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# Migrating to Apache Tomcat 8

Mark Thomas, Staff Engineer, Pivotal

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#### Agenda

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

### Introductions

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#### 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
- 3<sup>rd</sup> 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

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#### **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

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# **Tomcat Changes**

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

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

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

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# Summary

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#### 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

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