

TOMCAT MONITORING ALTERNATIVES: PROS AND CONS

Charlie Arehart

Independent Consultant/Server Troubleshooter

(CArehart.org, @carehart)



A large fire burning in a forest at night, with tall utility poles in the foreground. The fire is intense and bright orange, with thick black smoke rising into the dark sky. The utility poles are silhouetted against the fire, and some have blue lights. The ground in the foreground is dark and appears to be covered in ash or charred debris.

A DAY IN THE LIFE



WHO MIGHT YOU BE?

A photograph of a hardware store aisle, likely Home Depot, with various signs and products. The aisle is filled with boxes and tools. Signs for 'Watering', 'Landscape', 'Garden Tools', and 'Hand Tools' are visible. A 'jumbuck' logo is on a box in the foreground. The text 'CHOOSING YOUR TOOLS' is overlaid in white.

CHOOSING YOUR TOOLS

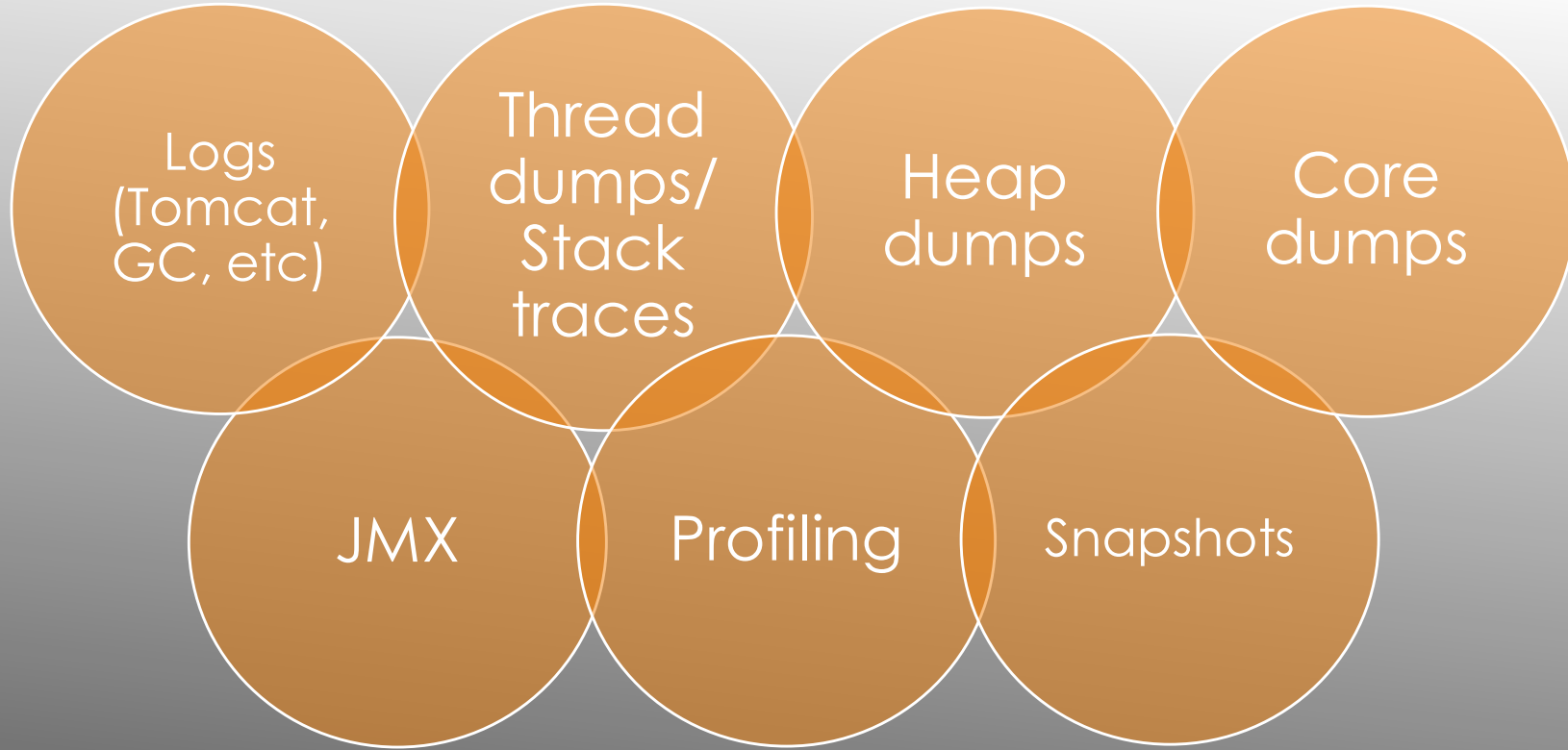
WHO AM I?



- ▶ What are some of the common troubleshooting approaches you have used?
 - ▶ Not asking about tools, for now

COMMON TROUBLESHOOTING APPROACHES?





COMMON TROUBLESHOOTING APPROACHES



- ▶ What are some of the typical **tools** you have used?

TYPICAL TOOLS?



- ▶ Built-in JVM tools
 - ▶ Thread dump/viewing, heap dump/viewing
 - ▶ Memory space monitoring
 - ▶ GC timing/triggering
 - ▶ Thread profiling
 - ▶ JMX monitoring, manipulation
 - ▶ And more
- ▶ Tomcat Manager
 - ▶ Can help with some of same, and more
- ▶ 3rd party JVM tools
 - ▶ Often focused on one of these aspects
- ▶ Log analysis tools
- ▶ APM tools

TYPICAL TOOLS



- ▶ What are some of the common problems you have faced?

COMMON PROBLEMS?





COMMON PROBLEMS?





LESS COMMON PROBLEMS



- ▶ CPU, Memory, Disk, Network
 - ▶ On Tomcat box
 - ▶ On boxes of any related services (db, cache, etc.)
- ▶ Special issues with VMs
 - ▶ Issues on the VM host
 - ▶ Issues with other VMs within host

SYSTEM RESOURCE ISSUES



A photograph of a server room with two technicians. One technician is standing in the background, reaching into a server rack. The other is kneeling in the foreground, looking at a document. The room is filled with rows of server racks, each with numerous cables and components. The lighting is dim, and the overall tone is professional and technical.

THE CHALLENGE OF SCALE

Charlie Arehart (CArehart.org, @carehart)

- ▶ Not trying to scare or overwhelm you
- ▶ Just saying there's a place for various tools
 - ▶ And not all tools are best suited to solving all problems
- ▶ May seem obvious
 - ▶ But again my experience suggests otherwise

SCARED AWAY? NOT MY GOAL



DEMO TIME



- ▶ There are so many tools in the java and tomcat monitoring space
 - ▶ Can't show them all
- ▶ Let's look at a bit more about most of them
 - ▶ In same order originally introduced before

NO TIME TO DEMO ALL POSSIBLE TOOLS



- ▶ Manager available but **not enabled** by default
 - ▶ Take care to consider **security concerns** with enabling it
- ▶ Monitoring-oriented features
 - ▶ Show server status, observe sessions, help with memory leaks, trigger thread dumps,
- ▶ Available REST, UI, and ANT automation
- ▶ More: <https://tomcat.apache.org/tomcat-9.0-doc/manager-howto.html>

TOMCAT MANAGER



- ▶ Tools provided in JDK only (not JRE)
 - ▶ Some only as of a certain JVM version (added/removed)
 - ▶ Often most easily used if JMX remoting enabled
 - ▶ On Windows, may need to “run as admin” for some to work
- ▶ jvisualvm / visualvm
 - ▶ Removed from JDK as of Java 9, now at <https://visualvm.github.io>
 - ▶ <https://docs.oracle.com/javase/8/docs/technotes/guides/visualvm/>
- ▶ Java Mission Control / jmc
 - ▶ Was originally only available to licensees, then open sourced
 - ▶ More: <http://hirt.se/blog/>
 - ▶ New builds: <http://jdk.java.net/jmc/>
 - ▶ <https://docs.oracle.com/javase/9/tools/jmc.htm>
- ▶ ...

MORE ON JVM TOOLS



- ▶ As well as ...
- ▶ jcmd
 - ▶ <https://docs.oracle.com/javase/8/docs/technotes/tools/windows/jcmd.html>
- ▶ jconsole
 - ▶ <https://docs.oracle.com/javase/8/docs/technotes/guides/management/jconsole.html>
- ▶ jstack
 - ▶ <https://docs.oracle.com/javase/8/docs/technotes/tools/windows/jstack.html>
- ▶ jmap
 - ▶ <https://docs.oracle.com/javase/8/docs/technotes/tools/windows/jmap.html>
- ▶ jstat
 - ▶ <https://docs.oracle.com/javase/8/docs/technotes/tools/windows/jstat.html>

MORE ON JVM TOOLS



- ▶ VisualVM
- ▶ Java Mission Control
- ▶ Yourkit: <https://www.yourkit.com/>
- ▶ Jprofiler: <https://www.ej-technologies.com/>
- ▶ Xrebel: <https://zeroturnaround.com/software/xrebel/>
- ▶ Netbeans: <https://profiler.netbeans.org>
- ▶ <http://www.spyglasstools.com/products/spyglass-remote-profiler/>
- ▶ And others, including APMs

JVM PROFILERS



- ▶ Taking thread dumps
 - ▶ VisualVM, Java Mission Control
 - ▶ Tomcat Manager
 - ▶ Jcmd, jstack, kill -3, windows (ctrl+break), threadmxbean, apm tools
- ▶ Analyzing them
 - ▶ TDA: <https://github.com/irockel/tda>
 - ▶ Samurai: <https://github.com/yusuke/samurai>
 - ▶ <http://fastthread.io/>
 - ▶ <http://www.spyglasstools.com/products/spyglass-smart-thread-dump/>
 - ▶ <https://www.site24x7.com/tools/thread-dump-analyzer.html>
 - ▶ And more, including APMs

THREAD DUMP TOOLS



- ▶ Taking heap dumps
 - ▶ VisualVM, Java Mission Control
 - ▶ Tomcat Manager
 - ▶ jcmd, jmap, jmx, HeapDumpOnOutOfMemoryError, apm tools
- ▶ Analyzing them
 - ▶ Eclipse memory analyzer tool (MAT)
 - ▶ <http://www.eclipse.org/mat/>
 - ▶ jhat
 - ▶ <https://docs.oracle.com/javase/7/docs/technotes/tools/share/jhat.html>
 - ▶ <http://heaphero.io>
 - ▶ <https://plumbr.io>
 - ▶ <https://go.nastel.com/autopilot-heap-detective>
 - ▶ And more, including APMs

HEAP DUMP TOOLS



- ▶ Tomcat Manager jmxproxy
- ▶ Jvisualvm, jmc, jconsole
- ▶ Jmxsh: <https://github.com/davr/jmxsh>
- ▶ Jolokia: <https://jolokia.org/>
- ▶ Jmx exporter: https://github.com/prometheus/jmx_exporter
- ▶ Tick Stack (using jolokia): <https://dzone.com/articles/how-to-get-metrics-from-a-java-application-inside>
- ▶ More:
<https://docs.oracle.com/javase/8/docs/technotes/guides/jmx/tutorial/tutorialTOC.html>

JMX TOOLS



- ▶ Tools to analyze GC logs
 - ▶ <http://gceasy.io/>
 - ▶ <https://github.com/chewiebug/GCViewer/wiki>
- ▶ Tools to manage/store/search any logs
 - ▶ Elastic stack / ELK (elasticsearch/logstash/kibana)
 - ▶ logz.io
 - ▶ Fluentd (Fluentd.org)
 - ▶ splunk.com, loggly.com, sumologic.com, humio.com, etc
- ▶ More: <https://blog.newrelic.com/engineering/best-logging-tools/>

OTHER TOOLS



- ▶ Appdynamics
- ▶ Dynatrace
- ▶ NewRelic APM
- ▶ Java Melody
- ▶ Plumb
- ▶ Appedo
- ▶ Perfino

- ▶ Sematext
- ▶ Stackify (prefix and retrace)
- ▶ Moskito
- ▶ Hawkular
- ▶ Nastel
- ▶ FusionReactor
- ▶ And more

AVAILABLE APMS



- ▶ Most APMs implemented via javaagent
 - ▶ Some tools can auto-attach, or auto-register
- ▶ Some require instrumentation of code, but not all do
- ▶ Most JMX tools can control frequency of polling
- ▶ Safe to monitor production?
 - ▶ Some tools are, absolutely. Others can have impact
 - ▶ Need to assess each for your self

OTHER POINTS



- ▶ Tracking things over time, value of alerting
- ▶ Tracking queries within requests
 - ▶ Tracking external server call time
 - ▶ Some APMs offer this ability
- ▶ Tracking errors
- ▶ Monitoring from central repository off-server
- ▶ ...

OTHER APM FEATURES TO WATCH FOR



- ▶ Tracking server response time success/failure over time
 - ▶ Some APMs offer daily/weekly/monthly reports
- ▶ Tracking end user response time
 - ▶ Some APMs offer js code to add to your app
 - ▶ Then network time/browser render time are tracked in the APM
- ▶ Tracking sessions build up
 - ▶ Perhaps due to spiders/bots
 - ▶ Ways to watch it, ways to address it

OTHER APM FEATURES TO WATCH FOR (CONT.)



- ▶ Again, profiling, heap dumps, thread dumps and GC logs are one way to go
- ▶ Need also to see what requests are running, have run
- ▶ Will often benefit from tracking over time, alerting, reports
- ▶ Explore APMs and other alternative solutions to find best fit
- ▶ If I can answer any questions about my talk, please contact me:
 - ▶ charlie@carehart.org
 - ▶ @carehart (twitter, linkedin, github, facebook, etc.)

CONCLUSION

