ETSI GR NFV-TST 007 V2.5.1 (2018-08)



Network Functions Virtualisation (NFV) Release 2; Testing; Guidelines on Interoperability Testing for MANO

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Reference RGR/NFV-TST007ed251

Keywords interoperability, management, MANO, NFV, testing

ETSI

650 Route des Lucioles F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C Association à but non lucratif enregistrée à la Sous-Préfecture de Grasse (06) N° 7803/88

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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.

[i.1]	ETSI GS NFV-TST 002 (V1.1.1): "Network Functions Virtualisation (NFV); Testing Methodology; Report on NFV Interoperability Testing Methodology".
[i.2]	ETSI GS NFV 003 (V1.2.1): "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".
[i.3]	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".
[i.4]	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".
[i.5]	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".
[i.6]	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".

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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	/IM			
Functional Area	Software Image Management	oftware Image Management			
Observed Reference Point	Or-Vi)r-Vi			
Observed Interface	Software Image Management				
Producer/Consumer	Producer				
References	ferences 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	oserved Interface 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			

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	VIM					
Functional Area	VNF Lifecycle Management	/NF Lifecycle Management				
Observed Reference Point	Or-Vi					
Observed Interface	Virtualised Compute Resource Manage	ment				
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	Μ				
VIM_CRM_INFO_TO_NFVO	VIM can send compute resource information to the NFVO	Μ				
VIM_CRM_OPERATE_BY_NFVO	VIM supports "operate compute resource" operation requests from the NFVO	Μ				
VIM_CRM_TERMINATE_BY_NFVO	VIM supports "terminate compute resource" operation requests from the NFVO	Μ				

Table 4.2.3-2

Functional Block	VIM				
Functional Area	VNF Lifecycle Management	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

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	м			

Table 4.2.3-4

Functional 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	VIM				
Functional Area	VNF Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Storage Resource Manager	ment			
Producer/Consumer	ucer/Consumer Producer				
References	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 can send storage resource				
VIM_SRM_INFO_TO_NFVO	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]				
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	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_NOTIFY_BY_VNFM	VIM can generate virtualised resources fault alarm notifications to the VNFM	М			

4.2.5 Performance Management

Functional Block		VIM				
Functional Area		Fault Management				
Observed Reference Point Or-Vi						
Observed Interface Virtualised Resources P		erformanc	e Managemen	t		
Producer/Consumer		Producer		0		
References		ETSI GS NFV-IFA 005 [i	.3]			
Interoperability Features						
ld	Feature		Status	Support	Details	
VIM_PM_PMJOB_CREATE_BY_NFVO		ports VR PM jobs by the NFVO	М			
VIM_PM_PMJOB_SUBSCRIBE_BY_NFVO		oorts VR PM job tions from the NFVO	М			
VIM_PM_PMJOB_NOTIFY_BY_NFVO		generate VR PM ons to the NFVO	М			
VIM_PM_PMJOB_QUERY_BY_NFVO	VIM supp by the N	oorts VR PM job queries FVO	М			
VIM_PM_PMJOB_DELETE_BY_NFVO		ports VR PM jobs by the NFVO	М			
VIM_PM_PMTH_CREATE_BY_NFVO		oorts VR PM thresholds by the NFVO	М			
VIM_PM_PMTH_QUERY_BY_NFVO	VIM supp	oorts VR PM threshold by the NFVO	М			
VIM_PM_PMTH_DELETE_BY_NFVO		borts VR PM thresholds by the NFVO	М			

Table 4.2.5-1

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Table 4.2.5-2

Functional Block	VIM				
Functional Area	Performance Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Resources Performance N	/lanageme	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_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

Table 4.2.6-1

				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	NS Lifecycle Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	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					
Functional Area	NS Lifecycle Management	NS 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						
Id	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 BIOCK					
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Network Resource Manage	ment			
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			
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	VIM				
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 Manage	ment		
Producer/Consumer	Producer			
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_TERMINATE_BY_VNFM	VIM supports "terminate network resource" operation requests from the VNFM	М		
VIM_NRM_INFO_TO_VNFM	VIM can send network resource information to the VNFM	М		

Table 4.2.6-8

Functional Block	VIM			
Functional Area	NS 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_TERMINATE_BY_VNFM	VIM supports "terminate storage resource" operation requests from the	М		
	VNFM			

Table 4.2.6-9

Functional Block		VIM			
Functional Area		NS Lifecycle Managemei	nt		
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	1	Status	Support	Details
VIM_PM_PMJOB_CREATE_BY_NFVO		ports VR PM jobs by the NFVO	М		
VIM_PM_PMJOB_SUBSCRIBE_BY_NFVO		ports VR PM job tions from the NFVO	М		
VIM_PM_PMJOB_NOTIFY_BY_NFVO		generate VR PM ons to the NFVO	М		
VIM_PM_PMTH_CREATE_BY_NFVO		ports VR PM thresholds by the NFVO	М		

Table 4.2.6-10

Functional Block	VIM			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Resources Performance	/lanageme	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			
Functional Area	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	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			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Compute Resource Mana	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			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Network Resource Manage	ment		
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			
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 can generate "allocate storage			
VNFM_SRM_ALLOCATE	resource" operation requests to the VIM	Μ		

Table 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			
Producer/Consumer	Producer			
References	ETSI GS NFV-IFA 008 [i.6]			
Interoperability Features				
Id	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	VNFM			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-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 can generate "Grant VNF			
VNFM_VNFLCM_GRANTING	Lifecycle Operation" requests to the	0		
	NFVO			

4.3.4 Fault Management

Table 4.3.4-1

Functional Block	VNFM			
Functional Area	Fault Management			
Observed Reference Point	Vi-Vnfm			
Observed Interface	Virtualised Resources Fault Managem	ent		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 006 [i.4]			
Interoperability 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 can get the list of virtualised	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]			
Interoperability Features				
interoperability realties				
Id	Feature	Status	Support	Details
	Feature VNFM supports alarm notifications subscriptions from by the NFVO	Status M	Support	Details
ld	VNFM supports alarm notifications		Support	Details

4.3.5 Performance Management

Functional Block	VNFM				
Functional Area	Performance Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Resources Performance Ma	anagemei	nt		
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 on the VIM	М			
VNFM_PM_VR_PMJOB_NOTIFY	VNFM supports VR PM job notifications from the VIM	М			
VNFM_PM_VR_PMJOB_QUERY	VNFM can query VR PM jobs from the VIM	М			
VNFM_PM_VR_PMJOB_DELETE	VNFM can delete VR PM jobs from the VIM	М			
VNFM_PM_VR_PMTH_CREATE	VNFM can create VR PM thresholds on the VIM	М			
VNFM_PM_VR_PMTH_QUERY	VNFM can query VR PM thresholds from the VIM	М			
VNFM_PM_VR_PMTH_DELETE	VNFM can delete VR PM thresholds from the VIM	М			

Table 4.3.5-1

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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	Software Image Management			
Producer/Consumer	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_SWIM_QUERY_IM	VNFM can query software image information on the VIM	М			

Table 4.3.6-2

Functional Block	VNFM	VNFM			
Functional Area	NS 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 4.3.6-3

Functional Block	VNFM				
Functional Area	NS Lifecycle Management				
Observed Reference Point	Vi-Vnfm				
Observed Interface	Virtualised Network Resource Manage	ment			
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			

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Table 4.3.6-4

Functional Block	VNFM			
Functional Area	NS 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 VIM	м		
VNFM_SRM_TERMINATE	VNFM can generate "terminate storage 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 Ma	anagemer	nt	
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 on the VIM	Μ		
VNFM_PM_VR_PMJOB_NOTIFY	VNFM supports VR PM job notifications from the VIM	М		

Table	4.3.6-6
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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 supports "create VNF			
VNFM_VNFLCM_CREATE_VNFID	NFVO	Μ		
VNFM_VNFLCM_INSTANTIATE	VNFM supports "instantiate VNF" operation requests from the NFVO	М		
VNFM_VNFLCM_DELETE_VNFID	NFVO	Μ		
VNFM_VNFLCM_TERMINATE	VNFM supports "terminate VNF" operation requests from the NFVO	Μ		
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	Μ		
VNFM_VNFLCM_VNF_SCALE_OUT	VNFM supports "scale out by adding VNFC instances" requests from the NFVO	Μ		
VNFM_VNFLCM_VNF_SCALE_IN	VNFM supports "scale in by removing VNFC instances" requests from the NFVO	Μ		

Table 4.3.6-7

Functional Block	VNFM					
Functional Area	NS Lifecycle Management	NS Lifecycle Management				
Observed Reference Point	Or-Vnfm	Or-Vnfm				
Observed Interface	Indicator	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
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Functional Block	VNFM					
Functional Area	NS Lifecycle Management					
Observed Reference Point	Ve-Vnfm					
Observed Interface	Indicator	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
i abio	

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

Table 4.4.2-1

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	Μ		
NFVO_VNFPM_ABORT_DELETE	NFVO supports the delete VNF Package operation abortion	М		

4.4.3 VNF Lifecycle Management

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

Table 4.4.3-2

Functional Block	NFVO				
Functional Area	VNF Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Compute Resource Manag	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	NFVO			
Functional Area	VNF Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Network Resource Management	Virtualised Network Resource Management		
Producer/Consumer	Consumer			
References	ETSI GS NFV-IFA 005 [i.3]			
Interoperability Features				
ld	Feature	Status	Support	Details
	NFVO can query network resource			
NFVO_NRM_QUERY	information from the VIM	М		
NFVO_NRM_QUERY NFVO_NRM_ALLOCATE		M M		

Table 4.4.3-1

Table 4.4.3-4

Functional Block	NFVO	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	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 to the VIM	М			

Table 4.4.3-5

Functional Block	NFVO				
Functional Area	VNF Lifecycle Management				
Observed Reference Point	Or-Vnfm	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 Operation" requests from the VNFM	0		

4.4.4 Fault Management

Functional Block	NFVO	NFVO			
Functional Area	Fault Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Resource Fault Management	Virtualised Resource Fault Management			
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			

Table 4.4.4-1

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
NFVO FM VNF SUBSCRIBE	NFVO can subscribe to alarm	М		
	notifications on the VNFM			
NEVO FM VNE NOTIFY	NFVO can process VNF fault alarm	м		
	notifications from by the VNFM	101		
NFVO FM VNF GET ALARMS	NFVO can get the list of VNF fault alarms from the VNFM	м		

4.4.5 Performance Management

T					
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	м			
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			

Table 4.4.5-1

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Table 4.4.5-2

Functional Block	NFVO				
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	М			
NFVO_PM_VNF_PMTH_DELETE	NFVO can delete VNF PM thresholds from the VNFM	М			

4.4.6 NS Lifecycle Management

Functional Block NFVO **Functional Area** NS 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 Status ld Feature Support Details NFVO can query software image NFVO_SWIM_QUERY_IM М information on the VIM

Table 4.4.6-2

Functional Block	NEVO			
Functional Area	NS Lifecycle Management			
Observed Reference Point	Or-Vi			
Observed Interface	Virtualised Compute Resource Manag	ement		
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	Μ		
NFVO_CRM_TERMINATE	NFVO can generate "terminate compute resource" operation requests to the VIM	Μ		

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	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 4.4.6-1

Table 4.4.6-4

Functional Block	NFVO	NFVO			
Functional Area	NS Lifecycle Management				
Observed Reference Point	Or-Vi				
Observed Interface	Virtualised Storage Resource Manage	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 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	t	
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	М		
NFVO_PM_VR_PMJOB_NOTIFY	NFVO supports VR PM notifications from the VIM	М		

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Functional Block	NEVO			
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	Μ		
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		

Table 4.4.6-7

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

4.5 IFS for EM/VNF

4.5.1 Software Image Management

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

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]			
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_INF O	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.

4.5.5 Performance Management

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

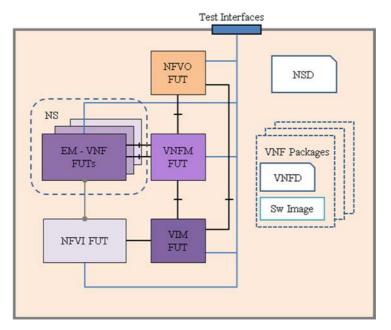
4.5.6 NS Lifecycle Management

Table 4.5.6-1

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	Interoperability Features				
ld	Feature	Status	Support	Details	
EM_VNFINDI_SUBSCRIBE	EM/VNF supports VNF indicator subscriptions from the VNFM	М			
EM VNFINDI NOTIFY	EM/VNF can generate VNF indicator	М			

5 System Under Test (SUT)

5.1 SUT Configuration 1



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Figure 5.1-1: SUT Configuration 1

5.2 SUT Configuration 2

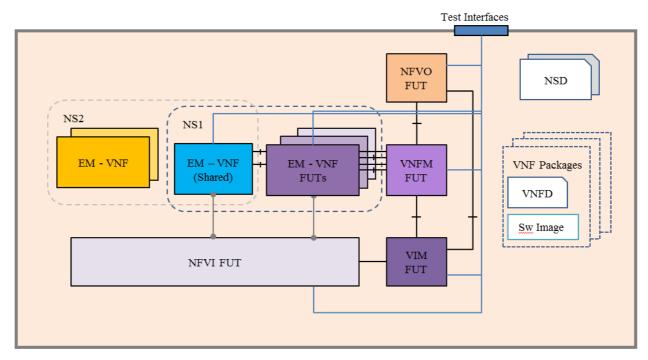
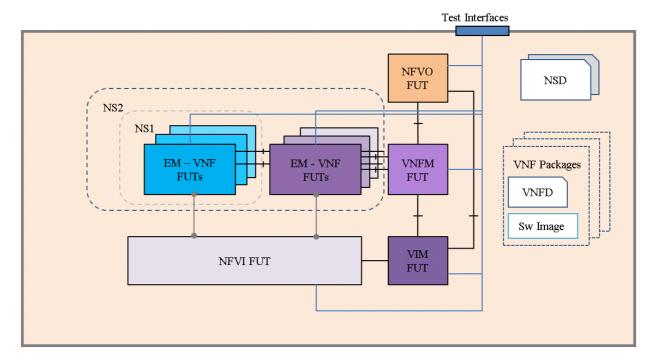


Figure 5.2-1: SUT Configuration 2



5.3 SUT Configuration 3



6 Test Suite Structure

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.

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_

Table 6.1-1

6.2 Software Image Management Test Cases Overview

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

Table 6.2-1

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
TD_NEV_VNEPM_ABORTDEL_001	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

Table 6.4-1

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

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 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

Table 6.6-1

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

6.7 NS Lifecycle Management Test Cases Overview

Table	6.7-1
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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

Test case Identifier	Test case purpose
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 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

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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	dentifier TD_NFV_SWIM_ADD_001				
Test Purpose		Verify that the NFVO can add a software image to the image repository managed by the VIM			
Configuration	١	SUT Configuration 1			
References		ETSI GS NFV-IFA 005 [i.3]			
Applicability Pre-test cond	itions	 VIM suppor VIM suppor (VIM_SWIN 	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 M_QUERY_IM_BY_NFVO)		
		001110101			
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					

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7.2.2 Query Software Image

7.2.2.1 Query Software Image by NFVO

		Tes	t Description: query software image by NFVO	
Identifier		TD_NFV_SWIN		
Test Purpose	;	Verify that the NFVO can retrieve the information of a software image from the imag managed by the VIM		
Configuratio	n	SUT Configuration 1		
References		ETSI GS NFV-IFA 005 [i.3]		
Applicability		 VIM suppo 	query software image information on the VIM (NFVO_SWIM_QUE rts software image information queries by the NFVO M_QUERY_IM_BY_NFVO)	κτ_IIVI)
Pre-test cond	ditions		re image to be queried is added to the image repository managed SWIM_ADD_001)	by the VIM
				by the VIM
Test	ditions Step 1	(TD_NFV_	SWIM_ADD_001)	-
Test		(TD_NFV_	Description Trigger the query of the relevant image information on the	-
Pre-test cond Test Sequence	Step 1	(TD_NFV_ 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		
Test Purpose		Verify that the VNFM can retrieve the information of a software image from the image r managed by the VIM		
Configuration		SUT Configuration 1		
References		ETSI GS NFV-IFA 006 [i.4]		
Applicability		 VNFM can query software image information on the VIM (VNFM_SWIM_QUERY_IM) VIM supports software image information queries by the VNFM (VIM_SWIM_QUERY_IM_BY_VNFM) 		
Pre-test cond	itions		re image to be queried is added to the image repository managed SWIM_ADD_001)	by the VIM
Test	Step	Туре	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 step 2	
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 Verify that the N			FVO can update the metadata of a software image in the image re	pository		
-		managed by the VIM				
Configuration		SUT Configuration 1				
References		ETSI GS NFV-IFA 005 [i.3]				
Applicability		 NFVO can update software image information on the VIM (NFVO_SWIM_UPDATE_IM 				
		 VIM support 	ts "update image" operations by the NFVO (VIM_SWIM_UPDATE	_IM)		
			ts software image information queries by the NFVO			
			L_QUERY_IM_BY_NFVO)			
Pre-test cond	itions	 The softwar 	e image to be updated is added to the image repository managed	by the VIM		
			SWIM_ADD_001)			
		The update	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 Configuration 1			
References		ETSI GS NFV-IFA 005 [i.3]			
Applicability		NFVO can delete software images from the VIM (NFVO_SWIM_DELETE_IM)			
		 VIM suppor 	ts "delete image" operations by the NFVO (VIM_SWIM_DELETE_	IM)	
		 VIM suppor 	ts software image information queries by the NFVO		
		(VIM_SWIN	/_QUERY_IM_BY_NFVO)		
Pre-test condit	tions		re 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					

7.3 VNF Package Management

7.3.1 On-board VNF Package

			Test Description: on-board VNF package	
Identifier			M ONBOARD 001	
Test Purpose		To verify that a VNF Package can be successfully on-boarded to the VNF catalogue man the NFVO		
Configuration	۱	SUT Configuration 1		
References		ETSI GS NFV-IFA 013 [i.9] and ETSI GS NFV-IFA 011 [i.8]		
Applicability Pre-test cond				stored
		and artefact		
Test	Step	Туре	Description	
				Result
Sequence	1	Stimulus		Result
Sequence	1 2		Trigger the on-boarding of a VNF Package on the NFVO Verify that the VNF Package is stored in the VNF catalogue managed by the NFVO	Result
Sequence	1 2 3	Stimulus	Trigger the on-boarding of a VNF Package on the NFVO Verify that the VNF Package is stored in the VNF catalogue	Result

			Test Description: delete VNF package	
Identifier		TD_NFV_VNFP	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		SUT Configuration	on 1	
References		ETSI GS NFV-IF	A 013 [i.9]	
Applicability		(NFVO_VN	access the VNF catalogue where the VNF Packages information is FPM_ACCESS) orts on-boarded VNF Packages gueries (NFVO_VNFPM_QUERY	
		 NEVO supp 	ons on-boarded vine Fackages queries (ine vo_vine Fin_QUER f)
Pre-test condi	tions		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	
	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			M_ABORTDEL_001	
Test Purpose			on-boarded VNF Package that is in deletion pending state can be etion by the NFVO	successfully
Configuration		SUT Configuration	on 1	
References		ETSI GS NFV-IF	A 013 [i.9]	
Applicability		(NFVO_VN	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 Description: instantiate VNF with an EM request				
Identifier	TD_NFV_VNFLCM_INSTANTIATE_VNF_001				
Test Purpose	Verify that a VNF be successfully instantiated when an "instantiate 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				
			M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM
			M can generate "allocate network resource" operation requests to t 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
		 VIM suppor 	M_ALLOCATE of VNFM_SRM_ALLOCATE) ts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM
		 VIM suppor 	_ALLOCATE_BT_INFVO OF VIM_CRIM_ALLOCATE_BT_VNFM) ts "allocate network resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM
		 VIM suppor 	s "allocate storage resource" operation requests from the NFVO/V ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	'NFM
		NFVO/VNF	M can query software image information from the VIM (NFVO_SW)	IM_QUERY_IM
		 VIM suppor 	ts software image information queries by the NFVO/VNFM /_QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)	
			M can query compute resource information from the VIM (NFVO_C	CRM_QUERY or
			M can query network resource information from the VIM (NFVO_N	RM_QUERY or
		 NFVO/VNF VNFM_SRM 	M can query storage resource information from the VIM (NFVO_SF M_QUERY)	RM_QUERY or
		VIM_CRM_	nd compute resource information to the NFVO (VIM_CRM_INFO_1 INFO_TO_VNFM)	
		VIM_NRM_	nd network resource information to the NFVO (VIM_NRM_INFO_T INFO_TO_VNFM)	_
		VIM_SRM_	nd storage resource information to the NFVO (VIM_SRM_INFO_T(INFO_TO_VNFM)	D_NFVO or
		(EM_VNFL	nerate "Instantiate VNF" requests to the VNFM CM_VNF_INSTANTIATE)	
			ports "instantiate VNF" requests from the EM FLCM_VNF_INSTANTIATE)	
		 Optionally, ' 	VNFM can generate "Grant VNF Lifecycle Operation" requests to the	
		 Optionally, ' (VNFM_VN)		
Pre-test condit	tions	 Optionally, ' (VNFM_VN requests from the second secon	VNFM can generate "Grant VNF Lifecycle Operation" requests to the FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation"	eration"
Pre-test condit	tions	Optionally, (VNFM_VN requests frc Any constra resource loc	VNFM can generate "Grant VNF Lifecycle Operation" requests to the FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING)	eration"
Pre-test condit	tions	 Optionally, ' (VNFM_VN requests from the source loc Any constrative source loc The softwar 	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" om the VNFM (NFVO_VNFLCM_GRANTING) aints required for the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM	eration"
Pre-test condit	tions	 Optionally, ' (VNFM_VN requests from Any constrative resource loop The softwar 	VNFM can generate "Grant VNF Lifecycle Operation" requests to the FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING)	eration"
	tions	 Optionally, ' (VNFM_VN requests from Any constrative resource loop The softwar 	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation om the VNFM (NFVO_VNFLCM_GRANTING) aints required for the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI Description	eration"
Test		 Optionally, ' (VNFM_VN requests from Any constrative resource loop The softwar The require 	VNFM can generate "Grant VNF Lifecycle Operation" requests to the FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING) and the VNFD reactions are defined in the VNFD reactions are defined in the VNFD reactions are available on the NFVI and resources are available on the NFVI and resourc	eration" y rules and
Test	Step	Optionally, (VNFM_VN requests from the request from the request from the require for the software for the software for the require the requi	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" om the VNFM (NFVO_VNFLCM_GRANTING) aints required for the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and	eration" y rules and
Test	Step	 Optionally, ' (VNFM_VN requests from Any constrative resource loop The softwar The require Type Stimulus 	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" om the VNFM (NFVO_VNFLCM_GRANTING) aints required for the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the	eration" y rules and
	Step	 Optionally, ' (VNFM_VN requests from Any constrative resource loop The softwar The require Type Stimulus 	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" mether VNFM (NFVO_VNFLCM_GRANTING) aints required for the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been	eration" y rules and
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	Step	Optionally, ' (VNFM_VN requests fro Any constra resource loo The softwar The require Type Stimulus IOP Check IOP Check	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation om the VNFM (NFVO_VNFLCM_GRANTING) aints required for the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM	eration" y rules and
Test	Step 1 2 3 4	Optionally, ' (VNFM_VN requests fro Any constra resource loo The softwar The require <u>Type Stimulus IOP Check IOP Check IOP Check </u>	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation om the VNFM (NFVO_VNFLCM_GRANTING) aints required for the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI <u>Description</u> Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM Verify that the requested virtualised resources have been allocated by the VIM according to the VNFD	eration" y rules and
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Pre-test condit Test Sequence	Step 1 2 3 4	Optionally, ' (VNFM_VN requests fro Any constra resource loo The softwar The require <u>Type Stimulus IOP Check IOP Check IOP Check </u>	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation mether VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING) and resources are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM Verify that the requested virtualised resources have been allocated by the VIM according to the VNFD Verify that virtualised resource allocation constraints have been met by querying the VIM Verify that any existing virtualised resources have not been affected by the allocation of the new virtualised resources by	eration" y rules and
Test	Step 1 2 3 4 5	 Optionally, ' (VNFM_VN requests from the equests from the equests from the equests from the software the software the software the equire the equ	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation on the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING) and the VNFD one image repository is reachable by the VIM of resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM Verify that the requested virtualised resources have been allocated by the VIM according to the VNFD Verify that virtualised resource allocation constraints have been met by querying the VIM Verify that any existing virtualised resources have not been affected by the allocation of the new virtualised resources by querying the VIM Verify that the VNF instance resources are visible on the	eration" y rules and
Test	Step 1 2 3 4 5 6 7	 Optionally, ' (VNFM_VN requests from the equests from the equests from the software the software the software the software the software the the equire the e	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation of the VNFM (NFVO_VNFLCM_GRANTING) and the VNFD set of the virtualised resource such as affinity/anti-affinity cations are defined in the VNFD re image repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM Verify that the requested virtualised resources have been allocated by the VIM according to the VNFD Verify that any existing virtualised resources have not been affected by the allocation of the new virtualised resources by querying the VIM Verify that the VNF instance resources are visible on the VNFM	eration" y rules and
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Test	Step 1 2 3 4 5 6 7 8	 Optionally, ' (VNFM_VN requests from the equests from the equests from the software resource low the software the software the software the software the equire the equ	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING) and the VNFD reimage repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM Verify that the requested virtualised resources have been allocated by the VIM according to the VNFD Verify that any existing virtualised resources have not been affected by the allocation of the new virtualised resources by querying the VIM Verify that the VNF instance resources are visible on the VNFM Verify that the VNF instance resources are visible on the NFVO Verify that the VNF instance resources are visible on the NFVO Verify that the VNF instance is reachable via the management network Verify that the VNF instance has been configured according to	eration" y rules and
Test	Step 1 2 3 4 5 6 7 8 9	 Optionally, ' (VNFM_VN requests from the software resource low of the software the software of the s	VNFM can generate "Grant VNF Lifecycle Operation" requests to th FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING) and the VNFM (NFVO_VNFLCM_GRANTING) and the VNFD reimage repository is reachable by the VIM d resources are available on the NFVI Description Trigger an "instantiate VNF" operation on the EM If VNFM_VNFLCM_GRANTING and NFVO_VNFLCM_GRANTING are supported, verify that the requested grant for the "instantiate VNF" operation has been approved by the NFVO Verify that the software images have been successfully added to the image repository managed by the VIM Verify that the requested virtualised resources have been allocated by the VIM according to the VNFD Verify that any existing virtualised resources have not been met by querying the VIM Verify that any existing virtualised resources have not been affected by the allocation of the new virtualised resources by querying the VIM Verify that the VNF instance resources are visible on the VNFM Verify that the VNF instance resources are visible on the NFVO Verify that the VNF instance is reachable via the management network	eration" y rules and

ETSI

7.4.2

		Test Des	cription: query VNF information with an EM request	
Identifier			CM QUERY VNF 001	
Test Purpose			/NF instance's information can be queried successfully by the EM	
Configuration		SUT Configurat		
References		ETSI GS NFV-I		
Applicability		 EM can get 	nerate "query VNF" requests to the VNFM (EM_VNFLCM_VNF_QU	JERY)
		 VNFM supplication 	ports "query VNF" requests from the EM (VNFM_VNFLCM_VNF_Q	UERÝ)
				•
Pre-test cond	itions	 The VNF is 	s instantiated (TD_NFV_VNFLCM_INSTANTIATE_VNF_001)	
Test	Step	Туре	Description	Result
Test Sequence	Step 1	Type Stimulus	Description Trigger the EM to query the VNF information using the unique VNF instance identifier from the VNFM	Result
	Step 1 2		Trigger the EM to query the VNF information using the unique	Result
	1	Stimulus	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
	1	Stimulus IOP Check	Trigger the EM to query the VNF information using the unique VNF instance identifier from the VNFMVerify that the EM has received the VNF information from the VNFMVerify that VNF information in Step 2 matches the VNF	Result

7.4.3 Modify VNF Configuration Information with an EM Request

		Test	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	
Configuration	า เ	SUT Configurati	on 1	
References		ETSI GS NFV-IF	A 007 [i.5] and ETSI GS NFV-IFA 008 [i.6]	
Applicability		(EM_VNFL) • VNFM supp	nerate "modify VNF information" requests to the VNFM CM_VNF_MODIFY_INFO) Ports "modify VNF information" requests from the EM FLCM_VNF_MODIFY_INFO)	
		 NFVO can of 	query VNF information from the VNFM (NFVO_VNFLCM_QUERY) orts VNF information queries by the NFVO (VNFM_VNFLCM_QU	
Pre-test cond		 The original 	instantiated (TD_NFV_VNFLCM_INSTANTIATE_VNF_001) VNF instance information is available for comparison /NFLCM_QUERY_VNF_001)	
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger the EM to modify the VNF instance information on the VNFM	
	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	
IOP Verdict				

7.4.4 Start VNF/VNFC with an EM Request

Idontifier			Description: start VNF/VNFC with an EM request	
Identifier			CM_START_VNF_001 F/VNFC instance be successfully started when an "operate VNF" c	noration in
Test Purpose		triggered by the		peration is
Configuration		SUT Configurat		
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i. 5	i] and ETSI
		GS NFV-IFA 00		
Applicability			nerate "operate VNF" requests to the VNFM (EM_VNFLCM_VNF_C	
			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
			rts "operate compute resource" operation requests from the NFVO/	VNFM
			_OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM)	
			M can query compute resource information from the VIM (NFVO_C	RM_QUERY o
			M_QUERY)	
			nd compute resource information to the NFVO/VNFM	
			_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM)	
			nd network resource information to the NFVO/VNFM _INFO_TO_NFVO or VIM_NRM_INFO_TO_VNFM)	
			nd storage resource information to the NFVO/VNFM (VIM_SRM_IN	
			M_INFO_TO_VNFM)	
			query VNF information from the VNFM (NFVO_VNFLCM_QUERY)	
			ports VNF information queries by the NFVO (VNFM_VNFLCM_QUI	
			VNFM can generate "Grant VNF Lifecycle Operation" requests to t	
			IFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op	eration"
		requests fro	om the VNFM (NFVO_VNFLCM_GRANTING)	
Pre-test cond	itions	 The VNF is 		
	nions		instantiated (TD_NFV_VNFLCM_INSTANTIATE_VNF_001)	
			TVNPC Instance is in a stopped operational state. See hote.	
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	
	6	IOP Check	VNFM is indicated as "started" Verify that the EM indicates the "operate VNF" operation result	
	0		as successful	
	7	IOP Check	Verify that the VNF/VNFC instance operates successfully by	
			running the end-to-end functional test	
		•		
IOP verdict				
I OP Verdict NOTE: In th	ne state	STOPPED, the	virtualised container(s), where the VNFC instance(s) of the VNF ru	n, are shut dow

7.4.5 Stop VNF/VNFC with an EM Request

		Test D	Description: stop VNF/VNFC with an EM request	
Identifier		TD_NFV_VNFL	CM_STOP_VNF_001	
Test Purpose		Verify that a VN triggered by the	IF/VNFC instance be successfully stopped when an "operate VNF" EM	operation is
Configuration		SUT Configurat		
References		ETSI GS NFV-II GS NFV-IFA 00	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 18 [i.6]] and ETSI
Applicability		 VNFM supp NFVO/VNF (NFVO_CR VIM suppor (VIM_CRM NFVO/VNF VNFM_CRI VIM can se (VIM_CRM VIM can se (VIM_NRM VIM can se or VIM_SRI NFVO can VNFM supp Optionally, (VNFM_VN 	herate "operate VNF" requests to the VNFM (EM_VNFLCM_VNF_C borts "operate VNF" requests from the EM (VNFM_VNFLCM_VNF_ in can generate "operate compute resource" operation requests to the operate compute resource" operation requests from the NFVO/ _OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM) in can query compute resource information from the VIM (NFVO_C M_QUERY) and compute resource information to the NFVO/VNFM _INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM) ind network resource information to the NFVO/VNFM _INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM) and storage resource information to the NFVO/VNFM _INFO_TO_NFVO or VIM_RM_INFO_TO_VNFM) and storage resource information to the NFVO/VNFM _INFO_TO_NFVO or VIM_RM_INFO_TO_VNFM) and storage resource information to the NFVO/VNFM (VIM_SRM_IN M_INFO_TO_VNFM) query VNF information from the VNFM (NFVO_VNFLCM_QUERY) borts VNF information queries by the NFVO (VNFM_VNFLCM_QUERY) borts VNF information queries by the NFVO (VNFM_VNFLCM_QUERY) borts VNF information queries by the NFVO (VNFM_VNFLCM_QUE VNFM can generate "Grant VNF Lifecycle Operation" requests to the IFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" requests to the VNFM (NFVO_VNFLCM_GRANTING)	OPERATE) the VIM VNFM RM_QUERY or IFO_TO_NFVO ERY) ne NFVO
Pre-test condi	tions		instantiated (TD_NFV_VNFLCM_INSTANTIATE_VNF_001) //VNFC instance is in a "started" operational state	
Test	Ston	Type	Description	Result
	Step	Type Stimulus	Trigger the EM to stop the target VNF/VNFC instance	Result
Sequence	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 stopped by querying the VIM. See note.	
	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 "stopped"	
	6	IOP Check	Verify that the EM indicates the "operate VNF" operation result as successful	
IOP Verdict				
NOTE: In th			virtualised container(s), where the VNFC instance(s) of the VNF rur	

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	but 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.4	5], ETSI
Applicability			8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9] M can generate "allocate compute resource" operation requests to	the VIM
Applicability			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 t	the VIM
		(VIM_CRM_	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/	VNFM
			_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)	to the VIM
		NFVO/VNF	M can generate "terminate network resource" operation requests t	o the VIM
			M_TERMINATE or VNFM_NRM_TERMINATE) M can generate "terminate storage resource" operation requests to	the VIM
			M can generate terminate storage resource operation requests it M_TERMINATE or VNFM_SRM_TERMINATE)	
		 VIM suppor 	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	
		 VIM suppor 	ts "terminate storage resource" operation requests from the NFVO	/VNFM
			_TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)	
			orts "heal VNF" requests from EM/VNF (VNFM_VNFLCM_VNF_H n generate "heal VNF" requests to the VNFM (EM_VNFLCM_VNF	
			VNFM can generate "Grant VNF Lifecycle Operation" requests to the	
			FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op	
		requests fro	om the VNFM (NFVO_VNFLCM_GRANTING)	
Pre-test condit	ions		failed state (for example a virtualised resource needed by the impact seen terminated directly on the VIM)	acted VNF
	-	•		
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger the EM/VNF to send a VNF healing request to the VNFM	
	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	
	4	IOP Check	descriptors Verify that healed VNF instance is running and reachable via	
	-	IOI Check	the management network	
	5	IOP Check	Verify that the healed VNF instance has 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 EM/VNF indicates the VNF healing operation	
	8	IOP Check	result as successful 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	
		1		
OP Verdict				

7.4.7 VNF Scale Out with an EM/VNF Request

	ŀ		scription: scale out VNF with an EM/VNF request	
Identifier Test Purpose			CM_SCALE_OUT_VNF_001 F can be successfully scaled out by adding VNFC instances trigge	red by the
		EM/VNF		
Configuratio		SUT Configurat		
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.4]	5], ETSI
Applicability		 NFVO/VNF 	18 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9] The can generate "allocate compute resource" operation requests to RM_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM
	1	 NFVO/VNF 	M_ALLOCATE of VNI M_CRM_ALLOCATE) M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM
	I	NFVO/VNF	M_ALLOCATE or VNFM_SRM_ALLOCATE)	the VIM
	1	 VIM support 	rts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	/VNFM
	I	 VIM support 	rts "allocate network resource" operation requests from the NFVO/^ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	VNFM
l	1	(VIM_SRM	rts "allocate storage resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	
	,	(EM_VNFL	an generate "scale out by adding VNFC instances" requests to the ` CM_VNF_SCALE_OUT)	
	1		ports "scale out by adding VNFC instances" requests from the EM/ IFLCM_VNF_SCALE_OUT)	VNF
l	1	 Optionally, (VNFM_VN 	VNFM can generate "Grant VNF Lifecycle Operation" requests to t IFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Op om the VNFM (NFVO_VNFLCM_GRANTING)	
Pre-test conc	ditions		onfigured to trigger scale out when scale out request is received fro ne required amount of consumable virtual resources to run the scal	
				ed-out VNF
			t scale level of the VNF instance is not at the maximum scale level	ed-out VNF
Test		The current	t scale level of the VNF instance is not at the maximum scale level	
Test Sequence	Step		t scale level of the VNF instance is not at the maximum scale level Description	ed-out VNF Result
	Step 1	The current Type Stimulus	t scale level of the VNF instance is not at the maximum scale level	
	Step	The current Type	t scale level of the VNF instance is not at the maximum scale level	
	Step 1	The current Type Stimulus	t scale level of the VNF instance is not at the maximum scale level	
Test Sequence	Step 1	The current Type Stimulus	t scale level of the VNF instance is not at the maximum scale level	
	Step 1	The current Type Stimulus	t scale level of the VNF instance is not at the maximum scale level	
	Step 1 2 3	The current Type Stimulus IOP Check IOP Check	t scale level of the VNF instance is not at the maximum scale level	
	Step 1 2	The current Type Stimulus IOP Check	t scale level of the VNF instance is not at the maximum scale level	
	Step 1 2 3	The current Type Stimulus IOP Check IOP Check	t scale level of the VNF instance is not at the maximum scale level	
	Step 1 2 3 4	The current Type Stimulus IOP Check IOP Check IOP Check	t scale level of the VNF instance is not at the maximum scale level	
	Step 1 2 3 4 5	The current Type Stimulus IOP Check IOP Check IOP Check IOP Check	Description Trigger the EM/VNF to send a "scale out by adding 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 out" operation has been approved by the NFVO Verify that the "scale out by adding VNFC instance(s)" procedure has been started on the 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 VNFD 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	
	Step 1 2 3 4 5 6	The current Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check	Description Trigger the EM/VNF to send a "scale out by adding 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 out" operation has been approved by the NFVO Verify that the "scale out by adding VNFC instance(s)" procedure has been started on the 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 VNFD 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 VNFD by querying the VNFM Verify that the Additional VNFC instances (s) are connected to VNFD by querying the VNFM	
	Step 1 2 3 4 5 6 7	The current Type Stimulus IOP Check	Description Trigger the EM/VNF to send a "scale out by adding 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 out" operation has been approved by the NFVO Verify that the "scale out by adding VNFC instance(s)" procedure has been started on the 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 VNFD 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(s) are connected to include the additional VNFC instances (s) are connected to the VNFD by querying the VNFM Verify that the additional VNFC instances(s) are connected to the VL(s) according to the VNFD Verify that the EM/VNF indicates the scaling operation result as	
	Step 1 2 3 4 5 6 7 8	The current Type Stimulus IOP Check	Description Trigger the EM/VNF to send a "scale out by adding 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 out" operation has been approved by the NFVO Verify that the "scale out by adding VNFC instance(s)" procedure has been started on the 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 VNFD 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 instance(s) are running and are reachable through their management network Verify that the VNFC instances according to the VNFD by querying the VNFM Verify that the additional VNFC instances(s) are connected to the VL(s) according to the VNFD	
	Step 1 2 3 4 5 6 7 8 9	The current Type Stimulus IOP Check IOP Check	t scale level of the VNF instance is not at the maximum scale level	

7.4.8	VNF Scale In with an EM/VNF Request
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Identifier			escription: VNF scale in with an EM/VNF request .CM_SCALE_IN_VNF_001	
Test Purpose			IF can be successfully scaled in by removing VNFC instances trigge	ered by the
		EM/VNF		
Configuration		SUT Configurat		
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5	5], ETSI
Applicability			8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9] M can generate "terminate compute resource" operation requests	
		 NFVO/VNF (NFVO_NF (NFVO_SR VIM suppo (VIM_CRM VIM suppo (VIM_NRM VIM suppo (VIM_SRM VIM suppo (VIM_SRM EM/VNF ca (EM_VNFL VNFM supp (VNFM_VN Optionally, (VNFM_VN 	RM_TERMINATE or VNFM_CRM_TERMINATE) M can generate "terminate network resource" operation requests to RM_TERMINATE or VNFM_NRM_TERMINATE) M can generate "terminate storage resource" operation requests to RM_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 NFVC _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM) rts "terminate storage resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM) an generate "scale in by removing VNFC instances" to the VNFM .CM_VNF_SCALE_IN) ports "scale in by removing VNFC instances" requests from the EM IFLCM_VNF_SCALE_IN) VNFM can generate "Grant VNF Lifecycle Operation" requests to the IFLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Operation" requests to the IFLCM_GRANTING) and NFVO Supports "Grant VNF Lifecycle Operation" requests to the IFLCM_ONFM (NFVO_VNFLCM_GRANTING)	o the VIM D/VNFM /VNFM /VNFM /VNF
Pre-test condi	itions	The curren	t NS deployment size allows scaling in t scale level of the VNF instance is not at the minimum scale level	
Pre-test condi Test	itions Step	The curren	t NS deployment size allows scaling in t scale level of the VNF instance is not at the minimum scale level Description	Result
	Step 1	 The curren The curren Type Stimulus 	t NS deployment size allows scaling in t 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	Result
Test	Step	The curren The curren The curren Type	t NS deployment size allows scaling in t 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	Result
Test	Step 1	 The curren The curren Type Stimulus 	t NS deployment size allows scaling in t 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)"	Result
Test	Step 1 2	 The curren The curren Type Stimulus IOP Check 	t NS deployment size allows scaling in t 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	Result
Test	Step 1 2 3	The curren The curren Type Stimulus IOP Check IOP Check	t NS deployment size allows scaling in t 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	Result
Test	Step 1 2 3 4 5 6	The curren The curren Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check	t NS deployment size allows scaling in t 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	Result
Test	Step 1 2 3 4 5	The curren Type Stimulus IOP Check	t NS deployment size allows scaling in t 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	Result
Test	Step 1 2 3 4 5 6	The curren The curren Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check	t NS deployment size allows scaling in t 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	Result
Test	Step 1 2 3 4 5 6 7	The curren Type Stimulus IOP Check	t NS deployment size allows scaling in t 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(s) and VL(s) are still connected according to the descriptors Verify that the EM/VNF indicates the scaling operation result as	Result
Test	Step 1 2 3 4 5 6 7 8	The curren Type Stimulus IOP Check	t NS deployment size allows scaling in t 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(s) and VL(s) are still connected according to the descriptors	Result
Test	Step 1 2 3 4 5 6 7 8 9	The curren Type Stimulus IOP Check	t NS deployment size allows scaling in t 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 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 connected according to the descriptors Verify that the EM/VNF indicates the scaling operation result as successful Verify that the NFVO indicates the scaling operation result as	Result

7.4.9 Terminate VNF with an EM Request

Identifier Test Purpose Configuration References Applicability	V E S	ferify that a VNI Configuration SUT Configuration SUT Configuration	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 8 [i.6] M can generate "terminate compute resource" operation requests to 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) ts "terminate compute resource" operation requests from the NFVC _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) ts "terminate storage resource" operation requests from the NFVO _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 query compute resource information from the VIM (NFVO_NIM_QUERY) M can query network resource information from the VIM (NFVO_NIM_QUERY)	5] and ETSI 5] and ETSI 50 the VIM 50 the VIM 50 the VIM 50 the VIM 50 VNFM 70			
Configuration References	E S G O O O O O O O O O O O O O O O O O O	M SUT Configuration SUT Config	on 1 FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 8 [i.6] M can generate "terminate compute resource" operation requests to 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) ts "terminate compute resource" operation requests from the NFVC _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) ts "terminate storage resource" operation requests from the NFVO _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 query compute resource information from the VIM (NFVO_N M_QUERY) M can query network resource information from the VIM (NFVO_N M_QUERY)	5] and ETSI 5] and ETSI 50 the VIM 50 the VIM 50 the VIM 50 the VIM 50 VNFM 70 VNFM 70 VNFM 70 VNFM 70 VNFM 70 VNFM 70 RM_QUERY or 70 RM_QUERY or			
References	E G • • • • •	TSI GS NFV-IFA 008 NFVO/VNFI (NFVO_CRI NFVO/VNFI (NFVO_NRI NFVO/VNFI (NFVO_SRI VIM support (VIM_CRM_ VIM support (VIM_NRM_ VIM support (VIM_SRM_ NFVO/VNFI NFVO/VNFI VNFM_CRM NFVO/VNFI	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 8 [i.6] M can generate "terminate compute resource" operation requests to 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) ts "terminate compute resource" operation requests from the NFVC _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) ts "terminate storage resource" operation requests from the NFVO _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 query compute resource information from the VIM (NFVO_NIM_QUERY) M can query network resource information from the VIM (NFVO_NIM_QUERY)	to the VIM the VIM the VIM VVNFM VVNFM VNFM CRM_QUERY or RM_QUERY or			
	G • • • • • •	SS NFV-IFA 006 NFVO/VNFI (NFVO_CRI NFVO/VNFI (NFVO_NRI NFVO/VNFI (NFVO_SRI VIM support (VIM_CRM_ VIM support (VIM_SRM_ NFVO/VNFI NFVO/VNFI NFVO/VNFI VNFM_CRM	<u>B [i.6]</u> M can generate "terminate compute resource" operation requests to 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) ts "terminate compute resource" operation requests from the NFVC _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) ts "terminate storage resource" operation requests from the NFVO _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 query compute resource information from the VIM (NFVO_N M_QUERY) M can query network resource information from the VIM (NFVO_N M_QUERY)	to the VIM the VIM the VIM VVNFM VVNFM VNFM CRM_QUERY or RM_QUERY or			
Applicability	•	NFVO/VNFI (NFVO_CRI NFVO/VNFI (NFVO_NRI NFVO/VNFI (NFVO_SRI VIM support (VIM_CRM_ VIM support (VIM_NRM_ VIM support (VIM_SRM_ NFVO/VNFI NFVO/VNFI VNFM_CRM	M can generate "terminate compute resource" operation requests to 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) ts "terminate compute resource" operation requests from the NFVC _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) ts "terminate storage resource" operation requests from the NFVO _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 query compute resource information from the VIM (NFVO_N M_QUERY) M can query network resource information from the VIM (NFVO_N M_QUERY)	o the VIM o the VIM D/VNFM /VNFM /VNFM CRM_QUERY or RM_QUERY or			
Applicability	• • • •	(NFVO_CRI NFVO/VNFI (NFVO_NRI NFVO/VNFI (NFVO_SRI VIM support (VIM_CRM_ VIM support (VIM_NRM_ VIM support (VIM_SRM_ NFVO/VNFI NFVO/VNFI VNFM_CRM	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) ts "terminate compute resource" operation requests from the NFVO _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) ts "terminate storage resource" operation requests from the NFVO _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 query compute resource information from the VIM (NFVO_NIM M can query network resource information	o the VIM o the VIM D/VNFM /VNFM /VNFM CRM_QUERY or RM_QUERY or			
	• • •	(NFVO_NRI NFVO/VNFI (NFVO_SRI VIM support (VIM_CRM_ VIM support (VIM_NRM_ VIM support (VIM_SRM_ NFVO/VNFI VNFM_CRM NFVO/VNFI VNFM_NRM	M_TERMINATE or VNFM_NRM_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_BY_VNFM) ts "terminate network resource" operation requests from the NFVO _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) ts "terminate storage resource information from the VIM (NFVO_C M_QUERY) M can query network resource information from the VIM (NFVO_NIM M_QUERY)	o the VIM D/VNFM /VNFM /VNFM CRM_QUERY or RM_QUERY or			
	•	NFVO/VNFI (NFVO_SRI VIM support (VIM_CRM_ VIM support (VIM_NRM_ VIM support (VIM_SRM_ NFVO/VNFI VNFM_CRM NFVO/VNFI VNFM_NRM	M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE) ts "terminate compute resource" operation requests from the NFVC _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) ts "terminate storage resource" operation requests from the NFVO/ _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM) M can query compute resource information from the VIM (NFVO_C M_QUERY) M can query network resource information from the VIM (NFVO_NIM_ M_QUERY)	D/VNFM /VNFM /VNFM CRM_QUERY or RM_QUERY or			
	•	VIM support (VIM_CRM_ VIM support (VIM_NRM_ VIM support (VIM_SRM_ NFVO/VNFI VNFM_CRM NFVO/VNFI VNFM_NRM	ts "terminate compute resource" operation requests from the NFVC _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) ts "terminate storage resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM) M can query compute resource information from the VIM (NFVO_C M_QUERY) M can query network resource information from the VIM (NFVO_NIM _QUERY)	/VNFM /VNFM CRM_QUERY or RM_QUERY or			
	•	VIM support (VIM_NRM_ VIM support (VIM_SRM_ NFVO/VNFI VNFM_CRM NFVO/VNFI VNFM_NRM	ts "terminate network resource" operation requests from the NFVO _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 query compute resource information from the VIM (NFVO_C M_QUERY) M can query network resource information from the VIM (NFVO_N M_QUERY)	/VNFM /VNFM CRM_QUERY or RM_QUERY or			
	•	VIM support (VIM_SRM_ NFVO/VNFI VNFM_CRM NFVO/VNFI VNFM_NRM	ts "terminate storage resource" operation requests from the NFVO/ _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM) M can query compute resource information from the VIM (NFVO_C M_QUERY) M can query network resource information from the VIM (NFVO_NI M_QUERY)	/VNFM CRM_QUERY or RM_QUERY or			
	•	NFVO/VNFI VNFM_CRM NFVO/VNFI VNFM_NRM	M can query compute resource information from the VIM (NFVO_C M_QUERY) M can query network resource information from the VIM (NFVO_N M_QUERY)	CRM_QUERY or			
		NFVO/VNFI VNFM_NRM	M can query network resource information from the VIM (NFVO_N M_QUERY)				
	•						
			 VNFM_NRM_QUERY) NFVO/VNFM can query storage resource information from the VIM (NFVO_SRM_QUERY or 				
		 VNFM_SRM_QUERY) 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) 					
	•	• EM can generate "terminate VNF" requests to the VNFM (EM_VNFLCM_VNF_TERMINATE)					
	•						
	•		VNFM can generate "Grant VNF Lifecycle Operation" requests to th				
			FLCM_GRANTING) and NFVO supports "Grant VNF Lifecycle Ope om the VNFM (NFVO_VNFLCM_GRANTING)	eration			
		requests no					
Pre-test condition	ns 🖕	The target \	/NF is instantiated				
	•	The larget v					
Test Ste	tep	Туре	Description	Result			
	1	Stimulus	Trigger an "terminate VNF" operation on the EM	Rooun			
-	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	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							

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	erify that a fault alarm notification propagates to the NFVO when a virtualised resource that is equired for the NS connectivity fails				
Configuration			JT Configuration 1				
References		ETSI GS NFV-I	SI GS NFV-IFA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		 NFVO can (NFVO_FM VIM suppor (VIM_FM_S VIM can ge (VIM_FM_M NFVO can (NFVO_FM NFVO can (NFVO_FM NFVO can (NFVO_FM VIM suppor 	subscribe to virtualised resource fault alarms on the VIM LVR_SUBSCRIBE) rts alarm notifications subscriptions from the NFVO SUBSCRIBE_BY_NFVO) nerate virtualised resources fault alarm notifications to the NFVO NOTIFY_BY_NFVO) process virtualised resource fault alarm notifications from the VIM LVR_NOTIFY) get the list of virtualised resource fault alarms from the VIM LVR_GET_ALARMS) rts virtualised resource fault alarm list queries by the NFVO QUERY_BY_NFVO)				
Pre-test condi	itions		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				
OP Verdict							

7.5.1.2 Virtualised Resource Fault Alarm Clearance Notification

	Test Description: virtualised resource fault alarm clearance notification						
Identifier	TD_NFV_FM_VR_CLEAR_001						
Test Purpose	Verify that a fault clearance notification propagates to the NFVO when a failed virtualised resource that is required for the NS connectivity is recovered						
Configuration	SUT Configuration 1						
References	ETSI GS NFV-IFA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]						
Applicability	 NFVO can subscribe to virtualised resource fault alarms on the VIM (NFVO_FM_VR_SUBSCRIBE) VIM supports virtualised resource fault alarms subscriptions from the NFVO (VIM_FM_SUBSCRIBE_BY_NFVO) VIM can generate virtualised resource fault alarm notifications to the NFVO (VIM_FM_NOTIFY_BY_NFVO) NFVO can process virtualised resource fault alarm notifications from the VIM (NFVO_FM_VR_NOTIFY) NFVO can get the list of virtualised resource fault alarms from the VIM (NFVO_FM_VR_GET_ALARMS) VIM supports virtualised resource fault alarm list queries by the NFVO (VIM_FM_QUERY_BY_NFVO) 						

Pre-test cond	 Pre-test conditions NS is instantiated (TD_NFV_NSLCM_INSTANTIATE_001) NFVO is subscribed to virtualised resources fault alarms on the VIM NS fault alarm is created on the NFVO by failing a virtualised resource that is re NS connectivity (TD_NFV_FM_VR_NOTIFY_001) 					
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						

7.5.2 VNF Fault Management

7.5.2.1 VNF Fault Alarm Notifications

		Те	est Description: VNF fault alarm notification				
Identifier		TD_NFV_FM_VNF_NOTIFY_001					
Test Purpose			F fault alarm notification propagates via the VNFM to the NFVO whether the	nen a VNF fault			
•		is triggered by a	failed virtualised resource				
Configuration		SUT Configurati					
References			FA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 01	3 [i.9]			
Applicability		 NFVO can subscribe to alarm notifications on the VNFM (NFVO_FM_VNF_SUBSCRIBE) 					
		(VNFM_FM	(VNFM_FM_VNF_SUBSCRIBE)				
		 VNFM can 	subscribe to alarm notifications on the VIM (VNFM_FM_VR_SUBS	SCRIBE)			
			ts alarm notifications subscriptions by the VNFM SUBSCRIBE_BY_VNFM)				
		VNFM can	generate VNF fault alarm notifications to the NFVO (VNFM_FM_V	NF_NOTIFY)			
			process VNF fault alarm notifications from the VNFM (NFVO_FM_	,			
			nerate virtualised resources fault alarm notifications to the VNFM	_ /			
		 VIM_EM_NOTIFY_BY_VNFM) VNFM can process virtualised resource fault alarm notifications by the VIM (VNFM_FM_VR_NOTIFY) NFVO can get the list of VNF fault alarms from the VNFM (NFVO_FM_VNF_GET_ALARMS) VNFM supports VNF fault alarm list queries by the NFVO (VNFM_FM_VNF_QUERY) 					
		 VNFM can get the list of virtualised resource fault alarms from the VIM 					
		(VNFM_FM_VR_GET_ALARM)					
		 VIM supports virtualised resources fault alarm list queries by the VNFM 					
		(VIM_FM_QUERY_BY_VNFM)					
-	_						
Pre-test condit	tions	 NS is instar 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)				
		 NFVO is subscribed to VNF fault alarms on the VNFM 					
		 VNFM is su 	bscribed to virtualised resources fault alarms on the VIM				
Test	Step	Туре	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							

			scription: VNF fault alarm clearance notification				
Identifier			NF_CLEAR_001				
Test Purpose		VNF fault is clea	F fault alarm clearance notification propagates via the VNFM to the red by resolving a failed virtualised resource	e NFVO when a			
Configuration		SUT Configurati					
References		ETSI GS NFV-IF	FA 006 [i.4], ETSI GS NFV-IFA 007 [i.5] and ETSI GS NFV-IFA 013	3 [i.9]			
Applicability		 VNFM supp 	subscribe to alarm notifications on the VNFM (NFVO_FM_VNF_SU ports alarm notifications subscriptions from the NFVO _VNF_SUBSCRIBE)	JBSCRIBE)			
		•	 VNFM can subscribe to alarm notifications on the VIM (VNFM_FM_VR_SUBSCRIBE) 				
		 VIM supports alarm notifications subscriptions by the VNFM (VIM_FM_SUBSCRIBE_BY_VNFM) 					
		• VNFM can g	generate VNF fault alarm clearance notifications to the NFVO _VNF_NOTIFY)				
		 NFVO can p 	process VNF fault alarm clearance notifications from the VNFM				
		 VIM can generate virtualised resources fault alarm clearance notifications to the VNFM (VIM_FM_NOTIFY_BY_VNFM) 					
		 VNFM can process virtualised resource fault alarm clearance notifications from the VIM (VNFM_FM_VR_NOTIFY) 					
		 NFVO can get the list of VNF fault alarms from the VNFM (NFVO_FM_VNF_GET_ALARM) 					
		 VNFM supports VNF fault alarm list queries by the NFVO (VNFM_FM_VNF_QUERY) 					
		 VIM supports virtualised resources fault alarm list queries by the VNFM (VIM_FM_QUERY_BY_VNFM) 					
		(*					
Pre-test condi	tions	 NS is instan 	itiated (TD_NFV_NSLCM_INSTANTIATE_001)				
		 NFVO is subscribed to VNF fault alarms on the VNFM 					
			bscribed to virtualised resources fault alarms on the VIM				
		 NS fault ala 	rm is created on the NFVO by failing a virtualised resource that is IF instance (TD_NFV_FM_VNF_NOTIFY_001)	allocated to the			
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 Description: VR PM job creation and notification monitoring				
Identifier	TD_NFV_PM_VR_CREATE_NOTIFY_001			
Test Purpose	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	SUT Configuration 1			
References	ETSI GS NFV-IFA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]			

Applicability	1		THE ALL AND	\
Applicability			create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CREATE	
			rts VR PM jobs creation by the NFVO (VIM_PM_PMJOB_CREATE	,
			subscribe to VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_SU	BSCRIBE)
			rts VR PM job subscriptions from the NFVO PMJOB_SUBSCRIBE_BY_NFVO)	
			enerate VR PM notifications to the NFVO (VIM_PM_PMJOB_NOTIF	
		•	•	,
			ports VR PM job notifications from the VIM (NFVO_PM_VR_PMJOI	
			query VR PM jobs from the VIM (NFVO_PM_VR_PMJOB_QUERY	,
		 VIM support 	rts VR PM job queries by the NFVO (VIM_PM_PMJOB_QUERY_B	Y_NFVO)
Pre-test conditions NS is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)				
		Monitoring	parameters (e.g. metrics, metric groups, collection and reporting pe	eriods) 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 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		tion and nor	na naviada akayıldıka takan inte ananyat	
NOTE: Me	tric collec	and report	ng periods should be taken into account.	

7.6.1.2 Virtualised Resource PM Job Creation and Threshold Monitoring

		Test Descri	ption: VR PM job creation and threshold monitoring				
Identifier			R_CREATE_THRESHOLD_001				
Test Purpose		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					
Configuration			SUT Configuration 1				
References		ETSI GS NFV-IF	ETSI GS NFV-IFA 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)					
		 VIM supports VR PM jobs creation by the NFVO (VIM_PM_PMJOB_CREATE_BY_NFVO) 					
			create VR PM thresholds on the VIM (NFVO_PM_VR_PMTH_CRE	,			
			ts VR PM thresholds creation by the NFVO	,			
		(VIM_PM_PMTH_CREATE_BY_NFVO)					
		 VIM can ge 	 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) 					
		 NFVO can query VR PM jobs from the VIM (NFVO_PM_VR_PMJOB_QUERY) 					
		 VIM supports VR PM job queries by the NFVO (VIM_PM_PMJOB_QUERY_BY_NFVO) 					
		 NFVO can guery VR PM thresholds from the VIM (NFVO_PM_VR_PMTH_QUERY) 					
		 VIM supports VR PM threshold queries by the NFVO (VIM_PM_PMTH_QUERY_BY_NFVO) 					
Pre-test condi	tions	 NS is instar 	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				
			to the monitoring parameters by querying the VR PM jobs				
	3	Stimulus	Trigger the NFVO to create a VR PM threshold for the virtualised resource monitored in step 1				
	4	Stimulus	Trigger the NFVO to subscribe to the threshold crossing				
	4	Sumulus	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	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			

7.6.1.3 Virtualised Resource PM Job Deletion

			Test Description: VR PM job deletion			
Identifier	-	TD_NFV_PM_\	/R_DELETE_MONITOR_001			
Test Purpose			nonitoring of performance metrics of a virtualised resource that is re ctivity can be stopped by deleting PM jobs	quired for a NS		
Configuration		SUT Configurat				
References		<u>ETSI GS NFV-I</u>	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_DELETI	E)		
		 VIM suppo 	rts 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			
			rts VR PM job subscriptions from the NFVO	,		
			PMJOB_SUBSCRIBE_BY_NFVO)			
		•	enerate VR PM notifications to the NFVO (VIM_PM_PMJOB_NOTIF	Y BY NFVO)		
		•	ports VR PM job notifications from the VIN (NFVO_PM_VR_PMJOE	,		
		 NFVO can query VR PM jobs from the VIM (NFVO_PM_VR_PMJOB_QUERY) 				
		 VIM supports VR PM job queries by the NFVO (VIM_PM_PMJOB_QUERY_BY_NFVO) 				
Pre-test cond	litiana					
	altions a	NS is insta	ntiated (TD_NEV_NSLCM_INSTANTIATE_001)			
			ntiated (TD_NFV_NSLCM_INSTANTIATE_001) ad resource that is required for the NS connectivity is monitored by the	he NEVO		
		 A virtualise 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) ed resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)	he NFVO		
		 A virtualise 	d resource that is required for the NS connectivity is monitored by the	he NFVO		
Test		 A virtualise 	d resource that is required for the NS connectivity is monitored by the	he NFVO Result		
Test Sequence		 A virtualise (TD_NFV_ 	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)			
		 A virtualise (TD_NFV_ Type 	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001) Description			
	Step 1	A virtualise (TD_NFV_	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)			
	Step 1	A virtualise (TD_NFV_	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)			
	Step 1 2	A virtualise (TD_NFV_ Type Stimulus IOP Check	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)			
	Step 1 2	A virtualise (TD_NFV_ Type Stimulus IOP Check	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)			
Sequence	Step 1 2	A virtualise (TD_NFV_ Type Stimulus IOP Check	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)			
Sequence	Step 1 2 3	A virtualise (TD_NFV_ Type Stimulus IOP Check	d resource that is required for the NS connectivity is monitored by th PM_VR_CREATE_NOTIFY_001)			

		т	est Description: VR PM threshold deletion			
Identifier	-		R_DELETE_THRESHOLD_001			
Test Purpose	ľ	Verify that a three	eshold created for a virtualised resource that is required for a NS in	stance		
		connectivity can				
Configuration		SUT Configurati				
References		ETSI GS NFV-II	FA 005 [i.3] and ETSI GS NFV-IFA 013 [i.9]			
Applicability		 NFVO can 	n delete VR PM thresholds from the VIM (NFVO_PM_VR_PMTH_DELETE)			
		 VIM suppor 	ts VR PM thresholds deletion by the NFVO			
		(VIM_PM_F	PMTH_DELETE_BY_NFVO)			
		NFVO can :	subscribe to VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_SU	BSCRIBE)		
		 VIM support 	ts VR PM job subscriptions from the NFVO	,		
			PMJOB_SUBSCRIBE_BY_NFVO)			
		 VIM can ge 	nerate VR PM notifications to the NFVO (VIM_PM_PMJOB_NOTIF	Y BY NFVO)		
		 NFVO supports VR PM job notifications from the VIM (NFVO_PM_VR_PMJOB_NOTIFY) 				
		 NFVO can query VR PM thresholds from the VIM (NFVO_PM_VR_PMTH_QUERY) 				
		 VIM supports VR PM threshold queries by the NFVO (VIM_PM_PMTH_QUERY_BY_NFVO) 				
	ľ			T_DT_N(VO)		
Pre-test cond	itions	NS is instar	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			for a virtualised resource that is required for the NS connectivity is	are at a d by the		
			NFV_PM_VR_CREATE_THRESHOLD_001)	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: Virtu			collection and reporting periods should be taken into account.			

7.6.1.4 Virtualised Resource PM Threshold Deletion

7.6.2 VNF Performance Management

7.6.2.1 VNF PM Job Creation and Notification Monitoring

	Test Description: 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 inside a NS instance can be monitored using PM jobs and notifications
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	 NFVO can create VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_DELETE)
	 VNFM supports VNF PM jobs creation by the NFVO (VNFM_PM_VNF_PMJOB_CREATE)
	 VNFM can create VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_CREATE)
	 VIM supports VR PM jobs creation by the VNFM (VIM_PM_PMJOB_CREATE_BY_VNFM)
	 NFVO can subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM supports VNF PM job subscriptions from the NFVO (VNFM_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM can subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SUBSCRIBE)
	 VIM supports VR PM job subscriptions from the VNFM (VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM)
	 VIM can generate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTIFY_BY_VNFM)
	 VNFM supports 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)

		(NFVO_PNVNFM canVIM suppoNFVO can	ports VNF PM job notifications from the VNFM M_VNF_PMJOB_NOTIFY) query VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_QUERY rts VR PM job queries by the VNFM (VIM_PM_PMJOB_QUERY_B query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QL ports VNF PM job queries by the NFVO (VNFM_PM_VNF_PMJOB_	Y_VNFM) JERY)
Pre-test cond			ntiated (TD_NFV_NSLCM_INSTANTIATE_001) parameters (e.g. metrics, metric groups, collection and reporting pe NFVO	eriods) are
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	Result
	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 to the NFVO by monitoring the VNF PM notifications. See note.	
IOP Verdict				
NOTE: Met	ric collec	ction and reporti	ng periods should be taken into account.	

7.6.2.2 VNF PM Job Creation and Threshold Monitoring

	Test Description: VNF PM job creation and threshold monitoring
Identifier	TD_NFV_PM_VNF_CREATE_THRESHOLD_001
Test Purpose	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
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	 NFVO can create VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_CREATE)
	 VNFM supports VNF PM jobs creation by the NFVO (VNFM_PM_VNF_PMJOB_CREATE)
	 VNFM can create VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_CREATE)
	 VIM supports VR PM jobs creation by the VNFM (VIM_PM_PMJOB_CREATE_BY_VNFM)
	 NFVO can create VNF PM thresholds on the VNFM (NFVO_PM_VNF_PMTH_CREATE)
	 VNFM supports VNF PM thresholds creation by the NFVO
	(VNFM_PM_VNF_PMTH_CREATE)
	 VNFM can create VR PM thresholds on the VIM (VNFM_PM_VR_PMTH_CREATE)
	 VIM supports VR PM thresholds creation by the VNFM
	(VIM_PM_PMTH_CREATE_BY_VNFM)
	• NFVO can subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM supports VNF PM job subscriptions from the NFVO
	(VNFM_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM can subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SUBSCRIBE)
	 VIM supports VR PM job subscriptions from the VNFM
	(VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM)
	 VIM can generate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTIFY_BY_VNFM)
	 VNFM supports 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)
	 NFVO supports VNF PM job notifications from the VNFM
	(NFVO_PM_VNF_PMJOB_NOTIFY)
	 VNFM can query VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_QUERY)

Pre-test condit		 NFVO can VNFM support VNFM can VIM support NFVO can VNFM support 	ts VR PM job queries by the VNFM (VIM_PM_PMJOB_QUERY_B query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QL ports VNF PM job queries by the NFVO (VNFM_PM_VNF_PMJOB_ query VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_QL ts VR PM threshold queries by the VNFM (VIM_PM_PMTH_QUEF query VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH ports VNF PM threshold queries by the NFVO (VNFM_PM_VNF_PMTH ports VNF PM threshold queries by the NFVO (VNFM_PM_VNF_PMTH ports VNF PM threshold queries by the NFVO (VNFM_PM_VNF_PMTH)	JERY) _QUERY) JERY) RY_BY_VNFM) H_QUERY)
			parameters (e.g. VNF instance, metrics, metric groups, threshold)	are defined on
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger the NFVO to create a 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 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 virtualised resource monitored in step 1	
	5	Stimulus	Trigger the NFVO to subscribe to the threshold crossing notification for the VNF PM threshold created in step 4	
	6	Stimulus	Trigger the virtualised resource to cross the specified threshold (e.g. by increasing resource utilization levels in the virtualisation container)	
	7	IOP Check	Verify that the "threshold crossed" notification for the monitored virtualised resource was generated by the VIM to the VNFM by monitoring the VR PM notifications	
	8	IOP Check	Verify that the "threshold crossed" notification for the monitored virtualised resource was generated by the VNFM to the NFVO by monitoring the VNF PM notifications	
IOP Verdict				

7.6.2.3 VNF PM Job Deletion

	Test Description: VNF PM job deletion
Identifier	TD_NFV_PM_VNF_DELETE_MONITOR_001
Test Purpose	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
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	 NFVO can delete VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_DELETE)
	 VNFM supports VNF PM jobs deletion by the NFVO (VNFM_PM_VNF_PMJOB_DELETE)
	 VNFM can delete VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_DELETE)
	 VIM supports VR PM jobs deletion by the VNFM (VIM_PM_PMJOB_DELETE_BY_VNFM)
	 NFVO can delete VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH_DELETE)
	VNFM supports VNF PM thresholds deletion by the NFVO (NIFM PM V(NF PMT), DELETE)
	(VNFM_PM_VNF_PMTH_DELETE)
	 VNFM can delete VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_DELETE)
	 VIM supports VR PM thresholds deletion by the VNFM (VIM_PM_PMTH_DELETE_BY_VNFM)
	 NFVO can subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM supports VNF PM job subscriptions from the NFVO (VNFM_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM can subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SUBSCRIBE)
	 VIM supports VR PM job subscriptions from the VNFM (VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM)
	 VIM can generate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTIFY_BY_VNFM)
	 VNFM supports VR PM job notifications from the VIM (VNFM_PM_VR_PMJOB_NOTIFY)

	•	 NFVO supp (NFVO_PM VIM support NFVO can VNFM support VNFM can VIM support NFVO can 	generate PM notifications to the NFVO (VNFM_PM_VNF_PMJOB_ ports VNF PM job notifications from the VNFM 1_VNF_PMJOB_NOTIFY) tts VR PM job queries by the VNFM (VIM_PM_PMJOB_QUERY_B query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QL ports VNF PM job queries by the NFVO (VNFM_PM_VNF_PMJOB_ query VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_QL tts VR PM threshold queries by the VNFM (VIM_PM_PMTH_QUER query VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH_QUER ports VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH_QUER query VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH_QUER query VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH_QUER query VNF PM threshold queries by the NFVO (VNFM_PM_VNF_PMTH_QUER ports VNF PM threshold queries by the NFVO (VNFM_PM_VNF_PMTH_QUER)	Y_VNFM) JERY) _QUERY) JERY) XY_BY_VNFM) H_QUERY)
Pre-test cond		 A virtualise 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) d resource that is allocated to a VNF instance inside the target NS by the NFVO (TD_NFV_PM_VNF_CREATE_NOTIFY_001)	instance is
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.	
	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: Vir	tualised re	esource metric o	collection and reporting periods should be taken into account.	

7.6.2.4 VNF PM Threshold Deletion

	Test Description: VNF PM threshold deletion
Identifier	TD_NFV_PM_VNF_DELETE_THRESHOLD_001
Test Purpose	Verify that a threshold created for a virtualised resource that is allocated to a VNF instance inside
	a NS instance can be deleted
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	 NFVO can delete VNF PM thresholds from the VNFM (NFVO_PM_VNF_PMTH_DELETE)
	VNFM supports VNF PM thresholds deletion by the NFVO
	(VNFM_PM_VNF_PMTH_DELETE)
	• VNFM can delete VR PM thresholds from the VIM (VNFM_PM_VR_PMTH_DELETE)
	 VIM supports VR PM thresholds deletion by the VNFM
	(VIM_PM_PMTH_DELETE_BY_VNFM)
	• NFVO can subscribe to VNF PM jobs on the VNFM (NFVO_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM supports VNF PM job subscriptions from the NFVO
	(VNFM_PM_VNF_PMJOB_SUBSCRIBE)
	 VNFM can subscribe to VR PM jobs on the VIM (VNFM_PM_VR_PMJOB_SUBSCRIBE)
	 VIM supports VR PM job subscriptions from the VNFM
	(VIM_PM_PMJOB_SUBSCRIBE_BY_VNFM)
	• VIM can generate VR PM notifications to the VNFM (VIM_PM_PMJOB_NOTIFY_BY_VNFM)
	 VNFM supports VR PM job notifications from the VIM (VNFM_PM_VR_PMJOB_NOTIFY)
	 VNFM can query VR PM jobs from the VIM (VNFM_PM_VR_PMJOB_QUERY)
	 VIM supports VR PM job queries by the VNFM (VIM_PM_PMJOB_QUERY_BY_VNFM)
	 NFVO can query VNF PM jobs from the VNFM (NFVO_PM_VNF_PMJOB_QUERY)
	VNFM supports VNF PM job queries by the NFVO (VNFM_PM_VNF_PMJOB_QUERY)

Pre-test condi			ntiated (TD_NFV_NSLCM_INSTANTIATE_001) I for a virtualised resource that is allocated to a VNF instance inside	a NS instanc
			by the NFVO (TD_NFV_PM_VNF_CREATE_THRESHOLD_001)	
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	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	
	2	IOP Check	Verify that the relevant VNF PM threshold has been deleted on the VNFM by querying the VNF PM thresholds	
	3	IOP Check	Verify that the relevant VR PM threshold has been deleted on the VIM by querying the VR PM thresholds	
	4	Stimulus	Trigger the virtualised resource to cross the specified threshold (e.g. by increasing resource utilization levels in the virtualisation container)	
	5	IOP Check	Verify that no "threshold crossed" notification for the monitored virtualised resource has been generated by the VNFM to the NFVO by monitoring the VNF PM notifications. See note.	
	6	IOP Check	Verify that no "threshold crossed" notification for the monitored virtualised resource has been generated by the VIM to the VNFM by monitoring the VR PM notifications. See note.	
IOP Verdict				

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.5 3 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	o], ETSI
Applicability			M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM
			M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM
		NFVO/VNFI	M can generate "allocate storage resource" operation requests to t	he VIM
			s "allocate compute resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM
			s "allocate network resource" operation requests from the NFVO/ ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM
		 VIM support 	s "allocate storage resource" operation requests from the NFVO/V ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	/NFM
			M can query software image information from the VIM (NFVO_SW WIM_QUERY_IM)	IM_QUERY_IM
		 VIM support (VIM_SWIM 	is software image information queries by the NFVO/VNFM LQUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)	
		 NFVO/VNFI VNFM_CRM 	<pre>M can query compute resource information from the VIM (NFVO_C I_QUERY)</pre>	CRM_QUERY or
		 NFVO/VNFI VNFM_NRM 	<pre>M can query network resource information from the VIM (NFVO_N I_QUERY)</pre>	RM_QUERY or
		 NFVO/VNFI VNFM_SRM 	<pre>M can query storage resource information from the VIM (NFVO_SF 1_QUERY)</pre>	RM_QUERY or
			nd compute resource information to the NFVO (VIM_CRM_INFO_ INFO_TO_VNFM)	ΓO_NFVO or
		 VIM can ser 	nd network resource information to the NFVO (VIM_NRM_INFO_T INFO_TO_VNFM)	O_NFVO or
			nd storage resource information to the NFVO (VIM_SRM_INFO_T(NFO_TO_VNFM)	O_NFVO or
			uery VNF information from the VNFM (NFVO_VNFLCM_QUERY)	1
		 VNFM supp 	orts VNF information queries by the NFVO (VNFM_VNFLCM_QU	ERY)
Pre-test condit	tions	 NSD, its ass boarded to t 	sociated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) has never the NFVO	ave been on-
			e image repository is reachable by the VIM	
			d 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	

7.7.1.2 Nested NS Instantiation

		-	Test Description: nested NS instantiation	
Identifier			M INSTANTIATE NEST NS 001	
Test Purpose			NS referencing an existing nested NS can be successfully instantia	ted
Configuration		SUT Configurati		
References		ETSI GS NFV-IF	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5 B [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	i], ETSI
Applicability			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 t 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
		 VIM suppor 	ts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM
		 VIM suppor 	ts "allocate network resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM
		 VIM suppor 	ts "allocate storage resource" operation requests from the NFVO/V _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	ΊNFΜ
		NFVO/VNF	M can query software image information from the VIM (NFVO_SW WIM_QUERY_IM)	IM_QUERY_IM
			ts software image information queries by the NFVO/VNFM 1_QUERY_IM_BY_NFVO or VIM_SWIM_QUERY_IM_BY_VNFM)	
			nd compute resource information to the NFVO (VIM_CRM_INFO_T INFO_TO_VNFM)	O_NFVO or
		 VIM can ser 	nd network resource information to the NFVO (VIM_NRM_INFO_T INFO_TO_VNFM)	O_NFVO or
		 VIM can ser 	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)	
			orts VNF information queries by the NFVO (VNFM_VNFLCM_QUE	
				/
Pre-test cond	itions	 NSD2, its as boarded to 	ssociated descriptors (VLD(s), VNFFGD(s)) and VNF Package(s) h	nave been on-
			ences nested NSD1	
		 NS2 is not i 		
			intiated (TD_NFV_NSLCM_INSTANTIATE_001)	
			e image repository is reachable by the VIM	
		 The require 	d resources are available on the NFVI	
Test	Stor	Tunc	Description	Popult
Sequence	Step	Type Stimulus	Description	Result
Sequence	1	Stimulus IOP Check	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	
	3	IOP Check	Verify that resources associated to NS2 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	
	5	IOP Check	CPs) Verify that existing VNF instance(s) in NS1 are running and reachable via the management network	
	6	IOP Check	Verify that the VNF instance(s) in NS2 are running and reachable through the management network	
1	1	1		

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

7.7.2 NS Scaling

7.7.2.1 NS Scale Out

7.7.2.1.1 NS Scale out with an Operator Action

1		Test D	escription: NS scale out with an operator action	
Identifier		TD NFV NSLC	CM_SCALE_OUT_001	
Test Purpose		Verify that the N operator action	IS can be successfully scaled out by adding VNF instances triggere	ed by an
Configuration	<u>, </u>	SUT Configurat	ion 1	
References	•	ETSI GS NFV-II	FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.{ 18 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	
Applicability		 NFVO/VNF (NFVO_CR NFVO/VNF (NFVO_NR NFVO/VNF (NFVO_SR VIM suppor (VIM_CRM) VIM suppor (VIM_NRM) VIM suppor (VIM_SRM) NFVO can 	M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE) Can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE) Can generate "allocate storage resource" operation requests to t M_ALLOCATE or VNFM_SRM_ALLOCATE) The "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM) rts "allocate network resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM) rts "allocate network resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM) rts "allocate storage resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) rts "allocate storage resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) generate "scale out by adding VNF instances" requests to the VNF IFLCM_NS_SCALE_OUT)	the VIM the VIM the VIM VNFM VNFM
		 VNFM supp 	ports "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT)	
Pre-test cond	litions	VNFM supp (VNFM_VN NS is instar	ports "scale out by adding VNF instances" requests from the NFVO	
		VNFM supp (VNFM_VN NS is instar NFVI has th	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal	ed-out NS
Pre-test cond Test Sequence	litions	VNFM supp (VNFM_VN NS is instar	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNF instances to the NS in	
Test	Step	VNFM supp (VNFM_VN NS is instar NFVI has th Type	Dorts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description	ed-out NS
Test	Step 1	VNFM supp (VNFM_VN NS is instar NFVI has th Type Stimulus	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNF instances to the NS in NFVO with an operator action 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	ed-out NS
Test	Step 1 2	VNFM supp (VNFM_VN NS is instar NFVI has th Type Stimulus IOP Check	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNF instances to the NS in NFVO with an operator action 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	ed-out NS
Test	Step 1 2 3	VNFM supp (VNFM_VN NS is instar NFVI has th Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNF instances to the NS in NFVO with an operator action 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	ed-out NS
Test	Step 1 2 3 4	VNFM supp (VNFM_VN NS is instar NFVI has th Type Stimulus IOP Check IOP Check IOP Check	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNF instances to the NS in NFVO with an operator action 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	ed-out NS
Test	Step 1 2 3 4 5	VNFM supp (VNFM_VN NS is instar NFVI has th Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNF instances to the NS in NFVO with an operator action 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	ed-out NS
Test	Step 1 2 3 4 5 6	VNFM supp (VNFM_VN NS is instar NFVI has th Type Stimulus IOP Check	borts "scale out by adding VNF instances" requests from the NFVO IFLCM_NS_SCALE_OUT) Intiated (TD_NFV_NSLCM_INSTANTIATE_001) the required amount of consumable virtual resources to run the scal Description Trigger NS scale out by adding VNF instances to the NS in NFVO with an operator action 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), VL(s) and VNFFG(s) are connected according to the descriptors Verify that the NFVO indicates the scaling operation result as	ed-out NS

		Test	Description: NS scale out with a VNF indicator	
Identifier			CM_SCALE_OUT_002	
Test Purpose	•		IS can be successfully scaled out by adding VNF instances triggere	ed automatically
Configuration		SUT Configurat		
References			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
	1	NFVO/VNF	M can generate "allocate network resource" operation requests to M_ALLOCATE or VNFM_NRM_ALLOCATE)	the VIM
	I		M can generate "allocate storage resource" operation requests to t M_ALLOCATE or VNFM_SRM_ALLOCATE)	he VIM
	I		rts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM
	1		rts "allocate network resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM
	1	(VIM_SRM	rts "allocate storage resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	
			subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SU	
	1		pports VNF indicator subscriptions from the VNFM (EM_VNFINDI_	
			an generate VNF indicator notifications to the VNFM (EM_VNFIND) ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND)	
			generate "scale out by adding VNF instances" requests to the VNF	
			FLCM_NS_SCALE_OUT)	
	,		ports "scale out by adding VNF instances" requests from the NFVO	
			IFLCM_NS_SCALE_OUT)	
		•		
Pre-test cond	litions	 NS is instail 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	
		 NFVI has the second seco	ne required amount of consumable virtual resources to run the scal	ed-out NS
			M is configured to trigger "scale out by adding VNF instances" whe	n a given VNF
		indicator va	alue crosses a certain threshold	-
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 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	
	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				

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7.7.2.1.2 NS Scale out with a VNF Indicator

Identifier			est Description: NS scale out with a VIM KPI	
Test Purpose			CM_SCALE_OUT_003 IS can be successfully scaled out by adding VNF instances triggere	d automatically
rest Fulpose		by a VIM KPI	To call be successfully scaled out by adding VINF instances inggere	automatically
Configuration	۱	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.5 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	the VIM
			M_ALLOCATE or VNFM_CRM_ALLOCATE)	
			M can generate "allocate network resource" operation requests to tem 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
		 VIM support 	rts "allocate storage resource" operation requests from the NFVO/V _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	'NFM
			M can create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CF	REATE or
			_VR_PMJOB_CREATE)	
			rts VR PM jobs creation by the NFVO/VNFM PMJOB_CREATE_BY_NFVO or VIM_PM_PMJOB_CREATE_BY_`	√NFM)
		NFVO/VNF	M can create VR PM thresholds on the VIM (NFVO_PM_VR_PMT	
			_VR_PMTH_CREATE) rts VR PM thresholds creation by the NFVO/VNFM	
		(VIM_PM_I	PMTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VN	FM)
			M can subscribe to VR PM jobs on the VIM	
			1_VR_PMJOB_SUBSCRIBE or VNFM_PM_VR_PMJOB_SUBSCR rts VR PM job subscriptions from the NFVO/VNFM	IBE)
			PMJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIE	BE_BY_VNFM)
			enerate VR PM notifications to the NFVO/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_F	PM_VR_PMJOB_NOTIFY)	
			generate "scale out by adding VNF instances" requests to the VNF	Μ
			IFLCM_NS_SCALE_OUT) ports "scale out by adding VNF instances" requests from the NFVO	
			IFLCM_NS_SCALE_OUT)	
Pre-test cond	litions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	
			ne required amount of consumable virtual resources to run the scale	
		NFVO/VNF	M is configured to trigger "scale out by adding VNF instances" whe	
		 NFVO/VNF KPI value c Virtualised 	M is configured to trigger "scale out by adding VNF instances" whe crosses a certain threshold resource PM job with threshold monitoring has been created	
		 NFVO/VNF KPI value c Virtualised 	M is configured to trigger "scale out by adding VNF instances" whe crosses a certain threshold	
Test	Step	 NFVO/VNF KPI value c Virtualised (TD_NFV_I 	M is configured to trigger "scale out by adding VNF instances" whe crosses a certain threshold resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM
	Step	 NFVO/VNF KPI value c Virtualised 	M is configured to trigger "scale out by adding VNF instances" whe crosses a certain threshold resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001) Description Trigger the VIM to send the targeted KPI to the NFVO/VNFM	
Test Sequence		NFVO/VNF KPI value c Virtualised (TD_NFV_I Type	M is configured to trigger "scale out by adding VNF instances" whe crosses a certain threshold resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM
	1	NFVO/VNF KPI value c Virtualised (TD_NFV_I Type Stimulus	M is configured to trigger "scale out by adding VNF instances" whe prosses a certain threshold resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM
	1 2	NFVO/VNF KPI value c Virtualised (TD_NFV_I Type Stimulus IOP Check	M is configured to trigger "scale out by adding VNF instances" where the prosses a certain threshold resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM
	1 2 3	NFVO/VNF KPI value c Virtualised (TD_NFV_I) Type Stimulus IOP Check IOP Check	M is configured to trigger "scale out by adding VNF instances" whe rosses a certain threshold resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM
	1 2 3 4	NFVO/VNF KPI value of Virtualised (TD_NFV_I) Type Stimulus IOP Check IOP Check IOP Check	M is configured to trigger "scale out by adding VNF instances" where the prosses a certain threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM
	1 2 3 4 5	NFVO/VNF KPI value of Virtualised (TD_NFV_I) Type Stimulus IOP Check IOP Check IOP Check IOP Check	M is configured to trigger "scale out by adding VNF instances" where the prosses a certain threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM
	1 2 3 4 5 6	NFVO/VNF KPI value of Virtualised (TD_NFV_I) Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	M is configured to trigger "scale out by adding VNF instances" whe prosses a certain threshold resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	n a given VIM

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7.7.2.1.3 NS Scale out with a VIM KPI

	9	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 I	Description: NS scale in with an operator action	
Identifier		TD NFV NSLC	CM_SCALE_IN_001	
Test Purpose			IS can be successfully scaled in by removing VNF instances trigger	ed by an
		operator action	, , , , , , , , , , , , , , , , , , ,	, ,
Configuration		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.5)8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	i], ETSI
Applicability		NFVO/VNF	FM can generate "terminate compute resource" operation requests t	o the VIM
			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 M_TERMINATE or VNFM_SRM_TERMINATE)	the VIM
			rts "terminate compute resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)	
		(VIM_NRM	rts "terminate network resource" operation requests from the NFVO L_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)	/VNFM
			generate "scale in by removing VNF instances" requests to the VNI IFLCM_NS_SCALE_IN)	FM
			ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN))
			ports "scale in by removing VNF instances" requests from the NFVC)
Pre-test condi	itions	(VNFM_VN	ports "scale in by removing VNF instances" requests from the NFVC	
Pre-test condi	itions	(VNFM_VN NFVO supp	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera	
Pre-test condi	itions	(VNFM_VN NFVO supp NS is insta	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	
Pre-test condi	itions	(VNFM_VN NFVO supp NS is insta	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera	
		 (VNFM_VN NFVO supp NS is instate The current 	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in	tor's action
Test	itions Step 1	(VNFM_VN NFVO supp NS is insta	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera intiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in Description Trigger NS scale in by removing VNF instances from the NS in	
Test	Step	 (VNFM_VN NFVO supp NS is instal The curren Type 	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera intiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in Description Trigger NS scale in by removing VNF instances from the NS in NFVO with an operator action Verify that the impacted VNF instance(s) have been terminated	tor's action
Test	Step 1	(VNFM_VN NFVO supp NS is instal The curren Type Stimulus	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera intiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in Description Trigger NS scale in by removing VNF instances from the NS in NFVO with an operator action Verify that the impacted VNF instance(s) have been terminated by querying the VNFM Verify that the impacted VNF related resources have been	tor's action
Test	Step 1 2	(VNFM_VN NFVO supp NS is instal The curren Type Stimulus IOP Check	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in Description Trigger NS scale in by removing VNF instances from the NS in NFVO with an operator action Verify that the impacted VNF instance(s) have been terminated by querying the VNFM Verify that the impacted VNF related resources have been released by the VIM Verify that the remaining VNF instances(s) are still running and	tor's action
Test	Step 1 2 3	(VNFM_VN NFVO supp NS is instal The curren Type Stimulus IOP Check IOP Check	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in <u>Description</u> Trigger NS scale in by removing VNF instances from the NS in NFVO with an operator action Verify that the impacted VNF instance(s) have been terminated by querying the VNFM Verify that the impacted VNF related resources have been released by the VIM Verify that the remaining VNF instances(s) are still running and reachable via their management network Verify that the remaining VNF instances(s), VL(s) and	tor's action
Pre-test condi Test Sequence	Step 1 2 3 4	(VNFM_VN NFVO supple NS is installed The curren Type Stimulus IOP Check IOP Check IOP Check	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in <u>Description</u> Trigger NS scale in by removing VNF instances from the NS in NFVO with an operator action Verify that the impacted VNF instance(s) have been terminated by querying the VNFM Verify that the impacted VNF related resources have been released by the VIM Verify that the remaining VNF instances(s) are still running and reachable via their management network Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the descriptors Verify that the NFVO indicates the scaling operation result as	tor's action
Test	Step 1 2 3 4 5	(VNFM_VN NFVO supple NS is installed The current Type Stimulus IOP Check IOP Check IOP Check IOP Check	ports "scale in by removing VNF instances" requests from the NFVC IFLCM_NS_SCALE_IN) ports triggering "scale in by removing VNF instances" with an opera ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size supports scaling in <u>Description</u> Trigger NS scale in by removing VNF instances from the NS in NFVO with an operator action Verify that the impacted VNF instance(s) have been terminated by querying the VNFM Verify that the impacted VNF related resources have been released by the VIM Verify that the remaining VNF instances(s) are still running and reachable via their management network Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the descriptors	tor's action

		Test	Description: NS scale in with a VNF indicator	
Identifier			M_SCALE_IN_002	
Test Purpose			IS can be successfully scaled in by removing VNF instances trigge	red
-		automatically by	/ a VNF indicator	
Configuration	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. {	5], ETSI
		GS NFV-IFA 00	8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	
Applicability		(NFVO_CR	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)	o the VIM
			M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)	o the VIM
			rts "terminate compute resource" operation requests from the NFV(_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)	
		 VIM support 		/VNFM
		 VIM support 	rts "terminate storage resource" operation requests from the NFVO	/VNFM
		VNFM can	subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SU ipports VNF indicator subscriptions from the VNFM (EM_VNFINDI_	BSCRIBE)
			an generate VNF indicator subscriptions from the VNFM (EM_VNFINDI_	
			ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND	
			subscribe to VNF indicators on the VNFM (NFVO_NSVNFINDI_SL	
			ports VNF indicator subscriptions from the NFVO	DOORIDE)
			VNFINDI_SUBSCRIBE)	
		· · -	generate VNF indicator notifications to the NFVO (VNFM_NSVNFI	NDI NOTIFY)
			ports VNF indicator notifications from the VNFM (NFVO_NSVNFINI	
			generate "scale in by removing VNF instances" requests to the VN	
			IFLCM_NS_SCALE_IN)	
			ports "scale in by removing VNF instances" requests from the NFV	0
			IFLCM_NS_SCALE_IN)	•
		(
Pre-test cond	itions	NEVO is co	onfigured to trigger "scale in by removing VNF instances" when a gi	ven VNF
			alue crosses a certain threshold	
			ntiated (TD_NFV_NSLCM_INSTANTIATE_001)	
			t NS deployment size should support scaling in	
		 The current 	t NS deployment size should support scaling in	
Test	Ston	Туре	Description	Result
Sequence	Step 1	Type Stimulus	Description Trigger the EM/VNF to send the targeted VNF indicator to the	Nesuit
Cequence	'	Samulus	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		I		

7.7.2.2.2 NS Scale in with a VNF Indicator

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			est Description: NS scale in with a VIM KPI	
Identifier			M_SCALE_IN_003 IS can be successfully scaled in by removing VNF instances trigge	rod
Test Purpose		automatically by		lea
Configuration	1	SUT Configurati		
References		ETSI GS NFV-IF	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 "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
		NFVO/VNF	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 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)	
		(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_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
		(VIM_PM_F	ts VR PM thresholds creation by the NFVO/VNFM PMTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VN	FM)
			M can subscribe to VR PM jobs on the VIM _VR_PMJOB_SUBSCRIBE or VNFM_PM_VR_PMJOB_SUBSCR	IBE)
			ts VR PM job subscriptions from the NFVO/VNFM PMJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIE	BE BY VNFM)
		 VIM can ge 	nerate VR PM notifications to the NFVO/VNFM PMJOB_NOTIFY_BY_NFVO or VIM_PM_PMJOB_NOTIFY_BY_VI	
		NFVO/VNF	M supports VR PM notifications from the VIM (NFVO_PM_VR_PM M_VR_PMJOB_NOTIFY)	
		NFVO can	generate "scale in by removing VNF instances" requests to the VN FLCM_NS_SCALE_IN)	FM
			oorts "scale in by removing VNF instances" requests from the NFV(FLCM_NS_SCALE_IN)	0
Pre-test cond	itions		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 given VIM
			rosses a certain threshold	en a grien rim
			resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	
		-		
Test Sequence	Step 1	Type Stimulus	Description Trigger the VIM to send the targeted KPI to the NFVO/VNFM until the configured threshold is presend	Result
	2	IOP Check	until the configured threshold is crossed Verify that the "scale in by removing VNF instance(s)" procedure has been started in NEVO	
	3	IOP Check	procedure has been started in NFVO 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	

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7.7.2.2.3 NS Scale in with a VIM KPI

IOP Verdict

7.7.2.3 NS VNF Scale Out

7.7.2.3.1 NS VNF Scale Out with an Operator Action

· · · · · · · · · · · · · · · · · · ·		Tact Dac	cription: NS VNE scale out with an operator action			
Identifier			cription: NS VNF scale out with an operator action			
Test Purpose			VNF in a NS can be successfully scaled out by adding VNFC insta	nces when		
		triggered by a NFVO operator				
Configuration	<u>, </u>	SUT Configurat				
References		ETSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5], ETSI				
Kelelences		GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]				
Applicability		 NFVO/VNF (NFVO_CF 	M can generate "allocate compute resource" operation requests to RM_ALLOCATE or VNFM_CRM_ALLOCATE) M can generate "allocate network resource" operation requests to	the VIM		
		(NFVO_NF	RM_ALLOCATE or VNFM_NRM_ALLOCATE)			
		(NFVO_SR	M can generate "allocate storage resource" operation requests to t M_ALLOCATE or VNFM_SRM_ALLOCATE)			
			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)	VNFM		
		 VIM support 	rts "allocate storage resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	/NFM		
		NFVO can	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	0		
Pre-test cond	litions	(VNFM_VN	IFLCM_VNF_SCALE_OUT)			
Pre-test cond	litions	(VNFM_VN NFVO supp NS is instal		ator's action		
		 (VNFM_VN NFVO supp NS is instal NFVI has the second secon	VFLCM_VNF_SCALE_OUT) 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 ed-out NS		
Pre-test cond Test Sequence	litions	(VNFM_VN NFVO supp NS is instal	WFLCM_VNF_SCALE_OUT) 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	ator's action		
Test	Step	 (VNFM_VN NFVO supp NS is instal NFVI has the second secon	WFLCM_VNF_SCALE_OUT) 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	ator's action ed-out NS		
Test	Step 1	 (VNFM_VN NFVO supp NS is instal NFVI has the second secon	WFLCM_VNF_SCALE_OUT) 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	ator's action ed-out NS		
Test	Step 1 2	 (VNFM_VN NFVO supp NS is instate NFVI has the second se	WFLCM_VNF_SCALE_OUT) 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	ator's action ed-out NS		
Test	Step 1 2 3	 (VNFM_VN NFVO supp NS is instate NFVI has the second se	WFLCM_VNF_SCALE_OUT) 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 ed-out NS		
Test	Step 1 2 3 4	 (VNFM_VN NFVO supple NS is instate NFVI has the second se	WFLCM_VNF_SCALE_OUT) 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 Verify that the additional VNFC instances(s) are connected to the VVFM	ator's action ed-out NS		
Test	Step 1 2 3 4 5	 (VNFM_VN NFVO supp NS is instate NFVI has the second se	WFLCM_VNF_SCALE_OUT) 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 Verify that the Additional VNFC instances (s) are connected to	ator's action ed-out NS		
Test	Step 1 2 3 4 5 6	 (VNFM_VN NFVO supple NS is instate NFVI has the second se	WFLCM_VNF_SCALE_OUT) 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 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 ed-out NS		

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			escription: NS VNF scale out with a VNF indicator	
Identifier			CM_SCALE_OUT_VNF_002	
Test Purpose			VNF in a NS can be successfully scaled out by adding VNFC instan	nces when
			atically by a VNF indicator	
Configuration		SUT Configurat		
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		(NFVO_CF	M can generate "allocate compute resource" operation requests to M_ALLOCATE or VNFM_CRM_ALLOCATE) M can generate "allocate network resource" operation requests to t	
		(NFVO_NF	RM_ALLOCATE or VNFM_NRM_ALLOCATE)	
		(NFVO_SR	FM can generate "allocate storage resource" operation requests to th RM_ALLOCATE or VNFM_SRM_ALLOCATE)	
			rts "allocate compute resource" operation requests from the NFVO/\ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	VNFM
		 VIM support 	rts "allocate network resource" operation requests from the NFVO/V _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	/NFM
		 VIM support 	rts "allocate storage resource" operation requests from the NFVO/V	NFM
		 VNFM can 	_ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM) subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SUE	
			upports VNF indicator subscriptions from the VNFM (EM_VNFINDI_	
			an generate VNF indicator notifications to the VNFM (EM_VNFINDI_	- ,
			an generate VNF indicator notifications to the VNFM (EM_VNFINDI ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND)	- ,
Pre-test condi	itions	 VNFM supplement NS is instant NFVI has the VNFM is complement 	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale onfigured to trigger "scale out by adding VNFC instances" when a gi	I_NOTIFY)
Pre-test condi	itions	 VNFM supplement NS is instant NFVI has the VNFM is complement 	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale	I_NOTIFY)
		 VNFM supp NS is instate NFVI has the vector of the vector of	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he 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 iven VNF
Fest	itions	 VNFM supplement NS is instant NFVI has the VNFM is complement 	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND) ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale onfigured to trigger "scale out by adding VNFC instances" when a gialue crosses a certain threshold Description Trigger the EM/VNF to send the targeted VNF indicator to the	I_NOTIFY)
Fest	Step 1	 VNFM supp NS is instate NFVI has the vector of the second sec	ports VNF indicator notifications from the EM/VNF (VNFM_VNFIND) ntiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale onfigured to trigger "scale out by adding VNFC instances" when a gialue crosses a certain threshold Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured threshold is crossed	I_NOTIFY) ed-out NS iven VNF
Test	Step	 VNFM supp NS is instate NFVI has the vector of the vector of	Description Trigger the EM/VNF to send the targeted VNF indicator to the VNF to send the targeted VNF indicator to the VNFM until the configured the targeted VNF indicator to the VNFM until the send the targeted VNFC instances	I_NOTIFY) ed-out NS iven VNF
Fest	Step 1 2	VNFM supp NS is instat NFVI has ti VNFM is co indicator va Type Stimulus IOP Check	Description Trigger the EM/VNF to send the targeted VNF indicator to the VNF to send the targeted VNF indicator to the VNFM until the configured the targeted VNF indicator to the VNFM until the send the targeted VNFC instances	I_NOTIFY) ed-out NS iven VNF
Fest	Step 1	 VNFM supp NS is instate NFVI has the vector of the second sec	Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM_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	I_NOTIFY) ed-out NS iven VNF
Test	Step 1 2	VNFM supp NS is instat NFVI has ti 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 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 ging the targeted VNF indicator to the VNFM until the configured threshold is crossed Verify that the "scale out by adding 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 iven VNF
Fest	Step 1 2 3	 VNFM supp NS is instate NFVI has the second sec	Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured to trigger scale out by adding VNFC instances" when a gialue 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 VNFC instances" when a gialue crosse is 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 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	I_NOTIFY) ed-out NS iven VNF
Test	Step 1 2 3 4	 VNFM supp NS is instant NFVI has the second sec	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 configured threshold is crossed Verify that the "scale out by adding VNFC instances" when a gialue crosse a certain 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 iven VNF
Fest	Step 1 2 3 4 5	 VNFM supp NS is insta NFVI has the second secon	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 configured threshold is crossed Verify that the "scale out by adding VNFC instances" when a gialue crosse a certain 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 the additional VNFC instances according to the descriptors by	I_NOTIFY) ed-out NS iven VNF
Test	Step 1 2 3 4 5	 VNFM supp NS is insta NFVI has the second secon	Description Trigger data construction 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" 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) are running and are reachable through their management network Verify that the VNFC configuration has been updated to include the additional VNFC instance(s) are connected to verify that the Additional VNFC instance(s) are connected to 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	I_NOTIFY) ed-out NS iven VNF
Test	Step 1 2 3 4 5 6 7	 VNFM supp NS is instant NFVI has the second sec	Description Initiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale onfigured to trigger "scale out by adding VNFC instances" when a gialue crosses a certain threshold Image: 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 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 VNF configuration has been updated to include 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 iven VNF
Test	Step 1 2 3 4 5 6	 VNFM supp NS is instant NFVI has the second structure of the se	Description Initiated (TD_NFV_NSLCM_INSTANTIATE_001) he required amount of consumable virtual resources to run the scale onfigured to trigger "scale out by adding VNFC instances" when a gialue crosses a certain threshold Image: 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 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) are running and are reachable through their management network Verify that the VNF configuration has been updated to include the additional VNFC instances (s) are connected to the VVFM 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 iven VNF
Pre-test condi Test Sequence	Step 1 2 3 4 5 6 7	 VNFM supp NS is instant NFVI has the second sec	Description Trigger the EM/VNF to send the targeted VNF indicator to the VNFM until the configured to trigger "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 crosse a certain 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 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(s) are connected to the VNFM Verify that the Additional VNFC instance(s) are connected to 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 NFVO indicates the scaling operation result as	I_NOTIFY) ed-out NS iven VNF

7.7.2.3.2 NS VNF Scale Out with a VNF Indicator

7.7.2.3.3 NS VNF Scale Out with a VIM KPI

	Test Description: NS VNF scale out with a VIM KPI
Identifier	TD_NFV_NSLCM_SCALE_OUT_VNF_003
Test Purpose	To verify that a VNF in a NS can be successfully scaled out by adding VNFC instances when triggered automatically by a VIM KPI
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			M can generate "allocate compute resource" operation requests to th M_ALLOCATE or VNFM_CRM_ALLOCATE)	ne VIM
		 NFVO/VNF 	M can generate "allocate network resource" operation requests to the M_ALLOCATE or VNFM_NRM_ALLOCATE)	e VIM
		NFVO/VNF	M can generate "allocate storage resource" operation requests to the M_ALLOCATE or VNFM_SRM_ALLOCATE)	e VIM
		 VIM support 	rts "allocate compute resource" operation requests from the NFVO/VI _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	NFM
		 VIM support 	_ALLOCATE_BT_NEVO of VIM_CRM_ALLOCATE_BT_VMEM) ts "allocate network resource" operation requests from the NFVO/VN _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	IFM
		 VIM support 	rts "allocate storage resource" operation requests from the NFVO/VN _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	FM
		 NFVO/VNF 	_ALLOCATE_BT_NEVO OF VIM_SRM_ALLOCATE_BT_VNEM) M can create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CRE _VR_PMJOB_CREATE)	ATE or
		 VIM support 	ts VR PM jobs creation by the NFVO/VNFM	
		NFVO/VNF	PMJOB_CREATE_BY_NFVO or VIM_PM_PMJOB_CREATE_BY_VI M can create VR PM thresholds on the VIM (NFVO_PM_VR_PMTH_	
		 VIM support 	_VR_PMTH_CREATE) ts VR PM thresholds creation by the NFVO/VNFM	
		NFVO/VNF	PMTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VNFI	
		 VIM support 	I_VR_PMJOB_SUBSCRIBE or VNFM_PM_VR_PMJOB_SUBSCRIB	
		 VIM can ge 	PMJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIBE nerate VR PM notifications to the NFVO/VNFM	
		 NFVO/VNF 	PMJOB_NOTIFY_BY_NFVO or VIM_PM_PMJOB_NOTIFY_BY_VNF M supports VR PM notifications from the VIM (NFVO_PM_VR_PMJ0	
		NFVO can	PM_VR_PMJOB_NOTIFY) generate "scale out by adding VNFC instances" to the VNFM	
			FLCM_VNF_SCALE_OUT) ports "scale out by adding VNFC instances" requests from the NFVO	
		(VNFM_VN	IFLCM_VNF_SCALE_OUT)	
Pre-test cond			ntiated (TD_NFV_NSLCM_INSTANTIATE_001) ne required amount of consumable virtual resources to run the scaled	Lout NC
		NFVO/VNF	M is configured to trigger "scale out by adding VNFC instances" whe prosses a certain threshold	
		Virtualised	resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)	
		(
Test	Step	-		
Sequence		Туре	Description	Result
	1	Stimulus	Trigger the VIM to send the targeted KPI to the NFVO/VNFM until the configured threshold is crossed	Result
	2	Stimulus IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/VNFM until the configured threshold is crossed Verify that the "scale out by adding VNFC instance(s)" procedure has been started in NFVO	Result
	2	Stimulus IOP Check IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/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	Result
	2	Stimulus IOP Check IOP Check IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/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	Result
	2	Stimulus IOP Check IOP Check IOP Check IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/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	Result
	2 3 4	Stimulus IOP Check IOP Check IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/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 VNF configuration has been updated to include the additional VNFC instances according to the descriptors by	Result
	2 3 4 5	Stimulus IOP Check IOP Check IOP Check IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/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 VNF configuration has been updated to include the additional VNFC instances according to the descriptors by querying the VNFM	Result
	2 3 4 5 6	Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/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 VNF configuration has been updated to include 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 Verify that the NFVO indicates the scaling operation result as	Result
	2 3 4 5 6 7	Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	Trigger the VIM to send the targeted KPI to the NFVO/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 VNF configuration has been updated to include 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	Result

7.7.2.4 NS VNF Scale In

7.7.2.4.1 NS VNF Scale In with an Operator Action

Identifier			scription: NS VNF scale in with an operator action			
achthe			scription: NS VNF scale in with an operator action			
Test Purpose			F in a NS can be successfully scaled in by removing VNFC instance	es from an		
		existing VNF triggered by an operator action				
Configuration		SUT Configurat				
			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5	1 FTSI		
GS NFV-IFA (GS NFV-IFA 00	8 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]			
дрысалықу		 (NFVO_CR NFVO/VNF (NFVO_NR NFVO/VNF (NFVO_SR VIM support (VIM_CRM VIM support (VIM_NRM VIM support (VIM_SRM NFVO can 	M can generate "terminate compute resource" operation requests to 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) 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) rts "terminate storage 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)	o the VIM the VIM D/VNFM /VNFM		
Pre-test cond	itions	VNFM_VN NFVO supp	ports "scale in by removing VNFC instances" requests from the NFN IFLCM_VNF_SCALE_IN)	/0		
			ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			ntiated (TD_NEV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in			
Test	Step	The curren	t NS deployment size should support scaling in	Result		
Test Sequence	Step 1			Result		
		The current Type	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		
	1	The curren Type Stimulus IOP Check IOP Check	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	Result		
	1	The curren Type Stimulus IOP Check IOP Check IOP Check	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	Result		
	1 2 3	The curren Type Stimulus IOP Check IOP Check	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	Result		
	1 2 3 4	The curren Type Stimulus IOP Check IOP Check IOP Check	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 connected according to the descriptors	Result		
	1 2 3 4 5	The current Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check	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		
	1 2 3 4 5 6	The current Type Stimulus IOP Check	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 connected according to the descriptors Verify that the NFVO indicates the scaling operation result as	Result		

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		Test D	escription: NS VNF scale in with a VNF indicator			
Identifier			CM_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		ETSI GS NFV-I	TSI GS NFV-IFA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5], ETSI			
			/-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 to	o the VIM		
		(NFVO_CR	M_TERMINATE or VNFM_CRM_TERMINATE)			
			M can generate "terminate network resource" operation requests to	the VIM		
			RM_TERMINATE or VNFM_NRM_TERMINATE)			
			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)/VNFM		
			_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)			
			rts "terminate network resource" operation requests from the NFVO	VINEIVI		
			_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)			
			subscribe to VNF indicators on the EM/VNF (VNFM_VNFINDI_SUE	SCRIBE)		
			upports VNF indicator subscriptions from the VNFM (EM_VNFINDI_			
			an generate VNF indicator notifications to the VNFM (EM_VNFINDI_			
			VNFM supports VNF indicator notifications from the EM/VNF (VNFM_VNFINDI_NOTIFY)			
		than boop				
Pre-test cond	itions	 NS is instal 		<u> </u>		
Pre-test cond			ntiated (TD_NFV_NSLCM_INSTANTIATE_001)			
Pre-test cond		• The current	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in			
Pre-test cond		The currentVNFM is compared	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g			
Pre-test cond		The currentVNFM is compared	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in			
		 The current VNFM is control indicator value 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g			
Test		The currentVNFM is compared	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g alue crosses a certain threshold	given VNF		
Test	Step	The curren VNFM is co indicator va Type Stimulus	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g 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	given VNF		
Test	Step	 The current VNFM is consistent of the current of the cu	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g 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 in by removing VNFC instance(s)"	given VNF		
Test	Step 1 2	The curren VNFM is co indicator va Type Stimulus IOP Check	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g 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 in by removing VNFC instance(s)" procedure has been started in NFVO	given VNF		
Test	Step 1	The curren VNFM is co indicator va Type Stimulus	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g 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 in by removing VNFC instance(s)" procedure has been started in NFVO Verify that the impacted VNFC instance(s) inside the VNF have	given VNF		
Test	Step 1 2 3	 The curren VNFM is considered indicator value Type Stimulus IOP Check IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g 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 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	given VNF		
Test	Step 1 2	The curren VNFM is co indicator va Type Stimulus IOP Check	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g 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 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	given VNF		
Test	Step 1 2 3 4	 The curren VNFM is considered indicator value Type Stimulus IOP Check IOP Check IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a g 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 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	given VNF		
Test	Step 1 2 3	 The curren VNFM is considered indicator value Type Stimulus IOP Check IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue 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 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	given VNF		
Test	Step 1 2 3 4 5	 The current VNFM is considered indicator value Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue 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 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 Verify that the impacted VNFC instance(s) are still running and reachable via their management network	given VNF		
Test	Step 1 2 3 4	 The curren VNFM is considered indicator value Type Stimulus IOP Check IOP Check IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue 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 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 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	given VNF		
Test	Step 1 2 3 4 5	 The current VNFM is considered indicator value Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue 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 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	given VNF		
Test	Step 1 2 3 4 5 6	 The curren VNFM is considered indicator value Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check 	Intiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue crosses a certain threshold Image: 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 onfiguration has been updated to exclude the removed VNFC instances according to the descriptors by querying the VNFM	given VNF		
Test	Step 1 2 3 4 5	 The current VNFM is considered indicator value Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue 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 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 VNFC instances according to the descriptors by querying the VNFM	given VNF		
Test	Step 1 2 3 4 5 6 7	 The curren VNFM is considered indicator value Type Stimulus IOP Check 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue 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 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 connected according to the descriptors	given VNF		
Pre-test cond	Step 1 2 3 4 5 6	 The curren VNFM is considered indicator value Type Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check 	Intiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue crosses a certain threshold Image: 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 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	given VNF		
Test	Step 1 2 3 4 5 6 7 8	 The curren VNFM is considered indicator values Type Stimulus IOP Check 	Intiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue crosses a certain threshold Image: the trigger is the trigger of the trigger the trigger the trigger the trigger 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 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	given VNF		
Test	Step 1 2 3 4 5 6 7	 The curren VNFM is considered indicator value Type Stimulus IOP Check 	Intiated (TD_NFV_NSLCM_INSTANTIATE_001) t NS deployment size should support scaling in onfigured to trigger "scale in by removing VNFC instances" when a galue crosses a certain threshold Image: 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 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	given VNF		

7.7.2.4.2 NS VNF Scale In with a VNF Indicator

7.7.2.4.3 NS VNF Scale In with a VIM KPI

Test Description: NS scale in with a VIM KPI				
Identifier	TD_NFV_NSLCM_SCALE_IN_VNF_003			
Test Purpose	Verify that a VNF in a NS can be successfully scaled in by removing VNFC instances triggered automatically by a VIM KPI			
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	 NFVO/VNFM can generate "terminate compute resource" operation requests to the VIM (NFVO_CRM_TERMINATE or VNFM_CRM_TERMINATE) 			

Sequence	2 3 4 5 6	IOP Check IOP Check IOP Check IOP Check IOP Check	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 VNF configuration has been updated to exclude the removed VNFC instances according to the descriptors by					
Sequence	3	IOP Check IOP Check	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					
Sequence	3	IOP Check	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					
Sequence			procedure has been started in NFVO Verify that the impacted VNFC instance(s) inside the VNF have					
Sequence	2	IOP Check						
Sequence								
Test	Step 1	Type Stimulus	Description Trigger the VIM to send notifications of the targeted KPI to the NFVO/VNFM until the configured threshold is crossed	Result				
		Virtualised	resource PM job with threshold monitoring has been created PM_VR_CREATE_THRESHOLD_001)					
			M is configured to trigger "scale in by removing VNFC instances" w lue crosses a certain threshold	hen a given				
		• The current	NS deployment size should support scaling in					
Pre-test cond	ditions	 NS is instar 	ntiated (TD_NFV_NSLCM_INSTANTIATE_001)					
			FLCM_VNF_SCALE_IN)					
			FLCM_VNF_SCALE_IN) ports "scale in by removing VNFC instances" requests from the NF\	/0				
		NFVO can	or VNFM_PM_VR_PMJOB_NOTIFY) NFVO can generate "scale in by removing VNFC instances" to the VNFM					
		NFVO/VNF	M supports VR PM notifications from the VIM (NFVO_PM_VR_PM.					
		 VIM can ge 	nerate VR PM notifications to the NFVO/VNFM PMJOB_NOTIFY_BY_NFVO or VIM_PM_PMJOB_NOTIFY_BY_VN					
			ts VR PM thresholds creation by the NFVO/VNFM PMTH_CREATE_BY_NFVO or VIM_PM_PMTH_CREATE_BY_VN	FM)				
		VNFM_PM	M can create VR PM thresholds on the VIM (NFVO_PM_VR_PMTH _VR_PMTH_CREATE)	H_CREATE or				
		(VIM_PM_F	PMJOB_SUBSCRIBE_BY_NFVO or VIM_PM_PMJOB_SUBSCRIB					
		(NFVO_PM	I_VR_PMJOB_SUBSCRIBE or VNFM_PM_VR_PMJOB_SUBSCRI ts VR PM job subscriptions from the NFVO/VNFM	IBE)				
			PMJOB_CREATE_BY_NFVO or VIM_PM_PMJOB_CREATE_BY_\ M can subscribe to VR PM jobs on the VIM	/NFM)				
		 VIM support 	_VR_PMJOB_CREATE) ts VR PM jobs creation by the NFVO/VNFM					
		NFVO/VNF	M can create VR PM jobs on the VIM (NFVO_PM_VR_PMJOB_CF	REATE or				
		 VIM support 	ts "terminate storage resource" operation requests from the NFVO/ _TERMINATE_BY_NFVO or VIM_SRM_TERMINATE_BY_VNFM)	VNFM				
			ts "terminate network resource" operation requests from the NFVO _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)	/VNFM				
		(VIM_CRM	ts "terminate compute resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)					
		(NFVO_SR	NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)					
		(NFVO_NR	M can generate "terminate network resource" operation requests to M_TERMINATE or VNFM_NRM_TERMINATE) M can generate "terminate storage resource" operation requests to					

7.7.3 NS Update

7.7.3.1 Start VNF Instance

Identifier TD_NFV_NSLCM_UPDATE_START_001 Test Purpose Verify the capability to start a VNF instance inside a NS instance Configuration SUT Configuration 1 References ETSI GS NFV-IFA 005 [1:3], ETSI GS NFV-IFA 006 [1:4], ETSI GS NFV-IFA 007 [1:5] and ETSI GS NFV-IFA 013 [1:9] Applicability • NFVO can generate "operate VNF" operation requests to the VNFM (NFVO_VNFLCM_OPERATE) • VNFM supports "operate VNF" operation requests from the NFVO (VNFM (NFVO_CRM_OPERATE or VNFM_CRM_OPERATE) • NFVO/NFM can generate "operate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_OPERATE BY_VNFM) • NFVO/VNFM can query compute resource information from the VIM (NFVO_CRM_QUERY) • VIM can send acompute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM_CRM_INFO_TO_VNFM) • VIM can send acompute resource information to the NFVO (VIM_NRM_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 supports VNF information queries by 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 queries by the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM)				Test Description: start VNF instance				
SUT 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 013 [i.9] Applicability • NFVO can generate "operate VNF" operation requests to the VNFM (NFVO_VNFLCM_OPERATE) • VNFM supports "operate VNF" operation requests from the NFVO (VNFM_VNFLCM_OPERATE) • VNFM can generate "operate compute resource" operation requests to the VIM (NFVO_CRM_OPERATE or VNFM_CRM_OPERATE) • VNFM supports "operate Term version of the NFVO/VNFM (VIM_CRM_OPERATE_BY_NFW) • NFVO/VNFM can guery compute resource" operation requests from the NFVO/VNFM (VIM_CRM_OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM) • NFVO/VNFM can query compute resource information from the VIM (NFVO_CRM_QUERY) or VNFM_CRM_QUERY) • 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) • VIM can send storage resource information to the NFVO (VIM_QUERY) • VIM can send storage resource information the VNFM (NFVO_VNFLCM_QUERY) • VNFM supports VNF information queries by the NFVO (VNFL_VNFLCM_QUERY) • VIM can send storage resource information to the NFVO (VIM_M_VNFLCM_QUERY) • VNFM supports VNF information queries by the NFVO (VN	Identifier		TD_NFV_NSLC					
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 013 [i.9] Applicability • NFVO can generate "operate VNF" operation requests to the VNFM (NFVO_VNFLCM_OPERATE) • VNFM supports "operate VNF" operation requests from the NFVO (NFM_VNFLCM_OPERATE) • NFVO/NFM can generate "operate compute resource" operation requests to the VIM (NFVO_CRM_OPERATE or VNFM_CRM_OPERATE) • VIM supports "operate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_OPERATE_BY_NFVO or VIM_CRM_OPERATE) • VIM supports "operate compute resource information from the VIVM(NFVO_CRM_QUERY) or VNFM_CRM_QUERY) • VIM can send compute resource information to the NFVO (VIM_CRM_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) • NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY) • VIM supports VNF information queries by the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM) • NFVO can query VNF information from the VNFM (NFVO_CVNFLCM_QUERY) • VNFM supports VNF information from the VNFM (NFVO_UNFLCM_QUERY) • VIM can send storage resource anformation to the NFVO (VNFM_VNFLCM_QUERY) (M_NFVO can Query VNF information fro								
GS NFV-IFA 013 [I.9] NEVO Applicability • NFV0 Can generate "operate VNF" operation requests to the VNFM (NFVO_VNFLCM_OPERATE) • NFVO/VNFM can generate 'operate compute resource' operation requests to the VIM (NFVO_VNFM can generate 'operate compute resource' operation requests to the VIM (NFVO_VNFM can generate 'operate compute resource' operation requests from the NFVO/VNFM (VIM_CRM_OPERATE) • NFVO/VNFM can guery compute resource of operation requests from the NFVO/VNFM (VIM_CRM_OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_NNFM) • NFVO/VNFM can guery compute resource information from the VIM (NFVO_CRM_QUERY or VNFM_CRM_QUERY) • VIM can send compute resource information to the NFVO (VIM_CRM_INFO_TO_NFVO or VIM can send toropute resource information to the NFVO (VIM_SRM_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) • NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY) • VNFM supports VNF information from the VNFM (NFVO_VNFLCM_QUERY) • VNFM supports VNF information from the VNFM (NFVO_VNFLCM_QUERY) • NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY) • NFVO can query VNF is in a stopped operational state. See note. • Step Type Toget the NFVO to start the target VNF instance inside the INS instance 2 IOP Check Verify that the compute resources allocated to the VNFC instance since the performed operational state on the VNFM is instance inside the target VNF instance have been started by querying the VIM 4 IOP Check Verify that the NFVO shows no "operate VNF" operation er								
Applicability • NFVO can generate "operate VNF" operation requests to the VNFM (NFVO_VNFLCM_OPERATE) • VNFM supports "operate VNF" operation requests from the NFVO (VNFM_VNFLCM_OPERATE) • NFVO/VNFM can generate "operate compute resource" operation requests to the VIM (NFVO_CRM_OPERATE or VNFM_CRM_OPERATE) • VIM supports "operate compute resource" operation requests to the VIM (NFVO_CRM_OPERATE BY_NFVO OV VM_CRM_OPERATE BY_VNFM) • NFVO/VNFM can query compute resource" operation requests from the NFVO/VNFM (VIM_CRM_QUERY) • VIM can send compute resource information from the VIM (NFVO_CRM_QUERY) or VIM_CRM_QUERY) • VIM can send network resource information to the NFVO (VIM_SRM_INFO_TO_NFVO or VIM_SRM_INFO_TO_VNFM) • VIM can send network 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) • 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 queries by the NFVO (VNFM_VNFLCM_QUERY) • VIM S is instantiated (TD_NFV_NSLCM_INSTANTIATE_001) • Target VNF is in a stopped operational state. See note. Test Step Type Description Result § I Stimulus Trigger the NFVO to start the target VNF instance have been started by querying the VIM Querying the VIM 3	References				i] and ETSI			
Image: New York Comparison of the image of the	A							
(NFM_VNFL_CM_OPERATE) • NFVO/VNFM can generate "operate compute resource" operation requests to the VIM (NFVO_CRM_OPERATE or VNFM_CRM_OPERATE) • VIM supports "operate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM) • NFVO/VNFM can query compute resource information from the VIM (NFVO_CRM_QUERY) or VNFM_CRM_QUERY) • 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) • 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_VNFLCM_QUERY) • VNFM supports VNF information queries by the NFVO (VIM_VNFLCM_QUERY) • VNFM supports VNF information queries by the NFVO (VNFL_VNFLCM_QUERY) • VNF is in a stopped operational state. See note. Test Step Type Description Result Sequence 1 Stimulus Trigger the NFVO to start the target VNF instance inside the NS instance 1 OP Check Verify that the compute resources have not been alifected by the performed operation by querying the VIM	Аррисарину							
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VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY) Pre-test conditions NS is instantiated (TD_NFV_NSLCM_INSTANTIATE_001) Target VNF is in a stopped operational state. See note. Test Sequence Step Type Description Result Stimulus Trigger the NFVO to start the target VNF instance inside the NS instance I OP Check Verify that the compute resources allocated to the VNFC instances inside the target VNF instance have been started by querying the VIM OP Check Verify that other existing compute resources have not been affected by the performed operational state on the VNFM is indicated as "started" S IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that the NFVO shows no "operate VNF" operation errors IOP Check Verify that				· ·				
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• Target VNF is in a stopped operational state. See note. Test Step Type Description Result 1 Stimulus Trigger the NFVO to start the target VNF instance inside the NS instance 2 IOP Check Verify that the compute resources allocated to the VNFC 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 NF VO shows no "operate VNF" operation errors 0P Verdict Vorify that the NF operates successfully by running the end-to-end functional test				DORTS VINE INFORMATION QUERIES BY THE NEVO (VINEM_VINELCM_QUE	<u>-RY)</u>			
• Target VNF is in a stopped operational state. See note. Test Step Type Description Result 1 Stimulus Trigger the NFVO to start the target VNF instance inside the NS instance 2 IOP Check Verify that the compute resources allocated to the VNFC 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 NF VO shows no "operate VNF" operation errors 0P Verdict Vorify that the NF operates successfully by running the end-to-end functional test	Pro-test cond	litions		AND NEV NOLON INCLANTIATE (004)				
Step Type Description Result Sequence 1 Stimulus Trigger the NFVO to start the target VNF instance inside the NS instance 2 IOP Check Verify that the compute resources allocated to the VNFC instance 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 operation all 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 OP Verdict VortE: In the state STOPPED, the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down								
Sequence 1 Stimulus Trigger the NFVO to start 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 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 OP Verdict NOTE: In the state STOPPED, the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down			 Target VNF 	- is in a stopped operational state. See note.				
Sequence 1 Stimulus Trigger the NFVO to start 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 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 OP Verdict NOTE: In the state STOPPED, the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down	Tost	Ston	Туре	Description	Result			
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 operation by querying the VIM 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 OP Verdict Vortise the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down	Sequence			Trigger the NFVO to start the target VNF instance inside the	Nesuit			
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 OP Verdict NOTE: In the state STOPPED, the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down		2		instances inside the target VNF instance have been started by querying the VIM				
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 OP Verdict Verify that the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down		3	IOP Check					
6 IOP Check Verify that the NS functionality that utilizes the started VNF instance operates successfully by running the end-to-end functional test OP Verdict Verify that the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down		4	IOP Check					
Instance operates successfully by running the end-to-end functional test OP Verdict In the state STOPPED, the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down		5	IOP Check					
NOTE: In the state STOPPED, the virtualised container(s), where the VNFC instance(s) of the VNF run, are shut down		6	IOP Check	instance operates successfully by running the end-to-end				
	IOP Verdict							
but not terminated.	NOTE: In t	he state S	STOPPED, the	virtualised container(s), where the VNFC instance(s) of the VNF ru	n, are shut down			

7.7.3.2 Stop VNF Instance

Test Description: stop VNF instance				
Identifier	TD_NFV_NSLCM_UPDATE_STOP_001			
Test Purpose	Verify the capability to stop a VNF instance inside a NS instance			
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 013 [i.9]			

Applicability	NFVO can generate "operate VNF" operation requests to the VNFM (NFVO VNFL CM OPERATE)
	(NFVO_VNFLCM_OPERATE)
	 VNFM supports "operate VNF" operation requests from the NFVO (VNFM_VNFLCM_OPERATE)
	 NFVO/VNFM can generate "operate compute resource" operation requests to the VIM (NFVO_CRM_OPERATE or VNFM_CRM_OPERATE)
	 VIM supports "operate compute resource" operation requests from the NFVO/VNFM NFVO/VNFM (VIM_CRM_OPERATE_BY_NFVO or VIM_CRM_OPERATE_BY_VNFM)
	 NFVO/VNFM can query compute resource information from the VIM (NFVO_CRM_QUERY or VNFM_CRM_QUERY)
	 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)
	 NFVO can query VNF information from the VNFM (NFVO_VNFLCM_QUERY)
	 VNFM supports VNF information queries by the NFVO (VNFM_VNFLCM_QUERY)

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				

7.7.3.3 Instantiate VNF and Add Instance to NS Instance

	Test Description: NS update instantiating VNFs and adding instances
Identifier	TD_NFV_NSLCM_UPDATE_INST_ADD_VNF_001
Test Purpose	To verify that one or more VNFs can be instantiated and the instances added to a running NS
_	instance
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	NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE) NFVO/VNFM can generate "allocate actually resource" approximation requests to the V/M
	 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 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 can generate "create VNF identifier" operation requests to the VNFM (NFVO_VNFLCM_CREATE_VNFID)
	 VNFM supports "create VNF identifier" operation requests from the NFVO (VNFM_VNFLCM_CREATE_VNFID)
	 NFVO can generate "instantiate VNF" operation requests to the VNFM (NFVO_VNFLCM_INSTANTIATE)

	•		oorts "instantiate VNF" operation requests from the NFVO FLCM_INSTANTIATE)	
Pre-test conc	litions		ntiated (TD_NFV_NSLCM_INSTANTIATE_001) ges whose VNFDs are referred to in the NSD are on-boarded to th	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				

7.7.3.4 Remove VNF Instances from a NS Instance

		Test De	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 insta	nce		
Configuration		SUT Configuration				
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			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		
			<pre>M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)</pre>	the VIM		
			s "terminate compute resource" operation requests from the NFV(_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)			
			s "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 "terminate VNF" operation requests to the VNFM (NFVO_VNFLCM_TERMINATE) 				
		VNFM supp	orts "terminate VNF" operation requests from the NFVO FLCM_TERMINATE)			
		 NFVO can generate "delete VNF identifier" operation requests to the VNFM (NFVO_VNFLCM_DELETE_VNFID) 				
		VNFM supp	orts "delete VNF identifier" operation requests from the NFVO FLCM_DELETE_VNFID)			
Pre-test condi	itions	 NS is instan 	tiated (TD_NFV_NSLCM_INSTANTIATE_001)			
			tion without the impacted VNF instance(s)			
			refication 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				

7.7.3.5 Add Shared VNF Instances to NS Instance

		Test Des	cription: NS update adding shared VNF instances			
Identifier			M_UPDATE_ADD_SHVNF_001			
Test Purpose		To verify that one or more shared VNF instances can be added to a running NS instance				
Configuration		SUT Configurati				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.5], ETSI		
		GS NFV-IFA 00	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 M_ALLOCATE or VNFM_CRM_ALLOCATE)	the VIM		
		NFVO/VNF	M can generate "allocate network resource" operation requests to t M_ALLOCATE or VNFM_NRM_ALLOCATE)	he VIM		
		NFVO/VNF	M can generate "allocate storage resource" operation requests to the ALLOCATE or VNFM_SRM_ALLOCATE)	ne VIM		
		VIM suppor	ts "allocate compute resource" operation requests from the NFVO/ _ALLOCATE_BY_NFVO or VIM_CRM_ALLOCATE_BY_VNFM)	/NFM		
		VIM suppor	ts "allocate network resource" operation requests from the NFVO/v _ALLOCATE_BY_NFVO or VIM_NRM_ALLOCATE_BY_VNFM)	NFM		
		VIM suppor	ts "allocate storage resource" operation requests from the NFVO/V _ALLOCATE_BY_NFVO or VIM_SRM_ALLOCATE_BY_VNFM)	NFM		
		(101				
Pre-test condit	ions		antiated (TD_NFV_NSLCM_INSTANTIATE_001) ilize shared VNF instances			
		Functional	verification of the additional shared VNF instances is possible (i.e. t	raffic load		
		sharing)				
Test	Step	Туре	Description	Result		
Sequence	1	Stimulus	Trigger a NS update adding one or more shared VNF instances	Nesun		
Sequence			to NS1 on the NFVO			
	2	IOP Check	Verify that any additional resources associated to NS1 have been allocated and deployed by the VIM according to the updated descriptors			
	3	IOP Check	Verify that the existing VNF instance(s) in NS1 are running and			
			reachable through the management network			
	4	IOP Check	reachable through the management network Verify that the additional shared VNF instances(s) have been configured according to the descriptors by querying the VNFM			
	4 5	IOP Check	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			
		IOP Check IOP Check	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 instance(s)			
	5	IOP Check	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			

7.7.3.6 Remove Shared VNF Instances from NS Instance

	Test Description: NS update removing shared VNF instances			
Identifier	TD_NFV_NSLCM_UPDATE_REM_SHVNF_001			
Test Purpose	To verify that one or more shared VNF instances can be removed from a running NS instance			
Configuration	Configuration SUT Configuration 2			
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_CR NFVO/VNF (NFVO_NR NFVO/VNF (NFVO_SR VIM support (VIM_CRM) 	M can generate "terminate compute resource" operation requests t 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) 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 NFV0	o the VIM the VIM D/VNFM
		(VIM_NRM) VIM suppor	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)	
Pre-test cond	itions	 NS1 can fu 	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)
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger a NS update removing one or more existing VNF instances from NS1 on the NFVO	
	I			
	2	IOP Check	Verify that any additional resources associated to NS1 have been removed by the VIM according to the updated descriptors	
	2 3	IOP Check	Verify that any additional resources associated to NS1 have	
			Verify that any additional resources associated to NS1 have been removed by the VIM according to the updated descriptors Verify that the existing VNF instance(s) in NS1 are still running	
	3	IOP Check	Verify that any additional resources associated to NS1 have been removed by the VIM according to the updated descriptors Verify that the existing VNF instance(s) in NS1 are still running and reachable through the management network Verify that the previously shared VNF instances(s) have been configured according to the updated descriptors by querying the VNFM Verify that the NFVO indicates the shared VNF instance(s)	
	3	IOP Check	Verify that any additional resources associated to NS1 have been removed by the VIM according to the updated descriptors Verify that the existing VNF instance(s) in NS1 are still running and reachable through the management network Verify that the previously shared VNF instances(s) have been configured according to the updated descriptors by querying the VNFM Verify that the NFVO indicates the shared VNF instance(s) removal operation result as successful Verify that NS1 has been updated by running the end-to-end	
	3 4 5	IOP Check IOP Check IOP Check	Verify that any additional resources associated to NS1 have been removed by the VIM according to the updated descriptors Verify that the existing VNF instance(s) in NS1 are still running and reachable through the management network Verify that the previously shared VNF instances(s) have been configured according to the updated descriptors by querying the VNFM Verify that the NFVO indicates the shared VNF instance(s) removal operation result as successful	

7.7.3.7 Change VNF Deployment Flavour

	Test Description: NS update changing VNF instances DF
Identifier	TD_NFV_NSLCM_UPDATE_VNF_DF_001
Test Purpose	To verify that the deployment flavour of one or more VNF instances in a NS instance can be changed
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	 NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE) 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 network resource" operation requests from the NFVO/VNFM (VIM_NRM_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 to the VIM (NFVO/VNFM can generate "terminate compute resource" operation requests to the VIM (NFVO_CRM_TERMINATE or VNFM_CRM_TERMINATE) NFVO/VNFM can generate "terminate network resource" operation requests to the VIM (NFVO_NRM_TERMINATE or VNFM_NRM_TERMINATE) NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)

NS contains at least one VNF that accepts multiple deployment flavours The new deployment flavour is expected to impact a functional aspect of the VNF (i.e. performance) Test Step Type Description Re	Sequence	1	Stimulus	Trigger a NS update changing the deployment flavour (DF) of	lisoun
 The new deployment flavour is expected to impact a functional aspect of the VNF (i.e. 	Test	Step	Type	Description	Result
Pre-test conditions • NS is instantiated (TD_NFV_NSLCM_INSTANTIATE_001)	Fre-lest con	uitions	NS contairThe new d	ns at least one VNF that accepts multiple deployment flavours eployment flavour is expected to impact a functional aspect of the N	/NF (i.e. scale
			 VIM support (VIM_NRM) VIM support 	orts "terminate network resource" operation requests from the NFVC 1_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM orts "terminate storage resource" operation requests from the NFVC)))/VNFM
 VIM supports "terminate network resource" operation requests from the NFVO/VNFM (VIM_NRM_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) 				prts "terminate compute resource" operation requests from the NFV 1_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM	

Sequence		Stimulus	Ingger a NS update changing the deployment havour (DF) of	
			one or more VNF instances in a NS instance on NFVO	
	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				

7.7.4 NS Healing

7.7.4.1 Partial NS Healing with an Operator Action

	Test Description: partial NS healing with an operator action
Identifier	TD_NFV_NSLCM_HEAL_001
Test Purpose	Verify that VNF instances inside the NS can be successfully healed when partial NS healing (VNI
	healing) is triggered by an 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 [i.5], ETSI GS NEV-IFA 008 [i 6], ETSI GS NEV-IFA 010 [i 7] and ETSI GS NEV-IFA 013 [i 9]
Applicability	 GS NFV-IFA 008 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9] NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE) 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 network 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) NFVO/VNFM can generate "terminate compute resource" operation requests to the VIM (NFVO_CRM_TERMINATE or VNFM_CRM_TERMINATE) NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE) NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE) NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE) NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)
	 VIM supports "terminate network resource" operation requests from the NFVO/VNFM (VIM_NRM_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 VNF healing requests to the VNFM (NFVO_VNFLCM_HEAL)
	 VNFM supports VNF healing requests from the NFVO (VNFM_VNFLCM_HEAL)

Pre-test conc	litions	NS is instantiated (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- to-end functional test factoring the healed VNF instance(s)	
IOP Verdict				

7.7.4.2 Complete NS Healing with an Operator Action

	Test Description: complete NS healing with an operator action
Identifier	TD_NFV_NSLCM_HEAL_002
Test Purpose	Verify that a NS can be successfully healed when complete NS healing is triggered by an operator
0	
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	 NFVO/VNFM can generate "allocate compute resource" operation requests to the VIM (NFVO_CRM_ALLOCATE or VNFM_CRM_ALLOCATE) 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 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 generate "terminate compute resource" operation requests to the VIM (NFVO_CRM_TERMINATE or VNFM_CRM_TERMINATE)
	 NFVO/VNFM can generate "terminate network resource" operation requests to the VIM (NFVO_NRM_TERMINATE or VNFM_NRM_TERMINATE)
	 NFVO/VNFM can generate "terminate storage resource" operation requests to the VIM (NFVO_SRM_TERMINATE or VNFM_SRM_TERMINATE)
	 VIM supports "terminate compute resource" operation requests from the NFVO/VNFM (VIM_CRM_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)
	 VIM supports "terminate network resource" operation requests from the NFVO/VNFM (VIM_NRM_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 conditions	
	 NS is in a failed state (for example a virtualised resource needed by one or more VNF instances inside 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	
	4	IOP Check	Verify that VNF instance(s) inside the new NS instance are running and reachable via their management network	
	5	IOP Check	Verify that the VNF instances(s) inside the new NS instance have been configured according to the descriptors by querying the VNFM	
	6	IOP Check	Verify that the NFVO indicates the complete NS healing operation result as successful	
	7	IOP Check	Verify that NS has been successfully healed by running an end- to-end functional test	
IOP Verdict				

7.7.5 NS Termination

7.7.5.1 Standalone NS Termination

		Τe	est Description: standalone NS termination		
Identifier			M_TERMINATE_001		
Test Purpose		To verify that a s	standalone NS instance can be successfully terminated		
Configuration		SUT Configurati			
References		ETSI GS NFV-IF	A 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.3] 3 [i.6], ETSI GS NFV-IFA 010 [i.7] and ETSI GS NFV-IFA 013 [i.9]	5], ETSI	
Applicability		(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 t M_TERMINATE or VNFM_NRM_TERMINATE)		
		(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)	
 VIM supports "terminate network resource" operation requests from the NFVO/VNFM (VIM_NRM_TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM))		
			ts "terminate storage resource" operation requests from the NFVC _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) 			
		 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) 			
			query VNF information from the VNFM (NFVO_VNFLCM_QUERY)	
			orts VNF information queries from the NFVO (VNFM_VNFLCM_C		
Pre-test condit	ions	 NS is instar 	tiated (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 NEV NSLC	M TERMINATE NESTED NS 001			
Test Purpose			NS instance referencing an existing nested NS can be successfully	terminated		
Configuration		SUT Configurati				
References			FA 005 [i.3], ETSI GS NFV-IFA 006 [i.4], ETSI GS NFV-IFA 007 [i.4	51. ETSI		
			8 [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 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)	o the VIM		
		NFVO/VNF	M_TERMINATE of VM M_N(M_TERMINATE) M can generate "terminate storage resource" operation requests to M_TERMINATE or VNFM_SRM_TERMINATE)	the VIM		
		VIM suppor	ts "terminate compute resource" operation requests from the NFV(_TERMINATE_BY_NFVO or VIM_CRM_TERMINATE_BY_VNFM)			
		VIM suppor	ts "terminate_bf_NFVO of VIM_CRM_TERMINATE_bf_VNFM) ts "terminate network resource" operation requests from the NFVC _TERMINATE_BY_NFVO or VIM_NRM_TERMINATE_BY_VNFM)	/VNFM		
		 VIM suppor (VIM_SRM_ compute res 	 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) 			
		 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_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 from the NFVO (VNFM_VNFLCM_QUERY) 				
			ons vine information queries from the NEVO (VINEM_VINELCM_Q	UERT)		
Pre-test condi	tions	N050 (
Fre-lest condi	lions		ences nested NSD1			
			antiated (TD_NFV_NSLCM_INSTANTIATE_NEST_NS_001)			
		 NS1 instand 	ce can function without the impacted NS2 instance			
	1-					
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						

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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	ОК
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.

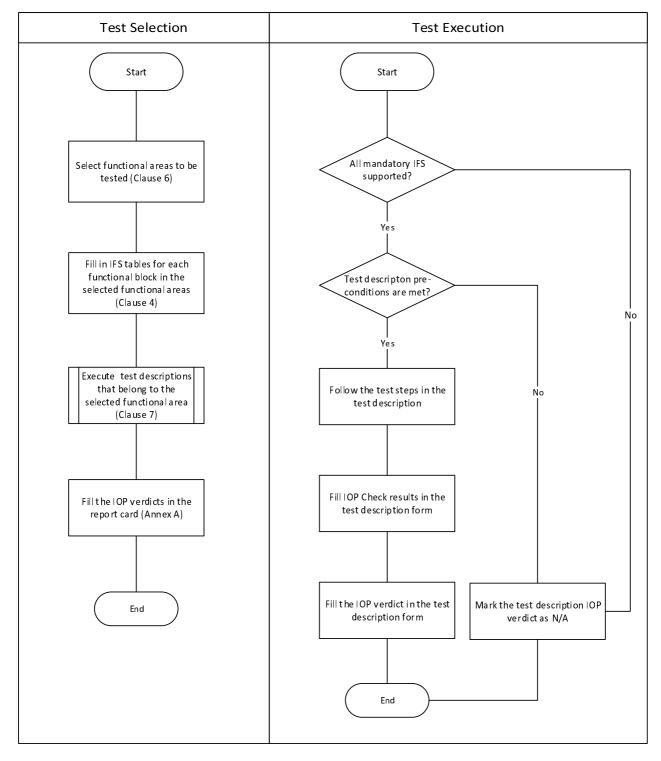


Figure B-1: Document usage process diagram

Annex C: Authors & Contributors

The following people have contributed to the present document:

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Rapporteur: Carsten Rossenhoevel, EANTC

Co-Rapporteur: Akram Al Sawaf, EANTC

Other contributors: Al Morton, AT&T

Eduardo Jacob, UPV-EHU

Jokin Garay, UPV-EHU

Jong-Hwa Yi, ETRI

Jörg Aelken, Ericsson

Marie-Paule Odini, Hewlett-Packard Enterprise

Pierre Lynch, Ixia

Silvia Almagia, ETSI Center for Testing and Interoperability (CTI)

History

Document history					
V1.1.1	November 2017	Publication			
V2.5.1	August 2018	Publication			

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