TOMCAT MONITORING ALTERNATIVES: PROS AND CONS

Charlie Arehart

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A DAY IN THE LIFE

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WHO MIGHT YOU BE?

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CHOOSING YOUR TOOLS

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WHO AM I?

Charlie Arehart (CArehart.org, @carehart)

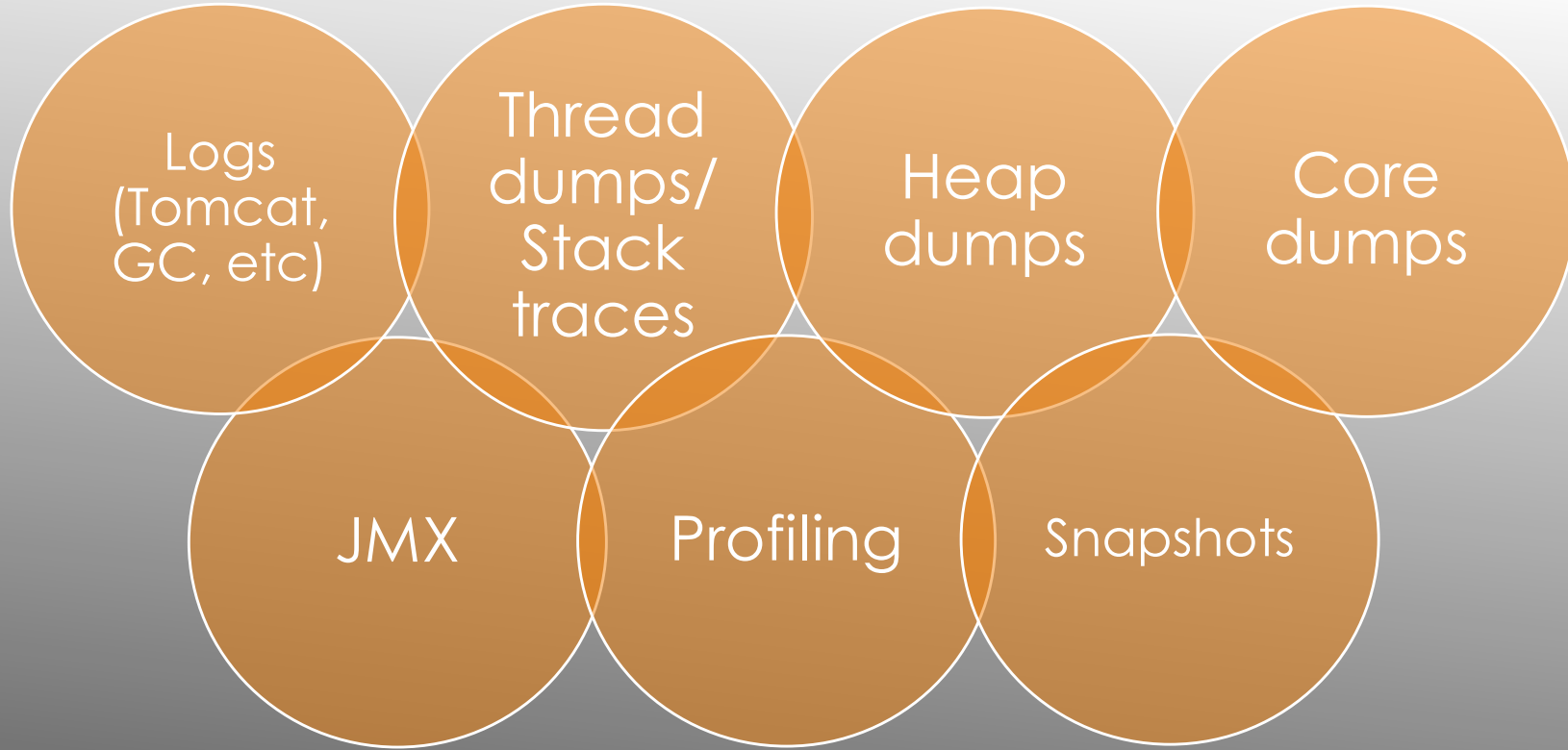- What are some of the common troubleshooting **approaches** you have used?
  - Not asking about **tools**, for now

COMMON TROUBLESHOOTING APPROACHES?

Logs (Tomcat, GC, etc)

Thread dumps/ Stack traces

Heap dumps

Core dumps

JMX

Profiling

Snapshots

COMMON TROUBLESHOOTING APPROACHES

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- 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

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

COMMON PROBLEMS?

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High
CPU

Hanging
requests

External
calls
hanging

And more

High
memory

DB calls
hanging

Tomcat
Crashing

COMMON PROBLEMS?

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Problems when no traffic

End-user time slow, not on server

Unexpected traffic

Tomcat crashing frequently/ unexpectdly

Web server issues

Web connector issues

And more

LESS COMMON PROBLEMS

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- 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

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THE CHALLENGE OF SCALE

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- 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

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- 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

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- 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

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- 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 (elasticache/logstach/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

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- Appdynamics
- Dynatrace
- NewRelic APM
- Java Melody
- Plumbr
- Appedo
- Perfino

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

AVAILABLE APMS

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- Most APMs implemented via javaagent

  - Some tools can auto-attach, or auto-register

- 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

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- 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

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- 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.)

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- 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:

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  - @carehart (twitter, linkedin, github, facebook, etc.)

CONCLUSION

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