AGENDA

• Where to find documentation
• Interesting bits found in the deep labyrinth of documentation
CONVENTIONS USED ON THE SLIDES

• Shorten long package names from org.apache.tomcat to o.a.t (or c for catalina)
LOST IN THE DOCS

• Possible reasons
  • Not reading the docs
  • Too much docs
  • Too many features
  • Source-Documented
HOW TO READ THE DOCS

Four main sources for documentation

- User Guide
- Reference
- Wiki
- Source
DOCS: TOMCAT USER GUIDE

Common use cases with sample code


When in doubt Start here
List of all configurable elements
Grouped by function

Good when you know what to look for
Community generated content

https://cwiki.apache.org/confluence/display/TOMCAT

Helpful when you are looking for broader information about general usage
Who needs documentation anyway
https://github.com/apache/tomcat/

Right place when you think documentation is wrong or missing
DOCS: OTHER SOURCES

Have a look around on the internet
E.g. by searching “site:tomcat.apache.org stuck thread” or use the mailing list
http://tomcat.apache.org/lists.html

For hard problems mailing list is really helpful
LOST IN THE DOCS

• Randomly picked interesting topics
• Subjective choice
PARALLEL DEPLOYMENT

- Enables deploying of new versions of your software without interruption
- Routes sessions to the correct version of your app
- Removes old versions when they are not used anymore (undeployOldVersions)
PARALLEL DEPLOYMENT
MORE DOCS

Mentioned in Tomcat Reference and User Guide:
PARALLEL DEPLOYMENT

USAGE

Deploy a new WAR with a name ending on `##VERSION_STRING`

Example: `ROOT##001.war`

Look out for warnings in the logs. You may hold on to your objects too tightly.
LOST IN SYSTEM PROPS

Tomcat can be fine tuned using quite a few system properties

They are listed at the reference section

LOST IN TOO MANY SYSTEM PROPS

• System props can be defined in conf/catalina.properties

• CATALINA_OPTS is used on startup only

• System props are set for the whole JVM

• Location of catalina.properties can be specified by catalina.config property
PROPERTY_SOURCE

Inserts values into Tomcat’s configuration files (context.xml, server.xml, web.xml)

**New** PropertySource that reads values from environment variables

Mentioned in Tomcat Reference:
PROPERTY_SOURCE
USAGE

In config file reference a value

```
<Context>
  <Resource name="jdbc/database"
    port="${db.port:-5432}" ...
</Context>
```

that is set by Java system property

`CATALINA_OPTS="-Ddb.port=4223"`
o.a.t.util.digester.
PROPERTY_SOURCE=my.PropertySource

Create `my.PropertySource` that implements
o.a.t.util.IntrospectionUtils.PropertySource
and place it in `${CATALINA_BASE}/lib`
RECYCLE_FACADES

Tomcat is re-using request/response objects

If you are holding onto those objects, you will get in trouble

This option gives you a new one every time
RECYCLE_FACADES

Set `o.a.c.connector.RECYCLE_FACADES` to `true`

Mentioned in Tomcat Reference

DEFAULTS FOR VIRTUAL HOSTS

Tomcat can set defaults for web.xml and context.xml based on virtual hosts

Useful to customize webapps for different parties on the same instance
DEFAULTS FOR VIRTUAL HOST
PREPS

Add a virtual host to `server.xml` inside Engine tag

```xml
<Host name="customerone"
  appBase="portal-webapps"
  unpackWars="true"
  autoDeploy="true" />
```

Create the `webapps` and `conf` folder

```
$ mkdir -p conf/Catalina/customerone
$ mkdir portal-webapps
```
**DEFAULTS FOR VIRTUAL HOSTS**

**USAGE**

- Put `web.xml.default` and/or `context.xml.default` files in `conf/Catalina/customerone`
- Possible content is same as `web.xml` and `context.xml`
- Order of element lookup in the files is
  1) Files deployed with the webapp
  2) Files found in the virtual host config dir
  3) Files found in the default host
     (which is called `localhost` in default setup)
DEFAULTS FOR VIRTUAL HOSTS

Mentioned in Tomcat Reference

Mentioned in Tomcat User Guide
SOURCE CODE DOCS

A new way of Tomcat’s cluster setup using Kubernetes is documented in the source only.

OK, it can be found in the wiki, too.
CLUSTER SETUP FOR KUBERNETES

• Tomcat’s builtin session replication uses multicast to find cluster nodes
• Kubernetes doesn’t like multicast
• Configure Membership Provider for Kubernetes
• Configure your application on Kubernetes
CLUSTER SETUP FOR KUBERNETES (TOMCAT SIDE)

Add a cluster definition in server.xml to your Engine or Host tag

```xml
<Cluster className="org.apache.catalina.ha.tcp.SimpleTcpCluster">
    <Channel className="org.apache.catalina.tribes.group.GroupChannel">
        <Membership className="o.a.c.t.membership.cloud.CloudMembershipService"/>
    </Channel>
</Cluster>
```
CLUSTER SETUP DOCS

- https://www.slideshare.net/jfclere/from-a-cluster-to-the-cloud
- https://github.com/jfclere/tomcat-kubernetes
- https://cwiki.apache.org/confluence/display/tomcat/ClusteringCloud
VALVES

• A small selection of built-in valves
  • StuckThreadDetectionValve
  • SemaphoreValve
  • RewriteValve
VALVES EXAMPLE 1

• **StuckThreadDetectionValve** detects requests that take too long

• Information about those requests is available through JMX and will be logged

• Optionally interrupts stuck threads
VALVES EXAMPLE 2

- **SemaphoreValve** guards a resource from too much concurrency
- Most useful for synchronous servlets
- Guards all or nothing :(  
- Subclasses can control concurrency by overwriting SemaphoreValve#controlConcurrency(request, response)
VALVES EXAMPLE 3

• **RewriteValve** mimics Apache httpd rewrite module

• Use it for simple rewrite rules that are read from a file named `rewrite.config`
LOST IN TOO MANY FEATURES

You may be wondering why Tomcat provides **two** different pool implementations for JDBC.
WHICH JDBC POOL

- **jdbc-pool**
  - fixed problems found in old dbcp based pool
  - capable of advanced stuff
  - development has stalled

- **tomcat-dbcp**
  - dbcp2 based pool (fixed the problems with old dbcp based pool)
  - is actively maintained
LOST ON THE RUN

An often overlooked gem is the file `RUNNING.txt` in the root directory of a fresh Tomcat installation.
BIN/SETENV.SH

Customize environment settings

Don’t edit catalina.sh or startup.sh

• You don’t need to
• Makes updates easier
MULTI-INSTANCE SETUP

• easy updates and lightweight instances

• CATALINA_HOME

  points to the extracted binaries downloaded from Tomcat homepage, can be read only

• CATALINA_BASE

  points to a stripped down installation that gets laid over CATALINA_HOME
MULTI-INSTANCE SETUP

USAGE

$ TCV=apache-tomcat-9.0.38
$ mkdir -p /srv/tomcat && cd /srv/tomcat
$ tar xf "~/tmp/"${TCV}".tar.gz"
$ mkdir -p
tc-instance/{bin,logs,webapps,temp,work}
$ cp -r "~/${TCV}/conf" tc-instance
$ export CATALINA_HOME=""$PWD/"${TCV}""
$ export CATALINA_BASE=""$PWD/tc-instance"
$ ""${CATALINA_HOME}/bin/startup.sh""
RESOURCE FRAMEWORK

• Every “file” – classes, jars, static resources – in Tomcat is read through the resource framework. (Tomcat 8.5 and up)

• Replaces VirtualDirContext and VirtualWebappClassLoader from Tomcat 7.0 and below
RESOURCES EXAMPLE

<Context>
  <Resources>
    <PreResources
      base=
      "$\{\text{catalina.base}\}/\text{special-config.jar}\$
      className=
      "\text{o.a.c.webresources.JarResourceSet}\"
      webAppMount=
      "/\text{WEB-INF/classes}\" />
  </Resources>
</Context>
RESOURCES TYPES

- WebResourceSet (Interface)
- DirResourceSet (files as files)
- FileResourceSet (one file as a file)
- JarResourceSet (files inside jar as files)
RESOURCES ORDERING

- PreResources
- MainResources
- ClassResources
- JarResources
- PostResources
LOST IN THE DOCS

- Thanks for listening
- Questions?
LOST IN THE DOCS

• Thanks for listening
• Find missing docs and add them