Deploying Celtix into a Servlet Container

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Overview

It is possible to deploy a Celtix Web service endpoint into a servlet container such as Tomcat. The sample applications hello_world and hello_world_RPCLit demonstrate this capability. However, these examples illustrate a very basic approach to accomplishing this task. This document will discuss alternative approaches that are more scalable and efficient.

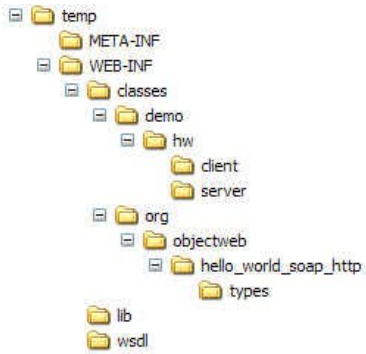
Before discussing these alternative approaches, it is essential that you understand what is needed to deploy a Celtix Web service endpoint into Tomcat. If you need guidance on installing Tomcat, refer to the last section in this document – Installing Tomcat on page 6.

A Deployed Celtix Web Service

Go to either the hello_world or hello_world_RPCLit examples and follow the instructions to build the `.war` file. Instructions for performing this task are near the end of the README file. The `.war` file is generated into the `build/war` directory. Review the content of the `build.xml` file in either example. Note that it has targets to create the `.war` file and to run the client application against the Tomcat hosted Web service. If you would rather run the client using `java` directly, refer to the instructions in the README file.

If desired, copy one, or both, of the `.war` files to the Tomcat `webapps` directory, start Tomcat, and run the client application(s).

Use WinZip to open the `.war` file and view its contents; then extract the archive to a temporary location.



Alternatively, if you installed the `.war` file(s) into Tomcat, you can view the contents from the `webapps` directory; the files will have been extracted into a directory with a name corresponding to the name of the `.war` file (without the `.war` extension).

The `classes` directory includes the code generated from the WSDL file plus any additional files you have added to the application. Note that files from both the server and client application are included. Obviously, the client related files are not needed and will not be included in the alternative approaches discussed later in this document.

The `lib` directory includes all of the JAR files from your Celtix installation's lib directory, and the `wsdl` directory contains the WSDL file for the application.

The `WEB-INF` directory includes two XML files: `web.xml` and `celtix-servlet.xml`. You need to understand the content of these files in order to appreciate the alternative approaches described in this document.

The XML Files

The `web.xml` file is the standard servlet deployment descriptor file while the `celtix-servlet.xml` file includes configuration information specific to the Celtix Web service endpoint.

The web.xml File

Although this file contains the standard servlet configuration information, you need to review its contents.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE web-app PUBLIC "-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
                         "http://java.sun.com/j2ee/dtds/web-app_2_3.dtd">
<web-app>
  <display-name>celtix</display-name>
  <description>celtix</description>
  <servlet>
    <servlet-name>celtix</servlet-name>
    <display-name>celtix</display-name>
    <description>Celtix endpoint</description>
    <servlet-class>
      org.objectweb.celtix.bus.jaxws.servlet.CeltixServlet
    </servlet-class>
    <load-on-startup>1</load-on-startup>
  </servlet>
  <servlet-mapping>
    <servlet-name>celtix</servlet-name>
    <url-pattern>/celtix/*</url-pattern>
  </servlet-mapping>
  <session-config>
    <session-timeout>60</session-timeout>
  </session-config>
</web-app>
```

Note that the servlet class is not actually part of your application. It is pre-written and part of your Celtix installation. This class file is located in the file `celtix-rt-<version number>.jar`, which is one of the files included in the `lib` directory.

Also note the `<url-pattern>` entry `celtix`. This will become part the the URL that client applications use to invoke on the Web service.

The celtix-servlet.xml File

This file contains content specific to the Celtix Web service application.

```
<?xml version="1.0" encoding="UTF-8"?>
<endpoints>
```

```
  <endpoint name="hello_world"
            interface="org.objectweb.hello_world_soap_http.Greeter"
            implementation="demo.hw.server.GreeterImpl"
            wsdl="WEB-INF/wsdl/hello_world.wsdl"
            service="{http://objectweb.org/hello_world_soap_http}SOAPService"
            port="{http://objectweb.org/hello_world_soap_http}SOAPPort"
            url-pattern="/hello_world" />

</endpoints>
```

Notice that all information related to a specific Web service is specified as attributes within the `<endpoint>` tag. The origin of most of these entries is straight-forward, being derived either from declarations in the WSDL file or from the class names of code generated from the WSDL file. The value for the `wsdl` attribute is the path to the application's WSDL file relative to the application's installation directory under the Tomcat `webapps` directory, and the values of the `service` and `port` attributes are derived from a combination of the target namespace and service, or port, name specified in the WSDL file.

The value for the `url-pattern` attribute is the same as the name attribute, but that is not a firm requirement. What is important, however, is that this entry will also become part of the URL that client applications will use to invoke on the Web service.

As you will see later in this document, if you want to deploy multiple Celtix Web service endpoints into the same Tomcat instance, you can simply add additional `<endpoint>` elements to this XML file.

The Endpoint URL

In order to access the Web service endpoint, client applications need a URL. Since the endpoint is hosted within Tomcat, access will be through the TCP/IP port used by Tomcat and not through the URL specified in the WSDL file. In the Celtix example applications, access to the hello_world Web service deployed into Tomcat uses the URL:

```
http://hostname:port/helloworld/celtix/hello_world
```

and access to the hello_world_RPCLit Web service uses the URL:

```
http://hostname:port/helloworldrpclit/celtix/hello_world_rpclit
```

Where:

- `http://hostname:port` refer to the host and TCP/IP port used by Tomcat (for Tomcat, the default port is generally 8080),
- `/helloworld` or `/helloworldrpclit` are derived from the name of the subdirectory under the Tomcat `webapps` directory that contains the application (note that this subdirectory has the same name as the `.war` file),
- `/celtix` is derived from the value of the `<url-pattern>` entry in the `web.xml` file, and
- `/hello_world` or `/hello_world_rpclit` are derived from the value of the `url-pattern` attribute within the `<endpoint>` tag in the `celtix-servlet.xml` file.

You should note how these URLs are specified when running the sample applications. If you choose to run the client application using Ant, the URL is derived from information supplied on the command line combined with information that is already included in the `<target name="client-servlet"...><celtix-run.../></target>` tags in the `build.xml` file. If you run the application using `java`, you must supply the URL as a command line parameter.

Alternative Deployment Approaches

While the approach used in the Celtix example applications demonstrates how Celtix Web services can be deployed into Tomcat, there are some improvements that you can make.

1. First, the client related files do not need to be included.
2. Second, the server mainline file is also not required.
3. Third, many of the Celtix JAR files are not needed.
4. Fourth, the Celtix JAR files can be moved into the `shared/lib` subdirectory under your Tomcat installation. With this arrangement, these files are shared by all Celtix applications that are deployed into Tomcat.
5. And fifth, multiple Web services can be deployed within the same directory hierarchy rather than deploying each service into a unique subdirectory under the Tomcat `webapps` directory.

   Once you have deployed the first Web service, you can deploy additional endpoints into the same directory hierarchy by simply copying the `.class` files and WSDL file corresponding to the Web service and extending the `celtix-servlet.xml` file with another `<endpoint>` entry. There is no need to actually generate the `.war` file, which will include files (client mainline, server mainline, Celtix JARS, and `web.xml`) that you do not need.

To illustrate these points, you can rework the hello_world and hello_world_RPCLit demos, combining them into a single servlet application.

Removing Extraneous Files

If you have not done so already, copy the `.war` files from the hello_world and hello_world_RPCLit example applications into the Tomcat `webapps` directory. Start Tomcat, which causes the `.war` files to be unpacked into subdirectories under `webapps`. Stop Tomcat and open a command window, or Windows explorer, to the subdirectory (`webapps/helloworld`) holding one of the hello_world deployed application.

Removing Unneeded Application Files

Under the `webapps/helloworld/WEB-INF/classes/demo/hw` directory, delete the entire `client` subdirectory and the file `Server.class` from the `server` subdirectory; be certain to leave the `.class` file corresponding to the implementation class. Also remove the `Server.class` file from the `webapps/helloworldrpclit/WEB-INF/classes/demo/hwRPCLit/server` subdirectory.

Removing Unneeded Celtix JAR Files

Delete the following JAR files from the `webapps/helloworld/WEB-INF/lib` directory: (REVISIT at v1.0 GA.)

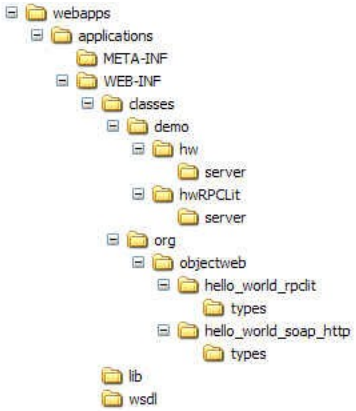
Relocating the Celtix JAR Files

Move the contents of the `webapps/helloworld/WEB-INF/lib` directory into the `shared/lib` directory. The Celtix JAR files will now be available to all Celtix applications deployed into this Tomcat instance. (REVISIT at v1.0 GA; approach to generating, and contents of, the .war file may change.)

Installing Multiple Web Services into a Common Directory Hierarchy

To avoid some confusion, you will first rename the **webapps/helloworld** directory to **webapps/applications**. Then you are going to copy the files from the hello_world_RPCLit example into the corresponding subdirectories under **webapps/applications**. Finally, you will edit the **celtix-servlet.xml** file, adding a second **<endpoint>** element that describes the hello_world_RPCLit service. When you restart Tomcat both endpoints will be accessed through a URL beginning with a common context: **http://hostname:port/applications/celtix/**.

1. Be certain that Tomcat is not running.
2. Rename the directory **webapps/helloworld** to **webapps/applications**. Expand each subdirectory.
3. Copy the directory **webapps/helloworldrpclit/WEB-INF/classes/demo/hwRPCLit** and paste it into the directory **webapps/applications/WEB-INF/classes/demo**. This step copies the directory containing the endpoint application, specifically the implementation class, from the hello_world_RPCLit example into the combined deployment.
4. Copy the directory **webapps/helloworldrpclit/WEB-INF/classes/demo/org/objectweb/hello_world_rpclit** and paste it into the directory **webapps/applications/WEB-INF/classes/demo/orb/objectweb**. This step copies the directory containing the types generated from the hello_world_RPCLit example's WSDL file into the combined deployment.



5. Copy the file **webapps/helloworldrpclit/WEB-INF/wsdl/hello_world_RPCLit.wsdl** and paste it into the directory **webapps/applications/WEB-INF/wsdl**.
6. In a text editor, open the file **webapps/helloworldrpclit/WEB-INF/celtix-servlet.xml** and copy the entire **<endpoint>** element. Paste this content into the file **webapps/applications/WEB-INF/celtix-servlet.xml** and save the file.

```
<?xml version="1.0" encoding="UTF-8"?>
<endpoints>

  <endpoint name="hello_world_rpclit"
            interface="org.objectweb.hello_world_rpclit.GreeterRPCLit"
            implementation="demo.hwRPCLit.server.GreeterRPCLitImpl"
            wsdl="WEB-INF/wsdl/hello_world_RPCLit.wsdl"
            service="{http://objectweb.org/hello_world_rpclit}SOAPServiceRPCLit"
            port="{http://objectweb.org/hello_world_rpclit}SOAPPortRPCLit"
            url-pattern="/hello_world_rpclit" />
```

```
  <endpoint name="hello_world"
            interface="org.objectweb.hello_world_soap_http.Greeter"
            implementation="demo.hw.server.GreeterImpl"
            wsdl="WEB-INF/wsdl/hello_world.wsdl"
            service="{http://objectweb.org/hello_world_soap_http}SOAPService"
            port="{http://objectweb.org/hello_world_soap_http}SOAPPort"
            url-pattern="/hello_world" />

</endpoints>
```

7. Delete the `helloworldrpclit` subdirectory and the two `.war` files from the `webapps` directory.
8. Restart Tomcat.
9. Access the hello_world_RPCLit Web service using the URL:

   ```
   http://hostname:port/applications/celtix/hello_world_rpclit
   ```

   From the `celtix/samples/hello_world_RPCLit` directory, run the client with the command:

   ```
   java -Djava.util.logging.config.file=%CELTIX_HOME%\etc\logging.properties
        demo.hwRPCLit.client.Client
        http://localhost:8080/applications/celtix/hello_world_rpclit
   ```

   Access the hello_world Web service using the URL:

   ```
   http://hostname:port/applications/celtix/hello_world
   ```

   From the `celtix/samples/hello_world` directory, run the client with the command:

   ```
   java -Djava.util.logging.config.file=%CELTIX_HOME%\etc\logging.properties
       demo.hw.client.Client http://localhost:8080/applications/celtix/hello_world
   ```

Installing Tomcat

Since Celtix requires the Java 2 Standard Edition, v5.0 or later, it is essential that you use a version of Tomcat that is compatible with this version of Java. Tomcat v5.5.x is the proper choice and may be downloaded from the Apache Software Foundation site at http://tomcat.apache.org/download-55.cgi.

For Windows, an executable installer is available. Alternatively Windows users can download a `.zip` file and UNIX/Linux users can download a `.tar.gz` file. If you download one of the archive files, you can simply extract the file to a convenient location. If you downloaded the Windows executable, double click on its icon to run the installation program. Windows users will generally find the executable installer more convenient to use as it eliminates a number of environment and batch files and sets up some management applications and Start menu items that you may find useful.

Once you have completed the installation, you must be certain that the environment is properly set before you try to launch Tomcat. If you installed Tomcat from one of the archives, then you must set two environment variables. Open a command window and issue the following commands:

```
set JAVA_HOME=C:\j2sdk5.0
set CATALINA_HOME=C:\apache-tomcat-[version]
```

If you installed Tomcat using the Windows installer, you only need to set one environment variable. Open a command window and issue the following commands:

```
set JAVA_HOME=C:\j2sdk5.0
```

Rather than setting these values explicitly in a command window, you may find it more convenient to set these variables through your global configuration.

Once the environment has been set, start Tomcat. If you installed Tomcat using one of the archives, run the script `startup.bat` or `startup.sh`. If you installed Tomcat using the Windows installer, start the executable program `Tomcat5.exe`. Both the scripts and the executable are in the `CATALINA_HOME/bin` directory.

By default, Tomcat is configured to use TCP/IP port 8080 to service requests. You can confirm that your Tomcat has been properly installed and configured by opening a Web browser and entering `http://localhost:8080` into the address text box. If everything is properly set, the browser will display a confirmatory page. If necessary, you can change any of the Tomcat TCP/IP ports used by editing the `server.xml` file, which is located in the `CATALINA_HOME/conf` directory.