1st ETSI NFV Plugtests Madrid, Spain 23rd January – 3rd February





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Foreword

This Test Plan has been produced by ETSI Centre for Testing and Interoperability during the preparation of the 1^{st} ETSI NFV Plugtests.

Introduction

The present document describes the Interoperability Test Plan that was followed during the 1st ETSI NFV Plugtests held from 23rd January to 3rd February 2017 in Madrid, Spain.

The Test Plan was developed following the interoperability testing methodology defined by ETSI NFV in [TST002]

During the 1st NFV Plugtests, this Test Plan was run on 160 Test Sessions, that is, it allowed to test for interoperability over 160 Systems Under Test made of different combinations of the 35 participating implementations.

1 Scope

The goal of this document it to support the interoperability test sessions run during the 1st NFV Plugtests. This event aimed at verifying early interoperability between different implementations of the main components of the NFV Architectural Framework, which included:

- Virtual Network Functions (VNF)
- Management and Orchestration (MANO) solutions, providing pre-integrated NFV Orchestrator (NFVO) and VNF Manager (VNFM) functionality
- NFV Platforms providing pre-integrated NFV infrastructure (NFVI) and Virtual Infrastructure Manager (VIM) functionality

During the Test Sessions, the Systems Under Test were composed of the following Functions Under Test; one NFV Platform (NFVI&VIM) one MANO solution, and one or several VNFs, each of them from different participants. The Test Sessions were supported by Test VNFs which were included in the Network Service together with the VNF(s) Under Test in order to be able to validate appropriate functional behaviour of the VNFs and NS.

This document includes several System Under Test configurations to illustrate how the Test Descriptions can be applied to different types of VNFs (end point, middle point, ...) and how scaling or updating operations would impact each of them.

The NS and VNF compositions shown in this Test Plan are not mandated but provided as examples. The Test Descriptions have been written in such a way that also apply to more complex VNFs and NS derived from the expamples provided in the SUT Configurations.

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.

[NFV002]	ETSI GS NFV 002: "Network Functions Virtualisation (NFV); Architectural Framework".
[NFV003]	ETSI GS NFV 003: "Network Functions Virtualisation (NFV); Terminology for main concepts in NFV".
[IFA005]	ETSI GS NFV-IFA 005: "Network Functions Virtualisation (NFV); Management and Orchestration; Or-Vi reference point - Interface and Information Model Specification".
[IFA006]	ETSI GS NFV-IFA 006: "Network Functions Virtualisation (NFV); Management and Orchestration; Vi-Vnfm reference point - Interface and Information Model Specification".
[IFA007]	ETSI GS NFV-IFA 007: "Network Functions Virtualisation (NFV); Management and Orchestration; Or-Vnfm reference point - Interface and Information Model Specification".

[IFA008]	ETSI GS NFV-IFA 008: "Network Functions Virtualisation (NFV); Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".
[IFA010]	ETSI GS NFV-IFA 010: "Network Functions Virtualisation (NFV); Management and Orchestration; Functional requirements specification".
[IFA013]	ETSI GS NFV-IFA 013: "Network Functions Virtualisation (NFV); Management and Orchestration; Os-Ma-Nfvo reference point - Interface and Information Model Specification".
[TST002]	ETSI GS NFV-TST 002: "Network Functions Virtualisation (NFV); Testing Methodology; Report on NFV Interoperability Testing Methodology"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [NFV003] and [TST002] apply.

3.2 Symbols

None

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in [NFV003] and [TST002] apply.

4 Test Suite Structure

4.1 Naming Convention

The Test Ids of this Test Plan have been created as per the following naming convention:

TEST ID = TD_<ROOT>_<GROUP>_<OPERATION>_<COMPLEMENT>_<NN>

Where <ROOT> is NFV, and <NN> corresponds to a sequential number starting at 01.

The possible values for <GROUP>, <OPERATION> and <COMPLEMENT> are summarized in the table below:

<group></group>	<operation></operation>	<complement></complement>	Description
SETUP	ONBOARD	VNF_PKG	Onboard VNF Package
SETUP		NSD	Onboard Network Service Descriptor
	INSTANTIATE	-	Instantiate Network Service
	SCALE	OUT	Scale Out by adding VNF instance(s)
		IN	Scale In by adding VNF instance(s)
	SCALE (VNF)	OUT_VNF	Scale Out by adding VNFC instance(s)
NS LCM		IN_VNF	Scale In by adding VNFC instance(s)
INO_LOW	UPDATE	STOP_VNF	Stop VNF
		START_VNF	Re-Start VNF
		ADD_VNF_VL	Add VNF and VL
		REM_VNF_VL	Remove VNF and VL
	TERMINATE	-	Terminate Network Service
TEARDOWN	DELETE	NSD	Delete Network Service Descriptor
TEARDOWN		VNF_PKG	Delete VNF Package

4.2 Test Summary

4.2.1 SETUP

Test Id	Test Purpose
TD_NFV_SETUP_ONBOARD_VNF_PKG_001	To on-board a VNF Package
TD_NFV_SETUP_ONBOARD_NSD_001	To onboard a NSD

4.2.2 NS LCM

4.2.2.1 INSTANTIATE

Test Id	Test Purpose
TD_NFV_NS_LCM_INSTANTIATE_001	To verify that an NS can be successfully instantiated

4.2.2.2 SCALE

Test Id	Test Purpose
TD_NFV_NS_LCM_SCALE_OUT_001	To verify that a NS can be successfully scaled out (by adding VNF instances) if triggered by a MANO operator
TD_NFV_NS_LCM_SCALE_OUT_001	To verify that a NS can be successfully scaled out (by adding VNF instances) if triggered by a MANO operator
TD_NFV_NS_LCM_SCALE_IN_001	To verify that a NS can be successfully scaled in (by removing VNF instances) if triggered by a MANO operator
TD_NFV_NS_LCM_SCALE_OUT_002	To verify that a NS can be successfully scaled out (by adding VNF instances) if triggered automatically in MANO by a VNF Indicator
TD_NFV_NS_LCM_SCALE_IN_002	To verify that a NS can be successfully scaled in (by removing VNF instances) if triggered automatically in MANO by a VNF Indicator
TD_NFV_NS_LCM_SCALE_OUT_003	To verify that a NS can be successfully scaled out (by adding VNF instances) if triggered automatically in MANO by a VIM KPI
TD_NFV_NS_LCM_SCALE_IN_003	To verify that a NS can be successfully scaled in (by removing VNF instances) if triggered automatically in MANO by a VIM KPI
TD_NFV_NS_LCM_SCALE_OUT_004	To verify that a NS can be successfully scaled out (by adding VNF instances) if triggered in MANO by a VNF/EM request
TD_NFV_NS_LCM_SCALE_IN_004	To verify that a NS can successfully scale in (by removing VNF instances) if triggered in MANO by a VNF/EM request

4.2.2.3 SCALE VNF

Test Id	Test Purpose
TD_NFV_NS_LCM_SCALE_OUT_VNF_001	To verify that a VNF in a NS can be successfully scaled out (by adding VNFC instances (VMs)) when triggered by a MANO operator
TD_NFV_NS_LCM_SCALE_IN_VNF_001	To verify that a VNF in a NS can be successfully scaled in (by removing VNFC instances (VMs)) when triggered by a MANO operator

TD_NFV_NS_LCM_SCALE_OUT_VNF_002	To verify that a VNF in a NS can be successfully scaled out (by adding VNFV instances (VMs)) when triggered automatically in MANO by a VNF Indicator
TD_NFV_NS_LCM_SCALE_IN_VNF_002	To verify that a VNF in a NS can be successfully scaled in (by adding VNFC instances (VMs)) when triggered automatically in MANO by a VNF Indicator
TD_NFV_NS_LCM_SCALE_OUT_VNF_003	To verify that a VNF in a NS can be successfully scaled out (by adding VNFC instances (VMs)) when triggered automatically in MANO by a VIM KPI
TD_NFV_NS_LCM_SCALE_IN_VNF_003	To verify that a VNF in a NS can be successfully scaled in (by adding VNFC instances (VMs)) when triggered automatically in MANO by a VIM KPI
TD_NFV_NS_LCM_SCALE_OUT_VNF_004	To verify that a VNF in a NS can be successfully scaled out (by adding VNFC instances (VMs)) when triggered in MANO by a VNF/EM request
TD_NFV_NS_LCM_SCALE_IN_VNF_004	To verify that a VNF in a NS can be successfully scaled in (by removing VNFC instances (VMs)) when triggered in MANO by a VNF/EM request

4.2.2.4 UPDATE

Test Id	Test Purpose
TD_NFV_NS_LCM_UPDATE_STOP_VNF_001	To verify that a VNF running in a NS can be successfully stopped by MANO
TD_NFV_NS_LCM_UPDATE_START_VNF_001	To verify that a stopped VNF in a NS can be successfully re-started by MANO
TD_NFV_NS_LCM_UPDATE_ADD_VNF_VL_001	To verify that VNF(s) and VL(s) can be added to a running NS
TD_NFV_NS_LCM_UPDATE_REM_VNF_VL_001	To verify that VNF(s) and VL(s) can be removed from a running NS

4.2.2.5 TERMINATE

Test Id	Test Purpose
TD_NFV_NS_LCM_TERMINATE_001	To verify that a NS can be successfully terminated

4.2.3 TEARDOWN

Test Id	Test Purpose
TD_NFV_TEARDOWN_DELETE_NSD_001	To delete a NSD
TD_NFV_TEARDOWN_DELETE_VNF_PKG_001	To delete a VNF Package

5 System Under Test Configurations

5.1 SUT_1_NS_1_ENDPOINT

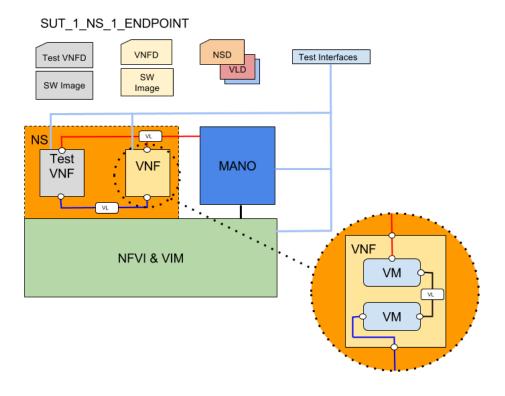


Figure 1. SUT_1_NS_1_ENDPOINT

5.2 SUT_1_NS_1_MIDDLEPOINT

SUT_1_NS_1_MIDDLEPOINT

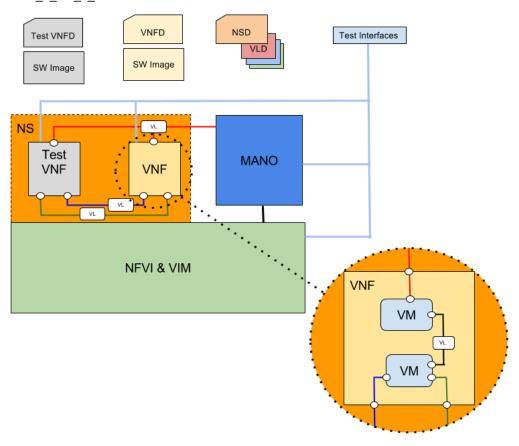
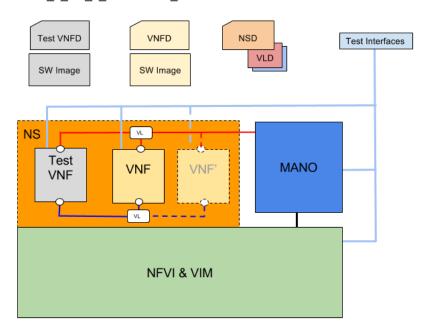


Figure 2. SUT_1_NS_1_MIDDLEPOINT

5.3 SUT_1_NS_1_ENDPOINT_SCALE

SUT_1_NS_1_ENDPOINT_SCALE



 $Figure~3.~SUT_1_NS_1_ENDPOINT_SCALE$

5.4 SUT_1_NS_1_MIDDLEPOINT_SCALE

SUT_1_NS_1_MIDDLEPOINT_SCALE

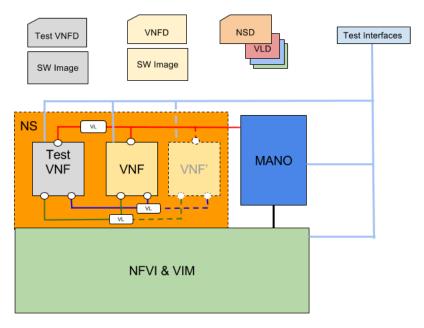


Figure 4. SUT_1_NS_1_MIDDLEPOINT_SCALE

5.5 SUT_1_NS_1_ENDPOINT_SCALE_VNF

SUT_1_NS_1_ENDPOINT_SCALE_VNF

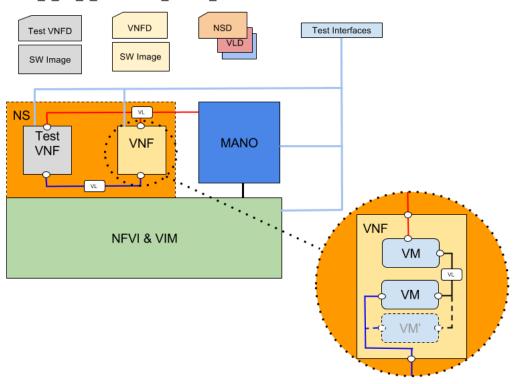
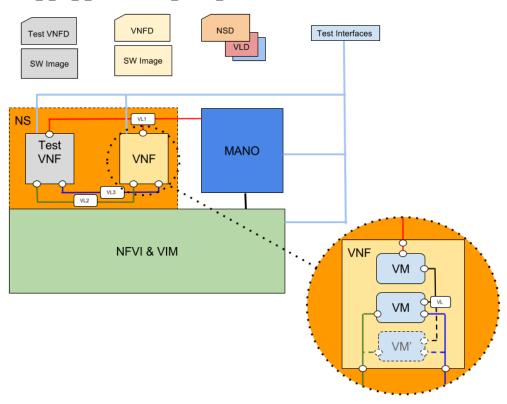


Figure 5. SUT_1_NS_1_ENDPOINT_SCALE_VNF

5.6 SUT_1_NS_1_MIDDLEPOINT_SCALE_VNF

SUT_1_NS_1_MIDDLEPOINT_SCALE_VNF



 $Figure~6.~SUT_1_NS_1_MIDDLEPOINT_SCALE_VNF$

5.7 SUT_1_NS_1_MIDDLEPOINT_UPDATE

SUT_1_NS_1_MIDDLEPOINT_UPDATE

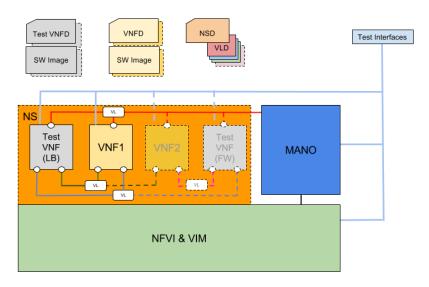


Figure 7. SUT_1_NS_1_MIDDLEPOINT_UPDATE

6 Interoperability Test Descriptions

6.1 SETUP

6.1.1 ONBOARD

6.1.1.1 TD_NFV_SETUP_ONBOARD_VNF_PKG_001

		Int	eroperability Test Description			
Identifier		TD_NFV_SETUP_ONBOARD_VNF_PKG_001				
Test Purpose		To on-board a V	NF Package			
Configuration	Configuration SUT_1_NS_1_ENDPOINT SUT_1_NS_1_MIDDLEPOINT					
References			A013 V2.1.1 (clauses 7.7) A010 V2.1.1 (clauses 6.5.1, 7.4.1)			
Applicability			·			
Pre-test condi	tions		ge resides on a repository reachable by MANO ge is complete and consumable by MANO			
Sequence	Step	Type	Description	Result		
	1	stimulus	Trigger the on-boarding of VNF package on MANO			
	2	IOP check	Verify the VNF Package information is correct and complete on MANO (i.e. display or query and check release date, vendor info, manifest, VNFD, SW image meta-data, files contained in the VNF Package,)			
IOP Verdict						

6.1.1.2 TD_NFV_SETUP_ONBOARD_NSD_001

		In	teroperability Test Description	
Identifier			IP ONBOARD NSD 001	
Test Purpose		To onboard a N		
Configuration		SUT_1_NS_1_I		
Comiguration	••	SUT_1_NS_1_I SUT_1_NS_1_I		
References			FA013 V2.1.1 (clauses 7.2.2, 7.3.2)	
			FA014 V2.1.1 (clause 6.2)	
Applicability			,	
		L		
Pre-test cond	aitions	conumed b • Required V	eferenced VLD and VNFFGDs exist and can be reached a y MANO 'NF Packages have been on-boarded SETUP_VNF_PKG_ONB_001)	nd
Test Sequence	Step	Туре	Description	Result
•	1	stimulus	Trigger the on-boarding of the NSD on MANO	
	2	IOP check	Verify that NSD is successfully on-boarded in MANO	
			(i.e query, display,)	
	3	IOP check	Verify that all VLDs and VNFFGDs referenced in the NSD have been successfully on-boarded in MANO	
IOP Verdict				

6.2 NS LCM

6.2.1 INSTANTIATE

6.2.1.1 TD_NFV_NS_LCM_INSTANTIATE_001

			teroperability Test Description			
Identifier			CM_INSTANTIATE_001			
Test Purpose			NS can be successfully instantiated			
Configuration		SUT_1_NS_1_E				
		SUT_1_NS_1_N				
References			FA013 V2.1.1 (clause 7.3.3)			
			FA005 V2.1.1 (clause 7.2.4)			
			FA006 V2.1.1 (clause 7.2.3)			
			FA008 V2.1.1 (clause 6.2.2)			
			FA010 V2.1.1 (clause 6.3.2)			
Applicability			request VIM_NFVI to add a SW image			
		VIM_NFVI:	supports adding a SW image			
		 MANO can 	request VIM_NFVI to allocate virtualised resources			
		VIM_NFVI:	supports allocating virtualised resources			
		 (If required 	by NSD) MANO can request VIM_NFVI to create NFP(s)			
		 (If required) 	by NSD) VIM_NFVI supports creating NFP(s)			
Pre-test condit	ions	 NSD, VLD(s), VNFFGD(s) and VNF Package(s) have been on-boarde	ed in		
		MANO `	, (,			
		The software	re image repository is reachable by the VIM			
		The software image repository is reachable by the Vitti The required resources are available on the NFVI				
		• The require	d resources are available on the Ni Vi			
Test		_	5			
Test Sequence	Step	Туре	Description	Result		
	1	Type stimulus	Description Trigger NS instantiation in MANO	Result		
			·	Result		
	1	stimulus IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM	Result		
	1	stimulus	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been	Result		
	1 2	stimulus IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors	Result		
	1 2	stimulus IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according	Result		
	1 2 3	stimulus IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs)	Result		
	1 2 3	stimulus IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been	Result		
	3	stimulus IOP check IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors	Result		
	3	stimulus IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable	Result		
	1 2 3 4 5	stimulus IOP check IOP check IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network	Result		
	1 2 3 4 5	stimulus IOP check IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network Verify that the VNF(s) have been configured according	Result		
	1 2 3 4 5	stimulus IOP check IOP check IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network Verify that the VNF(s) have been configured according to VNFD(s) (i.e by obtaining a result from the	Result		
	1 2 3 4 5 6	stimulus IOP check IOP check IOP check IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network Verify that the VNF(s) have been configured according to VNFD(s) (i.e by obtaining a result from the management interface)	Result		
	1 2 3 4 5	stimulus IOP check IOP check IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network Verify that the VNF(s) have been configured according to VNFD(s) (i.e by obtaining a result from the management interface) Verify that the VNF(s), VL(s) and VNFFG(s) have been	Result		
	1 2 3 4 5 6 7	stimulus IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network Verify that the VNF(s) have been configured according to VNFD(s) (i.e by obtaining a result from the management interface) Verify that the VNF(s), VL(s) and VNFFG(s) have been connected according to the Descriptors	Result		
	1 2 3 4 5 6	stimulus IOP check IOP check IOP check IOP check IOP check IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network Verify that the VNF(s) have been configured according to VNFD(s) (i.e by obtaining a result from the management interface) Verify that the VNF(s), VL(s) and VNFFG(s) have been connected according to the Descriptors Verify that the NS is successfully instantiated by	Result		
	1 2 3 4 5 6 7	stimulus IOP check	Trigger NS instantiation in MANO Verify that the software images have been onboarded in the VIM Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the VNF (s) have been deployed according to the descriptors (VMs, VLs, CPs) Verify that the VL and VNFFG instance(s) have been created according to the descriptors Verify that the VNF(s) are running and reachable through the management network Verify that the VNF(s) have been configured according to VNFD(s) (i.e by obtaining a result from the management interface) Verify that the VNF(s), VL(s) and VNFFG(s) have been connected according to the Descriptors	Result		

6.2.3 SCALE

6.2.3.1 TD_NFV_NS_LCM_SCALE_OUT_001

		In	teroperability Test Description				
Identifier			CM_SCALE_OUT_001				
Test Purpose			NS can be successfully scaled out (by adding VNF instanc	es) if			
		triggered by a M					
Configuration			ENDPOINT_SCALE				
			MIDDLEPOINT_SCALE				
References			FA005 V2.1.1 (clause 5.3.4)				
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)				
			FA008 V2.1.1 (clause 7.2.4)				
Amaliaabilitus			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)				
Applicability			request VIM_NFVI to allocate virtualised resources				
			supports allocating virtualised resources				
			ports triggering scale out with an operator's action				
			in a composite coale out by adding it is inclusioned				
		NS/VNF su	pports scale out by adding VNF instances				
Pre-test condit	ione	NC in innte	estate of /TD, NIEV/ NIC I CM INICTANITIATE (004)				
Fre-lest condit	10115	NS is instar	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)				
Test	I			1			
Sequence	Step	Туре	Description	Result			
-	1	stimulus	Trigger NS scale out (by adding VNF instances) in				
			MANO with an operator action				
	2	IOP check	Verify that the requested resources have been				
			allocated by the VIM according to the descriptors				
	3	IOP check	Verify that the additional VNF instance(s) have been				
			deployed				
	4	IOP check	Verify that the additional VNF instances(s) are running				
	5	IOP check	and reachable from the management network Verify that the additional VNF instances(s) have been				
	5	IOP check	configured according to the descriptors (i.e. by geting a				
			result through the management interface)				
	6	IOP check	Verify that the additional VNF instances(s), VL(s) and				
		.01 0110010	VNFFG(s) are connected according to the Descriptors				
				-			
	7	IOP check	Verify that NS has been scaled out by running the end-				
	7	IOP check	Verify that NS has been scaled out by running the end- to-end functional test				

6.2.3.2 TD_NFV_NS_LCM_SCALE_IN_001

		In	teroperability Test Description			
Identifier		TD_NFV_NS_LCM_SCALE_IN_001				
Test Purpose			NS can be successfully scaled in (by removing VNF instar	ices) if		
		triggered by a M				
Configuration			ENDPOINT_SCALE			
_			MIDDLEPOINT_SCALE			
			FA005 V2.1.1 (clause 5.3.4)			
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)			
			FA008 V2.1.1 (clause 7.2.4)			
			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)			
Applicability			request VIM_NFVI to terminate virtualised resources			
			supports terminating virtualised resources			
			Will to supporte triggering seals in that air operator suction			
			ports scale in by removing VNF instances			
		NS/VNF su	pports scale in by removing VNF instances			
Pre-test condit		NO: : (C + L/TD NIEV NIG LONG INIGTANITIATE (004)			
Pre-test condit	ions		ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)			
		 NS has been 	en scaled out by adding VNF instances			
_		T		T		
Test Sequence	Step	Туре	Description	Result		
	1	stimulus	Trigger NS scale in (by removing VNFs) in MANO with an operator action			
	2	IOP check	Verify that the impacted VNF instance(s) have been terminated			
	3	IOP check	Verify that the impacted VNF related resources have been released by the VIM			
	4	IOP check	Verify that the remaining VNF instances(s) are still running and reachable through the management network			
		1		<u> </u>		
	5	IOP check	Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the descriptors			
	5 6	IOP check	VNFFG(s) are still connected according to the			

6.2.3.3 TD_NFV_NS_LCM_SCALE_OUT_002

			teroperability Test Description			
Identifier			CM_SCALE_OUT_002			
Test Purpose		To verify that a NS can be successfully scaled out (by adding VNF instances) if				
			atically in MANO by a VNF Indicator			
Configuration		SUT_1_NS_1_E	ENDPOINT_SCALE			
			MIDDLEPOINT_SCALE			
References			FA005 V2.1.1 (clause 5.3.4)			
		ETSI GS NFV-II	FA006 V2.1.1 (clauses 7.3.1, 7.4.1)			
			FA008 V2.1.1 (clause 7.2.4)			
			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)			
Applicability			request VIM_NFVI to allocate virtualised resources			
			supports allocating virtualised resources			
		 MANO sup 	ports receiving VNF indicators from VNF/EM			
		 VNF/EM ca 	n send VNF indicator values to MANO			
		 MANO sup 	ports triggering scale out when a given VNF Indicator value	e crosses a		
		certain thre	shold			
		MANO supports scale out by adding VNF instances				
		 NS/VNF su 	pports scale out by adding VNF instances			
			· · · · · · · · · · · · · · · · · · ·			
Pre-test condit	ions	 NS is instar 	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)			
		 MANO is co 	onfigured to trigger SCALE OUT (by adding VNF instances) when a		
			Indicator value crosses a certain threshold	,		
		9				
Test Sequence	Step	Туре	Description	Result		
	1	stimulus	Trigger the VNF/EM to send the targeted VNF indicator			
			to MANO until the configured threshold is crossed			
	2	IOP check	Verify that the scale out (by adding VNF(s)) procedure			
			has been started in MANO			
	3	IOP check	Verify that the requested resources have been			
			allocated by the VIM according to the descriptors			
	4	IOP check	Verify that the additional VNF instance(s) have been			
			deployed			
	5	IOP check	Verify that the additional VNF(s) are running and			
			reachable through the management network			
	6	IOP check	Verify that the additional VNF instances(s) have been			
			configured according to VNFD (i.e by obtaining a result			
	<u> </u>	IOD also als	from the management interface)			
	7	IOP check	Verify that the additional VNF instances(s), VL(s) and			
	<u> </u>	IOD also als	VNFFG(s) are connected according to the Descriptors			
	8	IOP check	Verify that NS has been scaled out by running the end-			
IOP Verdict		<u> </u>	to-end functional test			

6.2.3.4 TD_NFV_NS_LCM_SCALE_IN_002

			teroperability Test Description				
Identifier		TD_NFV_NS_LCM_SCALE_IN_002					
Test Purpose		To verify that a NS can be successfully scaled in (by removing VNF instances) if					
			atically in MANO by a VNF Indicator				
Configuration		SUT_1_NS_1_E	ENDPOINT_SCALE				
		SUT_1_NS_1_I	MIDDLEPOINT_SCALE				
References			FA005 V2.1.1 (clause 5.3.4)				
		ETSI GS NFV-II	FA006 V2.1.1 (clauses 7.3.1, 7.4.1)				
			FA008 V2.1.1 (clause 7.2.4)				
		ETSI GS NFV-II	FA010 V2.1.1 (clauses 6.2.3, 6.3.3)				
Applicability		 MANO can 	request VIM_NFVI to terminate virtualised resources				
		VIM_NFVI:	supports termintaing virtualised resources				
		 MANO sup 	ports receiving VNF indicators from VNF/EM				
		 VNF/EM ca 	an send VNF indicator values to MANO				
		 MANO sup 	ports triggering scale in when a given VNF Indicator value	crosses a			
			certain threshold				
		MANO supports scale in by removing VNF instances					
		NS/VNF supports scale in by removing VNF instances					
			,, , , , , , , , , , , , , , , , , , , ,				
Pre-test condit	ions	NS is instar	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)				
		NS has been scaled out by adding VNF instances					
			onfigured to trigger SCALE IN (by removing VNF instances) when a			
			Indicator value crosses a certain threshold) Wileii a			
		given vivi	illulcator value crosses a certain tirresirolu				
Test	I	1		I			
Sequence	Step	Туре	Description	Result			
•	1	stimulus	Trigger the VNF/EM to send the targeted VNF indicator				
			to MANO until the configured threshold is crossed				
	2	IOP check	Verify that the scale out (by removing VNF(s))				
			procedure has been started in MANO				
	3	IOP check	Verify that the impacted VNF instance(s) have been				
			terminated				
	4	IOP check	Verify that the impacted VNF related resources have				
			been released by the VIM				
	5	IOP check	Verify that the remaining VNF instances(s) are still				
			running and reachable through the 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 NS has been scaled in by running the end-				
L			to-end functional test				

6.2.3.5 TD_NFV_NS_LCM_SCALE_OUT_003

			nteroperability Test Description			
Identifier			TD_NFV_NS_LCM_SCALE_OUT_003			
Test Purpose			NS can be successfully scaled out (by adding VNF instance	es) if		
			natically in MANO by a VIM KPI			
Configuration			ENDPOINT_SCALE			
			MIDDLEPOINT_SCALE			
References			FA005 V2.1.1 (clause 5.3.4)			
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)			
			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)			
Applicability			request VIM_NFVI to allocate virtualised resources			
			supports allocating virtualised resources			
			ports receiving VR related KPIs from VIM			
			can send VR related KPIs to MANO			
			ports triggering scale out when a given KPI crosses a certa	in treshold		
			ports scale out by adding VNF instances			
		 NS/VNF st 	upports scale out by adding VNF instances			
Pre-test condi-	tions	 NS is insta 	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)			
		 MANO is c 	onfigured to trigger SCALE OUT (by adding VNF instances) when a		
			KPI value crosses a certain threshold	,		
		<u> </u>				
Test	04	_	B tata	- ·		
Sequence	Step	Туре	Description	Result		
-	1	stimulus	Trigger the VIM to send the targeted KPI to MANO until			
			the configured threshold is crossed			
	2	IOP check	Verify that the scale out (by adding VNF(s)) procedure			
			has been started in MANO			
	3	IOP check	Verify that the requested resources have been			
			allocated by the VIM according to the descriptors			
	4	IOP check	Verify that the additional VNF instance(s) have been			
			deployed			
	5	IOP check	Verify that the additional VNF(s) are running and			
			reachable through the management network			
	6	IOP check	Verify that the additional VNF instances(s) have been			
			configured according to VNFD (i.e by obtaining a result			
			from the management interface)			
	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 NS has been scaled out by running the end-			
			to-end functional test			
IOP Verdict						

6.2.3.6 TD_NFV_NS_LCM_SCALE_IN_003

		In	nteroperability Test Description		
Identifier	•		.CM_SCALE_IN_003	•	
Test Purpose			NS can be successfully scaled in (by removing VNF instance)	ces) if	
			natically in MANO by a VIM KPI		
Configuration	ı		ENDPOINT_SCALE		
			MIDDLEPOINT_SCALE		
References			FA005 V2.1.1 (clause 5.3.4)		
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)		
A 12 1 . 124			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)		
Applicability			request VIM_NFVI to terminate virtualised resources		
			supports termintaing virtualised resources		
			ports receiving VR related KPIs from VIM		
			can send VR related KPIs to MANO	throohold	
		 MANO supports triggering scale in when a given KPI crosses a certain threshold MANO supports scale in by removing VNF instances 			
			ipports scale in by removing VNF instances		
		NS/VNF su	ipports scale in by removing vive instances		
Pre-test condi	itions	NS is insta	ntiated (TD_NEV_NS_LCM_INSTANTIATE_001)		
l re-lest condi	itions				
		 NS has been scaled out by adding VNF instances MANO is configured to trigger SCALE IN (by removing VNF instances) when a 			
) wnen a	
		given viivi	KPI value crosses a certain threshold		
Test	1	I		T	
Sequence	Step	Туре	Description	Result	
·	1	stimulus	Trigger the VIM to send the targeted KPI to MANO until		
			the configured threshold is crossed		
	2	IOP check	Verify that the scale out (by removing VNF(s))		
			procedure has been started in MANO		
	3	IOP check	Verify that the impacted VNF instance(s) have been		
			terminated		
	4	IOP check	Verify that the impacted VNF related resources have		
		100	been released by the VIM		
	5	IOP check	Verify that the remaining VNF instances(s) are still		
			running and reachable through the management network		
				I	
	6	IOP check			
	6	IOP check	Verify that the remaining VNF instances(s), VL(s) and		
	6	IOP check	Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the		
	6	IOP check	Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the descriptors		
			Verify that the remaining VNF instances(s), VL(s) and VNFFG(s) are still connected according to the		

6.2.3.7 TD_NFV_NS_LCM_SCALE_OUT_004

		In	teroperability Test Description	
Identifier			CM_SCALE_OUT_004	
Test Purpose		To verify that a I	NS can be successfully scaled out (by adding VNF instanc	es) if
			NO by a VNF/EM request	
Configuration			ENDPOINT_SCALE	
			MIDDLEPOINT_SCALE	
References			FA005 V2.1.1 (clause 5.3.4)	
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)	
			FA008 V2.1.1 (clause 7.2.4)	
			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)	
Applicability			request VIM_NFVI to allocate virtualised resources	
			supports allocating virtualised resources	
		_	can send scale out request to MANO	
			ports triggering scale out when the scale out request is rec	eived from
		VNF/EM		
			ports scale out by adding VNF instances	
		 NS/VNF su 	pports scale out by adding VNF instances	
	_			
Pre-test conditi	ions	 NS is instar 	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)	
		,		
Test Sequence	Step	Туре	Description	Result
	1	stimulus	Trigger the VNF/EM to send a scale out (by adding VNFs) request to MANO	
	2	IOP check	Verify that the scale out (by adding VNF(s)) procedure has been started in MANO	
	3	1		
	J	IOP check	Verify that the requested resources have been allocated by the VIM according to the descriptors	
	4	IOP check	allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) have been	
			allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) have been deployed Verify that the additional VNF(s) are running and	
	4	IOP check	allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) have been deployed Verify that the additional VNF(s) are running and reachable through the management network Verify that the additional VNF instances(s) have been configured according to VNFD (i.e by obtaining a result	
	4 5 6	IOP check IOP check IOP check	allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) have been deployed Verify that the additional VNF(s) are running and reachable through the management network Verify that the additional VNF instances(s) have been configured according to VNFD (i.e by obtaining a result from the management interface)	
	4 5	IOP check	allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) have been deployed Verify that the additional VNF(s) are running and reachable through the management network Verify that the additional VNF instances(s) have been configured according to VNFD (i.e by obtaining a result from the management interface) Verify that the additional VNF instances(s), VL(s) and	
	4 5 6	IOP check IOP check IOP check	allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) have been deployed Verify that the additional VNF(s) are running and reachable through the management network Verify that the additional VNF instances(s) have been configured according to VNFD (i.e by obtaining a result from the management interface) Verify that the additional VNF instances(s), VL(s) and VNFFG(s) are connected according to the Descriptors	
	4 5 6	IOP check IOP check IOP check	allocated by the VIM according to the descriptors Verify that the additional VNF instance(s) have been deployed Verify that the additional VNF(s) are running and reachable through the management network Verify that the additional VNF instances(s) have been configured according to VNFD (i.e by obtaining a result from the management interface) Verify that the additional VNF instances(s), VL(s) and	

6.2.3.8 TD_NFV_NS_LCM_SCALE_IN_004

		Ir	nteroperability Test Description		
Identifier			CM_SCALE_IN_004		
Test Purpose			NS can successfully scale in (by removing VNF instances) if triggered	
			VNF/EM request		
Configuration	l		ENDPOINT_SCALE		
			MIDDLEPOINT_SCALE		
References			FA005 V2.1.1 (clause 5.3.4)		
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)		
			FA008 V2.1.1 (clause 7.2.4)		
			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)		
Applicability			request VIM_NFVI to terminate virtualised resources		
			supports terminating virtualised resources		
			can send scale in request to MANO		
		MANO supports triggering scale in when the scale in request is received from			
		VNF/EM			
			ports scale in by removing VNF instances		
		NS/VNF supports scale in by removing VNF instances			
		T			
Pre-test cond	itions	 NS is insta 	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)		
		 NS has been 	en scaled out by adding VNF instances		
Test Sequence	Step	Туре	Description	Result	
	1	stimulus	Trigger the VNF/EM to send a scale out (by removing VNFs) request to MANO		
	2	IOP check	Verify that the scale out (by removingVNF(s)) procedure has been started in MANO		
	3	IOP check	Verify that the impacted VNF instance(s) have been terminated		
	4	IOP check	Verify that the impacted VNF related resources have been released by the VIM		
	5	IOP check	Verify that the remaining VNF instances(s) are still running and reachable through the 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 NS has been scaled in by running the end-		
	'	TOT OTTOOK	to-end functional test		

6.2.4 SCALE VNF

6.2.4.1 TD_NFV_NS_LCM_SCALE_OUT_VNF_001

			teroperability Test Description	
Identifier			CM_SCALE_OUT_VNF_001	
Test Purpose			VNF in a NS can be successfully scaled out (by adding VN	FC
)) when triggered by a MANO operator	
Configuration			ENDPOINT_SCALE_VNF	
			MIDDLEPOINT_SCALE_VNF	
References			FA005 V2.1.1 (clause 5.3.4)	
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)	
			FA013 V2.1.1 (clause 7.3.4)	
			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)	
Applicability			request VIM_NFVI to allocate virtualised resources	
			supports allocating virtualised resources	
			ports triggering scale out with an operator's action	
			ports scale out by adding VNFC instances (VMs)	
		 NS/VNF su 	pports scale out by adding VNF instances (VMs)	
Pre-test condit	ions	 NS is instar 	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)	
Test Sequence	Step	Туре	Description	Result
-	1	stimulus	Trigger NS scale out (by adding VNFC instances (VMs)	
			to a VNF in the NS) in MANO with an operator action	
	2	IOP check	Verify that the requested resources have been	
			allocated by the VIM according to the descriptors	
	3	IOP check	Verify that the additional VM(s) have been deployed (i.e	
			by querying the VIM)	
	4	IOP check	Verify that the additional VM(s) are running and are	
			reachable through the management network	
	5	IOP check	Verify that the additional VM(s) are connected to the	
			VL(s) according to the descriptors	
	6	IOP check	Verify that NS has been scaled out by running the end-	
			to-end functional test	
IOP Verdict				

6.2.4.2 TD_NFV_NS_LCM_SCALE_IN_VNF_001

	Interoperability Test Description						
Identifier		TD_NFV_NS_LC	CM_SCALE_IN_VNF_001				
Test Purpose		To verify that a V	To verify that a VNF in a NS can be successfully scaled in (by removing VNFC				
		nstances (VMs)) when triggered by a MANO operator					
Configuration		SUT_1_NS_1_ENDPOINT_SCALE_VNF					
		SUT_1_NS_1_M	IIDDLEPOINT_SCALE_VNF				
References		ETSI GS NFV-IF	A005 V2.1.1 (clause 5.3.4)				
		ETSI GS NFV-IF	A006 V2.1.1 (clauses 7.3.1, 7.4.1)				
		ETSI GS NFV-IFA013 V2.1.1 (clause 7.3.4)					
		ETSI GS NFV-IF	A010 V2.1.1 (clauses 6.2.3, 6.3.3)				
Applicability		 MANO can r 	request VIM_NFVI to terminate virtualised resources				
		 VIM_NFVI s 	upports terminating virtualised resources				
		 MANO supp 	orts triggering scale in with an operator's action				
		 MANO supp 	orts scale in by removing VNFC instances (VMs)				
			ports scale in by removing VNFC instances (VMs)				
		•					
Pre-test condit	tions	 NS has been 	n scaled out by adding VM				
Test Sequence	Step	Туре	Description	Result			

		Ir	nteroperability Test Description	
	1	stimulus	Trigger NS scale in (by removing VNFC instances	
			(VMs)) in MANO with an operator action	
	2	IOP check	Verify that the impacted VM(s) have been terminated	
	3	IOP check	Verify that the impacted VM related resources have	
			been released by the VIM	
	4	IOP check	Verify that the remaining VM(s) are still running and	
			reachable through the management network	
	5	IOP check	Verify that the remaining VM(s) and VL(s) are still	
			connected according to the descriptors	
	6	IOP check	Verify that NS has been scaled in by running the end-	
			to-end functional test	
IOP Verdict				

6.2.4.3 TD_NFV_NS_LCM_SCALE_OUT_VNF_002

Identifier					
in at a page (\langle /\langle					
instances (VMs)) when triggered automatically in MANO by a VNF Indicator					
Configuration SUT_1_NS_1_ENDPOINT_SCALE_VNF					
SUT_1_NS_1_MIDDLEPOINT_SCALE_VNF					
References ETSI GS NFV-IFA005 V2.1.1 (clause 5.3.4)					
ETSI GS NFV-IFA006 V2.1.1 (clauses 7.3.1, 7.4.1)					
ETSI GS NFV-IFA008 V2.1.1 (clause 7.2.4)					
ETSI GS NFV-IFA013 V2.1.1 (clause 7.3.4)					
ETSI GS NFV-IFA010 V2.1.1 (clauses 6.2.3, 6.3.3)					
MANO can request VIM_NFVI to allocate virtualised resources					
VIM_NFVI supports allocating virtualised resources					
MANO supports receiving VNF indicators from VNF/EM					
VNF/EM can send VNF indicator values to MANO					
MANO supports triggering scale out when a given VNF Indicator value cross	es a				
certain threshold					
MANO supports scale out by adding VNFC instances (VMs)					
NS/VNF supports scale out by adding VNFC instances (VMs)					
Pre-test conditions • NS is instantiated (TD, NEV, NS, LCM, INSTANTIATE, 001)					
110 10 motamated (15_111 V_110_2011_110 17 1111/112_001)					
MANO is configured to trigger SCALE OUT (by adding VM(s)) when a given					
VNF Indicator value crosses a certain threshold					
Test Sequence Step Type Description Res	ult				
1 stimulus Trigger the VNF/EM to send the targeted VNF indicator					
to MANO until the configured threshold is crossed					
2 IOP check Verify that the scale out (by adding VNFC instances					
(VMs)) procedure has been started in MANO					
3 IOP check Verify that the requested resources have been					
allocated by the VIM according to the descriptors					
4 IOP check Verify that the additional VM(s) have been deployed (i.e					
by querying the VIM)					
5 IOP check Verify that the additional VM(s) are running and are					
reachable through the management network					
6 IOP check Verify that the additional VM(s) are connected to the					
VL(s) according to the descriptors					
7 IOP check Verify that NS has been scaled out by running the end- to-end functional test					
IOP Verdict					
IOF VEHICL					

6.2.4.4 TD_NFV_NS_LCM_SCALE_IN_VNF_002

			eroperability Test Description				
Identifier		TD_NFV_NS_LC	CM_SCALE_IN_VNF_002				
Test Purpose		To verify that a VNF in a NS can be successfully scaled in (by adding VNFC					
			nstances (VMs)) when triggered automatically in MANO by a VNF Indicator				
Configuration			NDPOINT_SCALE_VNF				
			MIDDLEPOINT_SCALE_VNF				
References			A005 V2.1.1 (clause 5.3.4)				
			A006 V2.1.1 (clauses 7.3.1, 7.4.1)				
			A008 V2.1.1 (clause 7.2.4)				
			A013 V2.1.1 (clause 7.3.4)				
			A010 V2.1.1 (clauses 6.2.3, 6.3.3)				
Applicability			request VIM_NFVI to terminate virtualised resources				
			upports termintaing virtualised resources				
			orts receiving VNF indicators from VNF/EM				
		 VNF/EM car 	n send VNF indicator values to MANO				
			orts triggering scale in when a given VNF Indicator value	crosses a			
		certain thres	shold				
		 MANO supp 	orts scale in by removing VNFC instances (VMs)				
 NS/VNF supports scale in by removing VNFC instances (VMs) 							
Pre-test condi	tions	 NS is instan 	tiated (TD_NFV_NS_LCM_INSTANTIATE_001)				
		 NS has been 	n scaled out by adding VM(s)				
		 MANO is co 	nfigured to trigger SCALE IN (by removing VM(s)) when a	given			
			or value crosses a certain threshold	3			
Test	Step	Туре	Description	Result			
Sequence			•				
	1	stimulus	Trigger the VNF/EM to send the targeted VNF indicator				
			to MANO until the configured threshold is crossed				
	2	IOP check	Verify that the scale out (by removing VNFC instances				
		100 1	(VMs)) procedure has been started in MANO				
	3	IOP check	Verify that the impacted VM(s) have been terminated				
	4	IOP check	Verify that the impacted VM related resources have				
		100 1	been released by the VIM				
	5	IOP check	Verify that the remaining VM(s) are still running and				
		IOD altl	reachable through the management network				
	6	IOP check	Verify that the remaining VM(s) and VL(s) are still				
		IOD abaal:	connected according to the descriptors				
	7	IOP check	Verify that NS has been scaled in by running the end-				
IOD Vardiat			to-end functional test				
IOP Verdict							

6.2.4.5 TD_NFV_NS_LCM_SCALE_OUT_VNF_003

			teroperability Test Description		
Identifier		TD_NFV_NS_L	CM_SCALE_OUT_VNF_003		
Test Purpose			VNF in a NS can be successfully scaled out (by adding VNFC		
) when triggered automatically in MANO by a VIM KPI		
Configuration			ENDPOINT_SCALE_VNF		
			MIDDLEPOINT_SCALE_VNF		
References			FA005 V2.1.1 (clause 5.3.4)		
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)		
			FA013 V2.1.1 (clause 7.3.4)		
ETSI GS NFV-IFA010 V2.1.1 (clauses 6.2.3, 6.3.3)					
Applicability			request VIM_NFVI to allocate virtualised resources		
			supports allocating virtualised resources		
		 MANO supp 	ports receiving VR related KPIs from VIM		
		 VIM_NFVI 	can send VR related KPIs to MANO		
		 MANO supp 	ports triggering scale out when a given KPI crosses a certa	in treshold	
		 MANO supp 	ports scale out by adding VNFC instances (VMs)		
		 NS/VNF su 	pports scale out by adding VNFC instances (VMs)		
Pre-test condi	itions	 NS is instar 	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)		
			onfigured to trigger SCALE OUT (by adding VM(s)) when a	given VIM	
			rosses a certain threshold	J	
Test	Step	Туре	Description	Result	
Sequence	Otop	* *	•	Result	
	1	stimulus	Trigger NS scale out (by adding VMs to a VNF inside		
			the NS) in MANO with a VIM KPI		
	2	IOP check	Verify that the scale out (by adding VNFC instances		
			(VMs)) procedure has been started in MANO		
	3	IOP check	Verify that the requested resources have been		
			allocated by the VIM according to the descriptors		
	4	IOP check	Verify that the additional VM(s) have been deployed (i.e		
			by querying the VIM)		
	5	IOP check	Verify that the additional VM(s) are running and are		
		IOD also als	reachable through the management network		
	6	IOP check	Verify that the additional VM(s) are connected to the		
	<u> </u>	IOD	VL(s) according to the descriptors		
	7	IOP check	Verify that NS has been scaled out by running the end-		
			to-end functional test		
IOP Verdict					

6.2.4.6 TD_NFV_NS_LCM_SCALE_IN_VNF_003

		In	teroperability Test Description	
Identifier		TD_NFV_NS_L	CM_SCALE_IN_VNF_003	
Test Purpose		To verify that a '	VNF in a NS can be successfully scaled in (by adding VNF	С
		instances (VMs)) when triggered automatically in MANO by a VIM KPI	
Configuration		SUT_1_NS_1_E	ENDPOINT_SCALE_VNF	
		SUT_1_NS_1_N	MIDDLEPOINT_SCALE_VNF	
References		ETSI GS NFV-IF	FA005 V2.1.1 (clause 5.3.4)	
		ETSI GS NFV-IF	FA006 V2.1.1 (clauses 7.3.1, 7.4.1)	
			FA013 V2.1.1 (clause 7.3.4)	
ETSI GS NFV-IFA010 V2.1.1 (clauses 6.2.3, 6.3.3)				
Applicability		 MANO can 	request VIM_NFVI to terminate virtualised resources	
		 VIM_NFVI 	supports termintaing virtualised resources	
		 MANO supp 	ports receiving VR related KPIs from VIM	
			can send VR related KPIs to MANO	
		 MANO supr 	ports triggering scale in when a given KPI crosses a certair	threshold
			ports scale in by removing VNFC instances (VMs)	
			pports scale in by removing VNFC instances (VMs)	
			FF ()	
Pre-test condi	itions	NS is instar	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)	
		NS has been scaled out by adding VM(s) NS has been scaled out by adding VM(s)		
			onfigured to trigger SCALE IN (by removing VM(s)) when a	aires VIM
			onligured to trigger SCALE III (by removing vivi(s)) when a prosses a certain threshold	given viivi
		KFI value C	1055es a certain intestiolu	
Test	1			
Sequence	Step	Type	Description	Result
	1	stimulus	Trigger NS scale in (by removing VNFC instances	
			(VMs)) in MANO with a VIM KPI	
	2	IOP check	Verify that the scale out (by removing VM(s)) procedure	
			has been started in MANO	
	3	IOP check	Verify that the impacted VM(s) have been terminated	
	4	IOP check	Verify that the impacted VM related resources have	
			been released by the VIM	
	5	IOP check	Verify that the remaining VM(s) are still running and	
			reachable through the management network	
	6	IOP check	Verify that the remaining VM(s) and VL(s) are still	
			connected according to the descriptors	
	7	IOP check	Verify that NS has been scaled in by running the end-	· · · · · · · · · · · · · · · · · · ·
			to-end functional test	
IOP Verdict				

6.2.4.7 TD_NFV_NS_LCM_SCALE_OUT_VNF_004

		In	teroperability Test Description					
Identifier		TD_NFV_NS_L	D_NFV_NS_LCM_SCALE_OUT_VNF_004					
Test Purpose			o verify that a VNF in a NS can be successfully scaled out (by adding VNFC					
		instances (VMs)) when triggered in MANO by a VNF/EM request					
Configuration	1	SUT_1_NS_1_I	ENDPOINT_SCALE_VNF					
			MIDDLEPOINT_SCALE_VNF					
References			FA005 V2.1.1 (clause 5.3.4)					
			FA006 V2.1.1 (clauses 7.3.1, 7.4.1)					
			TSI GS NFV-IFA008 V2.1.1 (clause 7.2.4)					
			FA013 V2.1.1 (clause 7.3.4)					
ETSI GS NFV-IFA010 V2.1.1 (clauses 6.2.3, 6.3.3)								
Applicability			request VIM_NFVI to allocate virtualised resources					
			supports allocating virtualised resources					
			can send scale out request to MANO					
		 MANO sup 	ports triggering scale out when the scale out request is rece	eived from				
		VNF/EM						
		 MANO sup 	ports scale out by adding VNFC instances (VMs)					
		 NS/VNF su 	ipports scale out by adding VNFC instances (VMs)					
Pre-test cond	itions	 NS is instal 	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001)					
		- 110 10 1110101	Illiated (TD_INI V_INS_ECIVI_INSTANTIATE_001)					
		110 10 1110101	miated (TD_NEV_NO_LOW_INGTANTIATE_001)					
Test	Ston			Posult				
Test Sequence	Step	Туре	Description	Result				
	Step 1		Description Trigger the VNF/EM to send a scale out (by adding	Result				
		Туре	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO	Result				
		Туре	Description Trigger the VNF/EM to send a scale out (by adding	Result				
	1	Type stimulus	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO	Result				
	1	Type stimulus	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure	Result				
	1 2	Type stimulus IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO	Result				
	1 2	Type stimulus IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been	Result				
	1 2 3	Type stimulus IOP check IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the additional VM(s) have been deployed (i.e by querying the VIM)	Result				
	1 2 3	Type stimulus IOP check IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the additional VM(s) have been deployed (i.e by querying the VIM) Verify that the additional VM(s) are running and are	Result				
	1 2 3	Type stimulus IOP check IOP check IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the additional VM(s) have been deployed (i.e by querying the VIM) Verify that the additional VM(s) are running and are reachable through the management network	Result				
	1 2 3	Type stimulus IOP check IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the additional VM(s) have been deployed (i.e by querying the VIM) Verify that the additional VM(s) are running and are reachable through the management network Verify that the additional VM(s) are connected to the	Result				
	1 2 3 4 5	Type stimulus IOP check IOP check IOP check IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the additional VM(s) have been deployed (i.e by querying the VIM) Verify that the additional VM(s) are running and are reachable through the management network Verify that the additional VM(s) are connected to the VL(s) according to the descriptors	Result				
	1 2 3 4 5	Type stimulus IOP check IOP check IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the additional VM(s) have been deployed (i.e by querying the VIM) Verify that the additional VM(s) are running and are reachable through the management network Verify that the additional VM(s) are connected to the VL(s) according to the descriptors Verify that NS has been scaled out by running the end-	Result				
	1 2 3 4 5	Type stimulus IOP check IOP check IOP check IOP check	Description Trigger the VNF/EM to send a scale out (by adding VNFC instances (VMs)) request to MANO Verify that the scale out (by adding VM(s)) procedure has been started in MANO Verify that the requested resources have been allocated by the VIM according to the descriptors Verify that the additional VM(s) have been deployed (i.e by querying the VIM) Verify that the additional VM(s) are running and are reachable through the management network Verify that the additional VM(s) are connected to the VL(s) according to the descriptors	Result				

6.2.4.8 TD_NFV_NS_LCM_SCALE_IN_VNF_004

		Int	eroperability Test Description			
Identifier			CM_SCALE_IN_VNF_004			
Test Purpose		To verify that a \	/NF in a NS can be successfully scaled in (by removing VI	NFC		
-		instances (VMs)) when triggered in MANO by a VNF/EM request			
Configuration			NDPOINT_SCALE_VNF			
			MIDDLEPOINT_SCALE_VNF			
References			A005 V2.1.1 (clause 5.3.4)			
			A006 V2.1.1 (clauses 7.3.1, 7.4.1)			
			A008 V2.1.1 (clause 7.2.4)			
			FA013 V2.1.1 (clause 7.3.4)			
A 12 1 . 124			FA010 V2.1.1 (clauses 6.2.3, 6.3.3)			
Applicability			request VIM_NFVI to terminate virtualised resources			
			supports terminating virtualised resources			
		_	an send scale in request to MANO			
			ports triggering scale in when the scale in request is receive	ed from		
		VNF/EM				
			MANO supports scale in by removing VNFC instances (VMs)			
		NS/VNF sup	oports scale in by removing VNFC instances (VMs)			
Due teet eend!	(!		CALLIED NEW NO. LONGINGTANTIATE CO.			
Pre-test condi	tions		tiated (TD_NFV_NS_LCM_INSTANTIATE_001)			
		 NS has bee 	n scaled out by adding VM(s)			
_	_	T		T		
Test Sequence	Step	Туре	Description	Result		
	1	stimulus	Trigger the VNF/EM to send a scale out (by removing VNFC instances (VMs)) request to MANO			
	2	IOP check	Verify that the scale out (by removing VM(s)) procedure			
			has been started in MANO			
	3	IOP check	Verify that the impacted VM(s) have been terminated			
	4	IOP check	Verify that the impacted VM related resources have			
			been released by the VIM			
	5	IOP check	Verify that the remaining VM(s) are still running and			
			reachable through the management network			
	6	IOP check	Verify that the remaining VM(s) and VL(s) are still			
		100	connected according to the descriptors			
	7	IOP check	Verify that NS has been scaled in by running the end-			
IOD Vordict			to-end functional test			
IOP Verdict						

6.2.5 UPDATE

6.2.5.1 TD_NFV_NS_LCM_UPDATE_STOP_VNF_001

Interoperability Test Description							
Identifier		TD_NFV_NS_LC	TD_NFV_NS_LCM_UPDATE_STOP_VNF_001				
Test Purpose		To verify that a V	o verify that a VNF running in a NS can be successfully stopped by MANO				
Configuration SUT_1_NS_1_ENDPOINT							
		SUT_1_NS_1_M	SUT_1_NS_1_MIDDLEPOINT				
References		ETSI GS NFV-IF	A013 V2.1.1 (clause 7.3.5)				
Applicability	Applicability MANO can request VIM_NFVI to stop VM(s)						
		 VIM_NFVI s 	upports stoping running VM(s)				
Pre-test condit	ions	 NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) 					
		 VNF instance 	e(s) in the NS are running				
Test Sequence	Step	Туре	Description	Result			
	1	stimulus	Trigger the VNF(s) stop operation in MANO				

	Interoperability Test Description			
	2	IOP check	Verify the VNF(s) state inside the NS is "Stopped" on MANO (query, display,)	
	3	IOP check	Verify that individual VM(s) inside the VNF(s) are stopped on VIM (i.e query or display the state from VIM)	
IOP Verdict				

6.2.5.2 TD_NFV_NS_LCM_UPDATE_START_VNF_001

		lr	nteroperability Test Description			
Identifier			CM UPDATE START VNF 001			
Test Purpose			stopped VNF in a NS can be successfully re-started by MA	NO		
Configuration						
Comigaration	SUT 1 NS 1 MIDDLEPOINT					
References ETSI GS NFV-IFA013 V2.1.1 (clause 7.3.5)						
Applicability			request VIM_NFVI to re-start VM(s)			
			supports re-starting VM(s)			
	· ·	_				
Pre-test cond		One VNF in	ntiated (TD_NFV_NS_LCM_INSTANTIATE_001) nside the NS has been stopped			
		(TD_NFV_	NS_LCM_UPDATE_STOP_VNF_001)			
Test Sequence	Step	Type	Description	Result		
Test Sequence	Step	,	Description	Result		
	Step 1 2	Туре	Description Trigger the VNF(s) start operation in MANO Verify the VNF(s) state inside the NS is "Started" on	Result		
	1	Type stimulus	Description Trigger the VNF(s) start operation in MANO Verify the VNF(s) state inside the NS is "Started" on MANO (i.e query, display,) Verify that individual VM(s) inside the VNF(s) are	Result		
	1 2	Type stimulus IOP check	Description Trigger the VNF(s) start operation in MANO Verify the VNF(s) state inside the NS is "Started" on MANO (i.e query, display,)	Result		

6.2.5.3 TD_NFV_NS_LCM_UPDATE_ADD_VNF_VL_001

		Int	eroperability Test Description				
Identifier		TD_NFV_NS_LC	CM_UPDATE_ADD_VNF_VL_001				
Test Purpose		To verify that VN	o verify that VNF(s) and VL(s) can be added to a running NS				
Configuration		SUT_1_NS_1_M	SUT_1_NS_1_MIDDLEPOINT_UPDATE				
References			A005 V2.1.1 (clause 5.3.4)				
	ETSI GS NFV-IFA006 V2.1.1 (clauses 7.3.1, 7.4.1)						
		ETSI GS NFV-IF	A008 V2.1.1 (clause 7.2.4)				
		ETSI GS NFV-IF	A010 V2.1.1 (clauses 6.3.4)				
Applicability • MANO can request VIM_NFVI to allocate virtualised resources							
		VIM_NFVI supports allocating virtualised resources					
		MANO supports triggering NS update with an operator's action					
		 MANO supp 	orts adding VNFs to a running NS				
		 MANO supp 	orts adding VLs to a running NS				
			-				
Pre-test condit	ions	 NS is instant 	tiated (TD_NFV_NS_LCM_INSTANTIATE_001)				
		 Test VNF ca 	an loadshare traffic among several VNFs				
Test Sequence	Step	Туре	Description	Result			
	1	stimulus	The MANO operator triggers NS update adding VNF(s) and VL(s) to a running NS				

Interoperability Test Description				
	2 IOP check Verify that the requested resources have been			
			allocated by the VIM according to the descriptors	
	3	IOP check	Verify that the additional VNF(s) and VL(s) have been	
			deployed	
	4	IOP check	Verify that the additional VNF(s) are running and	
			reachable through the management network	
	5	IOP check	Verify that the additional VNF(s) are connected to the	
			VL(s) according to the descriptors	
	6	IOP check	Verify that NS has been updated by running the end-to-	
			end functional test	
IOP Verdict				

6.2.5.4 TD_NFV_NS_LCM_UPDATE_REM_VNF_VL_001

		In	teroperability Test Description				
Identifier		TD_NFV_NS_LCM_UPDATE_REM_VNF_VL_001					
Test Purpose		To verify that VN	To verify that VNF(s) and VL(s) can be removed from a running NS				
Configuration			MIDDLEPOINT_UPDATE				
References		ETSI GS NFV-II	A005 V2.1.1 (clause 5.3.4)				
		ETSI GS NFV-IFA006 V2.1.1 (clauses 7.3.1, 7.4.1)					
		ETSI GS NFV-IFA008 V2.1.1 (clause 7.2.4)					
		ETSI GS NFV-II	FA010 V2.1.1 (clauses 6.3.4)				
Applicability		 MANO can 	request VIM_NFVI to terminate virtualised resources				
		VIM_NFVI s	supports terminating virtualised resources				
		 MANO supp 	ports triggering NS update with an operator's action				
		 MANO supp 	ports removing VNF(s) from a running NS				
		 MANO supp 	ports removing VL(s) from a running NS				
Pre-test condi	tions	NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001)					
		 NS has been updated by adding VNF(s) and VL(s) 					
		(TD_NFV_NS_LCM_UPDATE_ADD_VNF_VL_001)					
	L.	,					
Test	Step	Type	Description	Result			
Sequence			'	resuit			
	1	stimulus	The MANO operator triggers NS update removing				
			VNF(s) and VL(s) from a running NS				
	2	IOP check	Verify that the specified VNF(s) and VL(s) have been				
		105 1	terminated				
	3	IOP check	Verify that the impacted resources have been released				
		100 1	by the VIM				
	4	IOP check	Verify that the remaining VNF(s) are still running and reachable				
	5	IOP check	Verify that the remaining VNF (s) and VL(s) are still				
			connected according to the descriptors				
	6	IOP check	Verify that NS has been updated by running the end-to-				
			end functional test				
IOP Verdict							

6.2.5 TERMINATE

6.5.1.1 TD_NFV_NS_LCM_TERMINATE_001

		Int	teroperability Test Description		
Identifier TD_NFV_NS_LCM_TERMINATE_001					
Test Purpose To verify that a NS can be successfully terminated					
Configuration		SUT_1_NS_1_E	<u>, </u>		
SUT_1_NS_1_MIDDLEPOINT					
References		ETSI GS NFV-IF	A013 V2.1.1 (clause 7.3.7)		
		ETSI GS NFV-IF	ETSI GS NFV-IFA005 V2.1.1 (clause 7.2.6)		
		ETSI GS NFV-IF	A008 V2.1.1 (clause 7.2.7)		
		ETSI GS NFV-IF	FA010 V2.1.1 (clause 6.3.5)		
Applicability		 MANO can 	request VIM_NFVI to terminate virtualised resources		
		 VIM_NFVI s 	supports terminating virtualised resources		
			by NSD) MANO can request VIM_NFVI to delete NFP(s)		
(If required by NSD) VIM_NFVI supports deleting NFP(s)					
		` '	, <u> </u>		
Pre-test condi	tions	 NS has bee 	n instantiated		
	Į.				
Test Sequence	Step	Туре	Description	Result	
•	1	stimulus	Trigger NS termination in MANO		
	2	IOP check	Verify that all the VNF instance(s) have been		
			terminated		
	3	IOP check	Verify that the resources that were allocated to the NS		
			and VNF(s) have been released by the VIM		
	4	IOP check			
	4 5	IOP check	and VNF(s) have been released by the VIM		

6.3 TEARDOWN

6.3.1 DELETE

6.3.1.1 TD_NFV_TEARDOWN_DELETE_NSD_001

		In	teroperability Test Description		
Identifier TD_NFV_TEARDOWN_DELETE_NSD_001					
Test Purpose To delete a NSD					
			ENDPOINT MIDDLEPOINT		
References		ETSI GS NFV-IFA013 V2.1.1 (clause 7.2.6)			
Applicability					
Pre-test conditions			ated in MANO (TD_NFV_SETUP_CREATE_NSD_001) sociated with the NSD have been terminated		
Test Sequence	Step	Туре	Description	Result	
-	1	stimulus	Trigger the deletion of NSD on MANO (i.e using tools produced by MANO)		
	2	IOP check	Verify that the NSD and referenced VLD(s) and VNFFGD(s) no longer exists on MANO		
IOP Verdict					

6.3.1.2 TD_NFV_TEARDOWN_DELETE_VNF_PKG_001

		In	teroperability Test Description		
Identifier TD_NFV_TEARDOWN_DELETE_VNF_PKG_001					
Test Purpose To delete a VNF Package					
Configuration		SUT_1_NS_1_E	ENDPOINT		
SUT_1_NS_1_MIDDLEPOINT					
References		ETSI GS NFV-II	FA013 V2.1.1 (clause 7.7)		
		ETSI GS NFV-II	ETSI GS NFV-IFA010 V2.1.1 (clauses 6.5.1, 7.4.1)		
Applicability					
Pre-test condit	ions	 VNF package 	ge has been on-boarded in MANO		
		(TD_NFV_S	SETUP_VNF_PKG_ONB_001)		
Test Sequence	Step	Туре	Description	Result	
	1	stimulus	Trigger the deletion of the VNF package on MANO		
	2	IOP check	Verify that the VNF Package information has been		
			deleted from MANO		
IOP Verdict					

Annex A:Interoperability Feature Statement Pro-Forma

A.1 IFS for MANO

IFS ID	Description	Support
IFS_MANO_SWIM_ADD	MANO can request VIM to add a SW image	
IFS_MANO_VRM_ALLOCATE	MANO can request VIM to allocate virtualised resources	
IFS_MANO_VRM_TERMINATE	MANO can request VIM to terminate virtualised resources	
IFS_MANO_NFPM_CREATE	MANO can request VIM to create NFP(s)	
IFS_MANO_NFPM_DELETE	MANO can request VIM to delete NFP(s)	
IFS_MANO_SCALE_OUT	MANO supports scale out by adding VNF instances	
IFS_MANO_SCALE_OUT_VNF	MANO supports scale out by adding VNFC instances	
IFS_MANO_SCALE_IN	MANO supports scale in by removing VNF instances	
IFS_MANO_SCALE_IN_VNF	MANO supports scale in by removing VNFC instances	
IFS_MANO_SCALE_OUT_BY_OPERATOR	MANO supports triggering scale out with an operator's action	
IFS_MANO_SCALE_IN_BY_OPERATOR	MANO supports triggering scale in with an operator's action	
IFS_MANO_RECEIVE_VNF_INDICATOR	MANO supports receiving VNF indicators from VNF/EM	
IFS_MANO_SCALE_OUT_BY_VNF_INDICATOR	MANO supports triggering scale out when a given VNF Indicator value crosses a certain threshold	
IFS_MANO_SCALE_IN_BY_VNF_INDICATOR	MANO supports triggering scale in when a given VNF Indicator value crosses a certain threshold	
IFS_MANO_RECEIVE_VIM_KPI	MANO supports receiving VR related KPIs from VIM	
IFS_MANO_SCALE_OUT_BY_VIM_KPI	MANO supports triggering scale out when a given KPI crosses a certain threshold	
IFS_MANO_SCALE_IN_BY_VIM_KPI	MANO supports triggering scale in when a given KPI crosses a certain threshold	
IFS_MANO_SCALE_OUT_BY_VNF_REQUEST	MANO supports triggering scale out when the scale out request is received from VNF/EM	
IFS_MANO_SCALE_IN_BY_VNF_REQUEST	MANO supports triggering scale in when the scale in request is received from VNF/EM	
IFS_MANO_STOP_VNFC	MANO can request VIM to stop VNFC (VMs)	
IFS_MANO_RESTART_VNFC	MANO can request VIM to re-start VNFC (VM)	
IFS_MANO_NS_UPDATE_OPERATOR	MANO supports triggering NS update with an operator's action	
IFS_MANO_ADD_VNF_RUNNING_NS	MANO supports adding VNFs to a running NS	
IFS_MANO_REMOVE_VNF_RUNNING_NS	MANO supports removing VNF(s) from a running NS	
IFS_MANO_ADD_VL_RUNNING_NS	MANO supports adding VLs to a running NS	
IFS_MANO_REMOVE_VL_RUNNING_NS	MANO supports removing VL(s) from a running NS	

A.2 IFS for VIM/NFVI

IFS ID	Description	Support
IFS_VIM_SWIM_ADD	VIM supports adding a SW image	
IFS_VIM_VRM_ALLOCATE	VIM supports allocating virtualised resources	
IFS_VIM_VRM_TERMINATE	VIM supports terminating virtualised resources	
IFS_VIM_NFPM_CREATE	VIM supports creating NFP(s)	
IFS_VIM_NFPM_DELETE	VIM supports deleting NFP(s)	
IFS_VIM_SEND_KPI	VIM can send VR related KPIs to MANO	
IFS_VIM_STOP_VNFC	VIM supports stoping running VNFCs (VMs)	
IFS_VIM_RESTART_VNFC	VIM supports re-starting VNFCs (VMs)	

A.3 IFS for NS/VNF/EM

IFS ID	Description	Support
IFS_VNF_NS_SCALE_OUT	NS/VNF supports scale out by adding VNF	
II 5_VIVI_IVS_SCALL_OUT	instances	
IFS VNF NS SCALE OUT VNF	NS/VNF supports scale out by adding VNFC	
II 5_VIVI_IVS_SCALL_OUI_VIVI	instances	
IFS_VNF_NS_SCALE_IN	NS/VNF supports scale in by removing VNF	
II 5_VIVI_IVS_SCALL_IIV	instances	
IFS VNF NS SCALE IN VNF	NS/VNF supports scale in by removing VNFC	
	instances	
IFS_VNF_EM_SEND_VNF_INDICATOR	VNF/EM can send VNF indicator values to	
	MANO	
IFS_VNF_EM_SEND_SCALE_OUT_REQUEST	VNF/EM can send scale out request to MANO	
IFS_VNF_EM_SEND_SCALE_IN_REQUEST	VNF/EM can send scale in request to MANO	