

AVP-2772 Java Troubleshooting Masterclass

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Agenda



- Introduction
- What to Monitor
- Approaches to Performance
- Rational Performance Tester
- IBM Monitoring and Diagnostic Tools for Java
 - Garbage Collection & Memory Visualizer
 - Health Center





What To Monitor

Metric	Meaning
Average response/service time	Response time statistics indicate how much time is spent in various parts of WebSphere Application Server and might quickly indicate where the problem is (for example, the servlet or the enterprise beans).
Number of requests (transactions)	Enables you to look at how much traffic is processed by WebSphere Application Server, helping you to determine the capacity that you have to manage.
Number of live HTTP sessions	The number of live HTTP sessions reflects the concurrent usage of your site. The more concurrent live sessions, the more memory is required.
Web server thread pools, the WAS Web Container and Enterprise JavaBeans (EJB) thread pools, Database connection pool size	These thread pools might constrain performance due to their size. The thread pools setting can be too small or too large, therefore causing performance problems. Setting the thread pools too large impacts the amount of memory that is needed on a system or might cause too much work to flow downstream if downstream resources cannot handle a high influx of work
Java virtual memory (JVM)	Use the JVM metric to understand the JVM heap dynamics, including the frequency of garbage collection. This data can assist in setting the optimal heap size. In addition, use the metric to identify potential memory leak
CPU, I/O , System paging	Observe these system resources to ensure that you have enough system resources, for example, CPU, I/O, and paging, to handle the workload capacity.





Approaches to performance

- Outside in approach
 - Start from where performance can be measured
 - Work along the activity path
 - Ideal for identified performance problems

- Layered approach
 - Analyze and eliminate layers of the application
 - Simplify the problem as you go
 - Ideal for application health check

- A hybrid of both approaches can often be useful





Rational Performance Tester: Overview

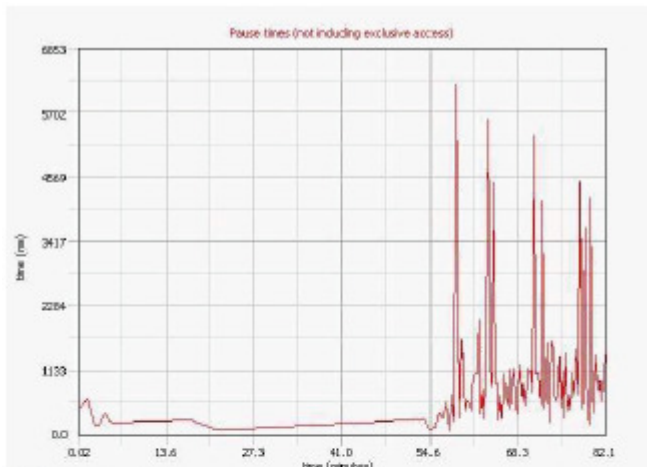
- Multi-user automated performance testing tool for Web-based applications
- Hosted in the IBM Rational Software Delivery Platform, a version of the Eclipse shell
- Rational Performance Tester tests and execution engine based on the Java programming language
- Highly scalable
- Platform support
 - Record and test execution on Microsoft® Windows® and Linux®
 - Agents (test execution) on some additional Microsoft® Windows Server® platforms



Rational Performance Tester: Features

- HTTP and HTTPS protocol support and capture
- Graphical test editing and workload modeling
- Built-in Verification Points (VPs)
- Automatic data correlation
- Data substitution with datapools
- Real-time monitoring and reporting
- Report customization and export capability
- Programming extensibility with Java custom code

Garbage Collection and Memory Visualizer (GCMV)



Tuning recommendation

- A high proportion of the nursery is tenured each collection. (The average is approximately 16%.) This can lead to longer pause times for collections in the nursery, more frequent collections in the tenured area, and slower application access to these objects. Consider increasing the nursery size or the tenure age to see if this ratio can be lowered.
- The application seems to be using some quite large objects. The largest request which triggered an allocation failure (and was recorded in the verbose gc log) was for 3643962 bytes.
- The memory usage of the application does not indicate any obvious leaks.

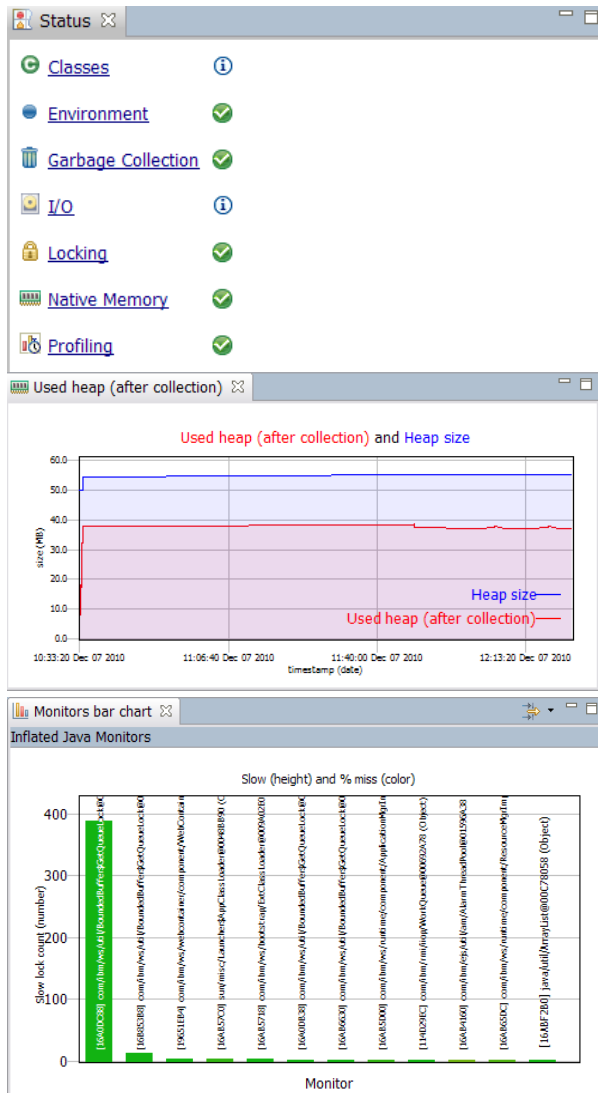
Summary

Allocation failure count	1286
Concurrent collection count	1
Forced collection count	0
Full collections	0
GC Mode	g1concn
Global collections - Mean garbage collection pause (ms)	693
Global collections - Mean interval between collections (minutes)	0.16
Global collections - Number of collections	21
Global collections - Total amount tenured (MB)	10290
Largest memory request (bytes)	3643962
Minor collections - Mean garbage collection pause (ms)	127
Minor collections - Mean interval between collections (ms)	56.1
Minor collections - Number of collections	1266
Minor collections - Total amount flipped (MB)	11756
Minor collections - Total amount tenured (MB)	9168
Proportion of time spent in garbage collection pauses (%)	75.8
Proportion of time spent unpaused (%)	24.2
Rate of garbage collection	0.163 MB/see c

- Helps analyze and diagnose memory related Java problems
- Provides graphing of verbose:gc
 - Allows graphing of all available data: pause times, heap size etc
 - Allows zoom, cropping and change of axes value and units
 - Allows comparison of multiple files
- Provides graphing of process memory from “ps” and “svmon”
- Analysis and Recommendations
 - Provides tuning recommendations based on data and flags errors.
 - Analysis can be limited using cropping.



Health Center



- Provides a view inside a running ‘in-flight’ Java application
 - Performance analysis
 - JVM configuration recommendations
- Small agent runs on the target JVM
 - Minimal overhead (circa 3%)
 - Supports all IBM Java platforms, requires Java 5 and above
- Use during the development phase
 - Performance problems
 - Functional issues
- Use in production
 - Configuration problems
 - Stability issues





Health Center cont...

The screenshot shows the Health Center 2.0 interface. On the left, a table lists current threads with their names and states. On the right, a graph titled 'Number of threads' shows a constant thread count of 20 over a period of 0:11 minutes. Below the graph, the 'Thread details' panel shows the 'Owned monitor name' as 'java.net.SocksSocketImpl@119c119c' and a 'Contented monitor' field.

Thread name	Thread state
main	RUNNABLE
JIT Compilation Thread	RUNNABLE
Signal Dispatcher	RUNNABLE
Gc Slave Thread	RUNNABLE
Finalizer thread	RUNNABLE
RMI TCP Accept-1972	RUNNABLE
Health Center trace subscriber	RUNNABLE
LT=0:P=800369:O=0:port=55465	RUNNABLE
RMI TCP Connection(1)-9.20.187.149	RUNNABLE
Attach API wait loop	RUNNABLE
RMI TCP Connection(3)-9.20.187.149	RUNNABLE
RT=0:P=800369:O=0:TCPTransport...	RUNNABLE
WT=1	RUNNABLE
WT=2	RUNNABLE
WT=3	RUNNABLE
RMI Scheduler(0)	TIMED_WAITING
Thread-3	WAITING
stop JMX Server on shutdown	WAITING
JMX server connection timeout 23	WAITING
WT=4	WAITING

New Features in Health Center 2.0

Late Attach

- This means you can attach Health Center to a running JVM (that has late attach functionality) “on the fly” without having pre-configured any command line properties.

Threads view

- List of current threads and states
- Number of threads over time
- See contended monitors

Live control of application

- Trigger dumps
- Enable verbosegc collection

The screenshot shows the 'Dump Wizard' dialog box with the following options:

Dump Options
Select the required dumps

- Heap Dump - Picture of in-memory objects on the Java heap, used for memory analysis.
- System Dump - Also known as core dump. Involves dumping the entire address space and as such can be very large.
- Java Dump - Also known as thread dump or Java core. Used for viewing the thread activity inside the JVM at a given time.

Buttons: Finish, Cancel





Additional Sessions at Impact 2012

- The Java Team are presenting other sessions that also cover these tools and other related subjects
 - 1513 Hands-on Lab: Java Performance Troubleshooting Masterclass
Wed, May 2, 2012 at 10:45 AM - 12:00 PM in Murano 3303
Repeats
Fri, May 4, 2012 at 8:45 AM - 10:00 AM in Murano 3303
Speakers:
Chris Bailey, IBM
 - 1517 Deploying Applications Into the Cloud with the IBM Application Pattern for Java
Wed, May 2, 2012 at 3:15 PM - 4:30 PM in Palazzo G
Repeats
Thu, May 3, 2012 at 4:45 PM - 6:00 PM in Palazzo P
Speakers:
Chris Bailey, IBM
 - 2965 Performance and Benchmarking Discussion
Thu, May 3, 2012 at 10:30 AM - 11:45 AM in Titian 2201B
Speakers:
Andrew Spyker, IBM; Brian K. Martin, IBM; Chris Bailey, IBM;
Christopher M. Richardson, IBM; DAVID W. HARE, IBM; Surya Duggirala, IBM;
Trevor Pearson, IBM; Weiming Gu, IBM



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