GridOps Management Suite 3.10

Switching Management Notification Interface

Functional Specification

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1. REFERENCES

#	Title	Description
1.	EcoStruxure GridOps Management Suite 3.10 Enterprise Integration Platform - Functional Specification	The document represents a set of common integration principles applied to all baseline integration adapters.
2.	EcoStruxure GridOps Management Suite 3.10 Switching Management - Functional Specification	The document provides a detailed description of the Switching Management application. The Switching Management application is a set of tools for managing and documenting all planned and unplanned switching activities in the network.
3.	EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface	EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface zip file contains essential configuration information, data mappings, as well as web service definitions complemented with message examples.

2. ASSUMPTIONS

The Switching Management Notification integration is designed under the following assumptions:

- Users of external system have possibility to get appropriate notification related to planned work (Work Requests, Switching Plans and Switching Steps).
- Message exchange is supported utilizing publish/subscribe integration pattern.
- Since switching management functionality is highly configurable, appropriate types (enumerations such as works status, switching plans status, switching step status, etc.) that need to be exchanged with the external systems must be defined during design sessions.
- Configurable coordinate conversion is possible for entities which encompass coordinates.

3. INTRODUCTION

EcoStruxure GridOps Management Suite is a family of solutions designed to help electric utilities in the operations and management of their grid. It is offered as EcoStruxure ADMS, EcoStruxure Grid Operation, EcoStruxure DERMS or EcoStruxure Energy Transmission Operation solutions, which share the same technology platform.

NOTE: The functionality described in this document applies to all solutions.

NOTE: Most images presented in this document are related to the EcoStruxure ADMS solution and should be used as an example. The images for other solutions may differ slightly.

In certain situations, service consumers want to be notified in near real-time about changes being made in planed works (Works, Switching Plans and Switching Steps).

The Switching Management Notification (SMN) Interface is designed to provide relevant information about changes in switching management model to other systems, in near real-time. Such functionality enables utilities to support various business processes and day-to-day activities. Integration is designed “one-way”, which means that flow of data is always towards external system.

Changes in switching management model to be sent to the external system are divided into three separate services: Data about works, data about switching plans and data about switching steps. That information is sent after creating, updating status, deleting planned works entities, etc. Data are sent via invoking corresponding externally hosted web services.

3.1. General Architecture

Described in the *EcoStruxure GridOps Management Suite 3.10 Enterprise Integration Platform - Functional Specification* [1].

4. INTERFACE OVERVIEW

The Switching Management Notification integration is implemented through the SMN Adapter component. The aforementioned adapter implements SOAP based Web Service Clients with appropriate set of operations:

- SendWorks – used for sending work requests related data to corresponding external web service:
  - CreatedWorks operation
  - ChangedWorks operation
  - DeletedWorks operation
- SendSwitchingPlans – used for sending switching plans data to corresponding external web service:
  - CreatedSwitchingPlans operation
  - ChangedSwitchingPlans operation
  - DeletedSwitchingPlans opertion
- SendSwitchingSteps – used for sending switching steps data to corresponding external web service:
  - CreatedSwitchingSteps operation
  - ChangedSwitchingSteps operation
  - DeletedSwitchingSteps operation

The following chapters provide more details regarding these interfaces (web service clients) and appropriate web service operations, data mappings (CIM Profiles → Switching Management Model), error handling scenarios etc.

The use case diagram that represents common participants (actors) and users of the aforementioned interfaces in the SMN integration is given in Figure 4.1.

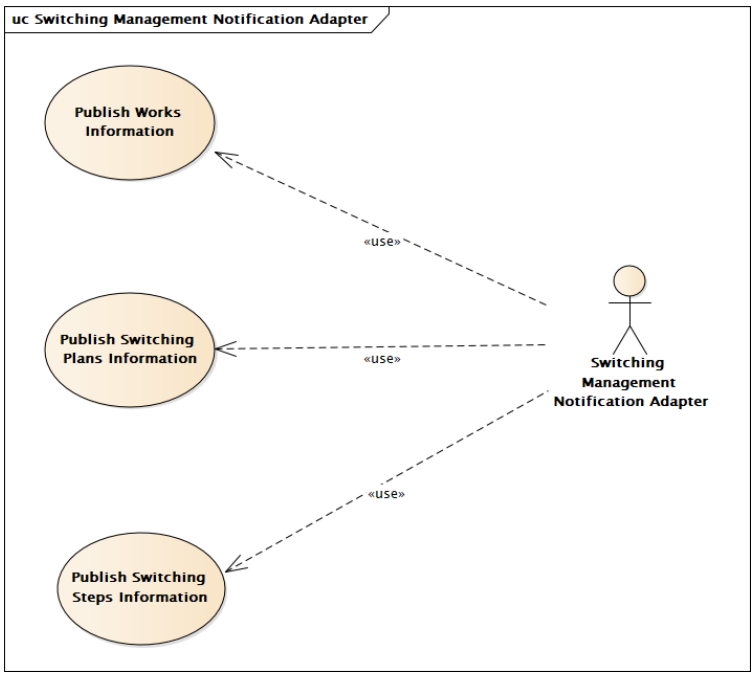

Figure 4.1 – The SMN Integration use case diagram

5. INTEGRATION INTERFACES

5.1. SendWorks Service

5.1.1. Overview

SMN adapter is subscribed to changes of work request data. When one of the defined triggers occurs, adapter handles the publication and forms a request message based on the type of the operation that relates to work request creation, update or deletion. SMN adapter performs initial data validation, based on the adapter configuration file, to determine whether the change is relevant and should be processed. When the publication does not meet the defined constraints requirement, adapter flags the publication as invalid and dumps it to adapter log file. Corresponding request message is later used to invoke external SendWorks service.

- CreatedWorks – when work request is created, adapter receives a message flagged with Insert operation type. If that message satisfies defined filtering criteria, described in Message Filtering, appropriate CreatedWorksEvent message is formed and corresponding CreatedWorks operation is invoked on SendWorks service. CreatedWorksEvent message is the same as ChangedWorksEvent message, content-wise, it just uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.1.
- ChangedWorks – updating work detail is common during the work lifecycle. User wants to be notified when status, start or end time of work request is changed. When the change occurs, ChangedWorksEvent message is formed and corresponding ChangedWorks operation is invoked on SendWorks service. ChangedWorksEvent message is the same as CreatedWorksEvent message, content-wise, it just uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.2.
- DeletedWorks – when finished, work is closed and archived. When work is archived, it is deleted from cache and stored in Operations database. Upon deletion, adapter component receives a notification and forms DeletedWorksEvent message. Corresponding DeletedWorks operation is invoked on SendWorks service. DeletedWorksEvent message contains a reduced set of attributes then the other two and uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.3.

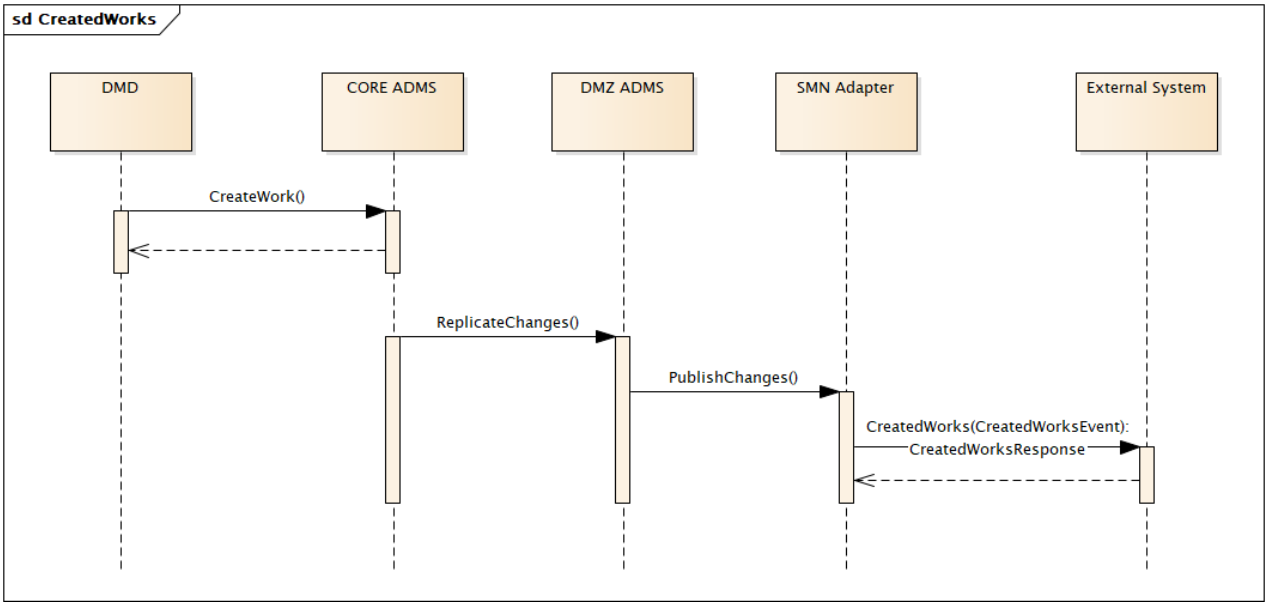

Figure 5.1 – Created Works - Sequence Diagram

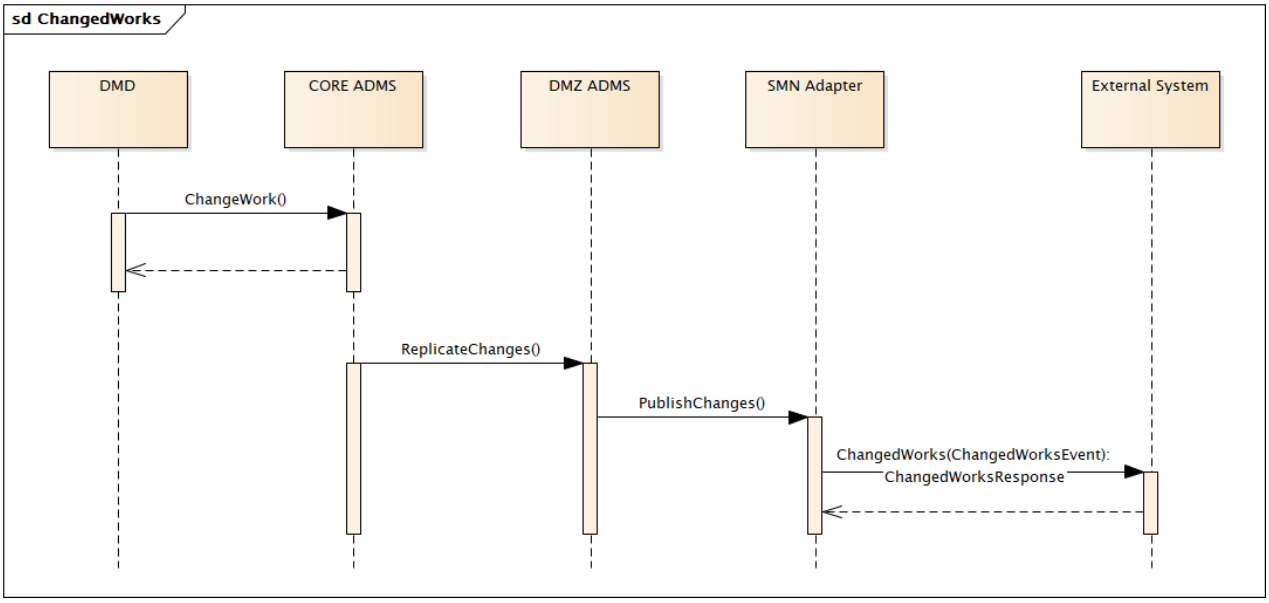

Figure 5.2 – Changed Works - Sequence Diagram

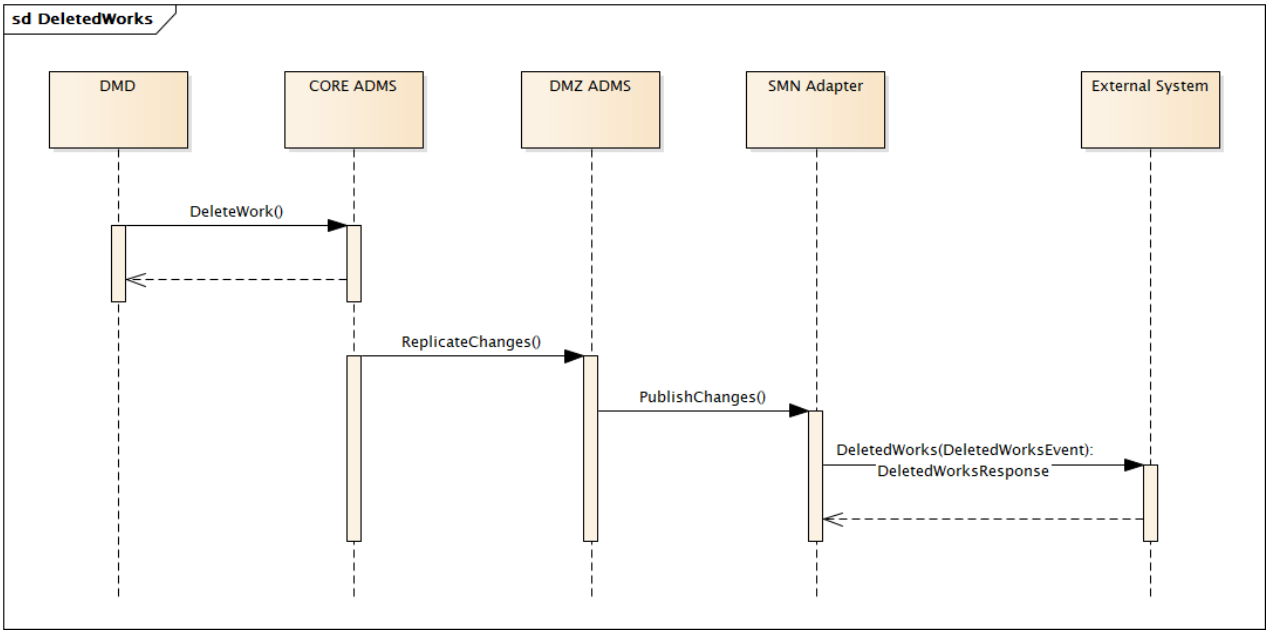

Figure 5.3 – Deleted Works - Sequence Diagram

In some occasion, a communication failure can occur with the external system. In those situations, adapter has an implemented queuing logic that preserves the message until communication with external system is restored. Queuing the messages preserves the time order.

5.1.2. Triggers

Adapter supports sending messages for event-based triggers only. Adapter listens to changes of work request model. When a change of interest occurs, adapter processes the received publication, queries for additional business process related data, and populates corresponding notification message. Following events will trigger creation of aforementioned messages.

- New work request is created – event triggers the CreatedWorks operation.
- Existing work request is deleted – event triggers the DeletedWorks operation.
- ChangedWorks operation is invoked when one of the following work request attributes are changed:
  - Work status – work status transitions to a new one. Work status trigger is highly configured within adapter configuration file. A list of supported works statuses can be defined there. By default, all status transitions are supported.
  - Work start date time – start time is changed.
  - Work end date time – end time is changed.

It should be noted that triggers for ChangedWorks operation are highly configurable within adapter configuration file. Abovementioned triggers are considered as default.

List of default triggers is given in the *Interface Configuration Specification.xlsx* file (sheet SmnFilterConfiguration) provided within the *Configuration* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

5.1.3. Use Cases

The list of possible use cases and corresponding faults is given in Table 5.1.

Table 5.1 – The SendWorks service operations use cases

Use Case	Message Mapping			Action
	Property	Type	Value	
Notification message is successfully sent to external system	Result	String	OK	SMN adapter successfully sends notification message to external system. Adapter receives response message with OK result from external system, Log Level: DebugLog Alarm: No Event: No Retry: No
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
Fault message is returned by external system	Result	String	FAILED	SMN adapter sends notification message, but for some reason message processing fails in external system due to an internal server error. Fault response message is sent by external system component Log Level: DebugLog Alarm: No Event: Yes Retry: Yes
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
Failed response message is returned by external system	Result	String	FAILED	SMN adapter sends notification message to external system. After receiving Failed message from external system, appropriate error is written to a log file. Log Level: DebugLog Alarm: No Event: Yes Retry: No
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
ESB is not available	Result	String	N/A	System sends notification message to the external system but it failed due to unavailability. Log Level: DebugLog
	Error.code	String	N/A	
	Error.level	String	N/A	

Use Case	Message Mapping			Action
	Property	Type	Value	
	Error.reason	String	N/A	Alarm: No Event: Yes Retry: Yes
	Error.details	String	N/A	
Failover event	Result	String	N/A	SMN tries to send notification messages to the external system which is unavailable. Adapter has a configurable retry mechanism and should retry sending in case of external system unavailability. In case a failover event occurs while adapter is in retry regime, STBY adapter instance resumes the where the formerly HOT adapter has stopped. All messages that were pending for sending are transferred to new HOT adapter instance via DMS Replication service.
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	

5.2. SendSwitchingPlans Service

5.2.1. Overview

SMN adapter is subscribed to changes of switching plans data. When one of the defined triggers occurs, adapter handles the publication and forms a request message based on the type of the operation that relates to switching plan creation, update or deletion. SMN adapter performs initial data validation, based on the adapter configuration file, to determine whether the change is relevant and should be processed. When the publication does not meet the defined constraints requirement, adapter flags the publication as invalid and dumps it to adapter log file. Corresponding request message is later used to invoke external SendSwitchingPlans service.

- CreatedSwitchingPlans – when switching plan is created, adapter receives a message flagged with Insert operation type. If that message satisfies defined filtering criteria, described in Message Filtering, appropriate CreatedSwitchingPlansEvent message is formed and corresponding CreatedSwitchingPlans operation is invoked on SendSwitchingPlans service. CreatedSwitchingPlansEvent message is the same as ChangedSwitchingPlansEvent message, content-wise, it just uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.4.
- ChangedSwitchingPlans – updating switching plan detail is common during the switching plan lifecycle. User wants to be notified when: switching plan status change, switching plan crew assignment change, switching plan start/end time changed, switching instruction reordered. When the change occurs, ChangedSwitchingPlansEvent message is formed and corresponding ChangedSwitchingPlans operation is invoked on SendSwitchingPlans service. ChangedSwitchingPlansEvent message is the same as CreatedSwitchingPlansEvent message, content-wise, it just uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.5.
- DeletedSwitchingPlans – when finished, switching plan is closed and archived. When switching plan is archived, it is deleted from cache and stored in Operations database. Upon deletion, adapter component receives a notification and forms DeletedSwitchingPlansEvent message. Corresponding DeletedSwitchingPlans operation is invoked on SendSwitchingPlans service. DeletedSwitchingPlansEvent message contains a reduced set of attributes then the other two and uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.6.

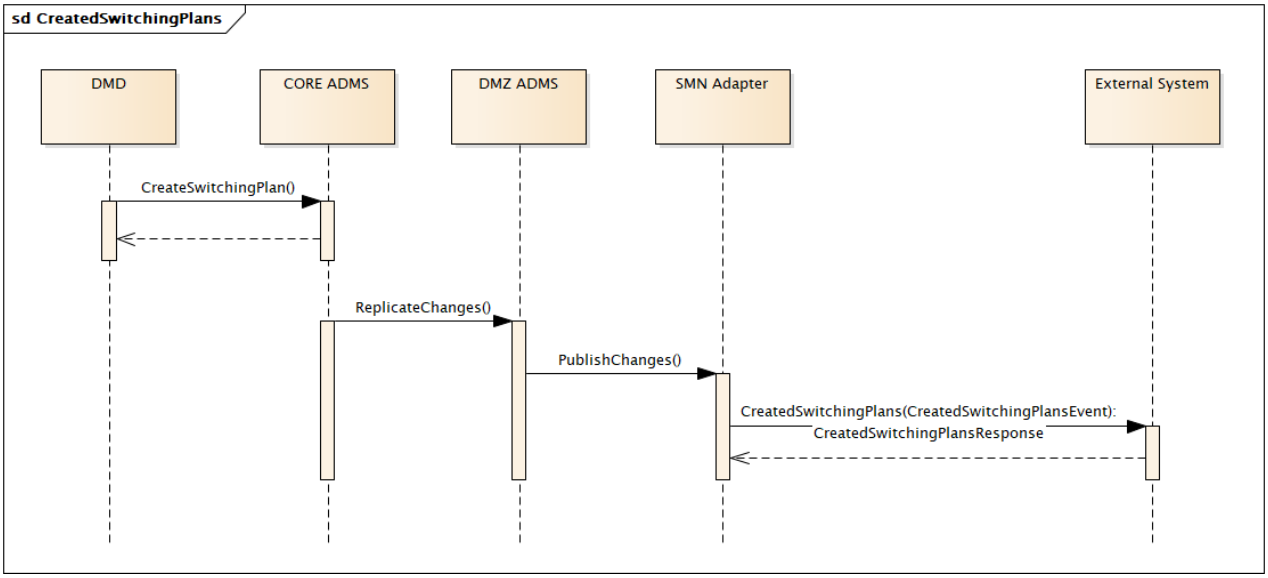

Figure 5.4 -– Created Switching Plans – Sequence Diagram

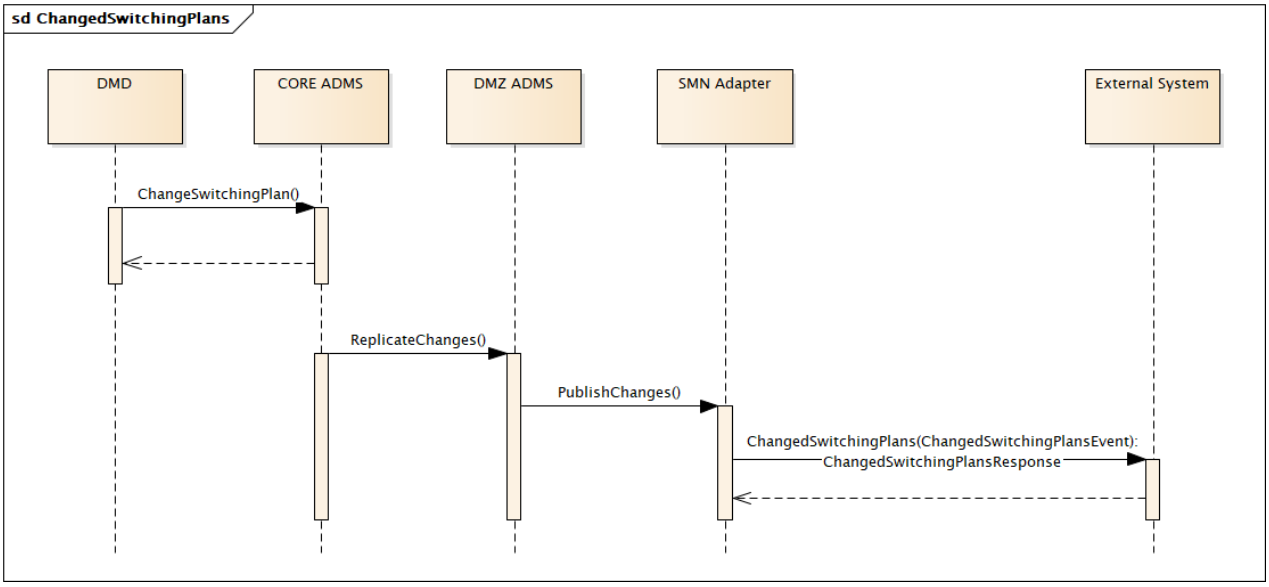

Figure 5.5 – Changed Switching Plans - Sequence Diagram

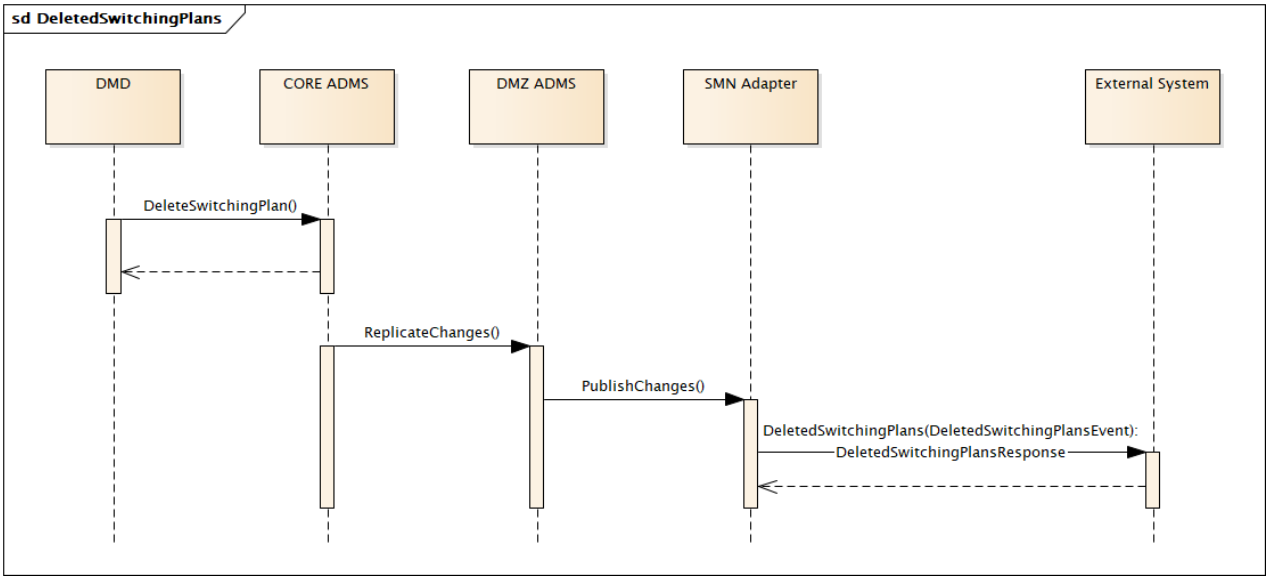

Figure 5.6 -– Deleted Switching Plans - Sequence Diagram

In some occasion, a communication failure can occur with the external system. In those situations, adapter has an implemented queuing logic that preserves the message until communication with external system is restored. Queuing the messages preserves the time order.

5.2.2. Triggers

Adapter supports sending messages only for event-based triggers. Adapter listens to changes of switching plan model. When a change of interest occurs, adapter processes the received publication, queries for additional business process related data, and populates corresponding notification message. Following events will trigger creation of aforementioned messages.

- New switching plan is created – event triggers the CreatedSwitchingPlans operation.
- Existing switching plan is deleted – event triggers the DeletedSwitchingPlans operation.
- ChangedSwitchingPlans operation is invoked when one of the following switching plans attributes are changed:
    - Switching plan status – switching plan status transitions to a new one. Switching plan status trigger is highly configured within adapter configuration file. A list of supported switching plan statuses can be defined there. By default, all status transitions are supported.
    - Switching plan start date time – start time is changed.
    - Switching plan end date time – end time is changed.
    - Crew assignments – new crew is assigned to switching plan or crew is deassigned from switching plan.
    - Switching instruction reordering – switching instruction order in switching plan is changed.

It should be noted that triggers for ChangedSwitchingPlans operation are highly configurable within adapter configuration file. Abovementioned triggers are considered as default.

List of default triggers is given in the *Interface Configuration Specification.xlsx* file (sheet SmnFilterConfiguration) provided within the *Configuration* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

5.2.3. Use Cases

The list of possible use cases and corresponding faults is given in Table 5.2.

Table 5.2 – The SendSwitchingPlans operation use cases

Use Case	Message Mapping			Action
	Property	Type	Value	
Notification message is successfully sent to external system	Result	String	OK	SMN adapter successfully sends notification message to external system. Adapter receives response message with OK result from external system, Log Level: DebugLog Alarm: No Event: No Retry: No
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
Failed response message is returned by external system	Result	String	FAILED	SMN adapter sends notification message to external system. After receiving Failed message from external system, appropriate error is written to a log file. Log Level: DebugLog Alarm: No Event: Yes Retry: No
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
Fault message is returned by external system	Result	String	FAILED	SMN adapter sends notification message, but for some reason message processing fails in external system due to an internal server error. Fault response message is sent by external system component Log Level: DebugLog Alarm: No Event: Yes Retry: Yes
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
ESB is not available	Result	String	N/A	System sends notification message to the external system but it failed due to unavailability. Log Level: DebugLog
	Error.code	String	N/A	
	Error.level	String	N/A	

Use Case	Message Mapping			Action
	Property	Type	Value	
	Error.reason	String	N/A	Alarm: No Event: Yes Retry: Yes
	Error.details	String	N/A	
Failover event	Result	String	N/A	SMN tries to send notification messages to the external system which is unavailable. Adapter has a configurable retry mechanism and should retry sending in case of external system unavailability. In case a failover event occurs while adapter is in retry regime, STBY adapter instance resumes the where the formerly HOT adapter has stopped. All messages that were pending for sending are transferred to new HOT adapter instance via DMS Replication service.
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	

5.3. SendSwitchingSteps Service

5.3.1. Overview

SMN adapter is subscribed to changes of switching steps data. When one of the defined triggers occurs, adapter handles the publication and forms a request message based on the type of the operation that relates to switching step creation, update or deletion. SMN adapter performs initial data validation, based on the adapter configuration file, to determine whether the change is relevant and should be processed. When the publication does not meet the defined constraints requirement, adapter flags the publication as invalid and dumps it to adapter log file. Corresponding request message is later used to invoke external SendSwitchingSteps service.

- CreatedSwitchingSteps – when switching step is created adapter receives a message flagged with Insert operation type. If that message satisfies defined filtering criteria, described in Message Filtering, appropriate CreatedSwitchingStepsEvent message is formed. Otherwise, first message with Update operation type that satisfies the filtering criteria will be treated as CreatedSwitchingStepsEvent. Corresponding CreateSwitchingSteps operation on SendSwitchingSteps service is invoked upon message creation. CreatedSwitchingStepsEvent message is the same as ChangedSwitchingStepsEvent message, content-wise, it just uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.7.
- ChangedSwitchingSteps – updating switching step detail is common during the switching step lifecycle. User wants to be notified when: switching step status change, crew assignment on switching step change, scheduling date time change. When the change occurs, ChangedSwitchingStepsEvent message is formed and corresponding ChangedSwitchingSteps operation is invoked on SendSwitchingSteps service. ChangedSwitchingStepsEvent message is the same as CreatedSwitchingStepsEvent message, content-wise, it just uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.8.
- DeletedSwitchingSteps – when switching step is removed form switching plan or switching plan is archived, switching step it is deleted from cache and stored in Operations database. Upon deletion, adapter component receives a notification and forms DeletedSwitchingStepsEvent message. Corresponding DeletedSwitchingSteps operation is invoked on SendSwitchingSteps service. DeletedSwitchingStepsEvent message contains a reduced set of attributes then the other two and uses a different envelope to differentiate the operation type. Sequence diagram is shown on Figure 5.9.

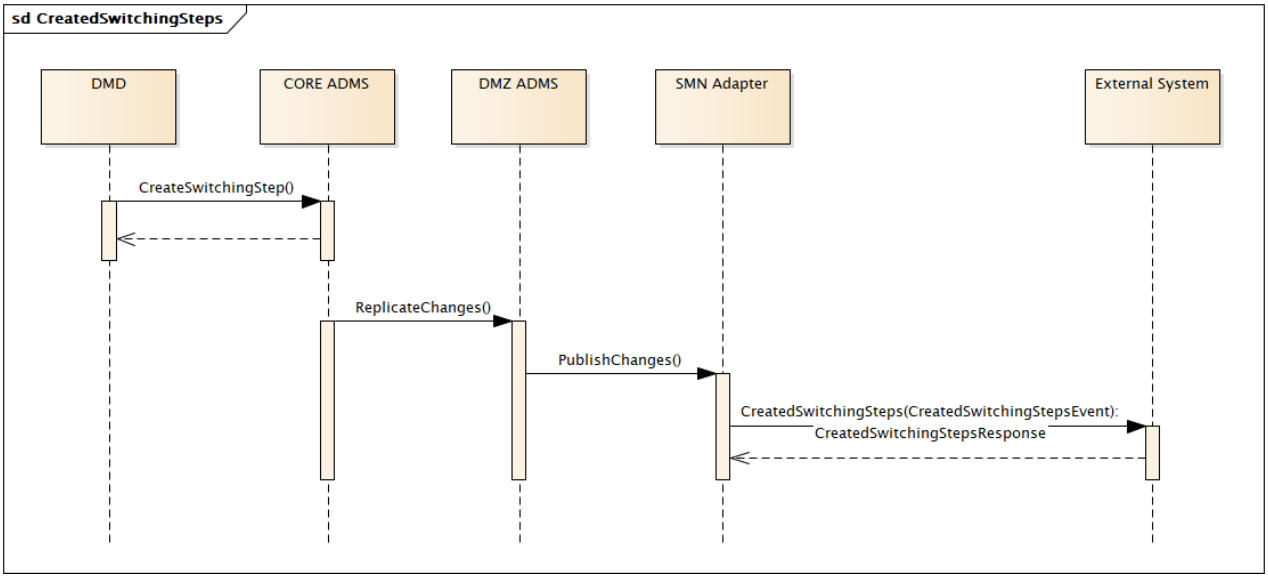

Figure 5.7 -– Created Switching Steps - Sequence Diagram

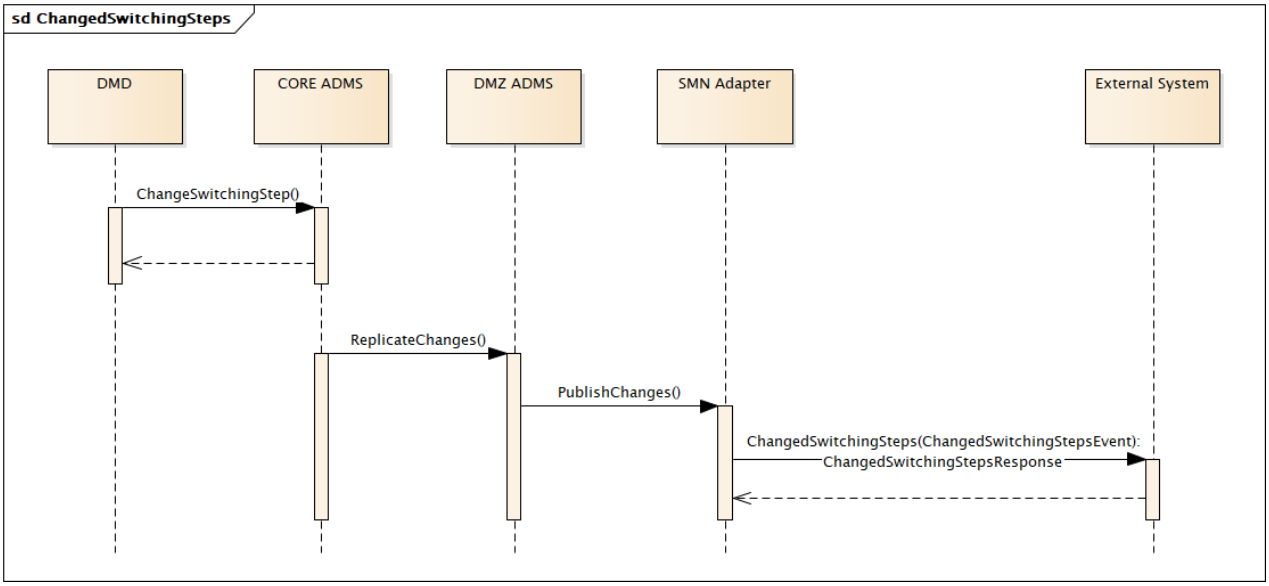

Figure 5.8 -– Changed Switching Steps - Sequence Diagram

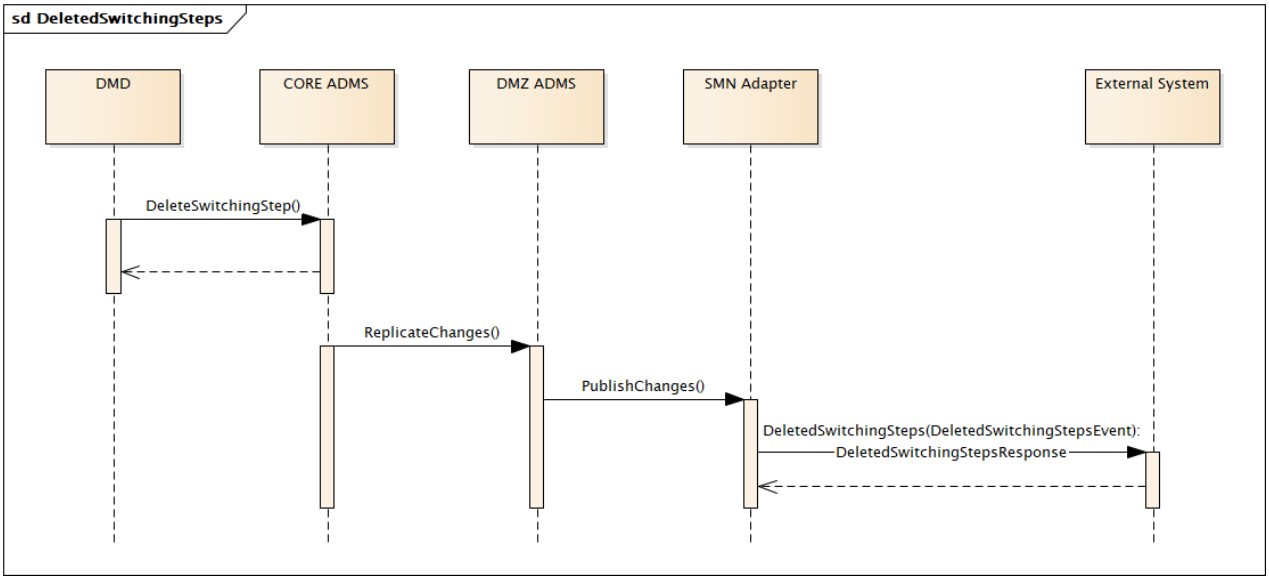

Figure 5.9 -– Deleted Switching Steps - Sequence Diagram

In some occasion, a communication failure can occur with the external system. In those situations, adapter has an implemented queuing logic that preserves the message until communication with external system is restored. Queuing the messages preserves the time order.

5.3.2. Triggers

Adapter supports sending messages only for event-based triggers. Adapter listens to changes of switching step model. When a change of interest occurs, adapter processes the received publication, queries for additional business process related data, and populates corresponding notification message. Notification message won't be sent for following switching step types: Safety Document, Changeset, Planned State, Breakpoint and Note. For other types of switching instruction notification message will be sent if filtering conditions are satisfied. Following events will trigger creation of aforementioned messages.

- New switching step is created – event triggers the CreatedSwitchingSteps operation.
- Existing switching step is deleted – event triggers the DeletedSwitchingSteps operation.
- ChangedSwitchingSteps operation is invoked when one of the following switching step attributes are changed:
  - Switching step status – switching step status transitions to a new one. Switching step status trigger is highly configured within adapter configuration file. A list of supported incidents statuses is defined there.
  - Scheduling date time – when scheduling date time is changed.
  - Crew assignments – when a crew is assigned or deassigned to an existing switching step.

It should be noted that triggers for ChangedSwitchingSteps operation are highly configurable within adapter configuration file. Abovementioned triggers are considered as default.

List of default triggers is given in the *Interface Configuration Specification.xlsx* file (sheet SmnFilterConfiguration) provided within the *Configuration* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

5.3.3. Use Cases

The list of possible use cases and corresponding faults is given in Table 5.3.

Table 5.3 – SendSwitchingSteps Operation Use Cases

Use Case	Message Mapping			Action
	Property	Type	Value	
Notification message is successfully sent to external system	Result	String	OK	SMN adapter successfully sends notification message to external system. Adapter receives response message with OK result from external system, Log Level: DebugLog Alarm: No Event: No Retry: No
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
Failed response message is returned by external system	Result	String	FAILED	SMN adapter sends notification message to external system. After receiving Failed message from external system, appropriate error is written to a log file. Log Level: DebugLog Alarm: No Event: Yes Retry: No
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
Fault message is returned by external system	Result	String	FAILED	SMN adapter sends notification message, but for some reason message processing fails in external system due to an internal server error. Fault response message is sent by external system component Log Level: DebugLog Alarm: No Event: Yes Retry: Yes
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	
ESB is not available	Result	String	N/A	System sends notification message to the external system but it failed due to unavailability. Log Level: DebugLog
	Error.code	String	N/A	
	Error.level	String	N/A	

Use Case	Message Mapping			Action
	Property	Type	Value	
	Error.reason	String	N/A	Alarm: No Event: Yes Retry: Yes
	Error.details	String	N/A	
Failover event	Result	String	N/A	SMN tries to send notification messages to the external system which is unavailable. Adapter has a configurable retry mechanism and should retry sending in case of external system unavailability. In case a failover event occurs while adapter is in retry regime, STBY adapter instance resumes the where the formerly HOT adapter has stopped. All messages that were pending for sending are transferred to new HOT adapter instance via DMS Replication service.
	Error.code	String	N/A	
	Error.level	String	N/A	
	Error.reason	String	N/A	
	Error.details	String	N/A	

6. MESSAGES

6.1. Common

6.1.1. Header

The header section is defined according to the IEC 61968-100 standard. Currently, there are two required fields that must be populated:

- ***Verb*** – to identify a specific action to be taken. There is an enumerated set of valid verbs, where commonly used values include “get”, “create”, “change”, “cancel”, “close”, “execute” and “reply”. Within the event notification messages “past tense” verbs are used, which can include “created”, “changed”, “canceled”, “closed” and “executed”. Implementations should treat deprecated verbs “update” and “updated” as synonyms to “change” and “changed”.
- ***Noun*** – to identify the subject of the action and/or the type of the payload, such as Incidents, Works, SwitchingPlans, SwitchingSteps etc.

Field that can be optionally supplied include the following:

- Revision – to indicate the revision of the message definition. By default, this should be “2.0”.
- ReplayDetection – this is a complex element with a timestamp and a nonce used to guard against replay attacks. The timestamp is generated by the source system to indicate when the message was created. The nonce is a sequence number or randomly generated string (e.g. UUID) that would not be repeated by the source system for at least a day. This serves to improve encryption.
- ***Context*** – a string that can be used to identify the context of the message. This can help provide an application level guard against incorrect message consumption in configurations where there may be multiple system environments running over the same messaging infrastructure. Some example values are PRODUCTION, TESTING, STUDY and TRAINING.
- Timestamp – an ISO 8601 compliant string that identifies the time the message was sent. This is analogous to the JMSTimestamp provided by JMS. Either Zulu (‘Z’) time or time with a time zone offset may be used.
- Source – identifying the source of the message, which should be the name of the system or organization.
- AsyncReplyFlag – the Boolean data type (“true” or “false” values) that indicates whether a reply message will be sent asynchronously. By default, replies are assumed to be sent synchronously.
- ReplyAddress – the address to which replies should be sent. This is typically used for asynchronous replies. This should take the form of a URL, topic name or queue name. This is analogous to the JMSReplyTo field provided by JMS. This is ignored when using unidirectional integration patterns (e.g., AckRequired=false). If the reply address is a topic, the topic name should be prefixed by “topic”. If the reply address is a queue, the queue name should be prefixed by “queue”. If the reply address is a web service, the reply address should be a URL beginning with “http://” or “https:/”.
- AckRequired – the Boolean data type (“true” or “false” values) that indicates whether an acknowledgement is required. If false, this would indicate that a unidirectional integration pattern is being used for communicating transactional messages.

- User – a complex structure that identifies the user and associated organization. Should be supplied as it may be required for some interfaces, depending upon underlying implementations. This allows the UsersID string and optional the Organization string as sub-elements.
- MessageID – a string that uniquely identifies a message. Use of the UUID or sequence number is recommended. This is analogous to the JMSMessageID provided by JMS. A process should not issue two messages using the same MessageID value.
- CorrelationID – this is used to “link” messages together. This can be supplied on a request, so that the client can correlate a corresponding reply message. The server will place the incoming CorrelationID value as the CorrelationID on the outgoing reply. If not supplied on the request, the CorrelationID of the reply should be set to the value of the MessageID that was used on the request, if present. This is analogous to the use of the JMSCorrelationID provided by JMS. Given that the CorrelationID is used to ‘link’ messages together, it may be reused on more than one message. Use of a UUID or sequence number is recommended.
- Comment – any descriptive text, but shall never be used for any processing logic.
- Property – a complex type that allows the custom name/value pairs to be conveyed. The source and targets would need to agree upon usage. These are analogous to a Property as defined by JMS.
- Any – it can be used for custom extensions.

Figure 6.1 shows the graphical representation of the header field.

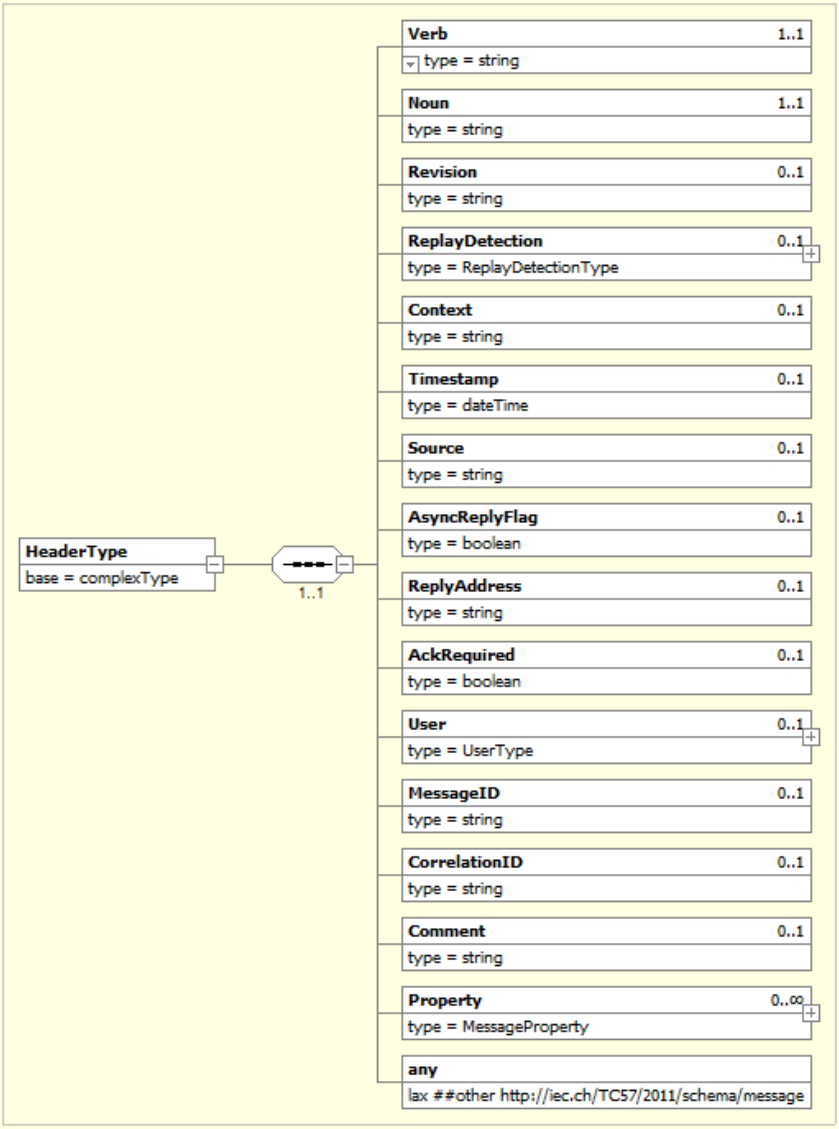

Figure 6.1 – The header field

6.1.2. Reply and Fault

The Reply.Result value is an enumeration and would be populated in the following manner:

- "OK" – if there are no errors and all results have been returned. There is no requirement that a Reply.Error element be present.
- "PARTIAL" – if only a partial set of results has been returned, with or without errors. Existence of errors is indicated with one or more Reply.Error.code elements.
- “FAILED" – if no result can be returned due to one or more errors, indicated with one or more Reply.Error elements, each with a mandatory application level ‘code’.

If the result type is “PARTIAL” or “FAILED”, the **Error** field will be populated with the appropriate error description. The contents the **Reply** and **Error** fields are presented in Figure 6.2.

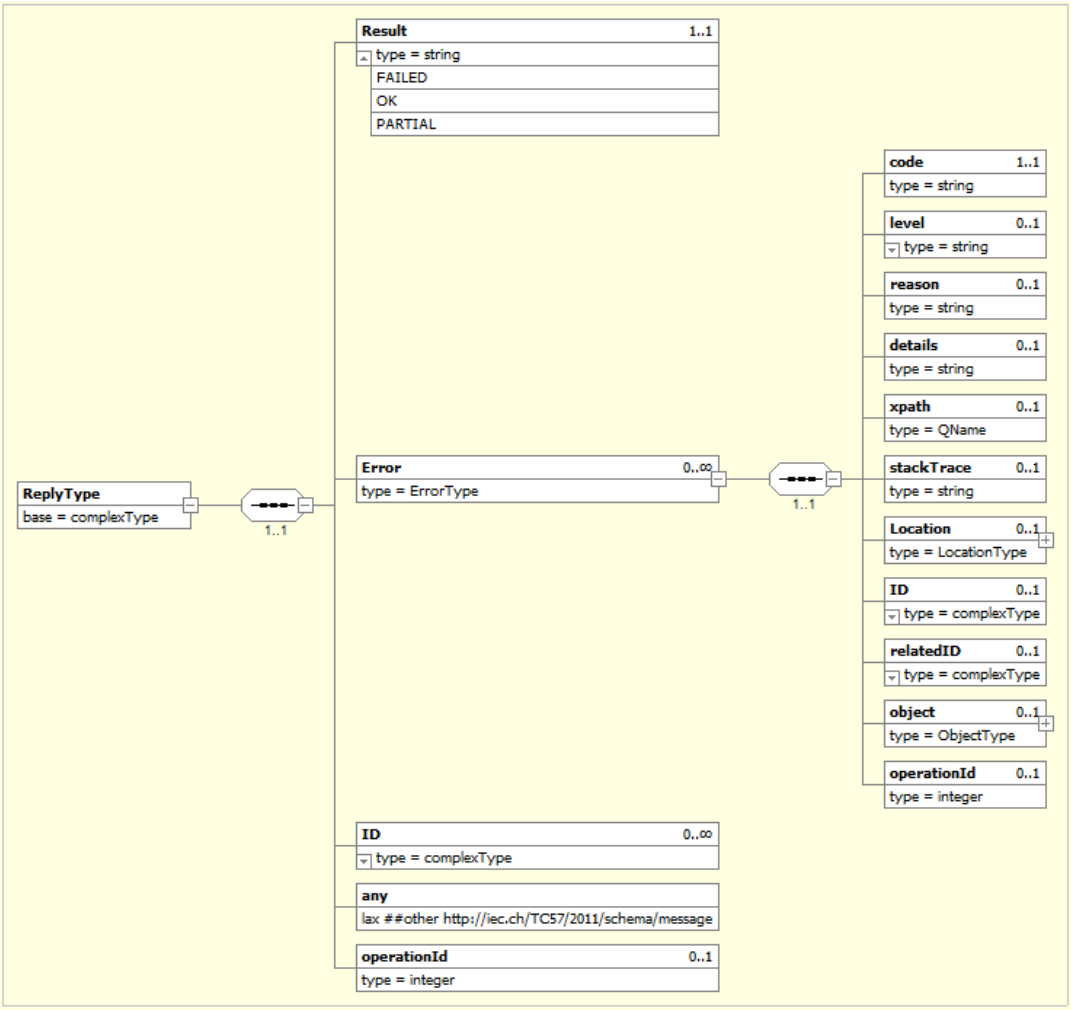

Figure 6.2 – The Reply and Error field contents

6.2. Works Operation Messages

The operation definitions:

CreatedWorksResponse CreatedWorks (CreatedWorksEvent)

ChangedWorksResponse ChangedWorks (ChangedWorksEvent)

DeletedWorksResponse DeletedWorks (DeletedWorksEvent)

6.2.1. CreatedWorks Operation Message

6.2.1.1. Request

The *CreatedWorks* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

CreatedWorks event message is defined in *WorksMessage.xsd* provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

The Payload section carries the CIM defined profile (*Works.xsd*) for notification about recently created works. *Works.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *Works.xsd* and the appropriate entities in the model for CreateWorks operation is given in Switching Management Notification Interface – Mappings in SendWorks sheet (table WorksEventMessage message (Created or Changed)).

6.2.1.2. Response

After work is sent to external system, the response is returned in form of the *CreatedWorksResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendWorks sheet (table *WorksResponseMessage* message).

6.2.1.3. Fault

The *WorksFault* message is depicted in Figure 6.3.

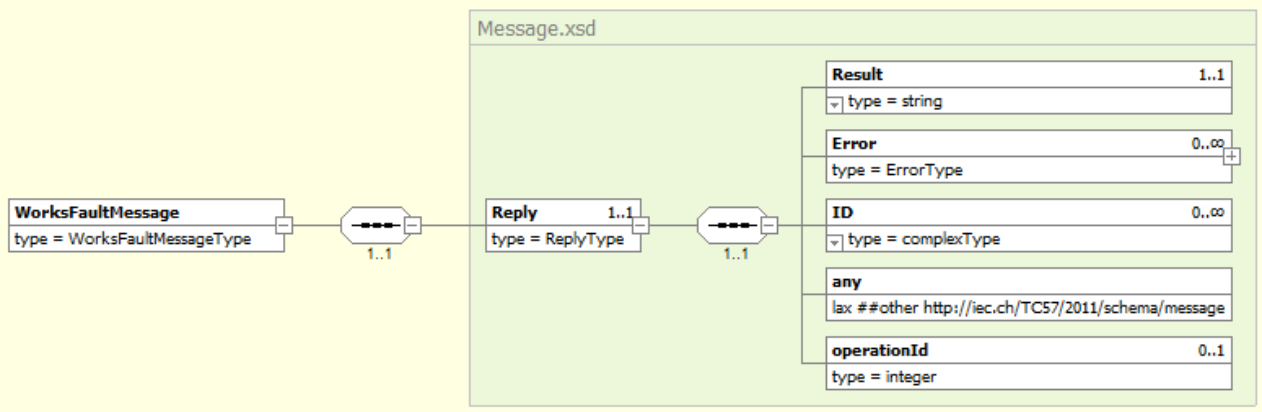

Figure 6.3 – The WorksFault message

6.2.2. ChangedWorks Operation Message

6.2.2.1. Request

The *ChangedWorks* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

ChangedWorks event message is defined in *WorksMessage.xsd* provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

The Payload section carries the CIM defined profile (*Works.xsd*) for notification about recently changed works. *Works.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *Works.xsd* and the appropriate entities in the model for ChangedWorks operation is given in Switching Management Notification Interface – Mappings in SendWorks sheet (table WorksEventMessage message (Created or Changed)).

6.2.2.2. Response

After work is sent to external system, the response is returned in form of the *ChangedWorksResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendWorks sheet (table *WorksResponseMessage* message).

6.2.2.3. Fault

The *WorksFault* message is depicted in Figure 6.3.

6.2.3. DeletedWorks Operation Message

6.2.3.1. Request

The *DeletedWorks* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

DeletedWorks event message is defined in *WorksMessage.xsd.*

The Payload section carries the CIM defined profile (*Works.xsd*) for notification about recently deleted works. *Works.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *Works.xsd* and the appropriate entities in the model for DeletedWorks operation is given in Switching Management Notification Interface – Mappings in SendWorks sheet (table WorksEventMessage message (Deleted)).

6.2.3.2. Response

After work is sent to external system, the response is returned in form of the *DeletedWorksResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendWorks sheet (table *WorksResponseMessage* message).

6.2.3.3. Fault

The *WorksFault* message is depicted in Figure 6.3.

6.3. SwitchingPlans Operation Message

The operation definitions:

CreatedSwitchingPlansResponse CreatedSwitchingPlans (CreatedSwitchingPlansEvent)

ChangedSwitchingPlansResponse ChangedSwitchingPlans (ChangedSwitchingPlansEvent)

DeletedSwitchingPlansResponse DeletedSwitchingPlans (DeletedSwitchingPlansEvent)

6.3.1. CreatedSwitchingPlans Operation Message

6.3.1.1. Request

The *CreatedSwitchingPlans* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

CreatedSwitchingPlans event message is defined in *SwitchingPlansMessage.xsd* provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

The Payload section carries the CIM defined profile (*SwitchingPlans.xsd)* for notification about recently created switching plans. *SwitchingPlans.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *SwitchingPlans.xsd* and the appropriate entities in the model for CreatedSwitchingPlans operation is given in Switching Management Notification Interface – Mappings in SendSwitchingPlans sheet (table SwitchingPlansEventMessage message (Created or Changed)).

6.3.1.2. Response

After switching plan is sent to external system, the response is returned in form of the *CreatedSwitchingPlansResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendSwitchingPlans sheet (table *SwitchingPlansResponseMessage* message).

6.3.1.3. Fault

The *SwitchingPlansFault* message is depicted in Figure 6.4.

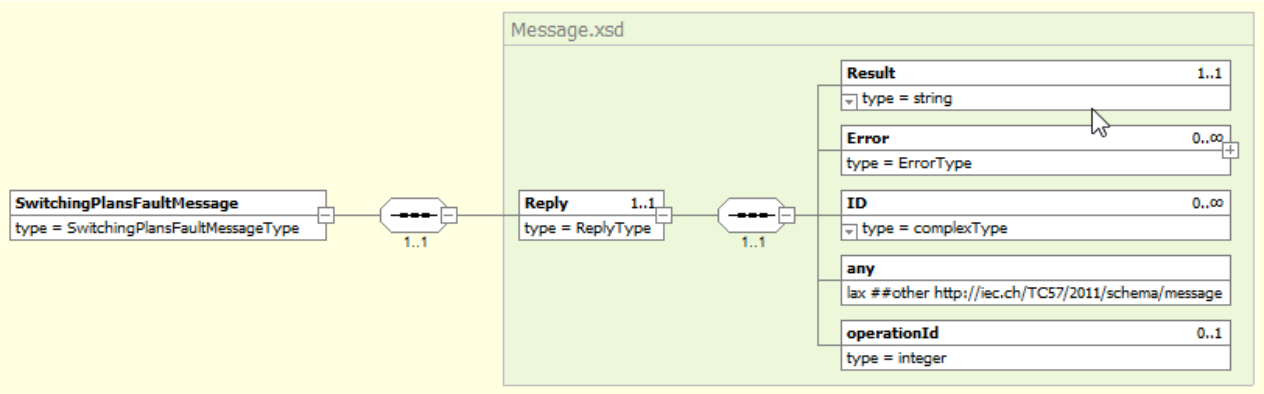

Figure 6.4 – The SwitchingPlansFault message

6.3.2. ChangedSwitchingPlans Operation Message

6.3.2.1. Request

The *ChangedSwitchingPlans* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

ChangedSwitchingPlans event message is defined in *SwitchingPlansMessage.xsd*.

The Payload section carries the CIM defined profile (*SwitchingPlans.xsd*) for notification about recently changed switching plans. *SwitchingPlans.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *SwitchingPlans.xsd* and the appropriate entities in the model for ChangedSwitchingPlans operation is given in Switching Management Notification Interface – Mappings in SendSwitchingPlans sheet (table SwitchingPlansEventMessage message (Created or Changed)).

6.3.2.2. Response

After switching plan is sent to external system, the response is returned in form of the *ChangedSwitchingPlansResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendSwitchingPlans sheet (table *SwitchingPlansResponseMessage* message).

6.3.2.3. Fault

The *SwitchingPlansFault* message is depicted in Figure 6.4.

6.3.3. DeletedSwitchingPlans

6.3.3.1. Request

The *DeletedSwitchingPlans* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

DeletedSwitchingPlans event message is defined in *SwitchingPlansMessage.xsd* (Document 6.3)

The Payload section carries the CIM defined profile (*SwitchingPlans.xsd*) for notification about recently deleted switching plans. *SwitchingPlans.xsd* is given in Document 6.4.

Mapping between the *SwitchingPlans.xsd* and the appropriate entities in the model for DeletedSwitchingPlans operation is given in Switching Management Notification Interface – Mappings in SendSwitchingPlans sheet (table SwitchingPlansEventMessage message (Deleted)).

6.3.3.2. Response

After switching plan is sent to external system, the response is returned in form of the *DeletedSwitchingPlansResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendSwitchingPlans sheet (table *SwitchingPlansResponseMessage* message).

6.3.3.3. Fault

The *SwitchingPlansFault* message is depicted in Figure 6.4.

6.4. SwitchingSteps Operation Message

The operation definitions:

CreatedSwitchingStepsResponse CreatedSwitchingSteps (CreatedSwitchingStepsEvent)

ChangedSwitchingStepsResponse ChangedSwitchingSteps (ChangedSwitchingStepsEvent)

DeletedSwitchingStepsResponse DeletedSwitchingSteps (DeletedSwitchingStepsEvent)

6.4.1. CreatedSwitchingSteps Operation Message

6.4.1.1. Request

The *CreatedSwitchingSteps* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

CreatedSwitchingSteps event message is defined in *SwitchingStepsMessage.xsd* provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

The Payload section carries the CIM defined profile (*SwitchingSteps.xsd*) for notification about recently created switching steps. *SwitchingSteps.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *SwitchingSteps.xsd* and the appropriate entities in the model for CreatedSwitchingSteps operation is given in Switching Management Notification Interface – Mappings in SendSwitchingSteps sheet (table SwitchingStepsEventMessage message (Created or Changed)).

6.4.1.2. Response

After switching step is sent to external system, the response is returned in form of the *CreatedSwitchingStepsResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendSwitchingSteps sheet (table *SwitchingStepsResponseMessage* message).

6.4.1.3. Fault

The *SwitchingStepsFault* message is depicted in Figure 6.5.

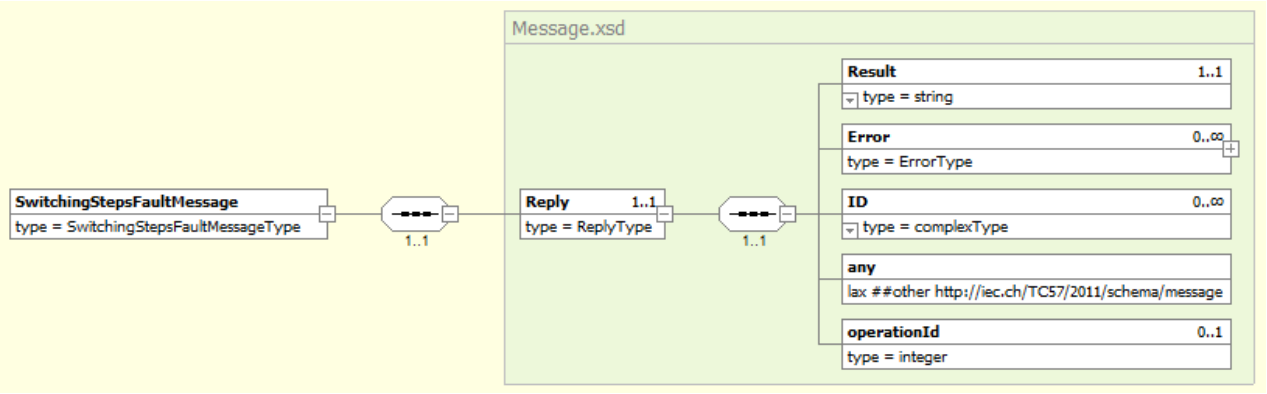

Figure 6.5 – The SwitchingStepsFault message

6.4.2. ChangedSwitchingSteps Operation Message

6.4.2.1. Request

The *ChangedSwitchingSteps* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

ChangedSwitchingSteps event message is defined in *SwitchingStepsMessage.xsd*.

The Payload section carries the CIM defined profile (*SwitchingSteps.xsd*) for notification about recently changed switching steps. *SwitchingSteps.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *SwitchingSteps.xsd* and the appropriate entities in the model for ChangedSwitchingSteps operation is given in Switching Management Notification Interface – Mappings in SendSwitchingSteps sheet (table SwitchingStepsEventMessage message (Created or Changed)).

6.4.2.2. Response

After switching step is sent to external system, the response is returned in form of the *ChangedSwitchingStepsResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendSwitchingSteps sheet (table *SwitchingStepsResponseMessage* message).

6.4.2.3. Fault

The *SwitchingStepsFault* message is depicted in Figure 6.5.

6.4.3. DeletedSwitchingSteps

6.4.3.1. Request

The *DeletedSwitchingSteps* event message is defined according to the IEC 61968-100 and contains the following two sections:

- Header
- Payload

DeletedSwitchingSteps event message is defined in *SwitchingStepsMessage.xsd*.

The Payload section carries the CIM defined profile (*SwitchingSteps.xsd*) for notification about recently deleted switching steps. *SwitchingSteps.xsd* is provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Mapping between the *SwitchingSteps.xsd* and the appropriate entities in the model for DeletedSwitchingSteps operation is given in Switching Management Notification Interface – Mappings in SendSwitchingSteps sheet (table SwitchingStepsEventMessage message (Deleted)).

6.4.3.2. Response

After switching step is sent to external system, the response is returned in form of the *DeletedSwitchingStepsResponse* message. The content is given in Switching Management Notification Interface – Mappings in SendSwitchingSteps sheet (table *SwitchingStepsResponseMessage* message).

6.4.3.3. Fault

The *SwitchingStepsFault* message is depicted in Figure 6.5.

7. DEPLOYMENT SPECIFICATION

Described in the *EcoStruxure GridOps Management Suite 3.10 Enterprise Integration Platform - Functional Specification* [1].

The deployment specification is provided in the following table:

Table 7.1 – The deployment specification

Deployment Specification	
Application	AdapterSMN
Critical process	Yes
OASyS service	OASyS DNA DMS_INTEGRATION Service
Servers	pdmz-int-1, pdmz-int-2, bdmz-int-1, bdmz-int-2
Zone	pdmz, bdmz
Installation Type	Product
Installation add-on name	Integration Adapters

8. INTERFACE CONFIGURATION

SMN adapter provides certain amount of configurability so that smaller adjustments in the functionality can be easily applied to the system, without interface down time. Such feature is provided through dedicated configuration files of the SMN adapter.

Table 8.1 – The configuration files specification

Name of the config file	Configuration File Description
AdapterSmn	Registry configuration xml file
SmnFilterConfiguration	Filter configuration xml file
AdapterSmn_WebServiceConfiguration	Web service configuration xml file

Details about the structure and shared content of common interface configuration files are located in *EcoStruxure GridOps Management Suite 3.10 Enterprise Integration Platform - Functional Specification* [1].

Detailed content of above-mentioned configuration files is provided within within the *Configuration* folder in the *EcoStruxure GirOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

8.1. Message Filtering

Each publication message received from must comply with configurable restraints which are defined in a related configuration xml file described in the *Interface Configuration Specification.xlsx* file provided within the Configuration folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3]. Notification message filtering is not a mandatory process. In cases where filtering is defined in the corresponding configuration file, a series of message filters must be performed on each publication. Only messages that satisfy all defined filter regulations will be processed and forwarded to external system. More details about the filtering configuration is in the *Interface Configuration Specification.xlsx* file provided within the *Configuration* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

Location of filter configuration file is stated in registry adapter configuration xml.

If a restraint is not defined for a certain model attribute, it is considered that all values for that attribute are supported.

9. APPENDIX

9.1. WSDL

The WSDL file, XSD schemas and sample messages defined according to the IEC 61968-100 for all SMN web services are provided within the *Web Service Definitions* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

9.2. Message Examples

Message examples for several use cases are provided within the *Message Examples* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

9.3. Switching Management Notification Interface – Mappings

Message mappings between messages and model is provided within the *Data Mappings* folder in the *EcoStruxure GridOps Management Suite 3.10 Switching Management Notification Interface.zip* file [3].

10. RELEASE NOTES

The following new features related to the Product SMN Interfaces were introduced in the software, starting from version 3.8 SP1.

11. DEFINITIONS AND ABBREVIATIONS

Definition/Abbreviation	Description
ADMS	Advanced Distribution Management System
CIM	Common Information Model
DMD	Dynamic Mimic Diagram
DMZ	Demilitarized Zone
HTTP	Hypertext Transfer Protocol
ESB	Enterprise Service Bus
EAM	Enterprise Asset Management
FC	Field Client
WMS	Work Management Service
SOAP	Simple Object Access Protocol
SDP	Service Delivery Point (Usage Point)
NACK	Negative Acknowledgement
WCF	Windows Communication Foundation
WS	Web Service
XML	Extensible Markup Language
XSD	XML Schema Definition
mRID	Unique identifier
SM	Switching Management
WR	Work Request
SP	Switching Plan
SD	Safety Document
SMN	Switching Management Notification