Understanding Catalina in Tomcat 8.5

Catalina is the name of the servlet container within Tomcat. It's responsible for handling requests and responses and managing web applications. Catalina provides core functionality for the Tomcat server and is configured through various XML files located in the `conf` directory of your Tomcat installation.

Key Configuration Files in Catalina

1. **server.xml**: Configures the overall server, including connectors (HTTP, AJP) and engine.
2. **web.xml**: Default settings for all web applications.
3. **context.xml**: Configures context-specific settings for web applications.
4. **logging.properties**: Configures logging for Catalina and Tomcat.

Step-by-Step Configuration of Catalina in Tomcat 8.5

1. Configuring `server.xml`

The `server.xml` file is the main configuration file for Catalina and includes settings for connectors, services, and engines.

Example Configuration:

```
xml
Copy code
<Server port="8005" shutdown="SHUTDOWN">
  <Listener className="org.apache.catalina.startup.VersionLoggerListener"
/>
  <Listener className="org.apache.catalina.core.AprLifecycleListener"
SSLEngine="on" />
  <Listener
className="org.apache.catalina.core.JreMemoryLeakPreventionListener" />
  <Listener
className="org.apache.catalina.mbeans.GlobalResourcesLifecycleListener" />
  <Listener
className="org.apache.catalina.core.ThreadLocalLeakPreventionListener" />

  <GlobalNamingResources>
    <Resource name="UserDatabase" auth="Container"
              type="org.apache.catalina.UserDatabase"
              description="User database that can be updated and saved"
              factory="org.apache.catalina.users.MemoryUserDatabaseFactory"
              pathname="conf/tomcat-users.xml" />
  </GlobalNamingResources>

  <Service name="Catalina">
    <Connector port="8080" protocol="HTTP/1.1"
               connectionTimeout="20000"
               redirectPort="8443" />
    <Connector port="8009" protocol="AJP/1.3" redirectPort="8443" />

    <Engine name="Catalina" defaultHost="localhost">
      <Realm className="org.apache.catalina.realm.LockOutRealm">
        <Realm className="org.apache.catalina.realm.UserDatabaseRealm"
```

```
               resourceName="UserDatabase"/>
      </Realm>
      <Host name="localhost" appBase="webapps"
            unpackWARs="true" autoDeploy="true">
        <Valve className="org.apache.catalina.valves.AccessLogValve"
directory="logs"
               prefix="localhost_access_log" suffix=".txt"
               pattern="%h %l %u %t &quot;%r&quot; %s %b" />
      </Host>
    </Engine>
  </Service>
</Server>
```

Explanation:

- **Server**: Defines the server port for shutdown and lifecycle listeners.
- **GlobalNamingResources**: Configures global resources such as a user database.
- **Service**: Configures services within the server, including connectors and engines.
- **Connector**: Defines how the server accepts requests (e.g., HTTP, AJP).
- **Engine**: Manages request processing. It includes a `Realm` for security and a `Host` for deploying applications.

2. Configuring `web.xml`

The `web.xml` file sets default configurations for all web applications deployed on the server.

Example Configuration:

```
xml
Copy code
<web-app>
  <display-name>Tomcat Default Web Application</display-name>

  <servlet>
    <servlet-name>default</servlet-name>
    <servlet-class>org.apache.catalina.servlets.DefaultServlet</servlet-
class>
    <init-param>
      <param-name>debug</param-name>
      <param-value>0</param-value>
    </init-param>
    <load-on-startup>1</load-on-startup>
  </servlet>

  <servlet-mapping>
    <servlet-name>default</servlet-name>
    <url-pattern>/</url-pattern>
  </servlet-mapping>

  <error-page>
    <error-code>404</error-code>
    <location>/404.html</location>
  </error-page>
</web-app>
```

Explanation:

- **Servlet**: Configures the default servlet to handle static content.
- **Servlet-mapping**: Maps the default servlet to the root URL pattern.
- **Error-page**: Specifies a custom error page for HTTP 404 errors.

3. Configuring `context.xml`

The `context.xml` file sets context-specific configurations for web applications.

Example Configuration:

```
xml
Copy code
<Context path="/myapp" docBase="myapp" reloadable="true">
  <Resource name="jdbc/mydb" auth="Container" type="javax.sql.DataSource"
            maxTotal="100" maxIdle="30" maxWaitMillis="10000"
            username="dbuser" password="dbpassword"
driverClassName="com.mysql.jdbc.Driver"
            url="jdbc:mysql://localhost:3306/mydb"/>
</Context>
```

Explanation:

- **Context**: Defines a web application's context.
- **Resource**: Configures a JDBC data source for the web application.

4. Configuring `logging.properties`

The `logging.properties` file sets up logging for Catalina.

Example Configuration:

```
properties
Copy code
handlers = java.util.logging.ConsoleHandler
.org.apache.catalina.level = INFO
.org.apache.catalina.handlers = java.util.logging.ConsoleHandler

java.util.logging.ConsoleHandler.level = INFO
java.util.logging.ConsoleHandler.formatter =
java.util.logging.SimpleFormatter
```

Explanation:

- **handlers**: Defines the logging handlers (e.g., console handler).
- **log levels**: Sets the logging levels for Catalina and its components.
- **formatter**: Configures the logging format.

Example: Configuring and Running a Simple Web Application

1. **Deploying the Application**:
   - Place your web application (e.g., `myapp.war`) in the `webapps` directory of your Tomcat installation.
2. **Configuring the Context**:

  - Create a `META-INF/context.xml` file inside your web application with the following content:

    ```
    xml
    Copy code
    <Context>
      <Resource name="jdbc/mydb" auth="Container"
    type="javax.sql.DataSource"
                maxTotal="100" maxIdle="30" maxWaitMillis="10000"
                username="dbuser" password="dbpassword"
    driverClassName="com.mysql.jdbc.Driver"
                url="jdbc:mysql://localhost:3306/mydb"/>
    </Context>
    ```

3. **Starting Tomcat**:
   - Start Tomcat using the startup script:

     ```
     sh
     Copy code
     $CATALINA_HOME/bin/startup.sh
     ```

4. **Accessing the Application**:
   - Open a web browser and navigate to `http://localhost:8080/myapp`.

By following these steps and understanding the configuration files, you can effectively manage and deploy applications using Catalina in Tomcat 8.5.

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