Deploying Jakarta EE 9 applications to Apache TomEE

NOTE: Apache TomEE is Web Profile compatible, not an implementation of Full Profile.

Get the source codes from Github.

Prerequisites

Make sure you have installed the following software.

- Java 11 (OpenJDK or AdoptOpenJDK)
- Apache Maven 3.6.3
- Apache TomEE (Plume) 9.0.0-M3

Manual Deployment

As an example, we select the *plume* version, which includes a super feature collection of Web Profile .

Extract the files from the downloaded archive into your local disk. The TomEE file structure is similar to Apache Tomcat.

To start a TomEE server, open a terminal window, enter the TomEE root folder and switch to *bin* folder, execute the following command to start a TomEE server in a separate window.

```
# Windows
startup.bat
# or
catalina.bat start

# Linux like system.
sh ./startup.sh
```

Or run the TomEE server in the same window by executing the following command.

```
# Windows
catalina.bat run

# Linux like system.
sh ./catalina.sh run
```

You will see the start up progress in the TomEE server console.

```
Using CATALINA_BASE:   "D:\appsvr\apache-tomee-plume-9.0.0-M3"
Using CATALINA_HOME:   "D:\appsvr\apache-tomee-plume-9.0.0-M3"
Using CATALINA_TMPDIR: "D:\appsvr\apache-tomee-plume-9.0.0-M3\temp"
Using JRE_HOME:        "D:\jdk11"
Using CLASSPATH:       "D:\appsvr\apache-tomee-plume-9.0.0-
M3\bin\bootstrap.jar;D:\appsvr\apache-tomee-plume-9.0.0-M3\bin\tomcat-juli.jar"
Using CATALINA_OPTS:   ""
...
```

Execute the following command in the project root folder to build the project into a *war* package in the *target* folder.

```
mvn clean package
```

To deploy the application, just copy the *target/jakartaee9-starter-boilerplate.war* to the *[tomee install dir]/webapps* folder.

In the console window, you will see the deployment progress is started automatically.

```
29-Nov-2020 15:40:33.673 INFO [Catalina-utility-1]
jdk.internal.reflect.DelegatingMethodAccessorImpl.invoke Deploying web application
archive [D:\appsvr\apache-tomee-plume-9.0.0-M3\webapps\jakartaee9-starter-
boilerplate.war]
29-Nov-2020 15:40:33.673 INFO [Catalina-utility-1]
org.apache.tomee.catalina.TomcatWebAppBuilder.init ------------------------
localhost -> /jakartaee9-starter-boilerplate


...


29-Nov-2020 15:40:37.955 INFO [Catalina-utility-1]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints REST Application:
http://localhost:8080/jakartaee9-starter-boilerplate/api                    ->
com.example.JaxrsActivator@69c1f1fe
29-Nov-2020 15:40:37.955 INFO [Catalina-utility-1]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints      Service URI:
http://localhost:8080/jakartaee9-starter-boilerplate/api/greeting        -> Pojo
com.example.GreetingResource
29-Nov-2020 15:40:37.955 INFO [Catalina-utility-1]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints               GET
http://localhost:8080/jakartaee9-starter-boilerplate/api/greeting/{name} ->
Response greeting(String)
29-Nov-2020 15:40:38.003 INFO [Catalina-utility-1]
jdk.internal.reflect.DelegatingMethodAccessorImpl.invoke Deployment of web
application archive [D:\appsvr\apache-tomee-plume-9.0.0-M3\webapps\jakartaee9-
starter-boilerplate.war] has finished in [4,330] ms
```

Once it is deployed successfully, use `curl` command to verify the deployment result.

```
curl http://localhost:8080/jakartaee9-starter-boilerplate/api/greeting/Hantsy
{"message":"Say Hello to Hantsy at 2020-11-29T15:44:29.252675900"}
```

To undeploy the application, just remove the **war** file from the *[tomee install dir]/webapps* folder. Wait a second, you will see the undeployment progress in the TomEE console.

To stop the running TomEE server, just send a `CTRL+C` signal in the TomEE console, or execute the shutdown command in another terminal window.

```
# Linux like system.
[tomee install dir]/bin/shutdown

# Windows
[tomee install dir]\bin\shutdown.bat
```

Using TomEE Maven Plugin

Apache TomEE provides a official maven plugin for developers to deploy and undeploy applications to TomEE server in application development stage.

Declare the `tomee-maven-plugin` under `plugins` in the *pom.xml* file.

```
<plugin>
    <groupId>org.apache.tomee.maven</groupId>
    <artifactId>tomee-maven-plugin</artifactId>
    <version>${tomee-maven-plugin.version}</version>
</plugin>
```

Define a `tomee-maven-plugin.version` property to specify the version of `tomee-maven-plugin` to use.

```
<tomee-maven-plugin.version>8.0.5</tomee-maven-plugin.version>
```
NOTE: Currently `tomee-maven-plugin` does not provide a preview version for Jakarta EE 9/TomEE 9, but the stable version(8.0.5) works great with the latest TomEE 9 preview version.

By default, `tomee-maven-plugin` will retrieve the latest stable version to serve your application. Add the following properties in the `configuration` of `tomee-maven-plugin` to force it to use the latest TomEE 9.0.0-M3 instead.

```
<!-- download and run on a managed Apache TomEE server -->
<tomeeVersion>${tomee.version}</tomeeVersion>
<tomeeArtifactId>apache-tomee</tomeeArtifactId>
<tomeeGroupId>org.apache.tomee.jakarta</tomeeGroupId>
<tomeeClassifier>plume</tomeeClassifier>
```

Define a `tomeeVersion` to specify the TomEE version.

```
<tomee.version>9.0.0-M3</tomee.version>
```
NOTE: The `tomeeGroupId` is **org.apache.tomee.jakarta**, which is different from the stable version, TomEE 8.0 uses groupId **org.apache.tomee**.

OK, now run the following command to start a TomEE 9 server and deploy the applications.

```
mvn clean package tomee:run -Ptomee
```

You will see the following info in the TomEE console.

```
[INFO] --- tomee-maven-plugin:8.0.5:run (default-cli) @ jakartaee9-starter-
boilerplate ---
[INFO] TomEE was unzipped in 'D:\hantsylabs\jakartaee9-starter-
boilerplate\target\apache-tomee'
[INFO] Removed not mandatory default webapps
[INFO] Installed 'D:\hantsylabs\jakartaee9-starter-boilerplate\target\jakartaee9-
starter-boilerplate.war' in D:\hantsylabs\jakartaee9-starter-
boilerplate\target\apache-tomee\webapps\ja
kartaee9-starter-boilerplate.war
[INFO] TomEE will run in development mode
```

```
[INFO] Running 'org.apache.openejb.maven.plugin.run'. Configured TomEE in plugin
is localhost:8080 (plugin shutdown port is 8005 and https port is null)
// ...
29-Nov-2020 14:50:20.179 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke Server version name:   Apache
Tomcat (TomEE)/9.0.39 (8.0.5)
29-Nov-2020 14:50:20.179 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke Server built:          Oct 6
2020 14:11:46 UTC
29-Nov-2020 14:50:20.179 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke Server version number:
9.0.39.0
29-Nov-2020 14:50:20.179 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke OS Name:
Windows 10
29-Nov-2020 14:50:20.179 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke OS Version:            10.0
29-Nov-2020 14:50:20.179 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke Architecture:          amd64
29-Nov-2020 14:50:20.179 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke Java Home:
D:\jdk11
29-Nov-2020 14:50:20.194 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke JVM Version:
11.0.9.1+1
29-Nov-2020 14:50:20.194 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke JVM Vendor:
AdoptOpenJDK
29-Nov-2020 14:50:20.194 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke CATALINA_BASE:
D:\hantsylabs\jakartaee9-starter-boilerplate\target\apache-tomee
29-Nov-2020 14:50:20.194 INFO [main]
jdk.internal.reflect.NativeMethodAccessorImpl.invoke CATALINA_HOME:
D:\hantsylabs\jakartaee9-starter-boilerplate\target\apache-tomee


//...

29-Nov-2020 14:50:28.371 INFO [main]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints REST Application:
http://localhost:8080/jakartaee9-starter-boilerplate/api
        -> com.example.JaxrsActivator@2ab8589a
29-Nov-2020 14:50:28.386 INFO [main]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints      Service URI:
http://localhost:8080/jakartaee9-starter-boilerplate/api/greeting
        -> Pojo com.example.GreetingResource
29-Nov-2020 14:50:28.386 INFO [main]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints           GET
http://localhost:8080/jakartaee9-starter-boilerplate/api/greeting
/{name} ->      Response greeting(String)
...
29-Nov-2020 14:50:29.325 WARNING [main]
org.apache.catalina.util.SessionIdGeneratorBase.createSecureRandom Creation of
SecureRandom instance for session ID generation using [SHA1PRNG]
took [829] milliseconds.
29-Nov-2020 14:50:29.341 INFO [main]
jdk.internal.reflect.DelegatingMethodAccessorImpl.invoke Starting ProtocolHandler
["http-nio-8080"]
```

```
29-Nov-2020 14:50:29.348 INFO [main]
jdk.internal.reflect.DelegatingMethodAccessorImpl.invoke Server startup in [6177]
milliseconds
```

You can also use `tomee-maven-plugin` to deploy the application to a running TomEE server, esp. running on a remote server.

Open the *[tomee install dir]/conf/tomcat-users.xml* file, uncomment the following the configuration.

```
<!-- Activate those lines to get access to TomEE GUI if added (tomee-webaccess) -->

<role rolename="tomee-admin" />
<user username="tomee" password="tomee" roles="tomee-admin,manager-gui" />
```

Open the *[tomee install dir]/conf/system.properties* file, uncomment and modify the following items.

```
tomee.remote.support = true
tomee.serialization.class.blacklist = -
tomee.serialization.class.whitelist = com.example.
openejb.system.apps = true
openejb.servicemanager.enabled = true
```

Let's return to the project *pom.xml* file, replace the former `tomee-maven-plugin` configuration with the following.

```
<configuration>
    <tomeeHost>localhost</tomeeHost>
    <user>tomee</user>
    <password>tomee</password>
    <path>${project.build.directory}/${project.build.finalName}.war</path>
</configuration>
```

Make sure the TomEE server is running, run the following command in the project root folder.

```
mvn clean package tomee:deploy -Ptomee
```

You can view the deployment progress info in the TomEE console.

```
...
29-Nov-2020 16:56:23.550 INFO [http-nio-8080-exec-8]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints REST Application:
http://localhost:8080/jakartaee9-starter-boilerplate/api                     ->
com.example.JaxrsActivator@affb16f
29-Nov-2020 16:56:23.550 INFO [http-nio-8080-exec-8]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints      Service URI:
http://localhost:8080/jakartaee9-starter-boilerplate/api/greeting      -> Pojo
com.example.GreetingResource
29-Nov-2020 16:56:23.550 INFO [http-nio-8080-exec-8]
org.apache.openejb.server.cxf.rs.CxfRsHttpListener.logEndpoints                GET
```

```
http://localhost:8080/jakartaee9-starter-boilerplate/api/greeting/{name} ->
Response greeting(String)
```

To undeploy the application, execute the following command.

```
mvn tomee:undeploy -Ptomee
```