

Seam Faces Module

Reference Guide

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Introduction

The goal of Seam Faces is to provide a fully integrated CDI programming model to the JavaServer Faces (JSF) 2.0 web-framework. With features such as observing Events, providing injection support for life-cycle artifacts (FacesContext, NavigationHandler,) and more.

Installation

To use the Seam Faces module, you need to put the API and implementation JARs on the classpath of your web application. Most of the features of Seam Faces are enabled automatically when it's added to the classpath. Some extra configuration, covered below, is required if you are not using a Servlet 3-compliant container.

1.1. Maven dependency configuration

If you are using [Maven](http://maven.apache.org/) [http://maven.apache.org/] as your build tool, you can add the following single dependency to your pom.xml file to include Seam Faces:

```
<dependency>
  <groupId>org.jboss.seam.faces</groupId>
  <artifactId>seam-faces</artifactId>
  <version>${seam.faces.version}</version>
</dependency>
```



Tip

Substitute the expression `${seam.faces.version}` with the most recent or appropriate version of Seam Faces. Alternatively, you can create a [Maven user-defined property](#) to satisfy this substitution so you can centrally manage the version.

Alternatively, you can use the API at compile time and only include the implementation at runtime. This protects you from inadvertently depending on an implementation class.

```
<dependency>
  <groupId>org.jboss.seam.faces</groupId>
  <artifactId>seam-faces-api</artifactId>
  <version>${seam.faces.version}</version>
  <scope>compile</scope>
</dependency>

<dependency>
  <groupId>org.jboss.seam.faces</groupId>
  <artifactId>seam-faces-impl</artifactId>
  <version>${seam.faces.version}</version>
  <scope>runtime</scope>
```

```
</dependency>
```

In a Servlet 3.0 or Java EE 6 environment, *your configuration is now complete!*

1.2. Pre-Servlet 3.0 configuration

If you are using Java EE 5 or some other Servlet 2.5 container, then you need to manually register several Servlet components in your application's web.xml to activate the features provided by this module:

```
<listener>
  <listener-class>org.jboss.seam.faces.beanManager.BeanManagerServletContextListener</
listener-class>
</listener>
```

You're now ready to dive into the JSF enhancements provided for you by the Seam Faces module!

Faces Scoping Support

JSF 2.0 introduced the concept of the Flash object and the `@ViewScope`; however, JSF 2.0 did not provide annotations accessing the Flash, and CDI does not support the non-standard `ViewScope` by default. The Seam Faces module does both, in addition to adding a new `@RenderScoped` context. Beans stored in the Render Scope will survive until the next page is rendered. For the most part, beans stored in the `ViewScope` will survive as long as a user remains on the same page, and data in the JSF 2 Flash will survive as long as the flash survives).

2.1. `@RenderScoped`

Beans placed in the `@RenderScoped` context are effectively scoped to, and live through but not after, "the next Render Response phase".

You should think about using the Render scope if you want to store information that will be relevant to the user even after an action sends them to another view. For instance, when a user submits a form, you may want to invoke JSF navigation and redirect the user to another page in the site; if you needed to store a message to be displayed when the next page is rendered -but no longer- you would store that message in the `RenderContext`. Fortunately, Seam provides `RenderScoped` messages by default, via the [Seam Messages API](#).

To place a bean in the Render scope, use the `@javax.faces.bean.RenderScoped` annotation. This means that your bean will be stored in the `org.jboss.seam.context.RenderContext` object until the next page is rendered, at which point the `RenderScope` will be cleared.

```
@RenderScoped
public class Bean {
    // ...
}
```

`@RenderScoped` beans are destroyed when the next JSF `RENDER_RESPONSE` phase ends, however, if a user has multiple browser windows open for the same user-session, multiple `RenderContexts` will be created, one for each incoming request. Seam Faces keeps track of which `RenderContext` belongs to each request, and will restore/destroy them appropriately. If there is more than one active `RenderContext` at the time when you issue a redirect, you will see a URL parameter `"?fid=..."` appended to the end of the outbound URL, this is to ensure the correct context is restored when the request is received by the server, and will not be present if only one context is active.



Caution

If you want to use the Render Scope with custom navigation in your application, be sure to call `ExternalContext.encodeRedirectURL(String url, Map<String,`

`List<String>> queryParams)` on any URL before using it to issue a redirect. This will ensure that the `RenderContext` ID is properly appended to the URL, enabling the `RenderContext` to be restored on the subsequent request. This is only necessary if issuing a `Servlet Redirect`; for the cases where Faces non-redirecting navigation is used, no URL parameter is necessary, and the context will be destroyed at the end of the current request.

2.2. `@Inject javax.faces.context.Flash` flash

JSF 2 does not provide proper system events to create a functional `@FlashScoped` context annotation integrated with CDI, so until a workaround can be found, or JSF 2 is enhanced, you can access the Flash via the `@Inject` annotation. For more information on the *JSF Flash* [<https://javaserverfaces.dev.java.net/nonav/docs/2.0/javadocs/javax/faces/context/Flash.html>], read *this API doc* [<https://javaserverfaces.dev.java.net/nonav/docs/2.0/javadocs/javax/faces/context/Flash.html>].

```
public class Bean {  
    @Inject private Flash flash;  
    // ...  
}
```

2.3. `@ViewScoped`

To scope a bean to the View, use the `@javax.faces.bean.ViewScoped` annotation. This means that your bean will be stored in the `javax.faces.component.UIViewRoot` object associated with the view in which it was accessed. Each JSF view (faces-page) will store its own instance of the bean, just like each `HttpServletRequest` has its own instance of a `@RequestScoped` bean.

```
@ViewScoped  
public class Bean {  
    // ...  
}
```



Caution

`@ViewScoped` beans are destroyed when the JSF `UIViewRoot` object is destroyed. This means that the life-span of `@ViewScoped` beans is dependent on the `javax.faces.STATE_SAVING_METHOD` employed by the application itself, but in

general one can assume that the bean will live as long as the user remains on the same page.

Messages API

While JSF already has the concept of adding `FacesMessage` objects to the `FacesContext` in order for those messages to be displayed to the user when the view is rendered, Seam Faces takes this concept one step farther with the Messages API provided by the Seam International module. Messages are template-based, and can be added directly via the code, or templates can be loaded from resource bundles using a `BundleKey`.

3.1. Adding Messages

Consistent with the CDI programming model, the Messages API is provided via bean injection. To add a new message to be displayed to the user, inject `org.jboss.seam.international.display.Messages` and call one of the Message factory methods. As mentioned earlier, factory methods accept either a plain-text template, or a `BundleKey`, specifying the name of the resource bundle to use, and the name of the key to use as a message template.

```
@Named
public class Example
{
    @Inject
    Messages messages;

    public String action()
    {
        messages.info("This is an {0} message, and will be displayed to {1}.", "INFO", "the user");
        return null;
    }
}
```

Adds the message: "This is an INFO message, and will be displayed to the user."

Notice how `{0}`, `{1}` ... `{N}` are replaced with the given parameters, and may be used more than once in a given template. In the case where a `BundleKey` is used to look up a message template, default text may be provided in case the resource cannot be loaded; default text uses the same parameters supplied for the bundle template. If no default text is supplied, a `String` representation of the `BundleKey` and its parameters will be displayed instead.

```
public String action()
{
```

```
messages.warn(new BundleKey("org.jboss.seam.faces.exampleBundle", "messageKey"),
"unique");
return null;
}
```

classpath:/org/jboss/seam/faces/exampleBundle.properties

messageKey=This {0} parameter is not so {0}, see?

Adds the message: "This unique parameter is not so unique, see?"

3.2. Displaying pending messages

It's great when messages are added to the internal buffer, but it doesn't do much good unless the user actually sees them. In order to display messages, simply use the `<h:messages />` tag from JSF. Any pending messages will be displayed on the page just like normal `FacesMessages`.

```
<html xmlns="http://www.w3.org/1999/xhtml"
xmlns:f="http://java.sun.com/jsf/core"
xmlns:h="http://java.sun.com/jsf/html"
xmlns:s="http://jboss.org/seam/faces"
xmlns:ui="http://java.sun.com/jsf/facelets">

<h1>Welcome to Seam Faces!</h1>
<p>All Messages and FacesMessages will be displayed below:</p>

<h:messages />

</html>
```

Messages added to the internal buffer via the Messages API are stored in a central location during each request, and may be displayed by any view-technology that supports the Messages API. Seam Faces provides an integration that makes all of this automatic for you as a developer, and in addition, messages will automatically survive JSF navigation and redirects, as long as the redirect URL was encoded using `ExternalContext.encodeRedirectURL(...)`. If you are using JSF-compliant navigation, all of this is handled for you.

Seam Faces Components

While Seam Faces does not provide layout components or other UI-design related features, it does provide functional components designed to make developing JSF applications easier, more functional, more scalable, and more practical.

For layout and design components, take a look at [RichFaces](http://jboss.org/richfaces) [http://jboss.org/richfaces], a UI component library specifically tailored for easy, rich web-interfaces.

4.1. Introduction

In order to use the Seam Faces components, you must first add the namespace to your view file, just like the standard JSF component libraries.

```
<html xmlns="http://www.w3.org/1999/xhtml"
      xmlns:f="http://java.sun.com/jsf/core"
      xmlns:h="http://java.sun.com/jsf/html"
      xmlns:s="http://jboss.org/seam/faces"
      xmlns:ui="http://java.sun.com/jsf/facelets">

  <h1>Welcome to Seam Faces!</h1>
  <p>
    This view imports the Seam Faces component library.
    Read on to discover what components it provides.
  </p>

</html>
```



Tip

All Seam Faces components use the following namespace: `http://jboss.org/seam/faces`

4.2. <s:validateForm>

On many occasions you might find yourself needing to compare the values of multiple input fields on a given page submit: confirming a password; re-enter password; address lookups; and so on. Performing cross-field form validation is simple - just place the `<s:validateForm>` component in the form you wish to validate, then attach your custom Validator.

```
<h:form id="locationForm">
```

```
<h:inputText id="city" value="#{bean.city}" />
<h:inputText id="state" value="#{bean.state}" />
<h:inputText id="zip" value="#{bean.zip}" />
<h:commandButton id="submit" value="Submit" action="#{bean.submitPost}" />

<s:validateForm validatorId="locationValidator" />
</h:form>
```

The corresponding Validator for the example above would look something like this:

```
@FacesValidator("locationValidator")
public class LocationValidator implements Validator
{
    @Inject
    Directory directory;

    @Inject
    @InputField
    private Object city;

    @Inject
    @InputField
    private Object state;

    @Inject
    @InputField
    private ZipCode zip;

    @Override
    public void validate(final FacesContext context, final UIComponent comp, final Object values)
        throws ValidatorException
    {
        if(!directory.exists(city, state, zip))
        {
            throw new ValidatorException(
                new FacesMessage("Sorry, that location is not in our database. Please try again."));
        }
    }
}
```




Tip

You may inject the correct type directly.

```
@Inject
@InputField
private ZipCode zip;
```

Notice that the IDs of the `inputText` components match the IDs of your Validator `@InputFields`; each `@Inject @InputField` member will be injected with the value of the form input field who's ID matches the name of the variable.

In other words - the name of the `@InputField` annotated member variable will automatically be matched to the ID of the input component, unless overridden by using a field ID alias (see below.)

```
<h:form id="locationForm">
  <h:inputText id="cityId" value="#{bean.city}" />
  <h:inputText id="stateId" value="#{bean.state}" />
  <h:inputText id="zip" value="#{bean.zip}" />
  <h:commandButton id="submit" value="Submit" action="#{bean.submitPost}" />

  <s:validateForm fields="city=cityId state=stateId" validatorId="locationValidator" />
</h:form>
```

Notice that "zip" will still be referenced normally; you need only specify aliases for fields that differ in name from the Validator `@InputFields`.



Tip

Using `@InputField("customID")` with an ID override can also be used to specify a custom ID, instead of using the default: the name of the field. This gives you the ability to change the name of the private field, without worrying about changing the name of input fields in the View itself.

```
@Inject
@InputField("state")
private String sectorTwo;
```

4.3. <s:viewAction>

The view action component (`UIViewAction`) is an `ActionSource2 UIComponent` that specifies an application-specific command (or action), using using an EL method expression, to be invoked during one of the JSF lifecycle phases proceeding Render Response (i.e., view rendering).

View actions provide a lightweight front-controller for JSF, allowing the application to accommodate scenarios such as registration confirmation links, security and sanity checking a request (e.g., ensuring the resource can be loaded). They also allow JSF to work alongside action-oriented frameworks, and existing applications that use them.

4.3.1. Motivation

JSF employs an event-oriented architecture. Listeners are invoked in response to user-interface events, such as the user clicking on a button or changing the value of a form input. Unfortunately, the most important event on the web, a URL request (initiated by the user clicking on a link, entering a URL into the browser's location bar or selecting a bookmark), has long been overlooked in JSF. Historically, listeners have exclusively been activated on postback, which has led to the common complaint that in JSF, "everything is a POST."

We want to change that perception.

Processing a URL request event is commonly referred to as bookmarkable or GET support. Some GET support was added to JSF 2.0 with the introduction of view parameters and the pre-render view event. View parameters are used to bind query string parameters to model properties. The pre-render view event gives the developer a window to invoke a listener immediately prior to the view being rendered.

That's a start.

Seam brings the GET support full circle by introducing the view action component. A view action is the compliment of a `UICommand` for an initial (non-faces) request. Like its cohort, it gets executed by default during the Invoke Application phase (now used on both faces and non-faces requests). A view action can optionally be invoked on postback as well.

View actions (`UIViewAction`) are closely tied to view parameters (`UIViewParameter`). Most of the time, the view parameter is used to populate the model with data that is consumed by the method being invoked by a `UIViewAction` component, much like form inputs populate the model with data to support the method being invoked by a `UICommand` component.

4.3.2. Usage

Let's consider a typical scenario in web applications. You want to display the contents of a blog entry that matches the identifier specified in the URL. We'll assume the URL is:

```
http://localhost:8080/blog/entry.jsf?id=10
```

We'll use a view parameter to capture the identifier of the entry from the query string and a view action to fetch the entry from the database.

```
<f:metadata>
  <f:viewParam name="id" value="#{blogManager.entryId}"/>
  <s:viewAction action="#{blogManager.loadEntry}"/>
</f:metadata>
```



Tip

The view action component must be declared as a child of the view metadata facet (i.e., `<f:metadata>`) so that it gets incorporated into the JSF lifecycle on both non-faces (initial) requests and faces (postback) requests. If you put it anywhere else in the page, the behavior is undefined.



Warning

In JSF 2.0, there must be at least one view parameter for the view metadata facet to be processed. This requirement was introduced into the JSF specification accidentally, but it's not so unfortunate since view parameters are typically needed to capture input needed by the view action.

What do we do if the entry can't be found? View actions support declarative navigation just like `UICommand` components. So you can write a navigation rule that will be consulted before the page is rendered. If the rule matches, navigation occurs just as though this were a postback.

```
<navigation-rule>
  <from-view-id>/entry.xhtml</from-view-id>
  <navigation-case>
    <from-action>#{blogManager.loadEntry}</from-action>
    <if>#{empty entry}</if>
    <to-view-id>/home.xhtml</to-view-id>
    <redirect/>
  </navigation-case>
</navigation-rule>
```

After each view action is invoked, the navigation handler looks for a navigation case that matches the action's EL method signature and outcome. If a navigation case is matched, or the response

is marked complete by the action, subsequent view actions are short-circuited. The lifecycle then advances appropriately.

By default, a view action is not executed on postback, since the primary intention of a view action is to support a non-faces request. If your application (or use case) is decidedly stateless, you may need the view action to execute on any type of request. You can enable the view action on postback using the `onPostback` attribute:

```
<s:viewAction action="#{blogManager.loadEntry}" onPostback="true"/>
```

You may only want the view action to be invoked under certain conditions. For instance, you may only need it to be invoked if the conversation is transient. For that, you can use the `if` attribute, which accepts an EL value expression:

```
<s:viewAction action="#{blogEditor.loadEntry}" if="#{conversation.transient}"/>
```

There are two ways to control the phase in which the view action is invoked. You can set the `immediate` attribute to `true`, which moves the invocation to the Apply Request Values phase instead of the default, the Invoke Application phase.

```
<s:viewAction action="#{sessionManager.validateSession}" immediate="true"/>
```

You can also just specify the phase directly, using the name of the phase constant in the `PhaseId` class (the case does not matter).

```
<s:viewAction action="#{sessionManager.validateSession}" phase="APPLY_REQUEST_VALUES"/>
```



Tip

The valid phases for a view action are:

- `APPLY_REQUEST_VALUES` (default if `immediate="true"`)
- `UPDATE_MODEL_VALUES`
- `PROCESS_VALIDATIONS`
- `INVOKE_APPLICATION` (default)

If the phase is set, it takes precedence over the immediate flag.

4.3.3. View actions vs the PreRenderViewEvent

The purpose of the view action is similar to use of the PreRenderViewEvent. In fact, the code to load a blog entry before the page is rendered could be written as:

```
<f:metadata>
  <f:viewParam name="id" value="#{blogManager.entryId}"/>
  <f:event type="preRenderView" listener="#{blogManager.loadEntry}"/>
</f:metadata>
```

However, the view action has several important advantages:

- It's lightweight
- It's timing can be controlled
- It's contextual
- It can trigger navigation

View actions are lightweight because they get processed on a non-faces (initial) request *before* the full component tree is built. When the view actions are invoked, the component tree only contains view metadata.

As demonstrated above, you can specify a prerequisite condition for invoking the view action, control whether it's invoked on postback, specify the phase in which it's invoked and tie the invocation into the declarative navigation system. The PreRenderViewEvent is quite basic in comparison.

4.4. UI Input Container

UIInputContainer is a supplemental component for a JSF 2.0 composite component encapsulating one or more input components (EditableValueHolder), their corresponding message components (UIMessage) and a label (HtmlOutputLabel).

This component takes care of wiring the label to the first input and the messages to each input in sequence. It also assigns two implicit attribute values, "required" and "invalid" to indicate that a required input field is present and whether there are any validation errors, respectively. To determine if a input field is required, both the required attribute is consulted and whether the property has Bean Validation constraints.

Finally, if the "label" attribute is not provided on the composite component, the label value will be derived from the id of the composite component, for convenience.

Composite component definition example (minus layout):

```
<cc:interface componentType="org.jboss.seam.faces.InputContainer"/>
<cc:implementation>
  <h:outputLabel id="label" value="#{cc.attrs.label}:" styleClass="#{cc.attrs.invalid ? 'invalid' :
  ''}">
    <h:outputText styleClass="required" rendered="#{cc.attrs.required}" value="*"/>
  </h:outputLabel>
  <cc:insertChildren/>
  <h:message id="message" errorClass="invalid message" rendered="#{cc.attrs.invalid}"/>
</cc:implementation>
```

Composite component usage example:

```
<example:inputContainer id="name">
  <h:inputText id="input" value="#{person.name}"/>
</example:inputContainer>
```



Tip

NOTE: Firefox does not properly associate a label with the target input if the input id contains a colon (:), the default separator character in JSF. JSF 2 allows developers to set the value via an initialization parameter (context-param in web.xml) keyed to `javax.faces.SEPARATOR_CHAR`. We recommend that you override this setting to make the separator an underscore (_).

Faces Artifact Injection

One of the goals of the Seam Faces Module is to make support for CDI a more ubiquitous experience, by allowing injection of JSF Lifecycle Artifacts into managed beans, and also by providing support for `@Inject` where it would not normally be available. This section describes the additional CDI integration for faces artifact injection

5.1. `@*Scoped` and `@Inject` in Validators and Converters

Frequently when performing complex validation, it is necessary to access data stored in a database or in other contextual objects within the application itself. JSF does not, by default, provide support for `@Inject` in Converters and Validators, but Seam Faces makes this available. In addition to injection, it is sometimes convenient to be able to scope a validator just as we would scope a managed bean; this feature is also added by Seam Faces.

Notice how the Validator below is actually `@RequestScoped`, in addition to using injection to obtain an instance of the `UserService` with which to perform an email database lookup.

```
@RequestScoped
@FacesValidator("emailAvailabilityValidator")
public class EmailAvailabilityValidator implements Validator
{
    @Inject
    UserService us;

    @Override
    public void validate(final FacesContext context, final UIComponent component, final Object value)
        throws ValidatorException
    {
        String field = value.toString();
        try
        {
            us.getUserByEmail(field);
            FacesMessage msg = new FacesMessage("That email address is unavailable");
            throw new ValidatorException(msg);
        }
        catch (NoSuchObjectException e)
        {
        }
    }
}
```



Warning

We recommend to always use `@RequestScoped` converters/validators unless a longer scope is required, in which case you should use the appropriate scope annotation, but it should not be omitted.

Because of the way JSF persists Validators between requests, particularly when using `@Inject` inside a validator or converter, forgetting to use a `@*Scoped` annotation could in fact cause `@Inject`'ed objects to become null.

An example Converter using `@Inject`

```
@SessionScoped
@FacesConverter("authorConverter")
public class UserConverter implements Converter
{
    @Inject
    private UserService service;

    @PostConstruct
    public void setup()
    {
        System.out.println("UserConverter started up");
    }

    @PreDestroy
    public void shutdown()
    {
        System.out.println("UserConverter shutting down");
    }

    @Override
    public Object getAsObject(final FacesContext arg0, final UIComponent arg1, final String userName)
    {
        // ...
        return service.getUserByName(userName);
    }

    @Override
    public String getAsString(final FacesContext context, final UIComponent comp, final Object user)
    {
        // ...
        return ((User)user).getUsername();
    }
}
```



```

    }
}

```

5.2. @Inject'able Faces Artifacts

This is the list of inject-able artifacts provided through Seam Faces. These objects would normally require static method-calls in order to obtain handles, but Seam Faces attempts to break that coupling by providing @Inject'able artifacts. This means it will be possible to more easily provide mocked objects during unit and integration testing, and also simplify bean code in the application itself.

Artifact Class	Example
javax.faces.context.FacesContext	<pre> public class Bean { @Inject FacesContext context; } </pre>
javax.faces.context.ExternalContext	<pre> public class Bean { @Inject ExternalContext context; } </pre>
javax.faces.application.NavigationHandler	<pre> public class Bean { @Inject NavigationHandler handler; } </pre>
javax.faces.context.Flash	<pre> public class Bean { @Inject Flash flash; } </pre>

Faces Events Propagation

When the seam-faces module is installed in a web application, JSF events will automatically be propagated via the CDI event-bridge, enabling managed beans to easily observe all Faces events.

There are two categories of events: JSF phase events, and JSF system events. Phase events are triggered as JSF processes each lifecycle phase, while system events are raised at more specific, fine-grained events during request processing.

6.1. JSF Phase events

A JSF phase listener is a class that implements `javax.faces.event.PhaseListener` and is registered in the web application's `faces-config.xml` file. By implementing the methods of the interfaces, the user can observe events fired before or after any of the six lifecycle phases of a JSF request: `restore view`, `apply request values`, `process validations`, `update model values`, `invoke application` or `render view`.

6.1.1. Seam Faces Phase events

What Seam provides is propagation of these Phase events to the CDI event bus; therefore, you can observe events using normal CDI `@Observes` methods. Bringing the events to CDI beans removes the need to register phase listener classes via XML, and gives the added benefit of injection, alternatives, interceptors and access to all other features of CDI.

Creating an observer method in CDI is simple; just provide a method in a managed bean that is annotated with `@Observes`. Each observer method must accept one method parameter: the event object; the type of this object determines the type of event being observed.

In this case, the event object passed along from the phase listener is a `javax.faces.event.PhaseEvent`. The following example observes all Phase events.

```
public void observeAll(@Observes PhaseEvent e)
{
    // Do something with the event object
}
```

Events can be further filtered by adding Qualifiers. The name of the method itself is not significant. (See the CDI Reference Guide for more information on events and observing.)

Since the example above simply processes all events, however, it might be appropriate to filter out some events that we aren't interested in. As stated earlier, there are six phases in the JSF lifecycle, and an event is fired before and after each, for a total of 12 events. The `@Before` and `@After` "temporal" qualifiers can be used to observe events occurring only before or only after a Phase event. For example:

```
public void observeBefore(@Observes @Before PhaseEvent e)
{
    // Do something with the "before" event object
}

public void observeAfter(@Observes @After PhaseEvent e)
{
    // Do something with the "after" event object
}
```

If we are interested in both the "before" and "after" event of a particular phase, we can limit them by adding a "lifecycle" qualifier that corresponds to the phase:

```
public void observeRenderResponse(@Observes @RenderResponse PhaseEvent e)
{
    // Do something with the "render response" event object
}
```

By combining a temporal and lifecycle qualifier, we can achieve the most specific qualification:

```
public void observeBeforeRenderResponse(@Observes @Before @RenderResponse PhaseEvent e)
{
    // Do something with the "before render response" event object
}
```

6.1.2. Phase events listing

This is the full list of temporal and lifecycle qualifiers

Qualifier	Type	Description
@Before	temporal	Qualifies events before lifecycle phases
@After	temporal	Qualifies events after lifecycle phases
@RestoreView	lifecycle	Qualifies events from the "restore view" phase
@ApplyRequestValues	lifecycle	Qualifies events from the "apply request values" phase
@ProcessValidations	lifecycle	Qualifies events from the "process validations" phase
@UpdateModelValues	lifecycle	Qualifies events from the "update model values" phase

Qualifier	Type	Description
@InvokeApplicationLifecycle	lifecycle	Qualifies events from the "invoke application" phase
@RenderResponseLifecycle	lifecycle	Qualifies events from the "render response" phase

The event object is always a `javax.faces.event.PhaseEvent` and according to the general CDI principle, filtering is tightened by adding qualifiers and loosened by omitting them.

6.2. JSF system events

Similar to JSF Phase Events, System Events take place when specific events occur within the JSF life-cycle. Seam Faces provides a bridge for all JSF System Events, and propagates these events to CDI.

6.2.1. Seam Faces System events

This is an example of observing a Faces system event:

```
public void observesThisEvent(@Observes ExceptionQueuedEvent e)
{
    // Do something with the event object
}
```

6.2.2. System events listing

Since all JSF system event objects are distinct, no qualifiers are needed to observe them. The following events may be observed:

Event object	Context	Description
SystemEvent	all	All events
ComponentSystemEvent	component	All component events
PostAddToViewEvent	component	After a component was added to the view
PostConstructViewMapEvent	component	After a view map was created
PostRestoreStateEvent	component	After a component has its state restored
PostValidateEvent	component	After a component has been validated
PreDestroyViewMapEvent	component	Before a view map has been restored
PreRemoveFromViewEvent	component	Before a component has been removed from the view
PreRenderComponentEvent	component	After a component has been rendered
PreRenderViewEvent	component	Before a view has been rendered

Event object	Context	Description
PreValidateEvent	component	Before a component has been validated
ExceptionQueuedEvent	system	When an exception has been queued
PostConstructApplicationEvent	system	After the application has been constructed
PostConstructCustomScopeEvent	system	After a custom scope has been constructed
PreDestroyApplicationEvent	system	Before the application is destroyed
PreDestroyCustomScopeEvent	system	Before a custom scope is destroyed

6.2.3. Component system events

There is one qualifier, `@Component` that can be used with component events by specifying the component ID. Note that view-centric component events `PreRenderViewEvent`, `PostConstructViewMapEvent` and `PreDestroyViewMapEvent` do not fire with the `@Component` qualifier.

```
public void observePrePasswordValidation(@Observes @Component("form:password") PreValidateEvent e)
{
    // Do something with the "before password is validated" event object
}
```

Global system events are observer without the component qualifier

```
public void observeApplicationConstructed(@Observes PostConstructApplicationEvent e)
{
    // Do something with the "after application is constructed" event object
}
```

The name of the observing method is not relevant; observers are defined solely via annotations.