Oracle® Complex Event Processing

Visualizer Help

Release 10*g*R3 (10.3)

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Oracle Complex Event Processing Visualizer Help, Release 10*g*R3 (10.3)

Contents

CHAPTER 1

Introduction and Roadmap

This section describes the contents and organization of this guide—*Oracle Complex Event Processing Visualizer Help*.

Document Scope and Audience

This document is a resource for software developers who develop event driven real-time applications. It also contains information that is useful for business analysts and system architects who are evaluating Oracle Complex Event Processing (or *Oracle CEP* for short) or considering the use of Oracle CEP for a particular application.

The topics in this document are relevant during the design, development, configuration, deployment, and performance tuning phases of event driven applications. The document also includes topics that are useful in solving application problems that are discovered during test and pre-production phases of a project.

It is assumed that the reader is familiar with the Java programming language and Spring.

Oracle CEP Documentation Set

This document is part of a larger Oracle CEP documentation set that covers a comprehensive list of topics. The full documentation set includes the following documents:

- *Oracle CEP Getting Started*
- *Oracle CEP Application Development Guide*
- *Oracle CEP Administration and Configuration Guide*
- *Oracle CEP EPL Reference Guide*
- *Oracle CEP Reference Guide*
- *Oracle CEP Release Notes*
- *Oracle CEP Visualizer Help*
- *Oracle CEP Type 4 JDBC Drivers*

See the main Oracle CEP documentation page for further details.

Guide to This Document

This document is organized as follows:

- This chapter, Chapter 1, "Introduction and Roadmap," introduces the organization of this guide.
- Chapter 2, "Overview of Visualizer," provides an overview of Visualizer, how to start it, and what you can do with it.
- Chapter 3, "Typical Application Tasks," provides procedures on performing the typical application-related task using Visualizer.
- Chapter 4, "Typical Server and Domain Tasks," provides procedures on performing the typical domain- or server-related tasks using Visualizer.
- Chapter 5, "Typical Security Tasks," provides procedures on performing typical security-related tasks using Visualizer.

Samples for the Oracle CEP Application Developer

In addition to this document, Oracle provides a variety of code samples for Oracle CEP application developers. The examples illustrate Oracle CEP in action, and provide practical instructions on how to perform key development tasks.

Oracle recommends that you run some or all of the examples before programming and configuring your own event driven application.

Note: When you initially install Oracle CEP, you must chose the `Custom` option to also install the examples. The `Typical` option does *not* include the examples.

If you previously installed Oracle CEP using the `Typical` option, and you now want to also install the examples, re-run the Oracle CEP installation process and specify the same Oracle CEP home directory; a later step in the installation process allows you to then install just the examples.

The examples are distributed in two ways:

- Pre-packaged and compiled in their own domain so you can immediately run them after you install the product.
- Separately in a Java source directory so you can see a typical development environment setup.

The following four examples are provided in both their own domain and as Java source in this release of Oracle CEP:

- HelloWorld—Example that shows the basic elements of an Oracle CEP application. See Hello World Example for additional information.

  The HelloWorld domain is located in *`ORACLE_CEP_HOME`*`\ocep_10.3\samples\domains\helloworld_domain`, where *`ORACLE_CEP_HOME`* refers to the Oracle CEP installation directory, such as `c:\oracle_cep`.

  The HelloWorld Java source code and configuration files are located in *`ORACLE_CEP_HOME`*`\ocep_10.3\samples\source\applications\helloworld`.

- ForeignExchange (FX)—Example that includes multiple adapters, streams, and complex event processor with a variety of EPL rules, all packaged in the same Oracle CEP application. See Foreign Exchange (FX) Example for additional information.

  The ForeignExchange domain is located in *`ORACLE_CEP_HOME`*`\ocep_10.3\samples\domains\fx_domain`, where

ORACLE_CEP_HOME refers to the Oracle CEP installation directory, such as `c:\oracle_cep`.

The ForeignExchange Java source code and configuration files are located in *ORACLE_CEP_HOME*`\ocep_10.3\samples\source\applications\fx`.

- Signal Generation—Example that receives simulated market data and verifies if the price of a security has fluctuated more than two percent, and then detects if there is a *trend* occurring by keeping track of successive stock prices for a particular symbol.See Signal Generation Example for additional information.

  The Signal Generation domain is located in *ORACLE_CEP_HOME*`\ocep_10.3\samples\domains\signalgeneration_domain`, where *ORACLE_CEP_HOME* refers to the Oracle CEP installation directory, such as `c:\oracle_cep`.

  The Signal Generation Java source code and configuration files are located in *ORACLE_CEP_HOME*`\ocep_10.3\samples\source\applications\signalgeneration`.

- Record and Playback—Example that shows how to configure the recording and playback of events to a persistent event store, as well as how to use the built-in HTTP pub-sub adapter to publish messages to a channel. See Event Record and Playback Example for additional information.

  The Record and Playback domain is located in *ORACLE_CEP_HOME*`\ocep_10.3\samples\domains\recplay_domain`, where *ORACLE_CEP_HOME* refers to the Oracle CEP installation directory, such as `c:\oracle_cep`.

  The Record and Playback Java source code and configuration files are located in *ORACLE_CEP_HOME*`\ocep_10.3\samples\source\applications\recplay`.

CHAPTER 2

Overview of Visualizer

This section contains information on the following subjects:

Overview of Visualizer

Oracle Complex Event Processing Visualizer, henceforth called *Visualizer* for simplicity, is a Web 2.0 application that consumes data from Oracle Complex Event Processing (or *Oracle CEP* for short), displays it in a useful and intuitive way to system administrators and operators, and, for specificied tasks, accepts data that is then passed back to Oracle CEP so as to change it configuration.

In particular, you can use the tool to perform the following tasks:

- View the structure of an Oracle CEP domain
- Manage security
- Configure Oracle CEP server instances
- Install, uninstall, suspend and resume applications
- View the EPN associated with an application

- Tune application parameters and monitor application status

Who Uses Visualizer?

Administrators who use Visualizer to connect to an Oracle CEP instance use role-based authorization to gain access. Users that successfully authenticate themselves when using Visualizer are assigned roles based on their group membership, and then subsequent access to administrative functions is restricted according to the roles held by the user. Anonymous users (non-authenticated users) will not have any access to Visualizer.

When an administrator uses the Configuration Wizard to create a new domain, they enter an administrator user that will be part of the `wlevsAdministrators` group. By default, this information is stored in a file-based provider filestore. The password is hashed using the SHA-256 algorithm. Once the domain has been created, the administrator can create new groups using Visualizer, assign roles to them, and then create new users and assign them to groups.

The following table describes the default Oracle CEP security roles available right after the creation of a new domain, as well as the name of the groups that are assigned to these roles.

Table 2-1 Available Oracle CEP Roles and Groups

Role	Description	Associated Group Name
Operator	Has read-only access to all server resources, services, and deployed applications.	`wlevsOperators`
Monitor	Has all Operator privileges as well as permission to enable/disable diagnostic functions, such as creating a diagnostic profile and recording events (then playing them back.)	`wlevsMonitors`
ApplicationAdmin	Has all Operator privileges as well as permission to update the configuration of any deployed application.	`wlevsApplicationAdmins`
Deployer	Has all Operator privileges as well as permission to deploy, undeploy, update, suspend, and resume any deployed application.	`wlevsDeployers`

Table 2-1 Available Oracle CEP Roles and Groups

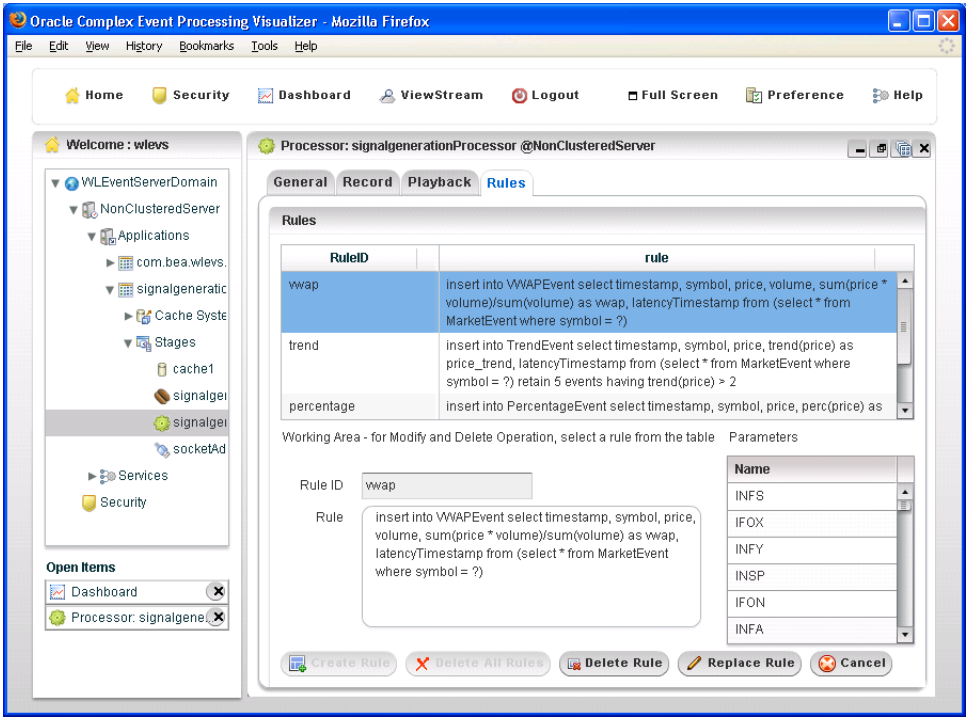
Role	Description	Associated Group Name
BusinessUser	Has all Operator privileges as well as permission to update the EPL rules associated with the processor of a deployed application.	`wlevsBusinessUsers`
Admin	Has all privileges of all the preceding roles, as well as permission to: • Create users and groups • Configure HTTP publish-subscribe security • Change the system configuration, such as Jetty, workmanager, and so on.	`wlevsAdministrators`

WARNING: The security features of Visualizer work only if you have security enabled for Oracle CEP. This means, for example, that if you specify the `-disablesecurity` flag in the server startup scripts, then Visualizer does not display the preceding list of users, groups, and roles and you cannot create new users, and so on. In this case, there is also no login page when first entering Visualizer.

Navigational Overview of Visualizer

Visualizer has three main panes, as shown in the following graphic:

Figure 2-1 Sample Visualizer Window



- **Top Pane**: Includes the most used buttons, such as a Home link that takes you to the main Visualizer page and the Security link that takes you to the security page in which you can add or configure users and groups and map users to roles. The Dashboard link takes you to the performance management screen that you use to monitor the throughput and latency of a running application and its stages; see "Overview of the Visualizer Dashboard" on page 2-5 for more information. The ViewStream link takes you to a screen from which you can monitor the messages streaming through the configured HTTP publish-subscribe channels.

  The Full Screen button fills your entire computer screen with the Visualizer tool; press the Esc key to return to a normal screen. The Preferences button takes you to a page where you can set user preferences, such as the language and maximum number of open panes. The Help button takes you to the task-oriented online-help posted on the Oracle Technology Network Web site.

- **Left Pane**: Displays a domain tree for the domain called WLEventServerDomain that includes all the objects contained in the domain, such as the Oracle CEP server instances, the deployed applications and services within each server instance, and domain-level security configuration.

  The Open Items box in the lower right half of the right pane lists the items that are currently open, making it easy to return to or close the windows after you have navigated away from them.

- **Right Pane**: Displays information about objects that you have clicked on in the left pane. The format of the information depends on the object; for example, if you click on a deployed application in the domain tree in the left pane, the right pane shows general information about the application (General tab) as well as variuos visual representations of the event processing network of the application (Event Processing Network tab). If you click on a particular stage of the network, such as a stream or processor, the right pane shows general information about it as well as stage-specific information, such as the rules for a processor.

  Each right pane panel includes buttons in the top right corner for minimizing or maximizing the panel, closing the panel, or closing all panels.

Figure 2-1 shows a domain that contains a single server instance called `NonClusteredServer`. The server contains two deployed applications: `com.bea.wlevs.dataservices` and `signalgeneration`; the `signalgeneration` application is currently opened. The right pane contains the configuration of the rules of the `algoTradingProcessor` stage; in particular, `algoTradingProcessor` has been configured with three rules called `vwap`, `trend`, and `percentage`.

The application called `com.bea.wlevs.dataservices` is associated with Visualizer itself and is always deployed in an Oracle CEP server instance. "The com.bea.wlevs.dataservices Application" on page 2-6 for details.

Overview of the Visualizer Dashboard

The Visualizer dashboard is a performance management screen that you use to monitor the throughput and latency of a running application and its stages or a path between two stages. You get to the dashboard by clicking the Dashboard link in the top pane.

The dashboard has three main sections:

- The Management Events section at the top of the dashboard displays alerts about the incoming monitoring events. The Visualizer monitoring feature defines a set of default

EPL rules that specify when these alerts show up in the Management Events table; you can change the EPL rules to customize this behavior.

- The latency and throughput graphs display the amount of time it takes an event to pass through the specified stage or path in the EPN or the number of events passing through, respectively. The stage or path is defined in the diagnostic profile.
- The table at the bottom lists the available diagnostic profiles; when you click on a particular profile, the corresponding latency and throughput information is displayed in the graphs.

See "Monitoring the Throughput and Latency of a Stage or Path in the EPN" on page 3-2 for detailed instructions on how to use this monitoring feature.

The com.bea.wlevs.dataservices Application

The `com.bea.wlevs.dataservices` application, called dataservices for short, is internal to Visualizer and is automatically deployed every time you start an Oracle CEP server instance. You are not allowed to uninstall the dataservices application.

The purpose of this application is to provide a filter for diagnostic monitoring metrics. The application is itself an Oracle CEP application made up of adapters, streams, and a processor. The processer includes the following default EPL rule used to filter the metrics; this rule determines which event show up in the Diagnostics Dashboard. The rule is as follows:

```
SELECT * FROM DSMonitorEvent RETAIN 1 EVENT WHERE metric > 10000
```

You can change this rule if you want to customize the filtering of events. See "Changing the EPL Monitoring Filtering Rules" on page 3-4 for details.

Overview of the Viewstream Panel

The main purpose of the Viewstream panel is to test channels of the HTTP publish-subscribe server and view the stream of data being published to the channel.

You get to the panel by clicking on the Viewstream button in the top panel of Visualizer. The EvS URL text box displays the HTTP pub-sub server URL included with Oracle CEP; click on the Initialize Client button to start the process.

Subscribe to user and internal channels by entering the channel name (beginning with a /) in the Subscribe Channel box and click Subscribe.

You can publish a message to a channel by entering its name (again with a beginning /) in the Publish Channel text box, entering the message, and clicking Publish.

Using Visualizer to Update Configuration Data

Although you can update much of the configuration of an Oracle CEP instance and its deployed applications, not all fields can be updated. The following bullets describe the rules that determine what fields can be updated.

- Information in the EPN assembly file is static and thus read-only. Examples of this type of information include the stages of the EPN and how they are wired together.
- Information in the component configuration files can be modified, although not typically added to or deleted from; the next bullet lists the two exceptions. Examples of this type of information include the maximum size and threads of a stream.

  When you are allowed to update fields on a Visualizer window, you will see three buttons: Modify, Commit, and Cancel. Click the Modify button to update the fields, then click Commit to commit the changes to the server or Cancel to cancel.
- The EPL rules associated with a processor and the channels associated with an HTTP pub/sub server cannot be modified, but you can add or delete to the existing list of rules or channels.

  For these two scenarios you will see buttons for adding and deleting rules or channels; the Modify button will not be provided.
- Some information in the server's configuration file (`config.xml`) can be modified, although much of it is read-only. An example of this type of information includes the configuration of work managers, the logging service, and the channels of the HTTP publish-subscribe server.

  Server configuration updates also use the three buttons: Modify, Commit, and Cancel.

Note: The preceding rules assume that you have logged onto Visualizer with the required authentication credentials for performing the desired update task.

How to Invoke and Start Using Visualizer

Visualizer is itself an Oracle CEP application that is automatically deployed each time you start a server. You invoke Visualizer in a browser to use it.

Note: On Windows, be sure you have installed version `WIN 9,0,124,0` of Flash Player for best results. Go to the Version test for Adobe Flash Player Web site for instructions on testing the current version of Flash Player installed on your computer .

To start using Visualizer, follow these steps:

1. Invoke the following URL in your browser:

   `http://host:port/wlevs`

   where *host* refers to the name of the computer on which Oracle CEP is running and *port* refers to the Jetty NetIO port configured in for the server (default value `9002`).

   The port number is configured in the *`DOMAIN_DIR`*`/config/config.xml` file, where *`DOMAIN_DIR`* refers to the domain directory such as `/oracle_cep/user_projects/domains/wlevs30_domain`. The port number is the value of the `<port>` child element of the `<netio>` object configured for the Jetty server, as shown in the following example (only relevant parts shown):

   ```
   <netio>
      <name>NetIO</name>
      <port>9002</port>
   </netio>

   ...

   <jetty>
      <name>JettyServer</name>
      <network-io-name>NetIO</network-io-name>
      ...
   </jetty>
   ```

   For example, if your browser is running on the same computer as Oracle CEP and you are using the default port, invoke the following URL:

   ```
   http://localhost:9002/wlevs
   ```

   If you want to use HTTPS to connect to Visualizer, specify the SSL port number. This is the port assigned to the `<netio>` element referenced by the `<secure-network-io-name>` Jetty element. The default value is `9003`.

   For example, if you have the following configuration (only relevant parts shown):

   ```
   <netio>
      <name>sslNetIo</name>
      ...
      <port>9003</port>
   </netio>

   <jetty>
      ...
      <secure-network-io-name>sslNetIo</secure-network-io-name>
   </jetty>
   ```

   use the following URL:

```
https://localhost:9003/wlevs
```

2. In the Logon screen, enter the name and password of the administrator user you configured when you created the domain.

   The Login screen does not appear if you have disabled security by using the `-disablesecurity` flag when you started Oracle CEP.

You are now ready to begin using Visualizer to manage, configure, and monitor Oracle CEP instances and the applications deployed to the server instances. For information on typical tasks, see:

- "Typical Application Tasks" on page 3-1
- "Typical Server and Domain Tasks" on page 4-1
- "Typical Security Tasks" on page 5-1

Using Visualizer With a Multi-Server Domain

You can use Visualizer to administer a multi-server domain. As described in "How to Invoke and Start Using Visualizer" on page 2-7, Visualizer works by connecting to a one particular server, based on its host and port. In the case of a multi-server domain, you connect to one server in the domain and then access the other servers from that server. All servers in a multi-server domain are candidates to host Visualizer, from which you administer all the other servers in the domain.

However, once you pick the server that hosts Visualizer, and then you start Visualizer, you should not run Visualizer from any other server in the domain simultaneously. For this reason, you should disable Visualizer access from all servers except for one in the multi-server domain.

To do this, specify the `-disablevisualizer` flag when you start the servers in the multi-server domain that will not provide access to Visualizer.

For example, assume you have a multi-server domain with three servers (`defaultserver`, `server1`, and `server2`). Each server directory is a child directory of the domain directory, which is `/oracle_cep/user_projects/domains/myDomain`. You want the `defaultserver` to host Visualizer and thus must disable access to Visualizer from the other two servers. In this case, you would start each server as follows:

```
prompt> cd /oracle_cep/user_projects/domains/myDomain/defaultserver
prompt> startwlevs
prompt> cd ../server1
prompt> startwlevs -disablevisualizer
```

```
prompt> cd ../server2
prompt> startwlevs -disablevisualizer
```

When using Visualizer in a multi-server domain, the navigation tree in the left pane is automatically refreshed to reflect changes in the domain. For example, when a new server joins the domain, it automatically shows up in the navigation tree. Conversely, if the server leaves the domain, the server automatically disappears from the navigation tree.

You can perform configuration management, of both the servers and applications, and operation management (such as diagnostics and event record and playback) on all servers in the multi-server domain. However, you cannot deploy an application to a group of the domain; you can deploy to a single server at a time.

See Configuring and Using Oracle CEP Multi-Server Domains for detailed description of multi-server domains and how to create, configure, and use them.

Updating User Preferences

Visualizer allows you to customize its behavior using user preferences. To change the preferences, follow these steps:

1. Click the Preference button at the top-right corner of any Visualizer screen. The Preference screen appears in the right panel.
2. Update the following preferences:
   - Select the language used by Visualizer. Default is English.
   - Set the time, in minutes, after which the client (browser) times out and automatically logs you out. Default value is 20 minutes, maximum 30.
   - Set the maximum number of open items that will appear in the Open Items frame in the lower left corner. Default value is 8; maximum value is 10.

     Note: For users that require accessibility, set the maximum open items to 1 to make keyboard navigation easier to use.
   - Click whether you want the domain tree in the left panel to be fully expanded every time you start Visualizer.
   - Click whether you want to enable the fullscreen function in Visualizer. You should uncheck this option if you require accessibility.
3. Click OK to save the preference, Cancel to cancel.

CHAPTER 3

Typical Application Tasks

This section contains the typical application tasks you can perform with Oracle CEP Visualizer.

Visualizer is fairly self-explanatory and intuitive, so not all tasks are discussed here, but rather, just those that are most common and typical and from which other similar tasks can be deduced.

This section describes how to:

Monitoring the Throughput and Latency of a Stage or Path in the EPN

You can use Visualizer to monitor the entry and exit points of a stage, or a specified path, of the event processing network (EPN) of an application. Oracle CEP defines the following metrics that you can monitor for each stage or path:

- Throughput—The number of events processed by the stage.
- Average Latency—The averge amount of time it takes an event to pass through a specified path of the EPN, or *latency.*
- Maximum Latency—The maximum amount of time it takes an event to pass through a specified path of the EPN.
- Average Latency Threshold—Specifies whether the average latency of events between the start- and end-points of a stage crosses a specified threshold.

The Visualizer monitoring feature is itself implement as an Oracle CEP application; this means that the diagnostic information can be viewed as an event, and the application uses EPL rules to process these diagnostic events.

To use Visualizer to monitor a stage or path of the EPN, you must first create a diagnostic profile, as described in the following steps:

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which the application is deployed.
2. Expand the *appname* > Stages node to see a list of the EPN stages in the domain tree.
3. Click on the stage of the application for which you want to monitor its latency or throughput, or the first stage in the path that you want to monitor.
4. In the right pane, click the General tab.
5. Click the Create Diagnostics button. An accordion menu with three tabs appears.
6. Click the top Diagnostic Profile Information tab and enter the information as follows:
   - Enter the name of the diagnostic profile you are about to create in the Profile Name field.
   - Select whether you want to enable the profile for immediate use.

7. Click the Latency tab in the accordion menu. Enter the information about the type of monitoring information you want to gather about latency in the Diagnostic Information section as follows:
   - `Max Latency Metric`—Specifies that you want to monitor the maximum amount of time it takes for events to flow through a stage or a subset of the event processing network (path).
   - `Average Latency Metric`—Specifies that you want to monitor the average amount of time it takes for events to flow through a stage or a subset of the event processing network (path).
   - `Threshold`—Specifies threshold for the average latency monitoring. This value is enabled only if you specify Average Latency Metric.
   - `Time Unit`—Specifies the time units for the threshhold and average interval fields.
   - `Average Interval`—Specifies the time interval for which you want to gather diagnostic data.

   Update the Path Information section as follows:
   - If you want to monitor just the current stage, rather than a path in the EPN, set the Start and End Stage Name to the name of the current stage. Select Entry for the Start Stage Name and Exit for the End Stage Name.
   - If you want to monitor a path in the EPN, Visualizer assumes that the current stage is the start of the path, and thus automatically selects it for the Start Stage Name field. Specify whether the start of the path should be the entry or exit of the current stage. Then select the End Stage name, or the end of the path you want to monitor, and specify whether the end of the path should be the entry or exit of the stage.
8. Click the Throughput tab in the accordion menu. Enter the information about the type of monitoring information you want to gather about throughput as follows:
   - `Average Throughput Metric`—Specifies that you want to monitor the average throughput of events flowing through the stage.
   - Stage Name—Specify whether you want to monitor the throughput at the entry or exit of the stage.
   - `Time Unit`—Specifies the time units for the average interval fields.
   - `Throughput Interval`—Specifies the time interval for which you want to gather metrics.
   - `Average Interval`—Specifies the interval for gathering the average throughput.

9. Click Save. The saved diagnostic profile appears in the left domain tree, under the stage from which you created it.

   WARNING: Diagnostic profiles are not persistent, which means that when you undeploy an application or restart a server, all diagnostic profiles are lost.

10. Click the Dashboard link at the top of Visualizer to go to the diagnostics dashboard window.

11. Drag the diagnostic profile you created in a preceding step from the domain tree in the left pane to the table at the bottom of the right pane; drop the diagnostic profile into the Profile Name column of the table.

12. Click on the name of the diagnostic profile in the table; you should start seeing latency and throughput information in the graphs in the middle of the dashboard.

13. The Management Events section at the top of the Dashboard displays alerts about the incoming monitoring events. The Visualizer monitoring feature defines a set of default EPL rules that specify when these alerts show up in the Management Events table; you can change the EPL rules to customize this behavior, as describe in "Changing the EPL Monitoring Filtering Rules" on page 3-4.

Changing the EPL Monitoring Filtering Rules

The `com.bea.wlevs.dataservices` application includes the `MonitorProcessor` which in turn is associated with a default EPL rule used to filter the events that are outputted to the diagnostic Dashboard. You can change this EPL rule, or add new ones, if you want to customize this filtering.

The event type used in the EPL rules is `com.bea.wlev.dataservice.cep.DSMonitorEvent`; it has the following properties:

- `profile`—Name of the diagnostic profile.
- `date` —Date and timestamp.
- `metric`—Metric number.
- `start`—Start stage name.
- `end`—End stage name.
- `type`—The type of metric; valid values are `avg-latency`, `avg-throughput` or `max-latency`.
- `application`—Application name

For example, if you want to filter the monitoring events by type and metric, you might change the EPL rules to the following:

```
SELECT * FROM DSMonitorEvent
RETAIN 1 EVENT
WHERE metric < 300 AND type = 'avg-latency'

SELECT * FROM DSMonitorEvent
RETAIN 1 EVENT
WHERE metric < 300 AND type = 'avg-throughput'

SELECT * FROM DSMonitorEvent
RETAIN 1 EVENT
WHERE metric < 300 AND type = 'max-latency'
```

If you want to continuously view three evnets where the number of metrics is less than 300 and group the events by type, try this EPL rule:

```
SELECT *, COUNT(metric)
FROM DSMonitorEvent
RETAIN BATCH OF 3 EVENTS PARTITION BY type
WHERE metric < 300
HAVING COUNT(metric) = 3
OUTPUT LAST 1 EVERY 3 EVENTS
```

If you want to continuously view three evnets where the average number of metrics is less than 300 and group the events by type, try this EPL rule:

```
SELECT *, AVG(metric)
FROM DSMonitorEvent
RETAIN BATCH OF 3 EVENTS PARTITION BY type
HAVING AVERAGE(metric) < 300
OUTPUT LAST 1 EVERY 3 EVENTS
```

To change the EPL rules of the dataservices Application, follow these steps:

1. In the left pane, click *Domain* > *Server* > Applications > com.bea.wlevs.dataservices> Stages > MonitorProcessor, where *Domain* is the name of your domain and *Server* is the name of your server.
2. In the right pane, click the Rules tab. The Rules table appears.
3. To change the default rule, click its name in the Rules table, make the change in the Rule text box in the Working Area, and click Replace Rule.

4. To create a new Rule, enter a rule ID and the rule text in the appropriate text boxes in the Working Area, then click Create Rule.

Viewing the Event Processing Network (EPN) of an Application

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which the application is deployed.
2. Click the name of the application shown below the Applications node.
3. In the right pane, click the Event Processing Network tab.
4. In the Layout drop-down choice box, chose your favorite layout, such as hierarchic or organic.
5. Alternately, expand the *appname* > EPN node in the left pane to see a list of the EPN stages in the domain tree. Click on an individual stage to see its configuration.

Recording and Playing Back Events Flowing Through an EPN

The event repository feature of Oracle CEP allows you to record events flowing through an event processing network (EPN) and store them so you can later play back the events. You configure the recording and playing back of events per stage, such as a processor or stream. Additionally, only events coming out of an event source can be recorded, and playback is possible only on event sinks (events are played back to the inbound side of the event sink stage.)

The only configuration options of record and playback that you can control using Visualizer is time and speed. You must manually update the appropriate component file to to configure the other options.

The Record and Playback Visualizer panels for a particular stage are divided into three sections, as described in the following bullets. The bullets describe the Record panel in particular, although the Playback panel is very similar with just a few additional properties, such as speed and repeat. The panels are as follows:

- The top section, called Recording Parameter and Status, specifies the name of the database schema (Data set name) and the provider information. You must pre-configured the provider for the event repository; see "Viewing the Event Type Repository" on page 4-6 for read-only details. The Current Status field displays a blinking Recording... if the system

has begun a recording session; it changes back to blank when the recording sessions ends. This section is read-only.

- The middle section of the panel contains a Record Entry table. In this release you can specify just a single recording entry. You must manually configure this data in your application before you deploy the application. The information in this section corresponds to the `<record-parameters>` element for a stage in the component configuration file. The entry details the recording start and end times as well as the event type you want to record. When you configure the recording entry in the application, the start and end time is optional although the event type is mandatory.
- The final section allows you to change some of the properties of your existing recording entry; some properties, such as the event type, cannot be changed using Visualizer. Use the calendar and clock controls to specify or change an existing start and end time for recording events. Finally, you can use

Refer to Using a Persistent Store to Record and Playback Events for detailed information about how event and record playback works and how to configure a component. Refer to Event Record and Playback Example) for an example.

1. Using your favorite XML editor or IDE, edit the configuration file of the stage for which you want to configure record and playback. Add a `<record-parameters>` child element of the stage (`<processor>`, `<stream>`, or `<adapter>`) to configure a record operation and a `<playback-parameters>` child element to configure a playback operation. The following example shows how to add record and playback to the `helloworldProcessor` of the HelloWorld sample application; relevant sections shown in bold:

```
<processor>
    <name>helloworldProcessor</name>

    <record-parameters>
        <dataset-name>test1data</dataset-name>
        <event-type-list>
            <event-type>HelloWorldEvent</event-type>
        </event-type-list>
        <provider-name>test-rdbms-provider</provider-name>
    </record-parameters>

    <playback-parameters>
        <dataset-name>test1data</dataset-name>
        <event-type-list>
            <event-type>HelloWorldEvent</event-type>
        </event-type-list>
        <provider-name>test-rdbms-provider</provider-name>
        <playback-speed>1.0</playback-speed>
```

```
            <loopback>false</loopback>
        </playback-parameters>

        <rules>
            <rule id="helloworldRule"> select * from HelloWorldEvent
retain 1 event </rule>
        </rules>
        <bindings/>
    </processor>
```

2. Redeploy the application so the new configuration takes effect.
3. Invoke Visualizer.
4. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which the application is deployed.
5. Expand the *appname* > Stages node to see a list of the EPN stages in the domain tree.
6. Click on the stage for which you added record and playback configuration to its configuration file.
7. In the right pane, click the Record tab.
8. If you want to change the time to start and end recording, click on the entry in the table, update the dates in the Change Schedule area, then click Update Schedule.

   WARNING: The changes to the calendar and clock are not committed until you click Update Schedule.

9. Click Start Recording to start recording, End Recording to end.

   Visualizer keeps track of whether a particular stage is currently recording or playing back events; based on this information, the Start Recording and End Recording buttons may be enabled or disabled as appropriate.

   When you start recording using Visualizer, Oracle CEP uses the event type information from your record entry and begins recording immediately; the pre-scheduled time, if any, remains unchanged. Use the End Recording button to stop recording of your session immediately

10. To playback, click the Playback tab. The buttons below work similarly to those of the Record tab.

Replacing a Rule Associated With a Processor

You can use the replace rule feature of Visualizer to modify an existing rule. However, you should use this feature with extreme caution; this is because, internally, Visualizer first deletes the rule and then adds it back again with the replaced text. The deletion of the rule causes all states to be lost befor the rule is added again. For this reason, you should replace only stateless rules.

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which the application is deployed.
2. Expand the *appname* > Stages node to see a list of the EPN stages in the domain tree.
3. Click on the processor to which you want to modify a rule.
4. In the right pane, click the Rules tab.
5. Select the rule you want to replace in the table.
6. In the Working Area, change the text of rule in the Rule text box.
7. Click Replace Rule.

Adding or Deleting Rules From a Processor

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which the application is deployed.
2. Expand the *appname* > Stages node to see a list of the EPN stages in the domain tree.
3. Click on the processor to which you want to add or delete rules.
4. In the right pane, click the Rules tab.
5. To delete a rule, select a rule in the table and click Delete Rule.
6. To add a rule, enter the rule ID and rule text in the boxes at the bottom of the page, then click New Rule.

Viewing and Changing the Configuration of a Stage

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which the application is deployed.

2. Expand the *appname* > Stages node to see a list of the EPN stages in the domain tree.
3. Click on the stage whose configuration you want to update.
4. In the right pane, click the General tab.

   Note: Not all stage's configuration can be updated by Visualizer. A Modify button will appear if the configuration can be updated.

5. If a stage's configuration can be updated, click Modify.
6. Enter the new values.
7. Click Commit.

Deploying an Application

Deploying an application refers to uploading to the server the JAR file that contains the application and then installing it, which makes it available to clients.

Oracle CEP internally deploys an application as a two step processes. The first step involves starting the application bundle inside the OSGi container. The second step involves starting and initializing the application. Because the second step is asynchrous in nature, Visualizer does not wait for the completion of the second operation. As soon as the application has successfully started, Visualizer's navigation tree will be updated automatically with the new deployment and a successful message will be send to the dashboard. However, if the application fails to start, you must check for errors on the server side because no messages/updates will occur on the Visualizer.

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which you want to deploy the application.
2. In the right pane, click the Deployment tab.
3. Click the Install button.
4. Click the Upload tab.
5. Click on the "..." button to invoke a file browsing window, browse to the directory that contains the JAR file of application, and click Open.
6. Click Upload. The JAR file appears in the table of applications.
7. Click the Install button and select your application in the table.

8. Click Deploy.
9. Click OK.

Your application is deployed and ready for clients to use.

Uninstalling an Application

When you uninstall an application, you completely remove it from the server so that clients can no longer access it.

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which you want to uninstall the application.
2. In the right pane, click the Deployment tab.
3. In the Deployments table, select the application you want to uninstall by checking the box to the left of its name.
4. Click Uninstall.
5. Click OK.

Suspending or Resuming an Application

1. In the left pane, navigate to and expand the Applications node of the Oracle CEP instance to which you want to suspend or resume an application.
2. In the right pane, click the Deployment tab.
3. In the Deployments table, select the application you want to suspend or resume by checking the box to the left of its name.
4. Click Suspend to suspend the application or Resume to resume the application.
5. Click OK.

CHAPTER 4

Typical Server and Domain Tasks

This section contains the typical server and domain tasks you can perform with Oracle CEP Visualizer.

Visualizer is fairly self-explanatory and intuitive, so not all tasks are discussed here, but rather, just those that are most common and typical and from which other similar tasks can be deduced.

This section describes the following topics:

Viewing the JMX Configuration

Oracle CEP provides standards-based interfaces that are fully compliant with the Java Management Extensions (JMX) specification. Software vendors can use these interfaces to monitor Oracle CEP MBeans, to change the configuration of an Oracle CEP domain, and to monitor the distribution (activation) of those changes to all server instances in the domain.

Visualizer and the `wlevs.Admin` command line tool both use JMX to connect to a server. However, to use these tools, and the JMX interfaces in general, you must configure Oracle CEP with the JMX configuration information in the `config.xml` file.

You can only view the JMX configuration of your Oracle CEP server using Visualizer. To change the configuration, you must manually update the server's `config.xml` file. For details, see Configuring JMX for Oracle CEP.

To view the JMX configuration of your Oracle CEP server:

1. In the left pane, click the *Domain* > *Server* node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.
2. In the right pane, click the JMX tab.
3. The JMX properties are displayed in the table:
   - `jndi-service-name`—The name of the JNDI service to which the jmx server will bind its object.
   - `rmi-service-name`—The name of the RMI service with which the jmx server will register to receive calls.
   - `rmi-jrmp-port`—The port on which to listen for RMI JRMP JMX requests.
   - `rmi-registry-port`—The port on which to start the RMIRegistry.

Viewing the Configured Data Sources

Oracle CEP supports Java Database Connectivity (JDBC) 3.0 for relational database access.

The JDBC API provides a standard, vendor-neutral mechanism for connecting to and interacting with database servers and other types of tabular resources that support the API. The JDBC `javax.sql.DataSource` interface specifies a database connection factory that is implemented by a driver. Instances of `DataSource` objects are used by applications to obtain database connections (instances of `java.sql.Connection`). After obtaining a connection, an application interacts with the resource by sending SQL commands and receiving results.

You can only view the data source configuration of your Oracle CEP server using Visualizer. To change the configuration, you must manually update the server's `config.xml` file. For details, see Configuring Access to a Relational Database.

To view the data sources configured for your Oracle CEP server:

1. In the left pane, click the *Domain* > *Server* node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.
2. In the right pane, click the DataSource tab.
3. In the Data Sources table, select the data source you want to view by clicking on its name.
4. Click the Data Source option to view basic configuration about the data source, such as:
   - `Name`—The name of the data source.
   - `JNDI name`—The JNDI path to where this data source will be bound.
   - `Global Tx Protocol`—The protocol for Oracle CEP to use for the transaction branch when processing a global transaction, such as one-phase commit, emulate two-phase commit, and so on.
5. Click the Driver option to view information about the database to which this data source connects, such as:
   - `URL`—The database URL used to connect to a database. This URL includes the name of the database, the host and port of the computer on which the database server is running, and so on.
   - `Driver Name`—The name of the database driver that Oracle CEP uses to connect to a database. Drivers are specific to the database server, such as Oracle, Derby, and so on.
   - `User Name`—The database user account name that you want to use for each connection in the data source.
   - `Password`—The password for the database user acccount.
   - `Use XA`—Whether to use an XA driver.
6. Click the Connection Pool option to view the connection pool properties of the data source, such as:
   - `Initial Capacity`—The number of physical connections to create when creating the connection pool.
   - `Max Capacity`—The maximum number of physical connections that this connection pool can contain.

– `Capacity Increment`—The increment with which to increase capacity, if required.

Viewing the Configuration of the Jetty Servers

Oracle CEP supports Jetty as the Java Web server to deploy HTTP servlets and static resources.

Oracle CEP support for Jetty is based on Version 1.2 the OSGi HTTP Service. This API provides the ability to dynamically register and unregister `javax.servlet.Servlet` objects with the run time and static resources.

You can only view the configuration of the Jetty servers configured in your Oracle CEP server using Visualizer. To change the configuration, you must manually update the server's `config.xml` file. For details, see Configuring Jetty for Oracle CEP.

To view the data sources configured for your Oracle CEP server:

1. In the left pane, click the *Domain* > *Server* node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.
2. In the right pane, click the HTTP Server tab.
3. In the right pane, the properties of the Jetty server are displayed:
   – The name of the Jetty server.
   – The network I/O object to which the Jetty server is bound.
   – The work manager name to which the Jetty server is bound.
   – The list of Web applications that are deployed to this Jetty server, along with the path of the application and its context path.

Configuring Work Managers

You can configure only existing work managers using Visualizer. You cannot delete old work managers or create new ones using Visualizer; rather, you must manually update the server's `config.xml` file. For details, see Work Managers.

To configure an existing work manager using Visualizer:

1. In the left pane, click the *Domain* > *Server* node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.
2. In the right pane, click the Work Manager tab.

3. In the Work Manager table, select the work manager you want to configure by clicking on its name.
4. Click the Change button at the bottom of the page.
5. Update the work manager configuration properties:
   - `Min threads`—The minimum number of threads that the server allocates so as to reduce the intial time it takes to perform a task.
   - `Max threads`—The maximum number of concurrent threads that execute requests from the constrained work set.
   - `Fair Share`—The average thread-use time required to process requests.
6. Click Save to save your changes or Cancel to cancel the update.

Viewing the Persistent Event Store

The Oracle CEP event repository feature allows you to persist the events that flow out of a component of the event processing network (EPN) to a store, such as a database table, and then play them back at a later stage or explicitly query the events from a component such as an event bean. By default, Oracle CEP stores recorded events in a database, which means that before you can start using the record and playback feature in your own application, you must specify where the database server is located along with the name of the database server that will contain the recorded events.

You can only view the event store configured for an Oracle CEP server using Visualizer. To change the configuration, you must manually update the server's `config.xml` file. For details, see Configuring an Event Store for Oracle CEP Server.

To view the event store configured for an Oracle CEP server:

1. In the left pane, click *Domain* > *Server* > Services > Event Repository, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.
2. The right pane shows the event stores that have been configured. In particular:
   - RDBMS Provider Name displays the name of the store provider
   - Data Source displays the JDBC data source associated with the provider.

Viewing the Event Type Repository

Event types define the properties of the events that are handled by Oracle CEP applications. All the event types used by the applications of a server make up the event type repository.

You can only view the event type repository, along with the its event types, configured for an Oracle CEP server using Visualizer. To create new event types, see Creating the Event Types.

To view the event store configured for an Oracle CEP server:

1. In the left pane, click *Domain* > *Server* > Services > Event Type Repository, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.

   The right pane displays the Event Name table that lists all the event types used by the applications of the server.

2. In the right pane, click the name of an event in the Event Name table. The text box at the bottom displays the properties of the event type. For example, a simple `Name` event type that has three properties, `first` and `last` which are `Strings` and `age` which is an integer, might look like:

   ```
   {first=java.lang.String, last=java.lang.String, age=int}
   ```

Configuring HTTP Publish-Subscribe Server Channels

Oracle CEP includes an HTTP publish-subscribe server to which applications can publish messages. Applications publish messages to a particular channel; other applications can then subscribe to this channel to receive these published messages.

You can use Visualizer to modify existing channels, as well as create new ones and delete existing ones. When you configure channels with Visualizer, they are permanent and survive server restart. Channels configured using APIs from a custom http pub-sub adapter are dynamic and do not survive server restart.

Visualizer includes the following preconfigured channels that are used by Visualizer itself; they cannot be deleted or modified:

- `/evsmonitor`
- `/evsalert`
- `/evsdomainchange`

See "Configuring Security for the HTTP Publish-Subscribe Channels" on page 5-4 for information on securing the channels.

Adding a Channel

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > *Server* > Services > Http Pub/Sub Server node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.

   A table appears in the right pane with the list of HTTP pub-sub servers configured for Oracle CEP.
3. In the right pane, click the name of the HTTP pub-sub server in the table. The default server is called `pubsub`.
4. In the working area towards the bottom of the right pane, enter the name of the new channel in the Channel Pattern text box. The channel must start with a `/`, such as `/mychannel`.
5. If you have security enabled, select the security roles that are allowed to publish and subscribe to the channel. Select more than one by holding down the Ctrl key.
6. Click the Add Channel. The new channel appears in the Channels table at the top right of the pane.

Deleting an Existing Channel

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > *Server* > Services > Http Pub/Sub server node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.

   A table appears in the right pane with the list of HTTP pub-sub servers configured for Oracle CEP.
3. In the right pane, click the name of the HTTP pub-sub server in the table. The default server is called `pubsub`.
4. In the Channels table, click the name of the channel you want to delete.
5. Click Delete Channel at the bottom of the pane.

Viewing Messages Published to HTTP Publish-Subscribe Channels

Oracle CEP includes an HTTP publish-subscribe server to which applications can publish messages. Applications publish messages to a particular channel; other applications can then subscribe to this channel to receive these published messages.

You can use Visualizer to view the messages that are currently being published to a channel, both the preconfigured channels used by Visualizer itself as well as user-defined channels.

See the Event Record and Playback example for an example of this feature.

1. In the top pane, click the Viewstream button.
2. In the right pane, click Initialize Client.
3. In the Subscribe Channel text box, enter the name of the channel to which the Oracle CEP server is publishing messages. For example, in the Record and Playback example, included in the Oracle CEP installation, the HTTP pub-sub adapter publishes to a channel called `/playbackchannel`.
4. Click Subscribe.

   The Received Messages text box displays events being published to the channel.
5. To unsubscribe to the channel, click Unsubscribe.

Configuring Logging

Visualizer allows you to change the server-wide logging configuration, such as the severity of log messages you want the server to print out, the name of the log file, and so on. You can also view logging information for a particular module, but you cannot change it.

See Configuring Logging and Debugging for details about what the properties in the Visualizer logging page mean.

To configure the logging system for Oracle CEP using Visualizer:

1. In the left pane, click the *Domain* > *Server* node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.
2. In the right pane, click the Logging tab.
3. Make the changes to the logging configuration using the various text fields or choices.

4. Click the Change button at the bottom of the page.
5. Click the Save button to commit your changes.

Typical Security Tasks

This section contains the typical security tasks you can perform with Oracle CEP Visualizer.

Visualizer is fairly self-explanatory, so not all tasks are discussed here, but rather, just those that are most common and typical and from which other similar tasks can be deduced.

This section describes the following topics:

Creating New Users

1. Be sure you log on to Visualizer using an administration user.

2. In the left pane, click the *Domain* > Security node, where *Domain* refers to the name of your Oracle CEP domain.
3. In the right pane, click the User tab.
4. Click the New User button at the bottom of the right pane.
5. Enter the name of the new user and their password. Enter an optional description of the user.
6. Click the groups to which the user belongs. You must assign a user to at least one group.
7. Click OK.

Changing the Groups to Which a User is Assigned

If, after you have created a user, you want to change the groups to which it is assigned, follow these steps:

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > Security node, where *Domain* refers to the name of your Oracle CEP domain.
3. In the right pane, click the User tab.
4. In the Users table, check the box to the left of the name of the user that you want to modify.
5. Click Modify User at the bottom of the pane.
6. Optionally modify the description of the user.
7. In the Groups table, check the groups to which the user belongs.
8. Click OK.

Deleting a User

Although you cannot delete the default administrator user, which is the administrator user originally configured for the domain when it was created with the Configuration Wizard, you can delete other users you subsequently created.

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > Security node, where *Domain* refers to the name of your Oracle CEP domain.

3. In the right pane, click the User tab.
4. In the Users table, check the boxes to the left of the name of the users that you want to delete.
5. Click Delete Users.

Changing the Password of a User

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > Security node, where *Domain* refers to the name of your Oracle CEP domain.
3. In the right pane, click the User tab.
4. In the Users table, check the box to the left of the name of the user whose password you want to change.
5. Click Change Password at the bottom of the pane.
6. Enter the new password, then enter it again to confirm it.
7. Click OK.

Creating a New Group

Oracle CEP is configured by default with a set of groups that are in turn mapped to roles. See ""Viewing the SSL Configuration for a Server" on page 5-5" on page 5-1 for details. This section describes how to create new groups.

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > Security node, where *Domain* refers to the name of your Oracle CEP domain.
3. In the right pane, click the Group tab.
4. Click the New Group button at the bottom of the pane.
5. Enter the name of the group, along with a description.
6. Click one or more roles to which the group maps. See ""Viewing the SSL Configuration for a Server" on page 5-5" on page 5-1 for details about the roles.
7. Click OK.

Modifying the Roles to Which a Group Maps

To change the roles to which a group maps after it has been created, follow these steps:

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > Security node, where *Domain* refers to the name of your Oracle CEP domain.
3. In the right pane, click the Group tab.
4. In the Groups table, click the box to the left of the name of the group that you want to modify.
5. Click Modify Group at the bottom of the pane.
6. Optionally modify the description of the group.
7. In the Has Roles table, click the roles to which this group maps. You must click at least one group.
8. Click OK.

Deleting a Group

You cannot delete the default groups that are automatically configured for Oracle CEP. You can, however, delete groups that you subsequently created.

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > Security node, where *Domain* refers to the name of your Oracle CEP domain.
3. In the right pane, click the Group tab.
4. In the Groups table, click the box to the left of the name of the group that you want to delete.
5. Click Delete Group at the bottom of the pane.

Configuring Security for the HTTP Publish-Subscribe Channels

Using Visualizer, you can specify the roles that are allowed to publish to the HTTP publish-subscribe channels that are configured for the HTTP pub-sub server included in Oracle CEP.

1. Be sure you log on to Visualizer using an administration user.
2. In the left pane, click the *Domain* > *Server* > Services > Http Pub/Sub Server node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.

   A table appears in the right pane with the list of HTTP pub-sub servers configured for Oracle CEP.
3. In the right pane, click the name of the HTTP pub-sub server in the table. The default server is called `pubsub`.
4. In the Channels table, click the name of the channel for which you want to configure security.
5. In the Publish Roles table, select the roles that are allowed to publish messages to this channel. If you want to select more than one role, use the Ctrl key.
6. Click Modify Channel at the bottom of the pane.

Viewing the SSL Configuration for a Server

You can only view the SSL configuration of your Oracle CEP server using Visualizer. To change the configuration, you must manually update the server's `config.xml` file. For details, see Uing SSL to Secure Network Traffic.

To view the SSL configurion of your Oracle CEP server:

1. In the left pane, click the *Domain* > *Server* node, where *Domain* refers to the name of your Oracle CEP domain and *Server* refers to the name of the server instance.
2. In the right pane, click the SSL tab.
3. In the left table, click the SSL configuration you want to view. The default configuration name is `sslConfig`.
4. The right table displays particular SSL configuration options.