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Session 10, EVENT LISTENERS

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Objectives

Introduction to Event Listeners

+ Understand the purpose of Event Listeners

+ Create, Declaring and Invoking Event Listeners

What is Event Listeners?

- Event Listeners is occurrence of something, in web application world an event can be initialization of application, destroying an application, request from client, creating/destroying a session, attribute modification in session etc.
- Text

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What it can be used for ?

Describe servlet event listeners

- Event Categories and Listener Interfaces
- Typical Event Listener Scenario
- Event Listener Declaration and Invocation
- Event Listener Coding and Deployment Guidelines
- Event Listener Methods and Related Classes

Event Categories and Listener Interfaces

- There are two levels of servlet events:

  - Servlet context-level (application-level) event

  This event involves resources or state held at the level of the application servlet context object.

  - Session-level event

  This event involves resources or state associated with the series of requests from a single user session; that is, associated with the HTTP session object.

Event Categories and Listener Interfaces

- Each of these two levels has two event categories:
  - Lifecycle changes
  - Attribute changes
- You can create one or more event listener classes for each of the four event categories. A single listener class can monitor multiple event categories.
- Create an event listener class by implementing the appropriate interface or interfaces of the javax.servlet package or javax.servlet.http package

Event Categories and Listener Interfaces

Event Category	Event Descriptions	Java Interface
Servlet context lifecycle changes	Servlet context creation, at which point the first request can be serviced Imminent shutdown of the servlet context	javax.servlet. ServletContextListener
Servlet context attribute changes	Addition of servlet context attributes Removal of servlet context attributes Replacement of servlet context attributes	javax.servlet. ServletContextAttributeListener
Session lifecycle changes	Session creation Session invalidation Session timeout	javax.servlet.http. HttpSessionListener
Session attribute changes	Addition of session attributes Removal of session attributes Replacement of session attributes	javax.servlet.http. HttpSessionAttributeListener

Table 1: Event Listener Categories and Interfaces1

Typical Event Listener Scenario

A typical use of the event listener mechanism would be to create a servlet context lifecycle event listener to manage the database connection. This listener may function as follows:

- The listener is notified of application startup.
- The application logs in to the database and stores the connection object in the servlet context.
- Servlets use the database connection to perform SQL operations.
- The listener is notified of imminent application shutdown (shutdown of the Web server or removal of the application from the Web server).
- Prior to application shutdown, the listener closes the database connection.

Event Listener Declaration and Invocation

- Event listeners are declared in the application web.xml deployment descriptor through <listener> elements under the top-level <web-app> element.
- Each listener has its own <listener> element, with a <listener-class> subelement specifying the class name.
- Within each event category, event listeners should be specified in the order in which you would like them to be invoked when the application runs.

Event Listener Declaration and Invocation

Here is an example of event listener declarations, from the Sun Microsystems *Java Servlet Specification, Version 2.3*:

```
<web-app>
   <display-name>MyListeningApplication</display-name>
   <listener>
      <listenerclass>com.acme.MyConnectionManager</listenerclass>
   </listener>
   <listener>
   <listener-class>com.acme.MyLoggingModule</listener-class>
   </listener>
   <servlet>
      <display-name>RegistrationServlet</display-name>
      ...
   </servlet>
</web-app>
```

Event Listener Coding and Deployment Guidelines

Be aware of the following rules and guidelines for event listener classes:

- In a multithreaded application, attribute changes may occur simultaneously. There is no requirement for the servlet container to synchronize the resulting notifications; the listener classes themselves are responsible for maintaining data integrity in such a situation.
- Each listener class must have a public zero-argument constructor.
- Each listener class file must be packaged in the application WAR file, either under /WEB-INF/classes or in a JAR file in /WEB-INF/lib.

Event Listener Methods and Related Classes

- This section contains event listener methods that are called by the servlet container when a servlet context event or session event occurs.
- These methods take different types of event objects as input

Event Listener Methods and Related Classes

- ServletContextListener Methods, ServletContextEvent Class

The ServletContextListener interface specifies the following methods:

- void contextInitialized(ServletContextEvent sce)

  The servlet container calls this method to notify the listener that the servlet context has been created and the application is ready to process requests.

- void contextDestroyed(ServletContextEvent sce)

  The servlet container calls this method to notify the listener that the application is about to be shut down.

Event Listener Methods and Related Classes

- ServletContextAttributeListener Methods,ServletContextAttributeEventClass

The ServletContextAttributeListener interface specifies the following methods:

- void attributeAdded(ServletContextAttributeEvent scae)

  The servlet container calls this method to notify the listener that an attribute was added to the servlet context.

- void attributeRemoved(ServletContextAttributeEvent scae)

  The servlet container calls this method to notify the listener that an attribute was removed from the servlet context.

- void attributeReplaced(ServletContextAttributeEvent scae)

  The servlet container calls this method to notify the listener that an attribute was replaced in the servlet context.

Event Listener Methods and Related Classes

- HttpSessionListener Methods, HttpSessionEvent Class

The HttpSessionListener interface specifies the following methods:

- void sessionCreated(HttpSessionEvent hse)

  The servlet container calls this method to notify the listener that a session was created.

- void sessionDestroyed(HttpSessionEvent hse)

  The servlet container calls this method to notify the listener that a session was destroyed.

Event Listener Methods and Related Classes

- HttpSessionAttributeListener Methods, HttpSessionBindingEvent Class

The HttpSessionAttributeListener interface specifies the following methods:

- void attributeAdded(HttpSessionBindingEvent hsbe)

The servlet container calls this method to notify the listener that an attribute was added to the session.

- void attributeRemoved(HttpSessionBindingEvent hsbe)

The servlet container calls this method to notify the listener that an attribute was removed from the session.

- void attributeReplaced(HttpSessionBindingEvent hsbe)

The servlet container calls this method to notify the listener that an attribute was replaced in the session.

Summary

1. **What is Event Listeners?**
2. **What it can be used for ?**
3. **Describe servlet event listeners**
   - Event Categories and Listener Interfaces
   - Typical Event Listener Scenario
   - Event Listener Declaration and Invocation
   - Event Listener Coding and Deployment Guidelines
   - Event Listener Methods and Related Classes