

**Oracle Utilities Smart Grid Gateway  
Adapter for Sensus RNI**

Configuration Guide

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Oracle Utilities Smart Grid Gateway adapter for Sensus Configuration Guide

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Primary Author: TUGBU Documentation

Contributing Author: TUGBU Documentation

Contributor: TUGBU Documentation

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# Chapter 1

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## Overview

This chapter provides an overview of this configuration guide and an introduction to the Oracle Utilities Smart Grid Gateway adapter for Sensus RNI, including the following:

- **What Is This Book?**
- **Other Documentation**
- **Oracle Utilities Application Framework Configuration Tools**

## What Is This Book?

This guide describes how to configure the Oracle Utilities Smart Grid Gateway adapter for Sensus RNI. It is intended for implementers and system administrators responsible for configuration and initial setup of the application.

The Oracle Utilities Smart Grid Gateway adapter for Sensus RNI is based on the Oracle Utilities Application Framework (OUAF). For information about using and configuring basic Framework functions, see the Oracle Utilities Application Framework documentation. This guide only covers configuration of functions specific to the Oracle Utilities Smart Grid Gateway adapter for Sensus RNI.

The body of this guide presents conceptual information to help you understand how the system works as well as how the various configuration options affect system functionality. Once you have an understanding of the system's capabilities, you can plan your data setup and design any customizations you want to implement.

When you are ready to implement your design, use **Chapter 2: General Configuration** to guide you through the setup process of admin data. This section lists each object that can be configured, defines any prerequisites for configuration.

This guide includes the following chapters:

- **Chapter 1: Overview** (this chapter) provides an overview of the Oracle Utilities Smart Grid Gateway adapter for Sensus RNI architecture and of the configuration tools and process used in implementing the product.
- **Chapter 2: General Configuration** provides an overview of some general configuration options used by the Oracle Utilities Smart Grid Gateway adapter for Sensus RNI.

## Other Documentation

This section describes other documentation provided with the Oracle Utilities Smart Grid Gateway adapter for Sensus RNI.

### Installation Documentation

Installation documentation describes the steps involved in the installation and initial set up of the system, and includes the following documents:

- Oracle Utilities Smart Grid Gateway Quick Install Guide
- Oracle Utilities Smart Grid Gateway DBA Guide
- Oracle Utilities Smart Grid Gateway Installation Guide

### User Documentation

User documentation provides conceptual information and procedures related to working with the various objects used in the system, and includes the following documents:

- Oracle Utilities Application Framework Business Process Guide
- Oracle Utilities Application Framework Administration Guide
- Oracle Utilities Service and Measurement Data Foundation User's Guide
- Oracle Utilities Smart Grid Gateway User's Guide

### Supplemental Documentation

Supplemental documentation provides technical information related to system administration tasks and include the following documents:

- Oracle Utilities Smart Grid Gateway Server Administration Guide

- Oracle Utilities Smart Grid Gateway Batch Server Administration Guide
- Oracle Utilities Smart Grid Gateway Configuration Guide
- Oracle Utilities Smart Grid Gateway Security Guide

The Oracle Utilities Smart Grid Gateway adapter for Sensus RNI uses Oracle Service Bus (OSB) and Oracle Business Process Execution Language (BPEL) as middleware components. These tools are part of the Oracle SOA Suite. See the Oracle SOA Suite Documentation library (<http://www.oracle.com/technetwork/middleware/soasuite/documentation/index.html>) for more information about using these tools.

## Embedded Help

Oracle Utilities Smart Grid Gateway, like all Oracle Utilities Application Framework applications, provides extensive internal documentation. For example, detailed descriptions of system objects are included in the objects' maintenance portals. The lifecycle of each business object is described on the Lifecycle tab and depicted in flow diagrams on the Summary tab. This information is extremely useful for implementers and system administrators.

Embedded help is provided for all non-obvious fields in most portals and zones. If a field has associated help text, a ? icon appears next to the field when the zone is displayed.

## Online Help

Oracle Utilities Smart Grid Gateway also includes context-sensitive help for all the user interface screens users will typically work with as they use the system. Online help contains conceptual information and procedures related to working with the various objects used in the system.

The online help is divided into the following three sections:

- Oracle Utilities Application Framework: Describes the features and functions of the application framework (F1)
- Oracle Utilities Service and Measurement Data Foundation: Describes the features and functions provided in the Service and Measurement Data Foundation (D1)
- Oracle Utilities Smart Grid Gateway: Describes the features and functions provided in the smart grid gateway application (D6)

## Oracle Utilities Application Framework Configuration Tools

Please refer to the general configuration guide for information on the Oracle Utilities Application Framework (OUAF) configuration tools that can be used to create and customize system entities, such as business objects, portals, zones, and UI maps. Refer to the Oracle Utilities Application Framework configuration tools documentation for instructions on using tools such as:

- **Configuration Process Overview**
- **Data Areas**
- **Algorithms**
- **Entity Naming Conventions**

This configuration guide does not duplicate the concepts and procedures presented in the Oracle Utilities Application Framework configuration tools documentation; rather, it will identify the specific objects used by the Oracle Utilities Smart Grid Gateway adapter for Sensus RNI that can be configured and customized using the configuration tools, as well as application parameters and objects that can be managed within the application components themselves.

This guide assumes that all individuals responsible for system configuration and implementation will be familiar with the Oracle Utilities Application Framework and will have completed training on the Oracle Utilities Application Framework Configuration Tools.



# Chapter 2

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## General Configuration

This chapter provides details on the components and configurations required for the Smart Grid Gateway adapter for Sensus RNI including the following:

- **Understanding the Adapter**
- **Understanding the Adapter Processing**

## Understanding the Adapter

The Oracle Utilities Smart Grid Gateway Adapter for Sensus RNI supports communication with the Sensus Regional Network Interface (RNI), including measurement data and device event loading, and command messaging in support of commissioning, connect, disconnect, decommissioning, status check, and on-demand read. The following table describes the attributes of the adapter:

| Attribute                   | Details   |
|-----------------------------|---|
| Currently Supported Version | Sensus RNI 3.1  |
| Protocol                    | MultiSpeak 3.0 & 4.1. RNI 3.1 and the SGG Sensus RNI adapter support MultiSpeak 4.1 |
| Market(s)                   | Worldwide   |
| Architecture                | Long range radio WAN (mesh)   |

The adapter uses Oracle Service Bus (OSB) and Oracle Business Process Execution Language (BPEL) to facilitate communication between Oracle Utilities Smart Grid Gateway and the Sensus RNI.

The following functionality is included:

**Measurement Data and Device Event Loading** - data parsing and transformation via Oracle Service Bus from Sensus RNI format into the Oracle Utilities Service and Measurement Data Foundation unified format for measurement data and device events.

**Measurement Data and Device Event Processing** - configurable mapping for Sensus RNI status codes and device event names to Oracle Utilities Service and Measurement Data Foundation standard values.

**Smart Meter Command Processing** - sending/receiving messages to/from the Sensus RNI application to initiate smart meter commands from Oracle Utilities Smart Grid Gateway. The Sensus RNI adapter supports the following types of commands and communications:

- **Meter Commissioning** - business objects and BPEL processes to support issuing meter commissioning commands.
- **Remote Connect** - business objects and BPEL processes to support issuing remote connect commands.
- **Remote Disconnect** - business objects and BPEL processes to support issuing remote disconnect commands
- **Meter Decommissioning** - business objects and BPEL processes to support issuing meter decommissioning commands.
- **On-Demand Read** - business objects and BPEL processes to support issuing on-demand read commands.
- **Device Status Check** - business objects and BPEL processes to support issuing device status check commands.

# Understanding the Adapter Processing

This section provides details concerning the OSB processing, BPEL Processes, and OUAF objects supplied as part of the base package. This information illustrates how the base package objects were designed, and can serve as the basis for any customizations you create as part of your implementation.

This section includes:

- **Initial Measurement Data Load and Device Events**
- **Device Communication**

## Initial Measurement Data Load and Device Events

The initial measurement data load and subsequent device event processing use OSB to poll for, parse, and transform the head-payloads into the Oracle Utilities Smart Grid Gateway service format. Payloads contain measurements and meter events in some head-end specific format OSB then places each service call into a JMS queue within the Oracle Utilities applications. The JMS client consumes the entries and invokes the respective services in parallel then a service creates initial measurements with data in a common format with head-end-specific processing as needed. A second service creates device events with data in a common format

### Initial Measurement

The usage data exported from the AMI head-end system as a file in Sensus RNI format is loaded into Oracle Utilities as Initial measurement data. The following OSB projects, delivered in the base product, help manage the usage processing:

1. SGG-D6-USAGE-BASE - contains components responsible for “actual” processing of incoming data. It should not be modified during configuration. This can be upgraded without affecting the customization and environment settings added to SGG-D6-USAGE-CM.
2. SGG-D6-USAGE-CM allows for customization and simplifies future upgrades.

The runtime configuration settings for the SGG-D6-USAGE-CM project are stored in the xquery file EnvironmentSettings.xq. You can use this file to adjust initial measurement data processing. For example, if you want to load raw data you would specify “true” for the content of the populateRawIMD element.

The following table describes the elements included in the EnvironmentSettings.xq file:

| Element            | Description  |
|--------------------|--|
| populateRawIMD     | Determines if the initial measurement data is populated as raw data. Valid values are: <ul style="list-style-type: none"> <li>• true</li> <li>• false</li> </ul> |
| callPreProcessing  | Determines if the preprocessing proxy service is called. Valid values are: <ul style="list-style-type: none"> <li>• true</li> <li>• false</li> </ul>             |
| callPostProcessing | Determines if the postprocessing proxy service is called. Valid values are: <ul style="list-style-type: none"> <li>• true</li> <li>• false</li> </ul>            |

| Element                        | Description  |
|--------------------------------|--|
| destinationRootElementInterval | Holds the name of XAI inbound service for the interval IMD seeder.   |
| destinationRootElementScalar   | Holds the name of XAI inbound service for the scalar IMD seeder. In most cases it is the same as destinationRootElementInterval. |

## Device Events

The device event data exported from the head-end system as a file in Sensus RNI format is loaded into Oracle Utilities as a Device Event. One of your configuration tasks is to customize the device events processing.

The required functionality is delivered in the base product as two OSB projects:

1. SGG-D6-EVENT-BASE contains components responsible for “actual” processing of incoming data. It can be upgraded in future without affecting the customization and environment settings that done in SGG-D6-EVENT-CM project.
2. SGG-D6-EVENT-CM allows the customization and simplifies the future upgrades.

## Base Package Business Objects

The Sensus RNI adapter base package includes the following initial measurement and device event business objects:

| Business Object Name         | Description  |
|------------------------------|--|
| D6-InitialLoadIMDInterval    | Sensus Initial Load IMD - Interval<br><br>Used when loading Sensus interval measurements into the system for the first time. |
| D6-InitialLoadIMDScalar      | Sensus Initial Load IMD - Scalar   |
| D6-DeviceEventMappingLookup  | Sensus Device Event Mapping  |
| D6-HeadendUOMLookup          | Sensus UOM Code to Standard UOM Mapping  |
| D6-IntStsCodeToCondMapLookup | Sensus Interval Status Mapping<br><br>This is a child BO of Interval Status Code to Condition Mapping                        |

## Sensus Device Event Mapping BO

The Sensus RNI head-end system is capable of sending a large selection of device events. The adapter maps these events into standard Oracle Utilities Smart Grid Gateway event names and categories. To meet this end, a Sensus-specific extendable lookup business object, D6-DeviceEventMappingLookup, holds device event names specific to Sensus RNI.

## Device Communication

The basic communication for all business processing is essentially the same. A communication request is sent from the Oracle Utilities application to Sensus RNI. This request would be for a connect/disconnect, commission/decommission, measurement data, device status check, or an on-demand read. The designated BPEL process transforms the request from Oracle Utilities format to MultiSpeak format and invokes the related Sensus RNI web service. Sensus RNI then returns a reply, and the BPEL process transforms the reply message back to the appropriate format so that Oracle Utilities can receive the response.

The following sections describe the key components in this processing, including:

- **Communication Flows**
- **Base Package Business Objects**
- **External System**
- **Outbound Message Types**
- **XAI Configuration**
- **BPEL Processes**

### Communication Flows

The table below lists the communications created for each Sensus RNI command:

| Command                   | Outbound Communication                   | Inbound Communication                        | Completion Event                        |
|---------------------------|--|--|---|
| Remote Connect            | Sensus – Initiate Connect Disconnect     | Sensus – Connect / Disconnect State Change   | Connect Device Completion Event         |
| Remote Disconnect         | Sensus – Initiate Connect Disconnect     | Sensus – Connect / Disconnect State Change   | Disconnect Device Completion Event      |
| Device Commissioning      | Sensus – Meter Add Notification          |  | Device Commissioning Completion Event   |
| Device Decommissioning    | Sensus – Meter Remote Notification       |  | Device Decommissioning Completion Event |
| On-Demand Read (Scalar)   | Sensus – Initiate Meter Read By Meter ID | Sensus – Reading Changed Notification        | Create IMD Completion Event             |
| On-Demand Read (Interval) |  | Interval data not supported                  |   |
| Device Status Check       | Sensus – Initiate Outage Detection       | Sensus – Outage Detection Event Notification |   |

### Base Package Business Objects

The Sensus RNI Adapter base package includes the following communication business objects:

| Business Object Name        | Description                              |
|-----------------------------|--|
| D6-ConnectDisconStateChgNtf | Sensus - Connect/Disconnect State Change |

| Business Object Name           | Description                                  |
|--------------------------------|--|
| D6-InitiateConnectDisconnect   | Sensus - Initiate Connect Disconnect         |
| D6-InitiateOutageDetection     | Sensus - Initiate Outage Detection           |
| D6-InitiateMeterByMeterId      | Sensus - Initiate Meter Read By Meter ID     |
| D6-MeterAddNotification        | Sensus - Meter Add Notification              |
| D6-MeterRemoveNotification     | Sensus - Meter Remove Notification           |
| D6-OutageDetectEvtNotification | Sensus - Outage Detection Event Notification |
| D6-ReadingChgNotification      | Sensus - Reading Changed Notification        |
| D6-UnsolicitedEvtNotification  | Sensus - Unsolicited Event Notification      |

### Sensus Event Data Mapping

The Sensus event file format maps as follows into the business object, D1-DeviceEventMappingLookup:

| Sensus Flat File Field              | Device Event Seeder BO Element           | Comments   |
|-------------------------------------|--|--|
| Transaction ID (from Header record) | External Source Identifier               | This is the file name.   |
| Device Identifier                   | External Device Identifier               |  |
| Event Name                          | External Event Name                      |  |
| Event Creation Date/Time            | Event Date/Time                          |  |
| Device Type                         | External Device Type                     | This element has no real bearing on the device type within MDM/SGG. Its valid values include (although the element itself is free-form):<br>Meter<br>Collector<br>Router |
| Service Location ID                 | External Service Location ID             |  |
| Communication Module Serial Number  | External Communication Module Identifier |  |
| Event Category ID                   | External Event Category                  |  |
| Event Severity                      | External Event Severity                  | Valid values include (although the element itself is free-form):<br>Alert<br>Information   |
| Status Value                        | External Status Value                    | This represents additional information that relates to the event itself.   |

| Sensus Flat File Field | Device Event Seeder BO Element | Comments   |
|------------------------|--------------------------------|--|
| Status Date/Time       | External Status Date/Time      | The date & time at which the additional information referenced above had occurred. |

## External System

You must create an External System for each external system to which Oracle Utilities Smart Grid Gateway will send messages. Each external system defines a set of outbound message types that will be sent to that system. Each external system outbound message type also specifies the following:

- The processing method used to send the message (Batch, XAI, or Real-time)
- The corresponding XAI senders
- Batch Control (if Processing Method is set to Batch)
- Message XSL, W3C Schema, and Response XSL (as applicable)

## Outbound Message Types

Acknowledgement and response messages are sent and received validating that commands have been transmitted.

## XAI Configuration

The XML Application Integration (XAI) utility allows you to configure your system to receive information from and to send information to external applications using XML. The Sensus RNI adapter for Smart Grid Gateway uses one XAI inbound service to map device events. This is the same XAI inbound service used by the D1 application.

## XAI Inbound Services

XAI inbound systems define the details of how messages are received from an external system, including the inbound communication business object (or business service or service script) to be invoked when the response message is received. As in the case of inbound communication business objects, the set of XAI inbound services you need to create is based on the types of messages the system is designed to send.

The Oracle Utilities Smart Grid Gateway adapter for Sensus RNI includes the following XAI inbound services:

| XAI Inbound Service  | Description  |
|----------------------|--|
| D1-BulkRequestHeader | Bulk Request Header<br>Schema Name: D1-BulkRequestHeader |
| D1-BulkRequestUpdate | Bulk Request Update<br>Schema Name: D1-BULKUPD           |
| D1-BulkResponse      | Bulk Response<br>Schema Name: D1-BulkResponse            |

| XAI Inbound Service  | Description   |
|----------------------|---|
| D1-DeviceEventSeeder | <p>Used for upload of device events.</p> <p>Schema Name: D1-DeviceEventSeeder.</p> <p>The Device Event Seeder business object serves as a means of adding device events both from outside the application and from online. Its pre-processing algorithms determine the device event type - which in turn defines the device event BO that should be used to create the device event.</p> <p>If a device event type can't be determined, the device event is created using this BO. Such a device event can then be re-processed - and if successful, a new device event is created.</p> |
| D1-InitialLoadIMD    | <p>Used for initial measurement upload.</p> <p>Schema Name: D1-IMDSeeder.</p> <p>The IMDSeeder business object is used to determine the type of initial measurement business object to instantiate when receiving usage readings from a head-end system.</p>  |
| D1-DeviceStatusCheck | <p>Device Status Check</p> <p>Schema Name: D1-DeviceStatusCheck</p> <p>This service is invoked by the integration layer to instantiate a Device Status Check command.</p>   |
| D1-InitialLoadIMD    | <p>Used by OSB to instantiate an IMD</p> <p>Schema Name: D1-IMDSeeder</p> <p>This XAI Inbound service is used by OSB to instantiate an Initial Measurement Data for incoming interval usage in the Sensus format.</p>   |
| D1-RemoteConnect     | <p>Remote Connect</p> <p>Schema Name: D1-RemoteConnect</p> <p>This service is invoked by the integration layer to instantiate a Remote Connect command.</p>   |
| D1-RemoteDisconnect  | <p>Remote Disconnect</p> <p>Schema Name: D1-RemoteDisconnect</p> <p>This service is invoked by the integration layer to instantiate a Remote Disconnect command.</p>  |



| <b>XAI Inbound Service</b>          | <b>Description</b>   |
|-------------------------------------|--|
| D6-ConDisconStChgNotification       | Initiate Connect Disconnect response.<br><br>Schema Name: D6-ConnectDisconStateChgNtf<br><br>Retrieve response from the Initiate Connect Disconnect command.                     |
| D6-OutageDetectionEventNotification | Initiate Outage Detection Response<br><br>Schema Name:<br>D6-OutageDetectEvtNotification<br><br>Retrieve response from the Initiate Outage Detection Event Notification command. |
| D6-ReadingChangedNotification       | Reading Changed Notification<br><br>Schema Name: D6-ReadingChgNotification<br><br>Notification that a Sensus device reading has changed.   |
| D6-UnsolicitedEventNotification     | Unsolicited Event Response<br><br>Schema Name: D6-UnsolicitedEvtNotification<br><br>Retrieve unsolicited notifications when an event triggers an alarm on the meter.             |

## XAI Senders

XAI senders define the details of how messages are sent to an external system. As in the case of outbound communication business objects and outbound message types, the set of XAI senders you need to create is based on the types of messages the system is designed to accept.

## BPEL Processes

These processes are responsible for performing the conversion from Oracle Utilities format to MultiSpeak 4.1 format, invoking process callouts and invoking the remote endpoint to trigger the device events.

**OnDemandRead Composite Process** - Invokes the remote endpoint to trigger the on-demand read event. An asynchronous reply responds to the OUAF layer when the reading arrives.

**ConnectDisconnect Composite Process** - Invokes the remote endpoint to trigger the connect/disconnect event. An asynchronous reply responds to the OUAF layer when confirmation of the requested event arrives.

**CommissionDecommission Composite Process** - Invokes the remote endpoint to trigger the commission or decommission event. After the synchronous call completes, a one of the following second business callout services is invoked to determine if the related “received” or “completed” callout should be executed:

- `isExecutingCommissionReceivedCallout`
- `isExecutingCommissionCompletedCallout`
- `isExecutingDecommissionReceivedCallout`
- `isExecutingDecommissionCompletedCallout`

**DeviceStatusCheck Composite** - Invokes the remote endpoint to trigger the initiate outage detection event. An asynchronous reply responds to the OUAF layer when confirmation of the requested event arrives.

**ProcessCallout Composite** - This business callout provides a point at which customers and implementers can incorporate custom business logic and transformations. This composite includes the WSDLs and processing logic for all of the MultiSpeak processes. The default implementation of each method is a direct return of the input.

## Web Services

These web services are all defined in the Sensus RNI head end system. The WSDLs were added to a Meta Data Storage (MDS) layer in OUAF and all references to the WSDL point to this MDS location. These web services have HTTP security by default. You may need to modify the security as a part of your implementation.

| Web Service      | Related BPEL Process | Description  |
|------------------|----------------------|--|
| CB_ServerService | ConnectDisconnect    | <p>This web service defines the return interface, the means by which the status is returned to the calling system.</p> <p>This web service is only be invoked by the head end system, not OUAF. Only the CDStateChangeNotification web method is implemented in the composite.</p> <p>The endpointURI format is: http://&lt;EM_SERVER&gt;:&lt;EM_SERVER_PORT&gt;/soa-infra/services/Sensus/ConnectDisconnect/CB_ServerService</p>  |
| CB_Server        | OnDemandRead         | <p>This web service defines the return interface, the means by which the reading is returned to the calling system.</p> <p>This web service is only be invoked by the head end system, not OUAF. Only the ReadingChangedNotification web method is implemented in the composite.</p> <p>The endpointURI format is: http://&lt;EM_SERVER&gt;:&lt;EM_SERVER_PORT&gt;/soa-infra/services/Sensus/OnDemandRead/CB_Server</p>  |
| OA_ServerService | DeviceStatusCheck    | <p>This web service defines the asynchronous return for InitiateOutageDetectionEventRequest for solicited responses. It is also used for unsolicited alarms.</p> <p>This web service is only be invoked by the head end system, not OUAF. Only the ODEventNotification, PingURL, and GetMethods web methods are implemented in the composite.</p> <p>The endpointURI format is: http://&lt;EM_SERVER&gt;:&lt;EM_SERVER_PORT&gt;/soa-infra/services/Sensus/DeviceStatusCheck/OA_ServerService</p> |

**Sensus RNI Web Services**

The following table describes the Sensus RNI web services and operations used for the Oracle Utilities Smart Grid Gateway command messaging:

| <b>Smart Grid Gateway Command</b>    | <b>AMI Adapter Business Objects</b> | <b>Sensus Web Services</b> | <b>Sensus Operations</b>                  |
|--------------------------------------|-------------------------------------|----------------------------|---|
| Device Commissioning                 | D6-MeterAddNotification             | MR                         | MeterAddNotification                      |
| Device Decommissioning               | D6-MeterRemoveNotification          | MR                         | MeterRemoveNotification                   |
| Remote Connect/<br>Remote Disconnect | D6-InitiateConnectDisconnect        | CD                         | InitiateConnectDisconnect                 |
|                                      | D6-ConnectDisconStateChgNtf         | CB                         | CDStatesChangedNotification (async reply) |
| Device Status Check                  | D6-InitiateOutageDetection          | OD                         | InitiateOutageDetectionEventRequest       |
|                                      | D6-OutageDetectEvtNotification      | OA                         | ODEventNotification (async reply)         |
| On-Demand Read                       | D6-InitiateMeterByMeterId           | MR                         | InitiateMeterReadingsByMeterID            |
|                                      | D6-ReadingChangedNotification       | CB                         | ReadingChangedNotification (async reply)  |

## Configuring a Sensus RNI Head-End System

This section outlines the configuration required for the Oracle Utilities Smart Grid Gateway Adapter for Sensus RNI to communicate with the Sensus RNI. This includes:

- **XAI Inbound Services**
- **XAI Senders**
- **Outbound Message Types**
- **External System**
- **Service Provider**
- **Processing Methods for Service Provider**

### XAI Inbound Services

XAI inbound services define the details of how messages are received from an external system. This includes incoming usage and device events, as well as messages sent from the Sensus Regional Network Interface (RNI) in response to a command request.

The following XAI Inbound Services must be configured in your system. If these are not present in your configuration, add them. Refer to the Oracle Utilities Application Framework documentation for more information about creating XAI inbound services.

| <b>XAI Inbound Service Name</b>     | <b>Description</b>                      | <b>Schema Type</b> | <b>Schema Name</b>             |
|-------------------------------------|---|--------------------|--------------------------------|
| D1-DeviceEventSeeder                | Device Event Seeder                     | Business Object    | D1-DeviceEventSeeder           |
| D1-DeviceStatusCheck                | Device Status Check                     | Business Object    | D1-DeviceStatusCheck           |
| D1-InitialLoadIMD                   | IMD Seeder                              | Business Object    | D1-IMDSeeder                   |
| D1-PayloadErrorNotif                | Payload Error Notification              | Business Object    | D1-PayloadErrorNotif           |
| D1-PayloadStatistics                | Payload Statistics                      | Business Object    | D1-PayloadStatistics           |
| D1-PayloadSummary                   | Payload Summary                         | Business Object    | D1-PayloadSummary              |
| D6-ConDisconStChgNotification       | Initiate Connect<br>Disconnect Response | Business Object    | D6-ConnectDisconStateChgNtf    |
| D6-OutageDetectionEventNotification | Initiate Outage Detection<br>Response   | Business Object    | D6-OutageDetectEvtNotification |
| D6-ReadingChangedNotification       | Reading Changed<br>Notification         | Business Object    | D6-ReadingChgNotification      |
| D6-UnsolicitedEventNotification     | Unsolicited Event<br>Response           | Business Object    | D6-UnsolicitedEvtNotification  |

## XAI Senders

XAI senders define the details of how messages are sent to an external system, such as messages containing device command requests.

The following XAI Senders must be configured in your system. If these are not present in your configuration, add them. Refer to the Oracle Utilities Application Framework documentation for more information about creating XAI senders.

| XAI Sender   | Description                                      | Operation                           | Service             |
|--------------|--|-------------------------------------|---------------------|
| D6-CONDISCON | Sensus Initiate Connect/Disconnect               | InitiateConnectDisconnect           | ConnectDisconnect   |
| D6-INTOUTDET | Initiate Outage Detection Request                | InitiateOutageDetectionEventRequest | OD_ServerService    |
| D6-InitMID   | Initiate Meter Read By Meter ID Outbound Message | InitiateMeterReadingsByMeterID      | OnDemandReadService |

Note: The following apply to all of the above XAI senders:

Main Tab:

- **Invocation Type:** Real-time
- **XAI Class:** RTHTTPSNDR (Sender routes message via HTTP real-time)
- **MSG Encoding:** UTF-8 message encoding

Context Tab:

- **HTTP Header:** SOAPAction:<OPERATION>
- **HTTP Login User:** <USER\_ID>
- **HTTP Login Password:** <PASSWORD>
- **HTTP Method:** POST
- **HTTP URL 1:** http://<EM\_SERVER>:<EM\_SERVER\_PORT>/soa-infra/services/Sensus/<SERVICE>

where:

- **<OPERATION>**: the operation performed by the XAI Sender (see Operation column in the table above)
- **<USER\_ID>**: the user ID used to log into WebLogic Enterprise Manager
- **<PASSWORD>**: the password used to log into WebLogic Enterprise Manager
- **<EM\_SERVER\_IP>**: the machine name or IP address of server where the WebLogic Enterprise Manager is installed
- **<EM\_SERVER\_PORT>**: the port where the WebLogic Enterprise Manager is installed
- **<SERVICE>**: the service invoked by the XAI Sender (see Service column in the table above)

## Outbound Message Types

Outbound message types define specific types of messages sent to an external system, such as messages containing device command requests.

The following outbound message types must be configured in your system. If these are not present in your configuration, add them. Refer to the Oracle Utilities Application Framework documentation for more information about creating outbound message types.

| Outbound Message Type | Description                        |
|-----------------------|------------------------------------|
| D6-CONDISCON          | Sensus Initiate Connect Disconnect |
| D6-INITMTR            | Initiate Meter Read By Meter ID    |
| D6-INTOUTDET          | Initiate Outage Detection Request  |

Note: The following apply to all of the above outbound message types:

- **Business Object:** D1-OutboundMessage (Outbound Message)
- **Priority:** Priority 50

## External System

External systems represent external applications with which the Smart Grid Gateway will exchange messages or data. In the case of the Smart Grid Gateway adapters, external systems represent the head-end systems with which the adapters communicate.

An external system that represents the Sensus RNI must be present in your system. If this is not present in your configuration, add it, along with the following Outbound Message Types. Refer to the Oracle Utilities Application Framework documentation for more information about creating external systems.

### External System - Sensus:

- **External System:** Sensus
- **Description:** Sensus
- **Outbound Message Types:**

| Outbound Message Type                             | XAI Sender  |
|---|---|
| D6-CONDISCON (Sensus Initiate Connect Disconnect) | D6-CONDISCON (Sensus Initiate Connect/Disconnect)             |
| D6-INITMTR (Initiate Meter Read By Meter ID)      | D6-InitMID (Initiate Meter Read By Meter ID Outbound Message) |
| D6-INTOUTDET (Initiate Outage Detection Request)  | D6-INTOUTDET (Initiate Outage Detection Request)              |

Note: The following apply to all of the above outbound message types:

- **Processing Method:** Real-time
- **Message XSL:** D6-Request.xsl
- **Response XSL:** D6-Response.xsl

## Service Provider

Service providers represent external entities that serve various roles relative to the application, including head-end systems, billing systems to which the application sends bill determinant data, market participants in a deregulated environment, outage management systems that receive meter event data from the application, or other parties that require or provide information to the system. The head-end systems that collect and send measurement data and meter events to the application are defined as service providers.

A service provider that represents the Sensus RNI must be present in your system. If this is not present in your configuration, add it. Refer to the Oracle Utilities Service and Measurement Data Foundation documentation for more information about creating service providers.

### Service Provider - Sensus:

- **Service Provider:** Sensus
- **Description:** Sensus
- **External Reference ID:** Sensus
- **External System:** Sensus
- **Our Name/ID in Their System:**
- **AMI Device ID Type:** Internal Meter Number
- **AMI Measuring Component ID Type:** Channel ID

## Processing Methods for Service Provider

Processing methods define the format or means by which a service provider receives and/or sends data from and/or to the application, including bill determinants, usage data, or device events. Processing methods are also used to define how to create information internal to the application such as initial measurement data and device events. Processing methods can also be used to define how command requests are sent to the Sensus RNI.

The following types of processing methods must be configured for the Sensus service provider. Refer to the Oracle Utilities Service and Measurement Data Foundation documentation for more information about configuring processing methods.

### Initial Measurement Creation

Initial measurement creation processing methods define the business objects used to create initial measurements. The IMD Seeder XAI Inbound Service uses this processing method to determine which type of initial measurement business object to instantiate when receiving usage from the Sensus RNI.

### Processing Method - Initial Measurement Creation

- **Service Provider:** Sensus
- **Processing Role:** Initial Measurement Creation
- **Description:** Sensus Initial Measurement Creation
- **Status:** Active
- **Default Processing Method:**
  - **Business Object:** D6-InitialLoadIMDInterval (Sensus Initial Load IMD - Interval)
- **Override Processing Method:**
  - **Measuring Component Type:** Electric Residential kWh Scalar
  - **Business Object:** D6-InitialLoadIMDScalar (Sensus Initial Load IMD - Scalar)



## Device Event Mapping

Device event mapping processing methods define how head-end-specific device events are mapped to standard device event names. The Device Event Seeder XAI Inbound Service uses this processing method to determine which type of device event business object to instantiate when receiving device events from the Sensus RNI.

### Processing Method - Device Event Mapping

- **Service Provider:** Sensus
- **Processing Role:** Device Event Mapping
- **Description:** Sensus Device Event Mapping
- **Status:** Active
- **Default Processing Method:**
  - **Business Object:** D6-DeviceEventMappingLookup (Sensus Device Event Mapping)
- **Override Processing Method:** based on implementation-specific requirements

## UOM Mapping

UOM mapping processing methods define how head-end-specific unit of measure (UOM) codes are mapped to standard UOM codes. This processing method is used to determine how to map Sensus UOM codes to standard UOM codes when receiving usage from the Sensus RNI.

### Processing Method - UOM Mapping

- **Service Provider:** Sensus
- **Processing Role:** UOM Mapping
- **Description:** Sensus UOM Mapping
- **Status:** Active
- **Default Processing Method:**
  - **Business Object:** D6-HeadendUOMLookup (Sensus UOM Code to Standard UOM Mapping)
- **Override Processing Method:** based on implementation-specific requirements

## Commands

Command processing methods define how command requests are sent to a head-end system. More specifically, they define the type of outbound communication business object to create for each type of command, and the outbound message type to send to the head-end system.

The following types of command processing methods can be configured for the Sensus service provider, based on the requirements of each implementation.

### Device Commission

- **Service Provider:** Sensus
- **Processing Role:** Device Commission
- **Description:** Sensus Device Commission
- **Status:** Active
- **Processing Method:**
  - **Default Business Object:** D6-MeterAddNotification (Sensus Meter Add Notification)
  - **Default Outbound Message Type:** Sensus Commissioning Outbound Message Type

### Device Decommission

- **Service Provider:** Sensus
- **Processing Role:** Device Decommission
- **Description:** Sensus Device Decommission
- **Status:** Active
- **Processing Method:**
  - **Default Business Object:** D6-MeterRemoveNotification (Sensus - Meter Remove Notification)
  - **Default Outbound Message Type:** Meter Decommissioning

### Device Status Check

- **Service Provider:** Sensus
- **Processing Role:** Device Status Check
- **Description:** Initiate Outage Detection
- **Status:** Active
- **Processing Method:**
  - **Default Business Object:** D6-InitiateOutageDetection (Sensus - Initiate Outage Detection)
  - **Default Outbound Message Type:** Initiate Outage Detection Request

### On-Demand Read (Scalar)

- **Service Provider:** Sensus
- **Processing Role:** On-Demand Read (Scalar)
- **Description:** On-Demand Read Sensus (Scalar)
- **Status:** Active
- **Processing Method:**
  - **Default Business Object:** D6-InitiateMeterByMeterId (Sensus - Initiate Meter Read by Meter ID)
  - **Default Outbound Message Type:** Initiate Meter Read by Meter ID

### Remote Connect

- **Service Provider:** Sensus
- **Processing Role:** Remote Connect
- **Description:** Sensus Initiate Connect
- **Status:** Active
- **Processing Method:**
  - **Default Business Object:** D6-InitiateConnectDisconnect (Sensus - Initiate Connect Disconnect)
  - **Default Outbound Message Type:** Connect Device

### Remote Disconnect

- **Service Provider:** Sensus
- **Processing Role:** Remote Disconnect
- **Description:** Sensus Initiate Disconnect

- **Status:** Active
- **Processing Method:**
  - **Default Business Object:** D6-InitiateConnectDisconnect (Sensus - Initiate Connect Disconnect)
  - **Default Outbound Message Type:** Initiate Connect Disconnect

## Configuring Sensus Extendable Lookups

This section outlines some of the extendable lookups that must be configured for use with the Sensus adapter. These include:

- **Sensus Device Event Mapping**
- **Sensus UOM Code to Standard UOM Mapping**
- **Sensus Interval Status Code to Condition Mapping**

Refer to the Oracle Utilities Application Framework documentation for more information about working with extendable lookups.

### Sensus Device Event Mapping

The Sensus Device Event Mapping extendable lookup is used to determine which type of device event business object to instantiate when receiving device events from the Sensus RNI.

Each value defined for the Sensus Device Event Mapping extendable lookup should include the following:

- **Head-End System Event Name:** The event name used by the Sensus RNI
- **Description:** A description of the device event
- **Status:** The status of the lookup value (can be Active or Inactive)
- **Standard Event Name:** The standard event name for device events of this type, from the “Standard Event Name” extendable lookup.

**Example:** The Sensus “Tampering” device event name could be mapped to the “Device Tampering” standard device event name as follows:

- **Head-End System Event Name:** Tampering
- **Description:** Tampering Detected
- **Status:** Active
- **Standard Event Name:** Device Tampering

### Sensus UOM Code to Standard UOM Mapping

Usage received from Sensus may use utility-specific unit of measures (UOMs). These custom UOMs must be mapped to standard UOM codes. The Sensus UOM Code to Standard UOM Mapping extendable lookup is used to determine how to map Sensus UOM codes to standard UOM codes when receiving usage from the Sensus RNI.

Each value defined for the Sensus UOM Code to Standard UOM Mapping extendable lookup should include the following:

- **Unit of Measure:** The unit of measure defined in the system. See Defining Units of Measure in the *Oracle Utilities Service and Measurement Data Foundation User's Guide* for more information about creating UOM codes for use with Oracle Utilities Smart Grid Gateway.
- **Head-end UOM:** The unit of measure code used by the Sensus RNI
- **Description:** A description of the unit of measure code.
- **Status:** The status of the lookup value (can be Active or Inactive)

**Example:** The Sensus “KWH” unit of measure code could be mapped to the “Kilowatt Hours” standard UOM code as follows:

- **Unit of Measure:** Kilowatt Hours
- **Head-end UOM:** kWh

- **Description:** Sensus Kilowatt Hours

## Sensus Interval Status Code to Condition Mapping

Interval usage received from the Sensus RNI can include Sensus interval status codes that indicate the status or condition of the interval value. These interval status codes must be mapped to standard condition codes in the system. The Sensus Interval Status Code to Condition Mapping extendable lookup is used to determine how to map Sensus interval status codes to standard status codes when receiving usage from the Sensus RNI.

Each value defined for the Sensus Interval Status Code to Condition Mapping extendable lookup should include the following:

- **Interval Status:** The Sensus interval status code
- **Description:** A description of the interval status code.
- **Status:** The status of the lookup value (can be Active or Inactive)
- **Condition:** The condition code to which the interval status code is to be mapped, from the Measurement Condition extendable lookup.

**Example:** The Sensus “Missing” interval status code could be mapped to the “Missing” condition code as follows:

- **Interval Status:** Missing
- **Condition:** Missing
- **Description:** Sensus Missing

## Extending the Adapter for Sensus

The Oracle Utilities Smart Grid Gateway Adapter for Sensus supports a number of commands, including:

- Commission Device
- Decommission Device
- Device Status Check
- On-Demand Read
- Remote Connect
- Remote Disconnect

The Adapter for Sensus can be extended to support additional commands provided by the Sensus RNI. See **Creating Custom Commands** on page 9-26 of the *Oracle Utilities Smart Grid Gateway Configuration Guide* for more information about adding commands to the Sensus adapter.

# Appendix

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## Glossary

This glossary provides definitions of commonly used terms.

### **Command Effective Date/Time**

The date and time when a device command becomes effective.

### **Command Expiration Date/Time**

The date and time when a device command expires.

### **Commissioning**

A command issued to establish communication between a device and the head-end system. The goal is to ensure connectivity has been established with the device, that any information needed to communicate with the meter has been defined in both Oracle Utilities Smart Grid Gateway and the head end system, and the meter will begin capturing usage and events.

### **Decommissioning**

A command issued to inform the head-end system when a meter needs to be removed from a service point, so that no further reads or events will arrive from the meter. Decommissioning is invoked when a meter must be removed or deactivated. The goal is to stop any communication between the device and the head-end system.

### **Head-End System**

A system that collects measurement data and meter events for eventual submission to the application. Many devices can communicate to the application through a single head-end system. A utility may have numerous head-end systems through which they communicate with devices.

### **On-Demand Read**

A request for the most up-to-date reading from a particular meter. It is not guaranteed to return immediately; it could require a person to manually read the meter. The purposes are to check the meter's operational status and/or obtain a more recent reading than is currently available.

### **Payload**

An upload component which contains measurements and meter events in a format specific to the

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head-end. Payloads are part of the initial upload of measurement data.

**Remote Connect**

A command issued when a meter needs to be connected at a service point.



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