Technical Report

O-RAN Work Group 6 (Cloudification and Orchestration)

Report on FOCOM and NFO SMOSs Northbound Interfaces

O-RAN ALLIANCE e.V., Buschkauler Weg 27, 53347 Alfter, Germany
Register of Associations, Bonn VR 11238, VAT ID DE321720189

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Foreword

This Technical Report (TR) has been produced by O-RAN ALLIANCE.

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- zz: the third digit-group included only in working versions of the document indicating incremental changes during the editing process. External versions never include the third digit-group. Always 2 digits with leading zero if needed.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the O-RAN Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in O-RAN deliverables except when used in direct citation.

Introduction

This technical report explores and documents the impacts and gaps associated with the FOCOM and NFO SMO services and provides recommended potential requirements on the interactions of FOCOM and NFO SMO services with other SMO services by identifying and analysing the use cases as defined in O-RAN.WG1.Decoupled-SMO-Architecture, clause 5.6 and 6.1.3 [i.1].

1 Scope

The scope of this present document is to identify and analyse use cases for FOCOM and NFO SMO services. Identification of use cases includes use cases defined in other O-RAN specifications as well as use cases identified in this present document which includes the new use cases in context of O-RAN.WG1.Decoupled-SMO-Architecture [i.1]. From the analysis of the use cases, recommendations are made for modifications to existing use cases, if needed and to provide potential requirements that can be used for future specifications for the FOCOM and NFO services

2 References

2.1 Normative references

“Not Applicable”

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies. In the case of a reference to a 3GPP document, a non-specific reference implicitly refers to the latest version of that document in Release 18, or the latest 3GPP release prior to Release 18 that includes that document.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, O-RAN cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] O-RAN.WG1.Decoupled-SMO-Architecture-R004-v3.00: "Decoupled SMO Architecture".

[i.2] O-RAN.WG6.ORCH-USE-CASES-R004: “O-RAN Orchestration Use Cases and Requirements for O-RAN Virtualized RAN”.

[i.3] O-RAN.WG10.TS.OAM-Architecture: "O-RAN Operations and Maintenance Architecture"

[i.4] O-RAN.WG6.TS.O2-GA&P: “O-RAN O2 Interface General Aspects and Principles”

[i.5] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications"

[i.6] O-RAN.WG2.TS.R1GAP: “R1 General Aspects and Principles“

[i.7] O-RAN.WG1.TS.OAD: “O-RAN Architecture Description”

[i.8] O-RAN.WG6.TS.O-CLOUD-IM: “O-Cloud Information Model”

[i.9] O-RAN.WG6.TS.O2IMS-INTERFACE: “O-RAN O2ims Interface Specification”

[i.10] O-RAN.WG2.TS.R1AP: "Application Protocols for R1 services"

3 Definition of terms, symbols and abbreviations

3.1 Terms

Void

3.2 Symbols

Void

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [i.5], O-RAN.WG1.Decoupled-SMO-Architecture [i.1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [i.5] and O-RAN.WG1.Decoupled-SMO-Architecture [i.1]

Void

4 Analysis of FOCOM SMOS and NFO SMOS Use Cases

4.1 Overview

The capabilities of the FOCOM, as O2IMS consumer, are to discover and manage the O-Cloud resources, while the capabilities of the NFO, as O2DMS consumer, are to orchestrate the NF Deployments, as specified in O-RAN.WG6.TS.O2-GA&P, clause 2.2.1 [i.4]. Clause 4 provides analysis and recommendations concerning the different orchestration use cases highlighting the required capabilities to be exposed by FOCOM SMOS and NFO SMOS, including new and existing use cases defined in other O-RAN specifications.

Clause 4 introduces the roles of FOCOM SMOS Producer and FOCOM SMOS Consumer. The principle of these roles is the same as service producer and service consumer as specified in O-RAN.WG1.TS.OAD, clause 5.3.1 [i.7].

4.2 Use Cases for the Exposure of FOCOM SMOS NBI

4.2.1 O-Cloud resources related information Query

4.2.1.1 High level description

This use case enables an authorized FOCOM SMOS Consumer to request a FOCOM SMOS Producer to retrieve information about the O-Cloud resources as provided by the IMS and O-Cloud templates identifiers supported in each O-Cloud.

The O-Cloud resources include all the O-Cloud physical and logical resources. The FOCOM SMOS Consumer (e.g., an rApp or other SMOF), can query this information from the FOCOM SMOS Producer to understand the capabilities, relationships and characteristics of the O-Cloud. The O-RAN.WG6.TS.O-CLOUD-IM [i.8] specifies the information model about O-Cloud resources, which is structured, from an information modelling perspective, into different namespaces.

The O-Cloud resources information may be cached within a FOCOM SMOS Producer and in that case FOCOM SMOS Producer can subscribe to receive notifications when there is an update to the O-Cloud resources using the O2ims interface.

4.2.1.2 Sequence Description

Table 4.2.1.2-1: O-Cloud resources related information Query

Use Case Stage	Evolution / Specification	>>Uses<<
Use Case Title	O-Cloud resource related information Query Use Case	
Goal	The goal of the Query O-Cloud resource information Use Case is the following: • To return information on O-Cloud resources as previously retrieved from the IMS. To return all information on O-Cloud resources that are specified in the query filter within the Query O-Cloud resource information request.	
Actors and Roles	**FOCOM SMOS Consumer** – An authorized consumer e.g. rApp or other SMOF, consuming the services of FOCOM SMOS Producer. **FOCOM SMOS Producer** –As service Producer, receives Query O-Cloud resource information requests and sends back Query O-Cloud resource information responses.	

	IMS - The IMS within the O-Cloud processes the Query Information request and receives the request over the O2ims interface.	
Assumptions	FOCOM SMOS Consumer knows about what information/data can be used to filter a query for information.	
Preconditions	**O-Cloud Operational** – O-Cloud is operational and has registered with the SMO. **Privilege** – The FOCOM SMOS Consumer is authorized.	
Begins when	A FOCOM SMOS Consumer, sends a query request for O-Cloud information to the FOCOM SMOS Producer.	Ref to R1 interface: O-RAN.WG2.TS.R1GAP , clause 5.5.2.2 [i.6].
Step 1 (M)	The FOCOM SMOS Consumer, initiates a Query O-Cloud resource information request with a query information payload which includes query filter. The query filter specifies the objects of interest in the Query O-Cloud resource Information request. A query filter may point to specific O-Cloud objects (like resources, artifacts, etc.) by referring to their attribution, as specified in the O-RAN.WG6.TS.O-CLOUD-IM [i.8].	
Step 2 (M)	On receiving the request from FOCOM SMOS Consumer, The FOCOM SMOS Producer authenticates the connection and processes the Query O-Cloud resource information request. FOCOM SMOS Consumer retrieve the available requested information.	
Based on the query request from FOCOM SMOS Consumer, if FOCOM SMOS Producer needs additional information it initiates a query request to the IMS		
OPT	On receiving the request from FOCOM SMOS Consumer the FOCOM SMOS Producer initiate a Query O-Cloud Information Request to IMS over the O2ims interface to retrieve additional information. NOTE: The sequence of interactions between the FOCOM SMOS Producer and IMS is specified in ORAN.WG6.ORCH-USE-CASES, clause 3.1.11 [i.2]	ORAN.WG6.ORCH-USE-CASES, clause 3.1.11 [i.2].
Step 3 (ALT)	If the Query Information operation was successful, the FOCOM SMOS Producer responds to FOCOM SMOS Consumer, with the results matching the Query filter in the Query O-Cloud resource information request. The information provided in the response message may contain additional details added by the FOCOM SMOS Producer.	
Step 4 (ALT)	If an exception occurs during the request processing, the FOCOM SMOS Producer returns information to FOCOM SMOS Consumer about the exception and probable cause such as: 1. no existing objects or attributes exception encountered 2. IMS encountered an unexpected condition	
Ends when	FOCOM SMOS Consumer receives the requested information or information on an occurred exception.	
Exceptions	**EXCEPTION: QUERY WITH NO EXISTING OBJECTS OR ATTRIBUTES** This exception is encountered when a Query O-Cloud Information request specifies objects that do not exist. An exception notification will be returned; and the use case will end this situation.	

	EXCEPTION: UNEXPECTED CONDITION The IMS encountered an unexpected condition, such as an internal software fault. An exception notification will be returned; and the use case will end this this situation.	
Post-conditions	**N/A**	
Traceability	[REQ-FOCOM-FUN[1], REQ-FOCOM-FUN[2], REQ-FOCOM-FUN[3]	

4.2.1.3 UML Sequence Diagram

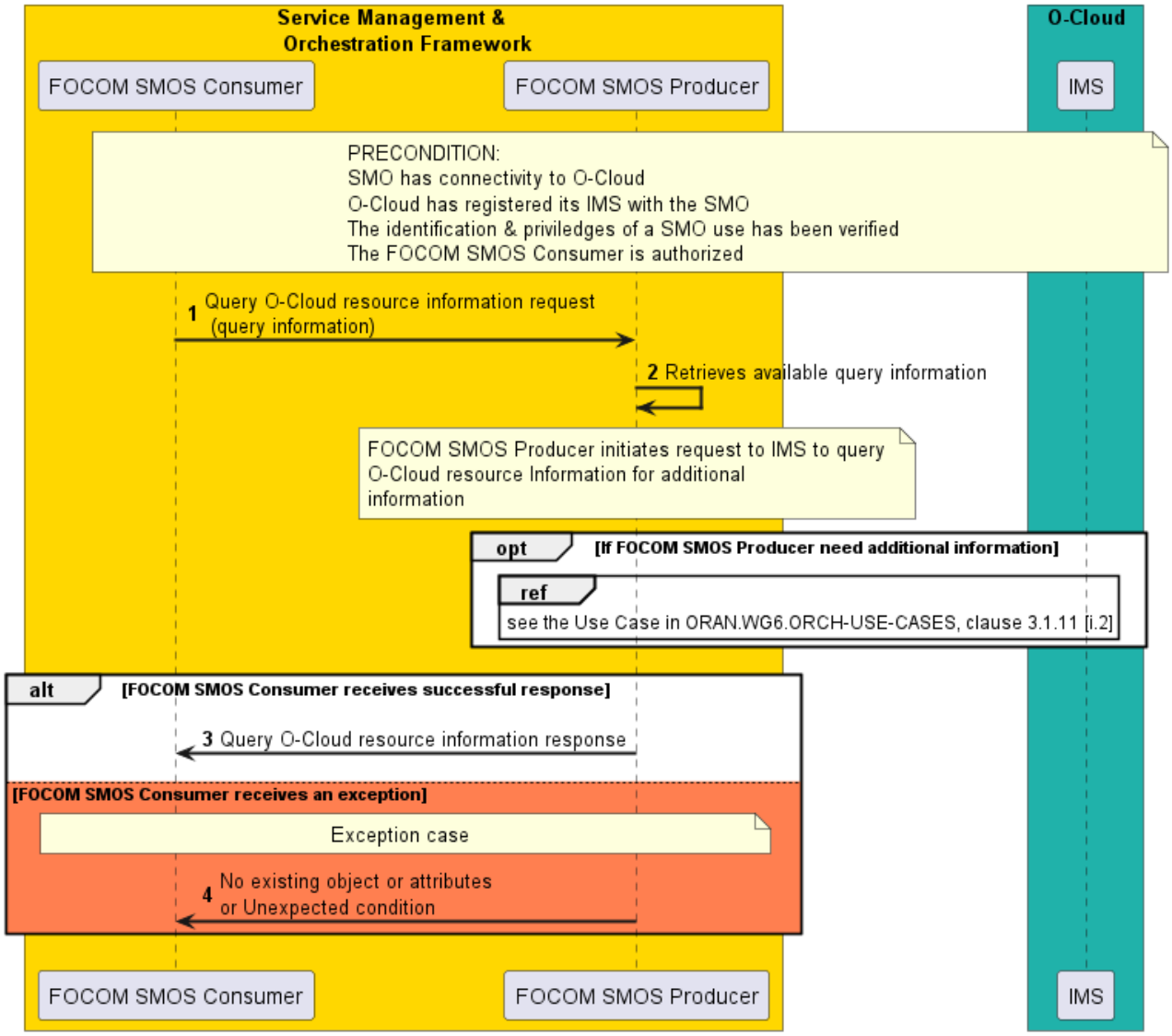


Figure 4.2.1.3-1: O-Cloud resource related information Query

4.2.2 O-Cloud template information Query Use Case

4.2.2.1 High level description

This use case enables a FOCOM SMOS Consumer e.g. an rApp or other SMOF, to retrieve information about the O-Cloud templates such as template characteristics, metadata and instance parameter schema information from FOCOM SMOS. FOCOM SMOS Consumer may use this information to understand the characteristics of the O-Cloud Node Cluster that are based on the O-Cloud templates and utilize this information for use cases such as create, delete or update a O-Cloud Node Cluster etc.,

4.2.2.2 Sequence Description

Table 4.2.2.2-2: O-Cloud template information Query use case

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	Enable FOCOM SMOS Consumer to query O-Cloud template information	
Actors and Roles	FOCOM SMOS Producer as service Producer FOCOM SMOS Consumer e.g. rApp or other SMOF	
Assumptions	N/A	
Preconditions	1) O-Cloud registration Use Case as defined in ORAN.WG6.ORCH-USE-CASES, clause 3.1.3 [i.2] has been executed and FOCOM SMOS Producer has discovered the current O-Cloud template(s) information. 2) FOCOM SMOS Consumer query O-Cloud resource information which includes the information of O-Cloud template identifier matching O-Cloud site	
Begins when	FOCOM SMOS Consumer intends to query the O-Cloud template information.	
Step 1 (M)	FOCOM SMOS Consumer sends a request to FOCOM SMOS Producer to query available O-Cloud template(s) information.	
Step 2 (M)	FOCOM SMOS Producer checks if the request received is from an authorized consumer.	
Step 3(M)	FOCOM SMOS Producer retrieves the available O-Cloud templates information	
Step 4 (alt)	FOCOM SMOS Producer responds with O-Cloud template(s) information.	
Step 5 (alt)	If an exception occurs during the request processing, the FOCOM SMOS Producer returns information to FOCOM SMOS Consumer about the exception and probable cause such as: 3. no existing objects or attributes exception encountered 4. IMS encountered an unexpected condition	
Ends when	FOCOM SMOS Consumer receives the O-Cloud templates information or information on an occurred exception.	
Exceptions	**EXCEPTION: QUERY WITH NO EXISTING OBJECTS OR ATTRIBUTES**	

	This exception is encountered when a Query O-Cloud Information request specifies objects that do not exist. An exception notification will be returned; and the use case will end this this situation. **EXCEPTION: UNEXPECTED CONDITION** The IMS encountered an unexpected condition, such as an internal software fault. An exception notification will be returned; and the use case will end this this situation.	
Post Conditions	N/A	
Traceability	REQ-FOCOM-FUN4	

4.2.2.3 UML Sequence Diagram

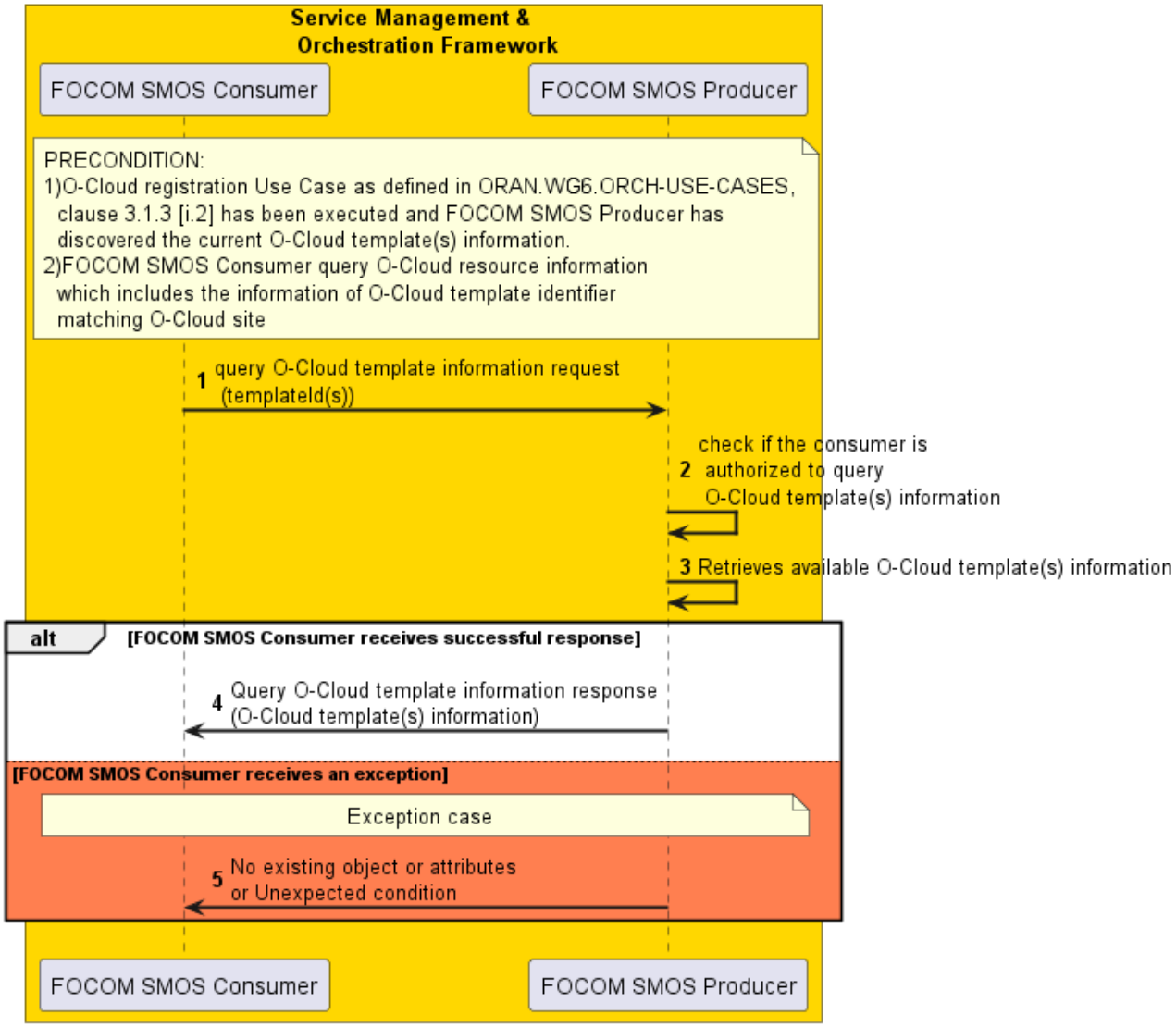


Figure 4.2.2.3-1: O-Cloud template information Query use case

4.2.3 Create, update and execute O-Cloud provisioning request using O-Cloud Template

4.2.3.1 High level description

The use case aims to assign a suitable set of O-Cloud resources to create an O-Cloud Node Cluster. Before this use case is started it is expected that the FOCOM SMOS Consumer has discovered the O-Cloud Template information. O-Cloud Template information is the properties about the O-Cloud Template that is exposed by the IMS towards the SMO. See clause 4.2.2 for further information.

To create an O-Cloud Node Cluster there are 3 different steps defined in this use case:

1. Create provisioningRequest revision
2. Update provisioningRequest revision
3. Execute provisioningRequest revision

NOTE: Even though the use case describes the three different steps of creation, updating and execution, these steps do not necessarily always take place sequentially, and these steps may be performed individually. Use case describes all of them for completeness of all relevant processes.

The term "version" refers to an O-Cloud template with same O-Cloud template name but with a different O-Cloud template version. The term "revision" refers to O-Cloud provisioning request instance with same provisioningRequestId but different revisionId e.g. updated in order to prepare for an update of existing O-Cloud provisioning request instance.

As specified in ORAN.WG6.ORCH-USE-CASES, clause 3.11.2.1 [i.2], the provisioning request from FOCOM SMOS towards the IMS at O-Cloud uses a declarative approach to create a O-Cloud Node Cluster. In this use case, FOCOM SMOS Consumer e.g. an rApp or other SMOF, request to FOCOM SMOS to create, update and execute a provisioning request based on supported O-Cloud Template.

The provisioning request from FOCOM SMOS Consumer will be stored and version controlled inside FOCOM SMOS as a Cluster and Infrastructure ProvisioningRequest instance which is referring to one single O-Cloud Template (template name/template version). Version control of the ProvisioningRequest enables tracking of new revisions of the ProvisioningRequest with any updated instance specific configuration and enables roll back to an old revision of the ProvisioningRequest in order to restore an older configuration. FOCOM SMOS will do the feasibility check of the required resources requested from FOCOM SMOS Consumer.

4.2.3.2 Sequence Description

Table 4.2.3.2-3: Create, update and execute O-Cloud provisioning request using O-Cloud Template

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	To create an O-Cloud Node cluster by creating, updating and executing the O-Cloud provisioning Request instance based on an O-Cloud Template	
Actors and Roles	**FOCOM SMOS Consumer** – An authorized consumer e.g. rApp or other SMOF, consuming the services of FOCOM SMOS **FOCOM SMOS Producer** – Receives create, update and execute request for the O-Cloud provisioning request and sends back responses.	
Assumptions	There are no assumptions for this use case	
Preconditions	**O-Cloud Operational** – O-Cloud is operational and has registered with the SMO **FOCOM SMOS Consumer** has the O-Cloud resource information and O-Cloud Template information (see clause 4.2.2) **Privilege** – The FOCOM SMOS Consumer is authorized	
Begins when	A FOCOM SMOS Consumer, sends a request to create a draft O-Cloud provisioning request revision	

Step 1 (M)	FOCOM SMOS Consumer sends a request to create a draft O-Cloud provisioning request revision by referring to the O-Cloud and O-Cloud template information which includes templateName, templateVersion and templateParameters. See NOTE 1	
Step 2 (M)	FOCOM SMOS Producer create a draft revision and generates new provisioningRequestId	
Step 3 (M)	FOCOM SMOS Producer sends an asynchronous response and Information about the state and status of provisioningRequest such as URI to fetch the information.	
Step 4 (M)	FOCOM SMOS Producer validates the template parameter based on the O-Cloud template schema exposed as part of O-Cloud template information. See NOTE 2	
Step 5 (M)	Validation of the template parameter is failed, FOCOM SMOS Producer responds to FOCOM SMOS Consumer with provisioningRequestId and information regarding the validation fail.	
Step 6 (M)	Validation is success, FOCOM SMOS Producer queries the IMS for identified resource types. See NOTE 3	
Step 7 (M)	IMS responds to the request	
Step 8 (M)	After receiving the response from IMS, FOCOM SMOS Producer performs a feasibility check by validating if enough resources are available	
Step 9 (M)	Validation of parameter and resource check success, FOCOM SMOS Producer respond with provisioningRequestId and resource check success.	
Step 10 (M)	Validation of parameter success but resource check fail. FOCOM SMOS Producer respond with provisioningRequestId and information regarding resource check failure.	
FOCOM SMOS Consumer, may update the new draft revision of the O-Cloud provisioning request with the instance specific input data. Step 11 – Step 19 are optional.		
Step 11	FOCOM SMOS Consumer sends a request to update the draft provisioning request with provisioningRequestId and updated template parameters	
Step 12	FOCOM SMOS Producer sends an asynchronous response	
Step 13	FOCOM SMOS Producer validates the template parameter based on the O-Cloud template schema exposed as part of O-Cloud template information. See NOTE 2.	

Step 14	Validation of the template parameter is failed, FOCOM SMOS Producer responds to FOCOM SMOS Consumer with provisioningRequestId and information regarding the validation fail	
Step 15	Validation is success, FOCOM SMOS Producer queries the IMS for identified resource types. See NOTE 3	
Step 16	IMS responds to the request	
Step 17	After receiving the response from IMS, performs a feasibility check by validating validates if enough resources are available	
Step 18	Validation of parameter and resource check success, FOCOM SMOS Producer respond with provisioningRequestId and resource check success.	
Step 19	Validation of parameter success but resource check fail. FOCOM SMOS Producer respond with provisioningRequestId and information regarding resource check failure.	
Step 20 (M)	FOCOM SMOS Consumer request to FOCOM SMOS Producer to approve the draft and execute the O-Cloud provisioning request See NOTE 4	
Step 21 (M)	FOCOM SMOS Producer check if the provisioningRequest is validated and resource check success	
FOCOM SMOS Producer accepts and approves the Provisioning Request and initiate a request to create provisioning request towards the IMS at O-Cloud See NOTE 5		
Step 22 (M)	FOCOM SMOS Producer updates the fulfilled O-Cloud provisioning request with information on provisioned resources.	
Step 23 (M)	If an exception occurs during the request processing, the FOCOM SMOS Producer returns information to FOCOM SMOS Consumer about the exception and probable cause such as: 5. no existing objects or attributes exception encountered 6. IMS encountered an unexpected condition	
Step 24 (M)	FOCOM SMOS Producer rejects to approve the provisioning request with information of rejection. SEE NOTE 6	
Ends when	FOCOM SMOS Consumer successfully request the creation of an O-Cloud Node Cluster and/or infrastructure resources or when the use case has encountered an exception	
Exceptions	**EXCEPTION: UNEXPECTED CONDITION** The exception is encountered an unexpected condition, such as an insufficient resources, creation failed, malformed request. An exception notification will be returned; and the use case will end this situation	

	See NOTE 7	
Post Conditions	N/A	
Traceability	REQ-FOCOM-FUN5, REQ-FOCOM-FUN6, REQ-FOCOM-FUN7, REQ-FOCOM-FUN8	

NOTE 1: A draft is a new O-Cloud provisioning request instance revision that is used by the FOCOM SMOS Consumer to prepare the new configuration information that has not been approved and executed the requested instance

NOTE 2: The validation is to provide feedback to the FOCOM SMOS Consumer whether the provided input data is compliant to the O-Cloud Template schema, e.g., if some mandatory data is missing etc.,

NOTE 3: FOCOM SMOS Producer needs to be aware of O-Cloud template parameters and template characteristics provided in the O-Cloud template information representing the below information:

1. O-Cloud site
2. If node groups are used, number of nodes per group and eligible resource types (for instance compute and site networks)
3. If node groups are not used, number of nodes and eligible resource types (for instance compute and site networks)

NOTE 4: An approve O-Cloud provisioning request instance revision is approved by the FOCOM SMOS Consumer and accepted for execution by FOCOM SMOS Producer

NOTE 5: The sequence of interactions between the FOCOM SMOS Producer and IMS is specified in ORAN.WG6.ORCH-USE-CASES, clause 3.11.2.3 [i.2]

NOTE 6: FOCOM SMOS Consumer repeats the update procedure (step 8-14) of provisioningRequest and triggers the approve request only when the updates are successfully validated and resource check success.

NOTE 7: After receiving the exception, FOCOM SMOS Producer will not automatically delete the instance of the provisioning request. The provisioning request will be updated as failed with the failure reason. Based on the failure further actions to be done from FOCOM SMOS Consumer

4.2.3.3 UML Sequence Diagram

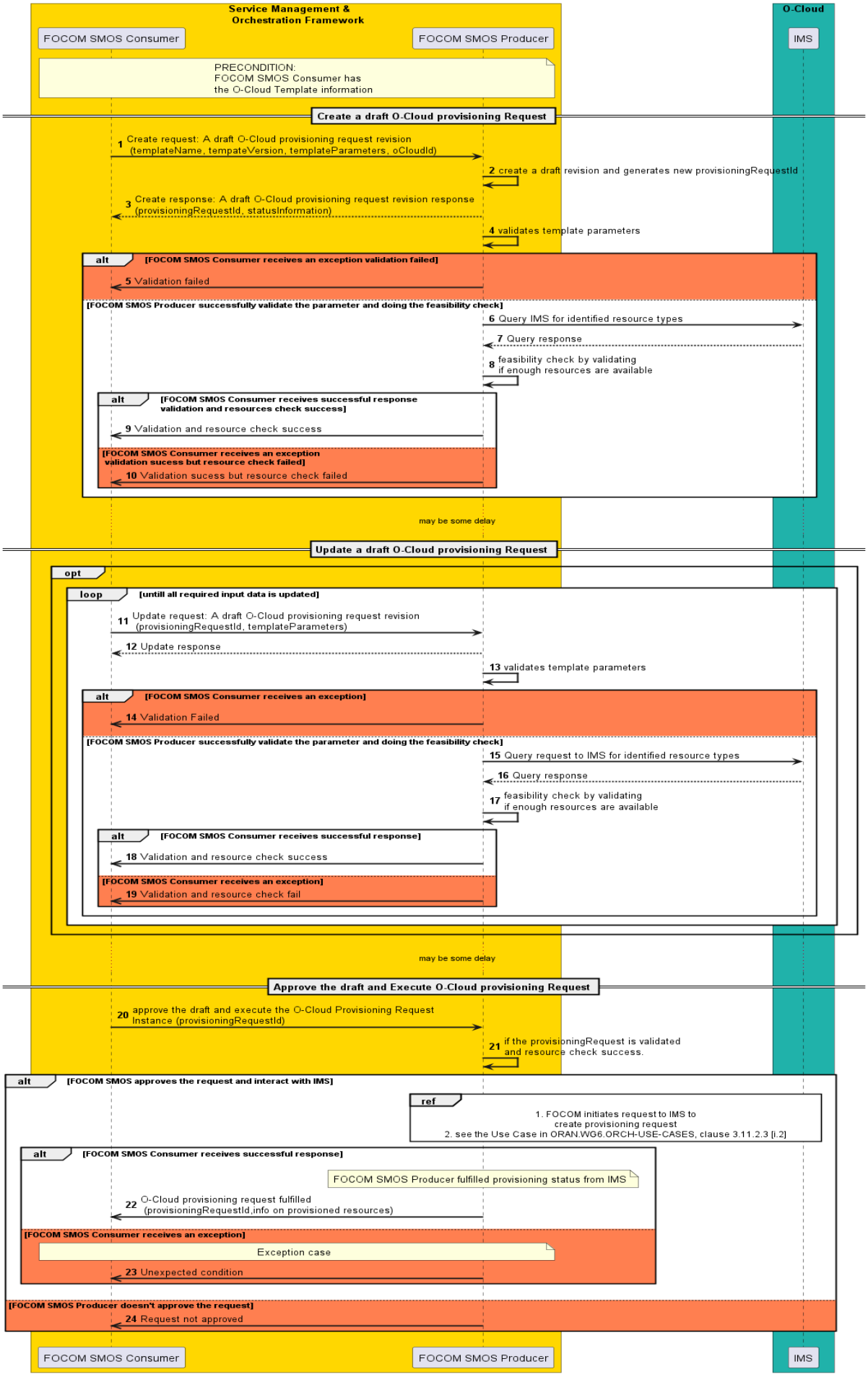


Figure 4.2.3.3-1: Create, update and execute O-Cloud provisioning request using O-Cloud Template

4.2.4 Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template

4.2.4.1 High level description

The use case aims to assign a suitable set of O-Cloud resources to update an O-Cloud Node Cluster and/or infrastructure resources using same O-Cloud Template. Before this use case is started it is expected that the FOCOM SMOS Consumer e.g. an rApp or other SMOF has acquired the provisioningRequestId by querying the list of already created and accepted provisioning request instance and has discovered the O-Cloud template information. O-Cloud template information is the properties about the O-Cloud Template that is exposed by the IMS towards the SMO. See clause 4.2.2 for further information.

In comparison with the use case in clause 4.2.3.2, this use case takes as a pre-condition that a ProvisioningRequest already exists and the purpose is to update it by providing new/updated parameter values.

To update an O-Cloud Node Cluster and/or infrastructure resources there are 3 different steps defined in this use case:

1. Create provisioningRequest revision
2. Update provisioningRequest revision
3. Execute provisioningRequest revision

NOTE: Even though the use case describes the three different steps of creation, updating and execution, these steps do not necessarily always take place sequentially, and these steps may be performed individually. Use case describes all of them for completeness of all relevant processes

FOCOM SMOS Consumer, request to FOCOM SMOS to create, update and execute a new draft of O-Cloud provisioning Request revision based on the content from the current revision of the provisioning request and same O-Cloud Template version.

See clause 4.2.3.1 for further information on the term “version”, “revision”, O-Cloud provisioningRequest instance and the purpose of version control of provisioning request.

4.2.4.2 Sequence Description

Table 4.2.4.2-4: Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	To update an O-Cloud Node Cluster and/or infrastructure resources by creating, updating and executing the O-Cloud provisioningRequest instance based on the content from the current revision of the provisioning request and same O-Cloud Template name and O-Cloud Template version	
Actors and Roles	**FOCOM SMOS Consumer** – An authorized consumer e.g. rApp or other SMOF, consuming the services of FOCOM SMOS **FOCOM SMOS Producer** – Receives create, update and execute request for the O-Cloud provisioning request and sends back responses. **IMS** – To execute the request received from FOCOM SMOS Producer	
Assumptions	There are no assumptions for this use case	
Preconditions	**O-Cloud Operational** – O-Cloud is operational and has registered with the SMO	

	FOCOM SMOS Consumer - Has acquired provisioningRequestId by querying the list of already created and accepted provisioning request and has acquired O-Cloud template information **IMS** - Declarative Provisioning request object exists **Privilege** – The FOCOM SMOS Consumer is authorized	
Begins when	A FOCOM SMOS Consumer, sends a request to create a new draft to update the O-Cloud provisioning request revision	
Step 1 (M)	FOCOM SMOS Consumer initiates a request to create a new draft to update O-Cloud provisioning request revision request with template parameter and provisioningRequestId as a parameter. See NOTE 1	
Step 2 (M)	FOCOM SMOS Producer create a draft revision	
Step 3 (M)	FOCOM SMOS Producer create a draft revision and sends an asynchronous response and Information about the state and status of provisioningRequest such as URI to fetch the information.	
Steps 4 to 21 on this use case are same as step 4 to step 21 of the use case specified in clause 4.2.3.2. But, Step 6, 7, 8 and Step 15, 16 and 17 in clause 4.2.3.2, will only be executed by the FOCOM SMOS Producer if additional O-Cloud resources are required due to the updated Provisioning request.		
FOCOM SMOS Producer accepts and approves the Provisioning Request and initiate a request to update provisioning request towards the IMS at O-Cloud See NOTE 2		
Steps 22 to 24 on this use case are same as step 22 to step 24 of the use case specified in clause 4.2.3.2		
Ends when	FOCOM SMOS Consumer successfully request an update to an O-Cloud Node Cluster and/or infrastructure resources or when the use case has encountered an exception	
Exceptions	See clause 4.2.3.2	
Post Conditions	N/A	
Traceability	REQ-FOCOM-FUN9, REQ-FOCOM-FUN4, REQ-FOCOM-FUN6, REQ-FOCOM-FUN7, REQ-FOCOM-FUN8	
NOTE 1: A draft is a new O-Cloud provisioning request instance revision that is used by the FOCOM SMOS Consumer to prepare the new configuration information that has not been approved and executed the requested instance. NOTE 2: The sequence of interactions between the FOCOM SMOS Producer and IMS is specified in ORAN.WG6.ORCH-USE-CASES, clause 3.11.4.3 [i.2]		

4.2.4.3 UML Sequence Diagram

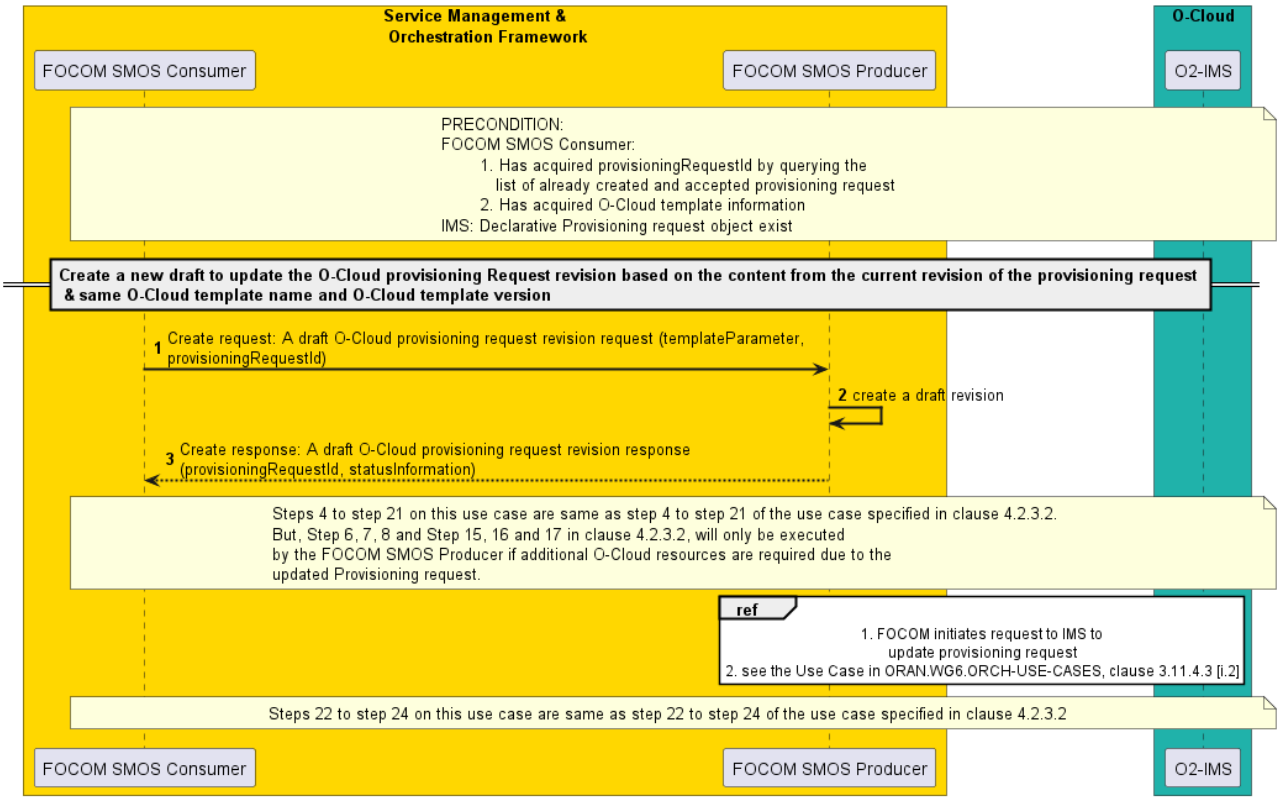


Figure 4.2.4.3-1: Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template

4.2.5 Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template

4.2.5.1 High level description

The use case aims to assign a suitable set of O-Cloud resources to update an O-Cloud Node Cluster and/or infrastructure resources using new O-Cloud Template. Before this use case is started it is expected that the FOCOM SMOS Consumer e.g. an rApp or other SMOF has acquired the provisioningRequestId by querying the list of already created and accepted provisioning request instance and has discovered the new O-Cloud template information. O-Cloud template information is the properties about the O-Cloud Template that is exposed by the IMS towards the SMO. See clause 4.2.2 for further information.

In comparison with the use case in clause 4.2.3.2, this use case takes a pre-condition that a ProvisioningRequest already exists and the purpose is to update it by referencing to a new O-Cloud template, with potentially providing new/updated parameter values.

To update an O-Cloud Node Cluster and/or infrastructure resources there are 3 different steps defined in this use case:

1. Create provisioningRequest revision
2. Update provisioningRequest revision
3. Execute provisioningRequest revision

NOTE: Even though the use case describes the three different steps of creation, updating and execution, these steps do not necessarily always take place sequentially, and these steps may be performed individually. Use case describes all of them for completeness of all relevant processes

FOCOM SMOS Consumer, request to FOCOM SMOS Producer to create, update and execute a new draft of O-Cloud provisioning Request revision based on the content from the current revision of the provisioning request and new O-Cloud Template version

See clause 4.2.3.1 for further information on the term "version", "revision", O-Cloud provisioningRequest instance and the purpose of versioning the provisioning request.

4.2.5.2 Sequence Description

Table 4.2.5.2-5: Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	To update an O-Cloud Node Cluster and/or infrastructure resources by creating, updating and executing the O-Cloud provisioningRequest instance based on the content from the current revision of the provisioning request and with new O-Cloud Template version and/or O-Cloud Template name	
Actors and Roles	**FOCOM SMOS Consumer** – An authorized consumer e.g. rApp or other SMOF, consuming the services of FOCOM SMOS **FOCOM SMOS Producer** – Receives create, update and execute request for the O-Cloud provisioning request and sends back responses. **IMS** – To execute the request received from FOCOM SMOS Producer	
Assumptions	There are no assumptions for this use case	
Preconditions	**O-Cloud Operational** – O-Cloud is operational and has registered with the SMO **FOCOM SMOS Consumer** - Has acquired provisioningRequestId by querying the list of already created and accepted provisioning request and has acquired new O-Cloud template information **IMS** - Declarative Provisioning request object exists **Privilege** – The FOCOM SMOS Consumer is authorized	
Begins when	A FOCOM SMOS Consumer, request to create a new draft to update the O-Cloud provisioning request revision based on new O-Cloud Template	
Step 1 (M)	FOCOM SMOS Consumer initiates a request create a new draft O-Cloud provisioning request revision request which includes templateName, templateVersion and templateParameters and provisioningRequestId as a parameter. templateName together with templateVersion uniquely identifies a template, where the templateName gives a human operator the association of what the template is meant for. See NOTE 1	
Step 2 (M)	FOCOM SMOS Producer create a draft revision	
Step 3 (M)	FOCOM SMOS Producer create a draft revision and sends an asynchronous response and Information about the state and status of provisioningRequest such as URI to fetch the information.	

Steps 4 to 21 on this use case are same as step 4 to step 21 of the use case specified in clause 4.2.3.2. But, Step 6, 7, 8 and Step 15, 16 and 17 in clause 4.2.3.2, will only be executed by the FOCOM SMOS Producer if additional O-Cloud resources are required due to the updated Provisioning request		
FOCOM SMOS Producer accepts and approves the Provisioning Request and initiate a request to update provisioning request towards the IMS at O-Cloud See NOTE 2		
Steps 22 to 24 on this use case are same as step 22 to step 24 of the use case specified in clause 4.2.3.2		
Ends when	FOCOM SMOS Consumer successfully request an update to an O-Cloud Node Cluster and/or infrastructure resources or when the use case has encountered an exception	
Exceptions	See clause 4.2.3.2	
Post Conditions	N/A	
Traceability	REQ-FOCOM-FUN10, REQ-FOCOM-FUN4, REQ-FOCOM-FUN6, REQ-FOCOM-FUN7, REQ-FOCOM-FUN8	
NOTE 1: A draft is a new O-Cloud provisioning request instance revision that is used by the FOCOM SMOS Consumer to prepare the new configuration information that has not been approved and executed the requested instance. NOTE 2: The sequence of interactions between the FOCOM SMOS Producer and IMS is specified in ORAN.WG6.ORCH-USE-CASES, clause 3.11.4.3 [i.2].		

4.2.5.3 UML Sequence Diagram

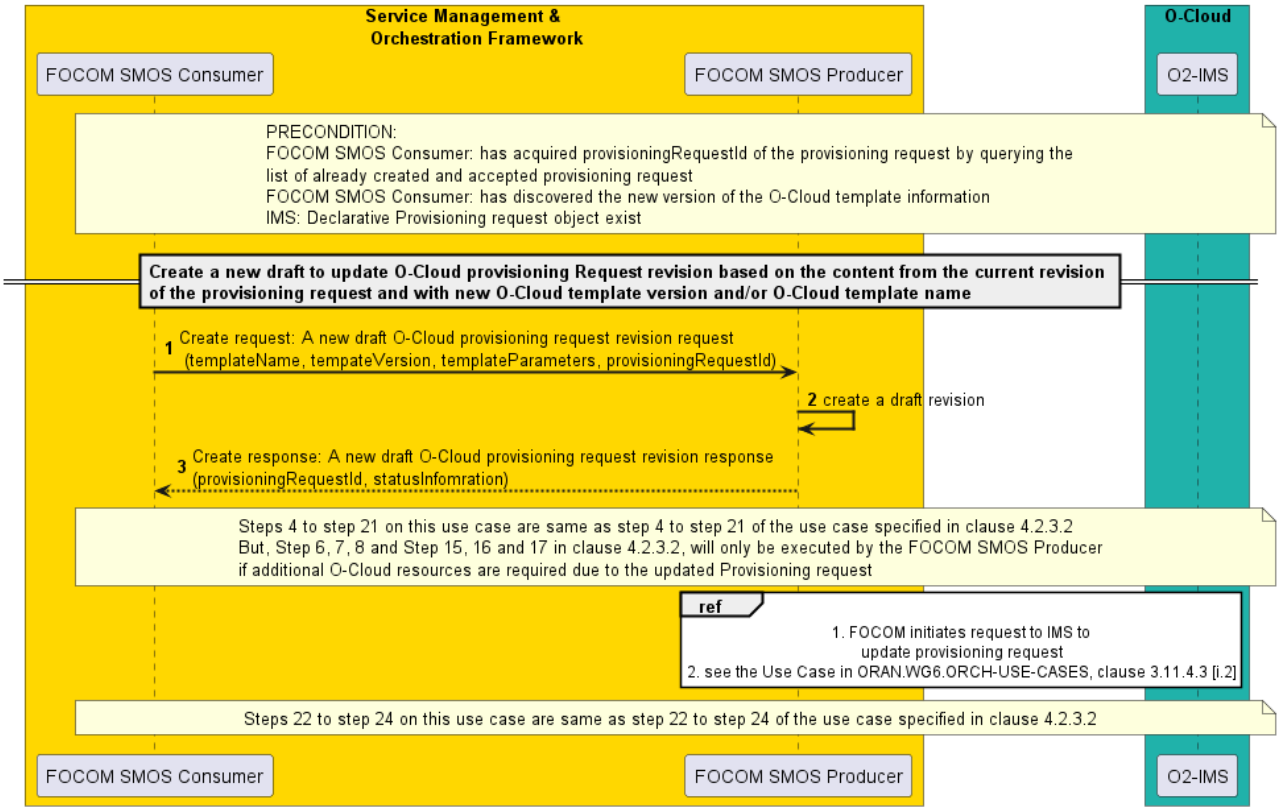


Figure 4.2.5.3-1: Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template

4.2.6 Registering FOCOM SMOS for PM DME datatypes and associated operations

4.2.6.1 High level description

The use case aims to register FOCOM SMOS as the data producer for a defined performance datatype in DME. PM data consumers e.g. rApps can discover these registered DME datatypes (see Note1) and can request or subscribe to performance data for that DME datatype.

As part of the register procedure, the FOCOM SMOS derives needed Performance data/PM Job related details & then uses DME APIs (see Note2) for PM DME datatype registration by sharing PM data/PM Job related details (DME Type Information).

FOCOM SMOS finally maintains mapping of created PM jobs for corresponding registered DME datatypes.

Additionally, these registered datatypes can also be updated/deregistered as and when required using DME mechanism & FOCOM SMOS.s

NOTE1: DME functionalities (Like Discovering registered Datatypes) are out of scope for this TR & are just mentioned to explain the need of this use case.

NOTE2: R1 DME service APIs are defined in O-RAN.WG2.TS.R1AP [i.10], but DME SMOS APIs are not yet defined.

NOTE: Detailed depiction of O2 interactions/actions towards O-Clouds are out of scope for this TR.

4.2.6.2 UML Sequence Table

Table 4.2.6.2-6: Registering FOCOM SMOS for Performance DME datatype & associated operations

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal (1)	**Registration: The FOCOM SMOS registers as producer of data for a DME type.**	
Actors and Roles	- FOCOM SMOS: Data Registration Service consumer - DME SMOS: Data registration service producer. - O-Cloud IMS: To execute the request received from FOCOM SMOS	
Assumptions	Capabilities assessment/exchange between SMO/FOCOM & O-Cloud(s)IMS(s) to : - Identify supported protocols, mechanisms, and formats supported by O-Clouds - IMS reports Performance Measurement Jobs and details like collection intervals to SMO	
Preconditions	- The FOCOM SMOS is authenticated/authorized to access & use the DME services. - Performance datatypes defined in DME SMOS - Availability of Default/customized PM Jobs	
Begins when	FOCOM SMOS determines the need to register as a producer of performance data for a DME type.	
Step 1 (M)	Using Capability info, FOCOM derives the “data type identifier and needed DME type information” required to register as producer against any DME Datatype	
Using DME APIs	The FOCOM SMOS interacts with DME SMOS for Registering DME datatype to DME SMOS using DME datatype registration service API Reference: see NOTE2	
Step 2(M)	FOCOM SMOS maintains mapping of PM jobs for corresponding registered DME datatypes	
Ends when	FOCOM SMOS registers as producer of performance data for a DME type & maintains mapping of PM jobs for corresponding registered DME datatypes.	
Exceptions	n/a	

Post Conditions	The performance DME type is discoverable by authenticated/authorized DME service consumers	
Traceability	REQ-FOCOM-FUN11	
Goal (2)	**Updating: The FOCOM SMOS as producer of performance data updates a DME type registration it has previously created.**	
Actors and Roles	- FOCOCM SMOS: Data registration and discovery service Consumer. - DME SMOS: Data registration and discovery service Producer.	
Assumptions		
Preconditions	- The FOCOM SMOS is authenticated/authorized to access & use the DME Services. - The FOCOM SMOS is registered as producer of data for a DME type.	
Begins when	The FOCOM SMOS determines the need to update a DME type registration previously created	
Step 1 (M)	Based on Capability info changes (O-Cloud Level/PM Job level), FOCOM derives the updates needed on “data type identifier or on DME type information” required to update the previous configured DME datatype registration	
Using DME APIs	The FOCOM SMOS interacts with DME SMOS to Update DME datatype on DME SMOS using Update registered service API Reference: see NOTE2	
Step 2 (M)	FOCOM SMOS updates the mapping list of PM job to registered DME datatypes	
Ends when	The FOCOM SMOS has updated the DME type registration & updates the mapping list of PM job to registered DME	
Exceptions	n/a	
Post Conditions	The “updated” Performance DME type is discoverable by authenticated/authorized DME Service Consumer.	
Traceability	REQ-FOCOM-FUN11	
Goal (3)	**Deregistration: The FOCOM SMOS deregisters as producer of performance data for a DME type.**	
Actors and Roles	- FOCOM SMOS: Data registration and discovery service consumer. - DME SMOS: Data registration and discovery service producer.	
Assumptions	FOCOM SMOS is not producing any data for the DME type.	
Preconditions	- The FOCOM SMOS is authenticated/authorized to access & use the DME Services. - The FOCOM SMOS is registered as producer of data for a DME type	
Begins when	The FOCOM SMOS determines the need to deregister as producer of data for a DME type that it no longer intends to produce.	
Step 1 (M)	Interface with respective O-Clouds(O2 IMSs) & Delete mapped PM Job (Suspended State) accordingly [Refer ORAN.WG6.ORCH-USE-CASES, clause3.8.7 [i.2]]	
Using DME APIs	The FOCOM SMOS interacts with DME SMOS for Deregistering DME datatype on DME SMOS using Deregister service API Reference: see NOTE2.	
Step 2 (M)	FOCOM SMOS Updates the mapping list of PM job to registered DME datatypes	
Ends when	The FOCOM SMOS was able to deregister the as producer of performance data for the DME type along with corresponding PM jobs deletion & mapping maintenance.	
Exceptions	n/a	
Post Conditions	The FOCOM SMOS will not receive any request of performance data for the DME type	
Traceability	REQ-FOCOM-FUN11	

4.2.6.3 UML Sequence Diagram

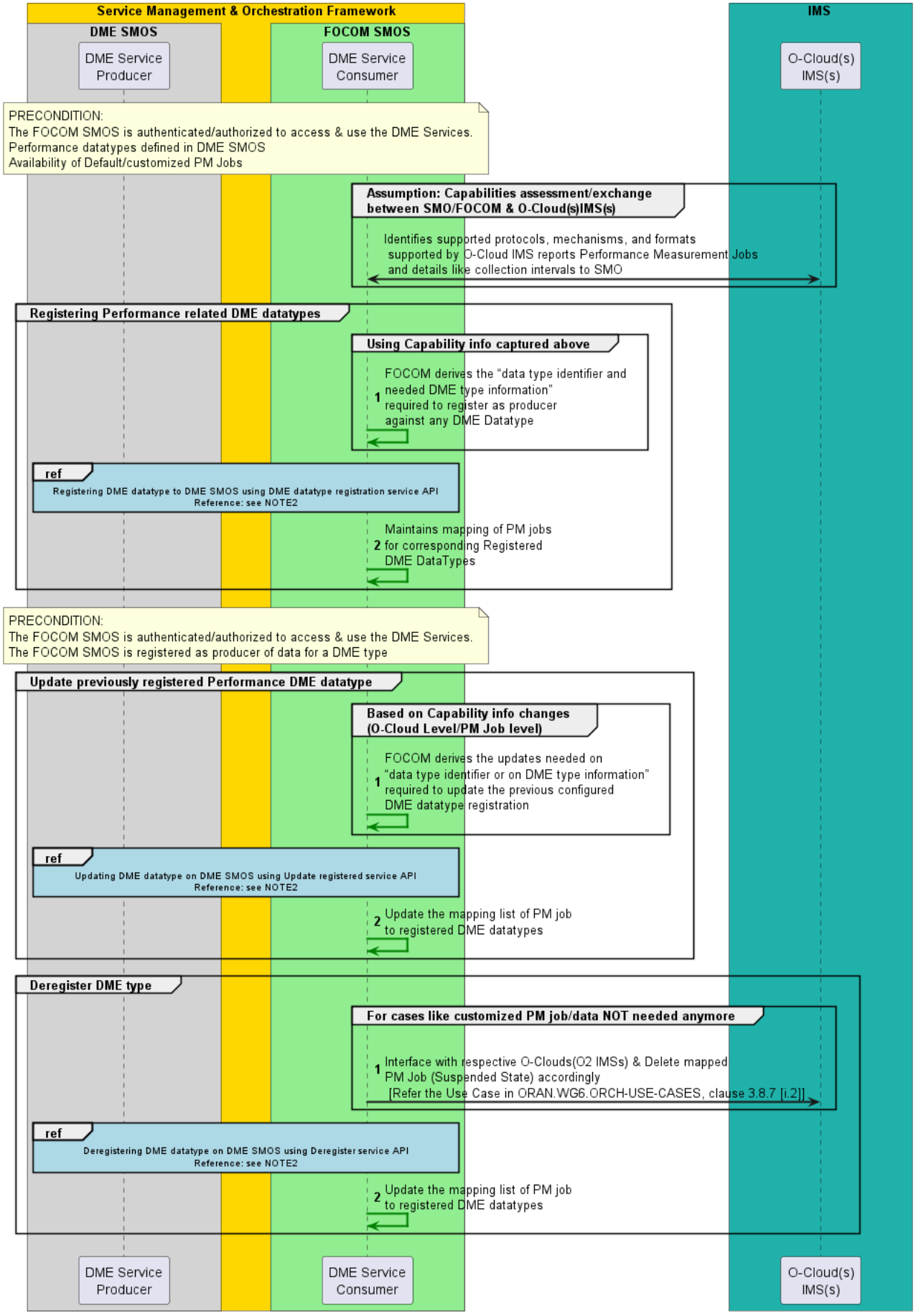


Figure 4.2.6.3-1: Registering FOCOM SMOS for Performance DME datatype & associated operations

4.2.7 Subscribing to PM Datatype/Dataset & associated operations (Update/Remove subscriptions)

4.2.7.1 High level description

The use case describes how an authenticated & authorized PM data consumer (like rApp) can subscribe and obtain PM data using DME mechanism & FOCOM SMOS NBIs. Additionally, these subscriptions can also be updated/removed as and when required using FOCOM SMOS NBIs.

The use case also covers these operations (create/update/remove subscription) in multi-user scenario.

4.2.7.2 UML Sequence Table

Table 4.2.7.2-7: Subscribing to PM Datatype/Dataset & associated operations (Update/Remove subscriptions)

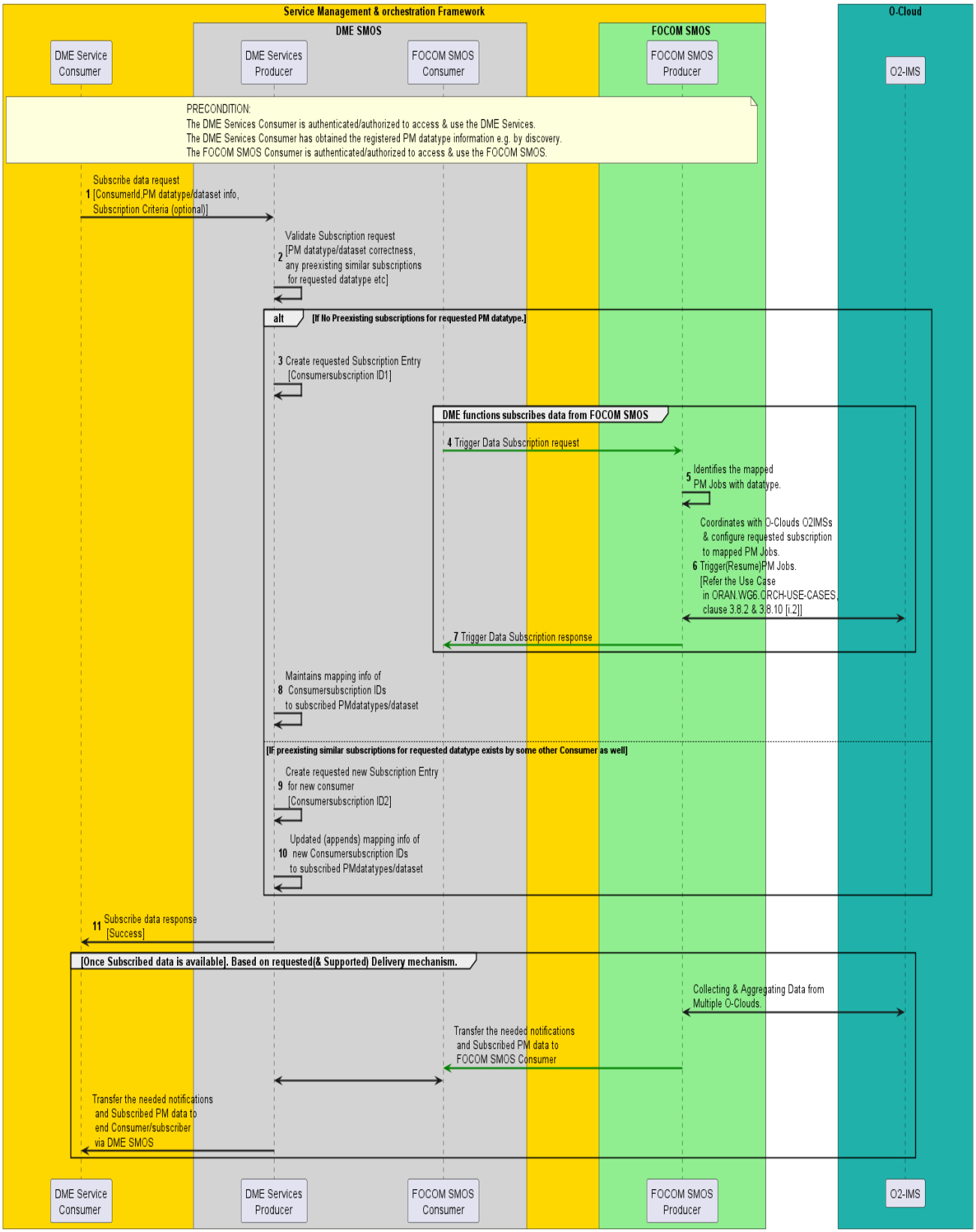
Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal (1)	**Subscription: The DME service consumer subscribes & obtains PM data.**	
Actors and Roles	- FOCOM SMOS: In the role of "FOCOM SMOS Producer" - DME SMOS: In the role of "DME Service Producer" & "FOCOM SMOS Consumer" - DME service consumer: End consumer of performance data e.g. rApps or other SMOF - O-Cloud IMS: To execute the request received from FOCOM SMOS	
Assumptions		
Preconditions	- The DME services consumer is authenticated/authorized to access & use the DME Services. - The DME services consumer has obtained the registered PM datatype information e.g. by discovery. - The FOCOM SMOS consumer is authenticated/authorized to access & use the FOCOM SMOS services.	
Begins when	The DME Service Consumer determines the need to subscribe to required PM data.	
Step 1 (M)	The DME service consumer triggers subscription request of PM data with subscription request information. This information may comprise ConsumerId, PM datatype/dataset info, and subscription criteria (optional).	
Step 2 (M)	The DME service producer validates the received subscription request information	
Alternative Procedure (ALT1)	If no preexisting subscriptions for requested PM datatype/dataset	
Step 3 (ALT1)	The DME service producer creates a new Consumer Subscription identifier entry on the PM datatype/dataset for that consumer [e.g. consumer subscription ID1].	
Step 4 (ALT1)	Upon creation of Consumer Subscription identifier entry, the DME SMOS in role of "FOCOM SMOS consumer" triggers a data subscription request towards FOCOM SMOS	
Step 5 (ALT1)	FOCOM SMOS identifies the corresponding PM jobs that are mapped with the datatype/dataset.	
Step 6 (ALT1)	Based on the requested subscription, FOCOM SMOS interfaces with respective O-Cloud (O2 IMSs) functions & configures the requested subscription to the mapped PM jobs. These PM jobs will be triggered and moved from suspended state to running.	Refer ORAN.WG6.ORCH-USE-CASES, clause 3.8.2 & 3.8.10 [i.2]

Step 7(ALT1)	FOCOM SMOS responds back to DME SMOS with confirmation of subscription creation.	
Step 8 (ALT1)	The DME service producer maintains a mapping info of Consumer Subscription identifier entry to subscribed PMdatatypes/dataset	
Alternative Procedure (ALT2)	If preexisting similar subscriptions for requested datatype/dataset exists	
Step 9 (ALT2)	The DME service producer creates a new Consumer Subscription identifier entry on the PM datatype/dataset for the new consumer [e.g. consumer subscription ID2]	
Step 10(ALT2)	The DME service producer updates the mapping info of the already subscribed PMdatatypes/dataset with the new Consumersubscription ID	
Step 11(M)	The DME service producer sends success response to DME service consumer (rApp) with the newly created Consumersubscription ID.	
Once Subscribed data is available. Based on requested (& Supported) Delivery mechanism		
Step (M)	FOCOM SMOS coordinates with respective **O-Cloud IMS for** Collecting & Aggregating PM Data from Multiple O-Clouds	
Step (M)	FOCOM SMOS Transfer the needed notifications and Subscribed PM data to FOCOM SMOS Consumer	
Step (M)	DME SMOS finally Transfer the needed notifications and Subscribed PM data to end Consumer/subscriber	
Ends when	End consumer is able to subscribe and finally receive needed notifications and Subscribed PM data	
Exceptions	n/a	
Post Conditions	DME service consumer/end consumer (e.g. rApp) is able to receive needed notifications and intended subscribed PM data	
Traceability	REQ-FOCOM-FUN12 , REQ-FOCOM-FUN15	
Goal (2)	**Update: The DME service consumer/end consumer (e.g. rApps) updates its previously created PM data subscription.**	
Actors and Roles	- FOCOM SMOS: In the role of “FOCOM SMOS Producer” - DME SMOS: In the role of “DME Service Producer” & “FOCOM SMOS Consumer” - DME service consumer: End consumer of performance data e.g. rApps or other SMOF - O-Cloud IMS: To execute the request received from FOCOM SMOS	
Assumptions		
Preconditions	- The consumer is authenticated/authorized to access & use the DME services. - The consumer has previously created PM data subscription. - The DME services consumer has obtained the registered PM datatype information e.g. by discovery.	
Begins when	The DME service consumer determines the need to update a subscription it has previously created	
Step 1 (M)	The DME service consumer triggers update request with subscription update information. This information may comprise ConsumerId, Consumersubscription ID and update information.	
Step 2 (M)	DME SMOS (DME service producer) validates the received update subscription request	
Alternative Procedure (ALT1)	If associated PM datatype is mapped with only single Consumersubscription ID	
Step 3 (ALT1)	DME SMOS (FOCOM SMOS consumer) triggers update subscription request towards FOCOM SMOS producer	
Step 4 (ALT1)	Based on the requested update, FOCOM SMOS interfaces with respective O-Cloud (O2 IMSs) functions & configures the requested update to the mapped PM jobs.	Refer ORAN.WG6.ORCH-USE-CASES, clause 3.8.13 [i.2]
Step 5 (ALT1)	FOCOM SMOS producer shares the update subscription success response to DME SMOS (FOCOM SMOS consumer)	
Alternative Procedure (ALT2)	If associated PM datatype is mapped with multiple Consumersubscription IDs	

Step 6 (ALT2)	The DME SMOS (DME service producer) removes the received Consumersubscription ID as well as its entries from the Consumersubscription IDs - PMdatatype Mapping table.	
Step 7 (ALT2)	Aligned to consumer update subscription changes, The DME service producer creates a new subscription entry for the requested PM datatype/dataset for that consumer [e.g. consumer subscription IDx].	
Step 8 (ALT2)	Upon creation of subscription entry, the DME SMOS in role of "FOCOM SMOS consumer" triggers a data subscription request towards FOCOM SMOS	
Step 9 (ALT2)	FOCOM SMOS identifies the corresponding PM jobs that are mapped with the requested datatype/dataset.	
Step 10 (ALT2)	Based on the requested subscription, FOCOM SMOS interfaces with respective O-Cloud (O2 IMSs) functions & configures the requested subscription to the mapped PM jobs. These PM jobs will be triggered and moved from suspended state to running.	
Step 11(ALT2)	FOCOM SMOS responds back to DME SMOS with confirmation of subscription creation.	
Step 12 (ALT2)	The DME service producer maintains a mapping info of Consumersubscription IDs to subscribed PMdatatypes/dataset(as per update request)	
Step 13 (M)	The DME service producer sends success response to DME service consumer (rApp) with same or newly created Consumersubscription ID.	
Ends when	DME Service Consumer (like rApp) has updated the data subscription.	
Exceptions	n/a	
Post Conditions	n/a	
Traceability	REQ-FOCOM-FUN13	
Goal (3)	The DME service Consumer/End Consumer (e.g. rAPP) removes the data subscription.	
Actors and Roles	- FOCOM SMOS: In the role of "FOCOM SMOS Producer" - DME SMOS: In the role of "DME Service Producer" & "FOCOM SMOS Consumer" - DME service consumer: End consumer of performance data e.g. rApps or other SMOF - O-Cloud IMS: To execute the request received from FOCOM SMOS	
Assumptions		
Preconditions	- The Consumer has previously created PM data subscription.	
Begins when	The **DME Service Consumer** (like rApp) determines the need to remove a subscription it has previously created	
Step 1 (M)	The **DME Service Consumer** (like rApp) triggers Unsubscribe request towards DME service Producer by sharing details like (ConsumerId, Consumersubscription ID)	
Step 2 (M)	DME SMOS (DME service Producer) Validate the Consumer's remove subscription request	
Alternative procedure (ALT1)	If associated subscribed PM datatype is Mapped with multiple Consumersubscription IDs	
Step 3 (ALT1)	DME SMOS (DME service Producer) Remove current Consumersubscription IDs & update Consumersubscription IDs - PMdatatype Mapping Table	
Alternative Procedure (ALT2)	if associated subscribed PM datatype is Mapped with only single Consumersubscription ID	
Step 4 (ALT2)	DME SMOS (FOCOM SMOS Consumer) triggers remove Subscription request towards FOCOM SMOS Producer	
Step 5 (ALT2)	FOCOM SMOS Producer in turns coordinates with respective O-Cloud IMSs & remove Subscription entries from mapped PM Jobs towards IMS	[Refer ORAN.WG6.ORCH-USE-CASES, clause 3.8.14 [i.2]]
Step 6 (ALT2)	FOCOM SMOS Producer shares the remove subscription success from mapped jobs response to DME SMOS (FOCOM SMOS Consumer)	
Step 7 (ALT2)	DME SMOS (DME service Producer) Remove this Consumersubscription IDs & update Consumersubscription IDs - PMdatatype Mapping Table	
Step 8 (M)	DME SMOS (DME service Producer) response to DME Service Consumer (like rApp) with Successful completion of remove Subscription request	

Ends when	DME Service Consumer (like rApp) has removed the data subscription.	
Exceptions	n/a	
Post Conditions	n/a	
Traceability	REQ-FOCOM-FUN14	

4.2.7.3 UML Sequence Diagram



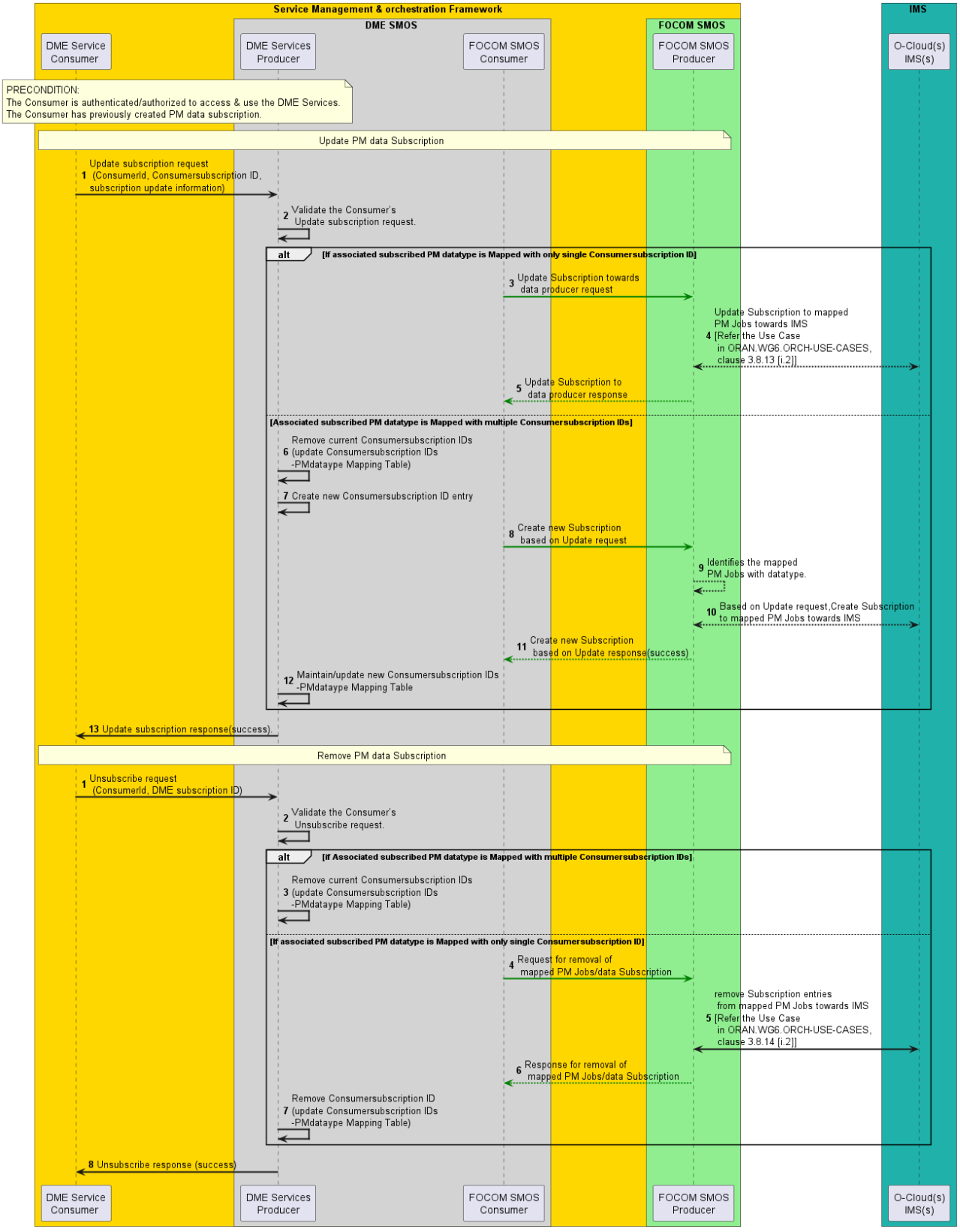


Figure 4.2.7.3-1: Subscribing PM Datatype/Data Set & associated operations (Update/Remove subscriptions)

4.2.8 Delete O-Cloud provisioningRequest instance

4.2.8.1 High level description

The use case aims to enable a FOCOM SMOS Consumer e.g. an rApp or other SMOF, to delete the existing O-Cloud provisioningRequest instance. Before this use case is initiated it is assumed that all FOCOM SMOS Consumers have coordinated in regard to deleting the provisioning Request.

4.2.8.2 Sequence Description

Table 4.2.8.2-8: Delete O-Cloud provisioningRequest instance

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	To delete the O-Cloud provisioningRequest instance	
Actors and Roles	**FOCOM SMOS Consumer** – An authorized consumer e.g. rApp or other SMOF, consuming the services of FOCOM SMOS **FOCOM SMOS Producer** – Execute the request to delete O-Cloud provisioning request instance. **IMS -** To execute the request received from FOCOM SMOS Producer	
Assumptions	1. It is assumed that all FOCOM SMOS Consumers have coordinated in regard to deleting the provisioningRequest	
Preconditions	1. FOCOM SMOS Producer has acquired provisioningRequestId 2. FOCOM SMOS Consumer is authorized to delete provisioningRequestId	
Begins when	FOCOM SMOS Consumer intends to delete the O-Cloud Node cluster and/or infrastructure resources	
Step 1 (M)	FOCOM SMOS Consumer sends a request to FOCOM SMOS Producer to delete the O-Cloud Node cluster and/or infrastructure resources with provisioningRequestId as a parameter	
Step 2 (M)	FOCOM SMOS Consumer validates the request	
Step 3 (M)	If the validation is successful, FOCOM SMOS Producer checks if the provisioningRequestId is in draft state. If provisioningRequestId is in draft state, FOCOM SMOS Producer delete the instance of the provisioningRequestId.	
Step 4(M)	FOCOM SMOS Producer responds to FOCOM SMOS Consumer	
Step 5(M)	If the validation is successful, FOCOM SMOS Producer checks if the provisioningRequestId is in approved state. FOCOM SMOS Producer interacts with IMS to delete the resources. NOTE 1	
Step 6 (M)	If success received from IMS, FOCOM SMOS Producer deletes the information related to the provisioningRequestId	
Step 7 (M)	FOCOM SMOS Producer sends success response to FOCOM SMOS Consumer	
Step 8 (M)	If failure is observed in IMS, FOCOM SMOS Producer responds with information about the failure	

Step 9 (M)	If the validation fail, FOCOM SMOS Producer responds with information about the failure	
Ends when	FOCOM SMOS Consumer successfully requests the deletion of the O-Cloud Node Cluster and/or infrastructure resources or when information about the failure is received	
Exceptions	1. The exception is encountered such as O-Cloud Node Cluster not found,. An exception notification will be returned; and the use case will end this situation 2. Validation Fail – This exception occurs when the validation of the request fails	
Post Conditions	ProvisioningRequest instance is deleted and O-Cloud Resource is released	
Traceability	REQ-FOCOM-FUN16	
NOTE 1: The sequence of interactions between the FOCOM SMOS Producer and IMS is specified in ORAN.WG6.ORCH-USE-CASES, clause 3.11.3 [i.2]		

4.2.8.3 UML Sequence Diagram

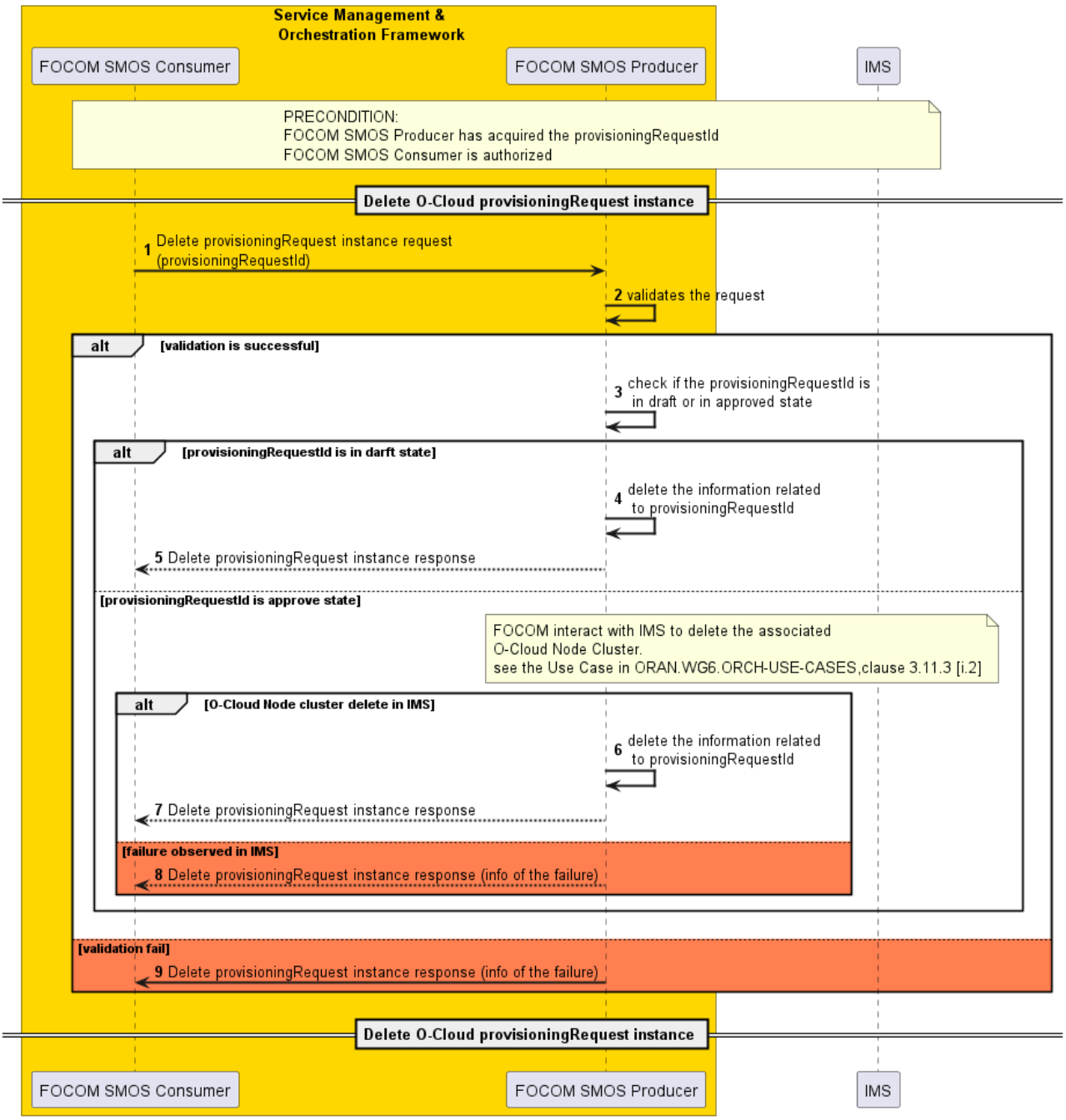


Figure 4.2.8.3-1: Delete O-Cloud provisioningRequest instance

4.2.9 Restore or Update O-Cloud provisioning request revision

4.2.9.1 High level description

The use case aims to restore to a previously created and accepted provisioning request configuration. The procedure is the same as the update procedure i.e., FOCOM SMOS Consumer uses the previous provisioning request revisionId and updates the configurations.

Before this use case is started it is expected that the FOCOM SMOS Consumer e.g. an rApp or other SMOF

1. Has acquired provisioningRequestId and O-Cloud template information.
2. Created and/or updated a draft provisioning request revision using same O-Cloud Template or different O-Cloud Template version.

4.2.9.2 Sequence Description

Table 4.2.9.2-9: Restore or Update O-Cloud provisioning request revision

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	To restore/update to previously created and approved provisioning request instance	
Actors and Roles	**FOCOM SMOS Consumer** – An authorized consumer e.g. rApp or other SMOF, consuming the services of FOCOM SMOS **FOCOM SMOS Producer** – Receives update and execute request for the O-Cloud provisioning request and sends back responses. **IMS** – To execute the request received from FOCOM SMOS Producer	
Assumptions	1. Previously allocated resources on the IMS have not changed compared to previously successfully deployed state 2. In the failed state, IMS shouldn't release the requested resources by the FOCOM SMOS Consumer	
Preconditions	**O-Cloud Operational** – O-Cloud is operational and has registered with the SMO **FOCOM SMOS Consumer** - Has acquired available provisioningRequestId and O-Cloud template information. Has created/updated a draft provisioning request revision using same O-Cloud Template or different O-Cloud Template version **IMS** - Declarative Provisioning request object exists **Privilege** – The FOCOM SMOS Consumer is authorized	Use case 4.2.2, Step 1 to 3 of use case 4.2.3 and 4.2.4
Begins when	A FOCOM SMOS Consumer, request to approve the draft O-Cloud provisioning request	
Step 1 (M)	FOCOM SMOS Consumer request to FOCOM SMOS Producer to approve the draft and execute the O-Cloud provisioning request with provisioningRequestId as a parameter See NOTE 1	
FOCOM SMOS Producer accepts and approves the Provisioning Request and initiates a request to update provisioning request towards the IMS at O-Cloud See NOTE 2		
Step 2 (M)	A failure was observed, the FOCOM SMOS Producer returns information to FOCOM SMOS Consumer about the failure and probable cause	
FOCOM SMOS Consumer, may Alternatives: 1. FOCOM SMOS Consumer either update the failed configuration or 2. FOCOM SMOS Consumer restore to same configuration of the previous revision and use that in order to create the new revision with new revisionId		
Alternative 1:		
Step 3 (M)	FOCOM SMOS Consumer initiates a request to create a new draft to update O-Cloud provisioning request revision request with updated template parameter and provisioningRequestId as a parameter	

Step 4 (M)	FOCOM SMOS Producer create a new draft revision based on the updated configuration	
Step 5 (M)	FOCOM SMOS Producer respond to FOCOM SMOS Consumer with provisioningRequestId as a parameter	
Alternative 2		
Step 6 (M)	FOCOM SMOS Consumer request FOCOM SMOS Producer to retrieve the previously approved revisionId of the provisioningRequest with provisioningRequestId, as a parameter	
Step 7 (M)	FOCOM SMOS Producer fetch the previously approved revisionId of the provisioningRequestId	
Step 8 (M)	FOCOM SMOS Producer respond with the revisionId	
Step 9 (M)	FOCOM SMOS Consumer request FOCOM SMOS Producer to restore the configuration of the provisioningRequest with provisioningRequestId, and previous revisionId as a parameter	
Step 10 (M)	FOCOM SMOS Producer create a new draft revision based on the previous approved configuration	
Step 11 (M)	FOCOM SMOS Producer, sends an asynchronous response to restore request with provisioningRequestId as a parameter	
Steps 12 to step 28 on this use case are same as step 4 to step 21 of use case specified in clause 4.2.3.2. But, Step 6, 7, 8 and Step 15, 16 and 17 in clause 4.2.3.2, will only be executed by the FOCOM SMOS Producer if additional O-Cloud resources are required due to the updated Provisioning request.		
FOCOM SMOS Producer accepts and approves the Provisioning Request and initiates a request to update provisioning request towards the IMS at O-Cloud See NOTE 2		
Steps 29 to 31 on this use case are same as step 22 to step 24 of the use case specified in clause 4.2.3.2		
Ends when	FOCOM SMOS Consumer either 1. FOCOM SMOS Consumer either update the failed configuration or 2. FOCOM SMOS Consumer restore to same configuration of the previous revision and use that in order to create the new revision with new revisionId	
Exceptions	N/A	
Post Conditions	N/A	
Traceability	REQ-FOCOM-FUN17, REQ-FOCOM-FUN4, REQ-FOCOM-FUN6, REQ-FOCOM-FUN7, REQ-FOCOM-FUN8	
NOTE 1: An approve O-Cloud provisioning request instance revision is approved by the FOCOM SMOS Consumer and accepted for execution by FOCOM SMOS Producer. NOTE 2: The sequence of interactions between the FOCOM SMOS Producer and IMS is specified in ORAN.WG6.ORCH-USE-CASES, clause 3.11.4 [i.2].		

4.2.9.3 UML Sequence Diagram

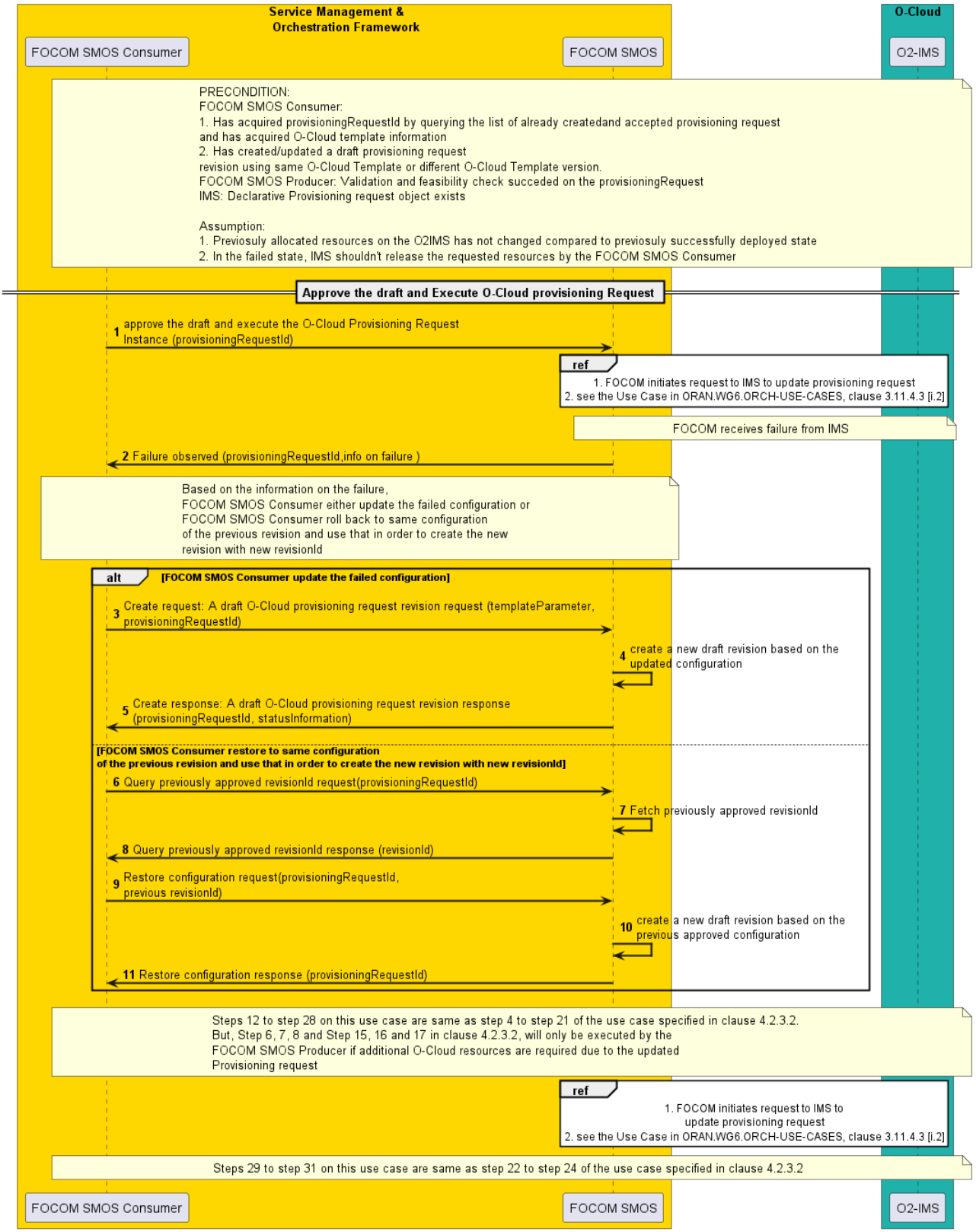


Figure 4.2.9.3-1: Restore or Update O-Cloud provisioning request revision

4.2.10 O-Cloud provisioningRequest status query

4.2.10.1 High level description

The use case aims to enable a FOCOM SMOS Consumer e.g. an rApp or other SMOF, to retrieve the status of the provisioningRequest. Before this use case is initiated, FOCOM SMOS has created the provisioningRequestId.

4.2.10.2 Sequence Description

Table 4.2.10.2-10: O-Cloud provisioningRequest status query

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	To retrieve the O-Cloud provisioningRequest status information	
Actors and Roles	**FOCOM SMOS Consumer** – An authorized consumer e.g. rApp or other SMOF, consuming the services of FOCOM SMOS **FOCOM SMOS Producer** – Produces the status information of provisioningRequest. **IMS -** To execute the request received from FOCOM SMOS Producer	
Assumptions	N/A	
Preconditions	3. FOCOM SMOS Producer has created provisioningRequestId 4. FOCOM SMOS Consumer is authorized to retrieve the status information	
Begins when	FOCOM SMOS Consumer intends to query the status of O-Cloud provisioningRequest	
Step 1 (M)	FOCOM SMOS Consumer sends a request to FOCOM SMOS Producer to query the status of provisioningRequest with provisioningRequestId as a parameter	
Step 2 (M)	FOCOM SMOS Producer validates the request	
If the validation is success, Step 3 and Step 4 are mandatory and use case ends. If the validation is fail skip step 3 and 4 and step 5 is mandatory and use case ends,		
Step 3 (M)	If the validation is successful, FOCOM SMOS Producer retrieves the status information related to the provisioningRequest or optionally fetch the latest status information of the provisioningRequest from the IMS as defined in O-RAN.WG6.TS.O2IMS-INTERFACE , clause 3.4.6.2.4 [i.9].	
Step 4 (M)	FOCOM SMOS Producer responds with status information	
Step 5 (M)	If the validation fail, FOCOM SMOS Producer responds with information about the failure	
Ends when	FOCOM SMOS Consumer receives the status information of provisioningRequest or information about the failure	
Exceptions	Validation Fail – This exception occurs when the validation of the request fails	

Post Conditions	N/A	
Traceability	REQ-FOCOM-FUN10	

4.2.10.3 UML Sequence Diagram

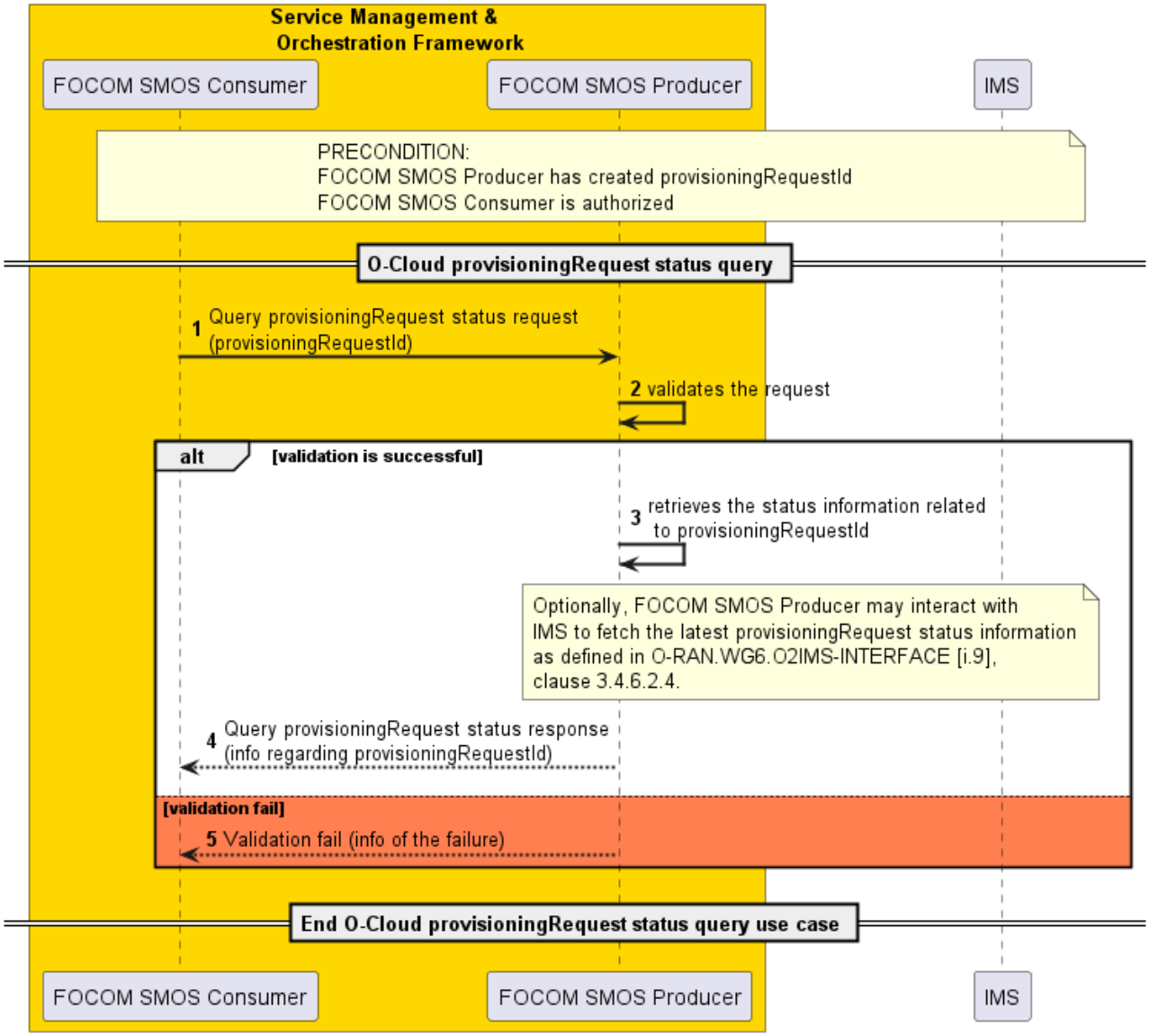


Figure 4.2.10.3-1: O-Cloud provisioningRequest status query

4.2.11 Support Fetching of PM Data through one-time/ad-hoc data requests

4.2.11.1 High level Description

The use case describes how an authenticated & authorized DME Service Consumer can obtain PM data (without subscription) that it needs to consume, using DME mechanism & FOCOM SMOS NBIs.

Before triggering the one-time/ad-hoc data requests, it's considered that using DME mechanism, DME Service Consumer have discovered (& is aware of) the available PM DME datatypes.

4.2.11.2 Sequence Description

Table 4.2.11.2-11 Fetching PM Data for one-time/ad-hoc data requests

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal	The DME Service Consumer obtains the data they intend to consume through one-time/ad-hoc data requests	
Actors and Roles	- FOCOM SMOS: In the role of "FOCOM Service Producer" - DME SMOS: In the role of "DME Service Producer" & "FOCOM Service Consumer" - DME Service Consumer: An Authorized end Consumer of Performance data e.g. rApp - O-Cloud IMS: To execute the request received from FOCOM SMOS	
Assumptions	This use-case focuses on data requests for PM metrics which are dependent/mapped to PM jobs. Additionally, this covers Positive/Success Scenarios only. PM jobs already exist during Registration step (& are kept in Suspended state unless datatype is Subscribed by any DME Service Consumer) Once data is collected for one-time/adhoc request, job state is changed back to "Suspended"	
Preconditions	The DME Services Consumer is authenticated/authorized to access & use the DME Services. The DME Services Consumer has obtained registered PM datatype information e.g. by discovery. The FOCOM SMOS Consumer is authenticated/authorized to access & use the FOCOM SMOS.	
Begins when	The DME Service Consumer initiates the request data procedure.	
Step 1 (M)	The DME Service Consumer sends to the Data management and exposure functions a request data request to obtain data for consumption, providing its Consumer identifier and data instance information.	
Step 2 (M)	The DME Service Producer receives the request & validates request i.e.PM datatype/dataset correctness & if requested data is already available or not.	
Alternative Procedure (ALT1)	If Requested data is already available (due to any preexisting subscription by some other DME Service Consumer).	
Step 3 (ALT1)	The DME Service Producer Retrieves Pull delivery details of data from repository	
Alternative Procedure (ALT2)	If Requested data is NOT available/collected previously (since datatype is not subscribed by any DME Service Consumer yet).	
Step 4 (ALT2)	The DME SMOS (as FOCOM SMOS Consumer) triggers PM Data Collection request towards FOCOM SMOS.	
Step 5 (ALT2)	The FOCOM SMOS identifies the mapped PM Jobs for requested datatype	
Step 6 (ALT2)	The FOCOM SMOS Interfaces with respective O2 IMSes & Triggers (resumes) needed mapped PM Jobs	
Step 7 (ALT2)	The FOCOM SMOS Interfaces with respective O2 IMSes to Collect & Uses <<O2>> service procedures for collecting requested PM Data.	
Step 8 (ALT2)	Once PM data transfer to repository is acknowledged by FOCOM SMOS FOCOM SMOS responds back to DME SMOS (FOCOM Consumer) for PM data collection request with Pull delivery Details	
Step 9 (ALT2)	The DME Service Producer Retrieves Pull delivery details of data from repository	
Step 10 (M)	DME producer responds to DME Service Consumer with Pull delivery details of requested PM data	
Step 11 (M)	DME Service Consumer triggers Pull PM data request (Using Pull delivery details)	
Step 12 (M)	DME Producer responds to DME Service Consumer with Pull PM data response (PM data included in the payload.)	
Ends when	The requested data have been delivered to the DME Service Consumer for consumption.	

Exceptions	n/a	
Post Conditions	The DME Service Consumer has consumed the requested data.	
Traceability	REQ-FOCOM-FUN15	

4.2.11.3 UML Sequence Diagram

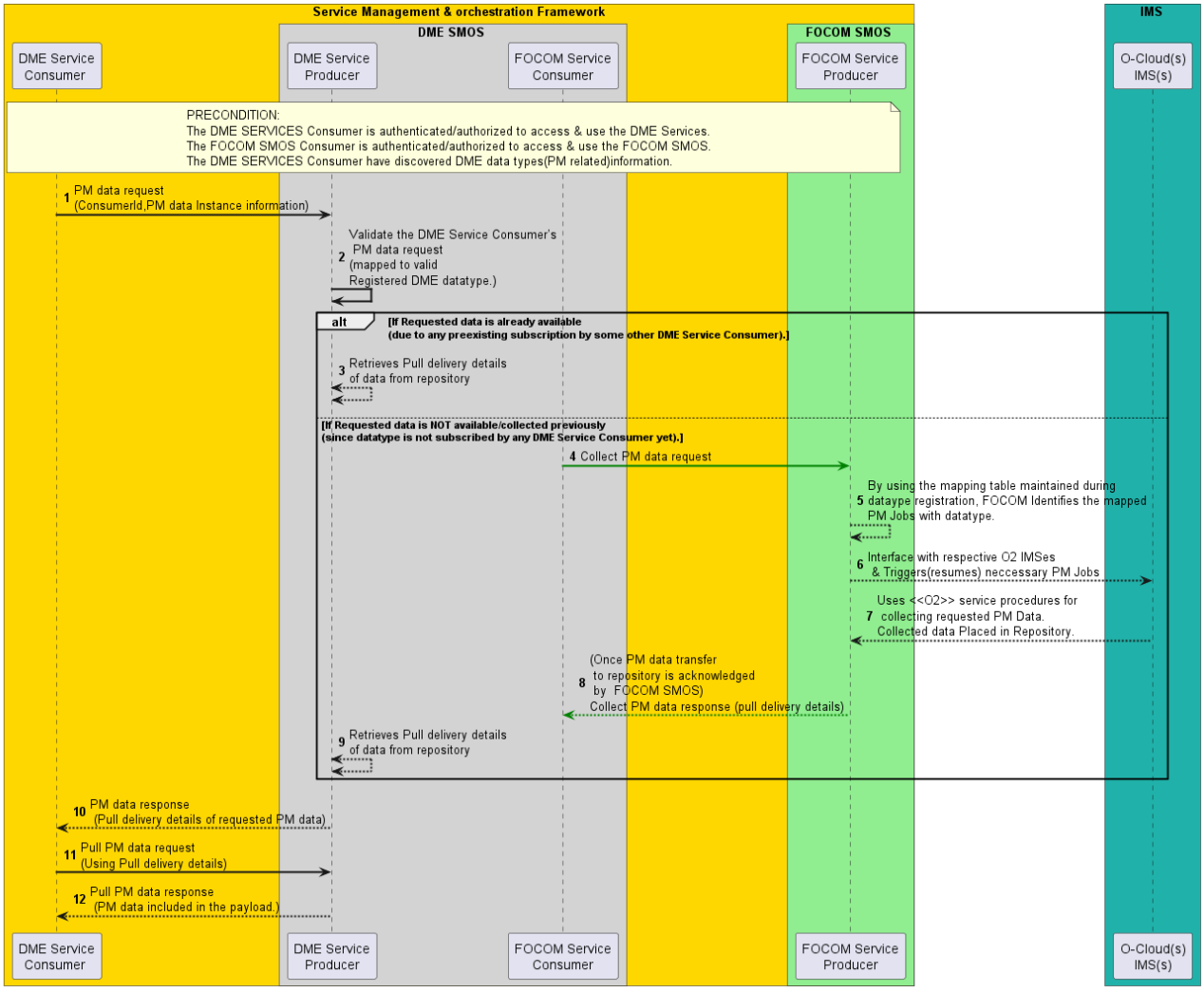


Figure 4.2.11.3-1: Fetching PM Data for one-time/ad-hoc data requests

4.2.12 O-Cloud Platform Software Update Use Case

4.2.12.1 High level description

This use case enables an authorized FOCOM SMOS Consumer to trigger an O-Cloud Platform Software Update (upgrades and downgrades) by interacting with a FOCOM SMOS Producer within the Service Management and Orchestration Framework.

4.2.12.2 Sequence Description

Table 4.2.12.2-12: O-Cloud Platform Software Update

Use Case Stage	Evolution / Specification	>>Uses<<
Goal	To enable the FOCOM SMOS Consumer to trigger an O-Cloud Platform Software update (upgrades and downgrades) by initiating the request and receiving acknowledgment through the FOCOM SMOS Producer.	
Actors and Roles	**FOCOM SMOS Consumer:** An authorized FOCOM SOMOS Consumer that requests O-Cloud platform software updates via FOCOM SMOS Producer. **FOCOM SMOS Producer:** Validates and acknowledges the update request and initiates the update with the O2 IMS for O-Cloud Platform Software update	
Assumptions	FOCOM SMOS Consumer is authorized to initiate O-Cloud Platform Software update (upgrades and downgrades) FOCOM SMOS Consumer has necessary information to trigger request for O-Cloud Platform Software update.	
Preconditions	**O-Cloud Operational** – O-Cloud is operational and has registered with the SMO. **Privilege** – The FOCOM SMOS Consumer is authorized.	
Begins when	The FOCOM SMOS Consumer sends a request to FOCOM SMOS Producer for a specific O-Cloud Platform Software update.	
Step 1 (M)	The FOCOM SMOS Consumer sends a request to initiate a specific O-Cloud Platform Software update. The request may include details such as the O-Cloud ID, the scope of the update (a single O-Cloud node, an O-Cloud node cluster, or the entire O-Cloud), and the desired software version.	
Step 2 (M)	FOCOM SMOS Producer validates the received O-Cloud Platform software update request.	
Alternative Procedure: Upon receiving a specific O-Cloud Platform Software update request from the FOCOM SMOS Consumer, the FOCOM SMOS Producer validates the request and, if successful, sends an acknowledgment response, and initiate request over O2 IMS to trigger Specific O-Cloud Platform Software update.		
Step 3.1 (ALT)	If the request is verified, FOCOM SMOS Producer response to Acknowledge O-Cloud platform software update request with Acknowledgement ID.	
Step 3.2 (ALT)	If validation fails, FOCOM SMOS Producer informs the FOCOM SMOS Consumer about the failure and provides failure details.	
Alternative Procedure: if verification succeed, FOCOM SMOS Producer start to interact with O2 IMS Ref Use case: 3.1.6 of ORAN.WG6.ORCH-USE-CASES [i.2]		
Step 4 (ALT)	FOCOM SMOS Producer Notify to the FOCOM SMOS Consumer about the outcome of O-Cloud Platform software update request once it received the outcome over O2 IMS.	
Ends when	The FOCOM SMOS Consumer receives the outcome of the O-Cloud Platform Software update request.	

Exceptions	None	
Post-conditions	The O-Cloud Platform Software is successfully updated, and a confirmation/notification is provided to the FOCOM SMOS Consumer. In case O-Cloud Platform Software is not successfully updated, the software update has been rollbacked as per the FOCOM-IMS procedure (see referenced clause 3.1.6 of ORAN.WG6.ORCH-USE-CASES [i.2].	
Traceability	[REQ-FOCOM-Platform SW Update-FUN19], [REQ-FOCOM-Platform SW Update-FUN20], [REQ-FOCOM-Platform SW Update-FUN21], [REQ-FOCOM-Platform SW Update-FUN22]	

4.2.x.3 UML Sequence Diagram

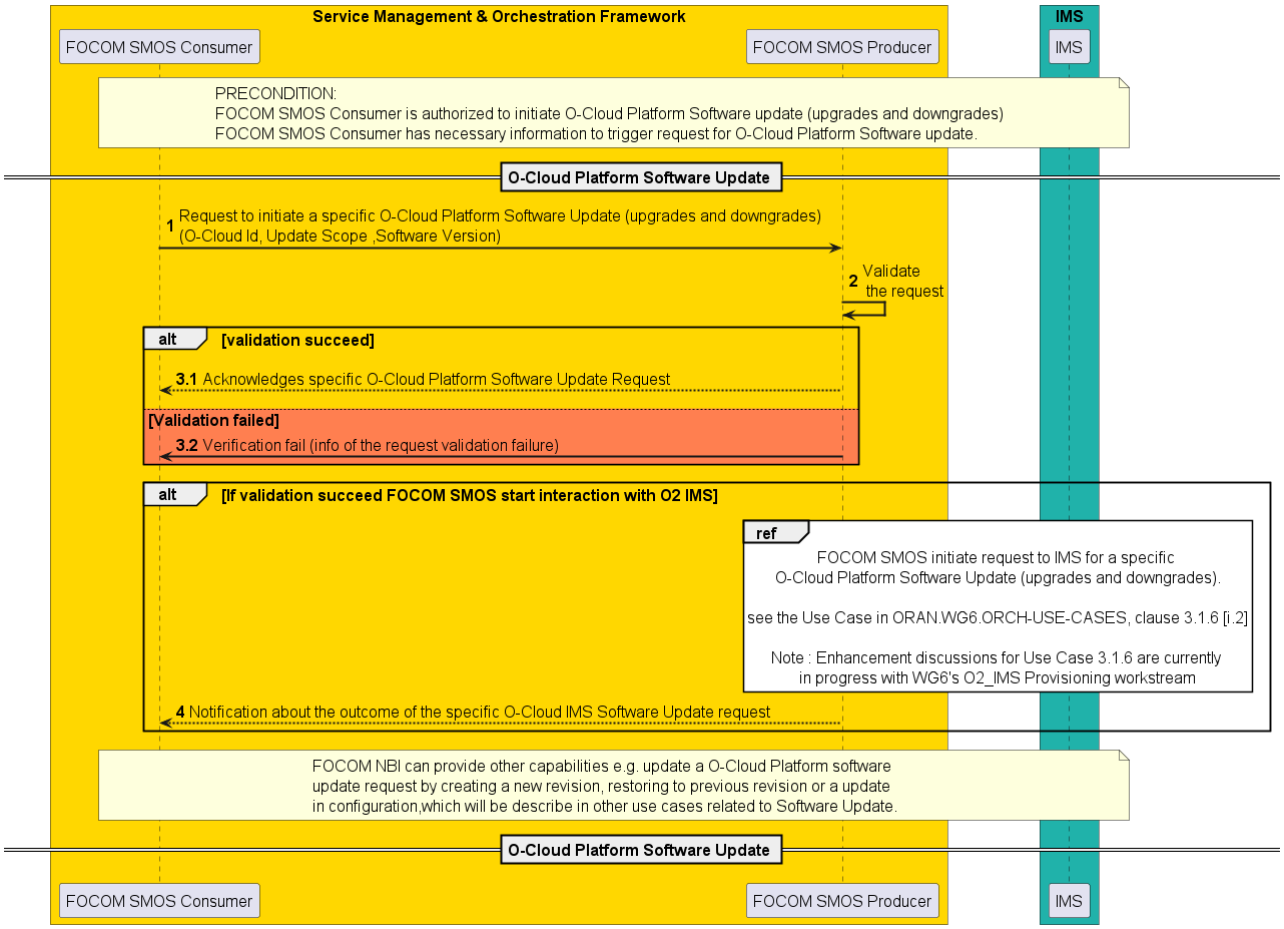


Figure 4.2.12.3-1: O-Cloud Platform Software Update

5 Potential Requirements on the FOCOM and NFO SMOS services

5.1 Potential Functional and Interface Requirements

REQ	Description	Notes
REQ-FOCOM_SMOS-FUN1	The FOCOM SMOS should have the capability enabling a FOCOM SMOS Consumer to query O-Cloud objects (like resources, artifacts, etc) and O-Cloud templates identifiers matching each O-Cloud site from a FOCOM SMOS	4.2.1 (O-Cloud resources related information Query Use Case)
REQ-FOCOM_SMOS-FUN2	The FOCOM SMOS should have the capability to expose information about FOCOM SMOS exposed information about O-Cloud objects (like resources, artifacts, etc.) is exposed as READ ONLY"	4.2.1 (O-Cloud resources related information Query Use Case)
REQ-FOCOM_SMOS-FUN3	The FOCOM SMOS should have the capability to subscribe to receive notifications when there is an update to the O-Cloud resources using the O2ims interface	4.2.1 (O-Cloud resources related information Query Use Case)
REQ-FOCOM-FUN4	A FOCOM SMOS Consumer shall be able to query information contained in O-Cloud template exposed to the SMO	4.2.2 (O-Cloud template information Query use case) 4.2.4 (Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template) 4.2.5 (Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template)
REQ-FOCOM-FUN5	The FOCOM SMOS shall have the capability enabling a FOCOM SMOS Consumer to create, update and execute O-Cloud provisioning request based on O-Cloud Template	4.2.3 (Create, update and execute O-Cloud provisioning request using O-Cloud Template)
REQ-FOCOM-FUN6	The FOCOM SMOS shall have the capability to handle the provisioning request revisions for instance by using a version control system.	4.2.3 (Create, update and execute O-Cloud provisioning request using O-Cloud Template) 4.2.4 (Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template) 4.2.5 (Create, update and execute existing O-Cloud provisioning

		request revision using new O-Cloud Template)
REQ-FOCOM-FUN7	FOCOM SMOS shall have the capability to validate O-Cloud provisioning request	4.2.3 (Create, update and execute O-Cloud provisioning request using O-Cloud Template) 4.2.4 (Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template) 4.2.5 (Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template)
REQ-FOCOM-FUN8	FOCOM SMOS shall have the capability to do a feasibility check on the requested resources from FOCOM SMOS Consumer	4.2.3 (Create, update and execute O-Cloud provisioning request using O-Cloud Template) 4.2.4 (Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template) 4.2.5 (Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template)
REQ-FOCOM-FUN9	The FOCOM SMOS shall have the capability enabling a FOCOM SMOS Consumer to create, update and execute an existing O-Cloud provisioning request revision using same O-Cloud Template name and O-Cloud Template version.	4.2.4 (Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template)
REQ-FOCOM-FUN10	The FOCOM SMOS shall have the capability enabling a FOCOM SMOS Consumer to create, update and execute an existing O-Cloud provisioning request revision using new O-Cloud Template version and/or O-Cloud Template name	4.2.5 (Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template)
REQ-FOCOM-FUN11	FOCOM SMOS should be able to support DME datatype registration process by handling tasks related concluding “data type identifier and needed DME type information” required to register as producer against any DME Datatype	4.2.6 Registering FOCOM SMOS for performance DME datatypes and associated operations
REQ-FOCOM-FUN12	The FOCOM SMOS NBI shall support necessary steps related to the creation of subscription of Performance datatype/dataset.	4.2.7 Subscribing PM Datatype/Data Set & associated operations (Update/Remove subscriptions)
REQ-FOCOM-FUN13	The FOCOM SMOS NBI shall support necessary steps related	4.2.7 Subscribing PM Datatype/Data Set & associated

	to update of subscription of Performance datatype/dataset.	operations (Update/Remove subscriptions)
REQ-FOCOM-FUN14	The FOCOM SMOS NBI shall support necessary steps related to termination of subscription of Performance datatype/dataset.	4.2.7 Subscribing PM Datatype/Data Set & associated operations (Update/Remove subscriptions)
REQ-FOCOM-FUN15	The FOCOM SMOS NBI shall receive and respond to PM data requests (ad-hoc or subscribed) from DME SMOS.	4.2.7 Subscribing PM Datatype/Data Set & associated operations (Update/Remove subscriptions) 4.2.11 Support Fetching of PM Data through one-time/ad-hoc data requests
REQ-FOCOM-FUN16	The FOCOM SMOS shall have the capability enabling a FOCOM SMOS Consumer to delete the O-Cloud Node cluster and/or infrastructure resources	4.2.8 (Delete O-Cloud provisioningRequest instance)
REQ-FOCOM-FUN17	The FOCOM SMOS shall have the capability enabling a FOCOM SMOS Consumer to restore previously created and accepted provisioning request configuration.	4.2.9 (Restore or Update O-Cloud provisioning request revision)
REQ-FOCOM-FUN18	The FOCOM SMOS shall have the capability enabling a FOCOM SMOS Consumer to retrieve the status of O-Cloud provisioningRequest	4.2.10 (O-Cloud provisioningRequest status query)
[REQ-FOCOM-Platform Software Update-FUN19]	FOCOM SMOS Producer shall have the capability enabling a FOCOM SMOS Consumer to request O-Cloud Platform Software update.	4.2.12 (O-Cloud Platform Software Update Use Case)
[REQ-FOCOM-Platform Software Update-FUN20]	FOCOM SMOS Producer shall have the capability to validate the request from FOCOM SMOS Consumer for O-Cloud platform software update.	4.2.12 (O-Cloud Platform Software Update Use Case)
[REQ-FOCOM-Platform Software Update-FUN21]	FOCOM SMOS Producer shall have the capability to notify FOCOM SMOS Consumer the result of a O-Cloud software update.	4.2.12 (O-Cloud Platform Software Update Use Case)
[REQ-FOCOM-Platform Software Update-FUN22]	FOCOM SMOS Producer shall have the capability to notify FOCOM SMOS Consumer the result from the verification of the O-Cloud platform software update request.	4.2.12 (O-Cloud Platform Software Update Use Case)

6 Recommendations

The current version of the present document has documented use cases and potential requirements as provided in section 4 and section 5 and as summarized in table 6-1. The use cases describe potential interactions on the NBI of the FOCOM SMOS regarding:

- O-Cloud infrastructure and resources provisioning,
- O-Cloud performance data collection and monitoring

It is recommended to further perform an analysis of the identified use cases and potential requirements, in order to determine the concepts, capabilities and management aspects produced by the FOCOM SMOS to other FOCOM SMOS Consumer. The outcome of this analysis is recommended to be captured and incorporated into the FOCOM SMOS NBI Technical Specifications, while new FOCOM SMOS NBI use cases can be documented as part of existing ORAN.WG6.ORCH-USE-CASES [i.2]. The list of use cases is not completed, and it can be further extended and/or update in future versions of the present document. The analysis is also recommended to consider any new and/or updated use cases that might be documented as part of future versions of the present document.

Table 6-1: List of use cases and potential functional requirements

SNo	Use Cases from section 4	Potential requirements from section 5
1	4.2.1 O-Cloud resources related information Query Use Case	REQ-FOCOM_SMOS-FUN1 REQ-FOCOM_SMOS-FUN2 REQ-FOCOM_SMOS-FUN3
2	4.2.2 O-Cloud template information Query use case	REQ-FOCOM-FUN4
3	4.2.3 Create, update and execute O-Cloud provisioning request using O-Cloud Template	REQ-FOCOM-FUN5 REQ-FOCOM-FUN6 REQ-FOCOM-FUN7 REQ-FOCOM-FUN8
4	4.2.4 Create, update and execute existing O-Cloud provisioning request revision using same O-Cloud Template	REQ-FOCOM-FUN4 REQ-FOCOM-FUN6 REQ-FOCOM-FUN7 REQ-FOCOM-FUN8 REQ-FOCOM-FUN9
5	4.2.5 Create, update and execute existing O-Cloud provisioning request revision using new O-Cloud Template	REQ-FOCOM-FUN4 REQ-FOCOM-FUN6 REQ-FOCOM-FUN7 REQ-FOCOM-FUN8 REQ-FOCOM-FUN10
6	4.2.6 Registering FOCOM SMOS for performance DME datatypes and associated operations	REQ-FOCOM-FUN11

7	4.2.7 Subscribing PM Datatype/Data Set & associated operations (Update/Remove subscriptions)	REQ-FOCOM-FUN12 REQ-FOCOM-FUN13 REQ-FOCOM-FUN14 REQ-FOCOM-FUN15
8	4.2.8 Delete O-Cloud provisioningRequest instance	REQ-FOCOM-FUN16
9	4.2.9 Restore or Update O-Cloud provisioning request revision	REQ-FOCOM-FUN4 REQ-FOCOM-FUN6 REQ-FOCOM-FUN7 REQ-FOCOM-FUN8 REQ-FOCOM-FUN17
10	4.2.10 O-Cloud provisioningRequest status query	REQ-FOCOM-FUN18

Annex (Informative):
Change history/Change request (history)

Date	Revision	Description

18.07.2025	01.00	Final version for July 2025 train, incorporating previous versions (00.00.01 to 00.00.08) which includes,
		• FOCOM SMOS Use Cases, covering:
		  ○ O-Cloud infrastructure and resources provisioning
		  ○ O-Cloud performance data collection and monitoring
		  ○ Software management
		• Potential requirements introduced for FOCOM SMOS.
		• Recommendations for further analysis related to the FOCOM SMOS NBI Technical Specification

