# ETSI GR NFV-TST 007 V1.1.1 (2017-11)



### Network Functions Virtualisation (NFV); Testing; Guidelines on Interoperability Testing for MANO

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# Foreword

This Group Report (GR) has been produced by ETSI Industry Specification Group (ISG) Network Functions Virtualisation (NFV).

## Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the <u>ETSI Drafting Rules</u> (Verbal forms for the expression of provisions).

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### 1 Scope

The present document describes a set of informative interoperability test guidelines for NFV capabilities that require interactions between the components implementing NFV functionality, namely, the NFVO, VNFM, EM-VNF and VIM-NFVI (Functions under Test).

The guidelines in the present document follow the interoperability testing methodology described in ETSI GS NFV-TST 002 [i.1] and are implementation agnostic. The capabilities in scope are enabled by the interfaces on the main NFV reference points between the Functions Under Test:

- Or-Vi;
- Or-Vnfm;
- Vi-Vnfm; and
- Ve-Vnfm.

# 2 References

### 2.1 Normative references

Normative references are not applicable in the present document.

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

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

ETSI GS NFV-TST 002 (V1.1.1): "Network Functions Virtualisation (NFV); Testing Methodology; Report on NFV Interoperability Testing Methodology".
ETSI GS NFV 003 (V1.2.1): "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".
ETSI GS NFV-IFA 005 (V2.3.1): "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Or-Vi reference point - Interface and Information Model Specification".
ETSI GS NFV-IFA 006 (V2.3.1): "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Vi-Vnfm reference point - Interface and Information Model Specification".
ETSI GS NFV-IFA 007 (V2.3.1): "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Or-Vnfm reference point - Interface and Information Model Specification".
ETSI GS NFV-IFA 008 (V2.3.1): "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".

- [i.7] ETSI GS NFV-IFA 010 (V2.3.1): "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Functional requirements specification".
- [i.8] ETSI GS NFV-IFA 011 (V2.3.1): "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; VNF Packaging Specification".
- [i.9] ETSI GS NFV-IFA 013 (V2.3.1): "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Os-Ma-Nfvo reference point - Interface and Information Model Specification".

# 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI GS NFV 003 [i.2] apply.

NOTE: A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI GS NFV 003 [i.2].

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS NFV 003 [i.2] and the following apply:

NOTE: An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in ETSI GS NFV 003 [i.2].

CRM	Compute Resource Management
DF	Deployment Flavour
EM	Element Manager
FM	Fault Management
IFS	Interoperability Features Statement
KPI	Key Performance Indicators
MANO	Management and Orchestration
NFV	Network Function Virtualisation
NFVI	NFV Infrastructure
NFVO	NFV Orchestrator
NIC	Network Interface Controller
NS	Network Service
NSD	NS Descriptor
NRM	Network Resource Management
PM	Performance Management
SRM	Storage Resource Management
SUT	System Under Test
VIM	Virtual Infrastructure Manager
VL	Virtual Link
VLD	VL Descriptor
VM	Virtual Machine
VNF	Virtual Network Functions
VNFC	VNF Component
VNFD	VNF Descriptor
VNFFG	VNF Forwarding Graph
VNFFGD	VNFFG Descriptor
VNFM	VNF Manager
VR	Virtual Resource

# 4 Interoperability Features Statement (IFS)

### 4.1 Introduction

This clause compiles the Interoperability Feature Statement (IFS) for VIM, VNFM, EM/VNF and NFVO according to clause 4.3.3 of ETSI GS NFV-TST 002 [i.1] and following the example in ETSI GS NFV-TST 002 [i.1], annex A.

The interoperability feature statement identifier starts with a reference to the relevant functional block that produces or consumes the interface:

- IDs starting with "VIM\_" designate features on interfaces produced or consumed by the VIM
- IDs starting with "VNFM\_" designate features on interfaces produced or consumed by the VNFM
- IDs starting with "NFVO\_" designate features on interfaces produced or consumed by the NFVO
- IDs starting with "EM\_" designate features on interfaces produced or consumed by the EM/VNF

The purpose of the Interoperable Features Statement (IFS) is to identify those standardized functions which a FUT supports, including those which are optional and those which are conditional on the support of other functions. Supported interoperability feature statements should be indicated by Y in the Support column (or N if not supported). The Details column can be used to add further support details when necessary.

### 4.2 IFS for VIM

#### 4.2.1 Software Image Management

Functional Block	VIM				
Functional Area	nctional Area Software Image Management				
Observed Reference Point	Or-Vi				
Observed Interface	Software Image Management				
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 005 [i.3]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VIM_SWIM_QUERY_IM_BY_NFVO	VIM supports software image information queries by the NFVO	М			
VIM_SWIM_ADD_IM	VIM supports "add image" operations by the NFVO	М			
VIM_SWIM_UPDATE_IM	VIM supports "update image" operations by the NFVO	М			
VIM_SWIM_DELETE_IM	VIM supports "delete image" operations by the NFVO	М			

#### Table 4.2.1-1

#### Table 4.2.1-2

Functional Block	VIM				
Functional Area	Software Image Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	ace Software Image Management				
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features	Interoperability Features				
ld	Feature Status Support Details				
VIM_SWIM_QUERY_IM_BY_VNFM	VIM supports software image information queries by the VNFM	М			

### 4.2.2 VNF Package Management

No IFS needed for VNF Package Management on the VIM.

### 4.2.3 VNF Lifecycle Management

#### Table 4.2.3-1

Functional Block	tional Block VIM			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Compute Resource Manage	ement		
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
VIM_CRM_ALLOCATE_BY_NFVO	VIM supports "allocate compute resource" operation requests from the NFVO	м		
VIM_CRM_INFO_TO_NFVO	VIM can send compute resource information to the NFVO	М		
VIM_CRM_OPERATE_BY_NFVO	VIM supports "operate compute resource" operation requests from the NFVO	м		
VIM_CRM_TERMINATE_BY_NFVO	VIM supports "terminate compute resource" operation requests from the NFVO	м		

#### Table 4.2.3-2

Functional Block	VIM			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Compute Resource Manage	ement		
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 006 [i.4]			
Interoperability Features	· · · ·			
ld	Feature	Status	Support	Details
VIM_CRM_ALLOCATE_BY_VNFM	VIM supports "allocate compute resource" operation requests from the VNFM	м		
VIM_CRM_INFO_TO_VNFM	VIM can send compute resource information to the VNFM	М		
VIM_CRM_OPERATE_BY_VNFM	VIM supports "operate compute resource" operation requests from the VNFM	М		
VIM_CRM_TERMINATE_BY_VNFM	VIM supports "terminate compute resource" operation requests from the VNFM	М		

#### Table 4.2.3-3

	l			
Functional Block	VIM			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Network Resource Manage	ment		
Producer/Consumer	Producer			
References	eferences ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
VIM_NRM_ALLOCATE_BY_NFVO	VIM supports "allocate network resource" operation requests from the NFVO	м		
VIM_NRM_INFO_TO_NFVO	VIM can send network resource information to the NFVO	М		
VIM_NRM_TERMINATE_BY_NFVO	VIM supports "terminate network resource" operation requests from the NFVO	м		

#### Table 4.2.3-4

Functional Block	Inctional Block VIM			
Functional Area	Network Resource Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Network Resource Manage	ment		
Producer/Consumer	Producer			
References	References ETSI GS NFV-IFA 006 [i.4]			
Interoperability Features	•			
ld	Feature	Status	Support	Details
VIM_NRM_ALLOCATE_BY_VNFM	VIM supports "allocate network resource" operation requests from the VNFM	м		
VIM_NRM_INFO_TO_VNFM	VIM can send network resource information to the VNFM	М		
VIM_NRM_TERMINATE_BY_VNFM	VIM supports "terminate network resource" operation requests from the VNFM	М		

#### Table 4.2.3-5

Functional Block	Inctional Block			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Storage Resource Manager	ment		
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
VIM_SRM_ALLOCATE_BY_NFVO	VIM supports "allocate storage resource" operation requests from the NFVO	м		
VIM_SRM_INFO_TO_NFVO	VIM can send storage resource information to the NFVO	М		

Table 4.2.3-6

Functional Block	VIM			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Storage Resource Manager	ment		
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 006 [i.4]			
Interoperability Features				
ld	Feature	Status	Support	Details
VIM_SRM_ALLOCATE_BY_VNFM	VIM supports "allocate storage resource" operation requests from the VNFM	м		
VIM_SRM_INFO_TO_VNFM	VIM can send storage resource information to the VNFM	М		
VIM_SRM_TERMINATE_BY_VNFM	VIM supports "terminate storage resource" operation requests from the VNFM	М		

### 4.2.4 Fault Management

Table 4.2.4-1

Functional Block	VIM				
Functional Area	Fault Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Resources Fault Managem	ent			
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 005 [i.3]	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features					
ld	Feature	Status	Support	Details	
VIM_FM_SUBSCRIBE_BY_NFVO	VIM supports alarm notifications subscriptions by the NFVO	М			
VIM_FM_NOTIFY_BY_NFVO	VIM can generate virtualised resources fault alarm notifications to the NFVO	М			
VIM_FM_QUERY_BY_NFVO	VIM supports virtualised resource fault alarm list queries by the NFVO	М			

#### Table 4.2.4-2

Functional Block	VIM			
Functional Area	Fault Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Resources Fault Managem	nent		
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 006 [i.4]			
Interoperability Features				
ld	Feature	Status	Support	Details
VIM_FM_SUBSCRIBE_BY_VNFM	VIM supports alarm notifications subscriptions by the VNFM	М		
VIM_FM_SUBSCRIBE_BY_VNFM VIM_FM_NOTIFY_BY_VNFM		M M		

### 4.2.5 Performance Management

Functional Block		VIM				
Functional Area		Fault Management				
Observed Reference Point		Or-Vi				
Observed Interface		Virtualised Resources Pe	erformance	e Management		
Producer/Consumer		Producer		•		
References		ETSI GS NFV-IFA 005 [i	.3]			
Interoperability Features						
ld	Feature		Status	Support	Details	
VIM_PM_PMJOB_CREATE_BY_NFVO		pports VR PM jobs by the NFVO	М			
VIM_PM_PMJOB_SUBSCRIBE_BY_NFVO	VIM supports VR PM job		М			
VIM_PM_PMJOB_NOTIFY_BY_NFVO	VIM can generate VR PM		М			
VIM_PM_PMJOB_QUERY_BY_NFVO	VIM supports VR PM job queries by the NFVO		М			
VIM_PM_PMJOB_DELETE_BY_NFVO	VIM supports VR PM jobs		М			
VIM_PM_PMTH_CREATE_BY_NFVO	VIM supports VR PM thresholds		М			
VIM_PM_PMTH_QUERY_BY_NFVO	VIM supports VR PM threshold		М			
VIM_PM_PMTH_DELETE_BY_NFVO		ports VR PM thresholds by the NFVO	М			

#### Table 4.2.5-1

#### Table 4.2.5-2

Functional Block	VIM					
Functional Area						
	Performance Management					
Observed Reference Point	Vi-Vnfm	-				
Observed Interface	Virtualised Resources Performance N	lanageme	nt			
Producer/Consumer	Producer					
References	ETSI GS NFV-IFA 006 [i.4]	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features	· · · · · · · · · · · · · · · · · · ·					
ld	Feature	Status	Support	Details		
VIM_PM_PMJOB_CREATE_BY_VNFM	VIM supports VR PM jobs creation by the VNFM	М				
VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM	VIM supports VR PM job subscriptions from the VNFM	М				
VIM_PM_PMJOB_NOTIFY_BY_VNFM	VIM can generate VR PM notifications to the VNFM	М				
VIM_PM_PMJOB_QUERY_BY_VNFM	VIM supports VR PM job queries by the VNFM	М				
VIM_PM_PMJOB_DELETE_BY_VNFM	VIM supports VR PM jobs deletion by the VNFM	М				
VIM_PM_PMTH_CREATE_BY_VNFM	VIM supports VR PM thresholds creation by the VNFM	М				
VIM_PM_PMTH_QUERY_BY_VNFM	VIM supports VR PM threshold queries by the VNFM	М				
VIM_PM_PMTH_DELETE_BY_VNFM	VIM supports VR PM thresholds deletion by the VNFM	М				

### 4.2.6 NS Lifecycle Management

#### Table 4.2.6-1

Functional Block	VIM			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Software Image Management			
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
VIM_SWIM_QUERY_IM_BY_NFVO	VIM supports software image information queries by the NFVO	М		

#### Table 4.2.6-2

Functional Block	VIM				
Functional Area	IS Lifecycle Management				
Observed Reference Point	/i-Vnfm				
Observed Interface	Software Image Management	Software Image Management			
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VIM_SWIM_QUERY_IM_BY_VNFM	VIM supports software image information queries by the VNFM	М			

#### Table 4.2.6-3

Functional Block	VIM	VIM			
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Compute Resource Manage	Virtualised Compute Resource Management			
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 005 [i.3]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VIM_CRM_ALLOCATE_BY_NFVO	VIM supports "allocate compute resource" operation requests from the NFVO	м			
VIM_CRM_TERMINATE_BY_NFVO	VIM supports "terminate compute resource" operation requests from the NFVO	м			
VIM_CRM_INFO_TO_NFVO	VIM can send compute resource information to the NFVO	М			
VIM_CRM_OPERATE_BY_NFVO	VIM supports "operate compute resource" operation requests from the NFVO	м			

#### Table 4.2.6-4

Functional Block	VIM
Functional Area	NS Lifecycle Management
Observed Reference Point	Or-Vi
Observed Interface	Virtualised Network Resource Management
Producer/Consumer	Producer
References	ETSI GS NFV-IFA 005 [i.3]

Interoperability Features				
ld	Feature	Status	Support	Details
VIM_NRM_ALLOCATE_BY_NFVO	VIM supports "allocate network resource" operation requests from the NFVO	м		
VIM_NRM_TERMINATE_BY_NFVO	VIM supports "terminate network resource" operation requests from the NFVO	М		
VIM_NRM_INFO_TO_NFVO	VIM can send network resource information to the NFVO	М		

#### Table 4.2.6-5

Functional Block	VIM	/IM			
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Storage Resource Manager	ment			
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 005 [i.3]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VIM_SRM_ALLOCATE_BY_NFVO	VIM supports "allocate storage resource" operation requests from the NFVO	М			
VIM_SRM_TERMINATE_BY_NFVO	VIM supports "terminate storage resource" operation requests from the NFVO	М			
VIM_SRM_INFO_TO_NFVO	VIM can send storage resource information to the NFVO	М			

#### Table 4.2.6-6

Functional Block	ЛМ					
Functional Area	NS Lifecycle Management					
Observed Reference Point	Vi-Vnfm					
Observed Interface	Virtualised Compute Resource Manage	ement				
Producer/Consumer	Producer					
References	ETSI GS NFV-IFA 006 [i.4]					
Interoperability Features						
ld	Feature	Status	Support	Details		
VIM_CRM_ALLOCATE_BY_VNFM	VIM supports "allocate compute resource" operation requests from the VNFM	м				
VIM_CRM_TERMINATE_BY_VNFM	VIM supports "terminate compute resource" operation requests from the VNFM	м				
VIM_CRM_INFO_TO_VNFM	VIM can send compute resource information to the VNFM	М				
VIM_CRM_OPERATE_BY_VNFM	VIM supports "operate compute resource" operation requests from the VNFM	М				

#### Table 4.2.6-7

Functional Block	VIM
Functional Area	NS Lifecycle Management
Observed Reference Point	Vi-Vnfm
Observed Interface	Virtualised Network Resource Management
Producer/Consumer	Producer
References	ETSI GS NFV-IFA 006 [i.4]

Details

#### Table 4.2.6-8

Functional Block	VIM					
Functional Area	NS Lifecycle Management	NS Lifecycle Management				
Observed Reference Point	Vi-Vnfm					
Observed Interface	Virtualised Storage Resource Manager	nent				
Producer/Consumer	Producer					
References	ETSI GS NFV-IFA 006 [i.4]					
Interoperability Features						
ld	Feature	Status	Support	Details		
VIM_SRM_ALLOCATE_BY_VNFM	VIM supports "allocate storage resource" operation requests from the VNFM	м				
VIM_SRM_TERMINATE_BY_VNFM	VIM supports "terminate storage resource" operation requests from the VNFM	м				
VIM_SRM_INFO_TO_VNFM	VIM can send storage resource information to the VNFM	М				

#### Table 4.2.6-9

Functional Block		VIM			
Functional Area		NS Lifecycle Management			
Observed Reference Point		Or-Vi			
Observed Interface		Virtualised Resources Pe	erformance	e Management	
Producer/Consumer		Producer			
References		ETSI GS NFV-IFA 005 [i.	.3]		
Interoperability Features					
ld	Feature		Status	Support	Details
VIM_PM_PMJOB_CREATE_BY_NFVO	VIM supports VR PM jobs creation by the NFVO		М		
VIM_PM_PMJOB_SUBSCRIBE_BY_NFVO	VIM supports VR PM job		М		
VIM_PM_PMJOB_NOTIFY_BY_NFVO	VIM can generate VR PM notifications to the NFVO		М		
VIM_PM_PMTH_CREATE_BY_NFVO		ports VR PM thresholds by the NFVO	М		

Status

Support

Feature

Interoperability Features

ld

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Functional Block	VIM				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Resources Performance	Manageme	ent		
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VIM_PM_PMJOB_CREATE_BY_VNFM	VIM supports VR PM jobs creation by the VNFM	М			
VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM	VIM supports VR PM job subscriptions from the VNFM	М			
VIM_PM_PMJOB_NOTIFY_BY_VNFM	VIM can generate VR PM notifications to the VNFM	М			
VIM_PM_PMTH_CREATE_BY_VNFM	VIM supports VR PM thresholds creation by the VNFM	М			

### 4.3 IFS for VNFM

### 4.3.1 Software Image Management

#### Table 4.3.1-1

Functional Block	VNFM	VNFM				
Functional Area	Software Image Management	Software Image Management				
Observed Reference Point	Vi-Vnfm					
Observed Interface	Software Image Management					
Producer/Consumer	Consumer					
References	ETSI GS NFV-IFA 006 [i.4]					
Interoperability Features						
ld	Feature	Feature Status Support Details				
VNFM_SWIM_QUERY_IM	VNFM can query software image information on the VIM	М				

### 4.3.2 VNF Package Management

No IFS needed for VNF Package Management on the VNFM.

### 4.3.3 VNF Lifecycle Management

Functional Block	VNFM	/NFM				
Functional Area	VNF Lifecycle Management	/NF Lifecycle Management				
Observed Reference Point	Vi-Vnfm					
Observed Interface	Virtualised Compute Resource Manag	gement				
Producer/Consumer	Consumer					
References	ETSI GS NFV-IFA 006 [i.4]					
Interoperability Features						
ld	Feature	Status	Support	Details		
VNFM_CRM_QUERY	VNFM can query compute resource information from the VIM	М				
VNFM_CRM_ALLOCATE	VNFM can generate "allocate compute resource" operation requests to the VIM	М				
VNFM_CRM_OPERATE	VNFM can generate "operate compute resource" operation requests to the VIM	М				
VNFM_CRM_TERMINATE	VNFM can generate "terminate compute resource" operation requests to the VIM	М				

#### Table 4.3.3-1

#### Table 4.3.3-2

Functional Block	VNFM	VNFM			
Functional Area	VNF Lifecycle Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Network Resource Manage	ement			
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VNFM_NRM_QUERY	VNFM can query network resource information from the VIM	М			
VNFM_NRM_ALLOCATE	VNFM can generate "allocate network resource" operation requests to the VIM	М			
VNFM_NRM_TERMINATE	VNFM can generate "terminate network resource" operation requests to the VIM	м			

#### Table 4.3.3-3

Functional Block	VNFM	VNFM			
Functional Area	VNF Lifecycle Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Storage Resource Manager	ment			
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features	•				
ld	Feature	Status	Support	Details	
VNFM_SRM_QUERY	VNFM can query storage resource information from the VIM	м			
VNFM_SRM_ALLOCATE	VNFM can generate "allocate storage resource" operation requests to the M VIM				
VNFM_SRM_TERMINATE	VNFM can generate "terminate storage resource" operation requests to the VIM	М			

Tab	le	4.3.3-4	

Functional Block	VNFM				
Functional Area	VNF Lifecycle Management				
Observed Reference Point	Or-Vnfm				
Observed Interface	VNF Lifecycle Management				
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 007 [i.5]				
Interoperability Features					
ld	Feature Status Support Details				
VNFM_VNFLCM_QUERY	VNFM supports VNF information queries by the NFVO	М			

#### Table 4.3.3-5

Functional Block	VNFM						
Functional Area	VNF Lifecycle Management						
Observed Reference Point	Ve-Vnfm						
Observed Interface	VNF Lifecycle Management	/NF Lifecycle Management					
Producer/Consumer	Producer						
References	ETSI GS NFV-IFA 008 [i.6]						
Interoperability Features	·						
ld	Feature	Status	Support	Details			
VNFM_VNFLCM_VNF_INSTANTIATE	VNFM supports "instantiate VNF" requests from the EM	М					
VNFM_VNFLCM_VNF_QUERY	VNFM supports "query VNF" requests from the EM	М					
VNFM_VNFLCM_VNF_MODIFY_INFO	VNFM supports "modify VNF information" requests from the EM	М					
VNFM_VNFLCM_VNF_OPERATE	VNFM supports "operate VNF" requests from the EM	М					
VNFM_VNFLCM_VNF_HEAL	VNFM supports "heal VNF" requests from the EM/VNF	М					
VNFM_VNFLCM_VNF_SCALE_OUT	VNFM supports "scale out by adding VNFC instances" requests from the EM/VNF	М					
VNFM_VNFLCM_VNF_SCALE_IN	VNFM supports "scale in by removing VNFC instances" requests from the EM/VNF	М					
VNFM_VNFLCM_VNF_TERMINATE	VNFM supports "terminate VNF" requests from the EM	М					

#### Table 4.3.3-6

Functional Block	/NFM			
Functional Area	/NF Lifecycle Management			
Observed Reference Point	Dr-Vnfm			
Observed Interface	VNF Lifecycle Operation Granting			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 007 [i.5]			
Interoperability Features	·			
ld	Feature	Status	Support	Details
VNFM_VNFLCM_GRANTING	VNFM can generate "Grant VNF Lifecycle Operation" requests to the NFVO	0		

### 4.3.4 Fault Management

Functional Block	VNFM					
Functional Area	Fault Management					
Observed Reference Point	Vi-Vnfm					
Observed Interface	Virtualised Resources Fault Manageme	Virtualised Resources Fault Management				
Producer/Consumer	Consumer	Consumer				
References	ETSI GS NFV-IFA 006 [i.4]	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features	ability Features					
ld	Feature	Status	Support	Details		
VNFM_FM_VR_SUBSCRIBE	VNFM can subscribe to alarm notifications on the VIM	М				
VNFM_FM_VR_NOTIFY	VNFM can process virtualised resource fault alarm notifications from by the VIM	М				
VNFM_FM_VR_GET_ALARM	VNFM can get the list of virtualised resource fault alarms from the VIM	М				

#### Table 4.3.4-1

#### Table 4.3.4-2

Functional Block	VNFM					
Functional Area	Fault Management					
Observed Reference Point	Or-Vnfm					
Observed Interface	VNF Fault Management					
Producer/Consumer	Producer					
References	ETSI GS NFV-IFA 007 [i.5]	ETSI GS NFV-IFA 007 [i.5]				
Interoperability Features						
1.1		-				
ld	Feature	Status	Support	Details		
IC VNFM_FM_VNF_SUBSCRIBE	VNFM supports alarm notifications subscriptions from by the NFVO	Status M	Support	Details		
	VNFM supports alarm notifications		Support	Details		

### 4.3.5 Performance Management

#### Table 4.3.5-1

Functional Block	VNFM
Functional Area	Performance Management
Observed Reference Point	Vi-Vnfm
Observed Interface	Virtualised Resources Performance Management
Producer/Consumer	Consumer
References	ETSI GS NFV-IFA 006 [i.4]

#### Table 4.3.5-2

Functional Block	VNFM				
Functional Area	Performance Management				
Observed Reference Point	Or-Vnfm				
Observed Interface	VNF Performance Management				
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 007 [i.5]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VNFM_PM_VNF_PMJOB_CREATE	VNFM supports VNF PM jobs creation by the NFVO	М			
VNFM_PM_VNF_PMJOB_SUBSCRIBE	VNFM supports VNF PM job subscriptions from the NFVO	М			
VNFM_PM_VNF_PMJOB_NOTIFY	VNFM can generate VNF PM notifications to the NFVO	М			
VNFM_PM_VNF_PMJOB_QUERY	VNFM supports VNF PM job queries by the NFVO	М			
VNFM_PM_VNF_PMJOB_DELETE	VNFM supports VNF PM jobs deletion by the NFVO	М			
VNFM_PM_VNF_PMTH_CREATE	VNFM supports VNF PM thresholds creation by the NFVO	М			
VNFM_PM_VNF_PMTH_QUERY	VNFM supports VNF PM threshold queries by the NFVO	М			
VNFM_PM_VNF_PMTH_DELETE	VNFM supports VNF PM thresholds deletion by the NFVO	М			

### 4.3.6 NS Lifecycle Management

#### Table 4.3.6-1

Functional Block	VNFM			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Software Image Management			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 006 [i.4]			
Interoperability Features				
ld	Feature	Status	Support	Details
VNFM_SWIM_QUERY_IM	VNFM can query software image information on the VIM	М		

#### Table 4.3.6-2

Functional Block	VNFM				
Functional Area	NS Lifecycle Management	NS Lifecycle Management			
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Compute Resource Mana	Virtualised Compute Resource Management			
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 006 [i.4]	ETSI GS NFV-IFA 006 [i.4]			
Interoperability Features					
ld	Feature	Status	Support	Details	
VNFM_CRM_QUERY	VNFM can query compute resource information from the VIM	М			
VNFM_CRM_ALLOCATE	VNFM can generate "allocate compute resource" operation requests to the VIM	М			
VNFM_CRM_OPERATE	VNFM can generate "operate compute resource" operation requests to the VIM	Μ			
VNFM_CRM_TERMINATE	VNFM can generate "terminate compute resource" operation requests to the VIM	м			

#### Table 4.3.6-3

Functional Block	VNFM				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Network Resource Management				
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VNFM_NRM_QUERY	VNFM can query network resource information from the VIM	М			
VNFM_NRM_ALLOCATE	VNFM can generate "allocate network resource" operation requests to the VIM	М			
VNFM_NRM_TERMINATE	VNFM can generate "terminate network resource" operation requests to the VIM	М			

#### Table 4.3.6-4

Functional Block	VNFM					
Functional Area	NS Lifecycle Management					
Observed Reference Point	Vi-Vnfm					
Observed Interface	Virtualised Storage Resource Manager	Virtualised Storage Resource Management				
Producer/Consumer	Consumer	Consumer				
References	ETSI GS NFV-IFA 006 [i.4]					
Interoperability Features						
ld	Feature	Status	Support	Details		
VNFM_SRM_QUERY	VNFM can query storage resource information from the VIM	М				
	VNFM can generate "allocate storage					
VNFM_SRM_ALLOCATE	resource" operation requests to the VIM	М				

#### Table 4.3.6-5

Functional Block	VNFM				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Resources Performance Management				
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 006 [i.4]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VNFM_PM_VR_PMJOB_CREATE	VNFM can create VR PM jobs on the VIM	М			
VNFM PM VR PMJOB SUBSCRIBE	VNFM can subscribe to VR PM jobs	М			
	on the VIM				

#### Table 4.3.6-6

Functional Block	VNFM				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vnfm				
Observed Interface	VNF Lifecycle Management				
Producer/Consumer	Producer				
References	ETSI GS NFV-IFA 007 [i.5]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VNFM_VNFLCM_CREATE_VNFID	VNFM supports "create VNF identifier" operation requests from the NFVO	М			
VNFM_VNFLCM_INSTANTIATE	VNFM supports "instantiate VNF" operation requests from the NFVO	М			
VNFM_VNFLCM_DELETE_VNFID	NFVO	М			
VNFM_VNFLCM_TERMINATE	VNFM supports "terminate VNF" operation requests from the NFVO	М			
VNFM_VNFLCM_QUERY	VNFM supports VNF information queries by the NFVO	М			
VNFM_VNFLCM_HEAL	VNFM supports VNF healing requests from the NFVO	М			
VNFM_VNFLCM_OPERATE	VNFM supports "operate VNF" operation requests from the NFVO	М			
VNFM_VNFLCM_NS_SCALE_OUT	VNFM supports "scale out by adding VNF instances" requests from the NFVO	М			
VNFM_VNFLCM_NS_SCALE_IN	VNFM supports "scale in by removing VNF instances" requests from the NFVO	М			
VNFM_VNFLCM_VNF_SCALE_OUT	VNFM supports "scale out by adding VNFC instances" requests from the NFVO	М			
VNFM_VNFLCM_VNF_SCALE_IN	VNFM supports "scale in by removing VNFC instances" requests from the NFVO	М			

Table 4.3.6-7	Tab	le	4.3	.6-7	
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Functional Block	VNFM			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Or-Vnfm			
Observed Interface	Indicator			
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 007 [i.5]			
Interoperability Features				
ld	Feature	Status	Support	Details
VNFM_NSVNFINDI_SUBSCRIBE	VNFM supports VNF indicator subscriptions from the NFVO	М		
VNFM_NSVNFINDI_NOTIFY	VNFM can generate VNF indicator notifications to the NFVO	М		

#### Table 4.3.6-8

Functional Block	VNFM			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Ve-Vnfm			
Observed Interface	Indicator			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 008 [i.6]			
Interoperability Features				
ld	Feature	Status	Support	Details
VNFM_VNFINDI_SUBSCRIBE	VNFM can subscribe to VNF indicators on the EM/VNF	М		
VNFM_VNFINDI_NOTIFY	VNFM supports VNF indicator notifications from the EM/VNF	М		

# 4.4 IFS for NFVO

### 4.4.1 Software Image Management

#### Table 4.4.1-1

Functional Block	NFVO			
Functional Area	Software Image Management			
Observed Reference Point	Or-Vi			
Observed Interface	Software Image Management			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_SWIM_ADD_IM	NFVO can add software images on the VIM	М		
NFVO_SWIM_QUERY_IM	NFVO can query software image information on the VIM	М		
NFVO_SWIM_UPDATE_IM	NFVO can update software image information on the VIM	М		
NFVO_SWIM_DELETE_IM	NFVO can delete software images from the VIM	М		

### 4.4.2 VNF Package Management

Functional Block	NFVO			
Functional Area	VNF Package Management			
Observed Reference Point	Os-Ma-Nfvo			
Observed Interface	VNF Package Management			
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 013 [i.9]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_VNFPM_VALIDATE	NFVO can check the integrity and validity of VNF Packages	М		
NFVO_VNFPM_ACCESS	NFVO can access the VNF catalogue where the VNF Packages information is stored	М		
NFVO_VNFPM_QUERY	NFVO supports on-boarded VNF Packages queries	М		
NFVO_VNFPM_ABORT_DELETE	NFVO supports the delete VNF Package operation abortion	М		

#### Table 4.4.2-1

### 4.4.3 VNF Lifecycle Management

#### Table 4.4.3-1

Functional Block	NFVO			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Software Image Management			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_SWIM_QUERY_IM	NFVO can query software image information on the VIM	М		

#### Table 4.4.3-2

Functional Block	NFVO			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Compute Resource Mana	gement		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features	· · · · · · · · · · · · · · · · · · ·			
ld	Feature	Status	Support	Details
NFVO_CRM_QUERY	NFVO can query compute resource information from the VIM	М		
NFVO_CRM_ALLOCATE	NFVO can generate "allocate compute resource" operation requests to the VIM	М		
NFVO_CRM_OPERATE	NFVO can generate "operate compute resource" operation requests to the VIM	М		
NFVO_CRM_TERMINATE	NFVO can generate "terminate compute resource" operation requests to the VIM	М		

#### Table 4.4.3-3

Functional Block	NEVO			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Network Resource Manage	ment		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features	· · · · ·			
ld	Feature	Status	Support	Details
NFVO_NRM_QUERY	NFVO can query network resource information from the VIM	М		
NFVO_NRM_ALLOCATE	NFVO can generate "allocate network resource" operation requests to the VIM	М		
NFVO_NRM_TERMINATE	NFVO can generate "terminate network resource" operation requests to the VIM	М		

#### Table 4.4.3-4

Functional Block	NFVO			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Storage Resource Manager	ment		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features	•			
ld	Feature	Status	Support	Details
NFVO_SRM_QUERY	NFVO can query storage resource information from the VIM	М		
NFVO_SRM_ALLOCATE	NFVO can generate "allocate storage resource" operation requests to the VIM	М		
NFVO SRM TERMINATE	NFVO can generate "terminate storage resource" operation requests	м		

#### Table 4.4.3-5

Functional Block	NFVO			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vnfm			
Observed Interface	VNF Lifecycle Management			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 007 [i.5]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_VNFLCM_QUERY	NFVO can query VNF information from the VNFM	М		

#### Table 4.4.3-6

Functional Block	NFVO			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vnfm			
Observed Interface	VNF Lifecycle Operation Granting			
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 007 [i.5]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_VNFLCM_GRANTING	NFVO supports "Grant VNF Lifecycle	0		

Operation" requests from the VNFM
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# 4.4.4 Fault Management

#### Table 4.4.4-1

Functional Block	NFVO			
Functional Area	Fault Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Resource Fault Manageme	nt		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_FM_VR_SUBSCRIBE	NFVO can subscribe to virtualised resource fault alarms on the VIM	М		
NFVO_FM_VR_NOTIFY	NFVO can process virtualised resource fault alarm notifications from the VIM	М		
NFVO FM VR GET ALARMS	NFVO can get the list of virtualised resource fault alarms from the VIM	м		

#### Table 4.4.4-2

Functional Block	NFVO			
Functional Area	Fault Management			
Observed Reference Point	Or-Vnfm			
Observed Interface	VNF Fault Management			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 007 [i.5]			
Interoperability Features				
ld	Feature	Status	Support	Details
· · ·	Feature           NFVO can subscribe to alarm           notifications on the VNFM	Status M	Support	Details
ld	NFVO can subscribe to alarm		Support	Details

## 4.4.5 Performance Management

#### Table 4.4.5-1

Functional Block	NFVO
Functional Area	Performance Management
Observed Reference Point	Or-Vi
Observed Interface	Virtualised Resource Performance Management
Producer/Consumer	Consumer
References	ETSI GS NFV-IFA 005 [i.3]

Interoperability Features					
ld	Feature	Status	Support	Details	
NFVO_PM_VR_PMJOB_CREATE	NFVO can create VR PM jobs on the VIM	М			
NFVO_PM_VR_PMJOB_SUBSCRIBE	NFVO can subscribe to VR PM jobs on the VIM	Μ			
NFVO_PM_VR_PMJOB_NOTIFY	NFVO supports VR PM notifications from the VIM	М			
NFVO_PM_VR_PMJOB_QUERY	NFVO can query VR PM jobs from the VIM	М			
NFVO_PM_VR_PMJOB_DELETE	NFVO can delete VR PM jobs from the VIM	М			
NFVO_PM_VR_PMTH_CREATE	NFVO can create VR PM thresholds on the VIM	М			
NFVO_PM_VR_PMTH_QUERY	NFVO can query VR PM thresholds from the VIM	М			
NFVO_PM_VR_PMTH_DELETE	NFVO can delete VR PM thresholds from the VIM	М			

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#### Table 4.4.5-2

Functional Block	NEVO			
Functional Area	Performance Management			
Observed Reference Point	Or-Vnfm			
Observed Interface	VNF Performance Management			
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 007 [i.5]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_PM_VNF_PMJOB_CREATE	NFVO can create VNF PM jobs on the VNFM	М		
NFVO_PM_VNF_PMJOB_SUBSCRIBE	NFVO can subscribe to VNF PM jobs on the VNFM	М		
NFVO_PM_VNF_PMJOB_NOTIFY	NFVO supports VNF PM notifications from the VNFM	М		
NFVO_PM_VNF_PMJOB_QUERY	NFVO can query VNF PM jobs from the VNFM	М		
NFVO_PM_VNF_PMJOB_DELETE	NFVO can create VNF PM jobs on the VNFM	М		
NFVO_PM_VNF_PMTH_CREATE	NFVO can create VNF PM thresholds on the VNFM	М		
NFVO_PM_VNF_PMTH_QUERY	NFVO can query VNF PM thresholds from the VNFM	Μ		
NFVO_PM_VNF_PMTH_DELETE	NFVO can delete VNF PM thresholds from the VNFM	М		

### 4.4.6 NS Lifecycle Management

#### Table 4.4.6-1

Functional Block	NFVO				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vi	Or-Vi			
Observed Interface	Software Image Management				
Producer/Consumer	Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features					
ld	Feature	Status	Support	Details	
NFVO_SWIM_QUERY_IM	NFVO can query software image information on the VIM	М			

#### Table 4.4.6-2

Functional Block	NFVO	NFVO			
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Compute Resource Mana	gement			
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 005 [i.3]				
Interoperability Features					
ld	Feature	Status	Support	Details	
NFVO CRM QUERY	NFVO can query compute resource	М			
	information from the VIM	101			
	NFVO can generate "allocate				
NFVO_CRM_ALLOCATE	compute resource" operation	Μ			
	requests to the VIM				
	NFVO can generate "operate				
NFVO_CRM_OPERATE	compute resource" operation	M			
	requests to the VIM				
	NFVO can generate "terminate				
NFVO_CRM_TERMINATE	compute resource" operation	Μ			
	requests to the VIM				

#### Table 4.4.6-3

Functional Block	NFVO			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Network Resource Manage	ment		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
NFVO_NRM_QUERY	NFVO can query network resource information from the VIM	М		
NFVO_NRM_ALLOCATE	NFVO can generate "allocate network resource" operation requests to the VIM	М		
NFVO_NRM_TERMINATE	NFVO can generate "terminate network resource" operation requests to the VIM	М		

#### Table 4.4.6-4

Functional Block	NFVO			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Storage Resource Manager	ment		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features	·			
ld	Feature	Status	Support	Details
NFVO_SRM_QUERY	NFVO can query storage resource information from the VIM	М		
	NFVO can generate "allocate storage			
NFVO_SRM_ALLOCATE	resource" operation requests to the VIM	М		

#### Table 4.4.6-5

Functional Block	NFVO				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Resource Performance Ma	nagement			
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 005 [i.3]				
Interoperability Features					
ld	Feature	Status	Support	Details	
NFVO_PM_VR_PMJOB_CREATE	NFVO can create VR PM jobs on the	м			
	VIM				
NFVO_PM_VR_PMJOB_SUBSCRIBE	VIM NFVO can subscribe to VR PM jobs on the VIM	M			

#### Table 4.4.6-6

Functional Block	NFVO				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vnfm				
Observed Interface	VNF Lifecycle Management				
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 007 [i.5]				
Interoperability Features					
ld	Feature	Status	Support	Details	
NFVO_VNFLCM_CREATE_VNFID	NFVO can generate "create VNF identifier" operation requests to the VNFM	м			
NFVO_VNFLCM_INSTANTIATE	NFVO can generate "instantiate VNF" operation requests to the VNFM	М			
NFVO_VNFLCM_DELETE_VNFID	NFVO can generate "delete VNF identifier" operation requests to the VNFM	М			
NFVO_VNFLCM_TERMINATE	NFVO can generate "terminate VNF" operation requests to the VNFM	М			
NFVO_VNFLCM_QUERY	NFVO can query VNF information from the VNFM	М			
NFVO_VNFLCM_HEAL	NFVO can generate VNF healing requests to the VNFM	М			
NFVO_VNFLCM_OPERATE	NFVO can generate "operate VNF" operation requests to the VNFM	М			
NFVO_VNFLCM_NS_SCALE_OUT	NFVO can generate "scale out by adding VNF instances" requests to the VNFM	М			
NFVO_VNFLCM_NS_SCALE_IN	NFVO can generate "scale in by removing VNF instances" requests to the VNFM	М			
NFVO_VNFLCM_VNF_SCALE_OUT	NFVO can generate "scale out by adding VNFC instances" to the VNFM	М			
NFVO_VNFLCM_VNF_SCALE_IN	NFVO can generate "scale in by removing VNFC instances" to the VNFM	М			

Tab	le	4.4.6-7

Functional Block	NFVO				
Functional Area	NS Lifecycle Management	NS Lifecycle Management			
Observed Reference Point	Or-Vnfm				
Observed Interface	Indicator				
Producer/Consumer	Consumer				
References	ETSI GS NFV-IFA 007 [i.5]				
Interoperability Features					
ld	Feature	Status	Support	Details	
VNFM_NSVNFINDI_SUBSCRIBE	NFVO can subscribe to VNF indicators on the VNFM	М			
	NFVO supports VNF indicator				

### 4.5 IFS for EM/VNF

### 4.5.1 Software Image Management

No IFS needed for Software Image Management on the EM/VNF.

### 4.5.2 VNF Package Management

No IFS needed for VNF Package Management on the EM/VNF.

### 4.5.3 VNF Lifecycle Management

#### Table 4.5.3-1

Functional Block	EM/VNF					
Functional Area	VNF Lifecycle Management					
Observed Reference Point	Ve-Vnfm					
Observed Interface	VNF Lifecycle Management					
Producer/Consumer	Consumer					
References	ETSI GS NFV-IFA 008 [i.6]	ETSI GS NFV-IFA 008 [i.6]				
Interoperability Features						
ld	Feature	Status	Support	Details		
EM_VNFLCM_VNF_INSTANTIATE	EM can generate "Instantiate VNF" requests to the VNFM	М				
EM_VNFLCM_VNF_QUERY	EM can generate "query VNF" requests to the VNFM	М				
EM_VNFLCM_VNF_MODIFY_INFO	EM can generate "modify VNF information" requests to the VNFM	М				
EM_VNFLCM_VNF_OPERATE	EM can generate "operate VNF" requests to the VNFM	М				
EM_VNFLCM_VNF_SCALE_OUT	EM/VNF can generate "scale out by adding VNFC instances" requests to the VNFM	м				
EM_VNFLCM_VNF_SCALE_IN	EM/VNF can generate "scale in by removing VNFC instances" requests to the VNFM	м				
EM_VNFLCM_VNF_HEAL	EM/VNF can generate "heal VNF" requests to the VNFM	М				
EM_VNFLCM_VNF_TERMINATE	EM can generate "terminate VNF" requests to the VNFM	М				

### 4.5.4 Fault Management

No IFS needed for Fault Management on the EM/VNF.

No IFS needed for Performance Management on the EM/VNF.

### 4.5.6 NS Lifecycle Management

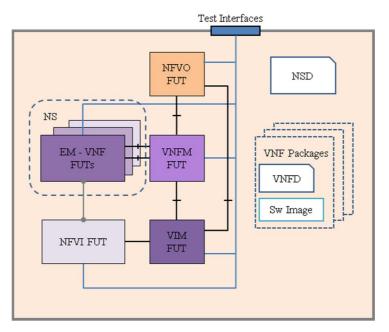
#### Table 4.5.6-1

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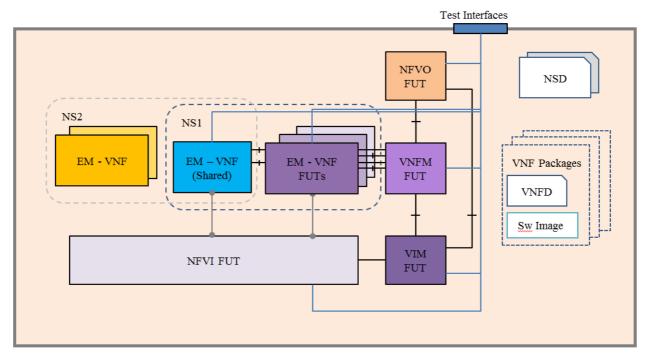
Functional Block	EM/VNF			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Ve-Vnfm			
Observed Interface	Indicator			
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 008 [i.6]			
Interoperability Features				
ld	Feature	Status	Support	Details
			ouppoir	Details
EM_VNFINDI_SUBSCRIBE	EM/VNF supports VNF indicator subscriptions from the VNFM	M		Details

# 5 System Under Test (SUT)

# 5.1 SUT Configuration 1



#### Figure 5.1-1: SUT Configuration 1



# 5.2 SUT Configuration 2



# 5.3 SUT Configuration 3

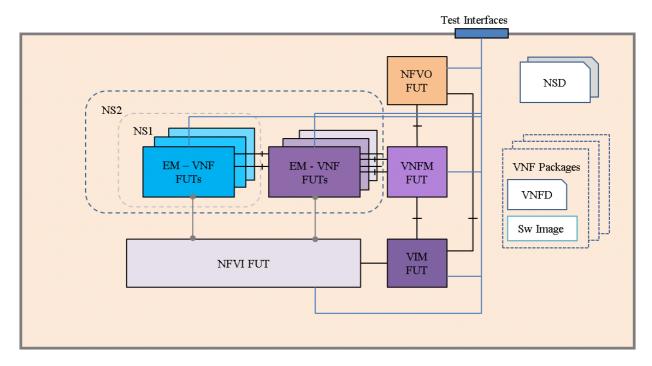


Figure 5.3-1: SUT Configuration 3

### 6.1 Introduction

This clause describes the test suite structure and naming convention for the test descriptions according to ETSI GS NFV-TST 002 [i.1], clause 4.3.5.

The test cases in this test suite are grouped by the major functional areas they cover. The test identifiers use a common prefix of TD\_NFV\_ with an additional unique string for each area. Each test has a unique test identifier and a running number of the test case (in case of additional test case that cover similar test purpose).

The test case groups and their corresponding identifier naming prefix are described in table 6.1-1.

.1-1

Test Case Group	Identifier Name Prefix
Software Image Management	TD_NFV_SWIM_
VNF Package Management	TD_NFV_VNFPM_
VNF Lifecycle Management	TD_NFV_VNFLCM_
Fault Management	TD_NFV_FM_
Performance Management	TD_NFV_PM_
NS Lifecycle Management	TD_NFV_NSLCM_

### 6.2 Software Image Management Test Cases Overview

#### Table 6.2-1

Test description identifier	Test purpose
TD_NFV_SWIM_ADD_001	Verify that the NFVO can add a software image to the image repository managed by the VIM
TD_NFV_SWIM_QUERY_001	Verify that the NFVO can retrieve the information of a software image from the image repository managed by the VIM
TD_NFV_SWIM_QUERY_002	Verify that the VNFM can retrieve the information of a software image from the image repository managed by the VIM
TD_NFV_SWIM_UPDATE_001	Verify that the NFVO can update the metadata of a software image in the image repository managed by the VIM
TD_NFV_SWIM_DELETE_001	Verify that the NFVO can delete a software image from the image repository managed by the VIM

## 6.3 VNF Package Management Test Cases Overview

#### Table 6.3-1

Test case Identifier	Test case purpose
TD_NFV_VNFPM_ONBOARD_001	To verify that a VNF Package can be successfully on-boarded to the VNF catalogue managed by the NFVO
	To verify that an on-boarded VNF Package can be successfully deleted from the VNF catalogue managed by the NFVO
	To verify that an on-boarded VNF Package that has been in deletion pending state can be successfully aborted the deletion by the NFVO

# 6.4 VNF Lifecycle Management Test Cases Overview

Test case Identifier	Test case purpose
TD_NFV_VNFLCM_INSTANTIATE_VNF_001	Verify that a VNF be successfully instantiated when a "instantiate VNF" operation is triggered by the EM
TD_NFV_VNFLCM_QUERY_VNF_001	Verify that the VNF instance's information can be queried successfully by the EM
TD_NFV_VNFLCM_MODIFY_VNF_INFO_001	Verify that the VNF information can be updated successfully by the EM
TD_NFV_VNFLCM_START_VNF_001	Verify that a VNF/VNFC instance be successfully started when an "operate VNF" operation is triggered by the EM
TD_NFV_VNFLCM_STOP_VNF_001	Verify that a VNF/VNFC instance be successfully stopped when an "operate VNF" operation is triggered by the EM
TD_NFV_VNFLCM_HEAL_VNF_001	Verify that a VNF can be successfully healed when VNF healing request is sent out by the EM/VNF
TD_NFV_VNFLCM_SCALE_OUT_VNF_001	Verify that a VNF can be successfully scaled out by adding VNFC instances triggered by a EM/VNF request
TD_NFV_VNFLCM_SCALE_IN_VNF_001	Verify that a VNF can be successfully scaled in by removing VNFC instances triggered by a EM/VNF request
TD_NFV_VNFLCM_TERMINATE_VNF_001	Verify that a VNF be successfully terminated when a "terminate VNF" operation is triggered by the EM

#### Table 6.4-1

## 6.5 Fault Management Test Cases Overview

#### Table 6.5-1

Test case Identifier	Test case purpose
TD_NFV_FM_VR_NOTIFY_001	Verify that a fault alarm notification propagates to the NFVO when a virtualised
	resource that is required for the NS connectivity fails
TD_NFV_FM_VR_CLEAR_001	Verify that a fault clearance notification propagates to the NFVO when a failed
TD_NEV_FIM_VR_CLEAR_001	virtualised resource that is required for the NS connectivity is recovered
TD_NFV_FM_VNF_NOTIFY_001	Verify that a VNF fault alarm notification propagates via the VNFM to the NFVO
	when a VNF fault is triggered by a failed virtualised resource
TD_NFV_FM_VNF_CLEAR_001	Verify that a VNF fault alarm clearance notification propagates via the VNFM to the
	NFVO when a VNF fault is cleared by resolving a failed virtualised resource

# 6.6 Performance Management Test Cases Overview

Test case Identifier	Test case purpose
TD_NFV_PM_VR_CREATE_NOTIFY_001	Verify that the performance metrics of a virtualised resource that is required for a NS instance connectivity can be monitored using PM jobs and notifications
TD_NFV_PM_VR_CREATE_THRESHOLD_001	Verify that the performance metrics of a virtualised resource that is required for a NS instance connectivity can be monitored using PM jobs and thresholds
TD_NFV_PM_VR_DELETE_MONITOR_001	Verify that the monitoring of performance metrics of a virtualised resource that is required for a NS instance connectivity can be stopped by deleting PM jobs
TD_NFV_PM_VR_DELETE_THRESHOLD_001	Verify that a threshold created for a virtualised resource that is required for a NS instance connectivity can be deleted
TD_NFV_PM_VNF_CREATE_NOTIFY_001	Verify that the performance metrics of a virtualised resource that is allocated to a VNF instance inside a NS instance can be monitored using PM jobs and notifications
TD_NFV_PM_VNF_CREATE_THRESHOLD_001	Verify that the performance metrics of a virtualised resource that is allocated to a VNF instance inside a NS instance can be monitored using PM jobs and thresholds
TD_NFV_PM_VNF_DELETE_MONITOR_001	Verify that the monitoring of performance metrics of a virtualised resource that is allocated to a VNF instance inside a NS instance can be stopped by deleting PM jobs
TD_NFV_PM_VNF_DELETE_THRESHOLD_001	Verify that a threshold created for a virtualised resource that is allocated to a VNF instance inside a NS instance can be deleted

### Table 6.6-1

# 6.7 NS Lifecycle Management Test Cases Overview

Test case Identifier	Test case purpose
TD_NFV_NSLCM_INSTANTIATE_001	To verify that a standalone NS can be successfully instantiated
TD_NFV_NSLCM_INSTANTIATE_NEST_NS_001	To verify that a NS referencing an existing nested NS can be successfully instantiated
TD_NFV_NSLCM_SCALE_OUT_001	Verify that the NS can be successfully scaled out by adding VNF instances triggered by an operator action
TD_NFV_NSLCM_SCALE_OUT_002	Verify that the NS can be successfully scaled out by adding VNF instances triggered automatically by a VNF indicator
TD_NFV_NSLCM_SCALE_OUT_003	Verify that the NS can be successfully scaled out by adding VNF instances triggered automatically by a VIM KPI
TD_NFV_NSLCM_SCALE_IN_001	Verify that the NS can be successfully scaled in by removing VNF instances triggered by an operator action
TD_NFV_NSLCM_SCALE_IN_002	Verify that the NS can be successfully scaled in by removing VNF instances triggered automatically by a VNF indicator
TD_NFV_NSLCM_SCALE_IN_003	Verify that the NS can be successfully scaled in by removing VNF instances triggered automatically by a VIM KPI
TD_NFV_NSLCM_SCALE_OUT_VNF_001	To verify that a VNF in a NS can be successfully scaled out by adding VNFC instances when triggered by a NFVO operator
TD_NFV_NSLCM_SCALE_OUT_VNF_002	To verify that a VNF in a NS can be successfully scaled out by adding VNFC instances when triggered automatically by a VNF indicator
TD_NFV_NSLCM_SCALE_OUT_VNF_003	To verify that a VNF in a NS can be successfully scaled out by adding VNFC instances when triggered automatically by a VIM KPI
TD_NFV_NSLCM_SCALE_IN_VNF_001	Verify that a VNF in a NS can be successfully scaled in by removing VNFC instances from an existing VNF triggered by an operator action
TD_NFV_NSLCM_SCALE_IN_VNF_002	Verify that a VNF in a NS can be successfully scaled in by removing VNFC instances triggered automatically by a VNF indicator
TD_NFV_NSLCM_SCALE_IN_VNF_003	Verify that a VNF in a NS can be successfully scaled in by removing VNFC instances triggered automatically by a VIM KPI
TD_NFV_NSLCM_UPDATE_START_001	Verify the capability to start a VNF instance inside a NS instance
TD_NFV_NSLCM_UPDATE_STOP_001	Verify the capability to stop a VNF instance inside a NS instance
TD_NFV_NSLCM_UPDATE_INST_ADD_VNF_001	To verify that one or more VNFs can be instantiated and the instances added to a running NS instance
TD_NFV_NSLCM_UPDATE_REM_VNF_001	To verify that one or more VNF instances can be removed from a running NS instance
TD_NFV_NSLCM_UPDATE_ADD_SHVNF_001	To verify that one or more shared VNF instances can be added to a running NS instance
TD_NFV_NSLCM_UPDATE_REM_SHVNF_001	To verify that one or more shared VNF instances can be removed from a running NS instance
TD_NFV_NSLCM_UPDATE_ADD_VL_001	To verify that one or more virtual links (VL) can be added to a

#### Table 6.7-1

	Inom a running NS instance
TD_NFV_NSLCM_UPDATE_ADD_VL_001	To verify that one or more virtual links (VL) can be added to a running NS instance
TD_NFV_NSLCM_UPDATE_REM_VL_001	To verify that one or more virtual links (VL) can be removed from a running NS instance
TD_NFV_NSLCM_UPDATE_VNF_DF_001	To verify that the deployment flavour of one or more VNF instances in a NS instance can be changed
TD_NFV_NSLCM_HEAL_001	Verify that VNF instances inside the NS can be successfully healed when partial NS healing (VNF healing) is triggered by an operator action
TD_NFV_NSLCM_HEAL_002	Verify that a NS can be successfully healed when complete NS healing is triggered by an operator action
TD_NFV_NSLCM_TERMINATE_001	To verify that a standalone NS instance can be successfully terminated
TD_NFV_NSLCM_TERMINATE_NESTED_NS_001	To verify that a NS instance referencing an existing nested NS can be successfully terminated

# 7 Test Descriptions

## 7.1 Introduction

This clause contains the test descriptions for the NFV functional areas. The results of IOP Checks and IOP Verdict inside each test description form should be indicated by OK/NOK according to clause 4.3.7 of ETSI GS NFV-TST 002 [i.1]. Non-applicable test descriptions can be marked as N/A. Collective results for functional areas can be reported according to the sample report card in annex A of the present document.

## 7.2 Software Image Management

### 7.2.1 Add Software Image

			Test Description: add software image	
Identifier		TD_NFV_SWIM	_ADD_001	
Test Purpose		Verify that the N	FVO can add a software image to the image repository managed	by the VIM
Configuration		SUT Configurati	on 1	•
References		ETSI GS NFV-IF	FA 005 [i.3]	
Applicability Pre-test cond	itions	<ul> <li>VIM suppor</li> <li>VIM suppor (VIM_SWIM</li> </ul>	add software images on the VIM (NFVO_SWIM_ADD_IM) ts "add image" operations by the NFVO (VIM_SWIM_ADD_IM) ts software image information queries by the NFVO 1_QUERY_IM_BY_NFVO)	
_				1
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger an "add image" operation on the NFVO	
	2	IOP Check	Verify the image information by querying the list of images on	
			the image repository managed by the VIM	
	3	IOP Check	Verify that the NFVO shows no "add image" operation errors	
IOP Verdict				

## 7.2.2 Query Software Image

#### 7.2.2.1 Query Software Image by NFVO

		Tes	t Description: query software image by NFVO			
ldentifier		TD NFV SWIM QUERY 001				
Test Purpose						
Configuration	า	SUT Configurat	ion 1			
References		ETSI GS NFV-I	FA 005 [i.3]			
Applicability		<ul> <li>VIM support</li> </ul>	query software image information on the VIM (NFVO_SWIM_QUE rts software image information queries by the NFVO /_QUERY_IM_BY_NFVO)	:RY_IM)		
Pre-test cond	litions	<ul> <li>The softwar</li> </ul>	re image to be queried is added to the image repository managed	hy the VIM		
		(TD_NFV_S	SWIM_ADD_001)			
Test	Step	(TD_NFV_S	SWIM_ADD_001) Description	Result		
	Step 1	1		-		
Test Sequence	<b>Step</b> 1 2	Туре	Description           Trigger the query of the relevant image information on the NFVO using the unique image identifier           Verify the image information by querying the list of images on the image repository managed by the VIM	-		
	1	Type Stimulus	Description           Trigger the query of the relevant image information on the NFVO using the unique image identifier           Verify the image information by querying the list of images on	-		

		Test	Description: query software image by VNFM			
Identifier		TD_NFV_SWIM_QUERY_002				
Test Purpose						
Configuratior	۱	SUT Configurati				
References		ETSI GS NFV-II				
Applicability		<ul> <li>VIM suppor</li> </ul>	query software image information on the VIM (VNFM_SWIM_QUE ts software image information queries by the VNFM /_QUERY_IM_BY_VNFM)	RY_IM)		
Pre-test cond	itions		re image to be queried is added to the image repository managed SWIM_ADD_001)	by the VIM		
Test	Step	Type	Description	Result		
Sequence	1	Stimulus	Trigger the query of the relevant image information on the VNFM using the unique image identifier			
	2	IOP Check	Verify the image information by querying the list of images on the image repository managed by the VIM			
	3	IOP Check	Verify that the image information obtained by the VNFM matches the image information in Step2			
IOP Verdict						

# 7.2.2.2 Query Software Image by VNFM

## 7.2.3 Update Software Image

			Test Description: update software image				
Identifier		TD_NFV_SWIM_UPDATE_001					
Test Purpose			FVO can update the metadata of a software image in the image re	pository			
		managed by the	VIM				
Configuration		SUT Configurati	on 1				
References		ETSI GS NFV-IF	FA 005 [i.3]				
Applicability		<ul> <li>NFVO can ι</li> </ul>	update software image information on the VIM (NFVO_SWIM_UPE	DATE_IM)			
		<ul> <li>VIM support</li> </ul>	ts "update image" operations by the NFVO (VIM_SWIM_UPDATE	_IM)			
		<ul> <li>VIM support</li> </ul>	ts software image information queries by the NFVO				
		(VIM_SWIM	I_QUERY_IM_BY_NFVO)				
Pre-test cond	itions	<ul> <li>The softwar</li> </ul>	e image to be updated is added to the image repository managed	by the VIM			
			SWIM_ADD_001)				
		<ul> <li>The update</li> </ul>	d software image metadata is defined				
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger an "update image" operation on the NFVO using the				
			unique image identifier and including the updated metadata				
	2	IOP Check	Verify the updated image information by querying the list of				
			images on the image repository managed by the VIM				
	3	IOP Check	Verify that the NFVO shows no "update image" operation errors				
IOP Verdict							

			Test Description: delete software image			
Identifier		TD_NFV_SWIM_DELETE_001				
Test Purpose	Verify that the NFVO can delete a software image from the image repository managed by the VI					
Configuration		SUT Configurati	on 1			
References		ETSI GS NFV-IF	A 005 [i.3]			
Applicability		<ul><li>VIM suppor</li><li>VIM suppor</li></ul>	delete software images from the VIM (NFVO_SWIM_DELETE_IM) ts "delete image" operations by the NFVO (VIM_SWIM_DELETE_ ts software image information queries by the NFVO 1_QUERY_IM_BY_NFVO)			
Pre-test condi	tions		e image to be deleted has been added to the image repository ma FV_SWIM_ADD_001)	naged by the		
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger a "delete image" operation on the NFVO using the unique image identifier			
	2	IOP Check	Verify that the affected image has been deleted from the image repository managed by the VIM by querying the list of images			
	3	IOP Check	Verify that the NFVO shows no "delete image" operation errors			
IOP Verdict						

# 7.2.4 Delete Software Image

# 7.3 VNF Package Management

# 7.3.1 On-board VNF Package

		•	Test Description: on-board VNF package			
Identifier	TD NFV VNFPM ONBOARD 001					
Test Purpose		To verify that a VNF Package can be successfully on-boarded to the VNF catalogue managed by the NFVO				
Configuration		SUT Configurati	on 1			
References		ETSI GS NFV-IF	A 013 [i.9] and ETSI GS NFV-IFA 011 [i.8]			
Applicability		<ul> <li>NFVO can a</li> </ul>	check the integrity and validity of VNF Packages (NFVO_VNFPM_) access the VNF catalogue where the VNF Packages information is FPM_ACCESS)			
Pre-test condi	tions	The VNF Pa and artefact	ackage contains all the necessary information including VNFD, soft s	ware image		
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger the on-boarding of a VNF Package on the NFVO			
	2	IOP Check	Verify that the VNF Package is stored in the VNF catalogue managed by the NFVO			
	3	IOP Check	Verify that a unique identifier for the VNF Package is generated by querying the VNF Package information on the NFVO			
IOP Verdict						

## 7.3.2 Delete VNF Package

			Test Description: delete VNF package		
Identifier		TD_NFV_VNFPI	M_DELETE_001		
Test Purpose		To verify that an managed by the	on-boarded VNF Package can be successfully deleted from the $\$ NFVO	/NF catalogue	
Configuration	1	SUT Configuration	on 1		
References		ETSI GS NFV-IF	A 013 [i.9]		
Applicability	pplicability         NFVO can access the VNF catalogue where the VNF Packages information is stored (NFVO_VNFPM_ACCESS)				
		<ul> <li>NFVO supplication</li> </ul>	orts on-boarded VNF Packages queries (NFVO_VNFPM_QUER)	<u></u>	
Pre-test cond	itions		ackage is on-boarded, not in a "used" state, and not in a "deletion instances associated to the VNF Package are terminated	pending" state	
Test	Step	Туре	Description	Result	
Sequence	1	Stimulus	Trigger the deletion of a VNF Package on the NFVO	litooun	
	2	IOP Check	Verify that VNF Package has been deleted by querying the NFVO		
IOP Verdict					

# 7.3.3 Abort VNF Package Delete Operation

		Test De	escription: abort VNF package delete operation			
Identifier						
Test Purpose		To verify that an on-boarded VNF Package that is in deletion pending state can be successfully aborted from deletion by the NFVO				
Configuration		SUT Configuration	on 1			
References		ETSI GS NFV-IF	A 013 [i.9]			
Applicability		(NFVO_VNF	orts the delete VNF Package operation abortion FPM_ABORT_DELETE) orts on-boarded VNF Packages queries (NFVO_VNFPM_QUERY	)		
Pre-test condi	tions	The VNF Pa	ackage is on-boarded and in "deletion pending" state			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger the abortion of the deletion operation of an on-boarded VNF Package on NFVO			
	2	IOP Check	Verify that the VNF Package is not deleted by querying the NFVO			
	3	IOP Check	Verify the VNF Package is in disabled state by querying the NFVO			
IOP Verdict						

# 7.4 VNF Lifecycle Management

# 7.4.1 Instantiate VNF with an EM Request

		Test D	escription: instantiate VNF with an EM request	
Identifier			CM_INSTANTIATE_VNF_001	
Test Purpose			be successfully instantiated when an "instantiate VNF" operation	is triggered by
Configuration		SUT Configurati	on 1	
References		ETSI GS NFV-IF	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.	5] and ETSI
		GS NFV-IFA 008	3 [i.6]	
Applicability	tions	<ul> <li>NFVO/VNFI (NFVO_CR</li> <li>NFVO/VNFI (NFVO_NR</li> <li>NFVO/VNFI (NFVO_SRI</li> <li>VIM support (VIM_CRM_</li> <li>VIM support (VIM_SRM_</li> <li>VIM support (VIM_SRM_</li> <li>VIM support (VIM_SRM_</li> <li>NFVO/VNFI or VNFM_SWIN</li> <li>NFVO/VNFI VNFM_CRM_</li> <li>NFVO/VNFI VNFM_NRM_</li> <li>NFVO/VNFI VNFM_SRM_</li> <li>VIM can set VIM_CRM_</li> <li>VIM can set VIM_CRM_</li> <li>VIM can set VIM_CRM_</li> <li>VIM can set VIM_SRM_</li> <li>VIM can set VIM_SM_</li></ul>	ALLOCATE or VNFM_CRM_ALLOCATE) M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE) M can generate "allocate storage resource" operation requests to th M_ALLOCATE or VNFM_SRM_ALLOCATE) M can generate "allocate storage resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM) is "allocate compute resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM) is "allocate storage resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) is "allocate storage resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) is sallocate storage resource operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) M can query software image information from the VIM (NFVO_SW WIM_QUERY_IM) is software image information queries by the NFVO/VNFM I_QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM) M can query compute resource information from the VIM (NFVO_CA A_QUERY) M can query network resource information from the VIM (NFVO_SA A_QUERY) M can query storage resource information from the VIM (NFVO_SA A_QUERY) M can query storage resource information from the VIM (NFVO_SA A_QUERY) M can query storage resource information from the VIM (NFVO_SA A_QUERY) M can query storage resource information to the NFVO (VIM_CRM_INFO_T INFO_TO_VNFM) m d network resource information to the NFVO (VIM_SRM_INFO_T (NFO_TO_VNFM) erate "Instantiate VNF" requests to the VNFM CM_VNF_INSTANTIATE) orts "instantiate VNF" requests from the EM FLCM_VNF_INSTANTIATE) /NFM can generate "Grant VNF Lifecycle Operation" requests to to FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" requests to to FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" requests to to FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" requests to to fut ov FM (NFVO_VNFLCM_GRANTING) 	the VIM the VIM VNFM VNFM IM_QUERY_IM CRM_QUERY or RM_QUERY or RM_QUERY or RM_QUERY or CO_NFVO or O_NFVO or O_NFVO or O_NFVO or
			e image repository is reachable by the VIM	
			d resources are available on the NFVI	
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger an "instantiate VNF" operation on the EM	
	2	IOP Check	If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been	
	3	IOP Check	approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM	
	4	IOP Check	Verify that the requested virtualised resources have been allocated by the VIM according to the VNFD	
	5	IOP Check	Verify that virtualised resource allocation constraints have been met by querying the VIM	
			met by querying the VIM	

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Test Sequence	6	IOP Check	Verify that any existing virtualised resources have not been affected by the allocation of the new virtualised resources by querying the VIM	
	7	IOP Check	Verify that the VNF instance resources are visible on the VNFM	
	8	IOP Check	Verify that the VNF instance resources are visible on the NFVO	
	9	IOP Check	Verify that the VNF instance is reachable via the management network	
	10	IOP Check	Verify that the VNF instance has been configured according to the VNFD by querying the VNFM	
	11	IOP Check	Verify that the EM shows no "instantiate VNF" operation errors	
IOP Verdict				

# 7.4.2 Query VNF with an EM Request

		Test Desc	cription: query VNF information with an EM request				
Identifier			CM_QUERY_VNF_001				
Test Purpose		Verify that the VNF instance's information can be queried successfully by the EM					
Configuration		SUT Configurat	ion 1				
References		ETSI GS NFV-I	FA 008 [i.6]				
Applicability		<ul> <li>EM can generate "query VNF" requests to the VNFM (EM_VNFLCM_VNF_QUERY)</li> <li>VNFM supports "query VNF" requests from the EM (VNFM_VNFLCM_VNF_QUERY)</li> </ul>					
Pre-test condi	tions	The VNE is	instantiated (TD NFV VNFLCM INSTANTIATE VNF 001)				
Test	Step	Type	Description	Result			
	_	1		Result			
Test	_	Туре	Description           Trigger the EM to query the VNF information using the unique	Result			
Test	Step 1	<b>Type</b> Stimulus	Description           Trigger the EM to query the VNF information using the unique           VNF instance identifier from the VNFM           Verify that the EM has received the VNF information from the	Result			
Test	<b>Step</b> 1 2	Type Stimulus IOP Check	Description           Trigger the EM to query the VNF information using the unique           VNF instance identifier from the VNFM           Verify that the EM has received the VNF information from the           VNFM           Verify that VNF information in Step 2 matches the VNF	Result			

# 7.4.3 Modify VNF Configuration Information with an EM Request

		Test	t Description: update VNF with an EM request			
Identifier		TD_NFV_VNFL	CM_MODIFY_VNF_INFO_001			
Test Purpose	)	Verify that the V	/NF information can be updated successfully by the EM			
Configuratio	uration SUT Configuration 1					
References		ETSI GS NFV-I	FA 007 [i.5] and ETSI GS NFV-IFA 008 [i.6]			
Applicability       • EM can generate "modify VNF information" requests to the VNFM (EM_VNFLCM_VNF_MODIFY_INFO)         • VNFM supports "modify VNF information" requests from the EM (VNFM_VNFLCM_VNF_MODIFY_INFO)         • NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)         • VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)         • The VNF is instantiated (TD_NFV_VNFLCM_INSTANTIATE_VNF_001)         • The original VNF instance information is available for comparison						
			VNFLCM_QUERY_VNF_001)			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger the EM to modify the VNF instance information on the VNFM	Kesuit		
	2	IOP Check	Verify that the VNF instance information has been updated on the VNFM			
	3	IOP Check	Verify that the VNF instance information has been updated by querying the NFVO			
	4	IOP Check	Verify that the EM indicates the "modify VNF information" operation result as successful			

## 7.4.4 Start VNF/VNFC with an EM Request

	Test Description: start VNF/VNFC with an EM request
Identifier	TD_NFV_VNFLCM_START_VNF_001
Test Purpose	Verify that a VNF/VNFC instance be successfully started when an "operate VNF" operation is
	triggered by the EM
Configuration	SUT Configuration 1
References	ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI
	GS NFV-IFA 008 [i.6]
Applicability	<ul> <li>EM can generate "operate VNF" requests to the VNFM (EM_VNFLCM_VNF_OPERATE)</li> <li>VNFM supports "operate VNF" requests from the EM (VNFM_VNFLCM_VNF_OPERATE)</li> <li>NFVO/VNFM can generate "operate compute resource" operation requests to the VIM (NFVO_CRM_OPERATE or VNFM_CRM_OPERATE)</li> <li>VIM supports "operate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM)</li> <li>NFVO/VNFM can query compute resource information from the VIM (NFVO_CRM_QUERY or VNFM_CRM_QUERY)</li> <li>VIM can send compute resource information to the NFVO/VNFM (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)</li> <li>VIM can send network resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> <li>NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)</li> <li>Optionally, VNFM can generate "Grant VNF Lifecycle Operation" requests to the NFVO (VNFM_VNFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" requests from the VNFM (NFVO_VNFLCM_GRANTING)</li> </ul>
Pre-test conditions	The VNF is instantiated (TD_NFV_VNFLCM_INSTANTIATE_VNF_001)
	<ul> <li>Target VNF/VNFC instance is in a "stopped" operational state. See note.</li> </ul>

		Test E	Description: start VNF/VNFC with an EM request	
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger the EM to start the target VNF/VNFC instance	
	2	IOP Check	If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "operate VNF" operation has been approved by the NFVO	
	3	IOP Check	Verify that the compute resources allocated to the target VNF/VNFC instance have been started by querying the VIM	
	4	IOP Check	Verify that other existing compute resources have not been affected by the performed operation by querying the VIM	
	5	IOP Check	Verify that the VNF/VNFC instance operational state on the VNFM is indicated as "started"	
	6	IOP Check	Verify that the EM indicates the "operate VNF" operation result as successful	
	7	IOP Check	Verify that the VNF/VNFC instance operates successfully by running the end-to-end functional test	
IOP Verdict				
			virtualised container(s), where the VNFC instance(s) of the VNF ru	n, are shut down
bu	ut not termi	nated.		

# 7.4.5 Stop VNF/VNFC with an EM Request

			escription: stop VNF/VNFC with an EM request			
Identifier		TD_NFV_VNFL	D_NFV_VNFLCM_STOP_VNF_001			
Test Purpose	)		F/VNFC instance be successfully stopped when an "operate VNF"	operation is		
<b>A H</b>		triggered by the				
Configuration	n	SUT Configurati				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.	.5] and ETSI		
		GS NFV-IFA 00				
Applicability			nerate "operate VNF" requests to the VNFM (EM_VNFLCM_VNF_			
			ports "operate VNF" requests from the EM (VNFM_VNFLCM_VNF			
			M can generate "operate compute resource" operation requests to M_OPERATE or VNFM_CRM_OPERATE)	the VIM		
		<ul> <li>VIM support</li> </ul>	ts "operate compute resource" operation requests from the NFVO	/VNFM		
			_OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM)			
		<ul> <li>NEVO/VNE VNEM_CRI</li> </ul>	M can query compute resource information from the VIM (NFVO_( M_QUERY)	CRM_QUERY or		
			nd compute resource information to the NFVO/VNFM			
		(VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)				
			nd network resource information to the NFVO/VNFM			
		(VIM_NRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)				
		• VIM can send storage resource information to the NFVO/VNFM (VIM_SRM_INFO_TO_NFVO				
		or VIM_SRM_INFO_TO_VNFM)				
		<ul> <li>NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)</li> </ul>				
		<ul> <li>VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)</li> </ul>				
		<ul> <li>Optionally, VNFM can generate "Grant VNF Lifecycle Operation" requests to the NFVO</li> </ul>				
		(VNFM_VNFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation"				
		requests fro	om the VNFM (NFVO_VNFLCM_GRANTING)			
Pre-test cond	litions		instantiated (TD_NFV_VNFLCM_INSTANTIATE_VNF_001)			
		<ul> <li>Target VNF</li> </ul>	/VNFC instance is in a "started" operational state			
Teet	Cton	Turne	Description	Decult		
Test Sequence	Step	Type Stimulus	Description	Result		
Sequence	1	IOP Check	Trigger the EM to stop the target VNF/VNFC instance If VNFM VNFLCM GRANTING and			
	2	IOP Check	NFVO_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the			
			requested grant for the "operate VNF" operation has been			
			approved by the NFVO			
	3	IOP Check	Verify that the compute resources allocated to the target			
	5	IOI OHECK	VNF/VNFC instance have been stopped by querying the VIM.			
			See note.			
	4	IOP Check	Verify that other existing compute resources have not been			
1			affected by the performed operation by querying the VIM			
	1	l	Tanootoa by the pononnoa oporation by quorying the vite	1		

Test Description: stop VNF/VNFC with an EM request					
5 IOP Check Verify that the VNF/VNFC instance operational state on the VNFM is indicated as "stopped"					
	6	IOP Check	Verify that the EM indicates the "operate VNF" operation result as successful		
IOP Verdict					
		STOPPED, the inated.	virtualised container(s), where the VNFC instance(s) of the VNF ru	n, are shut down	

# 7.4.6 VNF Healing with an EM/VNF Request

			scription: VNF healing with an EM/VNF Request			
Identifier			CM_HEAL_VNF_001			
Test Purpose		EM/VNF	F can be successfully healed when a VNF healing request is sent	out by the		
Configuration		SUT Configurati				
References			<sup>-</sup> A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i 3 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9			
Applicability		NFVO/VNF	M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE)	-		
		NFVO/VNF	M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM		
		NFVO/VNF	M can generate "allocate storage resource" operation requests to M_ALLOCATE or VNFM_SRM_ALLOCATE)	the VIM		
		<ul> <li>VIM support</li> </ul>	ts "allocate compute resource" operation requests from the NFVO _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	/VNFM		
		<ul> <li>VIM support</li> </ul>	ts "allocate network resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	VNFM		
		<ul> <li>VIM support</li> </ul>	ts "allocate storage resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	/NFM		
		NFVO/VNF	M can generate "terminate compute resource" operation requests M_TERMINATE or VNFM_CRM_TERMINATE)	to the VIM		
		<ul> <li>NFVO/VNFM can generate "terminate network resource" operation requests to the VIM (NFVO_NRM_TERMINATE or VNFM_NRM_TERMINATE)</li> </ul>				
		<ul> <li>NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)</li> </ul>				
		<ul> <li>VIM supports "terminate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)</li> </ul>				
		<ul> <li>VIM supports "terminate network resource" operation requests from the NFVO/VNFM (VIM_NRM_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)</li> </ul>				
		<ul> <li>VIM_NRM_TERMINATE_BY_NEVO of VIM_NRM_TERMINATE_BY_VNEM)</li> <li>VIM supports "terminate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNEM)</li> </ul>				
		<ul> <li>VNFM supports "heal VNF" requests from EM/VNF (VNFM_VNFLCM_VNF_HEAL)</li> </ul>				
		<ul> <li>VNFM supports "heal VNF" requests from EM/VNF (VNFM_VNFLCM_VNF_HEAL)</li> <li>EM/VNF can generate "heal VNF" requests to the VNFM (EM_VNFLCM_VNF_HEAL)</li> </ul>				
		<ul> <li>EM/VNF can generate "heal VNF" requests to the VNFM (EM_VNFLCM_VNF_HEAL)</li> <li>Optionally, VNFM can generate "Grant VNF Lifecycle Operation" requests to the NFVO</li> </ul>				
		(VNFM_VNFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" requests from the VNFM (NFVO_VNFLCM_GRANTING)				
		requests fro				
Dro to of a sm life	lan- I					
Pre-test condit	ions		failed state (for example a virtualised resource needed by the imp	acted VINF		
		instance ha	s been terminated directly on the VIM)			
Test	Step	Туре	Description	Result		
Sequence	1 1	Stimulus	Trigger the EM/VNF to send a VNF healing request to the VNFM	Nesuit		
	2	IOP Check	If VNFM_VNFLCM_GRANTING and			
			NFVO_VNFLCM_GRANTING are supported, verify that the			
			requested grant for the "heal VNF" operation has been			
			approved by the NFVO			
	3	IOP Check	Verify that any additional resources required for the healing			
			process have been allocated by the VIM according to the			
			descriptors			
	4	IOP Check	Verify that healed VNF instance is running and reachable via			
			the management network			
	5	IOP Check	Verify that the healed VNF instance has been configured			
	•		· · ·			

		Test D	escription: VNF healing with an EM/VNF Request	
			according to the descriptors by querying the VNFM	
	6	IOP Check	Verify that any failed resources have been terminated and released by the VIM	
	7	IOP Check	Verify that the EM/VNF indicates the VNF healing operation result as successful	
	8	IOP Check	Verify that the NFVO indicates the VNF healing operation result as successful	
	9	IOP Check	Verify that the VNF has been healed by running an end-to-end functional test factoring in the functionality of the healed VNF instance	
IOP Verdict		•	·	

# 7.4.7 VNF Scale Out with an EM/VNF Request

			scription: scale out VNF with an EM/VNF request				
Identifier			CM_SCALE_OUT_VNF_001				
Test Purpose	9	Verify that a VN EM/VNF	F can be successfully scaled out by adding VNFC instances trigge	red by the			
Configuration	n	SUT Configurati	ion 1				
References		ETSI GS NFV-II	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.4 8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	ō], ETSI			
Applicability		<ul> <li>NFVO/VNF</li> </ul>					
		NFVO/VNF	M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM			
			M can generate "allocate storage resource" operation requests to t M_ALLOCATE or VNFM_SRM_ALLOCATE)	the VIM			
		(VIM_CRM	ts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)				
		(VIM_NRM	ts "allocate network resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)				
		(VIM_SRM	ts "allocate storage resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)				
		(EM_VNFL	n generate "scale out by adding VNFC instances" requests to the CM_VNF_SCALE_OUT)				
		(VNFM_VN	VNFM supports "scale out by adding VNFC instances" requests from the EM/VNF (VNFM_VNFLCM_VNF_SCALE_OUT)				
		(VNFM_VN	VNFM can generate "Grant VNF Lifecycle Operation" requests to t FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op om the VNFM (NFVO_VNFLCM_GRANTING)				
Pre-test conc	ditions	<ul> <li>NFVI has the</li> </ul>	nfigured to trigger scale out when scale out request is received fro ne required amount of consumable virtual resources to run the scal c scale level of the VNF instance is not at the maximum scale level				
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the EM/VNF to send a "scale out by adding VNFC	Nesun			
Oequence			instance(s)" request to the VNFM				
	2	IOP Check	If VNFM_VNFLCM_GRANTING and				
			NFVO_VNFLCM_GRANTING are supported, verify that the				
			requested grant for the "VNF scale out" operation has been				
	3	IOP Check	approved by the NFVO Verify that the "scale out by adding VNFC instance(s)"				
	5	IOF CHECK	procedure has been started on the NFVO				
	4	IOP Check	Verify that the additional VNFC instance(s) have been				
	_		deployed by querying the VNFM				
	5	IOP Check	Verify that the additional resources have been allocated by the VIM according to the VNFD				
	6	IOP Check	Verify that the additional VNFC instance(s) are running and are reachable through their management network				
	7	IOP Check	Verify that the VNF configuration has been updated to include the additional VNFC instances according to the VNFD by querying the VNFM				
	8	IOP Check	Verify that the additional VNFC instances(s) are connected to				
		1.01.011001					

### 7.4.8 VNF Scale In with an EM/VNF Request

			escription: VNF scale in with an EM/VNF request				
Identifier			_CM_SCALE_IN_VNF_001	11 4			
Test Purpose		EM/VNF	NF can be successfully scaled in by removing VNFC instances trigge	ered by the			
Configuratio	n	SUT Configurat					
References			IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 08 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI			
Applicability		(NFVO_CF	FM can generate "terminate compute resource" operation requests f RM_TERMINATE or VNFM_CRM_TERMINATE)				
		(NFVO_SF	FM can generate "terminate storage resource" operation requests to RM_TERMINATE or VNFM_SRM_TERMINATE)				
		(VIM_CRM	rts "terminate compute resource" operation requests from the NFV( 1_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)				
		(VIM_NRM	rts "terminate network resource" operation requests from the NFVO 1_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)				
		(VIM_SRM	rts "terminate storage resource" operation requests from the NFVO I_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)				
		(EM_VNFL	an generate "scale in by removing VNFC instances" to the VNFM .CM_VNF_SCALE_IN)				
		(VNFM_VN	ports "scale in by removing VNFC instances" requests from the EM NFLCM_VNF_SCALE_IN)				
Pre-test conc	ditions	<ul> <li>(VNFM_VN requests from the current of the current of</li></ul>	VNFM can generate "Grant VNF Lifecycle Operation" requests to the NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" om the VNFM (NFVO_VNFLCM_GRANTING)				
Pre-test conc	ditions	<ul> <li>(VNFM_VN requests from the current of the current of</li></ul>	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op om the VNFM (NFVO_VNFLCM_GRANTING)				
Pre-test conc	ditions	<ul> <li>(VNFM_VN requests from the current of the current of</li></ul>	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op om the VNFM (NFVO_VNFLCM_GRANTING) It NS deployment size allows scaling in It scale level of the VNF instance is not at the minimum scale level Description				
		(VNFM_VN requests fr The curren The curren	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op om the VNFM (NFVO_VNFLCM_GRANTING) It NS deployment size allows scaling in It scale level of the VNF instance is not at the minimum scale level	eration"			
Test	Step	(VNFM_VN requests fr • The curren • The curren • Type	VFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in it scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the	eration"			
Test	<b>Step</b> 1 2	(VNFM_VN requests fr The curren The curren Type Stimulus IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in it scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO	eration"			
Test	<b>Step</b> 1 2 3	(VNFM_VN requests fr The curren The curren Type Stimulus IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in it scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO	eration"			
Test	Step           1           2           3           4	(VNFM_VN requests fr The curren The curren Type Stimulus IOP Check IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in it scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM	eration"			
Test	Step           1           2           3           4           5	(VNFM_VN requests fr The curren The curren Type Stimulus IOP Check IOP Check IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in it scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM	eration"			
Test	Step           1           2           3           4           5           6	(VNFM_VN requests fr The curren Type Stimulus IOP Check IOP Check IOP Check IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in the scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the remaining VNFC instance(s) are still running and reachable via their management network	eration"			
Test	Step           1           2           3           4           5	(VNFM_VN requests fr The curren The curren Type Stimulus IOP Check IOP Check IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in tt scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the remaining VNFC instance(s) are still running and reachable via their management network         Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM	eration"			
Test	Step           1           2           3           4           5           6	(VNFM_VN requests fr The curren Type Stimulus IOP Check IOP Check IOP Check IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in tt scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the remaining VNFC instance(s) are still running and reachable via their management network         Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by	eration"			
Гest	Step           1           2           3           4           5           6           7	(VNFM_VN requests fr The curren Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	NFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Option the VNFM (NFVO_VNFLCM_GRANTING)         It NS deployment size allows scaling in it scale level of the VNF instance is not at the minimum scale level         Description         Trigger the EM/VNF to send a "scale in by removing VNFC instance(s)" request to the VNFM         If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "VNF scale in" operation has been approved by the NFVO         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the remaining VNFC instance(s) are still running and reachable via their management network         Verify that the VNFC instances according to the descriptors by querying the VNFM         Verify that the remaining VNFC instances(s) and VL(s) are still	eration"			

### 7.4.9 Terminate VNF with an EM Request

			Description: terminate VNF with an EM request			
Identifier			CM_TERMINATE_VNF_001			
Test Purpose		Verify that a VNI EM	F is successfully terminated when a "terminate VNF" operation is t	riggered by the		
Configuration		SUT Configurati	on 1			
References		ETSI GS NFV-IF	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i	.5] and ETSI		
		GS NFV-IFA 008	3 [i.6]			
Applicability			M can generate "terminate compute resource" operation requests M_TERMINATE or VNFM_CRM_TERMINATE)	to the VIM		
		NFVO/VNF	M can generate "terminate network resource" operation requests t M_TERMINATE or VNFM_NRM_TERMINATE)	o the VIM		
		NFVO/VNF	M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)	o the VIM		
		<ul> <li>VIM suppor</li> </ul>	ts "terminate compute resource" operation requests from the NFV _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM			
		<ul> <li>VIM suppor</li> </ul>	ts "terminate network resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM	)/VNFM		
		<ul> <li>VIM suppor</li> </ul>	ts "terminate storage resource" operation requests from the NFVC TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM	/VNFM		
			M can query compute resource information from the VIM (NFVO_0			
			M can query network resource information from the VIM (NFVO_N	IRM_QUERY or		
		NFVO/VNF	VO/VNFM can query storage resource information from the VIM (NFVO_SRM_QUERY or FM_SRM_QUERY)			
		<ul> <li>VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)</li> </ul>				
		<ul> <li>VIM can set</li> </ul>	nd network resource information to the NFVO (VIM_NRM_INFO_1 INFO_TO_VNFM)	O_NFVO or		
		<ul> <li>VIM_INING INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING_INING INING_I</li></ul>				
			erate "terminate VNF" requests to the VNFM (EM_VNFLCM_VNF	TERMINATE)		
			orts "terminate VNF" requests from the EM (VNFM_VNFLCM_VN			
			VNFM can generate "Grant VNF Lifecycle Operation" requests to t			
			FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op	eration"		
		requests fro	m the VNFM (NFVO_VNFLCM_GRANTING)			
Pre-test condi	itions	<ul> <li>The target \</li> </ul>	/NF is instantiated			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger an "terminate VNF" operation on the EM			
	2	IOP Check	If VNFM_VNFLCM_GRANTING and			
			NFVO_VNFLCM_GRANTING are supported, verify that the			
			requested grant for the "VNF terminate" operation has been approved by the NFVO			
	3	IOP Check	Verify that the impacted virtualised resources have been terminated by the VIM			
	4	IOP Check	Verify that other allocated virtualised resources have not been affected by the termination of the virtualised resources of the VNF instance by querying the VIM			
IOP Verdict		I				

# 7.5.1 Virtualised Resource Fault Management

### 7.5.1.1 Virtualised Resource Fault Alarm Notification

		Test Desc	ription: virtualised resource fault alarm notification			
Identifier			R_NOTIFY_001			
Test Purpose		Verify that a fau	It alarm notification propagates to the NFVO when a virtualised res	source that is		
Configuration		SUT Configurati	ion 1			
References		ETSI GS NFV-IFA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		<ul> <li>NFVO can subscribe to virtualised resource fault alarms on the VIM (NFVO_FM_VR_SUBSCRIBE)</li> <li>VIM supports alarm notifications subscriptions from the NFVO (VIM_FM_SUBSCRIBE_BY_NFVO)</li> <li>VIM can generate virtualised resources fault alarm notifications to the NFVO (VIM_FM_NOTIFY_BY_NFVO)</li> <li>NFVO can process virtualised resource fault alarm notifications from the VIM (NFVO_FM_VR_NOTIFY)</li> <li>NFVO can get the list of virtualised resource fault alarms from the VIM (NFVO_FM_VR_GET_ALARMS)</li> <li>VIM supports virtualised resource fault alarm list queries by the NFVO (VIM_FM_QUERY_BY_NFVO)</li> </ul>				
Pre-test condi	tions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001) bscribed to virtualised resources fault alarms on the VIM			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger a fault on a virtualised resource that is required for the NS instance connectivity on the NFVI (e.g. disable the NIC allocated to a network resource)			
	2	IOP Check	Verify that a virtualised resource fault alarm has been created on the VIM by querying the list of virtualised resource fault alarms			
	3	IOP Check	Verify that a NS fault alarm has been created on the NFVO by querying the list of NS fault alarms			
IOP Verdict						

		Test Descriptio	n: virtualised resource fault alarm clearance notification					
Identifier		TD_NFV_FM_V	TD NFV FM VR CLEAR 001					
Test Purpose			It clearance notification propagates to the NFVO when a failed virtu for the NS connectivity is recovered	alised resource				
Configuration SUT Configuration 1								
References		ETSI GS NFV-I	FA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]					
Applicability <ul> <li>NFVO can subscribe to virtualised resource fault alarms on the VIM (NFVO_FM_VR_SUBSCRIBE)</li> <li>VIM supports virtualised resource fault alarms subscriptions from the NFVO (VIM_FM_SUBSCRIBE_BY_NFVO)</li> <li>VIM can generate virtualised resource fault alarm notifications to the NFVO (VIM_FM_NOTIFY_BY_NFVO)</li> <li>NFVO can process virtualised resource fault alarm notifications from the VIM (NFVO_FM_VR_NOTIFY)</li> <li>NFVO can get the list of virtualised resource fault alarms from the VIM (NFVO_FM_VR_GET_ALARMS)</li> <li>VIM supports virtualised resource fault alarm list queries by the NFVO (VIM_FM_QUERY_BY_NFVO)</li> </ul>								
Pre-test cond		<ul><li>NFVO is su</li><li>NS fault ala</li></ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) abscribed to virtualised resources fault alarms on the VIM arm is created on the NFVO by failing a virtualised resource that is tivity (TD_NFV_FM_VR_NOTIFY_001)	required for the				
Test	Step	Туре	Description	Result				
Sequence	1	Stimulus	Resolve the failure of the virtualised resource that is required for the NS instance connectivity (e.g. reconnect the NIC allocated to a network resource)					
	2	IOP Check	Verify that the relevant virtualised resource fault alarm has been cleared on the VIM by querying the list of virtualised resource fault alarms					
	3	IOP Check	Verify that the relevant NS fault alarm has been cleared on the NFVO by querying the list of NS fault alarms					
IOP Verdict								

### 7.5.1.2 Virtualised Resource Fault Alarm Clearance Notification

## 7.5.2 VNF Fault Management

### 7.5.2.1 VNF Fault Alarm Notifications

		Те	est Description: VNF fault alarm notification				
Identifier			NF_NOTIFY_001				
Test Purpose		Verify that a VNF fault alarm notification propagates via the VNFM to the NFVO when a VNF fault is triggered by a failed virtualised resource					
Configuration		SUT Configuration 1					
References			FA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 01	3 [i.9]			
Applicability		NFVO can s	subscribe to alarm notifications on the VNFM (NFVO_FM_VNF_SI				
			ports alarm notifications subscriptions from the NFVO I_VNF_SUBSCRIBE)				
			subscribe to alarm notifications on the VIM (VNFM_FM_VR_SUBS	SCRIBE)			
			ts alarm notifications subscriptions by the VNFM SUBSCRIBE_BY_VNFM)				
			generate VNF fault alarm notifications to the NFVO (VNFM_FM_V	,			
			process VNF fault alarm notifications from the VNFM (NFVO_FM_	VNF_NOTIFY)			
			nerate virtualised resources fault alarm notifications to the VNFM NOTIFY_BY_VNFM)	erate virtualised resources fault alarm notifications to the VNFM DTIFY BY VNFM)			
<ul> <li>NFVO can get the list of VNF fault alarms from the VNFM (NFVO_FM_VNF_GET_</li> </ul>							
<ul> <li>VNFM supports VNF fault alarm list queries by the NFVO (VNFM_FM_VNF_QUERY</li> </ul>				QUERY)			
			get the list of virtualised resource fault alarms from the VIM				
		(VNFM_FM_VR_GET_ALARM)					
			ts virtualised resources fault alarm list queries by the VNFM QUERY_BY_VNFM)				
		1					
Pre-test condi	tions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001)				
		NFVO is subscribed to VNF fault alarms on the VNFM					
		<ul> <li>VNFM is su</li> </ul>	bscribed to virtualised resources fault alarms on the VIM				
Test	Step	Type	Description	Result			
Sequence	1	Stimulus	Trigger a failure on a virtualised resource allocated to the relevant VNF instance (e.g. terminate the virtualised resource directly on the VIM)				
	2	IOP Check	Verify that a virtualised resource fault alarm has been created				
			on the VIM by querying the list of virtualised resource fault alarms				
	3	IOP Check	Verify that a VNF fault alarm has been created for the affected VNF instance on the VNFM by querying the list of VNF fault alarms				
	4	IOP Check	Verify that a NS fault alarm has been created on the NFVO by querying the list of NS fault alarms				
IOP Verdict							

		Test De	scription: VNF fault alarm clearance notification				
Identifier		TD_NFV_FM_VNF_CLEAR_001					
Test Purpose			F fault alarm clearance notification propagates via the VNFM to the	e NFVO when a			
• • • •		VNF fault is cleared by resolving a failed virtualised resource					
Configuration		SUT Configurati					
References		ETSI GS NFV-IF	A 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 01	3 [i.9]			
Applicability		NFVO can s	subscribe to alarm notifications on the VNFM (NFVO_FM_VNF_SU	JBSCRIBE)			
			orts alarm notifications subscriptions from the NFVO _VNF_SUBSCRIBE)				
		<ul> <li>VNFM can s</li> </ul>	subscribe to alarm notifications on the VIM (VNFM_FM_VR_SUBS	SCRIBE)			
			ts alarm notifications subscriptions by the VNFM UBSCRIBE_BY_VNFM)				
			generate VNF fault alarm clearance notifications to the NFVO _VNF_NOTIFY)				
			process VNF fault alarm clearance notifications from the VNFM _VNF_NOTIFY)				
		<ul> <li>VIM can generate virtualised resources fault alarm clearance notifications to the VNFM (VIM_FM_NOTIFY_BY_VNFM)</li> </ul>					
			NFM can process virtualised resource fault alarm clearance notifications from the VIM NFM_FM_VR_NOTIFY)				
			get the list of VNF fault alarms from the VNFM (NFVO_FM_VNF_GET_ALARM)				
			FM supports VNF fault alarm list queries by the NFVO (VNFM_FM_VNF_QUERY)				
		<ul> <li>VIM supports virtualised resources fault alarm list queries by the VNFM</li> </ul>					
			QUERY_BY_VNFM)				
		• • • •					
Pre-test condit	tions	<ul> <li>NS is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)</li> </ul>					
		NFVO is subscribed to VNF fault alarms on the VNFM					
		<ul> <li>VNFM is su</li> </ul>	NFM is subscribed to virtualised resources fault alarms on the VIM				
		<ul> <li>NS fault ala</li> </ul>	rm is created on the NFVO by failing a virtualised resource that is	allocated to the			
		relevant VN	F instance (TD_NFV_FM_VNF_NOTIFY_001)				
	1-	-					
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Resolve the failure of the virtualised resource allocated to the relevant VNF (e.g. restart the virtualised resource directly on the VIM)				
	2	IOP Check	Verify that the relevant virtualised resource fault alarm has been cleared on the VIM by querying the list of virtualised resource fault alarms				
	3	IOP Check	Verify that the relevant VNF fault alarm has been cleared on the VNFM by querying the list of VNF fault alarms				
	4	IOP Check	Verify that the relevant NS fault alarm has been cleared on the NFVO by querying the list of NS fault alarms				
IOP Verdict							

### 7.5.2.2 VNF Fault Alarm Clearance Notifications

# 7.6 Performance Management

## 7.6.1 Virtualised Resource Performance Management

### 7.6.1.1 Virtualised Resource PM Job Creation and Notification Monitoring

		Test Descrip	otion: VR PM job creation and notification monitoring				
Identifier		TD_NFV_PM_VR_CREATE_NOTIFY_001					
Test Purpose	9	Verify that the performance metrics of a virtualised resource that is required for a NS instance connectivity can be monitored using PM jobs and notifications					
Configuration	n	SUT Configuration 1					
References		ETSI GS NFV-II	FA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		NFVO can	create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CREATE	)			
		<ul> <li>VIM support</li> </ul>	ts VR PM jobs creation by the NFVO (VIM_PM_PMJOB_CREATE	BY NFVO)			
			subscribe to VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_SU	,			
			ts VR PM job subscriptions from the NFVO	,			
			PMJOB_SUBSCRIBE_BY_NFVO)				
		·	nerate VR PM notifications to the NFVO (VIM_PM_PMJOB_NOTIF	Y_BY_NFVO)			
		•	pports VR PM job notifications from the VIM (NFVO_PM_VR_PMJOB_NOTIFY)				
			n query VR PM jobs from the VIM (NFVO_PM_VR_PMJOB_QUERY)				
<ul> <li>VIM supports VR PM job queries by the NFVO (VIM_PM_PMJOB_QUERY_BY_NFVO)</li> </ul>							
Pre-test cond	ditions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)				
			parameters (e.g. metrics, metric groups, collection and reporting pe	eriods) are			
Test	Step	Туре	Description	Result			
Sequence	<u>3tep</u>	Stimulus	Trigger the NFVO to create a VR PM job for a virtualised	Result			
Oequence		Sumulus	resource that is allocated to the target NS instance				
	2	IOP Check	Verify that a VR PM job has been created on the VIM according				
			to the monitoring parameters by querying the VR PM jobs				
	3	Stimulus	Trigger the NFVO to subscribe to the VR PM job created in				
			step 1				
	4	IOP Check	Verify that a "performance information available" notification for				
			the monitored virtualised resource was generated by the VIM to				
	_		the NFVO by monitoring the VR PM notifications. See note.				
IOP Verdict							
NOTE: Me	tric colled	ction and reportir	ng periods should be taken into account.				

		Test Descri	ption: VR PM job creation and threshold monitoring				
Identifier			R_CREATE_THRESHOLD_001				
Test Purpose			erformance metrics of a virtualised resource that is required for a N	IS instance			
			be monitored using PM jobs and thresholds				
Configuration							
References			FA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		<ul> <li>NFVO can of</li> </ul>	create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CREATE	)			
		<ul> <li>VIM suppor</li> </ul>	ts VR PM jobs creation by the NFVO (VIM_PM_PMJOB_CREATE	_BY_NFVO)			
		<ul> <li>NFVO can of</li> </ul>	create VR PM thresholds on the VIM (NFVO_PM_VR_PMTH_CRE	EATE)			
		<ul> <li>VIM suppor</li> </ul>	ts VR PM thresholds creation by the NFVO				
		(VIM_PM_F	(VIM_PM_PMTH_CREATE_BY_NFVO)				
		<ul> <li>VIM can ge</li> </ul>	nerate VR PM notifications to the NFVO (VIM_PM_PMJOB_NOTII	FY_BY_NFVO)			
		<ul> <li>NFVO supp</li> </ul>	orts VR PM job notifications from the VIM (NFVO_PM_VR_PMJO	B_NOTIFY)			
		<ul> <li>NFVO can of</li> </ul>					
		<ul> <li>VIM supports VR PM job queries by the NFVO (VIM_PM_PMJOB_QUERY_BY_NFVO)</li> </ul>					
		<ul> <li>NFVO can of</li> </ul>	<ul> <li>NFVO can guery VR PM thresholds from the VIM (NFVO_PM_VR_PMTH_QUERY)</li> </ul>				
	• VIM supports VR PM threshold queries by the NFVO (VIM_PM_PMTH_QUERY_BY_NFVO)						
				ŕ			
Pre-test condit	tions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)				
		Monitoring parameters (e.g. metrics, metric groups, thresholds) are defined					
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the NFVO to create a VR PM job for a virtualised				
			resource that is allocated to the target NS instance				
	2	IOP Check	Verify that a VR PM job has been created on the VIM according				
	3	Stimulus	to the monitoring parameters by querying the VR PM jobs Trigger the NFVO to create a VR PM threshold for the				
	3	Sumulus	virtualised resource monitored in step 1				
	4	Stimulus	Trigger the NFVO to subscribe to the threshold crossing				
	-	Oumanas	notification for the VR PM threshold created in step 3				
	5	Stimulus	Trigger the virtualised resource to cross the specified threshold				
			(e.g. by increasing resource utilization levels in the				
			virtualisation container)				
	6	IOP Check	Verify that the "threshold crossed" notification for the monitored				
			virtualised resource was generated by the VIM to the NFVO by				
			monitoring the VR PM notifications				
IOP Verdict							

## 7.6.1.2 Virtualised Resource PM Job Creation and Threshold Monitoring

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			Test Description: VR PM job deletion				
Identifier		TD NFV PM VR DELETE MONITOR 001					
Test Purpose	<b>pose</b> Verify that the monitoring of performance metrics of a virtualised resource that is r						
		instance connect	ctivity can be stopped by deleting PM jobs				
Configuration SUT Configuration 1							
References		ETSI GS NFV-I	FA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		NFVO can	delete VR PM jobs from the VIM (NFVO_PM_VR_PMJOB_DELET	E)			
		<ul> <li>VIM support</li> </ul>	ts VR PM jobs deletion by the NFVO (VIM_PM_PMJOB_DELETE_	BY_NFVO)			
			subscribe to VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_SU	,			
			ts VR PM job subscriptions from the NFVO	/			
			PMJOB_SUBSCRIBE_BY_NFVO)				
			nerate VR PM notifications to the NFVO (VIM_PM_PMJOB_NOTIF	Y_BY_NFVO)			
		-					
<ul> <li>NFVO can query VR PM jobs from the VIM (NFVO_PM_VR_PMJOB_QUERY)</li> </ul>							
	<ul> <li>VIM supports VR PM job queries by the NFVO (VIM_PM_PMJOB_QUERY_BY_NFVO)</li> </ul>						
				<u>- (( ( ( ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )</u>			
Pre-test cond	itions	<ul> <li>NS is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)</li> </ul>					
			d resource that is required for the NS connectivity is monitored by t PM_VR_CREATE_NOTIFY_001)	he NFVO			
<b>T</b>				D K			
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the NFVO to delete a VR PM job of a virtualised resource that is allocated to the target NS instance				
	2	IOP Check	Verify that the relevant VR PM job has been deleted on the VIM				
	2		by querying the VR PM jobs				
	3	IOP Check	Verify that no "performance information available" notification for the monitored virtualised resource has been generated by				
			the VIM to the NFVO by monitoring the VR PM notifications.				
			See note.				
IOP Verdict			1				

### 7.6.1.3 Virtualised Resource PM Job Deletion

NOTE: Virtualised resource metric collection and reporting periods should be taken into account.

### 7.6.1.4 Virtualised Resource PM Threshold Deletion

		Т	est Description: VR PM threshold deletion				
Identifier		TD_NFV_PM_V	FD_NFV_PM_VR_DELETE_THRESHOLD_001				
Test Purpose				nstance			
Configuration		SUT Configurati					
References			A 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]				
Applicability			elete VR PM thresholds from the VIM (NFVO_PM_VR_PMTH_D	ELETE)			
			ts VR PM thresholds deletion by the NFVO MTH_DELETE_BY_NFVO)				
		NFVO can s	subscribe to VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_SU	BSCRIBE)			
		<ul> <li>VIM suppor</li> </ul>	rts VR PM job subscriptions from the NFVO				
			MJOB_SUBSCRIBE_BY_NFVO)				
		• VIM can generate VR PM notifications to the NFVO (VIM_PM_PMJOB_NOTIFY_BY_NFVO)					
		NFVO supports VR PM job notifications from the VIM (NFVO_PM_VR_PMJOB_NOTIFY)					
		<ul> <li>NFVO can query VR PM thresholds from the VIM (NFVO_PM_VR_PMTH_QUERY)</li> </ul>					
		<ul> <li>VIM supports VR PM threshold queries by the NFVO (VIM_PM_PMTH_QUERY_BY_NFVO)</li> </ul>					
Pre-test cond	litions	<ul> <li>NS is instar</li> </ul>	tiated (TD_NFV_NSLCM_INSTANTIATE_001)				
		<ul> <li>A threshold</li> </ul>	for a virtualised resource that is required for the NS connectivity is NFV_PM_VR_CREATE_THRESHOLD_001)	s created by the			
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the NFVO to delete a VR PM threshold of a virtualised				
			resource that is allocated to the target NS instance				
	2	IOP Check	Verify that the relevant VR PM threshold has been deleted on				
			the VIM by querying the VR PM thresholds				

	3	Stimulus	Trigger the virtualised resource to cross the specified threshold (e.g. by increasing resource utilization levels in the virtualisation container)	
	4	IOP Check	Verify that no "threshold crossed" notification for the monitored virtualised resource has been generated by the VIM to the NFVO by monitoring the VR PM notifications. See note.	
IOP Verdict				
NOTE: Virtualised resource metric collection and reporting periods should be taken into account.				

# 7.6.2 VNF Performance Management

## 7.6.2.1 VNF PM Job Creation and Notification Monitoring

		Test Descrip	tion: VNF PM job creation and notification monitoring				
Identifier		TD_NFV_PM_VNF_CREATE_NOTIFY_001					
Test Purpose	•	Verify that the performance metrics of a virtualised resource that is allocated to a VNF instance					
<b>a</b> <i>i</i> <b>i</b>			ance can be monitored using PM jobs and notifications				
Configuration	1	SUT Configurati					
References			FA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 01				
Applicability			create VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_DEL	,			
			oorts VNF PM jobs creation by the NFVO (VNFM_PM_VNF_PMJO				
		VNFM can	create VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_CREATE	()			
		<ul> <li>VIM support</li> </ul>	ts VR PM jobs creation by the VNFM (VIM_PM_PMJOB_CREATE	_BY_VNFM)			
			subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOE	3_SUBSCRIBE)			
			orts VNF PM job subscriptions from the NFVO LVNF_PMJOB_SUBSCRIBE)				
			subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SU	BSCRIBE)			
			ts VR PM job subscriptions from the VNFM	5001(152)			
		(VIM_PM_F	PMJOB_SUBSCRIBE_BY_VNFM)				
		•	nerate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTII	,			
		<ul> <li>VNFM supports VR PM job notifications from the VIM (VNFM_PM_VR_PMJOB_NOTIFY)</li> </ul>					
			orts VNF PM job notifications from the VNFM				
			(NFVO_PM_VNF_PMJOB_NOTIFY)				
			query VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_QUERY)				
			ts VR PM job queries by the VNFM (VIM_PM_PMJOB_QUERY_BY_VNFM)				
			query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QUERY)				
		<ul> <li>VINFINI Supp</li> </ul>	ports VNF PM job queries by the NFVO (VNFM_PM_VNF_PMJOB	QUERT)			
Pre-test cond	litions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)				
			parameters (e.g. metrics, metric groups, collection and reporting pe	ariada) ara			
		defined on		enous) are			
		donnod on					
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the NFVO to create a VNF PM job for a virtualised				
			resource allocated to the relevant VNF instance inside the				
			target NS instance				
	2	IOP Check	Verify that a VNF PM job has been created on the VNFM according to the monitoring parameters by querying the VNF				
			PM jobs				
	3	IOP Check	Verify that a virtualised resource PM job has been created on				
	-		the VIM according to the monitoring parameters by querying				
			the VR PM jobs				
	4	Stimulus	Trigger the NFVO to subscribe to the VNF PM job created in step 1				
	5	IOP Check	Verify that a "performance information available" notification for				
			the monitored virtualised resource was generated by the VIM to				
			the VNFM by monitoring the VR PM notifications. See note.				
	6	IOP Check	Verify that a "performance information available" notification for				
			the monitored virtualised resource was generated by the VNFM				
		1	to the NFVO by monitoring the VNF PM notifications. See note.				

#### 7.6.2.2 VNF PM Job Creation and Threshold Monitoring

		Test Descri	ption: VNF PM job creation and threshold monitoring				
Identifier			NF_CREATE_THRESHOLD_001				
Test Purpose	)		erformance metrics of a virtualised resource that is allocated to a \	/NF instance			
		inside a NS insta	ance can be monitored using PM jobs and thresholds				
Configuration	า	SUT Configurati					
References		ETSI GS NFV-I	FA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 01	3 [i.9]			
Applicability		<ul> <li>NFVO can</li> </ul>	create VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_CRE	EATE)			
		<ul> <li>VNFM supports VNF PM jobs creation by the NFVO (VNFM_PM_VNF_PMJOB_CREAT</li> </ul>					
		VNFM can	create VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_CREATE	E)			
		<ul> <li>VIM support</li> </ul>	ts VR PM jobs creation by the VNFM (VIM_PM_PMJOB_CREATE	BY_VNFM)			
			create VNF PM thresholds on the VNFM (NFVO_PM_VNF_PMTH	,			
		<ul> <li>VNFM supp</li> </ul>	ports VNF PM thresholds creation by the NFVO	_ ,			
			create VR PM thresholds on the VIM (VNFM_PM_VR_PMTH_CR	ATE)			
			ts VR PM thresholds creation by the VNFM				
		(VIM_PM_F	PMTH_CREATE_BY_VNFM)				
			subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOE	SUBSCRIBE)			
		(VNFM_PM	oorts VNF PM job subscriptions from the NFVO I_VNF_PMJOB_SUBSCRIBE)				
			subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SU	BSCRIBE)			
			<ul> <li>VIM supports VR PM job subscriptions from the VNFM (VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM)</li> </ul>				
		<ul> <li>VIM can ge</li> </ul>	VIM can generate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTIFY_BY_VNFM)				
<ul> <li>VNFM s</li> </ul>			pports VR PM job notifications from the VIM (VNFM_PM_VR_PMJOB_NOTIFY)				
		• VNFM can generate VNF PM notifications to the NFVO (VNFM_PM_VNF_PMJOB_NOTIFY)					
		<ul> <li>NFVO supports VNF PM job notifications from the VNFM (NFVO_PM_VNF_PMJOB_NOTIFY)</li> </ul>					
		VNFM can query VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_QUERY)					
			rts VR PM job queries by the VNFM (VIM_PM_PMJOB_QUERY_BY_VNFM)				
			query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QL	-			
			orts VNF PM job queries by the NFVO (VNFM_PM_VNF_PMJOB_QUERY) query VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_QUERY)				
			ts VR PM threshold queries by the VNFM (VIM_PM_PMTH_QUEF				
			query VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMT				
			ports VNF PM threshold queries by the NFVO (VNFM_PM_VNF_P				
Pre-test cond	litions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)				
			parameters (e.g. VNF instance, metrics, metric groups, threshold)	ara defined on			
		NFVO	parameters (e.g. vive instance, metrics, metric groups, timeshold)				
Fest	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the NFVO to create a PM job for a virtualised resource	nooun			
			allocated to the relevant VNF instance inside the target NS				
			instance				
	2	IOP Check	Verify that a VNF PM job has been created on the VNFM				
			according to the monitoring parameters by querying the VNF				
			PM jobs				
	3	IOP Check	Verify that a VR PM job has been created on the VIM according				
			to the monitoring parameters by querying the VR PM jobs				
	4	Stimulus	Trigger the NFVO to create a VNF PM threshold for the				
	-	Othersel	virtualised resource monitored in step 1				
	5	Stimulus	Trigger the NFVO to subscribe to the threshold crossing				
	6	Stimulus	notification for the VNF PM threshold created in step 4 Trigger the virtualised resource to cross the specified threshold				
	0	Sumulus	(e.g. by increasing resource utilization levels in the				
			virtualisation container)				
		1					

#### 7.6.2.3 VNF PM Job Deletion

			Test Description: VNE DM job deletion	1		
Identifier			Test Description: VNF PM job deletion NF_DELETE_MONITOR_001			
Test Purpose			onitoring of performance metrics of a virtualised resource that is a	llocated to a		
restrupose			side a NS instance can be stopped by deleting PM jobs	ilocaleu lo a		
Configuration		SUT Configuration 1				
References		ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 013 [i.9]				
Applicability			delete VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_DI			
			orts VNF PM jobs deletion by the NFVO (VNFM_PM_VNF_PMJO	,		
			delete VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_DELET	,		
			ts VR PM jobs deletion by the VNFM (VIM_MMVNMJOB_DELETE	,		
			delete VNF PM thresholds from the VNFM (VIVI_FM_FNJOB_DELETE	·		
			·	n_Delete)		
			orts VNF PM thresholds deletion by the NFVO _VNF_PMTH_DELETE)			
			 delete VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_DI	ELETE)		
			ts VR PM thresholds deletion by the VNFM	/		
			MTH_DELETE_BY_VNFM)			
			subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOE	3_SUBSCRIBE)		
			orts VNF PM job subscriptions from the NFVO _VNF_PMJOB_SUBSCRIBE)			
		<ul> <li>VNFM can s</li> </ul>	subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SU	BSCRIBE)		
			s VR PM job subscriptions from the VNFM MJOB_SUBSCRIBE_BY_VNFM)			
			nerate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTIFY_BY_VNFM)			
			orts VR PM job notifications from the VIM (VNFM_PM_VR_PMJOB_NOTIFY)			
			generate PM notifications to the NFVO (VNFM_PM_VNF_PMJOB_NOTIFY)			
• NFVO s			ports VNF PM job notifications from the VNFM M_VNF_PMJOB_NOTIFY)			
		VIM supports VR PM job queries by the VNFM (VIM_PM_PMJOB_QUERY_BY_VNFM)				
		<ul> <li>NFVO can query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QUERY)</li> </ul>				
		VNFM supports VNF PM jobs from the VNFM (NFVO_FM_VNF_PMJOB_QUERY)				
			VNFM can query VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_QUERY)			
			orts VR PM threshold queries by the VNFM (VIM M_ M_ VK_ MITL_QUERY_BY_VNFM)			
			query VNF PM thresholds from the VNFM (VIM_FM_FM_FM_FPMTH query VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH	,		
				,		
			orts VNF PM threshold queries by the NFVO (VNFM_PM_VNF_P			
Pre-test condit	ions	<ul> <li>NS is instan</li> </ul>	tiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			d resource that is allocated to a VNF instance inside the target NS	instance is		
			y the NFVO (TD_NFV_PM_VNF_CREATE_NOTIFY_001)	113101100 13		
			,			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger the NFVO to delete a PM job of a virtualised resource			
			that is allocated to a VNF instance inside the target NS instance			
	2	IOP Check	Verify that the relevant VNF PM job has been deleted on the			
			VNFM by querying the VNF PM jobs			
	3	IOP Check	Verify that the relevant VR PM job has been deleted on the VIM by querying the VR PM jobs			
	4	IOP Check	Verify that no "performance information available" notification			
			for the monitored virtualised resource has been generated by			
			the VIM to the VNFM by monitoring the VR PM notifications.			
			See note.			

	Test Description: VNF PM job deletion				
	5	IOP Check	Verify that no "performance information available" notification for the monitored virtualised resource has been generated by the VNFM to the NFVO by monitoring the VNF PM notifications. See note.		
IOP Verdict					
NOTE: Virtualised resource metric collection and reporting periods should be taken into account.					

### 7.6.2.4 VNF PM Threshold Deletion

Identifier			est Description: VNF PM threshold deletion				
			/NF_DELETE_THRESHOLD_001				
Test Purpose		Verify that a threat a	eshold created for a virtualised resource that is allocated to a VNF i	instance inside			
Configuration		SUT Configurat					
References			FA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 013	2 1; 01			
Applicability							
Аррисарину		<ul> <li>VNFM supp</li> </ul>	delete VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTI ports VNF PM thresholds deletion by the NFVO	H_DELETE)			
			<ul> <li>(VNFM_PM_VNF_PMTH_DELETE)</li> <li>VNFM can delete VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_DELETE)</li> </ul>				
		<ul> <li>VIM support</li> </ul>	rts VR PM thresholds deletion by the VNFM PMTH_DELETE_BY_VNFM)	,			
		•	subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB	SUBSCRIBE)			
		<ul> <li>VNFM supp</li> </ul>	ports VNF PM job subscriptions from the NFVO	_ ,			
		• VNFM can	subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SU rts VR PM job subscriptions from the VNFM	BSCRIBE)			
		(VIM_PM_F	PMJOB_SUBSCRIBE_BY_VNFM) nerate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTIF	TY BY VNEM			
		<ul> <li>VNFM supp</li> </ul>	ports VR PM job notifications from the VIM (VNFM_PM_VR_PMJO	B_NOTIFY)			
		VNFM can query VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_QUERY)					
			query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QU				
		<ul> <li>VNFM supp</li> </ul>	ports VNF PM job queries by the NFVO (VNFM_PM_VNF_PMJOB_	QUERY)			
Dro toct com				/			
Fie-test cond		<ul> <li>A threshold</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)				
		<ul> <li>A threshold is created b</li> </ul>	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)	a NS instance			
Test	Step	<ul> <li>A threshold is created b</li> <li>Type</li> </ul>	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001) Description				
Test		<ul> <li>A threshold is created b</li> </ul>	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)	a NS instance			
Test	Step	<ul> <li>A threshold is created b</li> <li>Type</li> </ul>	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)           Description           Trigger the NFVO to delete a VNF PM threshold of a virtualised resource that is allocated to a VNF instance inside the target NS instance           Verify that the relevant VNF PM threshold has been deleted on the VNFM by querying the VNF PM thresholds	a NS instance			
Test	Step 1	<ul> <li>A threshold is created b</li> <li>Type</li> <li>Stimulus</li> </ul>	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)           Description           Trigger the NFVO to delete a VNF PM threshold of a virtualised resource that is allocated to a VNF instance inside the target NS instance           Verify that the relevant VNF PM threshold has been deleted on	a NS instance			
Test	<b>Step</b> 1 2	A threshold is created b     Type     Stimulus     IOP Check	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)	a NS instance			
Test	<b>Step</b> 1 2 3	A threshold is created b     Type     Stimulus     IOP Check     IOP Check	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)	a NS instance			
Pre-test cond Test Sequence	Step           1           2           3           4	A threshold is created b     Type     Stimulus     IOP Check     IOP Check     Stimulus	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)	a NS instance			
Test	Step           1           2           3           4           5	A threshold is created b     Type     Stimulus     IOP Check     IOP Check     Stimulus     IOP Check	for a virtualised resource that is allocated to a VNF instance inside by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)	a NS instance			

# 7.7 NS Lifecycle Management

## 7.7.1 NS Instantiation

### 7.7.1.1 Standalone NS Instantiation

			st Description: standalone NS instantiation			
Identifier			M_INSTANTIATE_001			
Test Purpose			tandalone NS can be successfully instantiated			
Configuration		SUT Configuration				
References			A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.8] § [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI		
Applicability			I can generate "allocate compute resource" operation requests to I_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM		
		<ul> <li>NFVO/VNFI (NFVO_NRI</li> </ul>	A can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM		
			I can generate "allocate storage resource" operation requests to t I_ALLOCATE or VNFM_SRM_ALLOCATE)	he VIM		
			s "allocate compute resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	<b>VNFM</b>		
			s "allocate network resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM		
		(VIM_SRM_	s "allocate storage resource" operation requests from the NFVO/\ ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)			
		or VNFM_S	<pre>A can query software image information from the VIM (NFVO_SW WIM_QUERY_IM)</pre>	IM_QUERY_IM		
		(VIM_ŚŴIM	software image information queries by the NFVO/VNFM QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)			
		<ul> <li>NFVO/VNFI VNFM_CRM</li> </ul>	I can query compute resource information from the VIM (NFVO_C I_QUERY)	CRM_QUERY or		
		<ul> <li>NFVO/VNFI VNFM_NRM</li> </ul>	RM_QUERY or			
		<ul> <li>NFVO/VNFM can query storage resource information from the VIM (NFVO_SRM_QUERY or VNFM_SRM_QUERY)</li> </ul>				
		<ul> <li>VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)</li> </ul>				
		<ul> <li>VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> </ul>				
			d storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or NFO_TO_VNFM) uery VNF information from the VNFM (NFVO_VNFLCM_QUERY)			
		<ul> <li>NFVO can d</li> </ul>				
		<ul> <li>VNFM supp</li> </ul>	ts VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)			
			· · · · ·			
Pre-test condit	ions	<ul> <li>NSD, its ass boarded to t</li> </ul>	ociated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) hat he NFVO	ave been on-		
		<ul> <li>The softwar</li> </ul>	e image repository is reachable by the VIM			
			resources are available on the NFVI			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger NS instantiation on the NFVO			
	2	IOP Check	Verify that the software images have been successfully added to the image repository managed by the VIM			
	3	IOP Check	Verify that the requested resources have been allocated by the VIM according to the descriptors			
	4	IOP Check	Verify that the VNF instance(s) have been deployed according to the NSD (i.e. query the VIM and VNFM for VMs, VLs and CPs)			
	5	IOP Check	Verify that the VNF instance(s) are reachable via the management network			
	6	IOP Check	Verify that the VNF instance(s) have been configured according to the VNFD(s) by querying the VNFM			

IOP Verdict	9	IOP Check	as successful Verify that the NS is successfully instantiated by running the end-to-end functional test	
	8	IOP Check	been connected according to the descriptors Verify that the NFVO indicates NS instantiation operation result	
	7	IOP Check	Verify that the VNF instance(s), VL(s) and VNFFG(s) have	

### 7.7.1.2 Nested NS Instantiation

dentifier         TD_NFV_NSLCM_INSTANTIATE_NEST_NS_001           fest Purpose         To verify that a NS referencing an existing nested NS can be successfully instantiated           Configuration         SUT Configuration 3           References         ETSI GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]           Npplicability         NFV-07V/NFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)           NFV0/VNFM can generate "allocate torrage resource" operation requests to the VIM (NFVO_NFM_ALLOCATE or VNFM_SRM_ALLOCATE)           NFV0/VNFM can generate "allocate storage resource" operation requests to the VIM (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           VIM supports "allocate network resource" operation requests to the NFV0/VNFM (VIM_CRM_ALLOCATE or VNFM_SRM_ALLOCATE)           VIM supports "allocate compute resource" operation requests from the NFV0/VNFM (VIM_SRM_ALLOCATE BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)           VIM supports "allocate corage resource" operation requests from the NFV0/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)           VIM supports "allocate storage resource" operation requests from the NFV0/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)           VIM supports "allocate storage resource" operation requests from the NFV0/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)           VIM supports software image information from the VIM (NFVO_SVIM_QUERY_IM or VNFM_SVIM_QUERY_IM)           VIM can send compute resource information to the NFV0 (VIM_SRM_IN			•	Test Description: nested NS instantiation		
To: verify that a NS referencing an existing nested NS can be successfully instantiated	Identifier					
Sumfiguration         SUT Configuration 3           References         ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5], ETSI GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]           Applicability <ul> <li>NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate network resource" operation requests to the VIM (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate network resource" operation requests to the VIM (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE BY_NFM)</li> <li>VIM supports "allocate network resource" operation requests from the NFVO/VNFM (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_ALUCATE_BY_NFVO or VIM_SRM_ALLOCATE BY_VNFM)</li> <li>VIM supports software image information queries by the NFVO/VNFM (VIM_SRM_ALUCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports software image information queries by the NFVO/NFM</li></ul>					ted	
leferences         ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 013 [i.9]           gpplicability <ul> <li>NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]</li> </ul>					ieu	
GS NFV-IFA 008 [i.6], ĚTŠI GS NFV-IFA 010 [i.7] and ĚTSI GS NFV-IFA 013 [i.9]           Applicability              • NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM             (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)            • NFVO/VNFM can generate "allocate storage resource" operation requests to the VIM             (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)            • NFVO/VNFM can generate "allocate storage resource" operation requests to the VIM             (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)            • NFVO/VNFM can generate "allocate storage resource" operation requests from the NFVO/VNFM             (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)            • VIM supports "allocate network resource" operation requests from the NFVO/VNFM             (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)            • VIM supports "allocate network resource" operation requests from the NFVO/VNFM             (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)            • VIM supports "allocate storage resource" operation requests from the NFVO/VNFM             (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)            • VIM supports "allocate storage resource" operation requests from the NFVO/VNFM             (VIM_SRM_NCA anguery software image information from the VIM (NFVO_SWIM_QUERY_IM             or VNFM_SWIM_QUERY_IM)            • VIM can send compute resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or             VIM_CAR_INFO_TO_VNFM)            • VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or             VIM_CAR_INFO_TO_VNFM) <th></th> <th></th> <th></th> <th></th> <th></th>						
Applicability <ul> <li>NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate network resource" operation requests to the VIM (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate network resource" operation requests to the VIM (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)</li> <li>VIM supports "allocate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate network resource" operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports allocate storage resource operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports software image information from the VIM (NFVO_SWIM_QUERY_IM or VNFM_SVIM_QUERY_IM_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports software image information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_NFVM)</li> <li>VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> <li>VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_NFVM)</li> <li>VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_NFVM)</li> <li>VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM</li></ul>	References				J, ETSI	
NFVO/VNFM can generate "allocate network resource" operation requests to the VIM     (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)     NFVO/VNFM can generate "allocate storage resource" operation requests to the VIM     (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)     VIM supports "allocate compute resource" operation requests from the NFVO/VNFM     (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_NRM_ALLOCATE_BY_NFVO or VIM_RRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)     VIM supports coftware image information from the VIM (NFVO_SWIM_QUERY_IM     or VNFM_SWIM_QUERY_IM)     VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or     VIM_CRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or     VIM_CRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM supports VNF information queries by the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM     VIM supports VNF information queries by the NFVO (VNF_VNFLCM_QUERY)     * VNFM supports VNF information queries by the NFVO (VNF_VNFLCM_QUERY)     * VNFM supports VNF information queries by the NFVO (VNF_VNFLCM_QUERY)     * VNFM supports VNF information queries by the NFVO (VNF_VNFLCM_QUERY)     * NSD2 references nested NSD1     NSD2 references neste	Applicability		NFVO/VNF	M can generate "allocate compute resource" operation requests to	the VIM	
NFVO/VNFM can generate "allocate storage resource" operation requests to the VIM     (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)     VIM supports "allocate compute resource" operation requests from the NFVO/VNFM     (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)     VIM supports "allocate network resource" operation requests from the NFVO/VNFM     (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage information from the VIM (NFVO_SWIM_QUERY_IM     or VNFM_SWIM_QUERY_IM)     VIM supports software image information queries by the NFVO/VNFM     (VIM_SWIM_QUERY_IM_MPY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)     VIM can send compute resource information to the NFVO (VIM_SM_INFO_TO_NFVO or      VIM_CRM_INFO_TO_VNFM)     VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send atorage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VIM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     NSD2 is not instantiated     NS1 is instantiated		•		VO/VNFM can generate "allocate network resource" operation requests to the VIM		
VIM supports "allocate compute resource" operation requests from the NFVO/VNFM     (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage resource" operation requests from the NFVO/VNFM     (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)     VIM supports "allocate storage information from the VIM (NFVO_SWIM_QUERY_IM     or VNFM_SWIM_QUERY_IM)     VIM supports software image information queries by the NFVO/VNFM     (VIM_SWIM_QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)     VIM can send compute resource information to the NFVO (VIM_DRM_INFO_TO_NFVO or     VIM_CRM_INFO_TO_VNFM)     VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_CRM_INFO_TO_VNFM)     VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM supports VNF information queries by the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM supports VNF information queries by the NFVO (VIM_SRM_INFO_TO_NFVO or     VIM_SRM_INFO_TO_VNFM)     VIM tare sendate descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on-     boarded to the NFVO     NSD2 is associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on-     boarded to the NFVO     NSD2 is reachable by the VIM     The requir			NFVO/VNF	M can generate "allocate storage resource" operation requests to t	he VIM	
•       VIM supports "allocate network resource" operation requests from the NFVO/VNFM (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)         •       VIM supports "allocate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)         •       NFVO/VNFM can query software image information from the VIM (NFVO_SWIM_QUERY_IM or VNFM_SWIM_QUERY_IM)         •       NIM supports software image information queries by the NFVO/VNFM (VIM_SWIM_QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)         •       VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)         •       VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         •       VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         •       VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         •       NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)         •       VNFM supports VNF information queries by the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         •       NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on- boarded to the NFVO         •       NSD2 is not instantiated         •       NSD2 is not instantiated         •       NSD2 is not instantiated         •       NSD2 is not instantiated (TD_NFV_NSLCM_INSTA			<ul> <li>VIM suppor</li> </ul>	ts "allocate compute resource" operation requests from the NFVO/	VNFM	
•       VIM supports "allocate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)         •       NFVO/VNFM can query software image information from the VIM (NFVO_SWIM_QUERY_IM or VNFM_SWIM_QUERY_IM)         •       VIM supports software image information queries by the NFVO/VNFM (VIM_SWIM_QUERY_IM)         •       VIM supports software image information queries by the NFVO/VNFM (VIM_SWIM_QUERY_IM)         •       VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)         •       VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)         •       VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         •       VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         •       NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)         •       VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)         •       VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)         •       VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)         •       NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on- boarded to the NFVO         •       NSD2 references nested NSD1       NSD2 references nested NSD1         •       NSD2 references are a			<ul> <li>VIM suppor</li> </ul>	ts "allocate network resource" operation requests from the NFVO/V	/NFM	
NFVO/VNFM can query software image information from the VIM (NFVO_SWIM_QUERY_IM or VNFM_SWIM_QUERY_IM)     VIM supports software image information queries by the NFVO/VNFM (VIM_SWIM_QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)     VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)     VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)     VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)     NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (NFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     NSD2 is not instantiated     NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)     The software image repository is reachable by the VIM     The required resources are available on the NFVI			<ul> <li>VIM suppor</li> </ul>	ts "allocate storage resource" operation requests from the NFVO/V	NFM	
(VIM_SWIM_QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)         • VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)         • VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)         • VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         • VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         • VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         • VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         • VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         • VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         • NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)         • VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)         • NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been onboarded to the NFVO         • NSD2 references nested NSD1         • NSD2 is not instantiated         • NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)         • The required resources are available on the NFVI         * The required resources are available on the NFVO         2       IOP Check       Verify that the software images of the VNF(s) referenced			NFVO/VNF	M can query software image information from the VIM (NFVO_SWI	M_QUERY_IM	
•       VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)         •       VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)         •       VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)         •       VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         •       NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)         •       VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)         •       NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been onboarded to the NFVO         •       NSD2 references nested NSD1         •       NS1 is instantiated         •       NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)         •       The required resources are available on the NFVI         Fest       Step       Type         •       Description       Result         2       IOP Check       Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM						
VIM_NRM_INFO_TO_VNFM)         VIM_SRM_INFO_TO_VNFM)         VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)         NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)         VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)         Pre-test conditions         • NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on-boarded to the NFVO         • NSD2 references nested NSD1         • NS2 is not instantiated         • NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)         • The required resources are available on the NFVI         Test         Step       Type         0       Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM	<ul> <li>VIM can send compute resource information to the NFVO (VIM_</li> </ul>				O_NFVO or	
VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)     NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)     NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on-boarded to the NFVO     NSD2 references nested NSD1     NS2 is not instantiated     NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)     The software image repository is reachable by the VIM     The required resources are available on the NFVI     The required resources are available on the NFVI     If the software image NS2 instantiation on the NFVO     I OP Check Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM					IFO_TO_NFVO or	
NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)     VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)  Pre-test conditions     NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on- boarded to the NFVO     NSD2 references nested NSD1     NS2 is not instantiated     NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)     The software image repository is reachable by the VIM     The required resources are available on the NFVI  rest Sequence     Step Type Description Result     I Stimulus Trigger NS2 instantiation on the NFVO     IOP Check Verify that the software images of the VNF(s) referenced in     NSD2 have been successfully added to the image repository     managed by the VIM			<ul> <li>VIM can set</li> </ul>			
VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)  Pre-test conditions     NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on- boarded to the NFVO     NSD2 references nested NSD1     NS2 is not instantiated     NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)     The software image repository is reachable by the VIM     The required resources are available on the NFVI  Fest Sequence     Step Type Description Result     I Stimulus Trigger NS2 instantiation on the NFVO     IOP Check Verify that the software images of the VNF(s) referenced in     NSD2 have been successfully added to the image repository     managed by the VIM				•		
Pre-test conditions <ul> <li>NSD2, its associated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) have been on-boarded to the NFVO</li> <li>NSD2 references nested NSD1</li> <li>NS2 is not instantiated</li> <li>NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)</li> <li>The software image repository is reachable by the VIM</li> <li>The required resources are available on the NFVI</li> </ul> <li>Test Sequence</li> <li>Step Type Description Result</li> <li>Stimulus Trigger NS2 instantiation on the NFVO</li> <li>IOP Check Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM</li>						
Image: Second					•	
<ul> <li>NSD2 references nested NSD1</li> <li>NS2 is not instantiated</li> <li>NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)</li> <li>The software image repository is reachable by the VIM</li> <li>The required resources are available on the NFVI</li> </ul> Test Sequence           Step         Type         Description         Result           1         Stimulus         Trigger NS2 instantiation on the NFVO         2           2         IOP Check         Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM	Pre-test condi	itions	<ul> <li>NSD2, its a</li> </ul>	ssociated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) h	ave been on-	
NS2 is not instantiated     NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)     The software image repository is reachable by the VIM     The required resources are available on the NFVI      Sequence     Step Type Description Result     I Stimulus Trigger NS2 instantiation on the NFVO     IOP Check Verify that the software images of the VNF(s) referenced in     NSD2 have been successfully added to the image repository     managed by the VIM			boarded to	the NFVO		
NS1 is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)     The software image repository is reachable by the VIM     The required resources are available on the NFVI      Sequence     Step Type Description Result     I Stimulus Trigger NS2 instantiation on the NFVO     IOP Check Verify that the software images of the VNF(s) referenced in     NSD2 have been successfully added to the image repository     managed by the VIM			<ul> <li>NSD2 refer</li> </ul>	ences nested NSD1		
The software image repository is reachable by the VIM     The required resources are available on the NFVI     Sequence     Sequence     I Stimulus Trigger NS2 instantiation on the NFVO     IOP Check Verify that the software images of the VNF(s) referenced in     NSD2 have been successfully added to the image repository     managed by the VIM			<ul> <li>NS2 is not i</li> </ul>	nstantiated		
The software image repository is reachable by the VIM     The required resources are available on the NFVI     Sequence     Sequence <u>1 Stimulus Trigger NS2 instantiation on the NFVO     2 IOP Check Verify that the software images of the VNF(s) referenced in     NSD2 have been successfully added to the image repository     managed by the VIM </u>			<ul> <li>NS1 is insta</li> </ul>	intiated (TD_NFV_NSLCM_INSTANTIATE_001)		
The required resources are available on the NFVI      Sequence     Sequence     Sequence     I Stimulus Trigger NS2 instantiation on the NFVO     IOP Check Verify that the software images of the VNF(s) referenced in     NSD2 have been successfully added to the image repository     managed by the VIM						
Step         Type         Description         Result           Sequence         1         Stimulus         Trigger NS2 instantiation on the NFVO         2           2         IOP Check         Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM         1						
Sequence         1         Stimulus         Trigger NS2 instantiation on the NFVO           2         IOP Check         Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM						
2 IOP Check Verify that the software images of the VNF(s) referenced in NSD2 have been successfully added to the image repository managed by the VIM	Test	Step	Туре	Description	Result	
NSD2 have been successfully added to the image repository managed by the VIM	Sequence	1	Stimulus			
managed by the VIM		2	IOP Check			
3   IOP Check  Verify that resources associated to NS2 have been allocated by						
the VIM according to the descriptors		3	IOP Check			
4 IOP Check Verify that the VNF instance(s) have been deployed according		4	IOP Check			
to the NSD (i.e. query the VIM and VNFM for VMs, VLs and CPs)				to the NSD (i.e. query the VIM and VNFM for VMs, VLs and		
5 IOP Check Verify that existing VNF instance(s) in NS1 are running and		5	IOP Check			
reachable via the management network		L				
6 IOP Check Verify that the VNF instance(s) in NS2 are running and		6	IOP Check	Verify that the VNF instance(s) in NS2 are running and		
reachable through the management network				reachable through the management network		

	Test Description: nested NS instantiation				
	7	IOP Check	Verify that the VNF instances(s) in NS2 have been configured according to the VNFD(s) by querying the VNFM		
	8	IOP Check	Verify that the VNF instance(s), VL(s) and VNFFG(s) in NS2 have been connected according to the descriptors		
	9	IOP Check	Verify that the NFVO indicates NS2 instantiation operation		
			result as successful		
	10	IOP Check	Verify that NS2 is successfully instantiated by running an end- to-end functional test re-using the functionality of VNF instance(s) inside NS1		
IOP Verdict					

# 7.7.2 NS Scaling

### 7.7.2.1 NS Scale Out

### 7.7.2.1.1 NS Scale out with an Operator Action

Test Description: NS scale out with an operator action           Identifier         TD_NFV_NSLCM_SCALE_OUT_001           Test Purpose         Verify that the NS can be successfully scaled out by adding VNF instances trigg operator action           Configuration         SUT Configuration 1           References         ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 013 [i.           Applicability         • NFVO/VNFM can generate "allocate compute resource" operation requests (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)           • NFVO/VNFM can generate "allocate network resource" operation requests (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)         • NFVO/VNFM can generate "allocate storage resource" operation requests (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests to (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)         • NFVO/VNFM can generate "allocate storage resource" operation requests to (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests to (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)         • VIM supports "allocate compute resource" operation requests from the NFV (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)           • VIM supports "allocate storage resource" operation requests from the NFV (VIM_SRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	(i.5], ETSI 9] to the VIM o the VIM o the VIM O/VNFM
Test Purpose         Verify that the NS can be successfully scaled out by adding VNF instances trigg operator action           Configuration         SUT Configuration 1           References         ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.           Applicability         • NFVO/VNFM can generate "allocate compute resource" operation requests (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)           • NFVO/VNFM can generate "allocate network resource" operation requests (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)         • NFVO/VNFM can generate "allocate storage resource" operation requests (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests to (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)         • NFVO/VNFM can generate "allocate storage resource" operation requests to (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests from the NFV (VIM_CRM_ALLOCATE or VNFM_SRM_ALLOCATE)         • VIM supports "allocate compute resource" operation requests from the NFV (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)         • VIM supports "allocate network resource" operation requests from the NFV (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)         • VIM supports "allocate storage resource" operation requests from the NFV (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)         • VIM supports "allocate storage resource" operation requests from the NFV (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)         • VIM supports "allocate storage resource" operation requests from the NFV (VIM_NRM_AL	(i.5], ETSI 9] to the VIM o the VIM o the VIM O/VNFM
Configuration         SUT Configuration 1           References         ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.           Applicability         • NFVO/VNFM can generate "allocate compute resource" operation requests (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)           • NFVO/VNFM can generate "allocate network resource" operation requests (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests t (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests t (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • VIM supports "allocate compute resource" operation requests from the NFV (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)           • VIM supports "allocate network resource" operation requests from the NFVQ (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)           • VIM supports "allocate storage resource" operation requests from the NFVQ	to the VIM o the VIM o the VIM O/VNFM
References         ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.           Applicability         • NFVO/VNFM can generate "allocate compute resource" operation requests (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)           • NFVO/VNFM can generate "allocate network resource" operation requests (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests t (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • NFVO/VNFM can generate "allocate storage resource" operation requests t (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)           • VIM supports "allocate compute resource" operation requests from the NFV (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)           • VIM supports "allocate network resource" operation requests from the NFVQ (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)           • VIM supports "allocate storage resource" operation requests from the NFVQ	to the VIM o the VIM o the VIM O/VNFM
<ul> <li>Applicability</li> <li>NFVO/VNFM can generate "allocate compute resource" operation requests (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate network resource" operation requests (NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate storage resource" operation requests t (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate storage resource" operation requests from the NFV (VIM supports "allocate compute resource" operation requests from the NFV (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate network resource" operation requests from the NFV (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFV (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> </ul>	to the VIM o the VIM o the VIM O/VNFM
<ul> <li>(NFVO_NRM_ALLOCATE or VNFM_NRM_ALLOCATE)</li> <li>NFVO/VNFM can generate "allocate storage resource" operation requests to (NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)</li> <li>VIM supports "allocate compute resource" operation requests from the NFV (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate network resource" operation requests from the NFV( (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFV( (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFVC</li> </ul>	o the VIM O/VNFM
<ul> <li>(NFVO_SRM_ALLOCATE or VNFM_SRM_ALLOCATE)</li> <li>VIM supports "allocate compute resource" operation requests from the NFV (VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate network resource" operation requests from the NFV0 (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFV0</li> </ul>	O/VNFM
<ul> <li>(VIM_CRM_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate network resource" operation requests from the NFV( (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFV0</li> </ul>	
<ul> <li>(VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> <li>VIM supports "allocate storage resource" operation requests from the NFVO</li> </ul>	)/VNFM
<ul> <li>VIM supports "allocate storage resource" operation requests from the NFVC</li> </ul>	
	/VNFM
<ul> <li>NFVO can generate "scale out by adding VNF instances" requests to the VI (NFVO_VNFLCM_NS_SCALE_OUT)</li> </ul>	IEM
<ul> <li>VNFM supports "scale out by adding VNF instances" requests from the NFV (VNFM_VNFLCM_NS_SCALE_OUT)</li> </ul>	Ό
Pre-test conditions • NS is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)	
NFVI has the required amount of consumable virtual resources to run the second se	aled-out NS
Test Oten Tens Description	Desult
Test Step Type Description	Result
Sequence         1         Stimulus         Trigger NS scale out by adding VNF instances to the NS in NFVO with an operator action	
2 IOP Check Verify that the additional VNF instance(s) have been deployed by querying the VNFM	
3 IOP Check Verify that the additional resources have been allocated by the VIM according to the descriptors	
4 IOP Check Verify that the additional VNF instance(s) are running and reachable via their management network	
5 IOP Check Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM	
6 IOP Check Verify that the additional VNF instances(s), VL(s) and VNFFG(s) are connected according to the descriptors	
7 IOP Check Verify that the NFVO indicates the scaling operation result as successful	
8 IOP Check Verify that NS has been scaled out by running the end-to-end functional test factoring the VNF scale and capacity	

	Test Description: NS scale out with an operator action	
IOP Verdict		

#### 7.7.2.1.2 NS Scale out with a VNF Indicator

Identifier		1000	Description: NS scale out with a VNF indicator	
		TD_NFV_NSLC	CM_SCALE_OUT_002	
Test Purpose	,	Verify that the N	VS can be successfully scaled out by adding VNF instances triggere	ed automatically
		by a VNF indica	ator	
Configuration		SUT Configurat	ion 1	
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5	i], ETSI
			08 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	
Applicability			FM can generate "allocate compute resource" operation requests to RM_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM
			FM can generate "allocate network resource" operation requests to t RM_ALLOCATE or VNFM_NRM_ALLOCATE)	he VIM
		NFVO/VNF	FM can generate "allocate storage resource" operation requests to the RM_ALLOCATE or VNFM_SRM_ALLOCATE)	he VIM
		<ul> <li>VIM support</li> </ul>	rts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM
		<ul> <li>VIM support</li> </ul>	_ALLOCATE_BT_IN VO 01 VIM_CIXIM_ALLOCATE_BT_VNI M) rts "allocate network resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM
		<ul> <li>VIM support</li> </ul>	rts "allocate storage resource" operation requests from the NFVO/V _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	NFM
			subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SUB	BSCRIBE)
			upports VNF indicator subscriptions from the VNFM (EM_VNFINDI_	
			an generate VNF indicator notifications to the VNFM (EM_VNFINDI	
		<ul> <li>VNFM supp</li> </ul>	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND	I_NOTIFÝ)
		<ul> <li>NFVO can generate "scale out by adding VNF instances" requests to the VNFM</li> </ul>		
		(NFVO_VNFLCM_NS_SCALE_OUT)		
		VNFM supports "scale out by adding VNF instances" requests from the NFVO		
			IFLCM_NS_SCALE_OUT)	
Pre-test condi	tions	<ul> <li>NS is instal</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	
Pre-test condi			ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	ed-out NS
Pre-test condi		<ul> <li>NFVI has the second seco</li></ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale	
Pre-test condi		<ul><li>NFVI has the NFVO/VNF</li></ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale M is configured to trigger "scale out by adding VNF instances" whe	
Pre-test condi		<ul><li>NFVI has the NFVO/VNF</li></ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale	
		<ul> <li>NFVI has the NFVO/VNF indicator value</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale M is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold	n a given VNF
Test		<ul> <li>NFVI has the NFVO/VNF indicator value</li> <li>Type</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale M is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold <b>Description</b>	
Test	Step	<ul> <li>NFVI has the NFVO/VNF indicator value</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale M is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description Trigger the EM/VNF to send the targeted VNF indicator to the	n a given VNF
Test	Step	<ul> <li>NFVI has the NFVO/VNF indicator value</li> <li>Type</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale FM is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed Verify that the "scale out by adding VNF instance(s)" procedure	n a given VNF
Test	Step 1	<ul> <li>NFVI has the NFVO/VNF indicator value</li> <li>Type Stimulus</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale FM is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO           Verify that the additional VNF instance(s) have been deployed	n a given VNF
Test	<b>Step</b> 1 2	NFVI has the NFVO/VNF indicator value of the NFVO/VNFVO/VNF indicator value of the NFVO/VNFVVO/VNFVVO/VNFVO/VNFVO/VNFVO/VNFVVO/VNFVVO/VNFVO/VNFVV	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale FM is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO           Verify that the additional VNF instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the	n a given VNF
Test	<b>Step</b> 1 2 3	NFVI has the NFVO/VNF indicator value of the NFVO/VNFVO	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale FM is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO           Verify that the additional VNF instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the VIM according to the descriptors           Verify that the additional VNF instance(s) are running and	n a given VNF
Test	Step           1           2           3           4	<ul> <li>NFVI has the NFVO/VNF indicator value</li> <li>Type Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale FM is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO           Verify that the additional VNF instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the VIM according to the descriptors           Verify that the additional VNF instance(s) are running and reachable via their management network           Verify that the additional VNF instance(s) have been	n a given VNF
Test	Step           1           2           3           4           5           6	<ul> <li>NFVI has the NFVO/VNF indicator value</li> <li>Type Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale FM is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO           Verify that the additional VNF instance(s) have been deployed by querying the VNFM           Verify that the additional VNF instance(s) have been deployed by querying the descriptors           Verify that the additional VNF instance(s) are running and reachable via their management network           Verify that the additional VNF instance(s) have been configured according to the descriptors by querying the VNFM	n a given VNF
Test	Step           1           2           3           4           5	<ul> <li>NFVI has the NFVO/VNF indicator value</li> <li>Type Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale The scale out by adding VNF instances" whe alue crosses a certain threshold <b>Description</b> Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO Verify that the additional VNF instance(s) have been deployed by querying the VNFM Verify that the additional resources have been allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable via their management network Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM	n a given VNF
Test	Step           1           2           3           4           5           6           7	<ul> <li>NFVI has the NFVO/VNF indicator value of the NFVO/VNF indicator value of the NFVO/VNF of the NFVO/V</li></ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold <b>Description</b> Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO Verify that the additional VNF instance(s) have been deployed by querying the VNFM Verify that the additional resources have been allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable via their management network Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM Verify that the additional VNF instances(s), NL(s) and VNFFG(s) are connected according to the descriptors	n a given VNF
Pre-test condi Test Sequence	Step           1           2           3           4           5           6	<ul> <li>NFVI has the NFVO/VNF indicator value</li> <li>Type Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale The scale out by adding VNF instances" whe alue crosses a certain threshold <b>Description</b> Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO Verify that the additional VNF instance(s) have been deployed by querying the VNFM Verify that the additional resources have been allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable via their management network Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM	n a given VNF
Test	Step           1           2           3           4           5           6           7	<ul> <li>NFVI has the NFVO/VNF indicator value of the NFVO/VNF indicator value of the NFVO/VNF of the NFVO/V</li></ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale is configured to trigger "scale out by adding VNF instances" whe alue crosses a certain threshold Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO Verify that the additional VNF instance(s) have been deployed by querying the VNFM Verify that the additional resources have been allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable via their management network Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM Verify that the additional VNF instances(s), NL(s) and VNFFG(s) are connected according to the descriptors Verify that the NFVO indicates the scaling operation result as	n a given VNF

			st Description: NS scale out with a VIM KPI			
Identifier Test Purpose			M_SCALE_OUT_003 S can be successfully scaled out by adding VNF instances triggere	a automatically		
restrupose		by a VIM KPI	S can be successivily scaled but by adding vivil instances trigger	automatically		
Configuration	)	SUT Configurati	on 1			
References		ETSI GS NFV-IF	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI		
Applicability		<ul> <li>NFVO/VNF</li> </ul>	M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM		
		NFVO/VNF	M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM		
		<ul> <li>NFVO/VNF</li> </ul>	M can generate "allocate storage resource" operation requests to t M_ALLOCATE or VNFM_SRM_ALLOCATE)	he VIM		
			ts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM		
			ts "allocate network resource" operation requests from the NFVO/^ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM		
			ts "allocate storage resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	/NFM		
		VNFM_PM_	M can create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CI _VR_PMJOB_CREATE)	REATE or		
		(VIM_PM_F	ts VR PM jobs creation by the NFVO/VNFM PMJOB_CREATE_BY_NFVO or VIM_PM_PMJOB_CREATE_BY_			
		VNFM_PM	M can create VR PM thresholds on the VIM (NFVO_PM_VR_PMT _VR_PMTH_CREATE)	H_CREATE or		
		<ul> <li>VIM supports VR PM thresholds creation by the NFVO/VNFM (VIM_PM_PMTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VNFM)</li> </ul>				
		<ul> <li>NFVO/VNFM can subscribe to VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_SUBSCRIBE or VNFM_PM_VR_PMJOB_SUBSCRIBE)</li> </ul>				
		<ul> <li>VIM supports VR PM job subscriptions from the NFVO/VNFM (VIM_PM_PMJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM)</li> </ul>				
		<ul> <li>VIM can generate VR PM notifications to the NFVO/VNFM (VIM_PM_PMJOB_NOTIFY_BY_NFVO or VIM_PM_PMJOB_NOTIFY_BY_VNFM)</li> </ul>				
		<ul> <li>NFVO/VNFM supports VR PM notifications from the VIM (NFVO_PM_VR_PMJOB_NOTIFY or VNFM_PM_VR_PMJOB_NOTIFY)</li> </ul>				
		NFVO can generate "scale out by adding VNF instances" requests to the VNFM (NFVO_VNFLCM_NS_SCALE_OUT)				
			orts "scale out by adding VNF instances" requests from the NFVO FLCM_NS_SCALE_OUT)			
Pre-test cond	itions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			ne required amount of consumable virtual resources to run the scal M is configured to trigger "scale out by adding VNF instances" whe			
			rosses a certain threshold	a given viivi		
		Virtualised	resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger the VIM to send the targeted KPI to the NFVO/VNFM until the configured threshold is crossed			
	2	IOP Check	Verify that the "scale out by adding VNF instance(s)" procedure has been started in NFVO			
	3	IOP Check	Verify that the additional VNF instance(s) have been deployed by querying the VNFM			
	4	IOP Check	Verify that the additional resources have been allocated by the VIM according to the descriptors			
	5	IOP Check	Verify that the additional VNF instance(s) are running and reachable via their management network			
	6	IOP Check	Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM			
	7	IOP Check	Verify that the additional VNF instances(s), VL(s) and VNFFG(s) are connected according to the descriptors			
	8	IOP Check	Verify that the NFVO indicates the scaling operation result as successful			

### 7.7.2.1.3 NS Scale out with a VIM KPI

	Test Description: NS scale out with a VIM KPI			
	9	IOP Check Verify that NS has been scaled out by running the end-to-end functional test factoring the VNF scale and capacity		
IOP Verdict				

### 7.7.2.2 NS Scale In

### 7.7.2.2.1 NS Scale In with an Operator Action

		Test D	Description: NS scale in with an operator action				
Identifier			M_SCALE_IN_001				
Test Purpose	•		erify that the NS can be successfully scaled in by removing VNF instances triggered by an				
operator a							
Configuration	า	SUT Configurat	ion 1				
References	-		FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.	51. ETSI			
			8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	],			
Applicability			M can generate "terminate compute resource" operation requests	to the VIM			
			M_TERMINATE or VNFM_CRM_TERMINATE)				
			M can generate "terminate network resource" operation requests to	o the VIM			
			M_TERMINATE or VNFM_NRM_TERMINATE)				
			M can generate "terminate storage resource" operation requests to	the VIM			
			M_TERMINATE or VNFM_SRM_TERMINATE)				
		<ul> <li>VIM support</li> </ul>	ts "terminate compute resource" operation requests from the NFV	D/VNFM			
			_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)				
			ts "terminate network resource" operation requests from the NFVC				
			_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)				
			VIM supports "terminate storage resource" operation requests from the NFVO/VNFM				
			(VIM_SRM_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)				
		NFVO can generate "scale in by removing VNF instances" requests to the VNFM					
		(NFVO_VNFLCM_NS_SCALE_IN)					
			ports "scale in by removing VNF instances" requests from the NFV	)			
		(VNFM_VN	FLCM_NS_SCALE_IN)				
Pre-test cond	litiono						
Pre-test cond	ittions		ports triggering "scale in by removing VNF instances" with an opera	tor's action			
			ntiated (TD_NFV_NSLCM_INSTANTIATE_001)				
		<ul> <li>The current</li> </ul>	t NS deployment size supports scaling in				
		1					
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger NS scale in by removing VNF instances from the NS in				
			NFVO with an operator action				
	2	IOP Check	Verify that the impacted VNF instance(s) have been terminated				
	-		by querying the VNFM				
	3	IOP Check	Verify that the impacted VNF related resources have been				
			released by the VIM				
	4	IOP Check	Verify that the remaining VNF instances(s) are still running and				
	-		reachable via their management network				
	5	IOP Check	Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the descriptors				
	6	IOP Check	Verify that the NFVO indicates the scaling operation result as				
	0		successful				
	7	IOP Check	Verify that NS has been scaled in by running the end-to-end				
			functional test factoring the VNF scale and capacity				
IOP Verdict		I					

		Test	Description: NS scale in with a VNF indicator					
Identifier			M_SCALE_IN_002					
Test Purpose			S can be successfully scaled in by removing VNF instances trigge	red				
•			automatically by a VNF indicator					
Configuration		SUT Configuration 1						
References		ETSI GS NFV-IF	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.4	5], ETSI				
		GS NFV-IFA 008	3 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	-				
Applicability		<ul> <li>NFVO/VNFM can generate "terminate compute resource" operation requests to the VIM (NFVO_CRM_TERMINATE or VNFM_CRM_TERMINATE)</li> </ul>						
		NFVO/VNF	M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)	o the VIM				
		NFVO/VNF	M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)	the VIM				
		<ul> <li>VIM suppor</li> </ul>	ts "terminate compute resource" operation requests from the NFV( _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)					
		<ul> <li>VIM suppor</li> </ul>	ts "terminate network resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)	/VNFM				
		<ul> <li>VIM suppor</li> </ul>	ts "terminate storage resource" operation requests from the NFVO	/VNFM				
		<ul> <li>VNFM can s</li> </ul>	TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM) subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SU	BSCRIBE)				
			pports VNF indicator subscriptions from the VNFM (EM_VNFINDI_					
			n generate VNF indicator notifications to the VNFM (EM_VNFINDI					
			VNFM supports VNF indicator notifications from the EM/VNF (VNFM_VNFINDI_NOTIFY)					
		<ul> <li>NFVO can subscribe to VNF indicators on the VNFM (NFVO_NSVNFINDI_SUBSCRIBE)</li> <li>VNEM supports VNE indicator subscriptions from the NEVO</li> </ul>						
		VNFM supports VNF indicator subscriptions from the NFVO     (VNFM_NSVNFINDL_SUBSCRIBE)						
		<ul> <li>(VNFM_NSVNFINDI_SUBSCRIBE)</li> <li>VNFM can generate VNF indicator notifications to the NFVO (VNFM_NSVNFINDI_NOTIFY)</li> </ul>						
		<ul> <li>VNFM can generate VNF indicator notifications to the NFVO (VNFM_NSVNFINDI_NOTIFY)</li> <li>NFVO supports VNF indicator notifications from the VNFM (NFVO_NSVNFINDI_NOTIFY)</li> </ul>						
		<ul> <li>NFVO can generate "scale in by removing VNF instances" requests to the VNFM</li> </ul>						
			FLCM_NS_SCALE_IN)					
			orts "scale in by removing VNF instances" requests from the NFV	0				
			FLCM_NS_SCÁLE_IN)					
Pre-test condit	tions	<ul> <li>NFVO is co</li> </ul>	nfigured to trigger "scale in by removing VNF instances" when a gi	ven VNF				
			lue crosses a certain threshold					
		<ul> <li>NS is instar</li> </ul>	tiated (TD_NFV_NSLCM_INSTANTIATE_001)					
			NS deployment size should support scaling in					
Test	Step	Туре	Description	Result				
Sequence	1	Stimulus	Trigger the EM/VNF to send the targeted VNF indicator to the					
			VNFM until the configured threshold is crossed					
	2	IOP Check	Verify that the "scale in by removing VNF instance(s)" procedure has been started in NFVO					
	3	IOP Check	Verify that the impacted VNF instance(s) have been terminated by querying the VNFM					
	4	IOP Check	Verify that the impacted VNF related resources have been released by the VIM					
	5	IOP Check	Verify that the remaining VNF instance(s) are still running and reachable via their management network					
	6	IOP Check	Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the descriptors					
	7	IOP Check	Verify that the NFVO indicates the scaling operation result as successful					
	8	IOP Check	Verify that NS has been scaled in by running the end-to-end functional test factoring the VNF scale and capacity					
IOP Verdict								
IOP Verdict								

#### 7.7.2.2.2 NS Scale in with a VNF Indicator

			est Description: NS scale in with a VIM KPI	
Identifier			M_SCALE_IN_003	ra d
Test Purpose		automatically by	S can be successfully scaled in by removing VNF instances trigger	red
Configuration	ı	SUT Configurati		
References		ETSI GS NFV-IF	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	j], ETSI
Applicability		<ul> <li>NFVO/VNF</li> </ul>	M can generate "terminate compute resource" operation requests t M_TERMINATE or VNFM_CRM_TERMINATE)	to the VIM
		<ul> <li>NFVO/VNF</li> </ul>	M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)	o the VIM
		(NFVO_SR	M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)	
		(VIM_CRM	ts "terminate compute resource" operation requests from the NFV( _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)	
			ts "terminate network resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)	
			ts "terminate storage resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)	
			M can create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CI _VR_PMJOB_CREATE)	REATE or
		<ul> <li>VIM support</li> </ul>	ts VR PM jobs creation by the NFVO/VNFM	
		NFVO/VNF	M can create VR PM thresholds on the VIM (NFVO_PM_VR_PMT _VR_PMTH_CREATE)	
		<ul> <li>VIM support</li> </ul>	ts VR PM thresholds creation by the NFVO/VNFM PMTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VN	
		<ul> <li>NFVO/VNF</li> </ul>	M can subscribe to VR PM jobs on the VIM	
		<ul> <li>VIM support</li> </ul>	_VR_PMJOB_SUBSCRIBE or VNFM_PM_VR_PMJOB_SUBSCR ts VR PM job subscriptions from the NFVO/VNFM	
			PMJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIE nerate VR PM notifications to the NFVO/VNFM	BE_BY_VNFM)
			PMJOB_NOTIFY_BY_NFVO or VIM_PM_PMJOB_NOTIFY_BY_VI M supports VR PM notifications from the VIM (NFVO_PM_VR_PM	
		or VNFM_P	M_VR_PMJOB_NOTIFY) generate "scale in by removing VNF instances" requests to the VN	
		(NFVO_VN	FLCM_NS_SCALE_IN) ports "scale in by removing VNF instances" requests from the NFV(	
			FLCM_NS_SCALE_IN)	, 
Pre-test cond	litions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	
			NS deployment size should support scaling in M is configured to trigger "scale in by removing VNF instances" wh	en a diven VIM
		KPI value c	rosses a certain threshold	
			resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger the VIM to send the targeted KPI to the NFVO/VNFM until the configured threshold is crossed	Rooun
	2	IOP Check	Verify that the "scale in by removing VNF instance(s)" procedure has been started in NFVO	
	3	IOP Check	Verify that the impacted VNF instance(s) have been terminated by querying the VNFM	
	4	IOP Check	Verify that the impacted VNF related resources have been released by the VIM	
	5	IOP Check	Verify that the remaining VNF instance(s) are still running and reachable via their management network	
	6	IOP Check	Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the descriptors	
	7	IOP Check	Verify that the NFVO indicates the scaling operation result as successful	
	8	IOP Check	Verify that NS has been scaled in by running the end-to-end functional test factoring the VNF scale and capacity	

#### 7.7.2.2.3 NS Scale in with a VIM KPI

IOP Verdict

Test Description: NS scale in with a VIM KPI

### 7.7.2.3 NS VNF Scale Out

### 7.7.2.3.1 NS VNF Scale Out with an Operator Action

			cription: NS VNF scale out with an operator action			
dentifier			CM_SCALE_OUT_VNF_001			
Test Purpose	•	To verify that a VNF in a NS can be successfully scaled out by adding VNFC instances when triggered by a NFVO operator				
<u> </u>						
Configuration	n	SUT Configurat				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.4 )8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI		
Applicability		<ul> <li>(NFVO_CF</li> <li>NFVO/VNF</li> <li>(NFVO_NF</li> <li>NFVO/VNF</li> <li>(NFVO_SF</li> <li>VIM suppo</li> <li>(VIM_CRM</li> <li>VIM suppo</li> <li>(VIM_NRM</li> <li>VIM suppo</li> <li>(VIM_SRM</li> <li>NFVO can</li> <li>(NFVO_VN</li> <li>VNFM supp</li> </ul>	FM can generate "allocate compute resource" operation requests to RM_ALLOCATE or VNFM_CRM_ALLOCATE) FM can generate "allocate network resource" operation requests to RM_ALLOCATE or VNFM_NRM_ALLOCATE) FM can generate "allocate storage resource" operation requests to the RM_ALLOCATE or VNFM_SRM_ALLOCATE) rts "allocate compute resource" operation requests from the NFVO/ I_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM) rts "allocate network resource" operation requests from the NFVO/ I_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM) rts "allocate storage resource" operation requests from the NFVO/ I_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM) rts "allocate storage resource" operation requests from the NFVO/ I_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) generate "scale out by adding VNFC instances" to the VNFM IFLCM_VNF_SCALE_OUT) ports "scale out by adding VNFC instances" requests from the NFV	the VIM the VIM /VNFM VNFM /NFM		
		(VNFM_VN	IFLCM_VNF_SCALE_OUT)			
Pre-test cond	litions		IFLCM_VNF_SCALE_OUT) ports triggering "scale out by adding VNFC instances" with an operation			
Pre-test cond	litions	NFVO supp	ports triggering "scale out by adding VNFC instances" with an operative			
Pre-test cond	litions	<ul><li>NFVO suppleter</li><li>NS is instal</li></ul>	ports triggering "scale out by adding VNFC instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	ator's action		
Pre-test cond	litions	<ul><li>NFVO suppleter</li><li>NS is instal</li></ul>	ports triggering "scale out by adding VNFC instances" with an operative	ator's action		
		<ul> <li>NFVO supp</li> <li>NS is insta</li> <li>NFVI has t</li> </ul>	ports triggering "scale out by adding VNFC instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal	ator's action led-out NS		
Test	litions Step 1	<ul><li>NFVO suppleter</li><li>NS is instal</li></ul>	ports triggering "scale out by adding VNFC instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNFC instance(s) to a VNF in	ator's action		
Pre-test conc Test Sequence	Step 1	<ul> <li>NFVO suppleter</li> <li>NS is instation</li> <li>NFVI has to the second second</li></ul>	ports triggering "scale out by adding VNFC instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNFC instance(s) to a VNF in the NS in NFVO with an operator action	ator's action led-out NS		
Test	Step	<ul> <li>NFVO supp</li> <li>NS is insta</li> <li>NFVI has t</li> </ul>	ports triggering "scale out by adding VNFC instances" with an opera- ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNFC instance(s) to a VNF in the NS in NFVO with an operator action Verify that the additional VNFC instance(s) have been	ator's action led-out NS		
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Test	<b>Step</b> 1 2 3	<ul> <li>NFVO suppleter</li> <li>NS is instation</li> <li>NFVI has the transformation</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	ports triggering "scale out by adding VNFC instances" with an operantiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNFC instance(s) to a VNF in the NS in NFVO with an operator action Verify that the additional VNFC instance(s) have been deployed for the VNF by querying the VNFM Verify that the additional resources have been allocated by the VIM according to the descriptors	ator's action led-out NS		
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Test	Step           1           2           3           4           5	<ul> <li>NFVO suppleter NS is instation in the image of the image</li></ul>	ports triggering "scale out by adding VNFC instances" with an operantiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNFC instance(s) to a VNF in the NS in NFVO with an operator action Verify that the additional VNFC instance(s) have been deployed for the VNF by querying the VNFM Verify that the additional resources have been allocated by the VIM according to the descriptors Verify that the additional VNFC instance(s) are running and reachable via the management network Verify that the VNF configuration has been updated to include the additional VNFC instances according to the descriptors by querying the VNFM	ator's action led-out NS		
Test	Step           1           2           3           4           5           6	<ul> <li>NFVO support NS is instative in the initial structure in t</li></ul>	ports triggering "scale out by adding VNFC instances" with an operantiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNFC instance(s) to a VNF in the NS in NFVO with an operator action Verify that the additional VNFC instance(s) have been deployed for the VNF by querying the VNFM Verify that the additional resources have been allocated by the VIM according to the descriptors Verify that the additional VNFC instance(s) are running and reachable via the management network Verify that the VNF configuration has been updated to include the additional VNFC instances(s) are connected to the additional VNFC instances(s) are connected to the VL(s) according to the descriptors Verify that the Additional VNFC instances(s) are connected to the VL(s) according to the descriptors Verify that the Additional VNFC instances(s) are connected to the VL(s) according to the descriptors Verify that the NFVO indicates the scaling operation result as	ator's action led-out NS		
Test	Step           1           2           3           4           5           6	<ul> <li>NFVO support NS is instative in the initial structure in t</li></ul>	ports triggering "scale out by adding VNFC instances" with an operantiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal	ator's action led-out NS		
Test	Step           1           2           3           4           5           6           7	<ul> <li>NFVO support NS is instation NS is instation NFVI has the NFV</li></ul>	ports triggering "scale out by adding VNFC instances" with an operantiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scal	ator's action led-out NS		

		T	earlintion, NO V/NE eacle aut with a V/NE indianter			
			escription: NS VNF scale out with a VNF indicator			
Identifier			M_SCALE_OUT_VNF_002			
Test Purpose			VNF in a NS can be successfully scaled out by adding VNFC instan	ices when		
Configuration			atically by a VNF indicator			
References		SUT Configurat	101 1 FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5			
References			8 [i.6], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5]	], ETSI		
Applicability			M can generate "allocate compute resource" operation requests to	the VIM		
Applicability		(NFVO/VNPM can generate anocate compute resource operation requests to the VNM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)				
			M_ALEOCATE of VIA M_OTAL_ALEOCATE; M can generate "allocate network resource" operation requests to t	he VIM		
			M_ALLOCATE or VNFM_NRM_ALLOCATE)			
			M can generate "allocate storage resource" operation requests to the	ne VIM		
			M_ALLOCATE or VNFM_SRM_ALLOCATE)			
			rts "allocate compute resource" operation requests from the NFVO/	VNFM		
		(VIM_CRM	_ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)			
		VIM supports "allocate network resource" operation requests from the NFVO/VNFM				
			_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)			
			rts "allocate storage resource" operation requests from the NFVO/V	NFM		
			_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)			
			subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SUE			
			pports VNF indicator subscriptions from the VNFM (EM_VNFINDI_			
		EM/VNF can generate VNF indicator notifications to the VNFM (EM_VNFINDI_NOTIFY)				
Pre-test cond	litions	VNFM supp     NS is instal	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND) ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	I_NOTIFY)		
Pre-test cond		<ul> <li>VNFM supp</li> <li>NS is instate</li> <li>NFVI has the VNFM is compared to the second secon</li></ul>	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND)	I_NOTIFY)		
		<ul> <li>VNFM supp</li> <li>NS is instat</li> <li>NFVI has the VNFM is control indicator variable.</li> </ul>	borts VNF indicator notifications from the EM/VNF (VNFM_VNFIND) ntiated (TD_NFV_NSLCM_INSTANTIATE_001) ne required amount of consumable virtual resources to run the scale onfigured to trigger "scale out by adding VNFC instances" when a gi alue crosses a certain threshold	I_NOTIFY) ed-out NS ven VNF		
Pre-test cond Test Sequence		<ul> <li>VNFM supp</li> <li>NS is instate</li> <li>NFVI has the VNFM is compared to the second secon</li></ul>	Doorts VNF indicator notifications from the EM/VNF (VNFM_VNFIND)         Intiated (TD_NFV_NSLCM_INSTANTIATE_001)         The required amount of consumable virtual resources to run the scale         Description         Intigger the EM/VNF to send the targeted VNF indicator to the	I_NOTIFY)		
Test	Step 1	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vertical of the second s</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNF to send the sended vertice of the targeted VNF indicator to the VNFM until the configured the sended vertice of the targeted VNF indicator to the VNFM until the configured the sended vertice of the ve	I_NOTIFY) ed-out NS ven VNF		
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Fest	<b>Step</b> 1 2 3	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vertical of the second s</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold           Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instances" when a gialue crossed threshold is crossed	I_NOTIFY) ed-out NS ven VNF		
Fest	Step 1 2	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vector of the second sec</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold           Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instances" when a gialue crossed threshold is crossed           Verify that the additional VNFC instances)           Verify that the additional VNFC instances)           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the	I_NOTIFY) ed-out NS ven VNF		
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ſest	<b>Step</b> 1 2 3	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vertical of the second s</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold           Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instances" when a gialue crosse a certain threshold           Verify that the additional VNFC instances)           Verify that the additional VNFC instance(s)           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the VIM according to the descriptors           Verify that the additional VNFC instance(s) are running and are	I_NOTIFY) ed-out NS ven VNF		
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Test	Step           1           2           3           4	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vector of the sector of</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold           Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instances" when a gialue crosse a certain threshold           Verify that the difficult threshold is crossed           Verify that the additional VNFC instance(s)"           procedure has been started in NFVO           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the VIM according to the descriptors           Verify that the additional VNFC instance(s) are running and are reachable through their management network           Verify that the VNF configuration has been updated to include	I_NOTIFY) ed-out NS ven VNF		
Fest	<b>Step</b> 1 2 3 4 5	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vertical of the second s</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold           Verify that the additional VNFC instance(s)" procedure has been started in NFVO           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional VNFC instance(s) have been deployed by the VNFM           Verify that the additional VNFC instance(s) have been allocated by the VIM according to the descriptors           Verify that the additional VNFC instance(s) are running and are reachable through their management network	I_NOTIFY) ed-out NS ven VNF		
Fest	<b>Step</b> 1 2 3 4 5	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vertical of the second s</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold           Verify that the "scale out by adding VNFC instances" when a gialue crosses a certain threshold           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instances" when a gialue crosses a certain threshold           Verify that the additional VNFC instance(s)"           procedure has been started in NFVO           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the VIM according to the descriptors           Verify that the additional VNFC instance(s) are running and are reachable through their management network           Verify that the VNFC configuration has been updated to include the additional VNFC instances according to the descriptors by	I_NOTIFY) ed-out NS ven VNF		
Γest (	Step           1           2           3           4           5           6	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vector of the sector of</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold           Verify that the additional VNFC instance(s)"           verify that the additional VNFC instance(s)           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional VNFC instance(s) are running and are reachable through their management network           Verify that the VNFC instance(s) are running and are reachable through their management network           Verify that the VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instances according to the descriptors by querying the VNFM           Verify that the additional VNFC instances (s) are connected to the VL(s) according to the descriptors	I_NOTIFY) ed-out NS ven VNF		
Fest	Step           1           2           3           4           5           6	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vector of the sector of</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured to triggured to triggured threshold           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instances" when a gialue crosse a certain threshold           Verify that the scale out by adding VNFC instances" when a gialue crosse a certain threshold           Verify that the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instance(s)"           procedure has been started in NFVO           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the VIM according to the descriptors           Verify that the additional VNFC instance(s) are running and are reachable through their management network           Verify that the VNFC instances according to the descriptors by querying the VNFM           Verify that the additional VNFC instances(s) are connected to the VL(s) according to the descriptors           Verify that the Additional VNFC instances(s) are connected to the VL(s) according to the descriptors	I_NOTIFY) ed-out NS ven VNF		
Test	Step           1           2           3           4           5           6           7           8	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the second s</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured to triggured to trigger discle out by adding VNFC instances" when a gialue crosses a certain threshold           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instance(s)"           procedure has been started in NFVO           Verify that the additional VNFC instance(s) models of the descriptors           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instances according to the descriptors by querying the VNFM           Verify that the NFC onfiguration has been updated to include the additional VNFC instances (s) are connected to the VL(s) according to the descriptors           Verify that the Additional VNFC instances (s) are connected to the VL(s) according to the descriptors           Verify that the NFVO indicates the scaling operation result as successful	I_NOTIFY) ed-out NS ven VNF		
Test	Step           1           2           3           4           5           6           7	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the vector of the sector of</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured to triggured to trigger discle out by adding VNFC instances" when a gialue crosses a certain threshold           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instances" when a gialue crosses a certain threshold           Verify that the scale out by adding VNFC instances" when a gialue crossed           Verify that the scale out by adding VNFC instance(s)"           procedure has been started in NFVO           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional resources have been allocated by the VIM according to the descriptors           Verify that the additional VNFC instance(s) are running and are reachable through their management network           Verify that the VNFC instances according to the descriptors by querying the VNFM           Verify that the additional VNFC instances(s) are connected to the VL(s) according to the descriptors           Verify that the NFVO indicates the scaling operation result as successful           Verify that the NFVO indicates the scaling operation result as successful	I_NOTIFY) ed-out NS ven VNF		
Γest (	Step           1           2           3           4           5           6           7           8	<ul> <li>VNFM supp</li> <li>NS is instant</li> <li>NFVI has the second s</li></ul>	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured to triggured to trigger discle out by adding VNFC instances" when a gialue crosses a certain threshold           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale out by adding VNFC instance(s)"           procedure has been started in NFVO           Verify that the additional VNFC instance(s) models of the descriptors           Verify that the additional VNFC instance(s) have been deployed by querying the VNFM           Verify that the additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instance(s) are running and are reachable through their management network           Verify that the Additional VNFC instances according to the descriptors by querying the VNFM           Verify that the NFC onfiguration has been updated to include the additional VNFC instances (s) are connected to the VL(s) according to the descriptors           Verify that the Additional VNFC instances (s) are connected to the VL(s) according to the descriptors           Verify that the NFVO indicates the scaling operation result as successful	I_NOTIFY) ed-out NS ven VNF		

### 7.7.2.3.2 NS VNF Scale Out with a VNF Indicator

Test Purpose         To           Configuration         SU           References         ETS           Applicability         •           •         •	Test	Description: NS VNF scale out with a VIM KPI			
trig           Configuration         SU           References         ETS           Applicability         •           •		M_SCALE_OUT_VNF_003			
References         ETS GS           Applicability         •           •<	gered automa	/NF in a NS can be successfully scaled out by adding VNFC instance atically by a VIM KPI	ces when		
GS           Applicability         •           •         • <th>T Configurati</th> <th></th> <th></th>	T Configurati				
Pre-test conditions       •         •       •		A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5]. 3 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	, ETSI		
Pre-test conditions       •         •       •	NFVO/VNF	M can generate "allocate compute resource" operation requests to the M_ALLOCATE or VNFM_CRM_ALLOCATE)	he VIM		
Pre-test conditions       •         •       •	(NFVO_NR	M can generate "allocate network resource" operation requests to th M_ALLOCATE or VNFM_NRM_ALLOCATE)			
Pre-test conditions       •         •       •	(NFVO_SR	M can generate "allocate storage resource" operation requests to th M_ALLOCATE or VNFM_SRM_ALLOCATE)			
Pre-test conditions       •         •       •	(VIM_CRM_	ts "allocate compute resource" operation requests from the NFVO/V _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)			
Pre-test conditions       •         •       •	(VIM_NRM_	ts "allocate network resource" operation requests from the NFVO/Vt _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)			
Pre-test conditions       •         •       •	(VIM_SRM_	ts "allocate storage resource" operation requests from the NFVO/VN ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)			
Pre-test conditions       •         •       •	VNFM_PM_	M can create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CRI _VR_PMJOB_CREATE) ts VR PM jobs creation by the NFVO/VNFM	EATE OF		
Pre-test conditions       •         •       •	(VIM_PM_F	MJOB_CREATE_BY_NFVO or VIM_PM_PMJOB_CREATE_BY_V M can create VR PM thresholds on the VIM (NFVO_PM_VR_PMTH			
Pre-test conditions       •         •       •	VIM suppor	VR_PMTH_CREATE) ts VR PM thresholds creation by the NFVO/VNFM			
Pre-test conditions       •         •       •	NFVO/VNF	MTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VNF M can subscribe to VR PM jobs on the VIM			
Pre-test conditions       •         •       •					
Pre-test conditions       •         •       •	VIM can gei	MJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIBE nerate VR PM notifications to the NFVO/VNFM MJOB_NOTIFY_BY_NFVO or VIM_PM_PMJOB_NOTIFY_BY_VN			
Step         Step           2         10           3         10           4         10           5         10	NFVO/VNF	MJOB_NOTIFY_BY_INFVO OF VIM_PM_PMJOB_NOTIFY_BY_VM M supports VR PM notifications from the VIM (NFVO_PM_VR_PMJ M_VR_PMJOB_NOTIFY)			
Test         Step           Sequence         1           2         10           3         10           4         10           5         10	NFVO can g	generate "scale out by adding VNFC instances" to the VNFM FLCM_VNF_SCALE_OUT)			
Test         Step           Sequence         1           2         10           3         10           4         10           5         10	VNFM supp	orts "scale out by adding VNFC instances" requests from the NFVO FLCM_VNF_SCALE_OUT)			
Step           Sequence         1           2         10           3         10           4         10           5         10		tiated (TD_NFV_NSLCM_INSTANTIATE_001)			
Step         Step           2         1           3         10           4         10           5         10	NFVO/VNF	e required amount of consumable virtual resources to run the scaled It is configured to trigger "scale out by adding VNFC instances" whe			
Sequence         1           2         10           3         10           4         10           5         10	Virtualised r	rosses a certain threshold esource PM job with threshold monitoring has been created			
Sequence         1           2         10           3         10           4         10           5         10	•	PM_VR_CREATE_THRESHOLD_001)			
2 10 3 10 4 10 5 10	Type Stimulus	Description           Trigger the VIM to send the targeted KPI to the NFVO/VNFM	Result		
3 10 4 10 5 10	OP Check	until the configured threshold is crossed Verify that the "scale out by adding VNFC instance(s)" procedure			
5 10	OP Check	has been started in NFVO Verify that the additional VNFC instance(s) have been deployed			
	OP Check	by querying the VNFM Verify that the additional resources have been allocated by the			
6 10	OP Check	VIM according to the descriptors Verify that the additional VNFC instance(s) are running and are			
	OP Check	reachable through their management network Verify that the VNF configuration has been updated to include the additional VNFC instances according to the descriptors by guarging the VNFM	<u></u>		
7 10	OP Check	querying the VNFM Verify that the additional VNFC instances(s) are connected to the VL(s) according to the descriptors			
8 10	OP Check	Verify that the NFVO indicates the scaling operation result as			

#### 7.7.2.3.3 NS VNF Scale Out with a VIM KPI

Test Description: NS VNF scale out with a VIM KPI				
			successful	
	9	IOP Check	Verify that NS has been scaled out by running the end-to-end	
			functional test in relevance to the VNF scale and capacity	
IOP Verdict				

#### 7.7.2.4 NS VNF Scale In

### 7.7.2.4.1 NS VNF Scale In with an Operator Action

Identifier		Test Des	scription: NS VNF scale in with an operator action			
i aonunoi			CM_SCALE_IN_VNF_001			
Test Purpose		Verify that a VNF in a NS can be successfully scaled in by removing VNFC instances from an				
		existing VNF triggered by an operator action				
Configuration		SUT Configurat				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 18 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI		
Applicability			M can generate "terminate compute resource" operation requests t	to the VIM		
, ppilozomy		<ul> <li>NFVO/VNFM can generate terminate compute resource operation requests to the VNM (NFVO_CRM_TERMINATE or VNFM_CRM_TERMINATE)</li> <li>NFVO/VNFM can generate "terminate network resource" operation requests to the VIM (NFVO_NRM_TERMINATE or VNFM_NRM_TERMINATE)</li> </ul>				
					M_TERMINATE or VNFM_SRM_TERMINATE)	
			rts "terminate compute resource" operation requests from the NFV0 _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)			
			rts "terminate network resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)			
			rts "terminate storage resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)			
			generate "scale in by removing VNFC instances" to the VNFM			
			IFLCM_VNF_SCALE_IN)			
			ports "scale in by removing VNFC instances" requests from the NFV	/O		
		(VNFM_VN	IFLCM_VNF_SCALE_IN)			
Pre-test condi	itions					
		<ul> <li>NS is instar</li> </ul>	ports triggering scale in with an operator's action ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in			
		<ul> <li>NS is instar</li> </ul>				
Test	Step	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in Description	Result		
Test Sequence		<ul> <li>NS is instar</li> <li>The current</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in           Description           Trigger NS scale in by removing VNFC instance(s) from a VNF	Result		
	Step	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in           Description           Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action           Verify that the impacted VNFC instance(s) inside the VNF have	Result		
	<b>Step</b> 1 2	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in           Description           Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM	Result		
	Step 1	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> <li>Stimulus</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in           Description           Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action           Verify that the impacted VNFC instance(s) inside the VNF have	Result		
	<b>Step</b> 1 2	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> </ul>	Initiated (TD_NFV_NSLCM_INSTANTIATE_001)         t NS deployment size should support scaling in         Description         Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the remaining VNFC instance(s) are still running and	Result		
	<b>Step</b> 1 2 3	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	Initiated (TD_NFV_NSLCM_INSTANTIATE_001)         t NS deployment size should support scaling in         Description         Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the remaining VNFC instance(s) are still running and reachable via their management network         Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM	Result		
	Step           1           2           3           4	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	Initiated (TD_NFV_NSLCM_INSTANTIATE_001)         t NS deployment size should support scaling in         Description         Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the remaining VNFC instance(s) are still running and reachable via their management network         Verify that the VNF configuration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM         Verify that the remaining VNFC instances(s) and VL(s) are still	Result		
	Step           1           2           3           4           5	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in Description           Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the impacted VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM           Verify that the remaining VNFC instances(s) and VL(s) are still connected according to the descriptors           Verify that the NFVO indicates the scaling operation result as	Result		
	Step           1           2           3           4           5           6	<ul> <li>NS is instar</li> <li>The current</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in Description           Trigger NS scale in by removing VNFC instance(s) from a VNF in the NS in NFVO with an operator action           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the impacted VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM           Verify that the remaining VNFC instances(s) and VL(s) are still connected according to the descriptors	Result		

Identifier		Test D	escription: NS VNF scale in with a VNF indicator			
			M_SCALE_IN_VNF_002			
Test Purpose		Verify that a VNF in a NS can be successfully scaled in by removing VNFC instances triggered				
		automatically by a VNF indicator				
Configuration		SUT Configurat				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5	5], ETSI		
			8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]			
Applicability			M can generate "terminate compute resource" operation requests t M_TERMINATE or VNFM_CRM_TERMINATE)	o the VIM		
		NFVO/VNF	M_TERMINATE of VNI M_ORM_TERMINATE) M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)	the VIM		
		NFVO/VNF	M can generate "terminate storage resource" operation requests to	the VIM		
			M_TERMINATE or VNFM_SRM_TERMINATE)			
			rts "terminate compute resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)			
			rts "terminate network resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)			
		<ul> <li>VIM_INRM_TERMINATE_BT_INFVO OF VIM_INRM_TERMINATE_BT_VINFM)</li> <li>VIM supports "terminate storage resource" operation requests from the NFVO/VNFM</li> </ul>				
		(VIM_SRM	_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)			
		<ul> <li>VNFM can subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SUBSCRIBE)</li> </ul>				
			pports VNF indicator subscriptions from the VNFM (EM_VNFINDI_			
			an generate VNF indicator notifications to the VNFM (EM_VNFINDI			
		<ul> <li>VNFM supports VNF indicator notifications from the EM/VNF (VNFM_VNFINDI_NOTIFY)</li> </ul>				
Dro toot cond	Hana					
Pre-test cond	itions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
		<ul> <li>The current</li> </ul>	NC dealer meant aime abauld ar an art agaling in			
			t NS deployment size should support scaling in			
		<ul> <li>VNFM is co</li> </ul>	onfigured to trigger "scale in by removing VNFC instances" when a	given VNF		
		<ul> <li>VNFM is co</li> </ul>		given VNF		
		<ul> <li>VNFM is consistent of the second secon</li></ul>	onfigured to trigger "scale in by removing VNFC instances" when a glue crosses a certain threshold	-		
Test	Step	<ul> <li>VNFM is contract of the indicator value</li> <li>Type</li> </ul>	onfigured to trigger "scale in by removing VNFC instances" when a galue crosses a certain threshold  Description	given VNF Result		
Test Sequence	Step 1	<ul> <li>VNFM is consistent of the second secon</li></ul>	Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed	-		
		<ul> <li>VNFM is contract of the indicator value</li> <li>Type</li> </ul>	Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed Verify that the "scale in by removing VNFC instance(s)"	-		
	1	VNFM is co indicator va     Type     Stimulus     IOP Check	Image: Second Stress       Image: Second Stress         Image: Second	-		
	1 2	<ul> <li>VNFM is considered indicator value</li> <li>Type</li> <li>Stimulus</li> </ul>	Description         Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed         Verify that the "scale in by removing VNFC instance(s)"         procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have	-		
	1 2	VNFM is co indicator va     Type     Stimulus     IOP Check	Description         Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed         Verify that the "scale in by removing VNFC instance(s)"         procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have	-		
	1 2 3	VNFM is co indicator va     Type     Stimulus     IOP Check     IOP Check	Description         Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the impacted VNFC instance(s) resources have been released by the VIM	-		
	1 2 3 4 5	VNFM is co indicator va Type Stimulus IOP Check IOP Check IOP Check IOP Check	Description         Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed         Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO         Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM         Verify that the impacted VNFC instance(s) resources have been released by the VIM         Verify that the impacted VNFC instance(s) resources have been released by the VIM	-		
	1 2 3 4	VNFM is co indicator va     Type     Stimulus     IOP Check     IOP Check     IOP Check	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale in by removing VNFC instance(s)"           procedure has been started in NFVO           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the impacted VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by	-		
	1 2 3 4 5 6	VNFM is co indicator va Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale in by removing VNFC instance(s)"           procedure has been started in NFVO           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the impacted VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM	-		
	1 2 3 4 5	VNFM is co indicator va Type Stimulus IOP Check IOP Check IOP Check IOP Check	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale in by removing VNFC instance(s)"           procedure has been started in NFVO           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the impacted VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC configuration has been updated to exclude the removed VNFC instances (s) and VL(s) are still connected according to the descriptors	-		
	1 2 3 4 5 6	VNFM is co indicator va Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale in by removing VNFC instance(s)"           procedure has been started in NFVO           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the remaining VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC configuration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM           Verify that the remaining VNFC instances(s) and VL(s) are still connected according to the descriptors           Verify that the remaining VNFC instances(s) and VL(s) are still connected according to the descriptors	-		
	1 2 3 4 5 6 7	VNFM is co indicator values     Type     Stimulus     IOP Check	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale in by removing VNFC instance(s)"           procedure has been started in NFVO           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the impacted VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC configuration has been updated to exclude the removed VNFC instances (s) and VL(s) are still connected according to the descriptors	-		
	1 2 3 4 5 6 7 8	VNFM is co indicator val Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check	Description           Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed           Verify that the "scale in by removing VNFC instance(s)"           procedure has been started in NFVO           Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM           Verify that the impacted VNFC instance(s) resources have been released by the VIM           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the remaining VNFC instance(s) are still running and reachable via their management network           Verify that the VNFC onfiguration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM           Verify that the remaining VNFC instances(s) and VL(s) are still connected according to the descriptors           Verify that the NFVO indicates the scaling operation result as successful	-		

### 7.7.2.4.2 NS VNF Scale In with a VNF Indicator

L.L			est Description: NS scale in with a VIM KPI		
Identifier Test Purpose	<u> </u>		M_SCALE_IN_VNF_003 F in a NS can be successfully scaled in by removing VNFC instanc	oc triggorod	
restrupose		automatically by	, , ,	es inggered	
Configuratio		SUT Configurati	on 1		
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	], ETSI	
Applicability		NFVO/VNF	M can generate "terminate compute resource" operation requests t M_TERMINATE or VNFM_CRM_TERMINATE)	o the VIM	
		NFVO/VNF	M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)	the VIM	
		(NFVO_SR	M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)		
		(VIM_CRM	ts "terminate compute resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)		
		(VIM_NRM_	ts "terminate network resource" operation requests from the NFVO, _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)		
		(VIM_SRM_	ts "terminate storage resource" operation requests from the NFVO/ _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)		
		VNFM_PM	M can create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CF _VR_PMJOB_CREATE) ts VR PM jobs creation by the NFVO/VNFM	CEATE OF	
		(VIM_PM_F	PMJOB_CREATE_BY_NFVO or VIM_PM_PMJOB_CREATE_BY_\ M can subscribe to VR PM jobs on the VIM	/NFM)	
		(NFVO_PM	_VR_PMJOB_SUBSCRIBE or VNFM_PM_VR_PMJOB_SUBSCRI ts VR PM job subscriptions from the NFVO/VNFM	BE)	
		(VIM_PM_F	<ul> <li>VIM supports VIX IN Subscriptions non the VIV VO/VIX IN (VIM_PM_PMJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM)</li> <li>NFVO/VNFM can create VR PM thresholds on the VIM (NFVO_PM_VR_PMTH_CREATE or</li> </ul>		
			_VR_PMTH_CREATE) ts VR PM thresholds creation by the NFVO/VNFM		
		<ul> <li>VIM can ge</li> </ul>	PMTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VN nerate VR PM notifications to the NFVO/VNFM		
		<ul> <li>NFVO/VNF</li> </ul>	PMJOB_NOTIFY_BY_NFVO or VIM_PM_PMJOB_NOTIFY_BY_VN M supports VR PM notifications from the VIM (NFVO_PM_VR_PM,		
		<ul> <li>NFVO can g</li> </ul>	M_VR_PMJOB_NOTIFY) generate "scale in by removing VNFC instances" to the VNFM		
		<ul> <li>VNFM supp</li> </ul>	FLCM_VNF_SCALE_IN) ports "scale in by removing VNFC instances" requests from the NF\ FLCM_VNF_SCALE_IN)	/0	
		(010110_010			
Pre-test conc	litions	<ul> <li>NS is instar</li> </ul>	<pre>htiated (TD_NFV_NSLCM_INSTANTIATE_001)</pre>		
			NS deployment size should support scaling in		
			M is configured to trigger "scale in by removing VNFC instances" w	hen a given	
			ue crosses a certain threshold resource PM job with threshold monitoring has been created		
			PM_VR_CREATE_THRESHOLD_001)		
		\			
Test	Step	Туре	Description	Result	
Sequence	1	Stimulus	Trigger the VIM to send notifications of the targeted KPI to the NFVO/VNFM until the configured threshold is crossed		
	2	IOP Check	Verify that the "scale in by removing VNFC instance(s)" procedure has been started in NFVO		
	3	IOP Check	Verify that the impacted VNFC instance(s) inside the VNF have been terminated by querying the VNFM		
	4	IOP Check	Verify that the impacted VNFC instance(s) resources have been released by the VIM		
	5	IOP Check	Verify that the remaining VNFC instance(s) are still running and reachable via their management network		
	6	IOP Check	Verify that the VNF configuration has been updated to exclude the removed VNFC instances according to the descriptors by		
	7	IOP Check	querying the VNFM Verify that the remaining VNFC instances(s) and VL(s) are still		

	8	IOP Check	Verify that the NFVO indicates the scaling operation result as	
			successful	
	9	IOP Check	Verify that NS has been scaled in by running the end-to-end	
			functional test in relevance to the VNF scale and capacity	
IOP Verdict				

## 7.7.3 NS Update

### 7.7.3.1 Start VNF Instance

			Test Description: start VNF instance			
Identifier		TD_NFV_NSLCM_UPDATE_START_001				
Test Purpose			ility to start a VNF instance inside a NS instance			
Configuration		SUT Configurat	ion 1			
References		ETSI GS NFV-II GS NFV-IFA 01	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 3 [i.9]	i] and ETSI		
Applicability			generate "operate VNF" operation requests to the VNFM FLCM_OPERATE)			
			oorts "operate VNF" operation requests from the NFVO FLCM_OPERATE)			
			M can generate "operate compute resource" operation requests to M_OPERATE or VNFM_CRM_OPERATE)	the VIM		
			ts "operate compute resource" operation requests from the NFVO/ _OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM)	VNFM		
			M can query compute resource information from the VIM (NFVO_C M_QUERY)	RM_QUERY or		
		<ul> <li>VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)</li> </ul>				
		<ul> <li>VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> </ul>				
		<ul> <li>VIM can se</li> </ul>	nd storage resource information to the NFVO (VIM_SRM_INFO_T( INFO_TO_VNFM)	D_NFVO or		
			query VNF information from the VNFM (NFVO_VNFLCM_QUERY)			
			ports VNF information queries by the NFVO (VNFM_VNFLCM_QUE			
Pre-test condit	tions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
		<ul> <li>Target VNF</li> </ul>	is in a stopped operational state. See note.			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger the NFVO to start the target VNF instance inside the NS instance	Result		
	2	IOP Check	Verify that the compute resources allocated to the VNFC instances inside the target VNF instance have been started by querying the VIM			
	3	IOP Check	Verify that other existing compute resources have not been affected by the performed operation by querying the VIM			
	4	IOP Check	Verify that the VNF instance operational state on the VNFM is indicated as "started"			
	5	IOP Check	Verify that the NFVO shows no "operate VNF" operation errors			
	6	IOP Check	Verify that the NS functionality that utilizes the started VNF instance operates successfully by running the end-to-end functional test			
IOP Verdict			•			
NOTE: In the	e state	STOPPED, the	virtualised container(s), where the VNFC instance(s) of the VNF rur	n, are shut down		

			Test Description: stop VNF instance			
Identifier		TD_NFV_NSLC	M_UPDATE_STOP_001			
Test Purpose		Verify the capab	ility to stop a VNF instance inside a NS instance			
Configuration		SUT Configurati				
References		ETSI GS NFV-IF GS NFV-IFA 01	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 3 [i.9]	i] and ETSI		
Applicability		<ul> <li>(NFVO_VN)</li> <li>VNFM supp (VNFM_VN)</li> </ul>	generate "operate VNF" operation requests to the VNFM FLCM_OPERATE) ports "operate VNF" operation requests from the NFVO FLCM_OPERATE)			
			M can generate "operate compute resource" operation requests to M_OPERATE or VNFM_CRM_OPERATE)	the VIM		
			ts "operate compute resource" operation requests from the NFVO/ M (VIM_CRM_OPERATE_BY_NFVO or VIM_CRM_OPERATE_B)			
		<ul> <li>NFVO/VNFM can query compute resource information from the VIM (NFVO_CRM_QUERY or VNFM_CRM_QUERY)</li> <li>VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)</li> </ul>				
		<ul> <li>VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> </ul>				
		<ul> <li>VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> </ul>				
			query VNF information from the VNFM (NFVO_VNFLCM_QUERY) ports VNF information queries by the NFVO (VNFM_VNFLCM_QUE			
				•		
Pre-test condit	ions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger the NFVO to stop the target VNF instance inside the NS instance			
	2	IOP Check	Verify that the compute resources allocated to the VNFC instances inside the target VNF instance have been stopped by querying the VIM. See note.			
	3	IOP Check	Verify that other existing compute resources have not been affected by the performed operation by querying the VIM			
	4	IOP Check	Verify that the VNF instance operational state on the VNFM is indicated as "stopped"			
	5	IOP Check	Verify that the NFVO shows no "operate VNF" operation errors			
IOP Verdict						
		STOPPED, the vinated.	virtualised container(s), where the VNFC instance(s) of the VNF run	n, are shut down		

## 7.7.3.2 Stop VNF Instance

		Test Descripti	on: NS update instantiating VNFs and adding instances			
Identifier		TD_NFV_NSLC	M_UPDATE_INST_ADD_VNF_001			
Test Purpose		To verify that or instance	ne or more VNFs can be instantiated and the instances added to a	running NS		
Configuratior	1	SUT Configurat	ion 1			
References		ETSI GS NFV-I	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i. 8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI		
Applicability		NFVO/VNF	M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM		
		NFVO/VNF	M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM		
		NFVO/VNF	M can generate "allocate storage resource" operation requests to M_ALLOCATE or VNFM_SRM_ALLOCATE)	the VIM		
		<ul> <li>VIM support</li> </ul>	rts "allocate compute resource" operation requests from the NFVO _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	/VNFM		
		<ul> <li>VIM support</li> </ul>	rts "allocate network resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	VNFM		
		<ul> <li>VIM supports "allocate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)</li> </ul>				
		<ul> <li>NFVO can generate "create VNF identifier" operation requests to the VNFM (NFVO_VNFLCM_CREATE_VNFID)</li> </ul>				
		<ul> <li>VNFM supports "create VNF identifier" operation requests from the NFVO (VNFM_VNFLCM_CREATE_VNFID)</li> </ul>				
		NFVO can generate "instantiate VNF" operation requests to the VNFM				
		<ul> <li>(NFVO_VNFLCM_INSTANTIATE)</li> <li>VNFM supports "instantiate VNF" operation requests from the NFVO</li> </ul>				
			IFLCM_INSTANTIATE)			
Pre-test cond	itions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			ges whose VNFDs are referred to in the NSD are on-boarded to the	e NFVO		
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger a NS update instantiating VNF(s) and adding the resulting instance(s) to a running NS on the NFVO			
	2	IOP Check	Verify that the additional VNF instance(s) have been deployed by querying the VNFM			
	3	IOP Check	Verify that the additional resources have been allocated by the VIM according to the descriptors			
	4	IOP Check	Verify that the additional VNF instance(s) are running and reachable via their management network			
	5	IOP Check	Verify that the additional VNF instances(s) have been configured according to the descriptors by querying the VNFM			
	6	IOP Check	Verify that the NFVO indicates the VNF(s) instantiation and instance(s) addition operation result as successful			
	7	IOP Check	Verify that NS has been updated by running the end-to-end functional test that includes the additional VNF instance(s)			
IOP Verdict						

### 7.7.3.3 Instantiate VNF and Add Instance to NS Instance

		Test D	escription: NS update removing VNF instances			
Identifier			M_UPDATE_REM_VNF_001			
Test Purpose			e or more VNF instances can be removed from a running NS instal	nce		
Configuration		SUT Configurati				
References		ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5], ETSI GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		NFVO/VNF	M can generate "terminate compute resource" operation requests t M_TERMINATE or VNFM_CRM_TERMINATE)	o the VIM		
		NFVO/VNF	M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)	the VIM		
			M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)	the VIM		
		(VIM_CRM	ts "terminate compute resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)			
		(VIM_NRM_	ts "terminate network resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)			
		(VIM_SRM_	ts "terminate storage resource" operation requests from the NFVO/ _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)	VNFM		
		<ul> <li>NFVO can generate "terminate VNF" operation requests to the VNFM (NFVO_VNFLCM_TERMINATE)</li> </ul>				
			oorts "terminate VNF" operation requests from the NFVO FLCM_TERMINATE)			
			generate "delete VNF identifier" operation requests to the VNFM FLCM_DELETE_VNFID)			
			ports "delete VNF identifier" operation requests from the NFVO FLCM_DELETE_VNFID)			
<b>D</b>						
Pre-test condit	tions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
		<ul> <li>NS can fund</li> </ul>	ction without the impacted VNF instance(s)			
		<ul> <li>Functional v</li> </ul>	verification of the VNF instance(s) removal is possible (i.e. reduced	capacity)		
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger a NS update removing one or more VNF instances from a running NS instance on the NFVO			
	2	IOP Check	Verify that the impacted resources have been terminated by the VIM according to the descriptors			
	3	IOP Check	Verify that the remaining VNF instance(s) are running and reachable via their management network			
	4	IOP Check	NFVO indicates the update operation was successful			
	5	IOP Check	Verify that NS instance has been updated by running the end- to-end functional test factoring the removal of the VNF instance(s)			
IOP Verdict		•				

#### 7.7.3.4 Remove VNF Instances from a NS Instance

1		Test Des	cription: NS update adding shared VNF instances			
Identifier			M_UPDATE_ADD_SHVNF_001			
Test Purpose	9		he or more shared VNF instances can be added to a running NS ins	tance		
Configuratio		SUT Configurat				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5	5], ETSI		
GS NFV-IF			8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	-		
Applicability		(NFVO_CR	M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE)			
		(NFVO_NR	M can generate "allocate network resource" operation requests to t M_ALLOCATE or VNFM_NRM_ALLOCATE)			
			M can generate "allocate storage resource" operation requests to th M_ALLOCATE or VNFM_SRM_ALLOCATE)	ne VIM		
			rts "allocate compute resource" operation requests from the NFVO/^ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	/NFM		
		<ul> <li>VIM supports "allocate network resource" operation requests from the NFVO/VNFM (VIM_NRM_ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)</li> </ul>				
			VIM supports "allocate storage resource" operation requests from the NFVO/VNFM VIM_SRM_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)			
Pre-test conc	ditions	<ul> <li>NS1 can ut</li> </ul>	antiated (TD_NFV_NSLCM_INSTANTIATE_001) ilize shared VNF instances verification of the additional shared VNF instances is possible (i.e. tr	raffic load		
Pre-test conc		<ul> <li>NS1 can ut</li> <li>Functional sharing)</li> </ul>	ilize shared VNF instances verification of the additional shared VNF instances is possible (i.e. the			
Pre-test conc Test Sequence	ditions	<ul> <li>NS1 can ut</li> <li>Functional</li> </ul>	ilize shared VNF instances verification of the additional shared VNF instances is possible (i.e. the Description Trigger a NS update adding one or more shared VNF instances	raffic load Result		
Test	Step	<ul> <li>NS1 can ut</li> <li>Functional sharing)</li> <li>Type</li> </ul>	ilize shared VNF instances verification of the additional shared VNF instances is possible (i.e. the Description Trigger a NS update adding one or more shared VNF instances to NS1 on the NFVO Verify that any additional resources associated to NS1 have been allocated and deployed by the VIM according to the			
Test	Step	<ul> <li>NS1 can ut</li> <li>Functional sharing)</li> <li>Type</li> <li>Stimulus</li> </ul>	ilize shared VNF instances verification of the additional shared VNF instances is possible (i.e. the Description Trigger a NS update adding one or more shared VNF instances to NS1 on the NFVO Verify that any additional resources associated to NS1 have			
Test	<b>Step</b> 1 2	<ul> <li>NS1 can ut</li> <li>Functional sharing)</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> </ul>	Description         Trigger a NS update adding one or more shared VNF instances to NS1 on the NFVO         Verify that any additional resources associated to NS1 have been allocated and deployed by the VIM according to the updated descriptors         Verify that the existing VNF instance(s) in NS1 are running and			
Test	<b>Step</b> 1 2 3	<ul> <li>NS1 can ut</li> <li>Functional sharing)</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	Description           Trigger a NS update adding one or more shared VNF instances is possible (i.e. trested NS1 on the NFVO           Verify that any additional resources associated to NS1 have been allocated and deployed by the VIM according to the updated descriptors           Verify that the existing VNF instance(s) in NS1 are running and reachable through the management network           Verify that the additional shared VNF instance(s) have been configured according to the descriptors by querying the VNFM           Verify that the NFVO indicates the shared VNF instance(s) addition operation result as successful			
Test	<b>Step</b> 1 2 3 4	<ul> <li>NS1 can ut</li> <li>Functional sharing)</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	Description         Trigger a NS update adding one or more shared VNF instances is possible (i.e. tripped a non-structure)         Trigger a NS update adding one or more shared VNF instances to NS1 on the NFVO         Verify that any additional resources associated to NS1 have been allocated and deployed by the VIM according to the updated descriptors       Verify that the existing VNF instance(s) in NS1 are running and reachable through the management network         Verify that the additional shared VNF instances(s) have been configured according to the descriptors by querying the VNFM         Verify that the NFVO indicates the shared VNF instance(s)			
Test	Step           1           2           3           4           5	<ul> <li>NS1 can ut</li> <li>Functional sharing)</li> <li>Type</li> <li>Stimulus</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> <li>IOP Check</li> </ul>	Description         Trigger a NS update adding one or more shared VNF instances is possible (i.e. triverse in the NFVO         Verify that any additional resources associated to NS1 have been allocated and deployed by the VIM according to the updated descriptors         Verify that the existing VNF instance(s) in NS1 are running and reachable through the management network         Verify that the additional shared VNF instances(s) have been configured according to the descriptors by querying the VNFM         Verify that the NFVO indicates the shared VNF instance(s) addition operation result as successful         Verify that NS1 has been updated by running the end-to-end functional test that includes the additional shared VNF			

#### 7.7.3.5 Add Shared VNF Instances to NS Instance

		Test Desc	ription: NS update removing shared VNF instances			
Identifier			M_UPDATE_REM_SHVNF_001			
Test Purpose			e or more shared VNF instances can be removed from a running N	IS instance		
Configuration		SUT Configurati				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.:	5], ETSI		
			8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]			
(N		(NFVO_CR • NFVO/VNF	M can generate "terminate compute resource" operation requests t M_TERMINATE or VNFM_CRM_TERMINATE) M can generate "terminate network resource" operation requests to			
		(NFVO_NR	M_TERMINATE or VNFM_NRM_TERMINATE)			
			M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)	the VIM		
			ts "terminate compute resource" operation requests from the NFV0 _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)			
			ts "terminate network resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)			
		VIM supports "terminate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)				
Pre-test condi	tions	<ul> <li>NS1 can fui</li> </ul>	antiated (TD_NFV_NSLCM_INSTANTIATE_001) nction without the impacted VNF instances verification of the VNF instance(s) removal is possible (i.e. reduced	capacity)		
-	1		<b></b>			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger a NS update removing one or more existing VNF instances from NS1 on the NFVO			
	2	IOP Check	Verify that any additional resources associated to NS1 have been removed by the VIM according to the updated descriptors			
	3	IOP Check	Verify that the existing VNF instance(s) in NS1 are still running and reachable through the management network			
	4	IOP Check	Verify that the previously shared VNF instances(s) have been configured according to the updated descriptors by querying the VNFM			
	5	IOP Check	Verify that the NFVO indicates the shared VNF instance(s) removal operation result as successful			
	6	IOP Check	Verify that NS1 has been updated by running the end-to-end functional test factoring the shared VNF instance(s) removal			
	7	IOP Check	Verify that NS2 instance was unaffected by the NS update operation by running the relevant end-to-end functional tests that include the previously shared VNF instance(s)			

#### 7.7.3.6 Remove Shared VNF Instances from NS Instance

		Test Des	scription: NS update changing VNF instances DF	
Identifier	-		M_UPDATE_VNF_DF_001	
Test Purpose	-		deployment flavour of one or more VNF instances in a NS instan	ce can be
Configuratior		SUT Configurati	on 1	
References		ETSI GS NFV-IF	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i. 3 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI
Applicability		<ul> <li>NFVO/VNF (NFVO_CR</li> <li>NFVO/VNF (NFVO_NR</li> <li>NFVO/VNF (NFVO_SR</li> <li>VIM suppor (VIM_CRM_</li> <li>VIM suppor (VIM_SRM_</li> <li>VIM suppor (VIM_SRM_</li> <li>NFVO/VNF (NFVO_CR</li> <li>NFVO/VNF (NFVO_NR</li> <li>NFVO/VNF (NFVO_NR</li> <li>NFVO/VNF (NFVO_SR</li> <li>VIM suppor (VIM_CRM_</li> <li>VIM suppor (VIM_NRM_</li> <li>VIM suppor</li> </ul>	M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE) M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE) M can generate "allocate storage resource" operation requests to M_ALLOCATE or VNFM_SRM_ALLOCATE) ts "allocate compute resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM) ts "allocate network resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM) ts "allocate storage resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM) ts "allocate storage resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) M can generate "terminate compute resource" operation requests M_TERMINATE or VNFM_CRM_TERMINATE) M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE) M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE) M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE) ts "terminate compute resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE] ts "terminate network resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM) ts "terminate network resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)	the VIM the VIM VNFM VNFM to the VIM to the VIM to the VIM D/VNFM
Pre-test cond	itions	<ul> <li>NS is instar</li> </ul>	tiated (TD_NFV_NSLCM_INSTANTIATE_001)	
			at least one VNF that accepts multiple deployment flavours	
			ployment flavour is expected to impact a functional aspect of the V	/NF (i.e. scale or
Test	Step	Туре	Description	Result
Sequence	1 1	Stimulus	Trigger a NS update changing the deployment flavour (DF) of one or more VNF instances in a NS instance on NFVO	Neoun
	2	IOP Check	Verify that the virtualised resources have been updated by the VIM according to the new deployment flavour	
	3	IOP Check	Verify that the impacted VNF instance(s) are running and reachable through the management network	
	4	IOP Check	Verify that the NFVO indicates the VNF DF update operation result as successful	
	5	IOP Check	Verify that NS has been updated by running the end-to-end functional test factoring the new VNF DF	
IOP Verdict				

## 7.7.3.7 Change VNF Deployment Flavour

## 7.7.4 NS Healing

## 7.7.4.1 Partial NS Healing with an Operator Action

			cription: partial NS healing with an operator action			
Identifier		TD_NFV_NSLC				
Test Purpose		healing) is trigge	instances inside the NS can be successfully healed when partial N ered by an operator action	S healing (VNF		
Configuration		SUT Configuration 1				
References		ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5], ETSI GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		<ul> <li>NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE)</li> </ul>				
		NFVO/VNF	M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM		
		NFVO/VNF	M can generate "allocate storage resource" operation requests to t M_ALLOCATE or VNFM_SRM_ALLOCATE)	he VIM		
		<ul> <li>VIM suppor</li> </ul>	rts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM		
		<ul> <li>VIM support</li> </ul>	rts "allocate network resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM		
		<ul> <li>VIM suppor</li> </ul>	rts "allocate storage resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	/NFM		
		(NFVO_CR	M can generate "terminate compute resource" operation requests M_TERMINATE or VNFM_CRM_TERMINATE)			
		(NFVO_NR	M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)			
		<ul> <li>NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)</li> </ul>				
		<ul> <li>VIM supports "terminate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)</li> </ul>				
		<ul> <li>VIM supports "terminate network resource" operation requests from the NFVO/VNFM (VIM_NRM_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)</li> </ul>				
		<ul> <li>VIM supports "terminate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)</li> </ul>				
			generate VNF healing requests to the VNFM (NFVO_VNFLCM_HE ports VNF healing requests from the NFVO (VNFM_VNFLCM_HEA			
Pre-test condit	tions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			ailed state (for example a virtualised resource needed by one or monside the NS has been terminated directly on the VIM)	ore VNF		
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger partial NS healing (VNF healing) operation on the NFVO with an operator action			
	2	IOP Check	Verify that any additional resources required for the healing process have been allocated by the VIM according to the descriptors			
	3	IOP Check	Verify that other VNF instances(s) inside the NS are still running and reachable via their management network			
	4	IOP Check	Verify that healed VNF instance(s) are running and reachable via their management network			
	5	IOP Check	Verify that the healed VNF instances(s) have been configured according to the descriptors by querying the VNFM			
	6	IOP Check	Verify that any failed resources have been terminated and released by the VIM			
	7	IOP Check	Verify that the NFVO indicates the partial NS healing (VNF healing) operation result as successful			
	8	IOP Check	Verify that NS has been successfully healed by running an end-			
IOP Verdict			to-end functional test factoring the healed VNF instance(s)			

		Test Desci	iption: complete NS healing with an operator action			
Identifier		TD_NFV_NSLC				
Test Purpose			can be successfully healed when complete NS healing is triggered	by an operator		
Configuration	1	SUT Configurat	ion 1			
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.	51 FTSI		
			8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	- ·		
Applicability			M can generate "allocate compute resource" operation requests to			
, pp. ea.		(NFVO_CF	M_ALLOCATE or VNFM_CRM_ALLOCATE)			
		(NFVO_NF	M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)			
			M can generate "allocate storage resource" operation requests to t M_ALLOCATE or VNFM_SRM_ALLOCATE)	he VIM		
			rts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM		
			rts "allocate network resource" operation requests from the NFVO/^ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM		
		<ul> <li>VIM support</li> </ul>	rts "allocate storage resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	/NFM		
		NFVO/VNF	M can generate "terminate compute resource" operation requests M_TERMINATE or VNFM_CRM_TERMINATE)	to the VIM		
		NFVO/VNF	M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)	o the VIM		
		<ul> <li>NFVO_NRM_TERMINATE of VNFM_NRM_TERMINATE)</li> <li>NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)</li> </ul>				
		<ul> <li>VIM supports "terminate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)</li> </ul>				
		<ul> <li>VIM supports "terminate network resource" operation requests from the NFVO/VNFM</li> </ul>				
l		<ul> <li>VIM support</li> </ul>	_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM; rts "terminate storage resource" operation requests from the NFVO			
		(VIM_SRM	_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)			
Pre-test cond	itions	<ul> <li>NS is instal</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			ailed state (for example a virtualised resource needed by one or me			
			nside the NS has been terminated directly on the VIM)			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger complete NS healing operation on the NFVO with an operator action			
	2	IOP Check	Verify that resources allocated to the faulty NS instance have been terminated by the VIM			
	3	IOP Check	Verify that resources required by the new NS instance have been allocated by the VIM			
	3	IOP Check IOP Check	Verify that resources required by the new NS instance have been allocated by the VIM Verify that VNF instance(s) inside the new NS instance are			
			Verify that resources required by the new NS instance have been allocated by the VIM Verify that VNF instance(s) inside the new NS instance are running and reachable via their management network Verify that the VNF instances(s) inside the new NS instance have been configured according to the descriptors by querying			
	4	IOP Check	Verify that resources required by the new NS instance have been allocated by the VIM Verify that VNF instance(s) inside the new NS instance are running and reachable via their management network Verify that the VNF instances(s) inside the new NS instance have been configured according to the descriptors by querying the VNFM Verify that the NFVO indicates the complete NS healing			
	4 5	IOP Check IOP Check	Verify that resources required by the new NS instance have been allocated by the VIM Verify that VNF instance(s) inside the new NS instance are running and reachable via their management network Verify that the VNF instances(s) inside the new NS instance have been configured according to the descriptors by querying the VNFM			

## 7.7.4.2 Complete NS Healing with an Operator Action

### 7.7.5 NS Termination

#### 7.7.5.1 Standalone NS Termination

		Те	est Description: standalone NS termination		
Identifier		TD_NFV_NSLCM_TERMINATE_001			
Test Purpose		To verify that a standalone NS instance can be successfully terminated			
Configuration		SUT Configuration 1			
References         ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.           GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]			5], ETSI		
Applicability		<ul> <li>NFVO/VNFM can generate "terminate compute resource" operation requests to the VIM (NFVO_CRM_TERMINATE or VNFM_CRM_TERMINATE)</li> <li>NFVO/VNFM can generate "terminate network resource" operation requests to the VIM (NFVO_NRM_TERMINATE or VNFM_NRM_TERMINATE)</li> <li>NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)</li> </ul>			
		<ul> <li>VIM supports "terminate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)</li> <li>VIM supports "terminate network resource" operation requests from the NFVO/VNFM (VIM_NRM_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)</li> <li>VIM supports "terminate storage resource" operation requests from the NFVO/VNFM</li> </ul>			
		<ul> <li>(VIM_SRM_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)</li> <li>VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)</li> </ul>			
		<ul> <li>VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)</li> <li>VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_NFVO_NFVO or VIM_SRM_INFO_NFVO_NFVO or VIM_SRM_INFO_NFVO_NFVO or VIM_SRM_INFO_NFVO_NFVO_NFVO or VIM_SRM_INFO_NFVO_NFVO_NFVO_NFVO_NFVO_NFVO_NFVO_N</li></ul>			
		VIM_SRM_INFO_TO_VNFM)			
		<ul> <li>NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)</li> </ul>			
		<ul> <li>VNFM supp</li> </ul>	orts VNF information gueries from the NFVO (VNFM_VNFLCM_C	UERY)	
Pre-test condi	itions	<ul> <li>NS is instar</li> </ul>	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)		
Test	Step	Туре	Description	Result	
Sequence	1	Stimulus	Trigger the termination of the NS instance on the NFVO		
••••	2	IOP Check	Verify that all the VNF instance(s) have been terminated by querying the VNFM.		
	3	IOP Check	Verify that the resources allocated to the NS and VNF instance(s) have been released by the VIM		
	4	IOP Check	Verify that the NFVO indicates NS instance termination operation result as successful		
IOP Verdict					

			Test Description: nested NS termination			
Identifier		TD NFV NSLCM TERMINATE NESTED NS 001				
Test Purpose		To verify that a NS instance referencing an existing nested NS can be successfully terminated				
Configuration		SUT Configuration 3				
References		ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5], ETSI				
	GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 000 [i.7], ETSI GS NFV-IFA 007 [i.7], ETSI GS NFV-IFA 013 [i.9]		-			
Applicability						
Аррисарину			M can generate "terminate compute resource" operation requests M_TERMINATE or VNFM_CRM_TERMINATE)	to the VIM		
			M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE)	o the VIM		
		<ul> <li>NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)</li> </ul>				
		VIM supports "terminate compute resource" operation requests from the NFVO/VNFM				
		<ul> <li>(VIM_CRM_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)</li> <li>VIM supports "terminate network resource" operation requests from the NFVO/VNFM</li> </ul>				
		(VIM_NRM_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)				
		<ul> <li>VIM supports "terminate storage resource" operation requests from the NFVO/VNFM (VIM_SRM_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)</li> </ul>				
		• VIM can send network resource information to the NFVO (VIM_NRM_INFO_TO_NFVO or				
		VIM_NRM_INFO_TO_VNFM)				
		<ul> <li>VIM can send storage resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)</li> </ul>				
		<ul> <li>NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)</li> </ul>				
		<ul> <li>VNFM supp</li> </ul>	ports VNF information queries from the NFVO (VNFM_VNFLCM_Q	UERY)		
Pre-test cond	litions	<ul> <li>NSD2 refer</li> </ul>	ences nested NSD1			
		<ul> <li>NS2 is insta</li> </ul>	antiated (TD_NFV_NSLCM_INSTANTIATE_NEST_NS_001)			
			ce can function without the impacted NS2 instance			
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger NS2 instance termination on the NFVO			
	2	IOP Check	Verify that the resources that were allocated to the VNF instance(s) inside NS2 have been released by the VIM			
	3	IOP Check	Verify that VNF instance(s) inside NS1 are still running and reachable through the management network			
	4	IOP Check	Verify that all VNF instance(s) in NS2 have been terminated by querying the VNFM			
	5	IOP Check	Verify that the NFVO indicates NS2 instance termination operation result as successful			
	6	IOP Check	Verify that NS1 instance was unaffected by NS2 instance termination by running an end-to-end functional test factoring in the functionality of VNF instance(s) in NS1			
IOP Verdict						
	_					

### 7.7.5.2 Nested NS Termination

# Annex A: Technical Report Card Sample

Test ID	XXXX
Tested By	XXXX
Date and Time	dd-mm-yyyy hh:mm

Functional Block	Product Name	Version	Product Description	Configuration
NFVO				
VNFM				
VIM				
NFVI				
EM				
VNF				

Functional Area	Test Description ID	SUT Configuration	IOP Verdict
Software Image Management	TD_NFV_SWIM_ADD_001	SUT Configuration 1	OK
Software Image Management	TD_NFV_SWIM_DELETE_001	SUT Configuration 1	OK
VNF Package Management	TD_NFV_VNFPM_ONBOARD _001	SUT Configuration 1	OK
VNF Package Management	TD_NFV_VNFPM_DELETE_001	SUT Configuration 1	OK
VNF Lifecycle Management	TD_NFV_VNFLCM_INSTANTIATE_VNF_001	SUT Configuration 1	OK
VNF Lifecycle Management	TD_NFV_VNFLCM_QUERY_VNF_001	SUT Configuration 1	OK
VNF Lifecycle Management	TD_NFV_VNFLCM_MODIFY_VNF_INFO_001	SUT Configuration 1	NOK
VNF Lifecycle Management	TD_NFV_VNFLCM_START_VNF_001	SUT Configuration 1	OK
VNF Lifecycle Management	TD_NFV_VNFLCM_STOP_VNF_001	SUT Configuration 1	NOK
VNF Lifecycle Management	TD_NFV_VNFLCM_HEAL_VNF_001	SUT Configuration 1	N/A
VNF Lifecycle Management	TD_NFV_VNFLCM_SCALE_OUT_VNF_001	SUT Configuration 1	NOK
VNF Lifecycle Management	TD_NFV_VNFLCM_SCALE_IN_VNF_001	SUT Configuration 1	NOK
VNF Lifecycle Management	TD_NFV_VNFLCM_TERMINATE_VNF_001	SUT Configuration 1	OK
NS Lifecycle Management	TD_NFV_NSLCM_INSTANTIATE_001	SUT Configuration 1	OK
NS Lifecycle Management	TD_NFV_NSLCM_SCALE_OUT_001	SUT Configuration 1	OK
NS Lifecycle Management	TD_NFV_NSLCM_SCALE_IN_001	SUT Configuration 1	NOK
NS Lifecycle Management	TD_NFV_NSLCM_TERMINATE_001	SUT Configuration 1	OK

## Annex B: Document Usage Process Diagram

This clause explains how the present document can be best utilized in a process diagram.

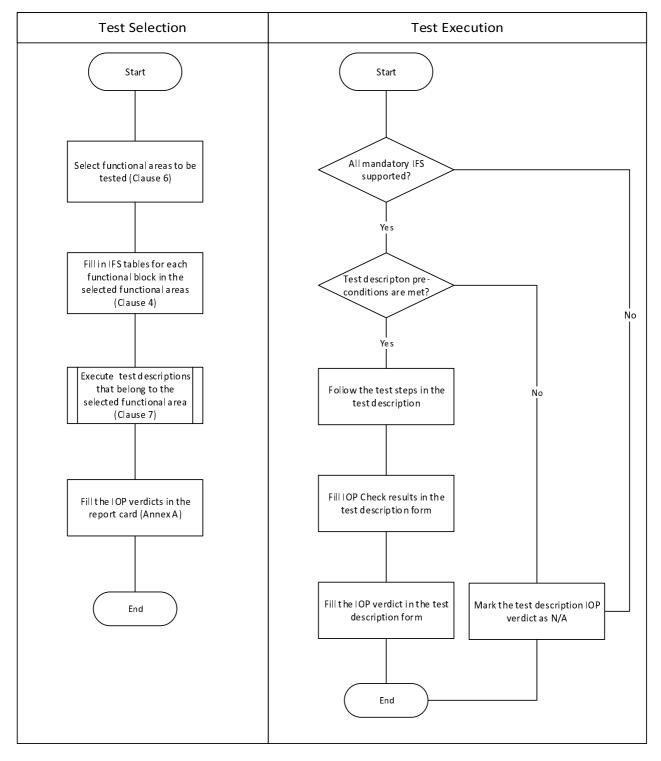


Figure B-1: Document usage process diagram

## Annex C: Authors & Contributors

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# History

Document history			
V1.1.1	November 2017	Publication	