

Pivotal

A NEW PLATFORM FOR A NEW ERA

Migrating to Apache Tomcat 8

Mark Thomas, Staff Engineer, Pivotal

9 April 2014

Agenda

- Introductions
- Specification changes
- Tomcat changes
- Summary
- Questions

Introductions

Introductions

- markt@apache.org
 - Apache Tomcat committer since December 2003
 - Apache Tomcat PMC member from the beginning
- Tomcat 8 release manager
- Member of the Apache Tomcat security team
- Apache Commons PMC member
- Member of the Apache Infrastructure team

Introductions

- Staff Engineer at Pivotal
- Primary role is to work on Apache Tomcat
- Pivotal tc Server
 - Based on Tomcat
 - Keep tc Server updated as new Tomcat versions are released
- 3rd line support for Tomcat and tc Server
- Lead the Pivotal security team

Why This Presentation?

- Lots of information available about what is new in Tomcat 8
 - <http://people.apache.org/~markt/presentations/2013-09-Apache-Tomcat8.pdf>
- J2EE specifications are meant to be backwards compatible
 - That isn't always the case
- Tomcat configuration often changes between versions
- Not so much information on what might break when you switch to Tomcat 8

Specification changes

Specification Changes

- Servlet 3.1 (JSR 340)
- JSP 2.3 (JSR 245 maintenance release)
- EL 3.0 (JSR 341)
- WebSocket 1.0 (JSR 356)

Specification Changes: EL 3.0

- Coercion of nulls to Number, Character or Boolean
- EL 2.2 and earlier (0, 0, false)
- EL 3.0 and later (null, null, null)
- System property
 - `org.apache.el.parser.COERCE_TO_ZERO`
 - Set to true for EL 2.2 behaviour

Specification Changes: JSP 2.3

- Minor changes to reflect the changes in EL 3.0
- JSP 2.3
 - Supported: GET, POST and HEAD
 - Undefined: Everything else
- JSP 2.2 and earlier
 - Undefined: Most implementations assumed all
- Tomcat only permits GET, POST and HEAD
 - Protection against verb tampering

Specification Changes: WebSocket 1.0

- Tomcat 7 initially shipped with a proprietary WebSocket API
- Tomcat 8 ships with a JSR 356 WebSocket implementation
 - Also back-ported to Tomcat 7
- The proprietary WebSocket API is deprecated in Tomcat 7
- Applications using the proprietary API need to migrate
 - Relatively simple
 - <https://svn.apache.org/r1424733>

Specification Changes: Servlet 3.1

- Session ID changes by default on authentication
 - Prevents session fixation

Specification Clarifications: Servlet 3.1

- Annotation scanning
 - Independent of version declared in web.xml
 - Declare version 2.5, all annotations (@WebServlet etc.) are still processed
 - Applications may change behaviour moving from Tomcat <=6 to Tomcat >=7
- Absolute ordering
 - Excluded JARs are not scanned for SCIs
 - Excluded JARs are not scanned for matches for SCIs
 - Excluded JARs are not scanned for annotations

Specification Clarifications: Servlet 3.1

- metadata-complete
 - Does not control scanning of SCIs
 - Does not control scanning of matches to SCI
- Container provided SCIs are always loaded
- Async processing
 - `AsyncContext.get[Request|Response]()` throws ISE outside of async processing
 - Default async timeout is 30 seconds
 - Listener exceptions are logged but do not affect other listeners

Tomcat Changes

Tomcat Changes: Connectors

- Default connector has changed from BIO to NIO
 - BIO is likely to be dropped for Tomcat 9
- Only BIO option not supported by NIO is irrelevant for NIO
 - disableKeepAlivePercentage
- May notice different network / CPU loads
 - More established, idle connections
 - Marginally higher CPU load

Tomcat Changes: Static Resources

- Tomcat 7
 - Aliases
 - VirtualLoader
 - VirtualDirContext
 - JAR resources
 - External repositories
- All variations on a theme
- Each implemented differently

Tomcat Changes: Static Resources

- Tomcat 8
 - New WebResources implementation
 - JAR resources
 - External resources for class loader
- Completely new configuration
- Caching attributes removed from Context

Tomcat Changes: Static Resources

- Resources now defined by as:
 - Pre-resources
 - Main resources
 - JAR resources
 - Post-resources

Tomcat Changes: Static Resources

- Resources attributes:
 - base
 - internalPath
 - webappMount
 - readOnly

Tomcat Changes: Internal APIs

- Lots of changes
 - Manager, Loader and Resources are now Context only
 - Mapper moved from Connector to Service
 - WebResources
- If you extend a Tomcat class, review the API docs

Tomcat Changes: Database Connection Pools

- Tomcat 7 and earlier based on DBCP 1
- Tomcat 8 based on DBCP 2
- Better performance in concurrent environments
 - Comparable to Tomcat's JDBC pool
- There are some changes to configuration attributes
 - Reflect consistency changes made in Commons Pool 2

Tomcat Changes: Database Connection Pools

- maxActive -> maxTotal
- maxWait -> maxWaitMillis
- Validation no longer requires a validation query
 - Uses Connection.isValid()

Tomcat Changes: Cookies

- The Cookie specifications are a mess
- Netscape Cookie spec (version 0) is full of holes
- RFC2109 (version 1) is generally OK but few browsers get even close to implementing it correctly
- RFC2965 (version 2) isn't really implemented at all
- Yet, generally, cookies work
- How come?

Tomcat Changes: Cookies

- RFC6265 pragmatic documentation of what has actually been implemented (mostly)
- Tomcat currently tries to correctly implement RFC2109
 - Has various workarounds for ‘broken’ clients
 - Has a number of bugs as identified by jboynes
 - Isn’t going to like it when UTF-8 data starts appearing in cookies
- Jeremy Boynes has done a very thorough review
 - <http://wiki.apache.org/tomcat/Cookies>

Tomcat Changes: Cookies

- Only changes so far have been code clean-up
- Changes need to be completed before Tomcat 8 is declared stable
 - Likely to be my next focus for Tomcat development
- Should be backwards compatible
- Cookie changes nearly always break something for someone
- Review the wiki page for full details

Summary

Summary

- Unlikely to be affected by most of the issues discussed here
 - Cookies?
- The ASF's JIRA instance switched to Tomcat 8 without hitting any of these issues
 - We did uncover a few Jira bugs though
- Help is always available on the Apache Tomcat user's mailing list

Questions

Pivotal

A NEW PLATFORM FOR A NEW ERA