



BEA WebLogic RFID Edge Server™

Workflow Reference

Copyright

Copyright © 1995-2006 BEA Systems, Inc. All Rights Reserved.

Restricted Rights Legend

This software is protected by copyright, and may be protected by patent laws. No copying or other use of this software is permitted unless you have entered into a license agreement with BEA authorizing such use. This document is protected by copyright and may not be copied photocopied, reproduced, translated, or reduced to any electronic medium or machine readable form, in whole or in part, without prior consent, in writing, from BEA Systems, Inc.

Information in this document is subject to change without notice and does not represent a commitment on the part of BEA Systems. THE DOCUMENTATION IS PROVIDED “AS IS” WITHOUT WARRANTY OF ANY KIND INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FURTHER, BEA SYSTEMS DOES NOT WARRANT, GUARANTEE, OR MAKE ANY REPRESENTATIONS REGARDING THE USE, OR THE RESULTS OF THE USE, OF THE DOCUMENT IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE.

Trademarks and Service Marks

Copyright © 1995-2006 BEA Systems, Inc. All Rights Reserved. BEA, BEA JRockit, BEA WebLogic Portal, BEA WebLogic Server, BEA WebLogic Workshop, Built on BEA, Jolt, JoltBeans, SteelThread, Top End, Tuxedo, and WebLogic are registered trademarks of BEA Systems, Inc. BEA AquaLogic, BEA AquaLogic Data Services Platform, BEA AquaLogic Enterprise Security, BEA AquaLogic Interaction, BEA AquaLogic Interaction Analytics, BEA AquaLogic Interaction Collaboration, BEA AquaLogic Interaction Content Services, BEA AquaLogic Interaction Data Services, BEA AquaLogic Interaction Integration Services, BEA AquaLogic Interaction Process, BEA AquaLogic Interaction Publisher, BEA AquaLogic Interaction Studio, BEA AquaLogic Service Bus, BEA AquaLogic Service Registry, BEA Builder, BEA Campaign Manager for WebLogic, BEA eLink, BEA Kodo, BEA Liquid Data for WebLogic, BEA Manager, BEA MessageQ, BEA WebLogic Commerce Server, BEA WebLogic Communications Platform, BEA WebLogic Enterprise, BEA WebLogic Enterprise Platform, BEA WebLogic Enterprise Security, BEA WebLogic Express, BEA WebLogic Integration, BEA WebLogic Java Adapter for Mainframe, BEA WebLogic JDriver, BEA WebLogic Log Central, BEA WebLogic Mobility Server, BEA WebLogic Network Gatekeeper, BEA WebLogic Personalization Server, BEA WebLogic Personal Messaging API, BEA WebLogic Platform, BEA WebLogic Portlets for Groupware Integration, BEA WebLogic Real Time, BEA WebLogic RFID Compliance Express, BEA WebLogic RFID Edge Server, BEA WebLogic RFID Enterprise Server, BEA WebLogic Server Process Edition, BEA WebLogic SIP Server, BEA WebLogic WorkGroup Edition, BEA Workshop for WebLogic Platform, BEA Workshop JSP, BEA Workshop JSP Editor, BEA Workshop Struts, BEA Workshop Studio, Dev2Dev, Liquid Computing, and Think Liquid are trademarks of BEA Systems, Inc. Accelerated Knowledge Transfer, AKT, BEA Mission Critical Support, BEA Mission Critical Support Continuum, and BEA SOA Self Assessment are service marks of BEA Systems, Inc.

All other names and marks are property of their respective owners.

Contents

1. Introduction and Roadmap

Document Scope and Audience	1-1
Guide to This Document	1-2
Related Information	1-2
New Features in This Release	1-3

2. Configuring and Using Workflows

Overview of RFID Workflow Technology	2-1
Prerequisites to Configuring Workflows	2-4
Configuring Workflows	2-4
Defining a Workflow Module: Main Steps	2-4
Defining a Workflow: Main Steps	2-5
Example: Setting Up an Observe Portal Workflow	2-6
Example: Setting Up a Bidirectional Portal Workflow	2-11

3. Workflow Module Reference

Overview of RFID Edge Server Workflow Modules	3-1
Output Destinations	3-1
Bidirectional Portal Module	3-2
Observe Portal Module	3-4
Message Notifier Module	3-6
Numeric Display Module	3-7
Stack Light Module	3-7

Index

Introduction and Roadmap

The following sections describe the contents, audience for, and organization of this guide—*WebLogic RFID Edge Server Workflow Reference*.

- [“Document Scope and Audience” on page 1-1](#)
- [“Guide to This Document” on page 1-2](#)
- [“Related Information” on page 1-2](#)
- [“New Features in This Release” on page 1-3](#)

Document Scope and Audience

This document describes the basic concepts of workflows, as well as how to configure and use the workflow modules included with the WebLogic RFID Edge Server. It does not explain other Edge Server functionality such as the ECSpec Editor. Refer to [“Related Information” on page 1-2](#) to determine which other documents you may need to consult.

This document is intended for the following audiences:

- System administrators—IT professionals who configure and deploy workflows. Related responsibilities may include installing, testing, maintaining, and upgrading RFID Edge Server. System administrators understand networking and Web protocols, as well as Java and XML.
- Application developers—Java programmers who focus on developing client applications using the Application Level Events (ALE) API, and working with other engineering,

quality assurance (QA), and database teams. Application developers have in-depth, working knowledge of Java.

Guide to This Document

This document is organized as follows:

- This chapter, [Introduction and Roadmap](#), describes the scope of this guide and lists related documentation.
- [Configuring and Using Workflows](#) is an overview of RFID Edge Server workflow functionality and describes how to configure workflows and workflow modules.
- [Workflow Module Reference](#) provides field-by-field descriptions of workflow module configuration options.

Related Information

The following BEA documents contain information that is relevant to the *WebLogic RFID Edge Server Workflow Reference*:

- [Product Overview](#) provides descriptive information about WebLogic RFID Edge Server, including use cases, key benefits, component architecture, functional overview, RFID concepts and terminology, and developer and RFID resources.
- [Using the RFID Edge Server Administration Console](#) describes how to use the RFID Administration Console to configure ECSpecs, ECReports, RFID devices, filters, and workflows.
- [RFID Reader Reference](#) describes how to configure the RFID devices supported by the RFID Edge Server.
- [Programming with the ALE and ALEPC APIs](#) describes the Application Level Events (ALE) and Application Level Events Programming Cycle (ALEPC) programming interfaces (APIs) that you use to create applications that interact with WebLogic RFID Edge Server by reading and writing electronic product code (EPC) tags.
- [Using the Reader Simulator](#) describes how to use the Reader Simulator software included with RFID Edge Server. The Reader Simulator minimally simulates a ThingMagic Mercury4 RFID reader.

- *WebLogic RFID Enterprise Server Administration Guide* provides further information on the EPC Information Service (EPCIS), and EPCIS events. Consult this document if you want to configure workflows to send EPCIS events.

New Features in This Release

Workflows are a new feature in WebLogic RFID Edge Server. Using workflows requires a premium license. For more information, see [About BEA Product Licenses](#) in *Installing WebLogic RFID Edge Server*.

Introduction and Roadmap

Configuring and Using Workflows

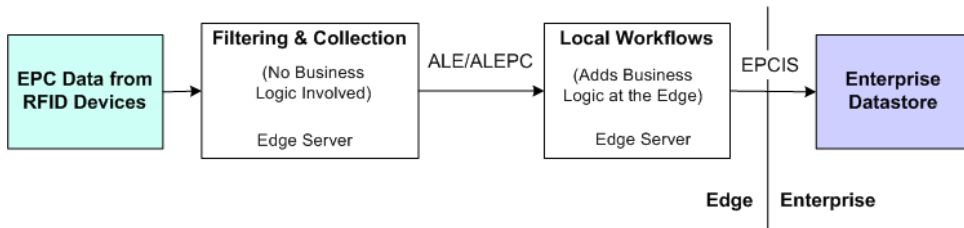
The following sections describe how to configure and use workflows:

- [“Overview of RFID Workflow Technology” on page 2-1](#)
- [“Prerequisites to Configuring Workflows” on page 2-4](#)
- [“Configuring Workflows” on page 2-4](#)
- [“Example: Setting Up an Observe Portal Workflow” on page 2-6](#)
- [“Example: Setting Up a Bidirectional Portal Workflow” on page 2-11](#)

Overview of RFID Workflow Technology

The WebLogic RFID Edge Server collects and filters data from RFID-labeled items moving through the supply chain, as shown in [Figure 2-1](#). This process is carried out at the *edge* (remote sites) in warehouses, distribution centers, and supply rooms, and involves no business logic. However, data gathered during this process can be sent through local workflows on the Edge Server, which apply business logic to the RFID data at the edge. Data that results from this workflow processing is then sent to the organization’s enterprise data center.

Figure 2-1 Workflows: Business Logic at the Edge



WebLogic RFID Edge Server lets you create custom RFID-enabled workflows easily and quickly. You construct workflows from *workflow modules*, which take input messages (event or programming cycle reports, or output from other modules), and emit workflow messages according to embedded business logic. There are two types of workflow modules: *business logic modules* (such as Bidirectional Portal or Observe Portal) that represent business processes, and *helper modules* (such as Stack Light) that the business logic modules call to control hardware at the edge or send messages to other systems.

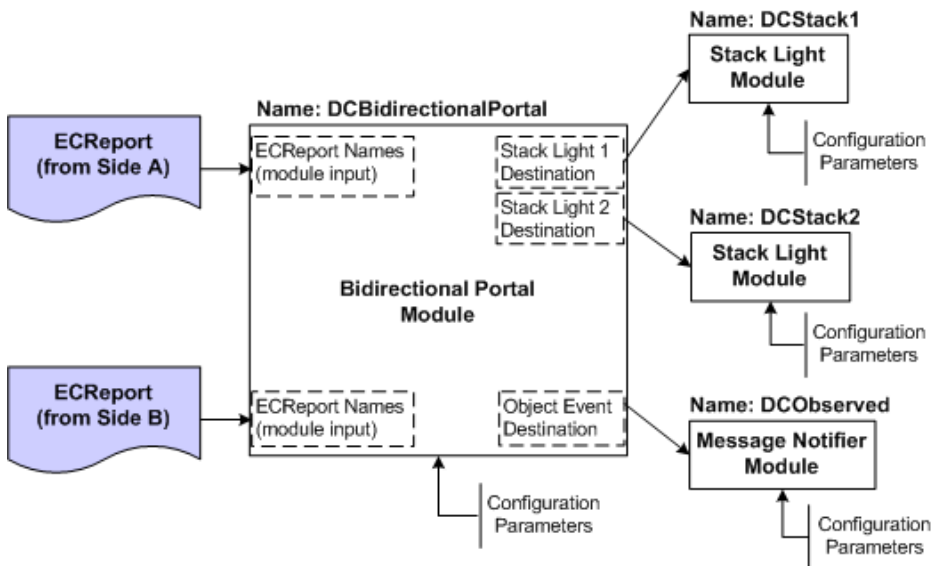
The WebLogic RFID Edge Server supports the following workflow modules:

- Business Logic Modules:
 - Bidirectional Portal—Used when it is necessary to carry out business logic based on the direction of detected tags. Monitors tag data traffic, detects directional item movement, and calls other modules to perform tasks based on tag direction.
 - Observe Portal—Used when it is necessary to carry out business logic based on tag data traffic observations. Monitors tag data traffic across a read point and calls other modules to perform tasks based on what is read.
- Helper Modules:
 - Numeric Display—Manages LED devices.
 - Stack Light—Manages stack light logical devices.
 - Message Notifier—Converts workflow messages to text or XML and sends them to notification destinations.

Note: Drivers for notification destinations must be configured within the RFID Edge Server. See *Installing WebLogic RFID Edge Server* for detailed instructions.

Figure 2-2 shows a workflow involving the Bidirectional Portal, Stack Light, and Message Notifier modules.

Figure 2-2 Configured Workflow

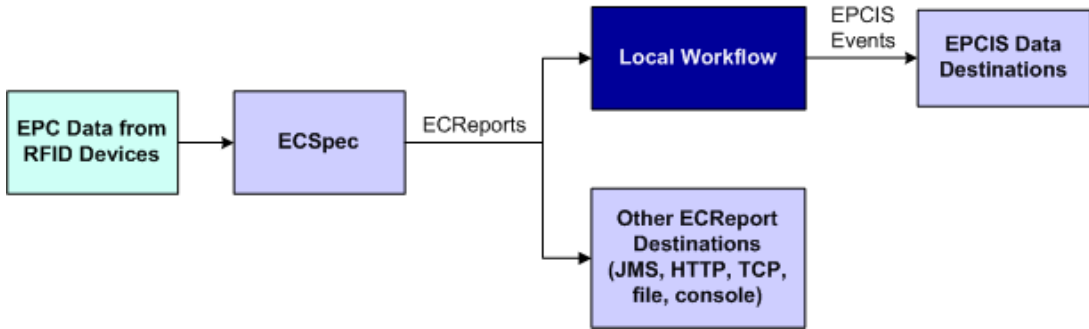


The Bidirectional Portal takes input from two observation points (Side A and Side B). Based on the movement of tags between two observation points, it can determine directionality and perform business logic based on the direction of the tagged objects; in this case, operating the stack lights and sending an EPCIS event to some destination.

At a more detailed level, workflows such as the Observe Portal or Bidirectional Portal can also be viewed as a series of actions triggered by the observation of an EPC. For example, the observation of an EPC on an RFID-tagged case of consumer goods travelling down a conveyor belt could increment an LED counter, change a stack light to green, send an EPCIS event, or send a notification to another system.

Figure 2-3 shows workflows in the context of EPC data.

Figure 2-3 Workflows in Context



Any or all of these workflow-related events could be triggered by the EPC observation. In more complex cases, multiple actions of the same type could be triggered (events or notifications could be sent to multiple destinations, for example).

Prerequisites to Configuring Workflows

Before you configure a workflow, you need to configure the ECSpec whose reports will provide input to the workflow. See [Using the RFID Edge Server Administration Console](#) for instructions on configuring an ECSpec. You must also have a working installation of the WebLogic RFID Edge Server, including one or more hardware devices (stack lights, RFID devices, and LED displays). If your workflows will send EPCIS events to the RFID Enterprise Server, you will also need a working installation of the WebLogic RFID Enterprise Server.

Configuring Workflows

You configure workflows by configuring workflow modules and connecting them together, using the RFID Edge Server Administration Console. Workflow modules are connected to one another by referring to the name of the next module in the workflow.

Defining a Workflow Module: Main Steps

To define a workflow module:

1. Start the RFID Edge Server Administration Console if it is not already running.
2. Select the **Workflow Modules** node under the Site and Edge Server you are working with.

3. Choose the type of operation to perform:
 - a. To define a new module, click **New**.
 - b. To create a copy of an existing module, select the module and click **Clone**.
4. Give the module you are creating a unique **Module Name**.
5. Choose the **Module Type** from the drop-down list.
6. Configure the workflow module by filling in values for the fields according to the information provided in [“Workflow Module Reference” on page 3-1](#).
7. Click **OK** to save your changes.

Defining a Workflow: Main Steps

To define a workflow:

1. Start the RFID Edge Server Administration Console if it is not already running.
2. Check that notification drivers are set up for all types of notifications you will be using.

These drivers are defined in the `RFID_EDGE_HOME/etc/edge.props` file, where `RFID_EDGE_HOME` is the directory where you installed the RFID Edge Server software.
3. Configure any RFID devices you will be using.

For testing purposes, as an RFID device, you can configure the Reader Simulator software included with the RFID Edge Server.

For more information on RFID device configuration, see the [RFID Reader Reference](#) and any manufacturer documentation provided with your hardware.
4. Create the ECSpecs and associated ECREports required by this workflow.

For more information on creating ECSpecs, see [Using the RFID Edge Server Administration Console](#).
5. Define helper workflow modules as described in steps 1-7, in [“Defining a Workflow Module: Main Steps” on page 2-4](#).
6. Similarly, define a business logic workflow module, referring to the name of helper modules as needed to form a complete workflow.
7. Create a subscriber for each ECSpec.

- a. Select `Workflow Module` for the **Type** field.
 - b. The **Module** field should contain `<workflow module name>` from [step 4](#), in “[Defining a Workflow Module: Main Steps](#)” on [page 2-4](#). For example, `WarehouseBidirectionalPortal`.
8. When you click **Subscribe**, the ECSpec will send ECREports to the workflow destination you specified.
- Active subscriptions allow you to test that the workflow is functioning correctly, and that the Edge Server is sending messages to the configured locations and devices.
9. Test the workflow by simulating a tag observation using the Reader Simulator, or by holding a tag near the antennas on your RFID reader.
- You should see evidence of workflow activity (workflow messages arriving at notification destinations and delivery of ECREports).

Example: Setting Up an Observe Portal Workflow

The Observe Portal workflow allows you to capture data about RFID-tagged objects observed at a particular read point. These instructions describe how to set up an Observe Portal workflow. Substitute your organization’s information for the example data shown here. See “[Workflow Module Reference](#)” on [page 3-1](#) for detailed field information.

To define the workflow modules:

1. Start the following components:
 - a. Ensure that your RFID hardware is connected and powered on or start the Reader Simulator (when it starts, de-select all EPC tags).
 - b. Start the WebLogic RFID Edge Server.
 - c. Start the Administration Console.
2. In the Administration Console, select the **RFID Devices** node under the Edge Server you started in [step 1](#).
3. Configure a reader using the following Symbol Matrics AR400 configuration properties as the example.

Field	Value
Reader Hostname	symbolar400
Default Rate	0
Socket Timeout	5000
Disable Programming Cycle Check	False
Antenna 0 Logical Reader Name	ar400-1
Antenna 0 Power Level	125
Antenna 1 Logical Reader Name	ar400-2
Antenna 1 Power Level	125
Left Stack Light Logical Reader Name	LeftStackLight
Right Stack Light Logical Reader Name	RightStackLight
Stack Light Control Protocol	Bytestream

Note: If you are testing workflows using the Reader Simulator instead of RFID hardware, configure a ThingMagic Mercury4 reader.

4. Select the **Workflow Modules** node under the Edge Server you started in [step 1](#).
5. Click **New**.
6. If using an LED, create a **Numeric Display** workflow module called `ObservePortalNumericDisplay` and define values as follows.

You reference the Numeric Display **Module Name**, `ObservePortalNumericDisplay`, when configuring the Observe Portal (Numeric Display) Output Destinations, in [step 9](#).

Field	Value
Device Host	localhost

Field	Value
Device Port	9090
Device Connection Timeout	5000

7. If using a Stack Light, create a **Stack Light** workflow module called `StackLight`.

You reference the Stack Light **Module Name**, `StackLight`, when configuring the Observe Portal (Stack Light) Output Destinations, in [step 9](#).

Field	Value
Logical Reader Name	LeftStackLight

8. Create a **Message Notifier** workflow module called `ObservePortalMessageNotifier`.

You reference the Message Notifier **Module Name**, `ObservePortalMessageNotifier`, when configuring the Observe Portal (EPCIS) Output Destinations, in [step 9](#).

Field	Value
Destination URI	console:PostbyObservePortalMessageNotifier
Message Format	xml

9. Create an **Observe Portal** workflow module called `ObservePortal`.

You reference the Observe Portal **Module Name**, `ObservePortal`, when configuring the ECSpec subscriber, in [step 11](#).

For detailed field information, see [“Observe Portal Module” on page 3-4](#).

Field	Value
Tag Addition ECReport Name	AdditionReport
EPCIS Object Event Action	OBSERVE
EPCIS Business Step URI	Receiving

Field	Value
EPCIS Read Point URI	urn:epc:id:sgln:004163.00020.0
EPCIS Business Location URI	urn:epc:id:sgln:004163.00018.0
(EPCIS) Output Destinations	ObservePortalMessageNotifier Note: This value must match the Message Notifier Module Name (in step 8). Otherwise, you will get exceptions in the Console when the workflow runs.
(Numeric Display) Display Duration	0
Tag Deletion ECRReport Name	DeletionReport
(Numeric Display) Output Destinations	ObservePortalNumericDisplay Note: This value must match the Numeric Display Module Name (in step 6). Otherwise, you will get exceptions in the Console when the workflow runs.
(Stack Light) Display Duration	0
(Stack Light) Output Destinations	StackLight Note: This value must match the Stack Light Module Name (in step 7). Otherwise, you will get exceptions in the Console when the workflow runs.

To define the workflow:

10. Create an ECSpec with two reports whose report names match those configured in the `ObservePortal` workflow module in [step 9](#) (AdditionReport and DeletionReport).

See [Working With ECSpecs](#) in *Using the RFID Edge Server Administration Console*.

Alternatively, if you are using sample data, import the XML file in the `RFID_EDGE_HOME/samples/Workflow/ObservePortal` directory, instead of performing the following steps a-c. Perform [step d](#).

- a. Add `Reader1` and `Reader2` as the logical readers used by this ECSpec, indicating that each antenna of the Reader Simulator can pick up `ObjectEvents`.

- b. Create and save a tag addition report.

See [Working With ECSpec Reports](#) in *Using the RFID Edge Server Administration Console*.

Field	Value
Report Name	AdditionReport Note: The report name must match the report name in the Observe Portal configuration (step 9) or you will get exceptions in the Console when the workflow runs.
Report Contents	Tag List
Report Set	Additions Note: When a tag appears for the first time in a reader field it will generate an Addition Report that will notify the registered listeners.

- c. Create and save a tag deletion report.

Field	Value
Report Name	DeletionReport Note: The report name must match the report name in the Observe Portal configuration (step 9) or you will get exceptions in the Console when the workflow runs.
Report Contents	Tag List
Report Set	Deletions Note: The workflow only sends information about deleted tags to the Numeric Display module.

- d. In the Administration Console, select **File > Deploy As** and name the ECSpec `ObservePortalECSpec`.

Now the Observe Portal workflow is ready to observe EPC tags. It will do so when you subscribe ECRreport notification to the Observe Portal.

11. Select the `ObservePortalECSpec` ECSpec from the ECSpecs node and click **New** in the ECSpec Subscribers pane at the bottom of the page.
 - a. Create a new subscription.

Field	Value
Type	Workflow Module
Module	ObservePortal
	<p>Note: The Module field must contain the ObservePortal instance name <i><Observe Portal Module Name></i> configured in step 9 or you will get exceptions in the Console when the workflow runs.</p>

- b. Click **Subscribe** to complete the subscription.

The subscriber is added to the ECSpec Subscribers pane.
12. Test the workflow by using the Reader Simulator to simulate a tag read (re-select the tags), or by presenting an EPC tag to the reader you configured earlier (if the ECSpec references a physical reader).

When an EPC tag is detected by a device, an ObjectEvent is sent to the configured destinations. The LED displays the EPC tag count and the stack light remains green until an error is detected. ObjectEvents are displayed in the Edge Server Console. When a tag is taken out of a reader area, the LED count decrements. If a problem is found during transmission of an ObjectEvent, the stack light displays red. No ObjectEvent is displayed in the Edge Server Console for tag removal.

For the Numeric Display module, you can also specify a host and port of the LED device to see the number of tags incremented or decremented.

Example: Setting Up a Bidirectional Portal Workflow

The Bidirectional Portal workflow allows you to determine the movement of RFID-tagged objects from one read point to another, and to capture data about those objects. These instructions describe how to set up a Bidirectional Portal. Substitute your organization’s information for the sample data shown here. See [“Workflow Module Reference” on page 3-1](#) for detailed field information.

Setting up a Bidirectional Portal workflow is very similar to setting up an Observe Portal. The primary differences are:

- You define two sets of configuration parameters, one for each read point, by configuring a Bidirectional Portal workflow module.
- You define a module for each hardware device controlled by the workflow. For example, if there is an LED by each read point, define a Numeric Display module for each one.
- You define two ECSpecs – one to provide ECRReport data to the each read point.

To set up a Bidirectional Portal workflow:

1. Follow steps 1 through 5 of [“Example: Setting Up an Observe Portal Workflow” on page 2-6](#). The remaining steps below explain how to adapt that procedure to setting up a Bidirectional Portal workflow.
2. In [step 6](#), create two **Numeric Display** workflow modules with the **Module Names** `BidirectionalNumericDisplayPoint1` and `BidirectionalNumericDisplayPoint2`. Their **Device Port** properties should be set to 9191 and 9292, respectively.
3. In [step 7](#), create two **Stack Light** workflow modules with the **Module Names** `BidirectionalStackLightPoint1` and `BidirectionalStackLightPoint2`. The **Logical Reader Name** properties should be set to `LeftStackLight` and `RightStackLight`, respectively (to match the logical reader names defined in the reader).
4. In [step 8](#), create a **Message Notifier** workflow module with the **Module Name** `BidirectionalPortalMessageNotifier` as follows:

Field	Value
Destination URI	<code>console:PostbyBidirectionalPortalMessageNotifier</code>

5. In [step 9](#), create a **Bidirectional Portal** workflow module called `BidirectionalPortal1`. For detailed field information, see [“Bidirectional Portal Module” on page 3-2](#).

Field	Value
Object Event Output Destinations	BidirectionalPortalMessageNotifier
	Note: This value must match the Message Notifier Module Name defined in step 4 .
EPCIS Read Point URI	urn:epc:id:sgln:004163.00018.0
Stale Tag Timeout	5000

Side A:

Field	Value
(Side A) Tag Addition ECRename	AdditionReport Side A
(Side A) Tag Deletion ECRename	DeletionReport Side A

Side B:

Field	Value
(Side B) Tag Addition ECRename	AdditionReport Side B
(Side B) Tag Deletion ECRename	DeletionReport Side B

Side A to Side B:

Field	Value
(EPCIS) Object Event Action	OBSERVE
(EPCIS) Aggregation Event Action	OBSERVE
(EPCIS) Business Step URI	Receiving
(EPCIS) Business Location URI	urn:epc:id:sgln:004163.00030.0

Field	Value
(Numeric Display) Display Duration	0
(Numeric Display) Reset Interval	15000
(Numeric Display) Output Destinations	BidirectionalNumericDisplayPoint1 Note: This value must match one of the Numeric Display Module Names defined in step 2 .
(Stack Light) Display Duration	5000
(Stack Light) Output Destinations	BidirectionalStackLightPoint1 Note: This value must match one of the Stack Light Module Names defined in step 3 .

Side B to Side A:

Field	Value
(EPCIS) Object Event Action	OBSERVE
(EPCIS) Aggregation Event Action	OBSERVE
(EPCIS) Business Step URI	Sending
(EPCIS) Business Location URI	urn:epc:id:sgln:004163.00040.0
(Numeric Display) Display Duration	0
(Numeric Display) Reset Interval	15000
(Numeric Display) Output Destinations	BidirectionalNumericDisplayPoint2 Note: This value must match one of the Numeric Display Module Names defined in step 2 .
(Stack Light) Display Duration	5000
(Stack Light) Output Destinations	BidirectionalStackLightPoint2 Note: This value must match one of the Stack Light Module Names defined in step 3 .

Aggregation Data:

Field	Value
Control Tag EPC Patterns	urn:epc:pat:sscc-96:4.0037000.* urn:epc:pat:giai-96:4.0037000.*
Parent Tag EPC Patterns	urn:epc:pat:sscc-96:4.0037000.* urn:epc:pat:giai-96:4.0037000.*
Delay After Detecting Direction	500
Output Destinations	BidirectionalPortalMessageNotifier Note: This value must match the Message Notifier Module Name defined in step 4 .

6. Substitute the instructions below for [step 10](#).

Create two ECSpecs with two reports each, whose report names match those configured in the `BidirectionalPortal` module in [step 5](#).

See [Working With ECSpecs](#) in *Using the RFID Edge Server Administration Console*.

Alternatively, if you are using sample data, import the XML files in the `RFID_EDGE_HOME/samples/Workflow/BidirectionalPortal` directory instead of performing steps a-c. Perform [step d](#) and [step e](#).

- a. Add `Reader1` as the logical reader used by the first ECSpec.
- b. Create and save a tag addition report. See [Working With ECSpec Reports](#) in *Using the RFID Edge Server Administration Console*.

Field	Value
Report Name	AdditionReport Side A Note: The report name must match the report name in the Bidirectional Portal configuration (step 5) or you will get exceptions at the console when the workflow runs.

Field	Value
Report Contents	Tag List
Report Set	Additions
	Note: When a tag appears for the first time in a reader field it will generate an Addition Report that will notify registered listeners.

- c. Create and save a tag deletion report.

Field	Value
Report Name	DeletionReport Side A
	Note: The report name must match the report name in the Bidirectional Portal configuration (step 5) or you will get exceptions at the console when the workflow runs.
Report Contents	Tag List
Report Set	Deletions
	Note: The workflow only sends information about deleted tags to the Numeric Display module.

- d. In the Administration Console, select **File > Deploy As** and name the ECSpec `BidirectionalPortal-Point1-ECSpec`.
- You have an ECSpec with two reports that are dedicated to displaying events for the Bidirectional Portal for its first read point.
- e. Repeat steps a-d to create a second ECSpec named `BidirectionalPortal-Point2-ECSpec` that uses `Reader2` as the logical reader. The two ECRports will be named `AdditionReport Side B` and `DeletionReport Side B`.
7. Substitute the instructions below for [step 11](#).

Now the Bidirectional Portal workflow is ready to observe EPC tags and discern their direction. It will do so when you subscribe ECRport notifications to the Bidirectional Portal.

- a. Select `BidirectionalPortal-Point1-ECSpec` from the ECSpecs node on the Administration Console and click **New** in the ECSpec Subscribers pane at the bottom of the page.
- b. Create a new subscription.

Field	Value
Type	Workflow Module
Module	BidirectionalPortal
	Note: The Module field must contain the BidirectionalPortal instance name <i><Bidirectional Portal Module Name></i> configured in step 5 or you will get exceptions in the Console when the workflow runs.

- c. Click **Subscribe** to complete the subscription.
The subscriber is added to the ECSpec Subscribers pane.
 - d. Repeat steps a-c to subscribe `BidirectionalPortal-Point2-ECSpec`.
8. Test the workflow by using the Reader Simulator to simulate a tag read, or by presenting an EPC tag to the readers you configured earlier (if the ECSpec references a physical reader).
- Note:** If you are using the Reader Simulator, make sure that both antennas have the same EPC tags to simulate the same tag moving from the first logical reader to the second. If the EPC tag is not exactly the same for each antenna, there will be no directional events.

Also if an Observe Portal ECSpec is using `Reader1` or `Reader2` you should suspend the ECSpec (or you will get redundant events from the Observe Portal as well as the expected directional events). This is not necessary, but it does improve readability of the Console output.

When an EPC tag is detected by `Reader1` and then by `Reader2`, a directional `ObjectEvent` is sent to configured destinations for that direction. In addition, the LED displays the current EPC tag count, and the stack light displays green until an error is detected. The `ObjectEvent` is displayed in the EdgeServer Console.

Configuring and Using Workflows

Workflow Module Reference

The following sections describe the WebLogic RFID Edge Server workflow modules:

- [“Overview of RFID Edge Server Workflow Modules”](#) on page 3-1
- [“Bidirectional Portal Module”](#) on page 3-2
- [“Observe Portal Module”](#) on page 3-4
- [“Message Notifier Module”](#) on page 3-6
- [“Numeric Display Module”](#) on page 3-7
- [“Stack Light Module”](#) on page 3-7

Overview of RFID Edge Server Workflow Modules

The following sections describe workflow module configuration parameters. You may notice similarities across modules. Each module requires parameters for operation (which can include information like timing data and EPCIS data) and parameters that allow it to connect to other modules and send data to outside destinations.

You configure workflow modules using the RFID Edge Server Administration Console. See [Configuring Workflow Modules](#) in *Using the Administration Console*.

Output Destinations

Output destinations are destinations for workflow messages. Workflow modules can send messages to multiple destinations; you do this by separating entries in the *Output Destinations*

field with commas. The possible destinations and configuration information are shown in [Table 3-1](#).

Table 3-1 Output Destinations Configuration Properties

Destination	Field Contents
Another workflow module	Destination module name (from the <i>Module Name</i> field).
A notification destination	<p>A URI with the appropriate format for this destination. Drivers for each kind of destination must be configured within the RFID Edge Server.</p> <p>See Installing WebLogic RFID Edge Server for more information on the types of notification mechanisms available in the RFID Edge Server and their URI formats.</p>

Bidirectional Portal Module

The Bidirectional Portal module monitors the movement of EPC tags between two read points and detects directional item movement. Based on tag direction, it maintains tag counts, generates EPCIS ObjectEvents, and manipulates stack lights and LED displays. If a parent tag is detected, it generates an EPCIS AggregationEvent.

Note: Avoid sharing numeric display modules between business modules; unexpected behavior will result.

Several fields in this module configuration are repeated for both read points (locations). These are indicated below by the notation (*Define one for first location and one for second location*).

Table 3-2 Bidirectional Portal Module Configuration Properties

Field Label	Description
Module Name	Unique user-defined identifier for this module.
Module Type	Type of module. Values are chosen from a list of module types.
Object Event Output Destinations	Destinations for EPCIS ObjectEvent information. See “Output Destinations” on page 3-1 . Note that this information can be sent to other destinations as well as to EPCIS.
EPCIS Read Point URI	Location that identifies how or where the EPCIS event was detected.

Table 3-2 Bidirectional Portal Module Configuration Properties (Continued)

Field Label	Description
Stale Tag Timeout	How long (in milliseconds) a tag is kept <i>active</i> (included in the current state management tracking) after it is no longer detected at the second read point. Defaults to 180000.
Tag Addition ECRReport Name	<i>(Define one for Side A and one for Side B)</i> Required. Name of the ECRReport containing tags that have been newly read during this event cycle. Configure this ECRReport to have <i>Additions</i> as its Report Set. Selecting <i>Tag List</i> in the Report Contents is required.
Tag Deletion ECRReport Name	<i>(Define one for Side A and one for Side B)</i> Required. Name of the ECRReport containing tags that have appeared during prior event cycles, but do not appear in the current event cycle. Configure this ECRReport to have <i>Deletions</i> as its Report Set. Selecting <i>Tag List</i> in the Report Contents is required.
(EPCIS) Object Event Action	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Required. One of the EPCIS actions: ADD, DELETE, or OBSERVE. Defaults to OBSERVE.
(EPCIS) Aggregation Event Action	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Required. One of the EPCIS actions: ADD, DELETE, or OBSERVE. Defaults to OBSERVE.
(EPCIS) Business Step URI	<i>(Define one for first location and one for second location)</i> Business context of an EPCIS event; the business process step that was occurring when the event was captured.
(EPCIS) Disposition URI	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Business state of the object participating in the EPCIS event (for example, "available for sale").
(EPCIS) Business Location URI	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Uniquely identified place where the object(s) observed will be located after the EPCIS event.
(Numeric Display) Display Duration	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Duration (in milliseconds) that data should be displayed or flashed on the LED, after which time the LED will go blank. Defaults to 0 (display infinitely).

Table 3-2 Bidirectional Portal Module Configuration Properties (Continued)

Field Label	Description
(Numeric Display) Reset Interval	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> How long (in milliseconds) to wait after last LED update before resetting the LED count to 0. Defaults to 15000.
(Numeric Display) Output Destinations	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Destinations for numeric display (LED) information. See “ Output Destinations ” on page 3-1.
(Stack Light) Display Duration	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Duration (in milliseconds) that each light combination should be displayed on the stack light. Defaults to 0 (display infinitely).
(Stack Light) Output Destinations	<i>(Define one for each direction: Side A to Side B, and Side B to Side A)</i> Destinations for stack light information. See “ Output Destinations ” on page 3-1.
Control Tag EPC Patterns	One or more EPC patterns belonging to a control tag. Entering a pattern in this field indicates to the workflow that aggregation (for example, pallet) data is expected. For more information on EPC patterns, see the <i>EPC Tag Data Standards</i> document, available at http://www.epcglobalinc.org/standards_technology/specifications.html .
Parent Tag EPC Patterns	One or more EPC patterns belonging to a parent tag. Entering a pattern in this field indicates to the workflow that there is an EPC hierarchy.
Delay After Detecting Direction	Delay (in milliseconds) between the control tag being read at the second read point, and the AggregationEvent being sent. Defaults to 0.
Output Destinations	Destinations for EPCIS AggregationEvent information. See “ Output Destinations ” on page 3-1. Note that this information can be sent to other destinations as well as to EPCIS.

Observe Portal Module

The Observe Portal module monitors EPC tag traffic across a read point. It maintains tag counts, generates EPCIS ObjectEvents, and manipulates stack lights and LED displays.

Table 3-3 Observe Portal Module Configuration Properties

Field Label	Description
Module Name	The unique user-defined identifier for this module.
Module Type	The type of module. Values are chosen from a list of module types.
Tag Addition ECRReport Name	Required. Name of the ECRReport containing tags that have been newly read during this event cycle. This ECRReport should be configured to have <i>Additions</i> as its Report Set.
(EPCIS) Object Event Action	Required. One of the EPCIS actions: ADD, DELETE, or OBSERVE. Defaults to OBSERVE.
(EPCIS) Business Step URI	Business context of an EPCIS event; the business process step that was happening when the event was captured.
(EPCIS) Disposition URI	Business state of the object participating in the EPCIS event (for example, "available for sale").
(EPCIS) Read Point URI	Location that identifies how or where the EPCIS event was detected.
(EPCIS) Business Location URI	Uniquely identified place where the object(s) observed will be located after the EPCIS event.
(EPCIS) Output Destinations	Destinations for EPCIS ObjectEvent information. See “Output Destinations” on page 3-1 . Note that this information can be sent to other destinations as well as to EPCIS.
(Numeric Display) Display Duration	Duration (in milliseconds) that data should be displayed or flashed on the LED. Defaults to 0 (display infinitely).
(Numeric Display) Tag Deletion ECRReport Name	Name of the ECRReport containing tags that have appeared during prior event cycles, but do not appear in the current event cycle. This ECRReport should be configured to have <i>Deletions</i> as its Report Set.
Reset Interval	How long (in milliseconds) to wait after last LED update before resetting the LED count to 0.
(Numeric Display) Output Destinations	Destinations for numeric display (LED) information. See “Output Destinations” on page 3-1 . Note: If Output Destinations is configured, you must provide either the Tag Deletion ECRReport Name or the Reset Interval.

Table 3-3 Observe Portal Module Configuration Properties (Continued)

Field Label	Description
(Stack Light) Display Duration	Duration (in milliseconds) that each light combination should be displayed on the stack light. Defaults to 0 (display infinitely).
(Stack Light) Output Destinations	Destinations for stack light information. See “Output Destinations” on page 3-1 .

Message Notifier Module

The Message Notifier module defines the parameters needed to send a message to a notification destination, using a driver previously defined in the RFID Edge Server. Only messages that support XML serialization can be sent. The module sends information from other workflow modules to a destination specified in the *Destination URI* field. It returns a result, which it sends to the destinations specified in the *Failure Output Destinations and Success Output Destinations* fields.

Table 3-4 Message Notifier Module Configuration Properties

Field Label	Description
Module Name	The unique user-defined identifier for this module.
Module Type	The type of module. Values are chosen from a list of module types.
Destination URI	Required. URI of the notification destination.
XSLT File Name	Path and file name of an XSLT file used to transform the message. This file must be available to the RFID Edge Server.
Failure Output Destinations	Destinations for module status messages. See “Output Destinations” on page 3-1 . This field may not contain a reference to a notification destination.
Success Output Destinations	Destinations for module status messages. See “Output Destinations” on page 3-1 . This field may not contain a reference to a notification destination.

Numeric Display Module

The Numeric Display module defines the parameters needed to connect to an LED display. It connects to the LED device using the host and port specified, and attempts to display a value (specified in the calling module). The module returns a result, which it sends to the destinations specified in the *Failure Output Destinations* and *Success Output Destinations* fields.

Table 3-5 Numeric Display Module Configuration Properties

Field Label	Description
Module Name	Unique user-defined identifier for this module.
Device Host	Required. Host name of the device.
Device Port	Required. TCP port used by the device.
Device Connection Timeout	Required. The amount of time (in milliseconds) the device maintains an idle connection with the Edge Server before closing the connection.
Initial Display	Value displayed when module comes on.
Failure Output Destinations	Destinations for module status messages. See “Output Destinations” on page 3-1 . This field may not contain a reference to a notification destination.
Success Output Destinations	Destinations for module status messages. See “Output Destinations” on page 3-1 . This field may not contain a reference to a notification destination.

Stack Light Module

The Stack Light module defines the parameters needed to connect to a stack light. It connects to the stack light using the logical name provided, and attempts to set the lights as specified in the *Initial Color* field. The module returns a result, which it sends to the destinations specified in the *Failure Output Destinations* and *Success Output Destinations* fields.

Table 3-6 Stack Light Module Configuration Properties

Field Label	Description
Module Name	Unique user-defined identifier for this module.
Module Type	Type of module. Values are chosen from a list of module types.

Table 3-6 Stack Light Module Configuration Properties (Continued)

Field Label	Description
Logical Reader Name	Required. Logical name for the stack light device.
Initial Color	Color displayed when module comes on. Allowed values are GREEN, RED, and NONE (no communication with the Stack Light).
Failure Output Destinations	Destinations for module status messages. See “Output Destinations” on page 3-1 . This field may not contain a reference to a notification destination.
Success Output Destinations	Destinations for module status messages. See “Output Destinations” on page 3-1 . This field may not contain a reference to a notification destination.

Index

B

Bidirectional Portal module 2-2, 3-2
business logic modules 2-2

E

EPCIS event 2-3
event cycle 2-4

H

helper modules 2-2

L

LED 2-2
license requirement 1-3

M

Message Notifier module 2-2, 3-6

N

Numeric Display module 2-2

O

Observe Portal module 2-2, 3-4
output destination 3-1

R

reader 2-5
Reader Simulator 2-11, 2-17

S

Stack Light module 2-2, 3-7

W

workflow 2-1
 Bidirectional Portal example 2-11
 configuring 2-5
 license requirement 1-3
 Observe Portal example 2-6
 sample data files 2-9, 2-15
workflow module 2-2, 2-4

