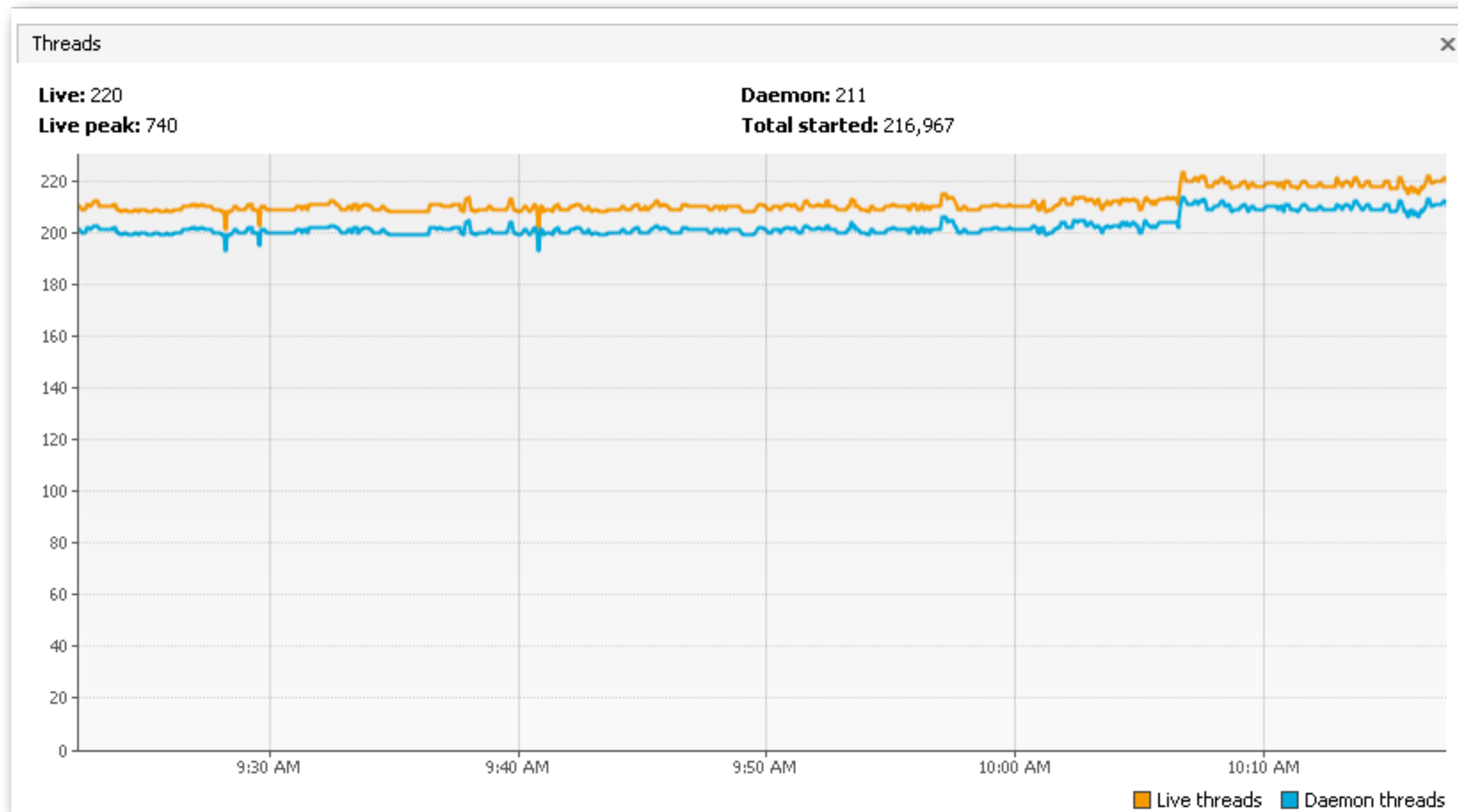
Healthy CPU



Healthy Heap

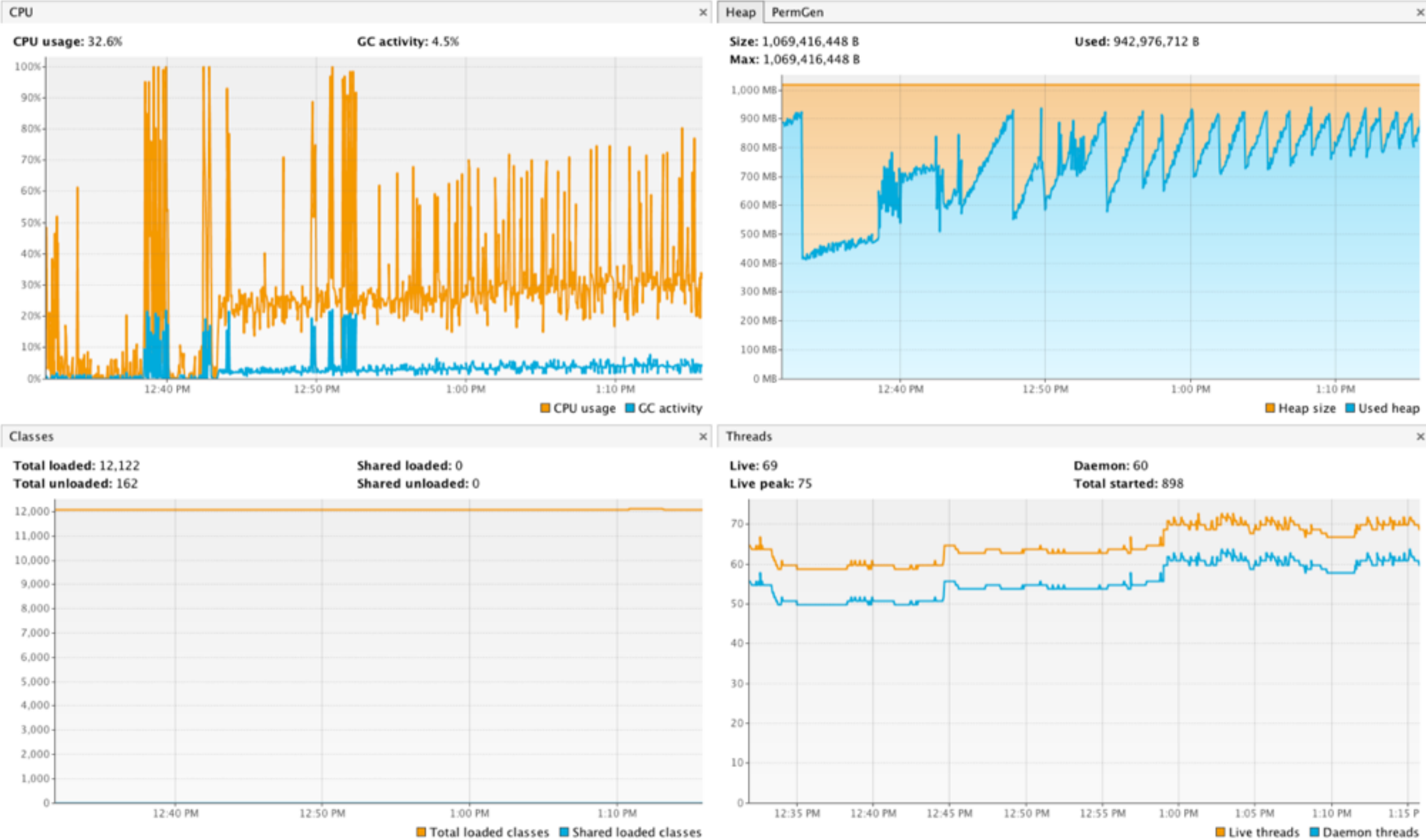


Healthy Threads



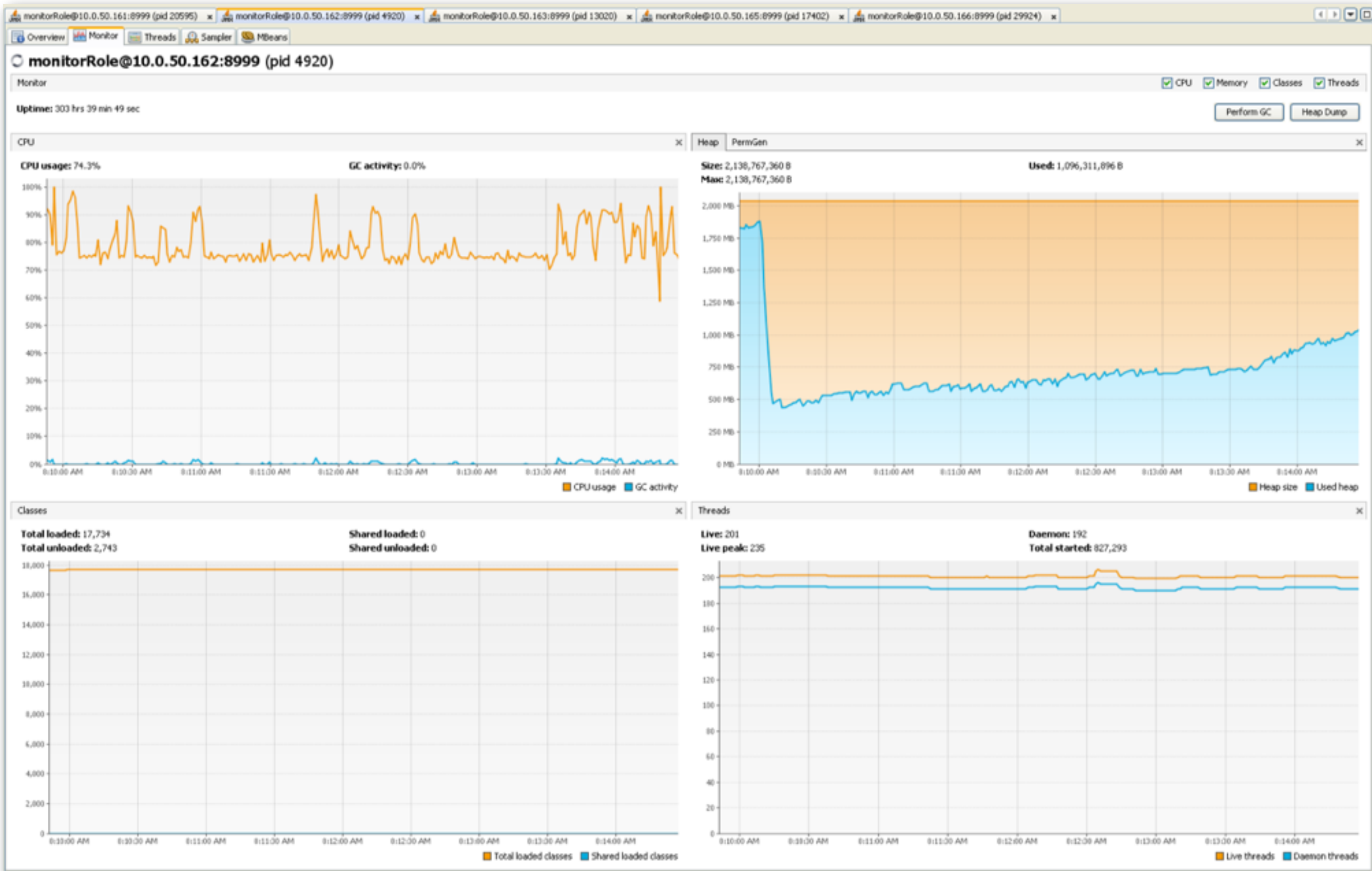
Role Playing

Example I

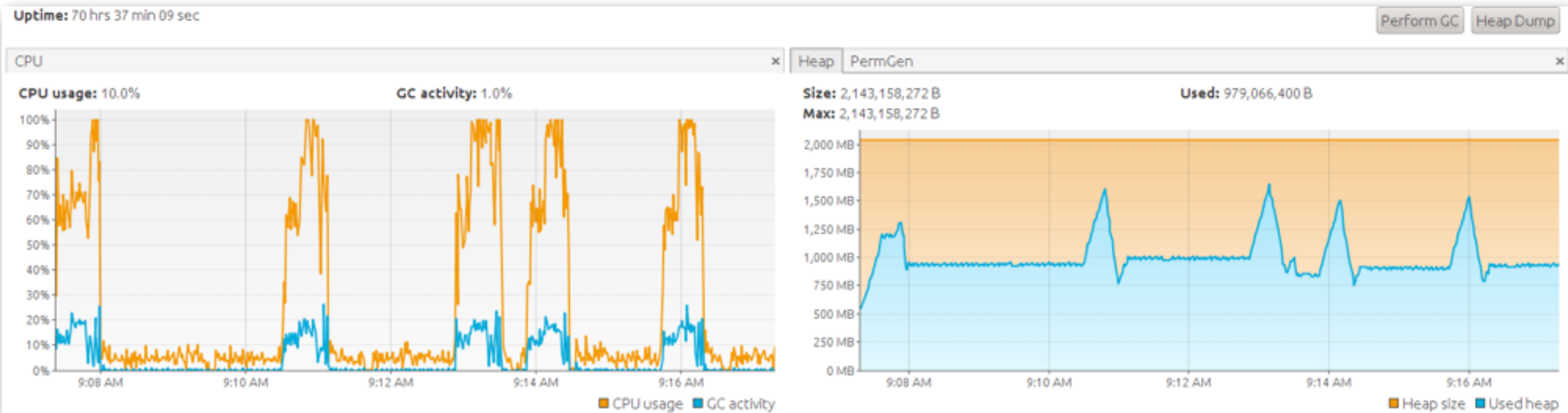




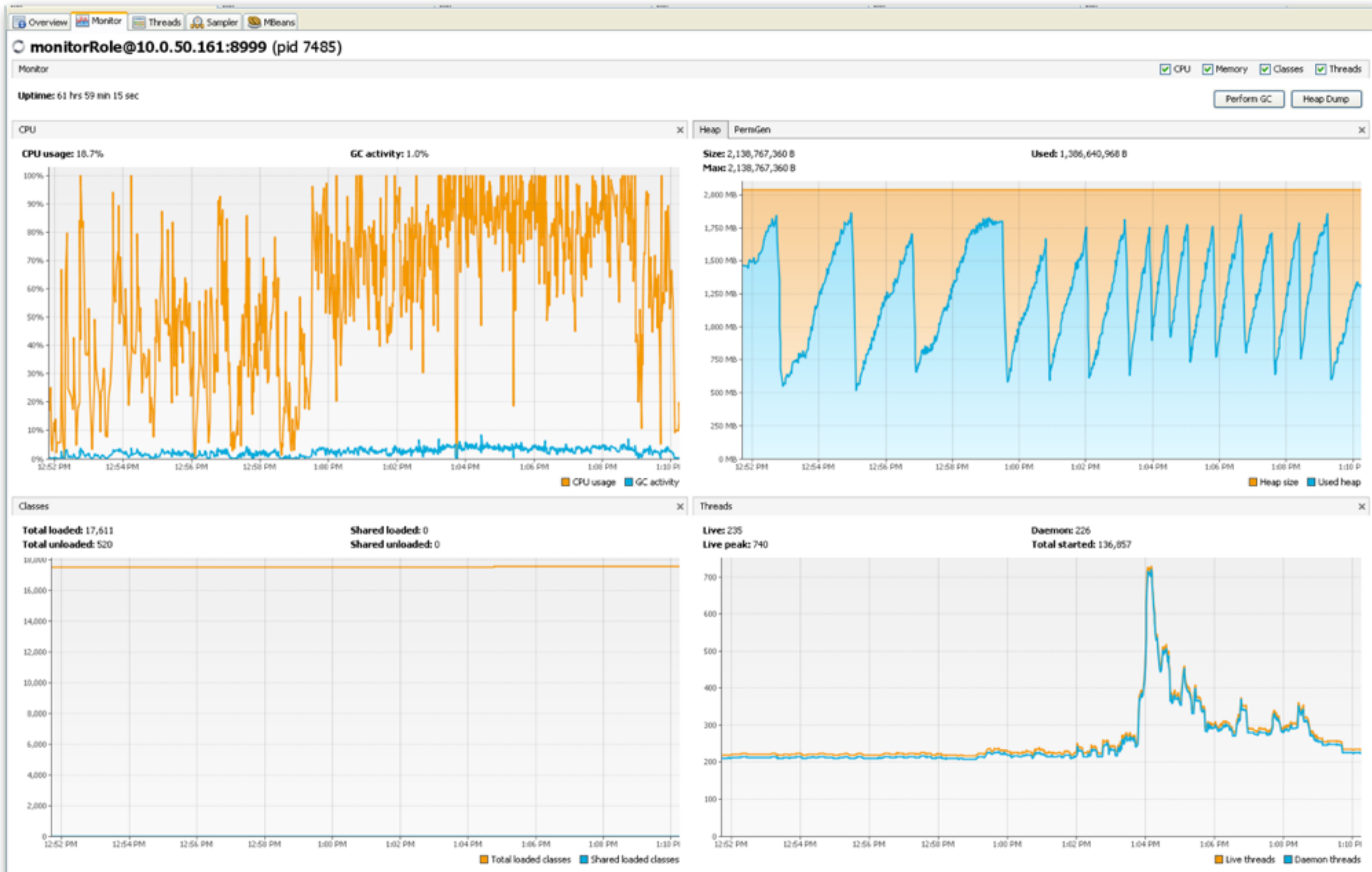
Example 2



Example 3



Example 4



Heap Dump

   Summary  **Classes**  Instances  OQL Console

 Classes Compare with another heap dump ×

Class Name	Instances [%] ▾	Instances	Size
org.apache.solr.common.params.CoreAdminParams\$CoreAdminAction		13 (0%)	364 (0%)
org.apache.solr.servlet.cache.Method		4 (0%)	112 (0%)
org.apache.solr.servlet.cache.Method[]		2 (0%)	96 (0%)
org.apache.solr.common.params.CoreAdminParams\$CoreAdminAction[]		1 (0%)	120 (0%)
org.apache.solr.servlet.RawRequestParser		1 (0%)	16 (0%)
org.apache.solr.servlet.SimpleRequestParser		1 (0%)	16 (0%)
org.apache.solr.response.RawResponseWriter		1 (0%)	24 (0%)
org.apache.solr.response.PHPSerializedResponseWriter		1 (0%)	16 (0%)
org.apache.solr.logging.jul.JulWatcher		1 (0%)	48 (0%)
org.apache.solr.logging.CircularList		1 (0%)	36 (0%)
org.apache.solr.response.XMLResponseWriter		1 (0%)	16 (0%)
org.apache.solr.response.JSONResponseWriter		1 (0%)	24 (0%)
org.apache.solr.handler.admin.CoreAdminHandler		1 (0%)	97 (0%)
org.apache.solr.response.PythonResponseWriter		1 (0%)	16 (0%)
org.apache.solr.servlet.StandardRequestParser		1 (0%)	32 (0%)
org.apache.solr.handler.admin.CollectionsHandler		1 (0%)	97 (0%)
org.apache.solr.servlet.MultipartRequestParser		1 (0%)	24 (0%)
org.apache.solr.logging.jul.RecordHandler		1 (0%)	73 (0%)
org.apache.solr.response.PHPResponseWriter		1 (0%)	16 (0%)
org.apache.solr.core.CoreContainer		1 (0%)	243 (0%)
org.apache.solr.core.SolrResourceLoader		1 (0%)	73 (0%)
org.apache.solr.core.Config		1 (0%)	48 (0%)
org.apache.solr.servlet.SolrDispatchFilter		1 (0%)	64 (0%)
org.apache.solr.servlet.LoadAdminUIServlet		1 (0%)	24 (0%)
org.apache.solr.common.util.XMLErrorLogger		1 (0%)	24 (0%)
org.apache.solr.servlet.SolrRequestParsers		1 (0%)	42 (0%)
org.apache.solr.core.SolrXMLSerializer		1 (0%)	16 (0%)
org.apache.solr.response.CSVResponseWriter		1 (0%)	16 (0%)
org.apache.solr.response.RubyResponseWriter		1 (0%)	16 (0%)
org.apache.solr.response.BinaryResponseWriter		1 (0%)	16 (0%)
org.apache.solr.response.transform.ValueSourceAugmenter		0 (0%)	0 (0%)
org.apache.solr.response.transform.ScoreAugmenter		0 (0%)	0 (0%)
org.apache.solr.search.QParserPlugin		0 (0%)	0 (0%)
org.apache.solr.core.NRTCachingDirectoryFactory		0 (0%)	0 (0%)
org.apache.solr.client.solrj.SolrRequest		0 (0%)	0 (0%)
org.apache.solr.schema.SortableDoubleField		0 (0%)	0 (0%)
org.apache.solr.core.SolrCore\$8		0 (0%)	0 (0%)
org.apache.solr.schema.IntField		0 (0%)	0 (0%)
org.apache.solr.common.cloud.ZkNodeProps		0 (0%)	0 (0%)
org.apache.solr.request.SolrRequestHandler		0 (0%)	0 (0%)
org.apache.solr.schema.TrieDateField		0 (0%)	0 (0%)
org.apache.solr.common.SolrDocumentList		0 (0%)	0 (0%)
org.apache.solr.schema.BCDStrField		0 (0%)	0 (0%)
org.apache.solr.handler.component.HttpShardHandlerFactory		0 (0%)	0 (0%)
org.apache.solr.response.ResultContext		0 (0%)	0 (0%)

[heapdump] Yesterday, 11:08:11 PM

Heap Dump

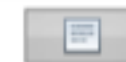


Summary

Classes

Instances

OQL Console



Query Results



[sun.misc.Launcher\\$AppClassLoader#1](#)
[javax.management.remote.rmi.RMIConnectionImpl\\$CombinedClassLoader\\$ClassLoaderWrapper#1](#)
[javax.management.remote.rmi.RMIConnectionImpl\\$CombinedClassLoader\\$ClassLoaderWrapper#2](#)
[java.net.FactoryURLClassLoader#1](#)
[java.util.ResourceBundle\\$RBClassLoader#1](#)
[org.apache.catalina.loader.WebappClassLoader#1](#)
[org.apache.catalina.loader.WebappClassLoader#2](#)
[org.apache.catalina.loader.WebappClassLoader#3](#)
[org.apache.catalina.loader.WebappClassLoader#4](#)
[org.apache.catalina.loader.WebappClassLoader#5](#)
[org.apache.catalina.loader.WebappClassLoader#6](#)
[org.apache.catalina.loader.StandardClassLoader#1](#)
[com.sun.jmx.remote.util.ClassLoaderWithRepository#1](#)
[com.sun.jmx.remote.util.ClassLoaderWithRepository#2](#)
[javax.management.remote.rmi.RMIConnectionImpl\\$CombinedClassLoader#1](#)
[javax.management.remote.rmi.RMIConnectionImpl\\$CombinedClassLoader#2](#)
[sun.misc.Launcher\\$ExtClassLoader#1](#)
[javax.management.remote.rmi.NoCallStackClassLoader#1](#)
[javax.management.remote.rmi.NoCallStackClassLoader#2](#)

Query Editor



```
select cl
from instanceof java.lang.ClassLoader cl
where !classof(cl).name.startsWith("sun.reflect") && !classof(cl).name.startsWith("org.apache.jasper")
```

Save

Execute

Saved Queries



- ▼ Custom
 - <No Custom Queries Defined>
- ▼ Samples
 - List java.io.File instances
 - Overallocated Strings
 - Overallocated Strings (JS)
 - Too many Booleans
- ▶ PermGen Analysis

Properties

Delete

Open

OQL

```
-- # of loaded classes
select count(heap.classes())

-- # of classes loaded in JVM bootstrap
select count(heap.classes(), 'it.loader == null')

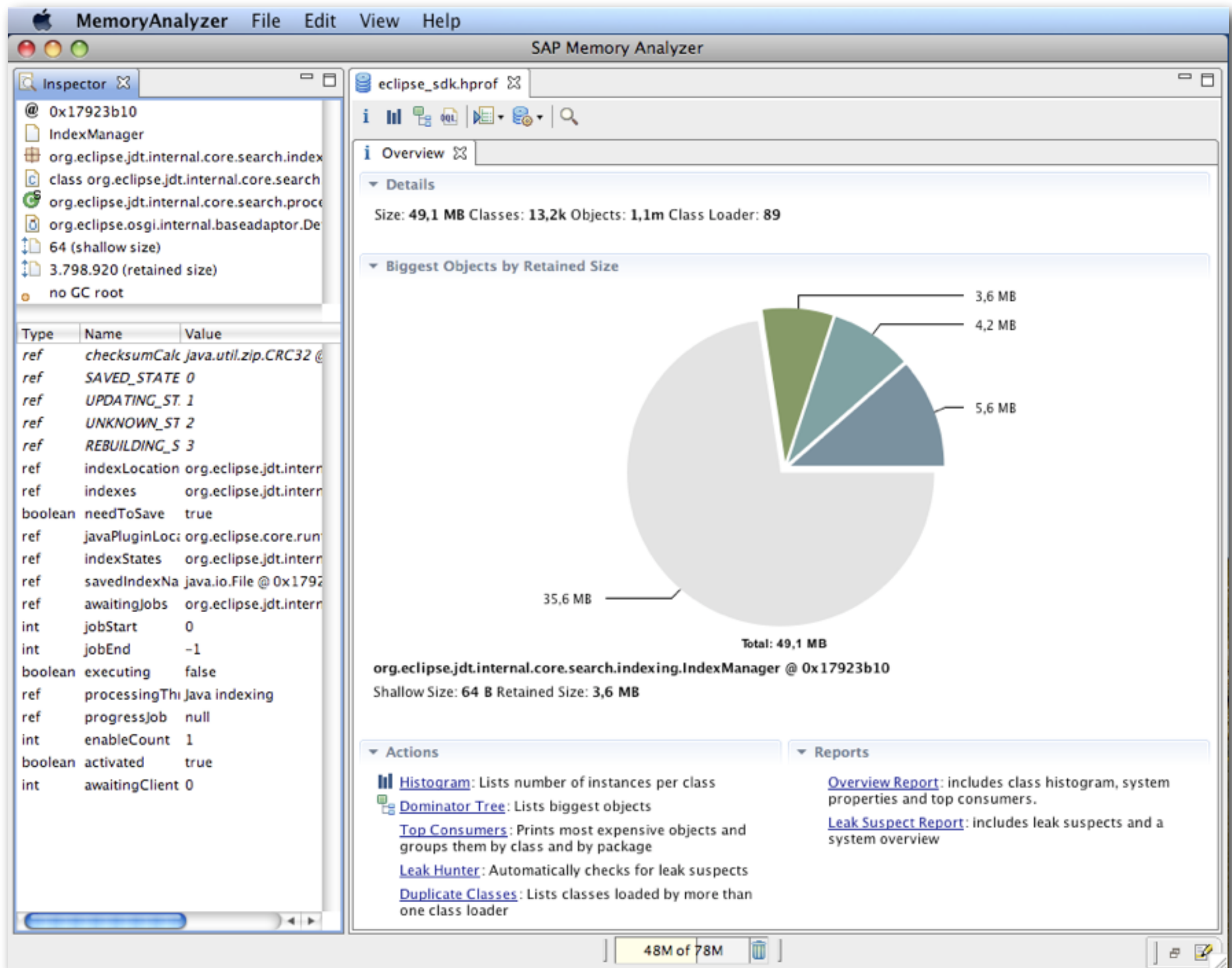
-- parent child relationship of classloaders
select map(heap.objects('java.lang.ClassLoader'),
    function(it) {
        var res='';
        while (it != null) {
            res += toHtml(it) + "->";
            it = it.parent;
        }
        res += "null";
        return res + "<br>";
    })

-- list of sub classes that start with a particular package
select classof(cl).name
from instanceof java.lang.ClassLoader cl
where classof(cl).name.startsWith("sun.reflect")

-- list sub classes that don't start with a particular package
select cl
from instanceof java.lang.ClassLoader cl
where !classof(cl).name.startsWith("sun.reflect") && !
classof(cl).name.startsWith("org.apache.jasper")

-- number of objects in memory of a particular class
select count(heap.objects("sun.reflect.DelegatingClassLoader"))

-- show path value of all File objects
select file.path.toString() from java.io.File file
```

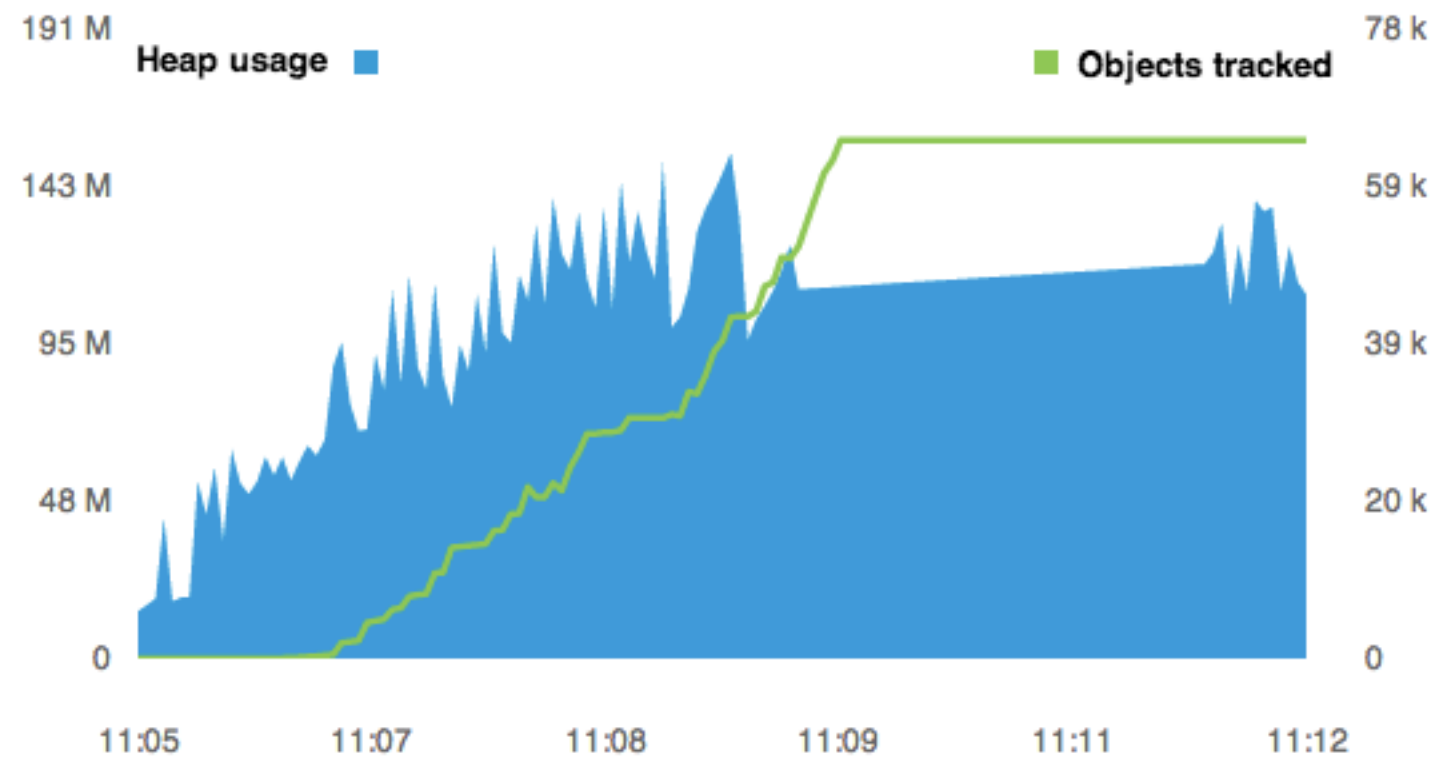



21949@woldemar.local

Plumbr run for
00h 06min 55sec

Analyzed
3 times

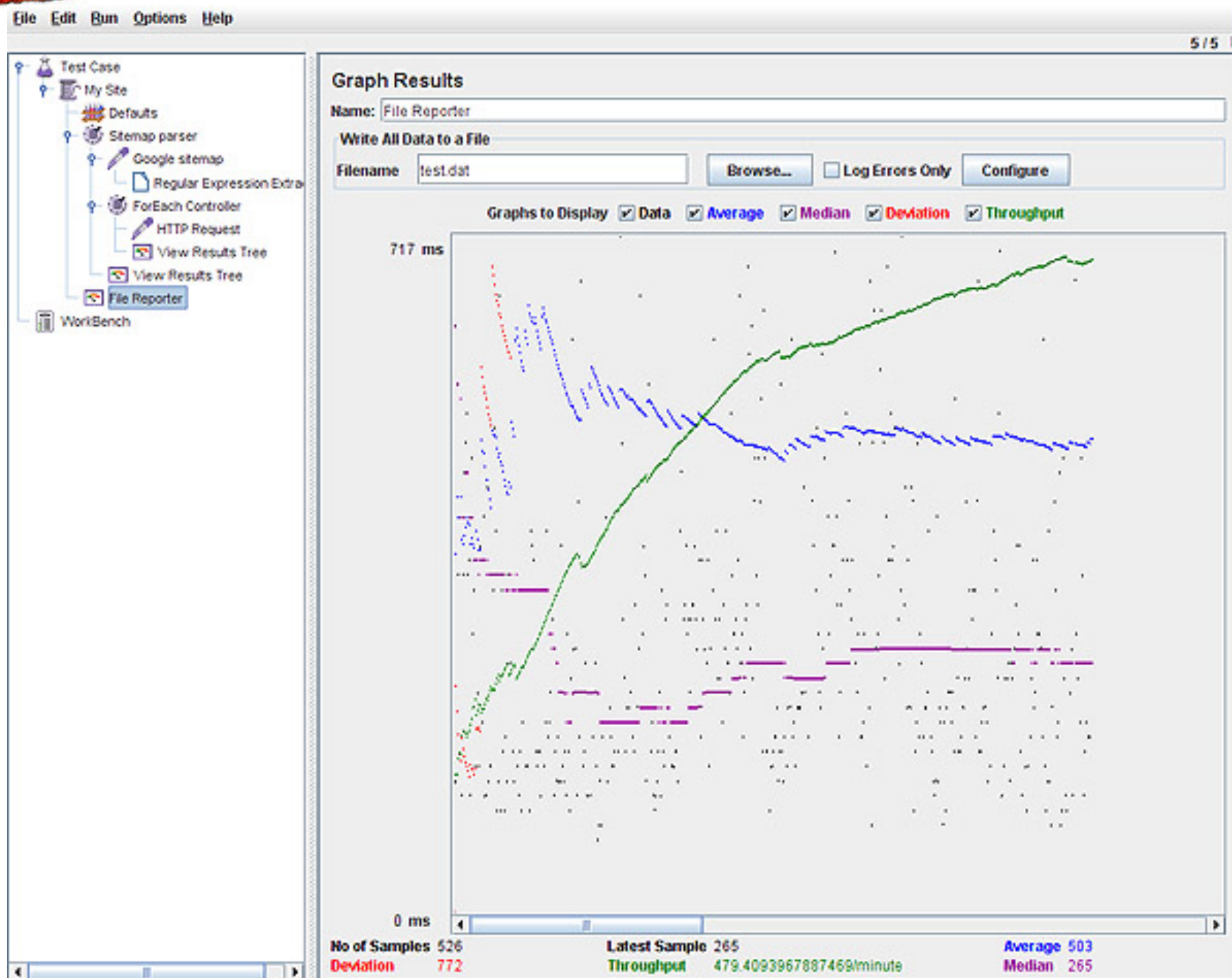
Plumbr found
1 LEAK



<http://plumbr.eu/>



Generating Load



<http://jmeter.apache.org/>

Gatling Project - Stress Tool
gatling-tool.org
rampart manifest aws altair imsafe soccer ecot.html RegExr Reflection.app - Air DZone Refcardz
Other Bookmarks
+1 77 Tweet 329 Fork me on GitHub

Gatling

STRESS TOOL

Efficient Load Testing

Links

Sponsors

About

Gatling is an **Open Source** Stress Tool with:

- High performances
- Simple concepts
- A DSL to describe scenarios
- HTTP support
- A scenario recorder
- Meaningful reports

Download

11/22/2012: Gatling 1.3.5 is out! ([Changelog](#))

You can download it here:

- [gatling-charts-highcharts-1.3.5-bundle.tar.gz](#)
- [gatling-charts-highcharts-1.3.5-bundle.zip](#)
- [gatling-charts-highcharts-1.3.5.deb](#)

Documentation

Gatling comes with helpful **User Documentation**...

- [Getting Started](#)
- [First Steps With Gatling](#)
- [Advanced Usage](#)

Examples

Check these examples out!

- [Gatling's DSL vs JMeter's](#)
- [HTML Reports](#)

Gatling In Action

Social

Gatling Tool

GatlingTool Gatling 1.3.5 is out. Fixed cookies, redirects, JsonPath and many more. Enjoy! [gatling-tool.org](#) [github.com/excilys/gatling...](#) yesterday · reply · retweet · favorite

soccertrash #Gatling appear to be a great stress/load test tool, thanks for introduction #devovxx 11 days ago · reply · retweet · favorite

AuroreBossus Gatling pres @devovxx was so cool, too bad it had to be that short... Nice job guys ;-) 11 days ago · reply · retweet · favorite

ebottard @slandelle talking about @GatlingTool at #devovxx Antwerp. The audience seem to appreciate the slides! [pic.twitter.com/44ucUAEj](#) 11 days ago · reply · retweet · favorite

nvahlas #devovxx #gatling: stress tool based on async architecture and scala: scenarios written in scala w/ rich dsl ... interesting approach. 11 days ago · reply · retweet · favorite

Join the conversation

Gatling

<http://gatling-tool.org/>

Other Profilers



<http://www.ej-technologies.com/products/jprofiler/overview.html>



<http://www.yourkit.com/>



<http://newrelic.com/>



<http://www.appdynamics.com/>



<http://www.appfirst.com>

**MAKE YOUR OWN
TOOLS**

Starting...

Date: Mon Apr 23 09:46:23 EDT 2012

Server: 10.0.50.161

cpu usage 65.12%

heap 1665.33/2138.77 (used/max)

threads 207/198/218 (live/daemon/peak)

queue size 0

[mls_mail] 0/ 10/ 60 (busy/total/max) 2rw7tt8m1miverrzbuxaz|7f5c693a

[sessionlog] 0/ 20/100 (busy/total/max) 2rw7tt8m1miverrzbuxaz|3612afd8

[mls] 5/ 35/300 (busy/total/max) 2rw7tt8m1miverrzbuxaz|6a48ffbc

active sessions 906

Server: 10.0.50.162

cpu usage 1.40%

heap 850.19/2138.77 (used/max)

threads 210/201/213 (live/daemon/peak)

queue size 0

[mls] 0/ 25/300 (busy/total/max) 2rw7tu8m1m49xyl3vtgggq|60f00e0f

[mls_mail] 0/ 10/ 60 (busy/total/max) 2rw7tu8m1m49xyl3vtgggq|5999ef99

[sessionlog] 0/ 15/100 (busy/total/max) 2rw7tu8m1m49xyl3vtgggq|15a1ad24

active sessions 321

Server: 10.0.50.164

cpu usage 95.79%

heap 1194.39/2138.77 (used/max)

threads 431/421/1308 (live/daemon/peak)

queue size 38

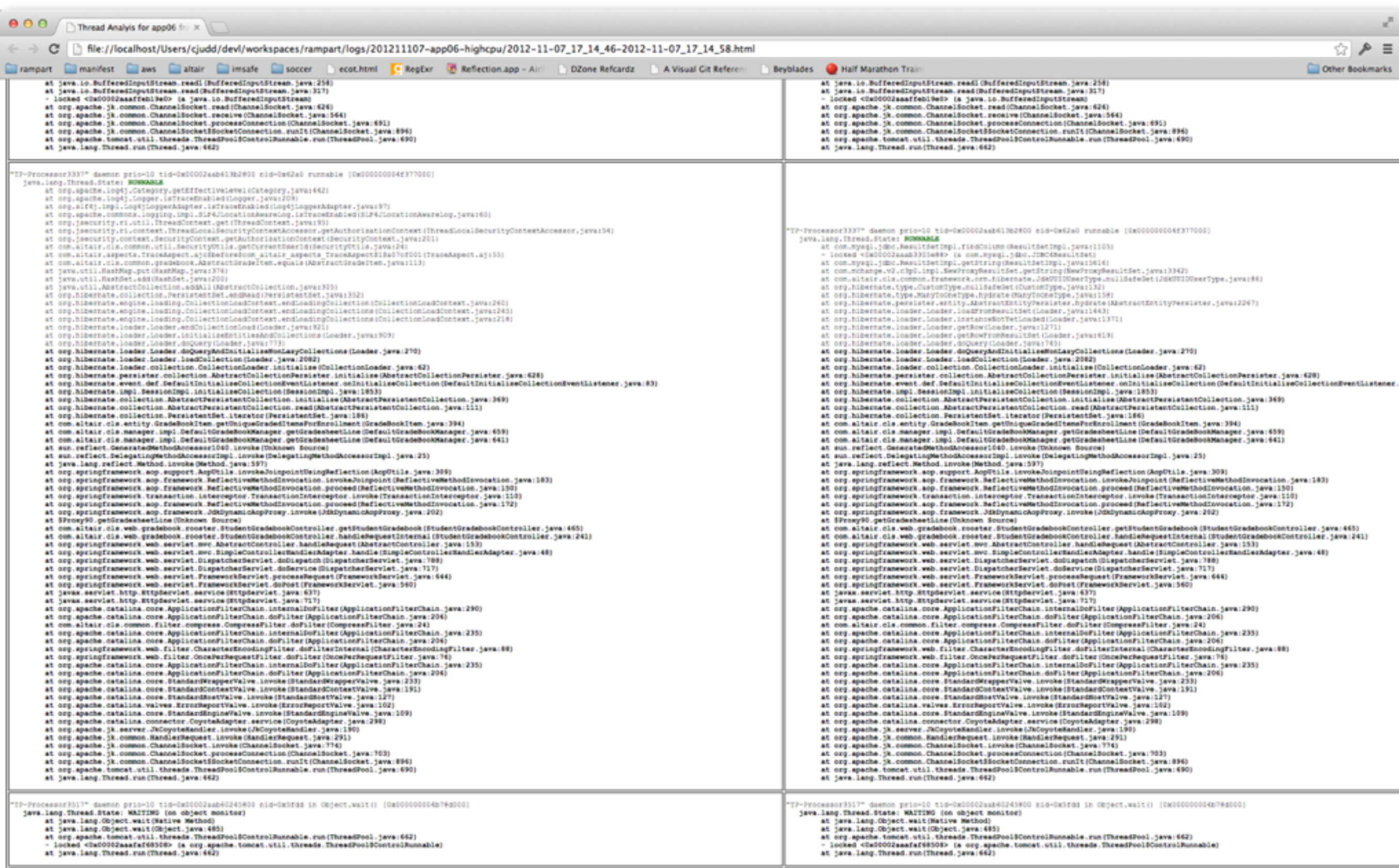
[sessionlog] 5/ 85/100 (busy/total/max) 2rw7tw8m1mj7yhpaojbdy|1bdf2b92

[cls] 60/300/300 (busy/total/max) 2rw7tw8m1mj7yhpaojbdy|334021a9

[cls_mail] 13/ 60/ 60 (busy/total/max) 2rw7tw8m1mj7yhpaojbdy|4da84fae

active sessions 664

Done...



capture

- 🌐 notes
- 🌐 screen shots
- 🌐 heap dumps
- 🌐 thread dumps
- 🌐 snapshots
- 🌐 app server logs
- 🌐 web server access and error logs
- 🌐 os process lists
- 🌐 database process list
- 🌐 key jmx values
- 🌐 slow query logs
- 🌐 core dumps

Java SE 6 Documentation

docs.oracle.com/javase/6/docs/

rampart

manifest

aws

altair

imsafe

DZone Refcardz

Beyblades

Half Marathon Traini

Other Bookmarks

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Java SE Documentation

Oracle Technology Network

Software Downloads

Documentation

Search

Java SE 6 Documentation

✉

🌐

📄

👤

🔗

What's New

Documentation

Release Notes

JDK Components

Base Libraries

Java I/O

CORBA

Java Virtual Machine

JDBC

Java Networking

Java Security

XML

Tools and Utilities

Tutorials and Training

The Java Tutorials

Online Training

Developer Resources

Courses and Certification

More Information

The two principal products in the Java SE platform are: Java Development Kit (JDK) and Java SE Runtime Environment (JRE).

The JDK is a superset of the JRE, and contains everything that is in the JRE, plus tools such as the compilers and debuggers necessary for developing applets and applications. The Java Runtime Environment (JRE) provides the libraries, the Java Virtual Machine, and other components to run applets and applications written in the Java programming language.

The following conceptual diagram illustrates all the component technologies in Java SE platform and how they fit together.

Java Language

java

javac

javadoc

apt

jar

javap

JPDA

JConsole

Java VisualVM

Java DB

Tools & Tool APIs

Security

Int'l

RMI

IDL

Deploy

Monitoring

Troubleshoot

Scripting

JVM TI

RIAs

Java Web Start

Applet / Java Plug-in

User Interface Toolkits

AWT

Swing

Java 2D

Integration Libraries

Accessibility

Drag n Drop

Input Methods

Image I/O

Print Service

Sound

JDK

IDL

JDBC

JNDI

RMI

RMI-IIOP

Scripting

JRE

Beans

Intl Support

Input/Output

JMX

JNI

Math

Other Base Libraries

Networking

Override Mechanism

Security

Serialization

Extension Mechanism

XML JAXP

lang and util

lang and util

Collections

Concurrency Utilities

JAR

Logging

Management

Base Libraries

Preferences API

Ref Objects

Reflection

Regular Expressions

Versioning

Zip

Instrumentation

Java Virtual Machine

Java Hotspot Client and Server VM

Java SE API

Java SE 6 API Documentation

more info

<http://docs.oracle.com/javase/6/docs/>



CONTENTS INCLUDE:

- Configuration
- JMX
- Available Plugins
- Java Memory Types
- JVM Settings
- and More!

Java Profiling with VisualVM

X-Ray Vision for Dramatic Performance Gains

By Mick Knutson

ABOUT VISUALVM

VisualVM is a visual tool integrating several command-line JDK tools and lightweight profiling capabilities. Designed for both production and development time use, it further enhances the capability of monitoring and performance analysis for the Java SE platform. <http://visualvm.java.net/>

CONFIGURATION

Repositories

Windows 7: C:\Users\[userId]\AppData\Roaming\visualvm\[version]\repository\
oS X: /Users/[userId]/Library/Application Support/visualvm/[version]/repository/

User Directory

Windows 7: C:\Users\[userId]\AppData\Roaming\visualvm\[version]\log\message.log
oS X: /Users/[userId]/Library/Application Support/visualvm/[version]/var/log/message.log

Message logs

Windows 7: C:\Users\[userId]\AppData\Roaming\visualvm\[version]\var\log\message.log
oS X: /Users/[userId]/Library/Application Support/visualvm/[version]/var/log/message.log

JMX

JMX connections

Default connection:

```
<hostname>:<port>
```

Detailed connection:

```
service:jmx:<protocol>:<sap>
```

Detailed connection example:

```
service:jmx:rmi://<hostname>:<port>/jndi/rmi://<hostname>:<port>/jmxrmi
```

Container specific configuration

Configuration for exposing JMX.

Glassfish administration:

JVM options can be set via Glassfish web administration page:
<http://localhost:4848/common/javaConfig/serverJvmOptions.jsf?configName=server-config>

Glassfish configuration file:

%GLASSFISH_HOME%\glassfish\domains\[domain]\config\domain.xml
 configuration file:

```
<configs> <config name="server-config">
... <java-config ...> ...
<jvm-options><JMX configuration parameters></jvm-options>
...
```

Tomcat:

```
export CATALINA_OPTS="-<JMX configuration parameters>"
```

Jetty standalone:

```
java "<JMX configuration parameters>" -jar start.jar etc/jetty-jmx.xml
```

Maven:

```
export MAVEN_OPTS="-<JMX configuration parameters>"
```

Container specific configuration parameters

Name	Parameter
Access file	-Dcom.sun.management.jmxremote.access.file=<access file>
Authenticate	-Dcom.sun.management.jmxremote.authenticate=<true / false>
Debug	-Djavax.net.debug=<level>
JMX port	-Dcom.sun.management.jmxremote.port=<PortNumber>
JMX remote enabled	-Dcom.sun.management.jmxremote
* Keystore file	-Djavax.net.ssl.keyStore=<keystore file>
* Keystore password	-Djavax.net.ssl.keyStorePassword=<password>
Management level	-Djavax.management.level=<level>
Password file	-Dcom.sun.management.jmxremote.password file=<password file>
RMI server hostname	-Djava.rmi.server.hostname=<public.ip.address>
SSL enabled	-Dcom.sun.management.jmxremote.ssl=<true / false>

AnswerHub Social Q&A for the Enterprise

of the Top 10
 StackExchange 1.0 Sites
 Now Run on AnswerHub

Discover Why Now!



Christopher M. Judd



CTO and Partner

email: cjudd@juddsolutions.com

web: www.juddsolutions.com

blog: juddsolutions.blogspot.com

twitter: [javajudd](https://twitter.com/javajudd)

