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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present document specifies use cases, requirements, management services and procedures for provisioning of 5G networks.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 28.525: "Telecommunication management; Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Requirements".

[3] ETSI GS NFV-IFA 013 (V2.4.1) (2018-02): "Network Function Virtualisation (NFV); Release 2; Management and Orchestration; Os-Ma-nfvo reference point - Interface and Information Model Specification".

[4] 3GPP TS 28.530: "Management and orchestration; Concepts, use cases and requirements".

[5] 3GPP TS 22.261 "Service requirements for next generation new services and markets".

[6] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[7] 3GPP TS 28.526: "Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Procedures".

[8] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[9] 3GPP TS 23.501: "Technical Specification Group Services and System Aspects;System Architecture for the 5G System;Stage 2".

[10] 3GPP TS 38.300: "Technical Specification Group Radio Access Network;NR; NR and NG-RAN Overall Description;Stage 2".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1], TS 28.530 [4] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1] and TS 28.530 [4].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], TS 28.530 [4] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC	5G Core Network
AMF	Access and Mobility Management Function
CSC	Communication Service Customer
CSMF	Communication Service Management Function
CSP	Communication Service Provider
CP	Control Plane
IOC	Information Object Class
MANO	Management and Orchestration
MnS	Management Service
NF	Network Function
NFV	Network Functions Virtualisation
NRM	Network Resource Model
NSaaS	Network Slice as a Service
NSI	Network Slice Instance
NSMF	Network Slice Management Function
NSSI	Network Slice Subnet Instance
NSSMF	Network Slice Subnet Management Function
TN	Transport Network
VNF	Virtualized Network Function
UP	User Plane

4 General

4.1 Overview

5G system consists of 5G Access Network (AN), 5G Core Network (5GC). Network slicing is one of 5G key features.

The management aspects of a Network Slice Instance (NSI) are described by the four phases shown in Figure 4.3.1.1 of TS 28.530 [4].

The provisioning of network slicing includes the four phases which are preparation, commissioning, operation and decommissioning:

- In the preparation phase the NSI does not exist. The preparation phase includes network slice design, on-boarding, evaluation of the network slice requirements, preparing the network environment and other necessary preparations required to be done before the creation of an NSI.
- During the NSI lifecycle stage which include commissioning phase, operation phase and decommissioning phase, the NSI provisioning operations include:
  - Create an NSI;
  - Activate an NSI;
  - Deactivate an NSI;
  - Modify an NSI;
  - Terminate an NSI.

The operations of the provisioning of an NSI occurs during different phases of a NSI:

a) During the commissioning phase:

- Create an NSI.

During NSI creation all resources to the NSI have been created and configured to satisfy the network slice requirements. NSI creation may trigger NSSI(s) creation or using existing NSSI(s) and setting up the corresponding associations.

b) During the operation phase:

- Activate an NSI;
- Modify an NSI;
- Deactivate an NSI.

NSI activation includes any actions that make the NSI active to provide communication services. NSI activation may trigger NSSI activation.

NSI modification in operation phase could map to several workflows, e.g. changes of NSI capacity, changes of NSI topology, NSI reconfiguration. NSI modification can be triggered by receiving new network slice related requirements, new communication service requirements, or the result of NSI supervision automatically. NSI modification may trigger NSSI modification.

The NSI deactivation operation may be needed before NSI modification operation and the NSI activation operation may be needed after the NSI modification operation. NSI deactivation includes any actions that make the NSI inactive and not providing any communication services. NSI deactivation trigger NSSI deactivation to deactivate constituent NSSI(s) which is not used by other NSI(s). Operator may decide to keep the NSI without termination after deactivation and reactivate it when receives new communication service request.

c) During the decommissioning phase:

- Terminate an NSI.

NSI termination step includes any action that make the NSI does not exist anymore and release resources that are not used by other NSI(s). NSI termination may trigger NSSI termination to terminate constituent NSSI(s) which is not used by other NSI(s).

Similarly, provisioning for network slice subnet instance includes the following operations:

- Create an NSSI;
- Activate an NSSI and associate it with certain NSI to be used by the NSI;
- Disassociate the NSSI with certain NSI and deactivate the NSSI if it’s not associated with any NSI;
- Modify an NSSI;
- Terminate an NSSI.

The following are NSSI states:

NSSI_NULL – the NSSI does not exist

NSSI_NOT_IN_USE – the NSSI exists, but is not used by (associated with) any NSI or NSSI

NSSI_IN_USE – the NSSI is used by (associated with) at least one NSI or at least one NSSI

The following is the state diagram:

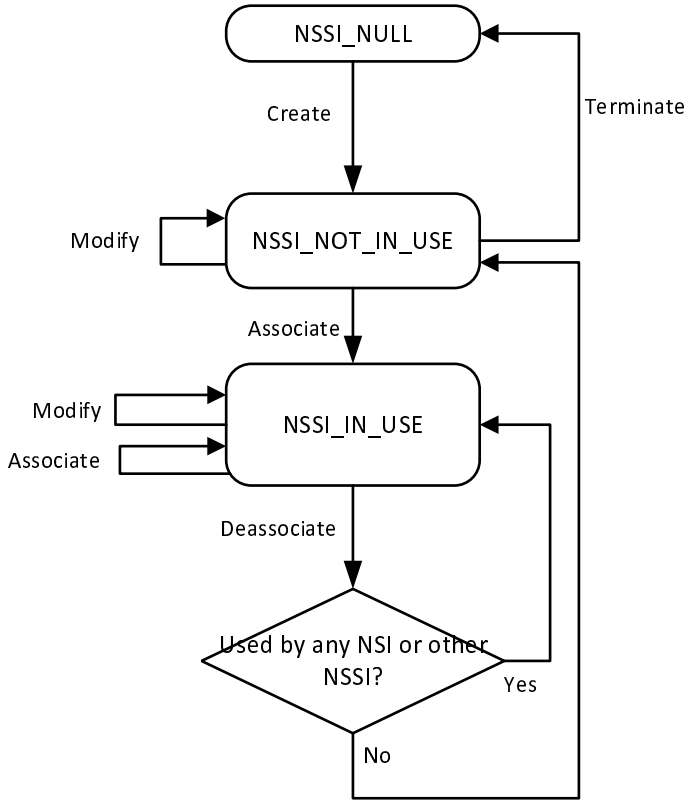

Figure 4.1-1

4.2 Configuration information for the constituents of an NSI

To use network slice to support communication service or deliver a network slice as a service, the 3GPP defined constituents of the NSI should be configured by 3GPP management system according to the types and requirements of the network slice so that the NSI can be operated and maintained.

The configuration information of these components may include:

- *Information on the requirements to be applied to every NSI constituent to satisfy the requirements of multiple NSIs* if the constituent is shared by multiple NSIs;
- *Network function selection information:* Information on the selection of the NFs (e.g., AMF) according to the requirements of this NSI;
- *Connection information*: The information of the logical links to carry the NSI's CP and UP data between the component and other NFs and NSSIs belonging to the NSI.

NOTE 1: The list of information above is not exhaustive.

NOTE 2: The list of information above is not all necessary for an NSI.

4.3 General information for network slice instance

The general information used to describe network slice instance may include:

- Resource model information, which describes the static parameters and functional components of network slice, includes service profile, network slice type (e.g. eMBB), additional system feature (e.g. multicast, Edge Computing), priority.

- Management model information, which describes the information model that is used for network slice lifecycle management, includes configuration profile (e.g. application configuration parameters).

- Capability model information, which describes the capability including supported communication service characteristic information (e.g. service type, UE mobility level, density of users, traffic density), QoS attributes (e.g. bandwidth, latency, throughput and so on) and capacity (e.g. maximum number of UEs), can be exposed to CSC via CSMF.

4.4 General information for network slice subnet instance

The general information used to describe network slice subnet instance may include:

- Resource model information, which describes the static parameters and functional component of network slice subnet, includes slice profile, network slice subnet type (e.g. RAN eMBB, CN eMBB), additional system feature (e.g. multicast, Edge Computing), priority, QoS attributes (e.g. bandwidth, latency, number of subscribers and so on), NSD ID.

- Management model information, which describes the information model that is used for network slice subnet lifecycle management, includes configuration profile (e.g. application configuration parameters).

- Capability model information, which describes the capability including supported communication service characteristic information (e.g. service type, UE mobility level, density of users, traffic density), QoS attributes (e.g. bandwidth, latency, throughput and so on) and capacity (e.g. maximum number of UEs).

4.5 General information for service profile

Depending on industry requirements and operator's design requirements, different service profiles may be used to represent SLS associated with instances of Network Slice IOC.

The following are examples for service profile:

- A service profile is used to capture a set of requirements for the new network slice instance such as (i.e. eMBB, MIoT, URLLC).

- A service profile is used to capture a set of specific industry requirements for creation of network slice instance such as (e.g. V2X, smart grid, Remote Healthcare).

4.6 General information for network slice related identifiers

There are following network slice related identifiers which serve different purposes:

Identifier	Description
Identifiers for network slice management purpose	
`NetworkSlice` identifier	Represent the management identifier of network slice instance. Management identifier of network slice instance is defined in TS 28.541[6] as objectinstance attribute of `NetworkSlice` IOC.
`NetworkSliceSubnet` identifier	Represent the management identifier for a network slice subnet instance. Management identifier of network slice subnet instance is defined in TS 28.541[6] as objectinstance attribute of `NetworkSliceSubnet` IOC.
Identifiers for network slice selection purpose	
NSI ID	Represent Core Network part of a Network Slice instance when multiple Network Slice instances of the same Network Slice are deployed, and there is a need to differentiate between them in the 5GC. Referred to TS 23.501[9].
S-NSSAI	Represent network slice. Referred to TS 23.501[9] and TS 38.300[10].

PLMN ID	Represent PLMN identifier.

The NSI ID and S-NSSAI are configured by the management system.

5 Specification level requirements

5.1 Use cases

5.1.1 Network slice instance allocation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To satisfy request for allocation of a network slice instance with certain characteristics, by creation of new or using existing network slice instance.	
Actors and Roles	CSMF, who acts as an example of network slice management service consumer. NOP operator	
Telecom resources	Network slice instance Network slice subnet instance Transport network NSMF, who acts as an example of network slice management service provider. NSSMF, who acts as an example of network slice subnet management service provider.	
Assumptions	N/A	
Pre-conditions	N/A	
Begins when	NSMF receives the request for allocation of the network slice instance with network slice related requirements.	
Step 1 (M)	If the requested NSI can be shared and if an existing NSI can be used, the NSMF decides to use the existing NSI. Modification of the existing NSI may be needed to satisfy the network slice instance related requirements. Use case is completed go to “Step 8". Otherwise, the NSMF triggers to create a new NSI, for which the following steps 2 – 8 are needed.	
Step 2 (M)	NSMF decides on the constituent NSSIs and the topology of the NSI to be created using the information from service profile [6]. For the constituent NSSIs, the NSMF derives network slice subnet related requirements from the network slice related requirements. If reconfiguration of the transport network is needed, the NSMF derives transport network related requirements (e.g., latency, bandwidth) from the network slice related requirements.	
Step 3 (M)	For the required NSSI(s), the NSMF sends network slice subnet related requirements to the NSSMF to request allocation of the required NSSI(s).	Network slice subnet instance allocation use case
Step 4 (M)	NSMF receives the information of the allocated NSSI(s) (e.g, the management identifier of NSSI, service access point information of NSSI, external connection point information of NSSI) from NSSMF.	
Step 5 (M)	NSMF, via NSSMF, sends the transport network related requirements (e.g. , external connection point, latency and bandwidth) to the TN Manager. The TN manager reconfigures the TN accordingly and responds to the NSMF via NSSMF.	
Step 6 (M)	NSMF receives the response from TN Manager via NSSMF.	
Step 7 (M)	NSMF associates the NSSI(s) with the corresponding NSI (e.g, allocation of the management identifier of NSI and mapping the management identifier of NSI with the received management Identifier of NSSI(s)) and triggers to establish the links between the service access points of the NSSI(s).	
Step 8 (M)	NSMF notifies the network slice instance information of NSI (e.g., the management identifier of NSI).	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	An NSI is ready to satisfy the network slice related requirements.	
Traceability	REQ-PRO_NSSI-FUN-1, REQ-PRO_NSI-FUN-3.	

5.1.2 Network slice subnet instance allocation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	Create a new network slice subnet instance or use an existing network slice subnet instance to satisfy the network slice subnet related requirements; provide the provisioning service consumer with identity of the NFVO which the consumer can use for further access to the information of the involved VNFs, PNFs and NSs.	
Actors and Roles	NSMF, who acts as an example of network slice subnet management service consumer.	
Telecom resources	Network Slice Subnet instance Network Service instance NSSMF, who acts as an example of network slice subnet management service provider. The operator deployed NFVO to manage the lifecycle of VNFs and interconnection between the VNFs and PNFs in terms of the NS instances.	
Assumptions	Network slice subnet instance may include network functions which are virtualized.	
Pre-conditions	VNF Packages for virtualized network functions to be included in the network slice subnet instance have been already on-boarded.	
Begins when	The NSMF sends to the NSSMF a request for a NSSI to be associated with the NSI; the request contains network slice subnet related requirements including the SliceProfile [6]. NSSMF receives request for a network slice subnet instance. The request contains network slice subnet related requirements in TS 28.541 [6]. The request may include guidance for use of particular NFVO(s) when VNFs and PNFs in certain part of the network are involved. The request may also include query of the identity of the NFVO to be used.	
Step 1 (M)	Based on the network slice subnet related requirements received, NSSMF decides to create a new NSSI or use an existing NSSI.	
Step 2 (M)	If an existing network slice subnet instance is decided to be used, NSSMF may trigger to modify the existing network slice subnet instance to satisfy the network slice subnet related requirements. Go to “Step 8”. Otherwise, NSSMF triggers to create a new NSSI, the following steps are needed.	
Step 3 (O)	If the required NSSI contains constituent NSSI(s) managed by other NSSMF(s), the first NSSMF derives the requirements for the constituent NSSI(s) and sends those requirements to the corresponding NSSMF(s) which manages the constituent NSSI(s). The first NSSMF receives the constituent NSSI information from the other NSSMF(s) and associates the constituent NSSI(s) with the required NSSI.	
Step 4 (M)	Based on the network slice subnet related requirements received and SliceProfile [6], the NSSMF decides that to satisfy the NSSI requirements, the part of the network controlled by certain NFVO should be involved. The NSSMF determines the NS related requirements (i.e., information about the target NSD and additional parameterization for the specific NS to instantiate, see clause 7.3.3 in ETSI GS NFV-IFA013 [3]).	
Step 5 (M)	Based on the NS related requirements, NSSMF triggers corresponding NS instantiation request to NFVO via Os-Ma-nfvo interface as described in clause 6.4.3 in TS 28.525 [2], and the NFVO performs NS instantiation(see note).	TS 28.525 [2] Clause 6.4.3 NS instance use cases
Step 6 (M)	NSSMF associates the NS instance with corresponding network slice subnet instance (e.g., allocation of the management identifier of NSSI and mapping with the corresponding identifiers).	
Step 7 (M)	NSSMF is using the NF provisioning service to configure the NSSI constituents. In case of RAN NSSI, the configuration contains RRM policy information for individual Radio cells. In the cells shared by multiple NSSIs such policy includes guidance for split of Radio resources between the NSSIs.	NF provisioning service
Step 8 (M)	NSSMF notifies the provisioning service consumer with the NSSI information (e.g. the management identifier of NSSI) and the NFVO identity when relevant. The NSMF associates the NSSI with the NSI.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	A NSSI is ready to satisfy the network slice subnet related requirements.	
Traceability	REQ-PRO_NSSI-FUN-2, REQ-PRO_NSSI-FUN-3, REQ-PRO_NSSI-FUN-4, REQ-PRO_NSSI-FUN-5, REQ-PRO_NSSI-FUN-6, REQ-PRO_NSSI-FUN-14.	
NOTE: According to the TS 28.525 [2], for the PNFs, NS instantiation includes only establishment of interconnection with other NFs.		

5.1.3 Network slice instance deallocation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To deallocate a network slice instance.	
Actors and Roles	CSMF, who acts as an example of network slice management service consumer. NOP Operator	
Telecom resources	Network slice instance Network slice subnet instances NSMF, who acts as an example of network slice management service provider. NSSMF, who acts as an example of network slice subnet management service provider.	
Assumptions	N/A	
Pre-conditions	N/A	
Begins when	NSMF receives the request indicating that an existing NSI is no longer needed to support particular service (identified by service profile Id). The NSI identification is included in the request.	
Step 1 (M)	Based on the request, NSMF deletes the corresponding slice profile and checks if there are other services to be supported by the NSI. If there are none the NSMF may decide to terminate the NSI; then proceed to Step 2. Otherwise, NSMF may decide to trigger to modify the NSI or to do nothing. The use case is completed; go to step 5.	NSI modification use case
Step 2 (M)	If the NSI to be terminated is active, NSMF de-activates the NSI. Then, the NSI to be terminated is inactive.	NSI de-activation use case
Step 3 (M)	NSMF identifies the network slice subnet instances used by the NSI, and for every such NSSI sends the request to the corresponding NSSMF(s) indicating that the NSSI(s) are no longer needed for the NSI. NSSMF(s) may decide to terminate or modify the NSSI(s) based on the request and disassociates them with the NSI.	
Step 4 (M)	NSMF receives the response from NSSMF(s) and terminates the NSI.	
Step 5 (M)	NSMF notifies its consumer of the NSI allocation.	
Ends when	All the steps identified above are successfully completed or skipped per condition in the Step 1.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The NSI has been deallocated.	
Traceability	REQ-PRO_NSI-FUN-3	

5.1.4 Network slice subnet instance deallocation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To deallocate a network slice subnet instance..	
Actors and Roles	Network slice subnet management service consumer. For example, NSMF plays the role of network slice subnet management service consumer.	
Telecom resources	Network slice subnet instance Network slice subnet management service provider. For example, NSSMF plays the role of network slice subnet management service provider.	
Assumptions	N/A	
Pre-conditions	N/A	
Begins when	Network slice subnet management service provider receives network slice subnet related request from its authorized consumer indicating that an existing NSSI is no longer needed to support a particular set of network slice subnet requirements identified by a slice profile id). The NSSI identification is included in the request.	
Step 1 (M)	Based on the request, network slice subnet management service provider decides whether the NSSI should be terminated. If the decision is the NSSI should be terminated, go to the Step 2. If the decision is that the NSSI should not be terminated (e.g. the NSSI is shared or network slice subnet management service provider decides to keep the NSSI for later use), network slice subnet management service provider disassociates the NSSI from its consumer and provides feedback to the authorized consumer, maybe with removing its consumer's configuration or not. Go to Step 5.	
Step 2 (M)	If the NSSI consists of constituent NSSIs that are not managed directly by the network slice subnet management service provider, the network slice subnet management service provider sends request to other network slice subnet management service provider indicating that the constituent NSSIs are no longer needed for the NSSI.	
Step 3 (M)	If the NSSI is associated with NS instance, network slice subnet management service provider disassociates the NS instance from the NSSI to be terminated, and network slice subnet management service provider may trigger corresponding request to NFVO for terminating or updating (e.g. scaling-in) the NS instance. (see note).	
Step 4 (M)	If there exists transport network segment used by the NSSI, the network slice subnet management service provider may indicate that the transport network segment is no longer needed to support the NSSI.	
Step 5 (M)	Network slice subnet management service provider sends response to its consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The NSSI has been deallocated.	
Traceability	REQ-PRO_NSSI-FUN-8, REQ-PRO_NSSI-FUN-11	

NOTE: In case where the NS instance is not dedicated for the NSSI, the network slice subnet provisioning management service provider does not terminate the NS instance.

5.1.5 Obtaining network slice subnet instance information

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	Enable network slice subnet management service consumer to obtain network slice subnet instance information (e.g. Slice/Service type, network slice subnet capability information).	
Actors and Roles	Network slice subnet management service consumer. For example, NSMF or NSSMF plays the role of network slice subnet management service consumer.	
Telecom resources	Network slice subnet instance Network slice subnet management service provider. For example, NSSMF plays the role of network slice subnet management service provider.	
Assumptions	Network slice subnet management service consumer is authorized to obtain the network slice subnet instance information from network slice subnet management service provider.	
Pre-conditions	NSSI is created.	
Begins when	Network slice subnet management service consumer wants to obtain the network slice subnet instance information.	
Step 1 (M)	Network slice subnet management service consumer sends a request to network slice subnet management service provider to obtain the network slice subnet instance information. The indication on which information needs to be obtained may be included in the request.	
Step 2 (M)	Network slice subnet management service provider processes this request.	
Step 3 (M)	Network slice subnet management service provider sends the result of network slice subnet instance information to network slice subnet management service consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	Network slice subnet management service consumer has obtained the network slice subnet instance information.	
Traceability	REQ-PRO_NSSI-FUN-7.	

5.1.6 Network slice feasibility check

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To check the feasibility of provisioning a network slice to determine whether the network slice requirements can be satisfied at a particular point in time (e.g., in terms of resources)	
Actors and Roles	Network slice management service consumer. For example, CSMF or CSP providing NSaaS plays the role of network slice management service consumer.	
Telecom resources	Network slice management service provider. For example, NSMF plays the role of network slice management service provider.	
Assumptions	Network slice management service consumer has decided to check the feasibility of provisioning a network slice based on, for example, internal decision or to facilitate an external service requests.	
Pre-conditions	Network slice requirements have been derived or received by network slice management service consumer.	
Begins when	Network slice management service provider receives the request to evaluate the feasibility of provisioning a network slice according to the network slice requirements at a particular point in time.	
Step 1 (M)	Network slice management service provider identifies the network slice subnets according to the requirements.	
Step 2 (M)	Network slice management service provider obtains the information necessary to evaluate the feasibility of provisioning a network slice by requesting the network slice subnets service provider(s) to evaluate the availability of resources under their contol.	
Step 3 (M)	Network slice subnet management service provider(s) checks the feasibility of provisioning a slice subnet(s) by analysing network constituents to ensure that their capabilities, e.g., resources, management services, etc. are (or will be) adequate to provision network slice instance, satisfying all requirements without impacting existing services. For the purpose of checking the feasibility of provisioning a network slice subnet(s) of the network slice , network slice subnet management service provider(s) may obtain information from the network (e.g., current or predicted load level information from the NWDAF).	5.1.21 Network slice subnet feasibility check
Ends when	Feasibility check results have been provided to network slice management service consumer.	
Exceptions	One of the mandatory steps fails.	
Post-conditions	N/A	
Traceability	REQ-PRO_NSSI-FUN-12, REQ-PRO_NSSI-FUN-13, REQ-PRO_NSI-FUN-8.	

5.1.7 Network slice instance activation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To activate an existing network slice instance which is inactive	
Actors and Roles	NetworkSliceActivation service consumer. For example, CSMF or CSP providing NSaaS plays the role of NetworkSliceActivation service consumer.	
Telecom resources	Network slice instance NetworkSliceActivation service provider. For example, NSMF plays the role of NetworkSliceActivation service provider.	
Assumptions	N/A	
Pre-conditions	An NSI has already been created and it is inactive.	
Begins when	The NetworkSliceActivation service provider decides to activate an NSI based on the received network slice related request from its authorized consumer.	
Step 1 (M)	NetworkSliceActivation service provider checks whether NSSIs associated with the NSI are all active, if there is an inactive NSSI, NetworkSliceActivation service provider requests NetworkSliceSubnetActivation service provider to activate the corresponding NSSI.	Network slice subnet instance activation use case
Step 2 (M)	NetworkSliceActivation service provider receives response from NetworkSliceSubnetActivation service provider indicating that the NSSI is active.	
Step 3 (M)	NetworkSliceActivation service provider activates the NSI and sends response to the requesting consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	An NSI has been activated.	
Traceability	REQ-PRO_NSI–FUN-4	

5.1.8 Network slice instance deactivation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To deactivate an existing network slice instance which is active.	
Actors and Roles	NetworkSliceActivation service consumer. For example, CSMF or CSP providing NSaaS plays the role of NetworkSliceActivation service consumer.	
Telecom resources	Network slice instance NetworkSliceActivation service provider. For example, NSMF plays the role of NetworkSliceActivation service provider.	
Assumptions	N/A	
Pre-conditions	NSI has already been created and it is active.	
Begins when	The NetworkSliceActivation service provider decides to deactivate an NSI based on the received network slice related request from its authorized consumer.	
Step 1 (M)	The NetworkSliceActivation service provider stops the NSI serving its subscribers	
Step 2 (M)	NetworkSliceActivation service provider checks whether NSSIs associated with the NSI are all inactive. If there is an active NSSI, NetworkSliceActivation service provider requests NetworkSliceSubnetActivation service provider to deactivate the corresponding NSSI. NetworkSliceSubnetActivation service provider receives the request and decides if the NSSI will be disassociated and deactivated.	Network slice subnet instance deactivation use case
Step 3 (M)	The NetworkSliceActivation service provider receives response from NetworkSliceSubnetActivation service provider that the NSSI deactivation request has been processed.	
Step 4 (M)	NetworkSliceActivation service provider deactivates the NSI and sends response to its authorized consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	An NSI has been deactivated.	
Traceability	REQ-PRO_NSI–FUN-5	

5.1.9 Network slice instance modification

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To modify an existing network slice instance	
Actors and Roles	Network slice management service consumer. See NOTE.	
Telecom resources	Network slice instance Network slice management service provider. For example, NSMF plays the role of network slice management service provider.	
Assumptions	N/A	
Pre-conditions	N/A.	
Begins when	The network slice management service provider receives request from its authorized customer with new set of network slice related requirements and decides to modify an existing NSI.	
Step 1 (M)	The network slice management service provider identifies the NSSI(s) associated with the NSI to be modified and generates network slice subnet related requirements for the NSSI(s).	
Step 2 (M)	The network slice management service provider sends requests to Network SliceSubnetConfiguration service provider with new sets of network slice subnet related requirements. The network slice management service provider receives request and decides whether the NSSI needs to be modified.	Network slice subnet instance modification use case
Step 3 (M)	Network slice management service provider receives the response from network slice subnet management service provider. If the NSSI modification request cannot be satisfied by the network slice subnet management service provider, network slice management service provider may re-generate the network slice subnet related requirements for the NSSI and go to step 2, or network slice management service provider may decide the modification request cannot be satisfied.	
Step 4 (M)	The network slice management service provider sends response to its authorized consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The NSI is modified.	
Traceability	REQ-PRO_NSI-FUN-6	
NOTE: Examples of roles and actors for this use case can be found in TS 28.530 [4].		

5.1.10 Network slice subnet instance activation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To activate an existing network slice subnet instance which is inactive.	
Actors and Roles	NetworkSliceSubnetActivation service consumer. For example, NSMF or NSSMF plays the role of NetworkSliceSubnetActivation service consumer.	
Telecom resources	Network slice subnet instance NetworkSliceSubnetActivation service provider. For example, NSSMF plays the role of NetworkSliceSubnetActivation service provider.	
Assumptions	N/A	
Pre-conditions	An NSSI has already been created and it is inactive.	
Begins when	The NetworkSliceSubnetActivation service provider decides to activate an NSSI based on the received network slice subnet related request from its authorized consumer.	
Step 1 (M)	The NetworkSliceSubnetActivation service provider identifies inactive constituents (e.g. NSSI, NF) of the NSSI and decides to activate those constituents.	
Step 2 (M)	If the constituent of NSSI is managed directly by the NetworkSliceSubnetActivation service provider, NetworkSliceSubnetActivation service provider activates the NSSI constituent directly.	
Step 3 (M)	If an NSSI constituent is managed by other NetworkSliceSubnetActivation service provider, NetworkSliceSubnetActivation service provider requests other NetworkSliceSubnetActivation service provider to activate the constituent NSSI.	
Step 4 (M)	If an NSSI constituent is an NF managed by NF related management service provider, the NetworkSliceSubnetActivation service provider request NF related management service provider to activate the NF (e.g., activate the NF in sleep mode, turn on the ports).	
Step 5 (M)	NetworkSliceSubnetActivation service provider receives response indicating that NSSI constituents are all activated.	
Step 6 (M)	NetworkSliceSubnetActivation service provider activates the network slice subnet instance and sends response to its authorized consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	An NSSI has been activated.	
Traceability	REQ-PRO_NSSI–FUN-9	

5.1.11 Network slice subnet instance deactivation

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To deactivate an existing network slice subnet instance which is active.	
Actors and Roles	NetworkSliceSubnetActivation service consumer. For example, NSMF or NSSMF plays the role of NetworkSliceSubnetActivation service consumer.	
Telecom resources	Network slice subnet instance NetworkSliceSubnetActivation service provider. For example, NSSMF plays the role of NetworkSliceSubnetActivation service provider.	
Assumptions	N/A	
Pre-conditions	An NSSI has already been created and is active.	
Begins when	The NetworkSliceSubnetActivation service provider decides to deactivate an NSSI based on the received network slice subnet related request from its authorized customer.	
Step 1 (M)	The NetworkSliceSubnetActivation service provider identifies the NSSI constituents that need to be deactivated.	
Step 2 (M)	If the constituent of NSSI is managed directly by the NetworkSliceSubnetActivation service provider, NetworkSliceSubnetActivation service provider deactivates the NSSI constituent directly.	
Step 3 (M)	If an NSSI constituent is managed by other NetworkSliceSubnetActivation service provider, the NetworkSliceSubnetActivation service provider request other NetworkSliceSubnetActivation service provider to deactivate the constituent NSSI.	
Step 4 (M)	If an NSSI constituent is managed by NF related management service provider, NetworkSliceSubnetActivation service provider requests NF related management service provider to deactivate the NF.	
Step 5 (M)	NetworkSliceSubnetActivation service provider receives response indicating that corresponding NSSI constituents are deactivated or not deactivated (e.g., shared constituents cannot be deactivated).	
Step 6 (M)	NetworkSliceSubnetActivation service provider deactivates the network slice subnet instance and send response to its authorized consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	A network slice subnet instance has been deactivated.	
Traceability	REQ-PRO_NSSI–FUN-10	

5.1.12 Network slice subnet instance modification

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To modify an existing network slice subnet instance	
Actors and Roles	NetworkSliceSubnet management service consumer.	
Telecom resources	Network slice subnet instance NetworkSliceSubnet management service provider. For example, NSSMF plays the role of NetworkSliceSubnet management service provider.	
Assumptions	N/A	
Pre-conditions	N/A	
Begins when	The NetworkSliceSubnetmanagement service provider receives request from its authorized consumer with new sets of network slice subnet related requirements and decides to modify an existing NSSI.	
Step 1 (M)	The NetworkSliceSubnetmanagement service provider identifies the NSSI constituents as well as the transport network (TN) part within the NSSI that needs to be modified, and generates new sets of requirements for the NSSI constituents and transport network if needed.	
Step 2 (M)	The NetworkSliceSubnetmanagement service provider checks whether the requirements for the identified NSSI constituents managed by itself could be satisfied, and then triggers the modification of the corresponding NSSI constituents if needed.	
Step 3 (M)	If the NSSI consists of constituent NSSI managed by other NetworkSliceSubnetmanagement service provider, and the constituent NSSI is identified to be modified, the NetworkSliceSubnetmanagement service provider sends modification request to other NetworkSliceSubnetmanagement service provider which manages the constituent NSSI with new sets of constituent NSSI requirements.	Network slice subnet instance modification use case
Step 4 (M)	If the NS instance associated with the NSSI needs to be modified, the NetworkSliceSubnetmanagement service provider derives the new sets of NS related requirements and triggers corresponding NS instance request to NFVO with Os-Ma-nfvo interface as described in clause 6.4.3 in TS 28.525 [2].	TS 28.525 [2] Clause 6.4.3 NS instance use cases
Step 5 (M)	If the related TN part of the NSSI is identified to be modified, the NetworkSliceSubnetmanagement service provider derives new sets of requirements for the TN part and coordinates with the corresponding TN management system.	
Step 6 (M)	The NetworkSliceSubnetmanagement service provider generates the modification result based on the received response and send response to its authorized consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The NSSI is modified.	
Traceability	REQ-PRO_NSSI-FUN-11	

5.1.13 Network slice subnet configuration

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To provide service for slice-specific (re)configuration of NSSI.	
Actors and Roles	NSS management service consumer (e.g., the operator or NSMF)	
Telecom resources	NSS management service provider (e.g., NSSMF) Network slice subnet instance NF(s)	
Assumptions	Authorized NSS management service consumer provide slice operation information (see 4.2) for (re-)configuring NSSI constituents.	
Pre-conditions	NSSI exists.	
Begins when	NSS management service consumer wants to (re-)configure the constituents of a NSSI.	
Step 1 (M)	NSS management service consumer sends requests to NSS management service provider with slice operation information for (re-)configuring a network slice subnet.	
Step 2 (M)	NSS management service provider (derives and) decomposes the received slice operation information, and then makes them as separate CM requests for each constituent if necessary and applicable. These (decomposed) requests may be delegated to other CM service providers (e.g., other NSS service providers, CM of NFs) with corresponding slice operation information. These requests may contain configuration for specific NFs such as 1) *Configuration of dedicated NFs* (e.g., configure the SMF with the information of new instantiated UPFs, see 5.3.2, 5.3.3 in [6]) and 2) *Configuration of shared NFs* (see 4.2 so that this information can be accessed by other constituents of the NSS (e.g., NSSF, AMF, SMF).	
Step 3 (M)	NSS management service provider sends the processing result to NSS management service consumer (might be based on applicable processing results from other CM service providers).	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The required (re)configuration is configured at the corresponding constituent(s).	
Traceability	REQ-PRO_NSSI-FUN-16	

5.1.14 Exposure of network slice management data

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	Enable network slice management service consumer to obtain network slice management data (e.g. PM data, FM data).	
Actors and Roles	Network slice management service consumer. For example, CSMF plays the role of network slice management service consumer. Network slice management service provider. For example, NSMF plays the role of network slice management service provider.	
Telecom resources	Network slice instance	
Assumptions	Network slice management service consumer is authorized to obtain the network slice management data from network slice management service provider.	
Pre-conditions	NSI is created.	
Begins when	Network slice management service consumer wants to obtain the network slice management data.	
Step 1 (M)	Network slice management service consumer sends a request to network slice management service provider to obtain the network slice management data.	
Step 2 (M)	Network slice management service provider provides the network slice management service consumer with the network slice management data .	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	Network slice management service consumer obtained the network slice management data.	
Traceability	REQ-PRO_NSI-FUN-7	

5.1.15 Exposure of network slice management capability

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	Enable authorized network slice management service consumer to obtain certain management capability to manage the network slice instance (e.g., provisioning) through the exposure interface.	
Actors and Roles	Network slice management service consumer. For example, CSMF or CSP providing NSaaS plays the role of network slice management service consumer.	
Telecom resources	Network slice instance Network slice management service provider. For example, NSMF plays the role of network slice management service provider.	
Assumptions	Network slice management service consumer is authorized to obtain the allowed management capability from network slice management service provider according to the pre-defined agreements.	
Pre-conditions	Level of management exposure has been agreed upon between the network slice management service provider and the network slice management service consumer.	
Begins when	Network slice management service consumer wants to obtain the network slice management capability.	
Step 1 (M)	Network slice management service consumer sends a request to network slice management service provider to obtain the network slice management capability. The information indicating which specific management capability needs to be obtained may be included in the request.	
Step 2 (M)	Network slice management service provider provides the required management capability to network slice management service consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	Network slice management service consumer obtained the allowed network slice management capability.	
Traceability	REQ-PRO_NSI-FUN-1, REQ-PRO_NSI-FUN-3, REQ-PRO_NSI-FUN-6	

5.1.16 Network slice subnet instance management capability exposure

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	Enable authorized NSS management service consumer to obtain network slice subnet management capability (e.g. obtaining measurement, updating resource allocations).	
Actors and Roles	NSS management service consumer (e.g., the operator or NSMF or NSSMF)	
Telecom resources	NSS management service provider (e.g., NSSMF) Network slice subnet instance NF(s)	
Assumptions	NSS management service consumer is authorized to obtain the allowed management capability from NSS management service provider.	
Pre-conditions	NSSI is created.	
Begins when	NSS management service consumer wants to obtain the network slice subnet management capability.	
Step 1 (M)	NSS management service consumer sends a request to NSS management service provider to obtain the network slice subnet instance management capability. The information indicating which specific management capability need to be obtained may be included in the request.	
Step 2 (M)	NSS management service provider processes this request.	
Step 3 (M)	NSS management service provider provides the required exposure interfaces to NSS management service consumer.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	NSS management service consumer obtained the allowed network slice subnet instance management capability.	
Traceability	REQ-PRO_NSSI-FUN-15	

5.1.17 Creation of a 3GPP NF

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to request creation of an instance of 3GPP NF.	
Actors and Roles	An authorized consumer of NF creation service.	
Telecom resources	VNF package(s) of the virtualized part of 3GPP NF; ETSI NFV MANO system; NF creation service producer.	
Assumptions	N/A	
Pre-conditions	The VNF package(s) of the virtualized part of 3GPP NF have been on-boarded to ETSI NFV MANO system.	
Begins when	The authorized consumer needs to create a new instance of 3GPP NF.	
Step 1 (M)	The authorized consumer requests the NF creation service producer to create a new instance of 3GPP NF.	
Step 2 (M)	The NF creation service producer checks the subject 3GPP NF contains virtualized part and/or non-virtualized part. If it contains virtualized part, then the NF instantiation service producer performs the step 3 and 4 to instantiate the virtualized part of the subject 3GPP NF. How to instantiate the non-virtualized part of the subject 3GPP NF is out of scope of present specification.	
Step 3 (M)	The NF creation service producer interacts, or requests another NF creation service producer to interact, with ETSI NFV MANO system to instantiate the VNF(s) that are realizing the virtualized part of subject 3GPP NF.	
Step 4 (M)	If all of the contained parts (i.e., virtualized part and non-virtualized part if any) of the 3GPP NF have been successfully instantiated, the NF creation service producer informs the consumer(s) (who have subscribed to the notifications for NF creation) that the instance of 3GPP NF has been created, and creates the MOI(s) for the subject 3GPP NF.	
Step 5 (M)	Created MOI(s) may be maintained by a Management Function which has the NF creation service or the 3GPP NF. When the MOI(s) is maintained by the 3GPP NF, the NF creation service producer sends a request of creating the MOI(s) to the corresponding NF management service producers in the created NF.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The instance of 3GPP NF has been created, and the MOI(s) of the 3GPP NF have been created.	
Traceability	REQ-PRO_NF-FUN-1, REQ-PRO_NF-FUN-2, REQ-PRO_NF-FUN-7	

5.1.18 Configuration of a 3GPP NF instance

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to request configuration of a 3GPP NF instance.	
Actors and Roles	An authorized consumer of NF management service.	
Telecom resources	ETSI NFV MANO system; NF management service producer.	
Assumptions	N/A	
Pre-conditions	The NF to be configured has been instantiated; The MOI of the NF has been created.	
Begins when	The authorized consumer needs to configure a 3GPP NF instance.	
Step 1 (M)	The consumer requests the NF management service producer to modify the attribute(s) of the MOI of the 3GPP NF instance.	
Step 2 (O)	If the 3GPP NF contains virtualized part and the corresponding VNF instance(s) need to be updated, the NF configuration service producer interacts, or requests another NF management service producer to interact, with ETSI NFV MANO system to update the corresponding VNF instance(s).	
Step 3 (M)	The NF management service producer configures the 3GPP NF instance, per the MOI attribute modification request received from the consumer.	
Step 4 (M)	The NF management service producer modifies the attributes of the MOI and informs the consumer that the 3GPP NF instance has been configured successfully.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The 3GPP NF instance has been configured.	
Traceability	REQ-PRO_NF-FUN-4, REQ-PRO_NF-FUN-5, REQ-PRO_NF-FUN-6, REQ-PRO_NF-FUN-3	

5.1.19 Creation of a 3GPP sub-network

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to request creation of a 3GPP sub-network.	
Actors and Roles	An authorized consumer of sub-network creation service.	
Telecom resources	VNF package(s) of the virtualized part of 3GPP NF(s); NSD(s) of the NS(s); ETSI NFV MANO system; Network creation service producer; NF configuration service producer.	
Assumptions	N/A	
Pre-conditions	The non-virtualized part of the NFs (including completely non-virtualized NFs) constituting the 3GPP sub-network have been deployed; The VNF package(s) of the virtualized part of 3GPP NF(s) have been on-boarded to ETSI NFV MANO system; The NSD(s) of the NS realizing the 3GPP sub-network have been on-boarded to ETSI NFV MANO system.	
Begins when	The authorized consumer needs to create a 3GPP sub-network.	
Step 1 (M)	The authorized consumer requests the sub-network creation service producer to create a 3GPP sub-network. The request needs to indicate the network capacity (e.g., the number of instances of each kind of NFs, and the capacity of each NF instance, for example, number of flows with certain QoS attributes to be supported), network topology information (e.g., the connections between NF instances), and the network QoS requirements (e.g., bandwidth and latency requirements of the interface between two NF instances).	
Step 2 (M)	The network creation service producer interacts, or requests another network creation service producer to interact, with ETSI NFV MANO system to instantiate the NS(s) realizing the sub-network.	
Step 3 (M)	ETSI NFV MANO system informs the NF configuration service producer about the instantiation of the NSs and the new VNFs.	
Step 4 (M)	The NF configuration service producer creates the MOI(s) of the 3GPP NFs that are realized by the newly instantiated VNF(s); there may be MOI(s) that specify the topology of the instantiated NSs.	
Step 5 (M)	The sub-network creation service producer is using the NF configuration service to configure the 3GPP NF instance(s) that are constituting the subject 3GPP sub-network.	NF configuration service
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The 3GPP sub-network has been created.	
Traceability	REQ-PRO_NW-FUN-1, REQ-PRO_NW-FUN-2	

5.1.20 Configuration of a 3GPP sub-network

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to request configuration of a 3GPP sub-network.	
Actors and Roles	An authorized consumer of network configuration service.	
Telecom resources	3GPP network; 3GPP NFs; ETSI NFG MANO system; Network management service producer.	
Assumptions	N/A	
Pre-conditions	The 3GPP sub-network has been created; The MOI(s) related to the sub-network has been created.	
Begins when	The authorized consumer needs to configure a 3GPP sub-network.	
Step 1 (M)	The authorized consumer requests to configure a 3GPP sub-network.	
Step 2 (M)	The consumer requests the network management service producer to modify the attribute of the MOI(s) related to the 3GPP sub-network.	
Step 3 (O)	If the 3GPP network is realized by NS(s) (ETSI ISG NFV concept), the network management service producer requests (directly or indirectly via another) ETSI NFV MANO system to update the NS(s) realizing the 3GPP sub-network.	
Step 4 (O)	If there are new VNFs instantiated by the NS update, ETSI NFV MANO system informs the NF management service producer about the instantiation of VNFs.	
Step 5 (O)	The NF configuration service producer creates the MOI(s) of the 3GPP NFs that are realized by the newly instantiated VNF(s).	
Step 6 (M)	The network management service producer consumes the NF configuration service to configure the impacted 3GPP NF instance(s).	NF configuration service
Step 7 (M)	The network management service producer configures the 3GPP sub-network, per the MOI attribute modification request received from the consumer.	
Step 8 (M)	The NF management service producer modifies the attributes of the MOI(s) of the 3GPP network and informs the consumer that the 3GPP sub-network has been configured successfully.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The 3GPP network has been configured.	
Traceability	REQ-PRO_NW-FUN-3, REQ-PRO_NW-FUN-4	

5.1.21 Network slice subnet feasibility check

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To check the feasibility of provisioning a network slice subnet to determine whether network slice subnet requirements can be satisfied at a particular point of time (e.g., in terms of resources)	
Actors and Roles	Network slice subnet management service consumer. For example, when a network slice subnet instance is to be provided as a constituent of a network slice instance.	
Telecom resources	Network slice subnet instance Network slice management service provider. For example, a management function that plays the role of network slice management service provider.	
Assumptions	Network slice subnet management service consumer has decided to check the feasibility of provisioning a network slice subnet based on, for example, internal decision or to facilitate an external service requests.	
Pre-conditions	Network slice subnet requirements have been derived or received by network slice subnet management service consumer.	
Begins when	Network slice subnet management service provider receives the request to evaluate the feasibility of provisioning a network slice subnet according to the network slice requirements at a particular point in time.	
Step 1 (M)	Network slice subnet management service provider identifies the network slice subnets constituents according to the requirements, e.g., network services to be requested from MANO.	
Step 2 (O)	For the purpose of checking the feasibility of provisioning a network slice subnet(s) of the network slice instance, network slice subnet management service provider(s) may obtain information from the network (e.g., current or predicted load level information, current or predicted resource usage information from management data analytics services).	
Step 3 (M)	Network slice subnet management service provider sends enquiries with reservation requests to other management providers (e.g., MANO) to determine availability of network constituents, e.g., network services, network functions. If some of the responses are negative, network slice subnet management service provider may send enquiries to different management providers.	
Ends when	Feasibility check results have been provided to network slice subnet management service consumer.	
Exceptions	One of the mandatory steps fails.	
Post-conditions	N/A	
Traceability		

5.1.22 Network slice resource capacity planning

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To calculate capacity of network slice instances and network slice subnet instances.	
Actors and Roles	Network slice management service consumer. For example, NSMF or NSSMF plays the role of network slice management service consumer.	
Telecom resources	Network slice instance Network slice subnet instance Network slice management service provider. For example, NSMF or NSSMF plays the role of network slice management service provider.	
Assumptions	Network slice management service consumer has decided to perform network slice resource capacity optimization process.	
Pre-conditions	Network slice resource capacity optimization objectives are set by network slice management service consumer.	
Begins when	Network slice management service consumer requests resource capacity planning of the NSIs and/or NSSIs when the pre-set resource optimization objectives need to be satisfied.	
Step 1 (M)	Network slice management service provider obtains information needed for the optimization process such as slice provisioning requirements, existing active or non-active NSI and/or NSSI resource information, and performance measurement data by requesting feasibility check operation.	
Step 2 (M)	Network slice management service provider performs resource optimization process based on the information obtained in Step 1. The goal of the process is to find an optimal capacity availability against the target objective	
Step 3 (M)	Network slice management service provider proceeds with network slice (NSI and/or NSSI) provisioning or modification processes until it meets the resource capacity optimization objective.	Network slice instance creation or modification/network slice subnet instance creation or modification use cases
Step 4 (M)	Network slice management service provider updates capacity availability information after provisioning or modification processes.	
Ends when	The capacity resource planning ends when it meets the optimization objective.	
Exceptions	One of the mandatory steps fails.	
Post-conditions	Capacity planning policy for either provisioning or modification is generated.	
Traceability	REQ-PRO_NSSI-FUN-3, REQ-PRO_NSI-FUN-9	

5.1.23 Network slice subnet management with assigned priority

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To assign priority on existing network slice subnet instance(s).	
Actors and Roles	Network slice subnet management service consumer. Network slice subnet management service provider (e.g. NSSMF)	
Telecom resources	Network slice subnet instance (i.e. NSSI) Network slice subnet management service provider	
Assumptions	Network slice subnet instance is deployed to support a communication service with priority, set by the operator.	
Pre-conditions	This use case is based on the condition that operator requires a priority assigned to network slice subnet.	
Begins when	The NSSI(s) should have been assigned with priority set by the operator.	
Step 1 (M)	The network slice management service provider identifies the NSSI(s) that needs to be associated with the priority, requested by authorized network slice subnet management service consumer. The network slice management service provider assigns priority to the identified NSSI(s)	Network slice subnet instance modification use case
Step 2 (M)	The network slice management service provider sends response to its authorized consumer about assigned priority on identified NSSI(s).	
Ends when	All the steps identified above are successfully completed. Network slice subnet priority was assigned by network slice subnet management service provider.	
Exceptions	One of the steps identified above fails.	
Post-conditions		
Traceability	REQ-PRO_NSI-FUN-x	

5.1.24 Management interaction with NFV MANO for network service priority

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	To enable the authorized consumer to request creation of a 3GPP sub-network, management interactions with NFV MANO is needed. This management interaction will assign priority on NFV NS(s).	
Actors and Roles	An authorized consumer of 3GPP sub-network creation.	
Telecom resources	VNF package(s) of the virtualized part of 3GPP NF(s); NSD(s) of the NS(s); ETSI NFV MANO system;	
Assumptions	N/A	
Pre-conditions	The ETSI NFV VNF package(s) of the virtualized part of 3GPP NF(s) have been on-boarded to ETSI NFV MANO system; The ETSI NFV NSD(s) used to instantiate NS(s) for realizing the 3GPP sub-network have been on-boarded to ETSI NFV MANO system.	
Begins when	The authorized consumer needs to create a 3GPP sub-network. This creation operation also needs to assign priority on 3GPP sub-network and on related ETSI NFV NS(s).	
Step 1 (M)	The authorized consumer requests the 3GPP sub-network creation service producer to create a 3GPP sub-network.	
Step 2 (M)	The sub-network creation service producer interacts, or requests another sub-network creation service producer to interact, with ETSI NFV MANO system to instantiate the NS(s) realizing the 3GPP sub-network.	
Step 3 (M)	ETSI NFV MANO is informed about NS priority.	
Ends when	All the steps identified above are successfully completed.	
Exceptions	One of the steps identified above fails.	
Post-conditions	The 3GPP sub-network has been created. Network service priority is identified by NFVO to support the 3GPP sub-network.	
Traceability	REQ-PRO_NW-FUN-1, REQ-PRO_NW-FUN-2	

5.2 Requirements

5.2.1 Requirements for network slice provisioning service

REQ-PRO_NSI-FUN-1 The network slice provisioning service provider shall have the capability allowing its authorized consumer to request a network slice instance.

REQ-PRO_NSI-FUN-2 The network slice provisioning service provider shall have the capability allowing its authorized consumer to send the network slice related requirements.

NOTE: The network slice related requirements include requirements such as area traffic capacity, coverage area, isolation/sharing, end-to-end latency, mobility, overall user density, priority, service availability, service reliability, UE speed; see TS 22.261 [5] where these parameters are defined for end user services.

REQ-PRO_NSI-FUN-3 The network slice provisioning service provider shall have the capability allowing its authorized consumer to request the deallocation of a network slice instance.

REQ-PRO_NSI–FUN-4 The network slice provisioning service provider shall have the capability allowing its authorized consumer to request activation of a network slice instance.

REQ-PRO_NSI–FUN-5 The network slice provisioning service provider shall have the capability allowing its authorized consumer to request deactivation of a network slice instance.

REQ-PRO_NSI-FUN-6 The network slice provisioning service provider shall have the capability allowing its authorized consumer to request the modification of a network slice instance.

REQ-PRO_NSI-FUN-7 The network slice provisioning service provider shall have the capability allowing its consumer to obtain the network slice management data.

REQ-PRO_NSI-FUN-8 The network slice provisioning service provider shall have the capability allowing its authorized consumer to obtain the feasibility of provisioning the requested network slice instance at a particular point of time.

REQ-PRO_NSI-FUN-9 The network slice management service provider shall have the capability allowing its authorized consumer to request the capacity planning of a network slice instance.

5.2.2 Requirements for network slice subnet provisioning service

REQ-PRO_NSSI-FUN-1 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to request a network slice subnet instance.

REQ-PRO_NSSI-FUN-2 The network slice subnet provisioning service provider shall have the capability of interaction with NFVO via the NS lifecycle management interface.

REQ-PRO_NSSI-FUN-3 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to send network slice subnet related requirements.

REQ-PRO_NSSI-FUN-4 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to request to create a new NSSI or use an existing NSSI based on the network slice subnet related requirements.

REQ-PRO_NSSI-FUN-5 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to request to associate the NS instance with corresponding NSSI.

REQ-PRO_NSSI-FUN-6 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to request the configuration of the RAN NSSI constituents with the RRM policy information for simultaneous support of multiple NSIs.

REQ-PRO_NSSI-FUN-7 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to obtain network slice subnet instance information.

REQ-PRO_NSSI-FUN-8 The network slice subnet provisioning service provider shall have the capability of allowing its authorized consumer to request the deallocation of a network slice subnet instance.

REQ-PRO_NSSI-FUN-9 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to request activation of a network slice subnet instance.

REQ-PRO_NSSI-FUN-10 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to request deactivation of a network slice subnet instance.

REQ-PRO_NSSI-FUN-11 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to request modification of a network slice subnet instance.

REQ-PRO_NSSI-FUN-12 The network slice subnet provisioning service provider shall have the capability allowing its consumer to obtain information regarding available network slice subnet resources.

REQ-PRO_NSSI-FUN-13 The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to obtain the feasibility of provisioning a network slice subnet instance at a particular point of time.

REQ-PRO_NSSI-FUN-14 The network slice subnet provisioning service provider shall have the capability to satisfy the request to consume the NF provisioning service.

REQ-PRO_NSSI-FUN-15 The network slice subnet provisioning service provider shall have the capability to expose limited management capability to its consumer according to mutual agreement.

REQ-PRO_NSSI-FUN-16 The network slice subnet provisioning service provider shall have the capability allowing its consumer to provide slice specific operation information for the (re)configuration to a NSSI.

REQ-PRO_NSI-FUN-x The network slice subnet provisioning service provider shall have the capability allowing its authorized consumer to assign priority of a network slice subnet.

5.2.3 Requirements for NF provisioning service

REQ-PRO_NF-FUN-1 The NF provisioning service producer shall have the capability allowing its authorized consumer to request creation of an instance of 3GPP NF.

REQ-PRO_NF-FUN-2 The NF provisioning service producer shall have the capability to fulfill the consumer's request to create an instance of 3GPP NF.

REQ-PRO_NF-FUN-3 The NF provisioning service producer shall have the capability to provide the VNF and VNFC related information of the NF instance to its authorized consumer.

REQ-PRO_NF-FUN-4 The NF provisioning service producer shall have the capability allowing its authorized consumer to request configuration of a 3GPP NF instance.

REQ-PRO_NF-FUN-5 The NF provisioning service producer shall have the capability to request updating the VNF(s) that are realizing the virtualized part of a 3GPP NF.

REQ-PRO_NF-FUN-6 The NF provisioning service producer shall have the capability to fulfill the consumer's request to configure a 3GPP NF instance.

REQ-PRO_NF-FUN-7 The NF provisioning service producer shall have the capability to request NF management service producers working in the concerned NF instance to create and maintain the MOI(s) for it.

5.2.4 Requirements for sub-network provisioning service

REQ-PRO_NW-FUN-1 The sub-network provisioning service producer shall have the capability allowing its authorized consumer to request creation of a 3GPP sub-network.

REQ-PRO_NW-FUN-2 The sub-network provisioning service producer shall have the capability to fulfil the consumer's request to create a 3GPP sub-network.

REQ-PRO_NW-FUN-3 The sub-network provisioning service producer shall have the capability allowing its authorized consumer to request configuration of a 3GPP sub-network.

REQ-PRO_NW-FUN-4 The sub-network provisioning service producer shall have the capability to fulfil the consumer's request to configure a 3GPP sub-network.

6 Management services for provisioning of networks and network slicing

6.1 Management services for network slice provisioning

The management services for network slice provisioning are listed in table 6.1-1.

Table 6.1-1: Management services for network slice provisioning

MnS Name	MnS Component Type A (operations and notifications)	MnS Component Type B (information model)	Note
Provisioning for NSI	Operations defined in clause 5 of TS 28.532 [8]: - createMOI operation - deleteMOI operation - getMOIAttributes operation - modifyMOIAttributes operation Operations defined in clause 6.5: - allocateNsi operation - deallocateNsi operation	NSI information model defined in clause 6.3 of TS 28.541 [6]	This management service enables its consumer to request allocating, deallocating, or modifying an NSI. The typical scenario is "Network Slices as NOP internals" model where this MnS is consumed by operators.
Provisioning data report for NSI	Operations defined in clause 5 of TS 28.532 [8]: - subscribe operation - unSubscribe operation Notifications defined in clause 5 of TS 28.532 [8]: notifyMOICreation notification - notifyMOIDeletion notification - notifyMOIAttributeValueChanges notification	NSI information model defined in clause 6.3 of TS 28.541 [6]	This management service enables its consumer to obtain notifications about NSI Information model data. The typical scenario is "Network Slices as NOP internals" model where this MnS is consumed by operators
Provisioning exposure for NSI	Operations defined in clause 5 of TS 28.532 [8]: - createMOI operation - deleteMOI operation - getMOIAttributes operation - modifyMOIAttributes operation Operations defined in clause 6.5: - allocateNsi operation - deallocateNsi operation	NSI information model defined in clause 6.3 of TS 28.541 [6]	This management service enables its consumer to request allocating, deallocating or modifying an NSI. The typical scenario is NSaaS model where this MnS is consumed by vertical industry.

Provisioning data report exposure for NSI	Operations defined in clause 5 of TS 28.532 [8]: - subscribe operation - unSubscribe operation Notifications defined in clause 5 of TS 28.532 [8]: - notifyMOICreation notification - notifyMOIDeletion notification - notifyMOIAttributeValueChanges notification	NSI information model defined in clause 6.3 of TS 28.541 [6]	This management service enables its consumer to obtain notifications about NSI Information model data. The typical scenario is NSaaS model where this MnS is consumed by vertical industry.

6.2 Management services for network slice subnet provisioning

The management services for network slice subnet provisioning are listed in table 6.2-1.

Table 6.2-1: Management services for NSS provisioning

MnS Name	MnS Component of type A (Operations and notifications)	MnS Component of type B (information model)
Provisioning for NSSI	Operations defined in clause 5 of TS 28.532 [8]: - createMOI operation - modifyMOIAttributes operation - getMOIAttributes operation - deleteMOI operation Operations defined in clause 6.5: - allocateNssi operation - deallocateNssi operation	NSSI information model defined in clause 6.3 of TS 28.541 [6]
Provisioning data report for NSSI	Operations defined in clause 5 of TS 28.532 [8]: - subscribe operation - unSubscribe operation Notifications defined in clause 5 of TS 28.532 [8]: - notifyMOICreation notification - notifyMOIDeletion notification - notifyMOIAttributeValue Changes notification	NSSI information model defined in clause 6.3 of TS 28.541 [6]

6.3 Management services for network function provisioning

The management services for network function provisioning are listed in table 6.3-1.

Table 6.3-1: Management services for NF provisioning

MnS Name	MnS Component of type A (Operations and notifications)	MnS Component of type B (information model)
Provisioning for NF	Operations defined in clause 5 of TS 28.532 [8]: - createMOI operation - modifyMOIAttributes operation - getMOIAttributes operation - deleteMOI operation	NF(s)/ME(s) information model defined in TS 28.541 [6]
Provisioning data report for NF	Operations defined in clause 5 of TS 28.532 [8]: - subscribe operation - unSubscribe operation Notifications defined in clause 5 of TS 28.532 [8]: - notifyMOICreation notification - notifyMOIDeletion notification - notifyMOIAttributeValueChanges notification	NF(s)/ME(s) information model defined in TS 28.541 [6]

6.4 Management services for network and sub-network provisioning

The management services for network and sub-networks provisioning are listed in table 6.4-1.

Table 6.4-1: Management services for network and sub-network provisioning

MnS name	MnS Component of type A (Operations and notifications)	MnS Component of type B (information model)
Provisioning for network and sub-networks	Operations defined in clause 5 of TS 28.532 [8]: - createMOI operation - modifyMOIAttributes operation - getMOIAttributes operation - deleteMOI operation Operation defined in clause 6.5: - AllocateNetwork operation	IOC(s) of sub-network, as defined in TS 28.541 [6]
Provisioning data report for sub-networks	Operations defined in clause 5 of TS 28.532 [8]: - subscribe operation - unSubscribe operation Notifications defined in clause 5 of TS 28.532 [8]: - notifyMOICreation notification - notifyMOIDeletion notification - notifyMOIAttributeValueChanges notification	IOC(s) of sub-network, as defined in TS 28.541 [6]

6.5. Operations of provisioning

6.5.1 `AllocateNsi` operation

6.5.1.1 Description

This operation is invoked by `allocateNsi` operation service consumer to request the provider to allocate a network slice instance to satisfy network slice related requirements. The provider may create a new NSI or using existing NSI to satisfy the request.

6.5.1.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
`attributeListIn`	M	LIST OF SEQUENCE< attribute name, attribute value>	This parameter specifies the network slice related requirements defined in ServiceProfile in Clause 6.3.3 in TS 28.541 [6].

6.5.1.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
attributeListOut	M	LIST OF SEQUENCE< attribute name, attribute value>	This list of name/value pairs contains the attributes of the NSI which has been allocated and the actual value assigned to each.
status	M	ENUM (OperationSucceeded, OperationFailed)	An operation may fail because of a specified or unspecified reason.
nSId	M	An attribute uniquely identifies the network slice instance.	It specifies the unifique identifier of the NSI which has been allocated.

6.5.2 AllocateNssi operation

6.5.2.1 Description

This operation is invoked by allocateNssi operation service consumer to request the provider to allocate a network slice subnet instance to satisfy the network slice subnet related requirements. The provider may create a new NSSI or using existing NSSI to satisfy the request.

6.5.2.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
attributeListIn	M	LIST OF SEQUENCE< attribute name, attribute value>	This parameter specifies the network slice subnet related requirements defined in SliceProfile in Clause 6.3.4 in TS 28.541 [6].

6.5.2.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
attributeListOut	M	LIST OF SEQUENCE< attribute name, attribute value>	This list of name/value pairs contains the attributes of the NSSI which has been allocated and the actual value assigned to each.
status	M	ENUM (OperationSucceeded, OperationFailed)	An operation may fail because of a specified or unspecified reason.
nSSId	M	An attribute uniquely identifies the network slice subnet instance.	It specifies the unifique identifier of the NSSI which has been allocated.

6.5.3 DeallocateNsi operation

6.5.3.1 Description

This operation is invoked by deallocateNsi operation service consumer to request the provider to deallocate a network slice instance since the NSI is no longer needed for the consumer. The provider may terminate the requested NSI or modify the requested NSI without termination to satisfy the request.

6.5.3.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
nSId	M	An attribute uniquely identifies the network slice instance.	It specifies the unifique identifier of the NSI which need to be deallocated.

6.5.3.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
status	M	ENUM (OperationSucceeded, OperationFailed)	An operation may fail because of a specified or unspecified reason.

6.5.4 DeallocateNssi operation

6.5.4.1 Description

This operation is invoked by deallocateNssi operation service consumer to request the provider to deallocate a network slice subnet instance since the NSSI is no longer needed for the consumer. The provider may terminate the requested NSSI or modify the requested NSSI without termination to satisfy the request.

6.5.4.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
nSSId	M	An attribute uniquely identifies the network slice subnet instance.	It specifies the unifique identifier of the NSSI which need to be deallocated.

6.5.4.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
status	M	ENUM (OperationSucceeded, OperationFailed)	An operation may fail because of a specified or unspecified reason.

6.5.5 AllocateNetwork operation

6.5.5.1 Description

This operation is invoked by allocateNetwork operation service consumer to request the provider to satisfy the network related requirements.

6.5.5.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
attributeListIn	M	LIST OF SEQUENCE< attribute name, attribute value>	This parameter specifies the network related requirements defined in ServiceProfile in Clause 6.3.3 in TS 28.541 [6].

6.5.5.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
serviceProfileId	M	String	A unique identifier of the network related requirements which have been supported by the allocated network.
status	M	ENUM (OperationSucceeded, OperationFailed)	An operation may fail because of a specified or unspecified reason.

7 Provisioning procedures of networks and network slicing

7.1 General

The procedures of provisioning of 5G networks are listed in this following subclauses.

7.2 Procedure of Network Slice Instance Allocation

The Figure 7.2-1 illustrates the procedure of creating a new NSI or using an existing NSI to satisfy the required network slice related requirements.

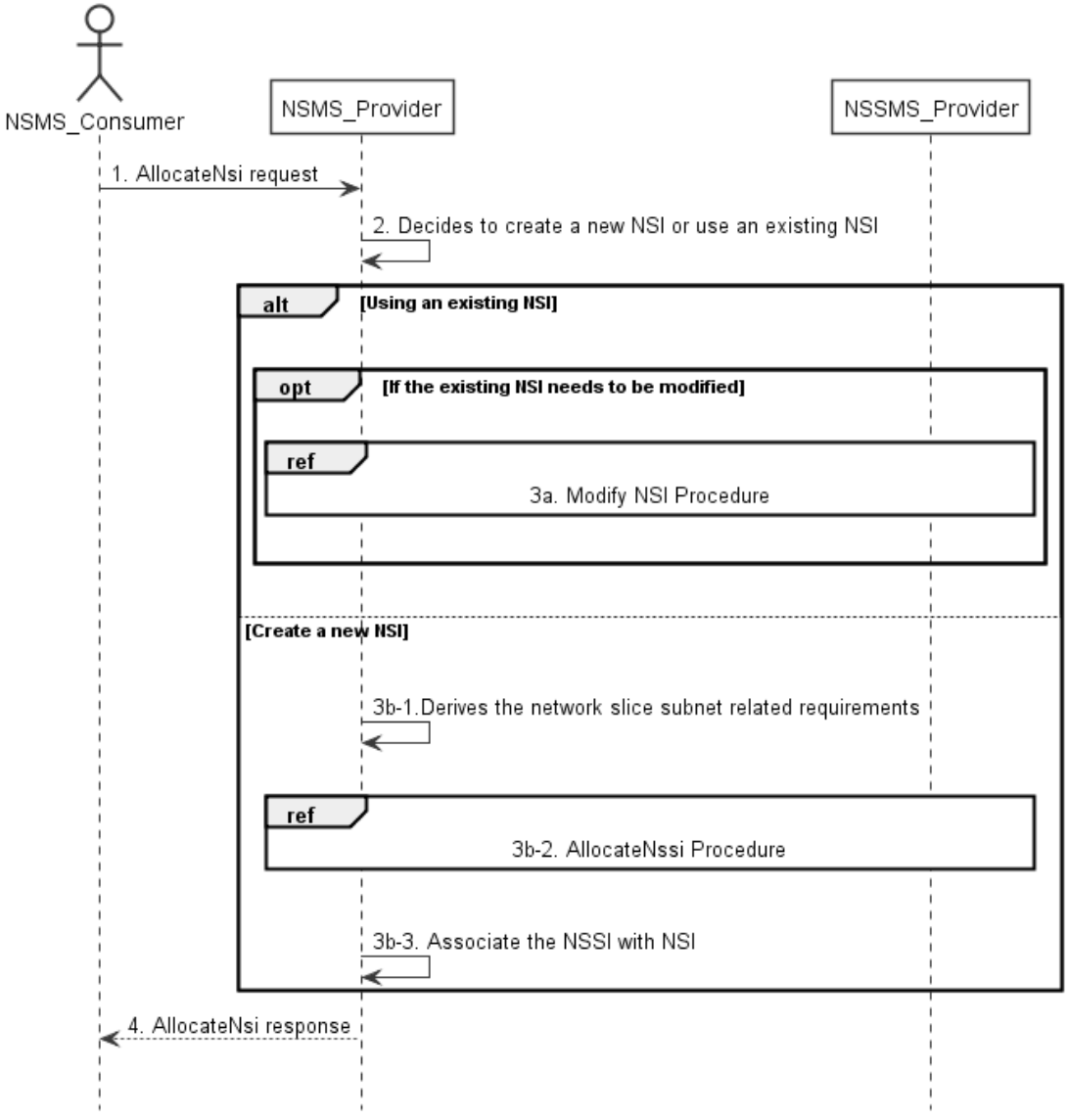

Figure 7.2-1: Network Slice Instance Allocation Request procedure

1) Network Slice Management Service Provider (NSMS_Provider) receives an AllocateNsi request (see AllocateNsi operation defined in clause 6.5.1) from Network Slice Management Service Consumer (NSMS_Consumer) with network slice related requirements (the network slice related requirements are defined as the attributes in the ServiceProfile see clause 6.3.3 in TS 28.541[6]).

2) Based on the network slice related requirements, the NSMS_Provider decides whether to use an existing NSI or create a new NSI. If the network slice related requirements allow the requested NSI to be shared and if an existing suitable NSI can be reused, the NSMS_Provider may decide to use the existing NSI.

3a) If using an existing NSI and the existing NSI needs to be modified to satisfy the network slice related requirements, the NSMS_Provider invokes the procedure to modify the existing NSI as described in clause 7.6.

3b-1) If creating a new NSI, the NSMS_Provider derives the network slice subnet related requirements from the received network slice related requirements. Before NSMS_Provider derives the network slice subnet related requirements, NSMS_Provider may invoke corresponding network slice subnet capability information querying procedure as described in clause 7.8.

3b-2) The NSMS_Provider invokes the NSSI allocation procedure as described in clause 7.3.

3b-3) The NSMS_Provider creates the MOI for NSI and configures the MOI with the DN of MOI for the NSSI, other configuration information may be configured for the created MOI.

NOTE: The detailed configuration information is described in network slice NRM (see NetworkSlice IOC defined in clause 6.3.1 in TS 28.541 [6]).

4) The NSMS_Provider sends NSI allocation result (see AllocateNsi operation defined in clause 6.5.1) to the NSMS_Consumer. If an existing NSI is modified or a new NSI is created successfully to satisfy the network slice related requirements, the result includes the relevant network slice instance information (see NetworkSlice IOC defined in clause 6.3.1 in TS 28.541 [6]):

- DN of the MOI for NSI.

Otherwise the result may include the reason of failure, for example, the required latency or user number cannot be satisfied, or the physical resource is not enough.

7.3 Procedure of Network Slice Subnet Instance Allocation

The Figure 7.3-1 illustrates the procedure of creating a new network slice subnet instance or using an existing network slice subnet instance to satisfy the required network slice subnet related requirements.

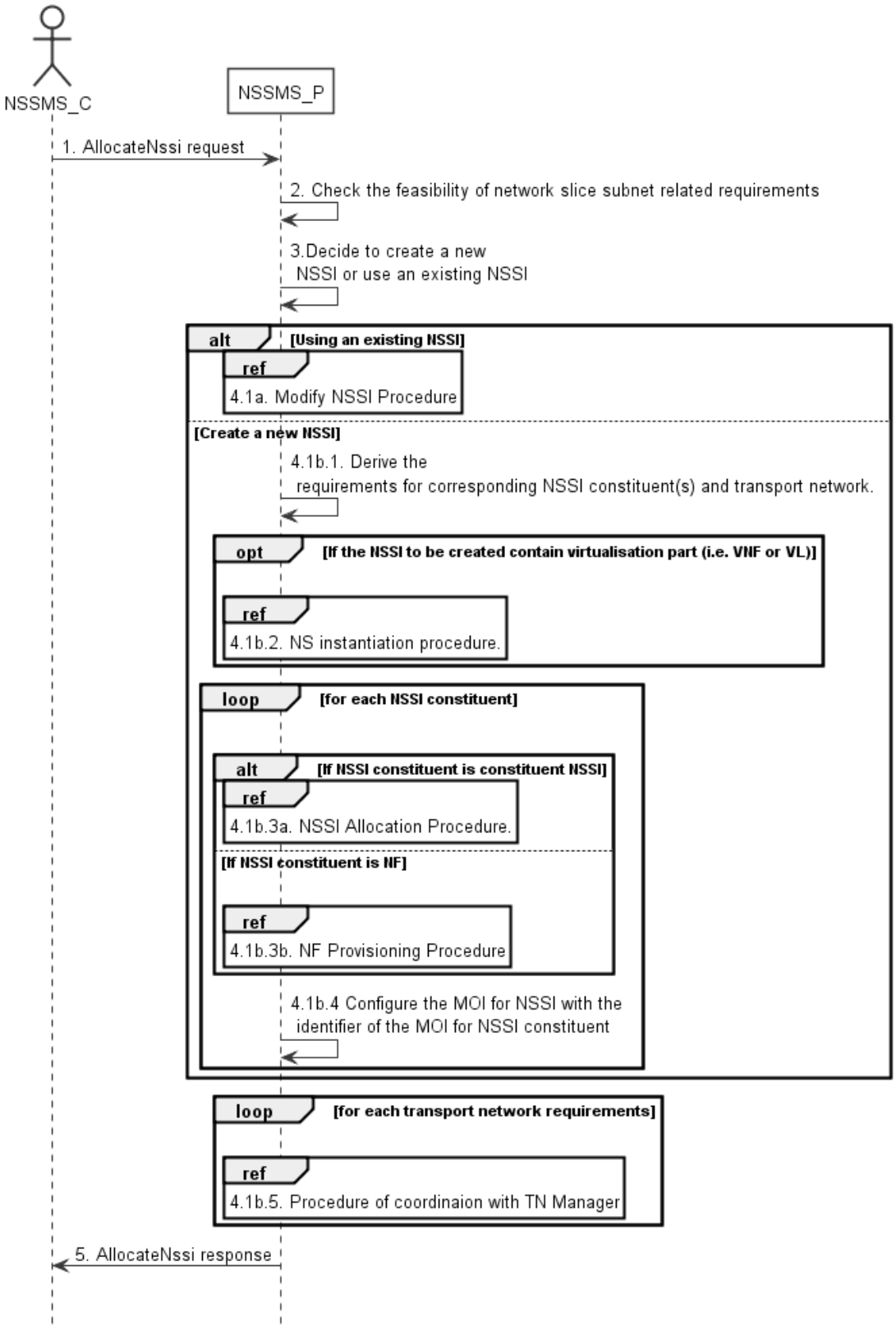

Figure 7.3-1: Network Slice Subnet Instance Allocation Request procedure

1) Network Slice Subnet Management Service Provider (NSSMS_P) receives an AllocateNssi request (see AllocateNssi operation defined in clause 6.5.2) from Network Slice Subnet Management Service Consumer (NSSMS_C) with network slice subnet related requirements (network slice subnet related requirements defined in SliceProfile see clause 6.3.4 in TS 28.541[6]).

2) NSSMS_P check the feasibility of network slice subnet related requirements. If the network slice subnet related requirements can be satisfied, the following step 3) are needed, else go to step 5).

3) Based on the network slice subnet related requirements, NSSMS_P decides whether to use an existing NSSI or create a new NSSI. If the network slice subnet related requirements allow the requested NSSI to be shared and if an existing suitable NSSI can be reused, the NSSMS_P decides to use the existing NSSI.

4.1a) If using an existing NSSI and the existing NSSI needs to be modified to satisfy the network slice subnet related requirements, the NSSMS_P invokes the procedure to modify the existing NSSI as described in clause 7.7.

4.1b.1) If creating a new NSSI, the NSSMS_P creates the MOI for the NSSI to be created. NSSMS_P derives the corresponding network slice subnet constituent (i.e. NF, constituent NSS) related requirements and transport network related requirements (e.g. 3GPP endpoint information, latency requirements, bandwidth requirements, isolation requirements) from the received network slice subnet related requirements. Before NSSMS_Provider derives the constituent network slice subnet related requirements, NSMS_Provider may invoke corresponding network slice subnet capability information querying procedure as described in clause 7.8.2.

4.1b.2)If the NSSI to be created contains virtualisation part (i.e. VNF or VL), NSSMS_P derives the NS instance instantiation information (the NS instance instantiation information is described in clause 7.3.2.2 and clause 7.3.3.2 [3]) based on network slice subnet related requirements. NSSMS_P determines VNF instance(s) that need to be deployed according to the necessary network function(s) and then derives the profile of virtual link(s) according to the connection requirements between the network functions. NSSMS_P chooses a proper NSD deployment flavour and creates data concerning the SAPs of the NS instance. NSSMS_P invokes the NS instantiation procedures to create a NS instance. NSSMS_P configures the NSS MOI with the NS instance identifier.

NOTE: NS instantiation procedure is described in TS 28.526 [7].

4.1b.3) For each required NSSI constituent, the following step 4.1b.3a) and 4.1b.3b) are needed:

4.1b.3a) If the required NSSI constituent is constituent NSSI, NSSMS_P invokes NSSI Allocation Procedure.

4.1b.3b) If the required NSSI constituent is NF instance, NSSMS_P invokes NF Creation Procedure as described in clause 7.10 or NF Modification Procedure as described in clause 7.11.

4.1b.4)NSSMS_P configures the MOI for NSSI with the DN of the MOI for NSSI constituent (i.e. NF, constituent NSSI).

4.1b.5)For each required transport network related requirements, NSSMS_P invokes corresponding procedure of coordination with relevant TN Manager to handle the TN part as described in clause 7.9.

5) The NSSMS_P sends the NSSI allocation result (see AllocateNssi operation defined in clause 6.5.2) to the NSSMS_C. If the NSSI is created successfully, the result includes the relevant constituent network slice subnet instance information (see NetworkSliceSubnet IOC defined in clause 6.3.2 in TS 28.541 [6]):

   - DN of the MOI for NSSI.

   - NS instance Info (e.g. NSinstanceId)

Otherwise the result may include the reason of failure, for example, the required latency or user Number cannot be satisfied, or the physical resource is not enough.

7.4 Procedure of Network Slice Instance Deallocation

Figure 7.4-1 depicts the procedure of deallocating a network slice instance by the network slice management service provider to satisfy the NSI deallocation request received from an authorized consumer.

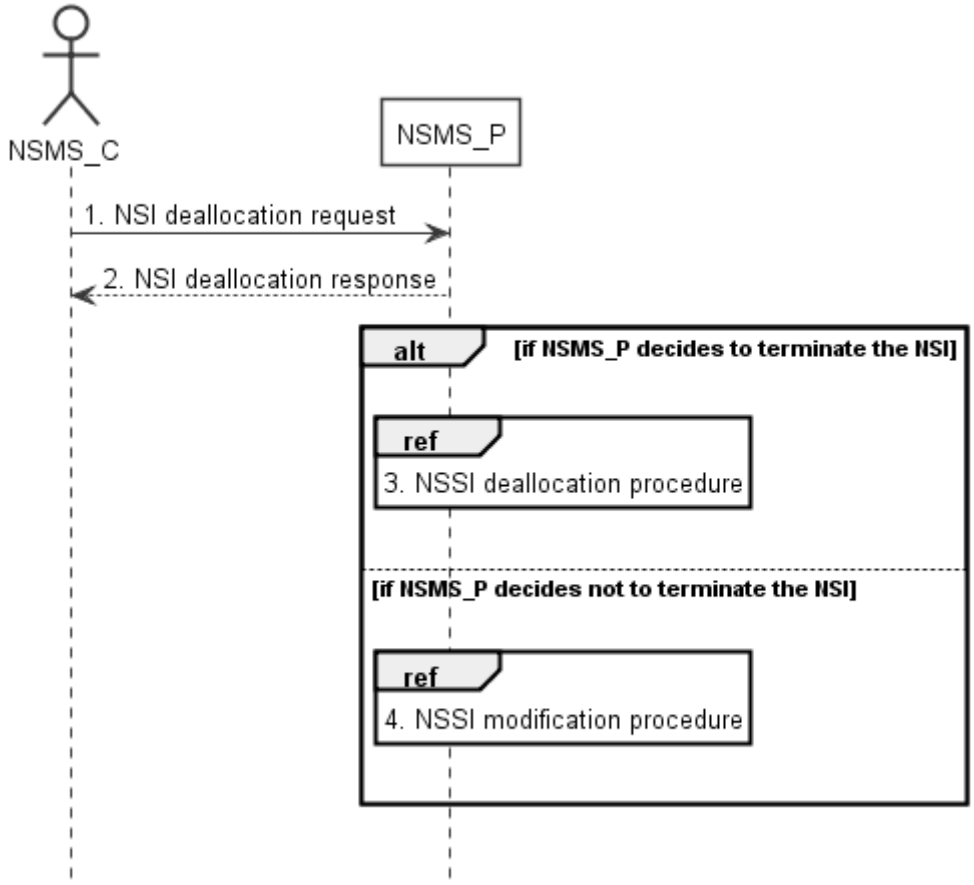

Figure 7.4-1: Network slice instance deallocation procedure

1) The network slice management service provider (NSMS_P) receives a NSI deallocation request (see DeallocateNsi operation defined in clause 6.5.3) from network slice management service consumer (NSMS_C) indicating that the NSI is no longer needed for the consumer.

2) The NSMS_P sends the NSI deallocation response (see DeallocateNsi operation defined in clause 6.5.3) to NSMS_C.

3) The NSMS_P may decide to terminate the NSI, then it invokes the NSSI deallocation procedure as described in clause 7.5.

4) The NSMS_P may decide not to terminate the NSI but to modify the NSI, then it invokes the NSI modification procedure as described in clause 7.6.

7.5 Procedure of Network Slice Subnet Instance Deallocation

Figure 7.5-1 depicts the procedure of deallocating a network slice subnet instance by the network slice subnet management service provider to satisfy the NSSI deallocation request received from an authorized consumer.

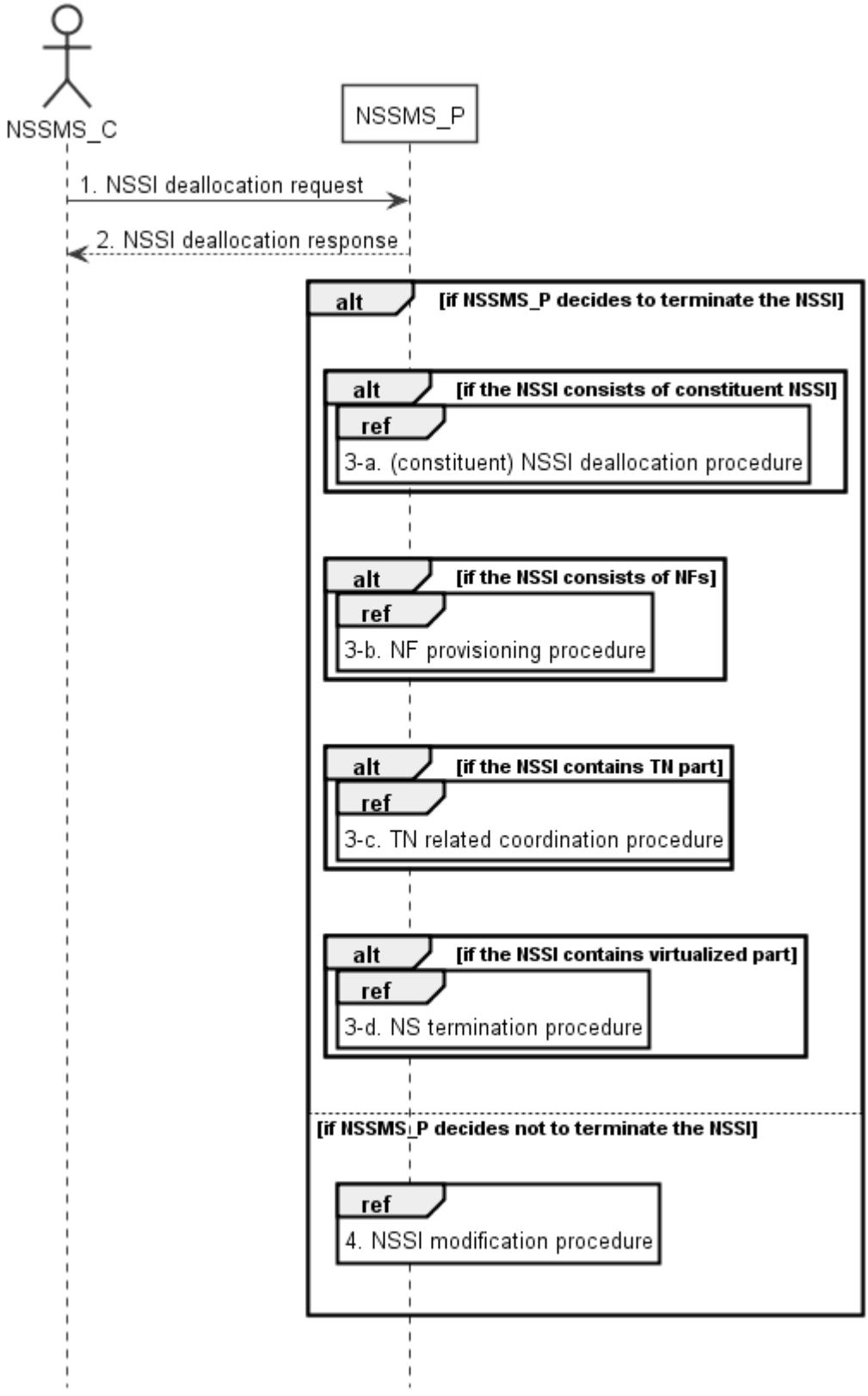

Figure 7.5-1: Network slice subnet instance deallocation procedure

1) The network slice subnet management service provider (NSSMS_P) receives NSSI deallocation request (see DeallocateNssi operation defined in clause 6.5.4) from network slice subnet management service consumer (NSSMS_C).

2) NSSMS_P sends response (see DeallocateNssi operation defined in clause 6.5.4) of NSSI deallocation service to NSSMS_C.

3-a) NSSMS_P may decide to terminate the NSSI, it invokes (constituent) NSSI deallocation procedure as described in clause 7.5 if the NSSI consists of constituent NSSI.

3-b) NSSMS_P invokes NF deletion procedure as described in clause 7.12 or NF modification procedure as described in clause 7.11 if the NSSI consists of NFs.

3-c) NSSMS_P invokes TN related coordination procedure with responsible manager as described in clause 7.9 if the NSSI consists of TN part.

3-d) NSSMS_P invokes NS termination procedure if the NSSI contains virtualized part.

NOTE: NS termination procedure is described in TS 28.526 [7].

4) NSSMS_P may decide not to terminate the NSSI, it invokes NSSI modification procedure as described in clause 7.7.

7.6 Procedure of Network Slice Instance Modification

The Figure 7.6-1 illustrates the procedure of modifying an existing NSI.

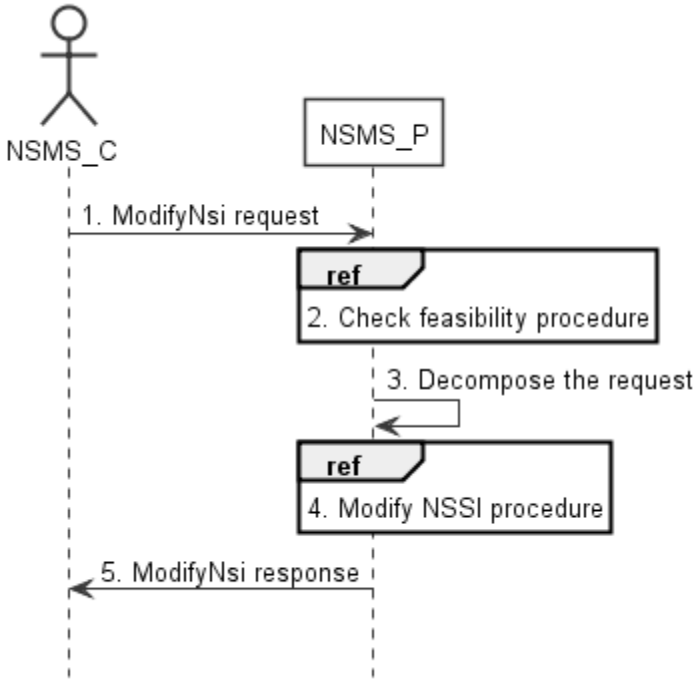

Figure 7.6-1: Network Slice Instance Modification Request procedure

1) Network Slice Management Service Provider (NSMS_P) receives a ModifyNsi request (see modifyMOIAttributes operation defined in TS 28.532 [8]) from Network Slice Management Service Consumer (NSMS_C) with the management identifier of NSI and the new network slice related requirements (see ServiceProfile defined in clause 6.3.3 in TS 28.541[6]).

2) Based on the new network slice related requirements, NSMS_P invokes the feasibility check procedure. If the modification requirements can be satisfied, go to step 3), else go to step 5).

3) NSMS_P decomposes the NSI modification request into NSSI modification request(s), i.e., generating the new network slice subnet related requirements for each NSSI if needed.

4) NSMS_P, as the role of Network Slice Subnet Management Service Consumer (NSSMS_C), invokes the NSSI modification procedure.

5) NSMS_P sends NSI modification result (see modifyMOIAttributes operation defined in TS 28.532 [8]) to NSMS_C.

7.7 Procedure of Network Slice Subnet Instance Modification

The Figure 7.7-1 illustrates the procedure of modifying an existing NSSI.

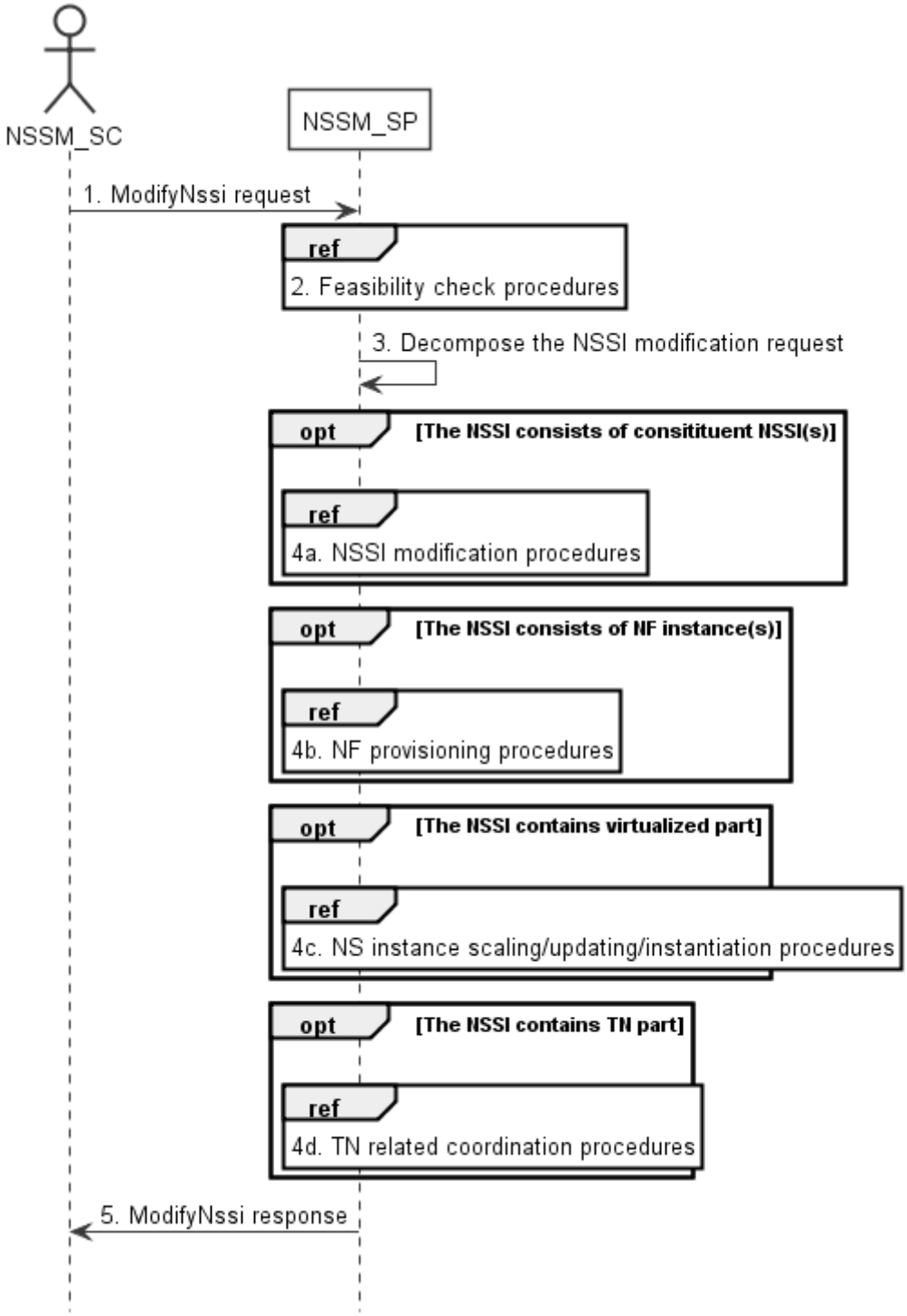

Figure 7.7-1: Network Slice Subnet Instance Modification Request procedure

1) Network Slice Subnet Management Service Provider (NSSM_SP) receives a ModifyNssi request (see modifyMOIAttributes operation defined in TS 28.532 [8]) from Network Slice Subnet Management Service Consumer (NSSM_SC) with the management identifier of NSSI and the new network slice subnet related requirements (see SliceProfile defined in clause 6.3.3 in TS 28.541[6]).

2) Based on the new network slice subnet related requirements, NSSM_SP invokes the feasibility check procedure. If the modification requirements can be satisfied, go to step 3), else go to step 5).

3) NSSM_SP decomposes the NSSI modification request into modification requests for each NSSI constituent.

4a) If the requested NSSI constituent is constituent NSSI, NSSM_SP invokes NSSI modification procedure as described in clause 7.7.

4b) If the requested NSSI constituent is NF instance, NSSM_SP invokes NF creation procedure as described in clause 7.10 or NF modification procedure as described in clause 7.11.

4c) If the NSSI contains the virtualized part, NSSM_SP invokes the NS instance scaling and/or NS instance updating and/or NS instance instantiation procedure as described in TS 28.526 [7].

4d) If the NSSI contains the TN part, NSSM_SP invokes the TN related coordination procedure as described in clause 7.9.

5) NSSM_SP sends NSSI modification results (see modifyMOIAttributes operation defined in TS 28.532 [8]) to NSSM_SC.

7.8 Procedure of Obtaining Network Slice Subnet Capability

7.8.1 Introduction

The clause illustrates possible procedures of obtaining network slice subnet capability information (e.g. supported maximum latency, supported capacity (e.g. maximum user number)) of network slice subnet instance(s) which can be provided by network slice subnet management service provider.

7.8.2 Querying Network Slice Subnet Capability Information

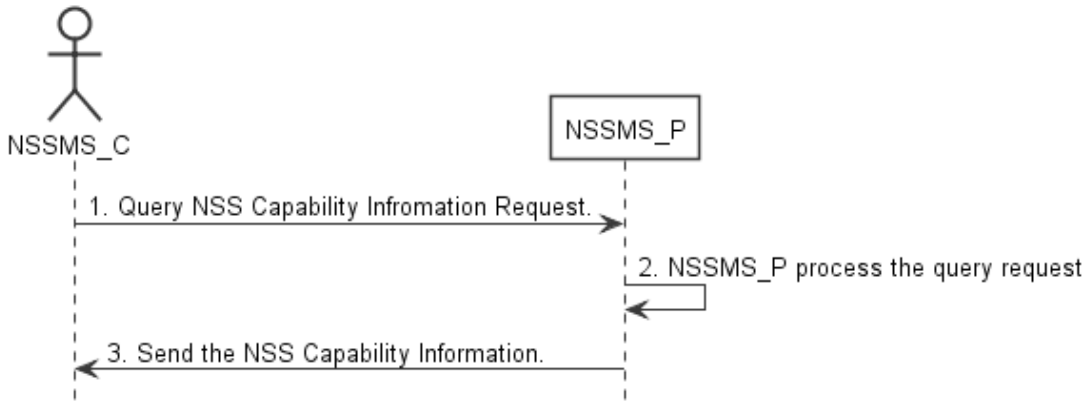

Figure 7.8-2: Procedure of querying network slice subnet capability information

1) Network Slice Subnet Management Service Consumer (NSSMS_C) wants to query the NSS capability information of the NSSI(s) which can be provided by corresponding Network Slice Subnet Management Service Consumer (NSSMS_P), NSSMS_C sends NSS capability querying request (see getMOIAttributes operation defined in TS 28.532 [8]) to NSSMS_P to obtain the NSS capability information of the NSSI(s) which can be provided by corresponding NSSMS_P.

2) NSSMS_P processes the NSS capability information querying request.

3) NSSMS_P sends the NSS capability information (e.g. supported maximum latency, supported capacity (e.g. user number)) of NSSI(s) that can be provided by itself (see getMOIAttributes operation defined in TS 28.532 [8]) to NSSMS_C.

7.8.3 Void

7.9 Procedure of TN coordination supporting network slicing

7.9.1 Introduction

This clause describes procedures of coordination with TN Manager to handle TN part supporting network slicing.

NOTE: The present document: addresses interactions with NFVO as TN manager,. interactions with other types of TN Manager (e.g. Optical, IP bearer transport network, etc.) have not been addressed.

7.9.2 Interaction with NFVO as TN Manager

This clause considers the procedure of interaction between the 3GPP management system and the NFVO, which behaves as TN Manager, to satisfy the TN related requirements for the virtual links used in NSSI. The procedure is applicable to creation and modification of the NSSI.

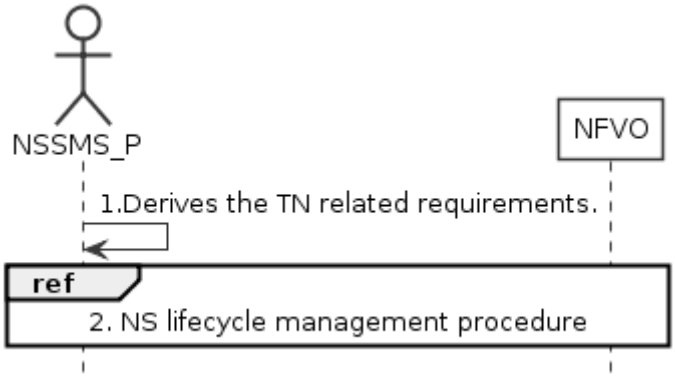

Figure 7.9.2-1: Interaction with NFVO as TN manager to support network slicing

1) Network Slice Subnet Management Service Provider (NSSMS_P) derives the TN related requirements (e.g. 3GPP endpoint information, latency requirements, bandwidth requirements, isolation requirements) for the TN part to be used in the NSSI.

2) To satisfy the TN related requirements NSSMS_P invokes the corresponding NS instance lifecycle management procedures as described in TS 28.526 [7].

3) After the NFVO executes the requested operation, it sends the corresponding notification to the NSSMS_P as described in TS 28.526 [7].

7.10 Procedure of NF instance creation

The Figure 7.10-1 illustrates the procedure of creating a new network function instance to satisfy the required network function related requirements.

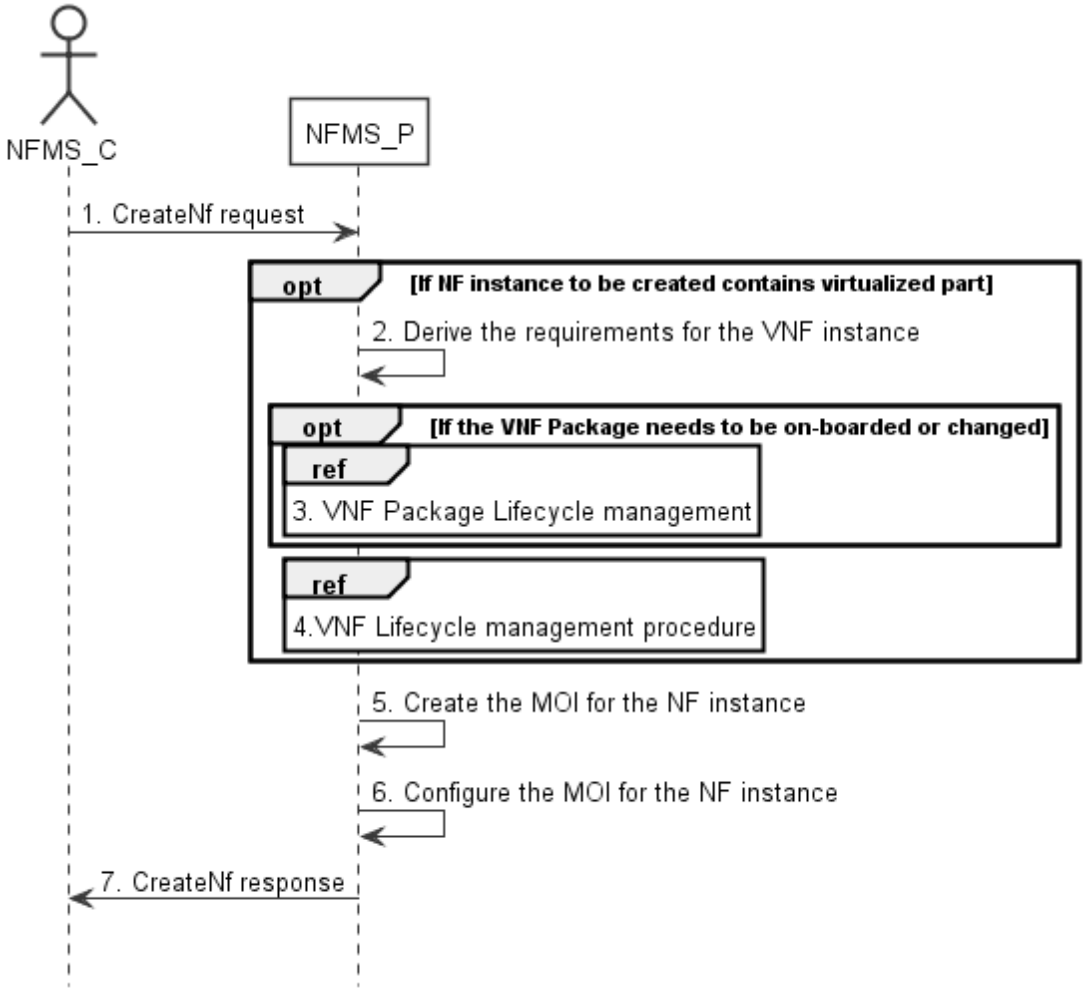

Figure 7.10-1: Network Function Instance Creation procedure

1) Network Function Management Service Provider (NFMS_P) receives a CreateNf request (see createMOI operation defined in TS 28.532 [8]) from Network Function Management Service Consumer (NFMS_C) with network function related requirements.

NOTE: The network function related requirements see information model definition for NR NRM in clause 4 and information model definition for 5GC NRM in clause 5 in TS 28.541[6] .

2) If NF instance to be created contains virtualized part, NFMS_P derives the requirements for VNF instance based on the network function related requirements.

3) If corresponding VNF Package needs to be on-boarded or changed, the NFMS_P invoke corresponding VNF Package management procedure as described in clause 4.3 in TS 28.526 [7].

4) The NFMS_P invokes VNF lifecycle management with requirements for VNF instance as descried in clause 4.2.2.2 in TS 28.526 [7].

5) The NFMS_P creates the MOI for the NF instance to be created. If the NF instance contains virtualized part, the NFMS_P may send the request of creating the MOI to the NFMS_P in the NF.

6) The NFMS_P configures the new created MOI with corresponding configuration information (see information model definition for NR NRM in clause 4 and information model definition for 5GC NRM in clause 5 in TS 28.541[6]).

7) The NFMS_P sends the CreateNf response (see createMOI operation defined in TS 28.532 [8]) to NFMS_C with identifier of MOI and with identifier of NFMS_P which actually maintains the MOI for NF instance.

7.11 Procedure of NF instance modification

The Figure 7.11-1 illustrates the procedure of modify NF instance.

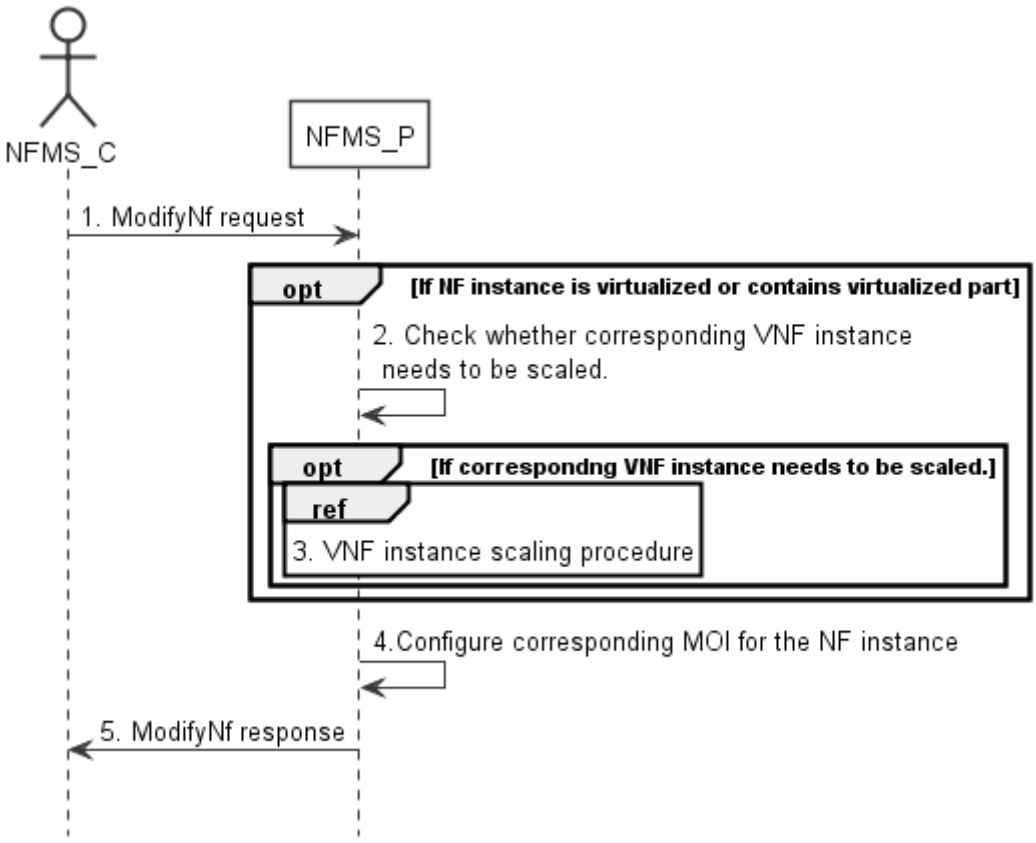

Figure 7.11-1: Network Function Instance Modify procedure

1) Network Function Management Service Provider (NFMS_P) receives a ModifyNf request (see modifyMOIAttributes operation defined in TS 28.532 [8])from Network Function Management Service Consumer (NFMS_C) with Identifier of MOI for NF instance and network function related requirements.

NOTE: The network funcation related requirements see information model definition for NR NRM in clause 4 and information model definition for 5GC NRM in clause 5 in TS 28.541[6].

2) If NF instance contains virtualized part, NFMS_P checks whether corresponding VNF instance needs to be scaled to satisfy the network function related requirements.

3) If corresponding VNF instance needs to be scaled, NFMS_P invokes corresponding VNF instance scaling procedure as described in clause 4.2.3 in TS 28.526 [7].

4) NFMS_P reconfigures corresponding MOI for the NF instance.

5) The NFMS_P sends the ModifyNf response (see modifyMOIAttributes operation defined in TS 28.532 [8]) to NFMS_C.

7.12 Procedure of NF instance deletion

The Figure 7.12-1 illustrates the procedure of deleting NF instance.

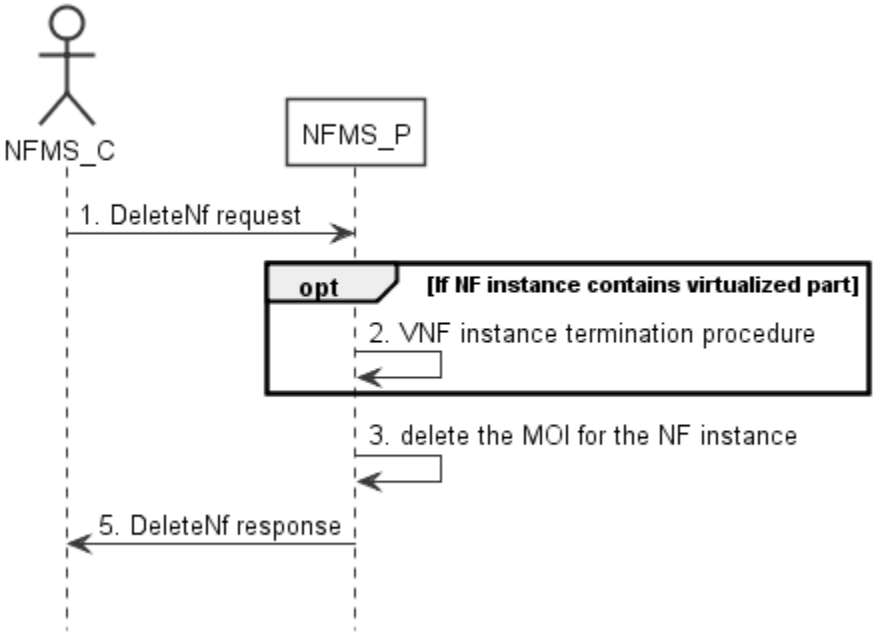

Figure 7.12-1: Network Function Instance Deletion procedure

1) Network Function Management Service Provider (NFMS_P) receives DeleteNf request (see deletetMOI operation defined in TS 28.532 [8]) from Network Function Management Service Consumer (NFMS_C) with Identifier of MOI for NF instance.

2) If the NF instance contains virtualized part, NFMS_P invokes VNF instance termination procedure as described in clause 4.2.4 in TS 28.526 [7].

3) NFMS_P deletes the MOI for the NF instance.

4) NFMS_P sends the DeleteNf response (see deleteMOI operation defined in TS 28.532 [8]) to NFMS_C.

7.13 Procedure of reservation and checking feasibility of NSI

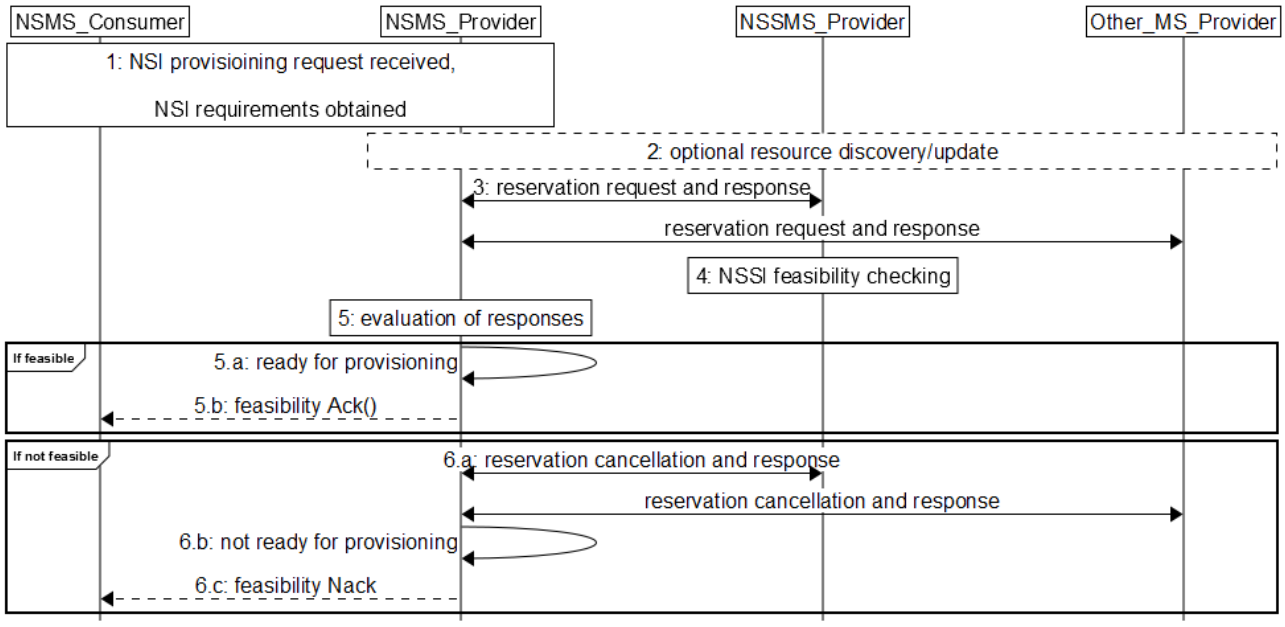

Figure 7.13-1 Network slice feasibility check procedure

1) Network Slice Management Service Provider (NSMS_Provider) receives a provisioning NSI request (e.g., AllocateNsi request (see AllocateNsi operation defined in clause 6.5.1), ModifyNsi request (see modifyMOIAttributes operation defined in TS 28.532 [8])) from Network Slice Management Service Consumer (NSMS_Consumer) with network slice related requirements (e.g. Area information, User Number, traffic demand, QoS Quality, whether the requested network slice instance could be shared).

2) [Optional] NSMS_Provider may request information and updates from NSSMS_Provider and Other_MS_Provider regarding the resources.

3) NSMS_Provider sends reservation requests to Network Slice Subnet Management Service Provider (NSSMS_Provider) and (if needed) Other Management Service Providers (Other_MS_Provider), e.g., MANO, TN manager. NSMS_Provider receives responses with information regarding allocated resources, e.g., their availability, identification information of reserved resources and so on.

4) A reservation request to NSSMS_Provider can trigger NSSI feasibility checking.

5) NSMS_Provider evaluates the responses to determine if the network slice requirements can be satisfied.

6) If feasible,

   6.a) NSMS_Provider is ready for provisioning.

   6.b) [Optional] Acknowledgement regarding reservation check results can be sent to NSMS_Customer.

7) If not feasible,

   7.a) NSMS_Provider cancels reservations, optionally may receive acknowledgement.

   7.b) NSMS_Provider is not ready for provisioning.

   7.c) NSMS_Provider may send negative acknowledgement regarding results of reservation check to NSMS_Customer.

7.14 Procedure of reservation and checking feasibility of network slice subnet

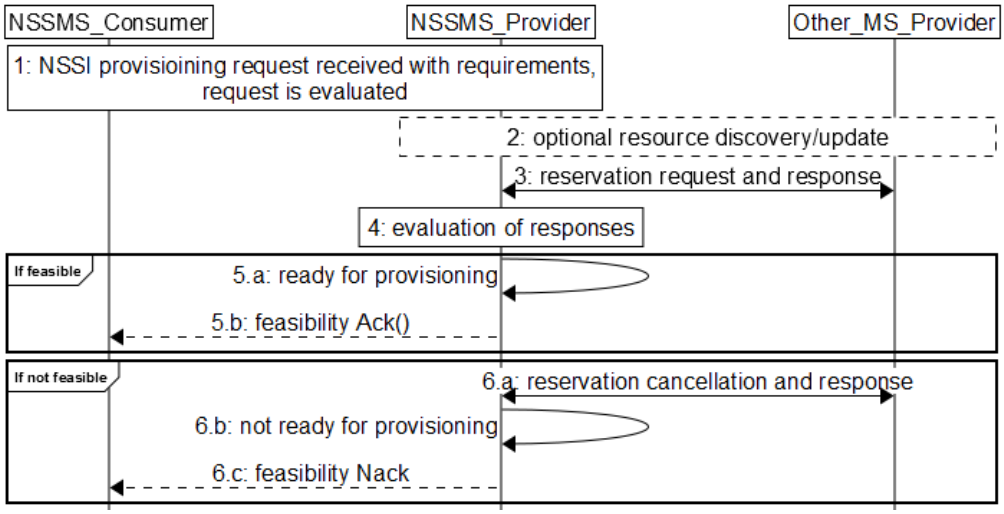

Figure 7.14-2 Network slice subnet feasibility check procedure

1) Network Slice Subnet Management Service Provider (NSSMS_Provider) receives a provisioning NSSI request (e.g., AllocateNssi request (see AllocateNssi operation defined in clause 6.5.2), ModifyNssi request (see modifyMOIAttributes operation defined in TS 28.532 [8])) from Network Slice Subnet Management Service Consumer (NSSMS_Consumer) with network slice subnet related requirements (e.g. Area information, User

Number, traffic demand, QoS Quality, whether the requested network slice instance could be shared). The request is evaluated and initial resources to be allocated are identified.

2) [Optional] NSSMS_Provider may request information and updates from NSSMS_Provider and Other_MS_Provider regarding the resources.

3) NSSMS_Provider sends reservation requests to Other Management Service Providers (Other_MS_Provider), e.g., MANO, TN manager. NSSMS_Provider receives responses with information regarding reserved resources, e.g., their availability, identification information of reserved resources and so on.

4) NSSMS_Provider evaluates the responses to determine if the network slice subnet requirements can be satisfied.

5) If feasible:

   5.a) NSSMS_Provider is ready for provisioning.

   5.b) [Optional] Acknowledgement regarding reservation check results can be sent to NSSMS_Customer.

6) If not feasible,

   6.a) NSSMS_Provider cancels reservations, optionally may receive acknowledgement.

   6.b) NSSMS_Provider is not ready for provisioning.

   6.c) NSSMS_Provider may send negative acknowledgement regarding results of reservation check to NSSMS_Customer.

7.15 Void

7.16 Procedure of allocating network with or without slicing for communication services

The Figure 7.16-1 illustrates the procedure of allocating network with or without slicing for communication services.

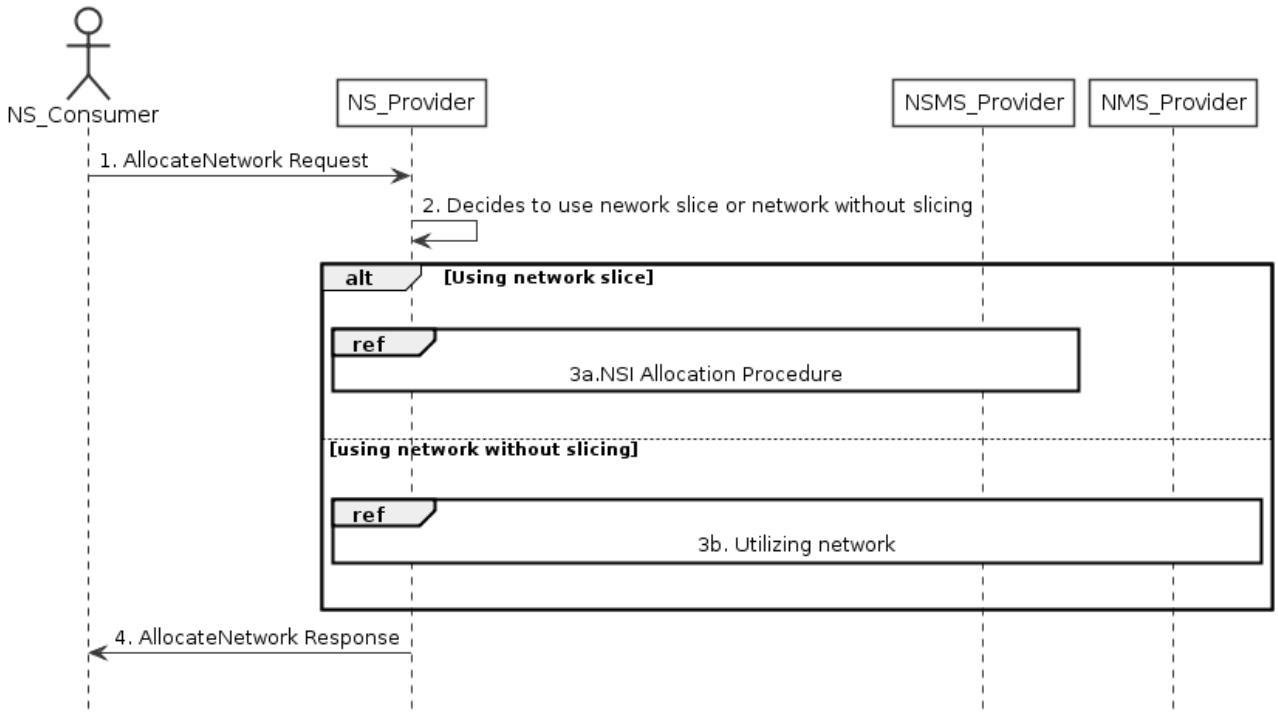

Figure 7.16-1 Allocating network with or without slicing for communication services

1) Network Service Provider (NS_Provider) receives AllocateNetwork request (see AllocateNetwork operation defined in clause 6.5.5) from Network Service Consumer (NS_Consumer). The received request includes network related service requirements (e.g. isolation, latency, coverage).

2) NS_Provider decides to use the network with or without slicing depending on these network related service requirements based on some internal admission control.

3) Based on the decision by NS_Provider:

   3a) If NS_Provider decides to use a network with slicing, network slice instance allocation procedures in clause 7.2 follows. These procedures may result a new network slice to be created, or use an existing network slice with modification.

   3b) If NS_Provider decides to use network without slicing, the network without slicing is utilized to satisfy the network related service requirements, there may be modification of the existing network or creation of a new network.

4) NS_Provider sends the AllocateNetwork response (see AllocateNetwork operation defined in clause 6.5.5) to NS_Consumer.

8 RESTful HTTP-based solution set of provisioning

8.1 Mapping of operations

8.1.1 Introduction

Table 8.1.1-1: Mapping of IS operations to SS equivalents

IS operation	HTTP Method	Resource URI	Qualifier
allocateNsi	POST	ObjectManagement/NS/ServiceProfiles	M
allocateNssi	POST	ObjectManagement/NSS/SliceProfiles	M
deallocateNsi	DELETE	ObjectManagement/NS/ServiceProfiles/{ServiceProfileId}	M
deallocateNssi	DELETE	ObjectManagement/NSS/SliceProfiles/{SliceProfileId}	M
allocateNetwork	POST	ObjectManagement/ServiceProfiles	M

8.1.2 Operation `AllocateNsi`

This operation is to allocate a network slice instance provided by the service provider, the network slice instance may be new or existing.

Table 8.1.2-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListIn	request body	attributeListIn	LIST OF SEQUENCE< attribute name, attribute value >	M

Table 8.1.2-2: Mapping of IS operation output parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListOut	response body	`attributeListOut`	LIST OF SEQUENCE< attribute name, attribute value >	M
status	response status codes	n/a	n/a	M
nSIId	response body	href	type:string, format: uri	M

8.1.3 Operation `AllocateNssi`

This operation is to allocate a network slice instance provided by the service provider, the network slice subnet instance may be new or existing.

Table 8.1.3-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListIn	request body	attributeListIn	LIST OF SEQUENCE< attribute name, attribute value >	O

Table 8.1.3-2: Mapping of IS operation output parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListOut	response body	`attributeListOut`	LIST OF SEQUENCE< attribute name, attribute value >	M
status	response status codes	n/a	n/a	M
nSSIId	response body	href	type:string, format: uri	M

8.1.4 Operation `DeallocateNsi`

This operation is to deallocate a network slice instance provided by the service provider, the network slice instance may be terminated or modified.

This operation does not support any input parameters.

Table 8.1.4-1: Mapping of IS operation output parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
status	response status codes	n/a	n/a	M

8.1.5 Operation `DeallocateNssi`

This operation is to deallocate a network slice subnet instance provided by the service provider, the network slice subnet instance may be terminated or modified.

This operation does not support any input parameters.

Table 8.1.5-1: Mapping of IS operation output parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
status	response status codes	n/a	n/a	M

8.1.6 Operation `AllocateNetwork`

This operation is to allocate a network provided by the service provider.

Table 8.1.6-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListIn	request body	attributeListIn	LIST OF SEQUENCE< attribute name, attribute value >	M

Table 8.1.6-2: Mapping of IS operation output parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
serviceProfileId	response body	serviceProfileId	String	M
status	response status codes	n/a	n/a	M

8.2 Resources

8.2.1 Resource definitions

8.2.1.1 Resource ObjectManagement/NS/ServiceProfiles

8.2.1.1.1 Description

This resource represents collects of network slice related requirement (i.e. ServiceProfiles).

8.2.1.1.2 URI

Resource URI: {URI authority}/ObjectManagement/NS/ServiceProfiles

The URI authority is defined by the service provider.

8.2.1.1.3 HTTP methods

8.2.1.1.3.1 POST

The POST method create a serviceProfile, the provider may create a NSI or using existing NSI to satisfy the serviceProfile.

This method shall support the request data structures, and the response data structures and response codes specified in the following tables.

Table 8.2.1.1.3.1-1: Data structures supported by the POST Request Body on this resource

Name	DATA TYPE	P	Cardinality	Description
attributeListIn	LIST OF SEQUENCE< attribute name, attribute value>	M	1	This parameter specifies the network slice related requirements or network related requirements defined in ServiceProfile in Clause 6.3.3 in TS 28.541 [6].

Table Y.2.1.1.3.1-2: Data structures supported by the POST Request Body on this resource

Name	DATA TYPE	P	Cardinality	Description
Href	URI	M	1	HTTP reference to an NSI or Network resource.
attributeListOut	LIST OF SEQUENCE< attribute name, attribute value>	M	1	For each returned NSI: A list of name/value pairs for NSI defined in Network Slice IOC.
status	HTTP response code	M	1	HTTP response code 200 indicates “OperationSucceeded”. All other HTTP response codes indicate “OperationFailed”.

8.2.1.2 Resource ObjectManagement/NSS/SliceProfiles

8.2.1.2.1 Description

This resource represents collects of network slice subnet related requirements (i.e. SliceeProfiles).

8.2.1.2.2 URI

Resource URI: {URI authority}/ObjectManagement/NSS/SliceProfiles

The URI authority is defined by the service provider.

8.2.1.2.3 HTTP methods

8.2.1.2.3.1 POST

The POST method create a SliceProfile, the provider may create a new NSSI or using existing NSSI to support the SliceProfile.

This method shall support the request data structures, and the response data structures and response codes specified in the following tables.

Table 8.2.1.2.3.1-1: Data structures supported by the POST Request Body on this resource

Name	DATA TYPE	P	Cardinality	Description
attributeListIn	LIST OF SEQUENCE< attribute name, attribute value>	M	1	This parameter specifies the network slice subnet related requirements defined in SliceeProfile in Clause 6.3.4 in TS 28.541 [6].

Table 8.2.1.2.3.1-2: Data structures supported by the POST Request Body on this resource

Name	DATA TYPE	P	Cardinality	Description
Href	URI	M	1	HTTP reference to an NSSI resource.
attributeListOut	LIST OF SEQUENCE< attribute name, attribute value>	M	1	For each returned NSSI: A list of name/value pairs for NSSI defined in Network Slice Subnet IOC.
status	HTTP response code	M	1	HTTP response code 200 indicates “OperationSucceeded”. All other HTTP response codes indicate “OperationFailed”.

8.2.1.3 Resource ObjectManagement/ServiceProfiles

8.2.1.3.1 Description

This resource represents collects of network related requirements (i.e. ServiceProfiles).

8.2.1.3.2 URI

Resource URI: {URI authority}/ObjectManagement/NS/ServiceProfiles

The URI authority is defined by the service provider.

8.2.1.3.3 HTTP methods

8.2.1.3.3.1 POST

The POST method create a serviceProfile.

This method shall support the request data structures, and the response data structures and response codes specified in the following tables.

Table 8.2.1.3.3.1-1: Data structures supported by the POST Request Body on this resource

Name	DATA TYPE	P	Cardinality	Description
attributeListIn	LIST OF SEQUENCE< attribute name, attribute value>	M	1	This parameter specifies the network related requirements defined in ServiceProfile in Clause 6.3.3 in TS 28.541 [6].

Table 8.2.1.3.3.1-2: Data structures supported by the POST Request Body on this resource

Name	DATA TYPE	P	Cardinality	Description
status	HTTP response code	M	1	HTTP response code 200 indicates “OperationSucceeded”. All other HTTP response codes indicate “OperationFailed”.

Annex A (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2018-09	SA#81					Upgrade to change control version	15.0.0
2018-12	SA#82	SP-181043	0001	1	F	Complete the reference information and reword the note	15.1.0
2018-12	SA#82	SP-181043	0002	-	F	Update operation names in the procedures of NSI provisioning	15.1.0
2018-12	SA#82	SP-181043	0003	-	F	Update operation names in the procedures of NSSI provisioning	15.1.0
2018-12	SA#82	SP-181043	0004	1	F	Update operation names in the procedures of NF provisioning	15.1.0
2018-12	SA#82	SP-181043	0005	1	F	Remove release specific information from clause 7.9.1	15.1.0
2018-12	SA#82	SP-181043	0006	1	F	Correct procedures with reference to TS 28.541	15.1.0
2018-12	SA#82	SP-181043	0009	1	B	Add Network slice subnet management use case with assigned priority	15.1.0
2018-12	SA#82	SP-181043	0010	2	B	Add network slice management interactions with NFV MANO for network service priority	15.1.0
2018-03	SA#83	SP-190123	0012	-	F	Update management services tables	15.2.0
2018-03	SA#83	SP-190123	0014	-	F	Correction on procedure of Network Slice Subnet Instance Deallocation	15.2.0
2018-03	SA#83	SP-190123	0016	1	F	Correct management service term	15.2.0
2018-06	SA#84	SP-190370	0020	-	F	Editor's change for configuration management service	15.3.0
2019-09	SA#85	SP-190754	0021	-	F	Update the incorrect reference	15.4.0
2019-09	SA#85	SP-190754	0023	3	F	Add the identifier description	15.4.0
2019-09	SA#85	SP-190742	0027	1	F	Fix inconsistencies related to service requirements	15.4.0
2019-12	SA#86	SP-191175	0031	1	F	Fix inconsistencies in feasibility check use cases and requirements	15.5.0
2020-06	SA#88-e	SP-200498	0046	1	F	Fix Network Slice subnet termination use case	15.6.0
2020-09	SA#89e	SP-200735	0055	-	F	Add clarifying note to ServiceProfile	15.7.0
2021-06	SA#92e	SP-210417	0063	1	F	Clarify misleading information in network slicing use cases	15.8.0
2021-09	SA#93e	SP-210881	0067	1	F	Correction of network slice subnet configuration	15.9.0
2021-09	SA#93e	SP-210881	0073	-	F	Removing network slice capacity planning	15.9.0
2021-09	SA#93e	SP-210881	0077	-	F	Removing Notify Network Slice Subnet Capability Information	15.9.0
2022-09	SA#97e	SP-220857	0143	-	F	Remove example from network slice subnet instance modification	15.10.0
2022-09	SA#97e	SP-220857	0144	-	F	Remove example from network slice instance modification	15.10.0
2022-12	SA#98e	SP-221173	0146	1	F	Correct vocabulary	15.11.0
2022-12	SA#98e	SP-221178	0163	-	F	Clarification and update of deallocation use case	15.11.0
2023-06	SA#100	SP-230671	0167	3	F	Clarify network slicing provisioning use case	15.12.0

History

Document history		
V15.0.0	October 2018	Publication
V15.1.0	April 2019	Publication
V15.2.0	May 2019	Publication
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V15.5.0	January 2020	Publication
V15.6.0	August 2020	Publication
V15.7.0	October 2020	Publication
V15.8.0	August 2021	Publication
V15.9.0	September 2021	Publication
V15.10.0	October 2022	Publication
V15.11.0	January 2023	Publication
V15.12.0	July 2023	Publication