4th ETSI NFV Plugtests NFV Interoperability Sophia Antipolis, France





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Foreword

This Test Plan has been produced by ETSI Centre for Testing and Interoperability during the preparation of the 4^{th} ETSI NFV Plugtests.

Introduction

The present document describes the Interoperability Test Plan that was followed during the 4^{th} ETSI NFV Plugtests held from 3^{rd} of June to 7^{th} of June 2019 in Sophia Antipolis, France.

The Test Plan was developed following the interoperability testing methodology and guidelines defined by ETSI NFV in [TST002] and [TST007] and building on the learninigs of the 1^{st} , 2^{nd} and 3^{rd} NFV Plugtests.

1 Scope

The goal of this document is to support the interoperability test sessions run during the 4th 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), possibly providing EM and /or specific VNF Manager (VNFM) functionality
- Management and Orchestration (MANO) solutions, providing NFV Orchestrator (NFVO) and generic VNFM functionality
- NFV Platforms providing pre-integrated NFV Infrastructure (NFVI) and Virtual Infrastructure Manager (VIM) functionality

This document includes several System Under Test Configurations to illustrate how Functions Under Test are combined to provide different end-to-end functionality

The NS 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 NS derived from the examples 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".
[SOL002]	ETSI GS NFV-SOL 002 V2.4.1: "Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point"
[SOL003]	ETSI GS NFV-SOL 003 V2.4.1: "Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point"
[SOL005]	ETSI GS NFV-SOL 005 V2.4.1: "Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Os-Ma-nfvo Reference Point"
[TST002]	ETSI GS NFV-TST 002: "Network Functions Virtualisation (NFV); Testing Methodology; Report on NFV Interoperability Testing Methodology"
[TST007]	ETSI GS NFV-TST 007: "Network Function Virtualization (NFV); Testing; Guidelines on Interoperability Testing for MANO"

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>_<SUBGROUP>_<OPERATION>_<NN>

Where <ROOT> is NFV, and <NN> corresponds to a sequential number starting at 001.

The possible values for <GROUP>, <SUBGROUP>, <OPERATION> are summarized in the tables below:

<group></group>	<subgroup></subgroup>	<operation></operation>	Description
		ONBOARD_VNF_PKG	Onboard VNF Package
		ONBOARD_NSD	Onboard Network Service Descriptor
		INSTANTIATE	Instantiate Network Service
		SCALE_OUT	Scale Out by adding VNF instance(s)
		SCALE_IN	Scale In by removing VNF instance(s)
		SCALE_OUT_VNF	Scale Out by adding VNFC instance(s)
	NS_LCM	SCALE_IN_VNF	Scale In by removing VNFC instance(s)
		SCALE_TO_LEVEL	Scale To Level by changing number of VNF instance(s)
		SCALE_TO_LEVEL_VNF	Scale To Level by changing number of VNFC instance(s)
		UPDATE VNF	Start and Stop VNF instances
		TERMINATE	Terminate Network Service
		SUBSCRIPTION	Subscribe and delete the fault alarm notification
	FM_NS_ALARM	NOTIFICATION	Virtualised resource fault alarm notification propagation by NFVO
	FM_NS_ALARM	CLEAR_NOTIFICATION	Virtualised resource fault alarm clearance notification propagation by NFVO
		QUERY	Query fault alarms
		CREATE_MONITORING_J OB	Monitoring NS performance metrics
		QUERY	Query NFVO to retrieve performance monitoring metrics
		CREATE_THRESHOLD	Create performance monitoring thresholds on NFVO
		CREATE_SUBSCRIPTION	Subscribe to performance metrics notifications
	PM_NS	THRESHOLD_CROSSED _NOTIFICATION	Expose threshold crossed notification by NFVO
		MONITORING_INFORMA TION_NOTIFICATION	Expose information availability notification by the NFVO when new and updated performance metrics are available
		DELETE_SUBSCRIPTION	Delete subscription to performance monitoring notifications
		DELETE_MONITORING_J OB	Deletion of monitoring of performance metrics

	DELETE_THRESHOLD	Deletion of performance monitoring thresholds related to performance metrics
	QUERY	Monitoring of VNF indicators
VNF_INDICATO R	SUBSCRIPTION	Subscribe to VNF indicators notifications
	NOTIFICATION	Expose VNF indicators value change notification
	DELETE_NSD	Deletion of Network Service Descriptor
	DELETE_VNF_PKG	Deletion of VNF Package

		INSTANTIATE	Instantiate Network Service with EPA requirements
		SCALE_OUT	Scale Out by adding VNF instance(s) with EPA requirements
		SCALE_IN	Scale In by removing VNF instance(s) with EPA requirements
EPA	NS_LCM	SCALE_OUT_VNF	Scale Out by adding VNFC instance(s) with EPA requirements
		SCALE_IN_VNF	Scale In by removing VNFC instance(s) with EPA requirements
		SCALE_TO_LEVEL	Scale To Level by changing number of VNF instance(s) with EPA requirements
		SCALE_TO_LEVEL_VNF	Scale To Level by changing number of VNFC instance(s) with EPA requirements

		INSTANTIATE	Instantiate Multi Site Network Service
		SCALE_OUT	Multi Site Scale Out by adding VNF instance(s)
		SCALE_IN	Multi Site Scale In by removing VNF instance(s)
MULTICITE	NS_LCM	SCALE_OUT_VNF	Multi Site Scale Out by adding VNFC instance(s)
MULTISITE		SCALE_IN_VNF	Multi Site Scale In by removing VNFC instance(s)
		SCALE_TO_LEVEL	Multi Site Scale To Level by changing number of VNF instance(s)
		SCALE_TO_LEVEL_VNF	Multi Site Scale To Level by changing number of VNFC instance(s)
		TERMINATE	Terminate Multi Site Network Service

4.2 Test Summary

4.2.1 NS

4.2.1.1 SUT Configurations

The System Under Test Configuration applicable to this group are:

- SUT_SINGLE-VENDOR_NS
- SUT_MULTI-VENDOR_NS
- SUT_S-VNFM
- SUT_AUTO-LCM-VALIDATION

See Clause 5 for further details

4.2.1.2 Applicable Test Groups and Operations

Group	Test IDs	# TDs
ONBOARD	TD_NFV_ONBOARD_XXX	2
INSTANTIATE	TD_NFV_NS_LCM_INSTANTIATE_XXX	1
SCALE_NS_MANUAL SCALE_NS_VNF_IND SCALE_NS_VIM_METRIC	TD_NFV_NS_LCM_SCALE_OUT/IN_xx x	8
SCALE_VNF_MANUAL SCALE_VNF_VNF_IND SCALE_VNF_VIM_METRIC SCALE_VNF_EM	TD_NFV_NS_LCM_SCALE_OUT/IN_V NF_xxx	10
SCALE_NS_TO_LEVEL_MANUAL SCALE_NS_TO_LEVEL_VNF_IND SCALE_NS_TO_LEVEL_VIM_METRIC	TD_NFV_NS_LCM_SCALE_TO_LEVEL_xxx	3
SCALE_VNF_TO_LEVEL_MANUAL SCALE_VNF_TO_LEVEL_VNF_IND SCALE_VNF_TO_LEVEL_VIM_METRIC SCALE_VNF_TO_LEVEL_EM	TD_NFV_NS_LCM_SCALE_TO_LEVEL_ VNF_xxx	4
UPDATE_VNF	TD_NFV_NS_LCM_UPDATE_XXX	2
FM_SUBSCRIPTION FM_ALARMS	TD_NFV_FM_NS_XXX	5
PM_JOB PM_SUBSCRIPTION PM_NOTIFICATION	TD_NFV_PM_ NS_XXX	10
VNF_IND	TD_NFV_VNF_INDICATOR_XXX	3
TERMINATE	TD_NFV_NS_LCM_TERMINATE_XXX	1
DELETE	TD_NFV_TEARDOWN_DELETE_XXX	2

4.2.3 EPA

4.2.3.1 SUT Configurations

The System Under Test Configuration applicable to this group are:

- SUT_SINGLE-VENDOR_NS
- SUT_MULTI-VENDOR_NS
- SUT_S-VNFM
- SUT_AUTO-LCM-VALIDATION

See Clause 5 for further details

4.2.3.2 Applicable Test Groups and Operations

Group	Test IDs	# TDs
ONBOARD	TD_NFV_ONBOARD_XXX	2
EPA_INSTANTIATE	TD_NFV_EPA_NS_LCM_INSTANTIATE _XXX	1
EPA_SCALE_NS_MANUAL	TD_NFV_EPA_NS_LCM_SCALE_OUT/I N_xxx	2
SCALE_NS_VNF_IND SCALE_NS_VIM_METRIC	TD_NFV_NS_LCM_SCALE_OUT/IN_xx x	6
EPA_SCALE_VNF_MANUAL	TD_NFV_EPA_NS_LCM_SCALE_OUT/I N_VNF_xxx	2
SCALE_VNF_VNF_IND SCALE_VNF_VIM_METRIC SCALE_VNF_EM	TD_NFV_NS_LCM_SCALE_OUT/IN_V NF_xxx	8
EPA_SCALE_NS_TO_LEVEL_MANUAL	TD_NFV_EPA_NS_LCM_SCALE_TO_L EVEL_xxx	1
SCALE_NS_TO_LEVEL_VNF_IND SCALE_NS_TO_LEVEL_VIM_METRIC	TD_NFV_NS_LCM_SCALE_TO_LEVEL_xxx	2
EPA_SCALE_VNF_TO_LEVEL_MANUAL	TD_NFV_EPA_NS_LCM_SCALE_TO_L EVEL_VNF_xxx	1
SCALE_VNF_TO_LEVEL_MANUAL SCALE_VNF_TO_LEVEL_VNF_IND SCALE_VNF_TO_LEVEL_VIM_METRIC SCALE_VNF_TO_LEVEL_EM	TD_NFV_NS_LCM_SCALE_TO_LEVEL_ VNF_xxx	3
UPDATE_VNF	TD_NFV_NS_LCM_UPDATE_XXX	2
FM_SUBSCRIPTION FM_ALARMS	TD_NFV_FM_NS_XXX	5
PM_JOB PM_SUBSCRIPTION PM_NOTIFICATION	TD_NFV_PM_ NS_XXX	10
VNF_IND	TD_NFV_VNF_INDICATOR_XXX	3
TERMINATE	TD_NFV_NS_LCM_TERMINATE_XXX	1
DELETE	TD_NFV_TEARDOWN_DELETE_XXX	2

4.2.4 SFC

4.2.4.1 SUT Configurations

The System Under Test Configuration applicable to this group are:

- SUT_SINGLE-VENDOR_NS
- SUT_MULTI-VENDOR_NS
- SUT_S-VNFM
- SUT_AUTO-LCM-VALIDATION

See Clause 5 for further details

4.2.4.2 Applicable Test Groups and Operations

Group	Test IDs	# TDs
ONBOARD	TD_NFV_ONBOARD_XXX	2
SFC_INSTANTIATE	TD_NFV_SFC_NS_LCM_INSTANTIATE _XXX	1
SCALE_NS_MANUAL SCALE_NS_VNF_IND SCALE_NS_VIM_METRIC	TD_NFV_NS_LCM_SCALE_OUT/IN_xx x	8
SCALE_VNF_MANUAL SCALE_VNF_VNF_IND SCALE_VNF_VIM_METRIC SCALE_VNF_EM	TD_NFV_NS_LCM_SCALE_OUT/IN_V NF_xxx	10
SCALE_NS_TO_LEVEL_MANUAL SCALE_NS_TO_LEVEL_VNF_IND SCALE_NS_TO_LEVEL_VIM_METRIC	TD_NFV_NS_LCM_SCALE_TO_LEVEL_xxx	3
SCALE_VNF_TO_LEVEL_MANUAL SCALE_VNF_TO_LEVEL_VNF_IND SCALE_VNF_TO_LEVEL_VIM_METRIC SCALE_VNF_TO_LEVEL_EM	TD_NFV_NS_LCM_SCALE_TO_LEVEL_ VNF_xxx	4
UPDATE_VNF	TD_NFV_NS_LCM_UPDATE_XXX	2
FM_SUBSCRIPTION FM_ALARMS	TD_NFV_FM_NS_XXX	5
PM_JOB PM_SUBSCRIPTION PM_NOTIFICATION	TD_NFV_PM_ NS_XXX	10
VNF_IND	TD_NFV_VNF_INDICATOR_XXX	3
TERMINATE	TD_NFV_NS_LCM_TERMINATE_XXX	1
DELETE	TD_NFV_TEARDOWN_DELETE_XXX	2

4.2.5 Multi Site

4.2.5.1 SUT Configuration

The System Under Test Configuration applicable to this group is:

• SUT_MULTI-SITE

See Clause 5 for further details

4.2.5.2 Applicable Test Groups and Operations

Group	Test IDs	# TDs
ONBOARD	TD_NFV_ONBOARD_XXX	2
MULTISITE_INSTANTIATE	TD_NFV_MULTISITE_NS_LCM_INSTA NTIATE_XXX	1
MULTISITE_SCALE_NS_MANUAL	TD_NFV_MULTISITE_NS_LCM_SCALE _OUT/IN_xxx	2
SCALE_NS_VNF_IND SCALE_NS_VIM_METRIC	TD_NFV_NS_LCM_SCALE_OUT/IN_xx x	6
MULTISITE_SCALE_VNF_MANUAL	TD_NFV_MULTISITE_NS_LCM_SCALE _OUT/IN_VNF_xxx	2
SCALE_VNF_VNF_IND SCALE_VNF_VIM_METRIC SCALE_VNF_EM	TD_NFV_NS_LCM_SCALE_OUT/IN_V NF_xxx	8
MULTISITE_SCALE_NS_TO_LEVEL_MANUAL	TD_NFV_MULTISITE_NS_LCM_SCALE _TO_LEVEL_xxx	1
SCALE_NS_TO_LEVEL_VNF_IND SCALE_NS_TO_LEVEL_VIM_METRIC	TD_NFV_NS_LCM_SCALE_TO_LEVEL_xxx	2
MULTISITE_SCALE_VNF_TO_LEVEL_MANUAL	TD_NFV_MULTISITE_NS_LCM_SCALE _TO_LEVEL_VNF_xxx	1
SCALE_VNF_TO_LEVEL_VNF_IND SCALE_VNF_TO_LEVEL_VIM_METRIC SCALE_VNF_TO_LEVEL_EM	TD_NFV_NS_LCM_SCALE_TO_LEVEL_ VNF_xxx	3
UPDATE_VNF	TD_NFV_NS_LCM_UPDATE_XXX	2
FM_SUBSCRIPTION FM_ALARMS	TD_NFV_FM_NS_XXX	5
PM_JOB PM_SUBSCRIPTION PM_NOTIFICATION	TD_NFV_PM_ NS_XXX	10
VNF_IND	TD_NFV_VNF_INDICATOR_XXX	3
TERMINATE	TD_NFV_NS_LCM_TERMINATE_XXX	1
DELETE	TD_NFV_TEARDOWN_DELETE_XXX	2

5 System Under Test Configurations

5.1 SUT_SINGLE-VENDOR_NS

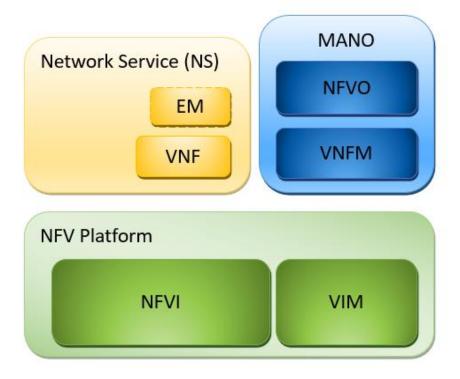


Figure 1: Single Vendor NS SUT Configuration

5.2 SUT_MULTI-VENDOR_NS

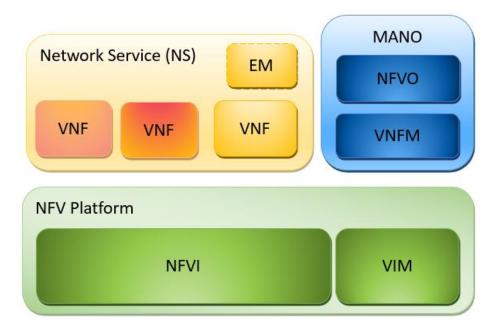


Figure 2: Multi Vendor NS SUT Configuration

5.3 SUT_S-VNFM

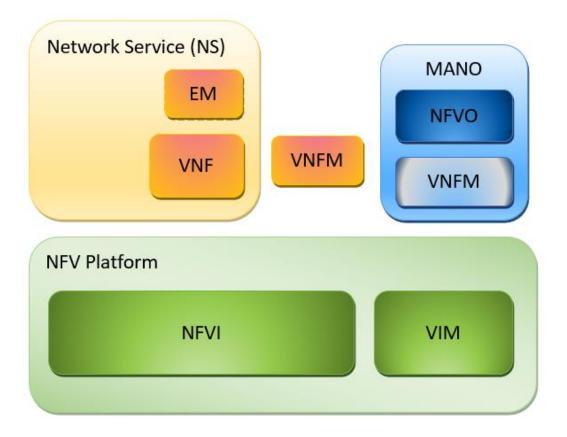


Figure 3: S-VNFM SUT Configuration

5.4 SUT_AUTO-LCM-VALIDATION

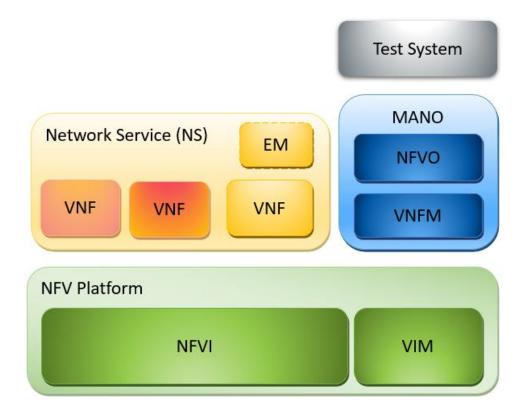


Figure 4: Auto LCM Validation SUT Configuration

5.5 SUT_MULTI-SITE

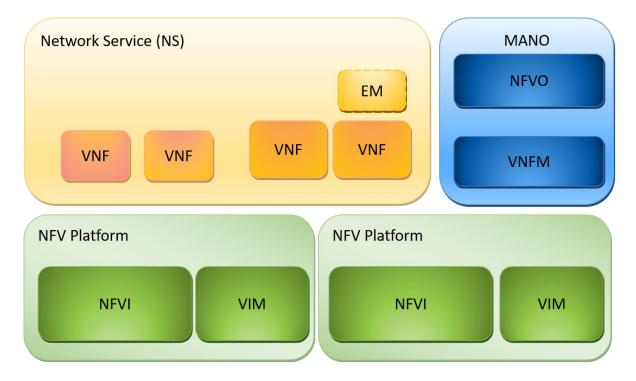


Figure 5: Multi Site SUT Configuration

6 Interoperability Test Descriptions

6.1 NS

6.1.1 ONBOARD

6.1.1.1 TD_NFV_ONBOARD_VNF_PKG_001

			Interoperability Test Description				
Identifie	r	TD_NFV_	TD_NFV_ONBOARD_VNF_PKG_001				
Test Purpo	ose	To on-boar	d a VNF Package				
Configuration SUT_SINGLE SUT_MULTI-SUT_MULTI-SUT_S-VNFM							
Reference	es	[IFA013] CI [SOL005] C					
Applicabil	ity						
Pre-test condition			kage resides on a repository reachable by NFVO kage is complete and consumable by NFVO				
Test Sequence	Step	Туре	Description	Result			
Ocquence	1	Stimulus	Trigger the on-boarding of a VNF package in NFVO (i.e create new resource and upload content)				
	2	IOP Check	Verfiy that a new VNF package resource has been created in the NFVO				
	3	IOP Check	Verify that the content of VNF package has been successfully uploaded to the NFVO (i.e query or display VNF Package)				
	4	IOP Check	Verify that VNF package is considered ONBOARDED by the NFVO (i.e. query or display VNF package)				
IOP Verdict							

6.1.1.2 TD_NFV_ONBOARD_NSD_001

	Interoperability Test Description					
Identifier	TD_NFV_ONBOARD_NSD_001					
Test Purpose	To onboard a NSD					
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_MULTI-SITE SUT_S-VNFM SUT_AUTO-LCM-VALIDATION					
References	[IFA013] Clause 7.2.2 [SOL005] Clause 5					

Applicabil	ity			
Pre-test cond	itions	* NSD can	be reached and consumed by NFVO	
	Step	Туре	Description	Result
	1	Stimulus	Trigger the on-boarding of the NSD in the NFVO (i.e. create new resource and upload content)	
Test Sequence	2	IOP Check	Verify that a new NSD resource has been created in NFVO	
·	3	IOP Check	Verify that the NSD content has been successfully uploaded to the NFVO (i.e. query or display NSD).	
	4	IOP Check	Verify that the NSD is considered ONBOARDED by the NFVO (i.e. query or display NSD)	
IOP Verdict				

6.1.2 INSTANTIATE

6.1.2.1 TD_NFV_NS_LCM_INSTANTIATE_001

			Interoperability Test Description				
Identifie	r	TD_NFV_	NS_LCM_INSTANTIATE_001				
Test Purpo	ose	Verify tha	t an NS can be successfully instantiated				
Configurat	tion	SUT_MUL SUT_S-VN	IT_SINGLE-VENDOR_NS IT_MULTI-VENDOR_NS IT_S-VNFM IT_AUTO-LCM-VALIDATION				
Referenc	es	[IFA007] C [IFA006] C [IFA005] C [SOL005] [SOL003]	Clause 7.3.3 Clause 7.2.3 Clauses 7.3, 7.4, 7.5 Clauses 7.3, 7.4, 7.5 Clause 6.3 Clause 5.4.4 Clause 9.4.2				
Applicabi	lity						
	* NSD, and VNF Package(s) have been on-boarded in NFVO (TD_NFV_ONBOARD_NSD_00 TD_NFV_ONBOARD_VNF_PKG_001) * The software image is reachable by the VIM * The required resources are available on the NFVI			001,			
	Step	Туре	Description	Result			
	1	Stimulus	Trigger NS instantiation in NFVO (i.e. create new NS instance resource and instantiate it)				
Test Sequence	2	IOP Check	Verify that the VNFM receives instantation requests for the VNFs composing the given NS				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the VNFs composing the given NS in the VIM				

			If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the VNFs composing the given NS	
	4	IOP Check	Verify that the requested resources have been allocated in the VIM according to the descriptors	
	5	IOP Check	Verify that the VNF(s) are running and reachable through the management network	
	6	IOP Check	Verify that the initial VNF(s) configuration has been successfully applied	
	7	IOP Check	Verify that the VNF instances composing the given NS are considered INSTANTIATED by the VNFM	
	8	IOP Check	Verify that the NS instance is considered INSTANTIATED by the NFVO (i.e. query or display the NS instance resource)	
	9	IOP Check	Verify that the NS is successfully instantiated by running the end-to-end functional test	
IOP Verdict				

6.1.3 SCALE NS

6.1.3.1 SCALE NS MANUALLY

6.1.3.1.1 TD_NFV_NS_LCM_SCALE_OUT_001

			Interoperability Test Description					
Identifie	r	TD_NFV_I	D_NFV_NS_LCM_SCALE_OUT_001					
Test Purpo	se	To verify	o verify that a NS can be successfully scaled out (Scale_NS) by an operator					
Configurat	ion	SUT_MUL SUT_S-VN	UT_SINGLE-VENDOR_NS UT_MULTI-VENDOR_NS UT_S-VNFM UT_AUTO-LCM-VALIDATION					
Reference		[IFA013] Clause 7.3.3 [IFA007] Clause 7.2.4 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [SOL005] Clause 6.3 [SOL003] Clause 5.4.4 [SOL002] Clause 9.4.2						
Applicabil	ity		V_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances V_NS_10] NS can scale out/in by adding/removing VNF instances (Scale_NS)					
Pre-test condition		* NS is ins	tantiated (TD_NFV_NS_LCM_INSTANTIATE_001)					
Test Sequence	Step	Туре	Description	Result				
004	1	Stimulus	Trigger NS scale out (Scale_NS) in NFVO with an operator request					
	2	IOP Check	Verify that the VNFM receives instantiation request for the additional VNF(s) to be deployed for the given NS					
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM					

			If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs	
	4	IOP Check	Verify that the additional resources have been allocated in the VIM according to the descriptors	
	5	IOP Check	Verify that the additional VNF instance(s) are running and reachable from the management network	
	6	IOP Check	Verify that the initial configuration for the additional VNF(s) has been successfully applied	
	7	IOP Check	Verify that the additional VNF instance(s) in the NS are considered INSTANTIATED by the VNFM	
	8	IOP Check	Verify in the NFVO that the NS has been scaled out (i.e. query or display the NS instance resource)	
	9	IOP Check	Verify that NS is functional by running the end-to-end functional test	
IOP Verdict				

6.1.3.1.2 TD_NFV_NS_LCM_SCALE_IN_001

			Interoperability Test Description					
Identifie	r	TD_NFV_	NS_LCM_SCALE_IN_001					
Test Purpo	ose	To verify	that a NS can be successfully scaled in (Scale_NS) by an operator					
Configurat	ion	SUT_MUL SUT_S-VN	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_AUTO-LCM-VALIDATION					
Reference	es	[IFA013] Clause 7.3.3 [IFA007] Clause 7.2.4 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [SOL005] Clause 6.3 [SOL003] Clause 5.4.8						
Applicabil	ity		V_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances V_NS_10] NS can scale out/in by adding/removing VNF instances (Scale_NS)					
Pre-test condition		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * The current NS deployment state allows for NS scale_in operation						
Test Sequence	Step	Туре	Description	Result				
Ocquemoc	1	Stimulus	Trigger NS scale in (Scale_NS) in NFVO with an operator request					
	2	IOP Check	Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS					
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs					
	4	IOP Check	Verify that the impacted VNF related resources have been released in the VIM by the VNFM					
	5	IOP Check	Verify that the remaining VNF instances(s) are still running and reachable through the management network					
	6	IOP Check	Verify in the NFVO that the NS has been scaled in (i.e. query or display the NS instance resource)					

	7	IOP Check	Verify that NS is functional by running the end-to-end functional test	
IOP Verdict				

6.1.3.2 SCALE NS FROM VNF INDICATOR

6.1.3.2.1 TD_NFV_NS_LCM_SCALE_OUT_002a

			Interoperability Test Description				
Identifie	r	TD_NFV_N	IS_LCM_SCALE_OUT_002a				
Test Purpo	se		o verify that a NS can be successfully scaled out (Scale_NS) automatically by a \mbox{N} andicator notification				
Configurat	ion	SUT_MULT SUT_S-VN SUT_MULT	UT_SINGLE-VENDOR_NS UT_MULTI-VENDOR_NS UT_S-VNFM UT_MULTISITE UT_AUTO-LCM-VALIDATION				
Reference	es	[IFA005] (Clause 7.3, 7.4, 7) [IFA006] (Clause 7.3, 7.4, 7.5) [IFA007] (Clause 7.2.4) [IFA008] (Clause 6.3.3) [SOL003] Clause 5.4.4 [SOL002] Clause 8.4.7, 9.4.2[
Applicabil	ity	* [IFS_NFV	_NFVO_14] NFVO supports automatic NS scaling out/in triggered by VNF Indica _NFVO_5] NFVO supports NS scaling by adding/removing VNF instances _NS_3] NS can scale by adding/removing VNF instances (Scale_NS)	ators			
Pre-test condition		* NFVO is s (TD_NFV_\	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) subscribed to the targeted VNF Indicator notifications VNF_INDICATOR_NOTIFICATION_001) configured to trigger SCALE OUT (Scale_NS) when a given VNF Indicator value reshold	crosses			
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the VNF to send the VNF indicator value change notifications until the	rooun			
			configured threshold is crossed				
	2	IOP Check					
	3		configured threshold is crossed Verify that the VNFM receives instantiation request from the NFVO for the				
		IOP Check	configured threshold is crossed Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the				
	3	IOP Check	configured threshold is crossed Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according				
	3 4	IOP Check IOP Check	Configured threshold is crossed Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through				
	4 5	IOP Check IOP Check IOP Check	configured threshold is crossed Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through the management network Verify that the initial configuration for the additional VNF(s) has been				
IOP Verdict	3 4 5 6	IOP Check IOP Check IOP Check IOP Check	Configured threshold is crossed Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through the management network Verify that the initial configuration for the additional VNF(s) has been successfully applied Verify in the NFVO that the NS has been successfully scaled out (i.e. query or				

6.1.3.2.2 TD_NFV_NS_LCM_SCALE_IN_002a

			Interoperability Test Description				
Identifie	r	TD_NFV_	NS_LCM_SCALE_IN_002a				
Test Purpo	ose	To verify the Indicator n	nat a NS can be successfully scaled in (Scale_NS) automatically by a VN otification	NF			
Configurat	ion	SUT_MULT SUT_S-VN SUT_MULT	JT_SINGLE-VENDOR_NS JT_MULTI-VENDOR_NS JT_S-VNFM JT_MULTISITE JT_AUTO-LCM-VALIDATION				
Reference	es	[IFA006] (C [IFA007] (C [IFA008] (C	lause 7.3, 7.4, 7.5) lause 7.3, 7.4, 7.5) lause 7.2.4) lause 6.3.3) clause 5.4.4				
Applicabil	lity	* [IFS_NFV_NFVO_14] NFVO supports automatic NS scaling out/in triggered by VNF Indi * [IFS_NFV_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances * [IFS_NFV_NS_3] NS can scale by adding/removing VNF instances (Scale_NS)					
		T .					
Pre-test condition		* NFVO is s (TD_NFV_\ * NFVO is c certain thre	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) subscribed to the targeted VNF Indicator notifications VNF_INDICATOR_NOTIFICATION_001) configured to trigger SCALE IN (Scale_NS) when a given VNF Indicator value croshold int NS deployment state allows for NS scale_in operation	osses a			
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the VNF to send the targeted VNF indicator notification until the configured threshold is crossed				
	2	IOP Check	Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS				
	3	IOP Check	 If VNFM is in direct mode: Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs 				
	4	IOP Check	Verify that the impacted VNF related resources have been released in 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 in the NFVO that the NS has been successfully scaled in (i.e. query or display the NS instance resource)				
	7	IOP Check	Verify that NS is functional by running the end-to-end functional test				
IOP Verdict							

6.1.3.2.3 TD_NFV_NS_LCM_SCALE_OUT_002b

Interoperability Test Description

Identifier		TD_NFV_NS_LCM_SCALE_OUT_002b					
Test Purpo	ose	To verify that a NS can be successfully scaled out (Scale_NS) automatically by querying a VNF Indicator					
Configuration		SUT_MUL SUT_S-VN SUT_MUL	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
References		[IFA006] (0 [IFA007] (0 [IFA008] (0 [SOL003]	[IFA005](Clause 7.3, 7.4, 7.5) [IFA006] (Clause 7.3, 7.4, 7.5) [IFA007] (Clause 7.2.4) [IFA008] (Clause 6.3.4) [SOL003] Clause 5.4.4 [SOL002] Clause 8.4.2, 9.4.2				
Applicabi	lity	* [IFS_NF	V_NFVO_14] NFVO supports automatic NS scaling out/in triggered by VNF Indicative V_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances V_NS_3] NS can scale by adding/removing VNF instances (Scale_NS)	ators			
Pre-test conditions		* NFVO is NS_CREA * NFVO is	* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * NFVO is monitoring the given VNF indicator (TD_NFV_PM_ NS_CREATE_MONITORING_JOB_001) * NFVO is configured to trigger SCALE OUT (Scale_NS) when a given VNF Indicator value crosses a certain threshold				
	T			I			
Test Sequence	Step		Description	Result			
	Step 1	Type Stimulus	Description In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation	Result			
			In the VNF, trigger the target VNF indicator to cross the configured auto-scaling	Result			
	1	Stimulus	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation Verify that the VNFM receives instantiation request from the NFVO for the				
	1 2	Stimulus IOP Check IOP	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the				
	3	Stimulus IOP Check IOP Check	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to				
	3	Stimulus IOP Check IOP Check IOP Check IOP	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through				
	3 4 5	Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through the management network Verify that the initial configuration for the additional VNF(s) has been				
	1 2 3 4 5 6	Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check IOP	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through the management network Verify that the initial configuration for the additional VNF(s) has been successfully applied Verify in the NFVO that the NS has been successfully scaled out (i.e. query or				

6.1.3.2.4 TD_NFV_NS_LCM_SCALE_IN_002b

Interoperability Test Description				
Identifier	TD_NFV_NS_LCM_SCALE_IN_002b			
Test Purpose	To verify that a NS can be successfully scaled in (Scale_NS) automatically by querying a VNF Indicator			
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS			

		SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
References		[IFA005] C [IFA006] C [IFA007] C [IFA008] C [SOL003]	SUT_AUTO-LCM-VALIDATION [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2 [IFA008] Clause 6.3 [SOL003] Clause 5.4.4 [SOL002] Clause 8.4.2				
Applicability		* [IFS_NF\	V_NFVO_14] NFVO supports automatic NS scaling out/in triggered by VNF Indica v_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances V_NS_3] NS can scale by adding/removing VNF instances (Scale_NS)	ators			
conditions		* NFVO is NS_CREA * NFVO is certain thre	* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * NFVO is monitoring the given VNF indicator (TD_NFV_PM_ NS_CREATE_MONITORING_JOB_001) * NFVO is configured to trigger SCALE IN (Scale_NS) when a given VNF Indicator value crosses a certain threshold * The current NS deployment state allows for NS scale in operation				
Test	Step	Туре	Description	Result			
Test Sequence	Step 1		Description In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale in operation	Result			
			In the VNF, trigger the target VNF indicator to cross the configured auto-scaling	Result			
	1	Stimulus	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale in operation Verify that the VNFM receives terminate request from the NFVO for the VNF(s)	Result			
	1 2	Stimulus IOP Check IOP	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale in operation Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the	Result			
	2	Stimulus IOP Check IOP Check	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale in operation Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs	Result			
	3	Stimulus IOP Check IOP Check IOP Check IOP	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale in operation Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs 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	Result			
	3	Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale in operation Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs 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 through the management network Verify in the NFVO that the NS has been successfully scaled in (i.e. query or	Result			

6.1.3.3 SCALE NS FROM VIM PERFORMANCE METRIC

6.1.3.3.1 TD_NFV_NS_LCM_SCALE_OUT_003

	Interoperability Test Description
Identifier	TD_NFV_NS_LCM_SCALE_OUT_003
Test Purpose	To verify that a NS can be successfully scaled out (Scale_NS) automatically by a VIM Performance Metric
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE

		SUT_AUT	O-LCM-VALIDATION			
[IFA006 [IFA007 [SOL00			Clause 7.3, 7.4, 7.5, 7.7 Clause 7.3, 7.4, 7.5, 7.7 Clause 7.2.4 Clause 5.4.4 Clause 9.4.2			
Applicability		* [IFS_NF\ metrics * [IFS_NF\ VIM	* [IFS_NFV_NFVO_11] NFVO supports receiving performance metrics from VNFM * [IFS_NFV_NFVO_15] NFVO supports automatic NS scaling out/in triggered by performance metrics * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from			
conditions * NF NS_ * NF		* NFVO is NS_CREA * NFVO is	tantiated (TD_NFV_NS_LCM_INSTANTIATE_001) monitoring the given VIM performance metric (TD_NFV_PMTE_MONITORING_JOB_001 configured to trigger SCALE OUT (Scale_NS) when a given VIM Performance Moses a certain threshold	etric		
Test						
Sequence	Step 1	Type Stimulus	Description Trigger the VIM to send the targeted Performance Metric until the configured	Result		
	'	Ottillalas	threshold is crossed			
			tilleshold is crossed			
	2	IOP Check	Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS			
	3	_	Verify that the VNFM receives instantiation request from the NFVO for the			
		Check IOP	Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the			
	3	Check IOP Check	Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to			
	3	IOP Check IOP Check IOP	Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through			
	3 2 3	IOP Check IOP Check IOP Check	Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through the management network Verify that the initial configuration for the additional VNF(s) has been			
	3 2 3 4	IOP Check IOP Check IOP Check IOP Check IOP	Verify that the VNFM receives instantiation request from the NFVO for the additional VNF(s) to be deployed for the given NS If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNF instance(s) are running and reachable through the management network Verify that the initial configuration for the additional VNF(s) has been successfully applied Verify in the NFVO that the NS has been successfully scaled out (i.e. query or			

6.1.3.3.2 TD_NFV_NS_LCM_SCALE_IN_003

	Interoperability Test Description
Identifier	TD_NFV_NS_LCM_SCALE_IN_003
Test Purpose	To verify that a NS can be successfully scaled in (Scale_NS) automatically by a VIM Performance Metric
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION
References	[IFA005] Clause 7.3, 7.4, 7.5, 7.7 [IFA006] Clause 7.3, 7.4, 7.5, 7.7

			[IFA007] Clause 7.2 [SOL003] Clause 5.4.4				
Applicability		* [IFS_NFV_NFVO_11] NFVO supports receiving performance metrics from VNFM * [IFS_NFV_NFVO_15] NFVO supports automatic NS scaling out/in triggered by performance metrics * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM * [IFS_NFV_NS_10] NS can scale out/in by adding/removing VNF instances (Scale_NS)					
Pre-test condition		* NFVO is NS_CREA * NFVO is value cross	tantiated (TD_NFV_NS_LCM_INSTANTIATE_001) monitoring the given VIM performance metric (TD_NFV_PM_ TE_MONITORING_JOB_001) configured to trigger SCALE IN (SCALE_NS) when a given VIM Perfromance Meses a certain threshold ent NS deployment state allows for NS scale_in operation	etric			
Test Sequence	Step	Туре	Description	Result			
	1	Stimulus	Trigger the VIM to send the targeted Performance Metric until the configured threshold is crossed				
	2	IOP Check	Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs				
	2	IOP Check	Verify that the impacted VNF related resources have been released in the VIM				
	3	IOP Check	Verify that the remaining VNF instances(s) are still running and reachable through the management network				
	4	IOP Check	Verify in the NFVO that the NS has been successfully scaled in (i.e. query or display the NS instance resource)				
	5	IOP Check	Verify that NS is functional by running the end-to-end functional test				
IOP Verdict							

6.1.4 SCALE VNF

6.1.4.1 SCALE VNF MANUALLY

6.1.4.1.1 TD_NFV_NS_LCM_SCALE_OUT_VNF_001

	Interoperability Test Description
Identifier	TD_NFV_NS_LCM_SCALE_OUT_VNF_001
Test Purpose	To verify that a VNF in a NS can be successfully scaled out (Scale VNF) by an operator
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_AUTO-LCM-VALIDATION
References	[IFA013] Clause 7.3 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2

Applicabil	ity	[SOL005] Clause 6.3 [SOL003] Clause 5.4.5 [SOL002] Clause 9.4.2 * [IFS_NFV_VNFM_4] VNFM supports VNF scaling in/out by adding/removing VNFC instances * [IFS_NFV_VNF_3] VNF can scale out/in by adding/removing VNFC instances (Scale_VNF)			
Pre-test condition		* NS is inst	tantiated (TD_NFV_NS_LCM_INSTANTIATE_001)		
Test Seguence	Step	Туре	Description	Result	
Sequence	1	Stimulus	Trigger NS scale out (Scale_VNF) in NFVO with an operator request		
	2	IOP Check	Verify that the VNFM receives from the NFVO scale out request for the impacted VNF in the given NS		
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s)		
	4	IOP Check	Verify that the additional resources have been allocated in the VIM according to the descriptors		
	5	IOP Check	Verify that the additional VNFC(s) are running and are reachable through the management network		
	6	IOP Check	Verify that the initial configuration for the additional VNFC(s) has been successfully applied		
	7	IOP Check	Verify from the NFVO that the VNF in the NS has been scaled out as requested (i.e. query or display the NS instance resource)		
	8	IOP Check	Verify that NS is functional by running the end-to-end functional test		
IOP Verdict					

6.1.4.1.2 TD_NFV_NS_LCM_SCALE_IN_VNF_001

	Interoperability Test Description
Identifier	TD_NFV_NS_LCM_SCALE_IN_VNF_001
Test Purpose	Verify that a VNF in a NS can be successfully scaled in (Scale VNF) by an operator
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_AUTO-LCM-VALIDATION
References	[IFA013] Clause 7.3 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2 [SOL005] Clause 6.3 [SOL003] Clause 5.4.5
Applicability	* [IFS_NFV_VNFM_4] VNFM supports VNF scaling in/out by adding/removing VNFC instances * [IFS_NFV_VNF_3] VNF can scale out/in by adding/removing VNFC instances (Scale_VNF)
Pre-test conditions	* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * The current VNF deployment state allows for scale_in operation (Scale_VNF)

Test Sequence	Step	Туре	Description	Result
Coquonico	1	Stimulus	Trigger NS scale in (Scale_VNF) in NFVO with an operator request	
	2	IOP Check	Verify that the VNFM receives from the NFVO scale in operation for the impacted VNF in the given NS	
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources related to the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling in of the impacted VNF(s)	
	4	IOP Check	Verify that the impacted VNFC related resources have been released in the VIM	
	5	IOP Check	Verify that the remaining VNFC(s) are still running and reachable through the management network	
	6	IOP Check	Verify from the NFVO that the VNF in the NS has been scaled in (i.e. query or display the NS instance resource)	
	7	IOP Check	Verify that NS is functional by running the end-to-end functional test	
IOP Verdict				

6.1.4.2 SCALE VNF FROM VNF INDICATOR - OPTIONAL

6.1.4.2.1 TD_NFV_NS_LCM_SCALE_OUT_VNF_002a

			Interoperability Test Description					
Identifie	r	TD_NFV_N	NS_LCM_SCALE_OUT_VNF_002a					
Test Purpo	ose	,	o verify that a VNF in a NS can be successfully scaled out (Scale_VNF) automatically a VNF Indicator notification					
Configurat	Configuration SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION							
Reference	es	[IFA006] C [IFA007] C [IFA008] C [SOL003] (
Applicabil	lity	* [IFS_NF\ VNF/EM * [IFS_NF\	V_VNFM_4] VNFM supports VNF scaling out/in by adding/removing VNFC instanty_VNFM_15] VNFM supports automatic VNF scaling triggered by VNF indicatorsy VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VNY_VNF_6] VNF can send VNF Indicators to VNFM (notifications)	from				
Pre-test conditions		* VNFM is _VNF_IND * VNFM is	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) subscribed to the targeted VNF Indicator notifications (TD_NFV ICATOR_SUBSCRIPTION_001) configured to trigger SCALE OUT (Scale_VNF) when a given VNF Indicator valuertain threshold	e				
Test Sequence	Step	Туре	Description	Result				
304401100	1	Stimulus	Trigger the VNF to send the VNF value change indicator notifications until the configured threshold is crossed					

	2	IOP Check	Verify that the VNFM starts scale out procedure for the impacted VNF	
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s)	
	2	IOP Check	Verify that the additional resources have been allocated in the VIM according to the descriptors	
	3	IOP Check	Verify that the additional VNFC(s) for the scaled VNF are running and are reachable through the management network	
	4	IOP Check	Verify that the initial configuration for the additional VNFC(s) has been successfully applied	
	5	IOP Check	Verify from the NFVO that the VNF in the NS has been successfully scaled out (i.e. query or display the NS instance resource)	
	6	IOP Check	Verify that NS is fuctional by running the end-to-end functional test	
IOP Verdict				

6.1.4.2.2 TD_NFV_NS_LCM_SCALE_IN_VNF_002a

Interoperability Test Description								
Identifie	r	TD_NFV_NS_LCM_SCALE_IN_VNF_002a						
			To verify that a VNF in a NS can be successfully scaled in (Scale_VNF) automatically by a VNF Indicator notification					
Configurat	ion	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION						
References		[IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5) [IFA007] Clause 7.2 [IFA008] Clause 6.3 [SOL003] Clause 5.4.5 [SOL 002] Clause 8.4.7						
Applicability		* [IFS_NFV_VNFM_4] VNFM supports VNF scaling out/in by adding/removing VNFC instances * [IFS_NFV_VNFM_15] VNFM supports automatic VNF scaling triggered by VNF indicators from VNF/EM * [IFS_NFV_VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VNF) * [IFS_NFV_VNF_6] VNF can send VNF Indicators to VNFM (notifications)						
Pre-test conditions		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * VNFM is subscribed to the targeted VNF Indicator notifications (TD_NFV _VNF_INDICATOR_SUBSCRIPTION_001) * VNFM is configured to trigger SCALE IN (Scale_VNF) when a given VNF Indicator value crosses a certain threshold * The current VNF deployment state allows for scale_in operation (Scale_VNF)						
Test Sequence	Step	Туре	Description	Result				
ocquenice	1	Stimulus	Trigger the VNF to send the VNF value change indicator notifications until the configured threshold is crossed					
	2	IOP Check	Verify that the VNFM starts the scale in operation for the impacted VNF(s)					

IOP Verdict				
	6	IOP Check	Verify that NS is functional by running the end-to-end functional test	
	5	IOP Check	Verify from the NFVO that the VNF in the NS has been successfully scaled in (i.e. query or display the NS instance resource)	
	4	IOP Check	Verify that the remaining VNFC(s) of the scaled VNF are still running and reachable through the management network	
	3	IOP Check	Verify that the impacted VNFC related resources have been released in the VIM	
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources related to the impacted VNF(s) If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling in of the impacted VNF(s)	

6.1.4.2.3 TD_NFV_NS_LCM_SCALE_OUT_VNF_002b

			Interoperability Test Description				
Identifie	r	TD_NFV_N	NS_LCM_SCALE_OUT_VNF_002b				
Test Purpo	ose		hat a VNF in a NS can be successfully scaled out (Scale_VNF) automating a VNF Indicator	cally			
Configurat	ion	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
Referenc	es	[IFA006] CI [IFA007] CI [IFA008] CI [SOL003] CI					
Applicabil	lity	* [IFS_NFV VNF/EM * [IFS_NFV	'_VNFM_4] VNFM supports VNF scaling out/in by adding/removing VNFC instancy '_VNFM_15] VNFM supports automatic VNF scaling triggered by VNF indicators '_VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VN/_VNF_6] VNF can send VNF Indicators to VNFM	from			
Pre-test condition		* NFVO is I NS_CREA* * VNFM is	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) monitoring the given VNF indicator (TD_NFV_PM_ TE_MONITORING_JOB_001) configured to trigger SCALE OUT (Scale_VNF) when a given VNF Indicator value certain threshold	e			
_							
Test Sequence	Step	Туре	Description	Result			
	1	Stimulus	In the VNF, trigger the target VNF indicator to cross the configured auto-scaling threshold value for scale out operation				
	2	IOP Check	Verify that the VNFM starts scale out procedure for the impacted VNF after collecting the new VNF indicator value				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s)				

	4	IOP Check	Verify that the additional resources have been allocated in the VIM according to the descriptors	
	5	IOP Check	Verify that the additional VNFC(s) for the scaled VNF are running and are reachable through the management network	
	6	IOP Check	Verify that the initial configuration for the additional VNFC(s) has been successfully applied	
	7	IOP Check	Verify from the NFVO that the VNF in the NS has been successfully scaled out (i.e. query or display the NS instance resource)	
	8	IOP Check	Verify that NS is functional by running the end-to-end functional test	
IOP Verdict				

6.1.4.2.4 TD NFV NS LCM SCALE IN VNF 002b

6.1.4.2.4 TE		TD_NFV	_NS_LCM_SCALE_IN_VNF_002b				
			Interoperability Test Description				
Identifie	r	TD_NFV_NS_LCM_SCALE_IN_VNF_002b					
Test Purpo	se		To verify that a VNF in a NS can be successfully scaled in (Scale_VNF) automatically by querying a VNF Indicator				
Configurat	ion	SUT_MULT SUT_S-VN SUT_MULT					
Reference	ės	[IFA006] C [IFA007] C [IFA008] C [SOL003] (FA005] Clause 7.3, 7.4, 7.5 FA006] Clause 7.3, 7.4, 7.5 FA007] Clause 7.2 FA008] Clause 6.3 SOL003] Clause 5.4.5 SOL002] Clause 8.4.2				
Applicabil	ity	* [IFS_NF\ VNF/EM * [IFS_NF\	NFV_VNFM_4] VNFM supports VNF scaling out/in by adding/removing VNFC instances NFV_VNFM_15] VNFM supports automatic VNF scaling triggered by VNF indicators from NFV_VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VNF) NFV_VNF_6] VNF can send VNF Indicators to VNFM				
Pre-test condition		* NFVO is NS_CREA * NFVO is a certain th	tantiated (TD_NFV_NS_LCM_INSTANTIATE_001) monitoring the given VNF indicator (TD_NFV_PM_ TE_MONITORING_JOB_001) configured to trigger SCALE IN (Scale_VNF) when a given VNF Indicator value or the state allows for scale_in operation (Scale_VNF)	crosses			
Test Sequence	Step	Туре	Description	Result			
	1	Stimulus	In the VNF, trigger the target VNF indicator to cross the configured auto- scaling threshold value for scale in operation				
	2	IOP Check	Verify that the VNFM starts the scale in operation for the impacted VNF after collecting the new VNF indicator value				
	3	IOP Check	If VNFM is in direct mode: Verify that the VNFM is granted by the NFVO to delete the virtualised resources related to the impacted VNF(s) If VNFM is in indirect mode: Verify that the VNFM is granted by the NFVO to manage the scaling in of the impacted VNF(s)				
	4	IOP Check	Verify that the impacted VNFC related resources have been released by the VIM				

	5		Verify that the remaining VNFC(s) for the scaled VNF are still running and reachable through the management network	
	6		Verify in the NFVO that the NS has been successfully scaled in (i.e. query or display the NS instance resource)	
	7	IOP Check	Verify that NS is functional by running the end-to-end functional test	
IOP Verdict				

6.1.4.3 SCALE VNF FROM VIM PERFORMANCE METRIC - OPTIONAL

6.1.4.3.1 TD_NFV_NS_LCM_SCALE_OUT_VNF_003

			Interoperability Test Description				
Identifie	r	TD_NFV_N	D_NFV_NS_LCM_SCALE_OUT_VNF_003				
Test Purpo	se		o verify that a VNF in a NS can be successfully scaled out (Scale_VNF) automatically by a VIM Performance Metric				
Configurat	ion	SUT_MUL' SUT_S-VN SUT_MUL'					
References		[IFA006] C [IFA007] C [SOL003] (IFA005] Clause 7.3, 7.4, 7.5, 7.7 IFA006] Clause 7.3, 7.4, 7.5, 7.7 IFA007] Clause 7.2 SOL003] Clause 5.4.5 SOL002] Clause 9.4.2				
Applicabil	ity	* [IFS_NF\ from VIM * [IFS_NF\	* [IFS_NFV_VNFM_4] VNFM supports VNF scaling out/in by adding/removing VNFC instances * [IFS_NFV_VNFM_18] VNFM supports automatic scaling out/in triggered by performance metrics from VIM * [IFS_NFV_VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VNF) * [IFS_NFV_VNF_6] VNF can send VNF Indicators to VNFM (notifications)				
Pre-test condition		* VNFM is NS_CREA * VNFM is	tantiated (TD_NFV_NS_LCM_INSTANTIATE_001) monitoring the given VIM performance metric (TD_NFV_PM_ TE_MONITORING_JOB_001) configured to trigger SCALE OUT (Scale_VNF) when a given VIM Performance ses a certain threshold	Metric			
Test Sequence	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger the VIM to send the targeted Performance Metric until the configured threshold is crossed				
	2	IOP Check	Verify that the VNFM starts scale out procedure for the impacted VNF after collecting the new VIM metric				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s)				
	2	IOP Check	Verify that the additional resources have been allocated in the VIM according to the descriptors				

	3	IOP Check	Verify that the additional VNFC(s) are running and are reachable through the management network	
	4	IOP Check	Verify that the initial configuration for the additional VNFC(s) has been successfully applied	
	5	IOP Check	Verify from the NFVO that the VNF in the NS has been successfully scaled out (i.e. query or display the NS instance resource)	
	6	IOP Check	Verify that NS is fuctional by running the end-to-end functional test	
IOP Verdict				

6.1.4.3.2 TD_NFV_NS_LCM_SCALE_IN_VNF_003

6.1.4.3.2		ID_NFV	_NS_LCM_SCALE_IN_VNF_003				
			Interoperability Test Description				
Identifie	r	TD_NFV_N	NS_LCM_SCALE_IN_VNF_003				
· · · · · · · · · · · · · · · · · · ·		•	nat a VNF in a NS can be successfully scaled in (Scale_VNF) automatically by brmance Metric				
SUT SUT SUT		SUT_MULT SUT_S-VN SUT_MULT	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference	es	[IFA006] C [IFA007] C	lause 7.3, 7.4, 7.5, 7.7 lause 7.3, 7.4, 7.5, 7.7 lause 7.2 Clause 5.4.5				
Applicabil	lity	* [IFS_NFV_VNFM_4] VNFM supports VNF scaling out/in by adding/removing VNFC instances * [IFS_NFV_VNFM_18] VNFM supports automatic scaling out/in triggered by performance metrics from VIM * [IFS_NFV_VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VNF) * [IFS_NFV_VNF_6] VNF can send VNF Indicators to VNFM (notifications)					
Pre-test condition		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * VNFM is monitoring the given VIM performance metric (TD_NFV_PM_ NS_CREATE_MONITORING_JOB_001) * VNFM is configured to trigger SCALE IN (Scale_VNF) when a given VIM Performance Metric value crosses a certain threshold * The current VNF deployment state allows for VNF scale_in operation (Scale_VNF)					
Test Sequence	Step	Туре	Description	Result			
	1	Stimulus	Trigger the VIM to send the targeted Performance Metric until the configured threshold is crossed				
	2	IOP Check	Verify that the VNFM starts the scale in operation for the impacted VNF after collecting the new VNF indicator value				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources related to the impacted VNF(s) If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling in of the impacted VNF(s)				
	3	IOP Check	Verify that the impacted VNFC related resources have been released by the VIM				
	4	IOP Check	Verify that the remaining VNFC(s) are still running and reachable through the management network				
	5	IOP Check	Verify from the NFVO that the VNF in the NS has been successfully scaled in (i.e. query or display the NS instance resource)				

	6	IOP Check	Verify that NS is functional by running the end-to-end functional test	
IOP Verdict				

6.1.4.4 SCALE VNF FROM VNF/EM REQUEST

6.1.4.4.1 TD_NFV_NS_LCM_SCALE_OUT_VNF_004

Interoperability Test Description							
Identifie	r	TD_NFV_N	NS_LCM_SCALE_OUT_VNF_004				
Test Purpo	=		To verify that a VNF in a NS can be successfully scaled out (Scale_VNF) by a request from the VNF/EM				
Configuration		SUT_MUL' SUT_S-VN SUT_MUL'	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference	es	[IFA006] C [IFA007] C [IFA008] C	[IFA005] Clause 7.3.1.2, 7.4.1.2, 7.5.1.2, 7.7 [IFA006] Clause 7.3.1.2, 7.4.1.2, 7.5.1.2, 7.7 [IFA007] Clause 7.2.4 [IFA008] Clause 7.2.4 [SOL002] Clause 5.4.5, 9.4.2				
Applicabil	ity	* [IFS_NF\	V_VNFM_6] VNFM supports VNF scaling out/in request from VNF/EM V_VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VIV_VNF_5] VNF/EM can request scaling to VNFM	NF)			
Dro toot		* NC in ince	toptioted /TD NEV NC LOW INCTANTIATE 004)				
Pre-test condition		INO IS ITISI	tantiated (TD_NFV_NS_LCM_INSTANTIATE_001)				
Test Seguence	Step	Туре	Description	Result			
Test Sequence	Step 1	Type Stimulus	Description Trigger the VNF/EM to send a VNF scale out request to the VNFM	Result			
			·	Result			
	1	Stimulus	Trigger the VNF/EM to send a VNF scale out request to the VNFM Verify that the VNFM receives from the VNF/EM a scale out request for the	Result			
	1 2	Stimulus IOP Check IOP	Trigger the VNF/EM to send a VNF scale out request to the VNFM Verify that the VNFM receives from the VNF/EM a scale out request for the impacted VNF If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling	Result			
	3	Stimulus IOP Check IOP Check	Trigger the VNF/EM to send a VNF scale out request to the VNFM Verify that the VNFM receives from the VNF/EM a scale out request for the impacted VNF If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s) Verify that the additional resources have been allocated in the VIM according	Result			
	3	IOP Check IOP Check IOP Check IOP Check IOP Check	Trigger the VNF/EM to send a VNF scale out request to the VNFM Verify that the VNFM receives from the VNF/EM a scale out request for the impacted VNF If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s) Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNFC(s) are running and are reachable through the management network Verify that the initial configuration for the additional VNFC(s) has been successfully applied	Result			
	1 2 3 4 5	Stimulus IOP Check IOP Check IOP Check IOP Check IOP	Trigger the VNF/EM to send a VNF scale out request to the VNFM Verify that the VNFM receives from the VNF/EM a scale out request for the impacted VNF If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s) Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNFC(s) are running and are reachable through the management network Verify that the initial configuration for the additional VNFC(s) has been	Result			
	1 2 3 4 5	Stimulus IOP Check IOP Check IOP Check IOP Check IOP Check IOP Check IOP	Trigger the VNF/EM to send a VNF scale out request to the VNFM Verify that the VNFM receives from the VNF/EM a scale out request for the impacted VNF If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s) Verify that the additional resources have been allocated in the VIM according to the descriptors Verify that the additional VNFC(s) are running and are reachable through the management network Verify that the initial configuration for the additional VNFC(s) has been successfully applied Verify from the NFVO that the VNF has been scaled out as requested (i.e.	Result			

6.1.4.4.2 TD_NFV_NS_LCM_SCALE_IN_VNF_004

			Interoperability Test Description				
Identifier		TD_NFV_N	NS_LCM_SCALE_IN_VNF_004				
Test Purpose		To verify that a VNF in a NS can be successfully scaled in (Scale_VNF) by a request from the VNF/EM					
Configuration		SUT_MUL SUT_S-VN SUT_MUL	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
References		[IFA006] C [IFA007] C [IFA008] C	[IFA005] Clause 7.3.1.2, 7.4.1.2, 7.5.1.2, 7.7 [IFA006] Clause 7.3.1.2, 7.4.1.2, 7.5.1.2, 7.7 [IFA007] Clause 7.2.4 [IFA008] Clause 7.2.4 [SOL002] Clause 5.4.5				
Applicabil	ity	* [IFS_NF\	* [IFS_NFV_VNFM_6] VNFM supports VNF scaling out/in request from VNF/EM * [IFS_NFV_VNF_3] VNF can scale out/in by adding/removing VNFCs instances (Scale_VNF) * [IFS_NFV_VNF_5] VNF/EM can request scaling to VNFM				
Pre-test condition		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * The current VNF deployment state allows for scale_in operation (Scale_VNF)					
_	ı						
Test Sequence	Step	Туре	Description	Result			
	1	Stimulus	Trigger the VNF/EM to send a scale in (by removing VNFC instances (VMs)) request to MANO				
	2	IOP Check	Verify that the VNFM receives from the VNF/EM scale in operation for the impacted VNF				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources related to the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling in of the impacted VNF(s)				
	4	IOP Check	Verify that the impacted VNFC related resources have been released in the VIM				
	5	IOP Check	Verify that the remaining VNFC(s) are still running and reachable through the management network				
	6	IOP Check	Verify from the NFVO that the VNF in the NS has been scaled in (i.e. query or display the NS instance resource)				
	7	IOP Check	Verify that NS is functional by running the end-to-end functional test				
IOP Verdict							

6.1.5 SCALE NS TO LEVEL

6.1.5.1 SCALE NS TO LEVEL MANUALLY

6.1.5.1.1 TD_NFV_NS_LCM_SCALE_TO_LEVEL_001

Interoperability Test Description

Identifi	er	TD_NFV_NS_L	NFV_NS_LCM_SCALE_TO_LEVEL_001							
Test Purp	ose		rify that a NS can be successfully scaled to another existing instantiation level cale_NS_to_level) by an operator							
Configura	ition	SUT_MULTI-V SUT_S-VNFM SUT_MULTISI	UT_SINGLE-VENDOR_NS UT_MULTI-VENDOR_NS UT_S-VNFM UT_MULTISITE UT_AUTO-LCM-VALIDATION							
Reference	ces	[IFA005] Clause [IFA006] Clause [IFA007] Clause [SOL005] Clause	[IFA013] Clause 7.3.4 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2 [SOL005] Clause 6.3 [SOL003] Clause 5.4.4, 5.4.8							
Applicab	ility	* [IFS_NFV_NF	FVO_5] NFVO supports NS scaling by adding/removing VNF instan- FVO_6] NFVO supports NS scale to level S_11] NS supports scale to level	ces						
Pre-tes conditio		* The NS initial	ated (TD_NFV_NS_LCM_INSTANTIATE_001) deployment size should support scaling to or from a specified level s of NS supports scale to level							
		T								
Test Sequence	Step		Description	Result						
-	1	Stimulus	Trigger NS scale to another existing instantiation level in NFVO with an operator request							
	2	IOP Check	Verify that the VNFM receives instantiation or termination request (according to the target scale level) for the impacted VNF(s)							
	3	IOP Check	If VNFM is in direct mode: Verify that the VNFM is granted by the NFVO to allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs							
	4	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors							
	5	IOP Check	Verify that all VNF instance(s) are running and reachable via the management network							
	6	IOP Check	Verify in the NFVO that the NS has been scaled as requested (i.e. query or display the NS instance resource)							
	7	IOP Check	Verify that NS is functional by running the end-to-end functional test							
IOP Verdict										

6.1.5.2 SCALE NS TO LEVEL FROM VNF INDICATOR

6.1.5.2.1 TD_NFV_NS_LCM_SCALE_TO_LEVEL_002

	Interoperability Test Description				
Identifier	TD_NFV_NS_LCM_SCALE_TO_LEVEL_002a				

Test Purp	ose	Verify that a NS car	n be successfully scaled to another existing instantiation level (VNF indicator	(Scale_NS_to_level)			
Configura	ation	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
References		[IFA005] Clause 7.3 [IFA006] Clause 7.3 [IFA007] Clause 7.2 [IFA008] Clause 6.3 [SOL005] Clause 6. [SOL003] Clause 5. [SOL002] Clause 9.	3, 7.4, 7.5 2 3 3 4.4, 5.4.8				
Applicab	ility	* [IFS_NFV_NFVO * [IFS_NFV_VNF_6 * [IFS_NFV_NS_10	* [IFS_NFV_NFVO_6] NFVO supports NS scale to level * [IFS_NFV_NFVO_14] NFVO supports automatic scaling triggered by VNF indicators * [IFS_NFV_VNF_6] VNF can send VNF Indicators to VNFM (notifications) * [IFS_NFV_NS_10] NS can scale out/in by adding/removing VNF instances (Scale_NS) * [IFS_NFV_NS_11] NS supports scale to level				
Pre-tes conditio		* The NS initial dep * NFVO is subscrib _VNF_INDICATOR * NFVO is configure certain threshold	(TD_NFV_SCALE-LEVEL_NS_LCM_INSTANTIATE_001) lloyment size should support scaling to or from a specified leve ed to the targeted VNF Indicator notifications (TD_NFV t_SUBSCRIPTION_001) ed to trigger "(Scale_NS_to_level)" when a given VNF indicator NS supports scale to level				
Test							
Sequence	Step 1	Stimulus	Trigger the VNF to send VNF indicator value change notifications until the configured threshold is crossed	Result			
	2	IOP Check	Verify that the VNFM receives from the NFVO instantiation or termination request (according to the target scale level) for the impacted VNF(s)				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to				
			allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs				
	2	IOP Check	allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted				
	2	IOP Check	allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs Verify that the virtualised resources have been allocated or				
			allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors Verify that all VNF instance(s) are running and reachable via				
IOP	3	IOP Check	allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors Verify that all VNF instance(s) are running and reachable via the management network Verify in the NFVO that the NS has been scaled as				

6.1.5.3 SCALE NS TO LEVEL FROM VIM PERFORMANCE METRIC - OPTIONAL

6.1.5.3.1 TD_NFV _NS_LCM_SCALE_TO_LEVEL_003

Interoperability Test Description

Identifi	er	TD_NFV_N	S_LCM_SCALE_TO_LEVEL_003		
Test Purp	ose		NS can be successfully scaled to another existing instantiation level y by a VIM Performance Metric	(Scale_NS_to_level)	
Configuration		SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION			
References		[IFA006] Cla [IFA007] Cla [SOL005] Cl			
Applicab	Applicability * [* [* [* [* [* [* [* [* [* [NFVO_6] NFVO supports NS scale to level NFVO_11] NFVO supports receiving performance metrics from VNF NFVO_15] NFVO supports automatic NS scaling out/in triggered by VNFM_11] VNFM supports receiving virtualised resource performance NS_10] NS can scale out/in by adding/removing VNF instances (Scales) NS_11] NS supports scale to level	performance metrics ce metrics from VIM	
Pre-tes conditio		*The NS init * NFVO is m _VNF_INDIG * NFVO is concresses a concresses a concresses.	intiated (TD_NFV _NS_LCM_INSTANTIATE_001) ial deployment size should support scaling to or from a specified leve nonitoring the given VIM performance metric (TD_NFV CATOR_SUBSCRIPTION_001) onfigured to trigger "(Scale_NS_to_level)" when a given VIM Perform ertain threshold atus of NS supports scale to level		
Test					
Sequence	Step 1	Stimulus	Description Trigger the VIM to cond the targeted Performance Metric until the	Result	
	•	Sumuius	Trigger the VIM to send the targeted Performance Metric until the configured threshold is crossed		
	2	IOP Check	Verify that the VNFM receives from the NFVO instantiation or termination request (according to the target scale level) for the impacted VNF(s)		
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs		
	2	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors		
	3	IOP Check	Verify that all VNF instance(s) are running and reachable via the management network		
	4	IOP Check	Verify in the NFVO that the NS has been scaled as requested (i.e. query or display the NS instance resource)		
	5	IOP Check	Verify that NS is functional by running the end-to-end functional test		
IOP Verdict					

6.1.6 SCALE VNF TO LEVEL

6.1.6.1 SCALE VNF TO LEVEL MANUALLY

6.1.6.1.1 TD_NFV _NS_LCM_SCALE_TO_LEVEL_VNF_001

			Interoperability Test Description			
Identifi	er	TD_NFV_NS	S_LCM_SCALE_TO_LEVEL_VNF_001			
Test Purp	ose	Verify that a VNF in a NS can be successfully scaled to another existing instantiation level (Sca VNF to Level) by an operator				
Configura	ation	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference	ces		use 7.3, 7.4, 7.5 use 7.3, 7.4, 7.5 use 7.2 ause 6.3 ause 5.4.6			
Applicab	ility	* [IFS_NFV_ * [IFS_NFV_ * [IFS_NFV_	NFVO_5] NFVO supports NS scaling by adding/removing VNF instanton NFVO_6] NFVO supports NS scale to level NNFM_4] VNFM supports VNF scaling out/in by adding/removing VNIVNF_4] NS supports scale to level			
Pre-tes conditio		 The NS i 	tantiated (TD_NFV_S-VNFM-D_NS_LCM_INSTANTIATE_001) nitial deployment size should support scaling to a specified level supports scale to level by adding/removing VNFC instances			
Tost						
Test Sequence	Step 1	Stimulus	Description Trigger NS scale by scaling to another existing instantiation level a	Result		
	2	IOP Check	VNF in the NS in NFVO with an operator request Verify that the VNFM receives scale to level request for the impacted VNF(s) in the given NS			
	3	IOP Check	If VNFM is in direct mode: Verify that the VNFM is granted by the NFVO to allocate or delete (according to the target scale level) the virtualised resources for scaling the impacted VNF(s) If VNFM is in indirect mode: Verify that the VNFM is granted by the NFVO to manage the scale to level operation on the impacted VNF(s)			
	4	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors by the VNFM			
	5	IOP Check	Verify that all VNFC instance(s) are running and reachable via the management network			
	6	IOP Check	Verify from the NFVO that the VNF in a NS has been successfully scaled (i.e. query or display the NS instance resource)			
	7	IOP Check	Verify that the NS is fuctional by running the end-to-end functional test			
IOP Verdict						

6.1.6.2 SCALE VNF TO LEVEL FROM VNF INDICATOR - OPTIONAL

6.1.6.2.1 TD_NFV _NS_LCM_SCALE_TO_LEVEL_VNF_002

			Interoperability Test Description			
Identifi	er	TD_NFV_N	S_LCM_SCALE_TO_LEVEL_VNF_002			
Test Purp	ose		a VNF in a NS can be successfully scaled to another existing ir F to Level) automatically by a VNF indicator	nstantiation level		
Configura	ation	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference			ause 6.3 Clause 5.4.6			
Applicab	ility	* [IFS_NFV] * [IFS_NFV] * [IFS_NFV] VNF/EM * [IFS_NFV] * [IFS_NFV]	_NFVO_6] NFVO supports NS scale to level _NFVO_14] NFVO supports automatic scaling triggered by VNF indica _VNFM_4] VNFM supports VNF scaling out/in by adding/removing VN _VNFM_15] VNFM supports automatic VNF scaling triggered by VNF _VNF_3] VNF can scale out/in by adding/removing VNFCs instances (_VNF_4] VNF supports scale to level _VNF_6] VNF can send VNF Indicators to VNFM (notifications)	FC instances indicators from		
Pre-tes conditio		* The VNF i * VNFM is s _VNF_INDI * VNFM is c certain thres	antiated (TD_NFV _NS_LCM_INSTANTIATE_001) nitial deployment size should support scaling to a specified level subscribed to the targeted VNF Indicator notifications (TD_NFV CATOR_SUBSCRIPTION_001) configured to trigger "(Scale_VNF_to_level)" when a given VNF indicate shold orts scale to level by adding VNFC instances	or value crosses a		
Test	Step		Description	Result		
Sequence	1	Stimulus	Trigger the VNF to send the VNF indicator value change notifications until the configured threshold is crossed	Noodii		
	2	IOP Check	Verify that the VNFM starts the scale to level operation for the impacted VNF in the given NS			
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate or delete (according to the target scale level) the virtualised resources for scaling the impacted VNF(s) If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scale to level operation on the impacted VNF(s)			
	4	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors by the VNFM			
	5	IOP Check	Verify that all VNFC instance(s) are running and reachable via the management network			
	6		Verify from the NFVO that the VNF in a NS has been successfully scaled (i.e. query or display the NS instance resource)			
	7	IOP Check	Verify that the NS is fuctional by running the end-to-end functional test			
IOP Verdict						

6.1.6.3 SCALE VNF TO LEVEL FROM VIM Performance Metric - OPTIONAL

6.1.6.3.1 TD_NFV_NS_LCM_SCALE_TO_LEVEL_VNF_003

			Interoperability Test Description	
ldentifi	er	TD_NFV_NS	LCM_SCALE_TO_LEVEL_VNF_003	
Test Purp	ose	Verify that a (Scale VNF	nstantiation level	
Configura	SUT_MULTI-' SUT_S-VNFN SUT_MULTIS		1	
Reference	ces	[IFA006] Clau: [IFA007] Clau: [[SOL003] Cla	use 5.4.6	
Applicab	ility	* [IFS_NFV_N * [IFS_NFV_V * [IFS_NFV_V	IFVO_6] NFVO supports NS scale to level IFVO_15] NFVO supports automatic NS scaling out/in triggered by p 'NFM_4] VNFM supports VNF scaling out/in by adding/removing VN 'NF_3] VNF can scale out/in by adding/removing VNFCs instances ('NF_4] VNF supports scale to level	IFC instances
Pre-tes conditio		 The VNF i VNFM is monopole NS_CREATE VNFM is considered Crosses a certain 	antiated (TD_NFV_SCALE-LEVEI_NS_LCM_INSTANTIATE_001) nitial deployment size should support scaling to a specified level initoring the given VIM performance metric (TD_NFV_PMMONITORING_JOB_001) configured to trigger "(Scale VNF to Level)" when a given VIM Perfor tain threshold upports scale to level by adding VNFC instances	mance metric value
Test				
Sequence	Step 1	Stimulus	Trigger the VIM to send the targeted Performance metric until the	Result
	2	IOP Check	Verify that the VNFM starts the scale to level operation for the impacted VNF in the given NS	
	3	IOP Check	If VNFM is in direct mode: Verify that the VNFM is granted by the NFVO to allocate or delete (according to the target scale level) the virtualised resources for scaling the impacted VNF(s) If VNFM is in indirect mode: Verify that the VNFM is granted by the NFVO to manage the scale to level operation on the impacted VNF(s)	
	4	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors by the VNFM	
	5	IOP Check	Verify that all VNFC instance(s) are running and reachable via the management network	
	6	IOP Check	Verify from the NFVO that the VNF in a NS has been successfully scaled (i.e. query or display the NS instance resource)	
	7	IOP Check	Verify that the NS is fuctional by running the end-to-end functional test	
IOP Verdict				

6.1.6.4 SCALE VNF TO LEVEL FROM VNF/EM REQUEST

6.1.6.4.1 TD_NFV_NS_LCM_SCALE_TO_LEVEL_VNF_004

			Interoperability Test Description				
Identifi	er	TD_NFV_NS	_LCM_SCALE_TO_LEVEL_VNF_004				
Test Purp	ose	Verify that a VNF in a NS can be successfully scaled to another existing instantiation level (Scale VNF to Level) by a request from VNF/EM					
Configura	ation	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
Reference	ces	[IFA006] Clau [IFA007] Clau	se 7.3, 7.4, 7.5, 7.7 se 7.3, 7.4, 7.5, 7.7 se 7.2 use 5.4.6, 9.4.2				
Applicab	ility	* [IFS_NFV_\ * [IFS_NFV_\	/NFM_5] VNFM supports scale-to-level /NFM_6] VNFM supports VNF scaling out/in request from VNF/EM /NF_4] VNF supports scale to level /NF_5] VNF/EM can request scaling to VNFM				
Pre-tes conditio			antiated (TD_NFV_SCALE-LEVEI_NS_LCM_INSTANTIATE_001) initial deployment size should support scaling to a specified level				
Test	Step			Result			
Sequence	1	Stimulus	Trigger the VIM to send the targeted Performance metric until the configured threshold is crossed				
	2	IOP Check	Verify that the VNFM starts the scale to level operation for the impacted VNF in the given NS				
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate or delete (according to the target scale level) the virtualised resources for scaling the impacted VNF(s) If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scale to level operation on the impacted VNF(s)				
	4	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors by the VNFM				
	5	IOP Check	Verify that all VNFC instance(s) are running and reachable via the management network				
	6	IOP Check	Verify from the NFVO that the VNF in a NS has been successfully scaled (i.e. query or display the NS instance resource)				
	7	IOP Check	Verify that the NS is fuctional by running the end-to-end functional test				
IOP Verdict							

6.1.7 UPDATE VNF

6.1.7.1 TD_NFV_NS_LCM_UPDATE_STOP_VNF_001

			Interoperability Test Description			
Identifie	r	TD_NFV_N	D_NFV_NS_LCM_UPDATE_STOP_VNF_001			
Test Purpo	ose	To verify the	at a VNF running in a NS can be successfully stopped			
Configurat	ion					
Reference	References [IFA013] Clause 7.3 [IFA007] Clause 7.2 [SOL005] Clause 6.3 [SOL003] Clause 5.4.10					
Applicabil	ity	* [IFS_NFV	_NFVO_7] NFVO can change VNF Operational state			
Pre-test condition	-		antiated (TD_NFV_NS_LCM_INSTANTIATE_001) nce(s) in the NS are running			
Test Sequence	Step	Туре	Description	Result		
Ocquence	1	Stimulus	Trigger the VNF(s) stop operation from the NFVO			
	2	IOP Check	Verify that individual VNFC(s) inside the VNF(s) are shutdown on VIM (i.e query or display the state from VIM)			
	3	IOP Check	Verify that the VNF in the NS instance is considered STOPPED by the NFVO (i.e. query or display the NS instance resource)			
IOP Verdict						

6.1.7.2 TD_NFV_NS_LCM_UPDATE_START_VNF_001

	Interoperability Test Description
Identifier	TD_NFV_NS_LCM_UPDATE_START_VNF_001
Test Purpose	To verify that a stopped VNF in a NS can be successfully re-started
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_AUTO-LCM-VALIDATION SUT_MULTISITE
References	[IFA013] Clause 7.3 [IFA007] Clause 7.2 [SOL005] Clause 6.3
Applicability	* [IFS_NFV_NFVO_7] NFVO can change VNF Operational state
Pre-test conditions	* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * One VNF inside the NS has been stopped (TD_NFV_NS_LCM_UPDATE_STOP_VNF_001)

Test Sequence	Step	Туре	Description	Result
ooquoco	1	Stimulus	Trigger the VNF(s) start operation by NFVO	
	2	IOP Check	Verify that individual VNFC(s) inside the VNF(s) are started on VIM (i.e query or display the state from VIM)	
	3	IOP Check	Verify that the VNF in NS instance is considered STARTED by the NFVO (i.e. query or display the NS instance resource)	
IOP Verdict				

6.1.8 FAULT MANAGEMENT

6.1.8.1 FAULT MANAGEMENT – SUBSCRIPTION

6.1.8.1.1 TD_NFV_FM_NS_ALARM_SUBSCRIPTION_CREATE_001

			Interoperability Test Description			
Identifie	r	TD_NFV_FM_NS_ALARM_SUBSCRIPTION_CREATE_001				
Test Purp						
Configuration SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION						
Referenc	_					
Applicabi	* [IFS_NFV_NFVO_13] NFVO supports receiving VNF faults/alarms from VNFM (notificated the support of the support			ns)		
				М		
				M		
Pre-tes	-	* [IFS_NFV		M		
	-	* [IFS_NFV	_VNFM_14] VNFM supports receiving virtualised resource faults/alarms from VII	M		
condition	-	* [IFS_NFV	_VNFM_14] VNFM supports receiving virtualised resource faults/alarms from VII	Result		
condition	ns	* [IFS_NFV	/_VNFM_14] VNFM supports receiving virtualised resource faults/alarms from VII antiated (TD_NFV_NS_LCM_INSTANTIATE_001)	I		
condition	Step	* [IFS_NFV * NS is insta * Type Stimulus		I		
condition	Step 1	* [IFS_NFV * NS is insta Type Stimulus IOP Check	Antiated (TD_NFV_NS_LCM_INSTANTIATE_001) Description Subscribe to the alarm notifications related to NS instance faults from NFVO (i.e create new subscription resource)	I		
condition	Step 1	* [IFS_NFV * NS is insta Type Stimulus IOP Check IOP Check	Description Subscribe to the alarm notifications related to NS instance faults from NFVO (i.e create new subscription resource) Verify that a new subscribed on the VNFM to the related VNF resources	Ī		

6.1.8.1.2 TD_NFV_FM_NS_ALARM_SUBSCRIPTION_DELETE_002

	Interoperability Test Description			
Identifier	TD_NFV_FM_NS_ALARM_SUBSCRIPTION_DELETE_002			

Test Purp	Verfiy that the subscription to NS faults alarm notifications can be deleted				
Configuration		SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION			
References		[IFA005] Clauses 5.3, 7.6, 8.6 [IFA013] Clauses 5.3, 7.6, 8.5 [SOL005] Clause 8.4.4 [SOL003] Clause 7.4.4			
Applicabi	lity	* [IFS_NFV_NFVO_13] NFVO supports receiving VNF faults/alarms from VNFM (notifications) * [IFS_NFV_VNFM_16] VNFM exposes VNF alarms towards NFVO (notifications) * [IFS_NFV_VNFM_14] VNFM supports receiving virtualised resource faults/alarms from VIM			
Pre-tes condition	-	* NS is instantiated (TD_NFV_S-VNFM-D_NS_LCM_INSTANTIATE_001) * NFVO is subscribed to the NS faults alarm notifications (TD_NFV_FM_ALARM_SUBSCRIPTION_CREATE_001)			
T1					
Test Seguence	Step	Туре	Description	Result	
Sequence	Step 1	Type Stimulus	Description Delete the subscription to related to NS instance faults in the NFVO	Result	
		Stimulus	•	Result	
	1	Stimulus IOP Check	Delete the subscription to related to NS instance faults in the NFVO Verify that the subscription related to NS instance fault alarm notifications is	Result	
	1 2	Stimulus IOP Check IOP Check IOP Check	Delete the subscription to related to NS instance faults in the NFVO Verify that the subscription related to NS instance fault alarm notifications is deleted in the NFVO Verify that the NFVO deletes the subscription on the VNFM to VNF related	Result	

6.1.8.2 FAULT MANAGEMENT - NS ALARMS

6.1.8.2.1 TD_NFV_FM_NS_ALARM_NOTIFICATION_001

	Interoperability Test Description
Identifier	TD_NFV_ FM_NS_ALARM_NOTIFICATION_001
Test Purpose	Verify that a fault alarm notification is exposed by the NFVO when a NS related resource fails.
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION
References	[IFA005] Clauses 5.3, 7.6, 8.6 [IFA013] Clauses 5.3, 7.6, 8.5 [SOL005] Clause 8.4.6 [SOL003] Clause 7.4.6
Applicability	* [IFS_NFV_NFVO_13] NFVO supports receiving VNF faults/alarms from VNFM (notifications) * [IFS_NFV_VNFM_16] VNFM exposes VNF alarms towards NFVO (notifications) * [IFS_NFV_VNFM_14] VNFM supports receiving virtualised resource faults/alarms from VIM

Pre-test conditions		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * NFVO is subscribed to the NS faults alarm notifications (TD_NFV_FM_ALARM_SUBSCRIPTION_CREATE_001)		
Test Sequence	Step	Туре	Description	Result
ooquonoo	1	Stimulus	Trigger a fault on a NS related resource matching an existing alarm notification subscription	
	2		If applicable, verify that a VNF fault alarm notification has been received by the VNFM (e.g. by querying the NS fault alarms database)	
	3	IOP Check	Verify that a VNF fault alarm notification is generated and dispatched by the VNFM to the NFVO	
	4		Verify that an NS fault alarm notification is generated and dispatched by the NFVO (e.g. by checking the GUI where applicable)	
IOP Verdict				

6.1.8.2.2		TD_NFV	_FM_NS_ALARM_CLEAR_NOTIFICATION_001	
			Interoperability Test Description	
Identifier		TD_NFV _F	FM_NS_ALARM_CLEAR_NOTIFICATION_001	
Test Purpose		Verify that a failure is cle	an alarm clear notification is dispatched by the NFVO when a NS related resource pared	Э
Configuration		SUT_MULT SUT_S-VNI SUT_MULT		
Reference	es			
Applicabil	ity	* [IFS_NFV	_NFVO_13] NFVO supports receiving VNF faults/alarms from VNFM (notification _VNFM_16] VNFM exposes VNF alarms towards NFVO (notifications) _VNFM_14] VNFM supports receiving virtualised resource faults/alarms from VIN	,
Pre-test condition		* NS fault a VNFM_FM_ * NFVO is s	antiated (TD_NFV_S-VNFM_NS_LCM_INSTANTIATE_001) larm is created on the NFVO by failing a NS related resource (TD_NFV_S- _VR_ALARM_NOTIFICATION_001) subscribed to the NS faults alarm notifications (TD_NFV_S- _ALARM_SUBSCRIPTION_CREATE_001)	
Test Sequence	Step	Туре	Description	Result
	1	Stimulus	Clear the failure of the NS related resource that triggered the alarm notification	
	2		If applicable, verify that a VNF clear alarm notification has been received by the VNFM (e.g. by querying the NS fault alarms database)	
	3	IOP Check	Verify that a VNF clear alarm notification is generated and dispatched by the VNFM to the NFVO	
	4	IOP Check	Verify that an NS clear alarm notification is generated and dispatched by the NFVO (e.g. by checking the GUI where applicable)	
IOP Verdict				

6.1.8.2.3 TD_NFV_FM_NS_ALARM_QUERY_001

	Interoperability Test Description					
Identifie	r	TD_NFV_F	M_NS_ALARM_QUERY_001			
Test Purpo	Purpose Verify that NS related fault alarms can be queried from the NFVO					
Configuration SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION						
Referenc	es	[IFA005] Clauses 5.3, 7, 8 [IFA013] Clauses 5.3, 7.6, 8.5 [SOL005] Clause 8.4.2, 8.4.3 [SOL003] Clause 7.4.2, 7.4.3				
Applicabil	lity	* [IFS_NFV_NFVO_12] NFVO supports receiving VNF faults/alarms from VNFM (query) * [IFS_NFV_VNFM_15] VNFM exposes VNF alarms towards NFVO (query response) * [IFS_NFV_VNFM_14] VNFM supports receiving virtualised resource faults/alarms from VIM				
Pre-test condition	-	* NS is insta	antiated (TD_NFV_NS_LCM_INSTANTIATE_001)			
Test Sequence	Step	Туре	Description	Result		
Coquonico	1	Stimulus	Trigger a fault on a NS related resource			
	2		If applicable, verify that a VNF fault alarm has been collected by the VNFM (e.g. by querying its VNF fault alarms database)			
	3	IOP Check	Verify that the VNF fault alarms are queried by NFVO from the VNFM and are properly exposed as NS fault alarms upon explicit NS fault alarms query on the NFVO (e.g. by checking the GUI where applicable)			
IOP Verdict						

6.1.9 PERFORMANCE MANAGEMENT

6.1.9.1 TD_NFV_PM_NS_CREATE_MONITORING_JOB_001

	Interoperability Test Description
Identifier	TD_NFV_PM_ NS_CREATE_MONITORING_JOB_001
Test Purpose	Verify that performance monitoring job for monitoring NS related metrics can be created to start monitoring NS performance metrics
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION
References	[SOL005] Clause 7.4.2 [SOL003] Clause 6.4.2
Applicability	* [IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM (notifications) * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM * [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)

Verdict

	Pre-test conditions		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * Monitoring parameters (e.g. performance metrics, metric groups) are defined in the NS descriptor (e.g. CPU usage, memory usage, etc.)	
		Ι		
	Step	Туре	Description	Result
	1	Stimulus	Create a performance monitoring job on the NFVO to start monitoring, with given collection and reporting periods, one or more performance metrics defined in the NS descriptor	
	2	IOP Check	If applicable, verify that the NFVO creates one or more perfomance monitoring jobs on the VNFM to collect the VNF related performance metrics	
	3	IOP Check (Optional)	If applicable, verify that the VNFM in turn issues the creation of performance monitoring jobs to collect the VNF performance metrics as virtualised resource metrics	
	4	IOP Check	Verify that performance metrics are properly collected by the VNFM with the requested collection period	
Test Sequence	5	IOP Check	Verify that NS performance metrics are properly collected by the NFVO from the VNFM with the requested collection period, e.g. by quering performance metrics database (if any) or checking directly the Graphical User Interface (if applicable)	
IOP				

6.1.9.2 TD_NFV_PM_NS_PERFORMANCE_METRICS_QUERY_001

	Interoperability Test Description			
Identifie	er	TD_NFV_P	M_NS_PERFORMANCE_METRICS_QUERY 001	
		Verify that It quering the	NS related performance monitoring metrics can be retrieved in the form of reports NFVO	by
Configuration SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION		TI-VENDOR_NS FM TISITE		
Referenc	es	[SOL005] C [SOL003] C		
Applicability		* [IFS_NFV VIM	_NFVO_10] NFVO supports receiving VNF performance metrics from VNFM (que_VNFM_11] VNFM supports receiving virtualised resource performance metrics f _VNFM_12] VNFM exposes VNF performance metrics towards NFVO (query res	rom
Pre-test conditions		* NS perfor	antiated (TD_NS_LCM_INSTANTIATE_001) mance monitoring job is created and NFVO is colleting performance metrics PM_NS_CREATE_MONITORING_JOB_001)	
	ı			
	Step	Туре	Description	Result
	1	Stimulus	Issue the query of one or more performance monitoring reports related to NS performance metrics to the NFVO	
	2	IOP Check	If applicable, verify that the NFVO queries VNF related perfomance monitoring reports from the VNFM to retrieve the given NS related metrics	
Test Sequence	3	IOP Check (Optional)	If applicable, verify that the VNFM queries virtualilsed resource related perfomance monitoring reports to retrieve the VNF related metrics	

	4	Verify that the performance metrics are properly retrieved from the VNFM and returned by the NFVO, e.g. checking directly the NFVO Graphical User Interface (if applicable)	
IOP Verdict			

6.1.9.3 TD_NFV_PM_NS_CREATE_THRESHOLD_001

	Interoperability Test Description						
Identifi	er	TD_NFV_P	M_NS_CREATE_THRESHOLD_001				
Test Purp	ose	Verify that performance	Verify that performance monitoring thresholds can be created for one or more NS related performance metrics on the NFVO				
Configura	ation	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
Referen	ces		Clause 7.4.5, 7.4.6 Clause 6.4.5, 6.4.6				
Applicab			* [IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM (notifications) * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM * [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)				
Pre-tes condition		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * NS performance monitoring job is created and NFVO is colleting performance metrics (TD_NFV_PM_ NS_CREATE_MONITORING_JOB_001)					
	Step	Туре	Description	Result			
	1	Stimulus	Create on the NFVO a performance monitoring threshold for a NS related monitored performance metric				
	2	IOP Check	If applicable, verify that the NFVO in creates one or more thresholds on the VNFM for VNF monitored performance metrics related to the given NS instance				
	3		If applicable, verify that the VNFM in turn creates one or more thresholds on virtualised resource monitored performance metrics related to the given VNF				
Test Sequence	4	IOP Check	Verify that the performance monitoring thresholds are properly created and maintained by the NFVO and the VNFM (e.g. checking the Graphical User Interface, if applicable)				
IOP Verdict							

6.1.9.4 TD_NFV_PM_NS_CREATE_SUBSCRIPTION_001

	Interoperability Test Description				
Identifier	TD_NFV_PM_NS_CREATE_SUBSCRIPTION_001				
Test Purpose	Verfiy that it is possible to suscribe to NS performance metrics notifications related to threshold crossed notifications				
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				

References	[SOL005] Clause 7.4.7, 7.4.8 [SOL003] Clause 6.4.7, 6.4.8
Applicability	* [IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM (notifications) * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM * [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)
Pre-test conditions	* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * NS performance monitoring threshold is created and NFVO is colleting performance metrics (TD_NFV_PM_NS_CREATE_THRESHOLD_001, TD_NFV_S-VNFM_PM_NS_CREATE_MONITORING_JOB_001)

	Step	Туре	Description	Result
	1	Stimulus	Subscribe to the threshold crossed notifications related to a NS performance monitoring threshold available in the NFVO (i.e create new subscription resource)	
	2	IOP Check	Verify that a new subscription resource is created in the NFVO	
Test Sequence	3	IOP Check	Verify that the NFVO is subscribed on the VNFM to the threshold crossed notifications related to VNF performance metrics for the given NS instance	
	4	IOP Check (Optional)	If applicable, verify that the VNFM in turn subscribes to the threshold crossed notifications related to virtualised resource performance metrics for the given VNFs	
IOP Verdict				

6.1.9.5 TD_NFV_PM_NS_CREATE_SUBSCRIPTION_002

			Interoperability Test Description	
Identifie	r	TD_NFV_P	PM_NS_CREATE_SUBSCRIPTION_002	
Test Purpose Verfiy that it is possible to suscribe to NS performance metrics notifications related to a performance information			· ·	oility of
Configuration SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Referenc	es	[SOL005] Clause 7.4.7, 7.4.8 [SOL003] Clause 6.4.7, 6.4.8		
(notifications) * [IFS_NFV_VNFM_11] VNFM : VIM		(notification * [IFS_NFV VIM	'_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM is) '_VNFM_11] VNFM supports receiving virtualised resource performance metrics is '_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notification)	
Pre-tes condition	-	* NS perfor	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) mance monitoring job is created and NFVO is colleting performance metrics PM_ NS_CREATE_MONITORING_JOB_001)	
	Step	Туре	Description	Result
Test Sequence	1	Stimulus	Subscribe to the performance information availability notifications related to a NS performance job in the NFVO (i.e create new subscription resource)	

	2	IOP Check	Verify that a new subscription resource is created in the NFVO	
	3		Verify that the NFVO is subscribed on the VNFM to the performance information availability related to VNF performance metrics for the given NS instance	
	4	(Optional)	If applicable, verify that the VNFM in turn subscribes to the performance information availability related to virtualised resource performance metrics for the given VNFs	
IOP Verdict				

6.1.9.6 TD_NFV_PM_NS_THRESHOLD_CROSSED_NOTIFICATION_001

			Interoperability Test Description				
Identifie	er	TD_NFV_P	M_NS_THRESHOLD_CROSSED_NOTIFICATION_001				
Test Purp	ose		Verify that a threshold crossed notification is exposed by the NFVO when a NS performance metric crosses a previously created threshold				
Configura	tion	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
Referenc	es	[SOL005] C [SOL003] C					
Applicabi	lity	(notification * [IFS_NFV VIM	[IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM notifications) [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)				
Pre-tes condition	-	* NS perfor	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) mance monitoring subscription is created to collect performance monitoring notific resholds crossed (TD_NFV_PM_ NS_CREATE SUBSCRIPTION_001)	ations			
	Step	Туре	Description	Result			
	1	Stimulus	Trigger the monitored NS performance metric to cross the specified threshold				
	2		If applicable, verify that the VNFM receives and collects virtualised resource threshold crossed notifications for the impacted VNF				
	3	IOP Check	Verify that a "threshold crossed" notification for the monitored VNF performance metric is generated and dispatched by the VNFM				
Test Sequence	4	IOP Check	Verify that a "threshold crossed" notification for the monitored NS performance metric is collected from the VNFM and dispatched by the NFVO (e.g. checking the Graphical User Interface, if applicable)				
IOP Verdict							

6.1.9.7 TD_NFV_PM_NS_MONITORING_INFORMATION_NOTIFICATION_001

Interoperability Test Description				
Identifier	TD_NFV_PM_NS_MONITORING_INFORMATION_NOTIFICATION_001			
Test Purpose	Verify that a monitoring information availability notification is exposed by the NFVO when new and updated NS performance monitoring metrics are available			

Configura	tion	SUT_MULT SUT_S-VNI SUT_MULT	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference	es	[SOL005] C [SOL003] C	Clause 7.4.9 Clause 6.4.9				
Applicabi	lity	* [IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM (notifications) * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM * [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)					
Pre-tes conditio	-	* NS perfori	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) mance monitoring subscription is created to collect performance monitoring notificate availability of new monitoring information (TD_NFV_PM_NS_CREATE TION_002)	ations			
		,					
	Step	Туре	Description	Result			
	1		If applicable, verify that the VNFM receives and collects virtualised resource monitoring information availability notification for the impacted VNF				
	2	IOP Check	Verify that a monitoring information availability notification for the monitored VNF performance metric is generated and dispatched by the VNFM				
Test Sequence	3	IOP Check	Verify that a monitoring information availability notification for the monitored NS performance metric is collected from the VNFM and dispatched by the NFVO (e.g. checking the Graphical User Interface, if applicable)				
IOP Verdict							

6.1.9.8 TD_NFV_PM_NS_DELETE_SUBSCRIPTION_002

			Interoperability Test Description				
Identifie	r	TD_NFV_P	TD_NFV_PM_NS_DELETE_SUBSCRIPTION_002				
Test Purpo	ose	Verfiy that t	Verfiy that the subscription to NS performance monitoring notifications can be deleted				
Configurat	ion	SUT_MULT SUT_S-VN SUT_MULT	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference	es		Clause 7.4.8 Clause 6.4.8				
Applicabil	* [IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM (notifications) * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM * [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)						
Pre-test conditions		* NFVO is s (TD_NFV_F	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) subscribed to the NS faults alarm notifications PM_NS_CREATE_SUBSCRIPTION_001 or PM_NS_CREATE_SUBSCRIPTION_002)				
Test Seguence	Step	Туре	Description	Result			
	1	Stimulus	Delete the subscription related to NS performance monitoring notifications in the NFVO				

	2	IOP Check	Verify that the subscription related to NS performance monitoring notifications is deleted in the NFVO	
	3	IOP Check	Verify that the NFVO deletes on the VNFM the subscription to VNF related resources performance monitoring notifications	
	4		If applicable, verify that the VNFM in turn deletes the subscription to virtualised resource related resources performance monitoring notifications	
IOP Verdict				

6.1.9.9 TD_NFV_PM_NS_DELETE_MONITORING_JOB_001

			Interoperability Test Description			
Identifie	er	TD_NFV_P	M_NS_DELETE_MONITORING_JOB_001			
Test Purp	ose	Verify that performance monitoring job for monitoring NS related metrics can be deleted to stomonitoring NS performance metrics				
Configura	tion	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Referenc	es		Clause 7.4.3 Clause 5.4.3			
Applicabi	(no * [I VII		[IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM notifications) [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from //IM [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)			
Pre-tes	-	* NS perfor	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) mance monitoring job is created and NFVO is colleting performance metrics PM_NS_CREATE_MONITORING_JOB_001)			
	Step	Туре	Description	Result		
	1	Stimulus	Delete a performance monitoring job on the NFVO to stop monitoring one or more performance metrics			
	2	IOP Check	If applicable, verify that the NFVO deletes the related VNF perfomance monitoring jobs on the VNFM to stop monitoring the impacted VNF performance metrics			
Test Sequence	3	IOP Check	Verify that the NS and VNF performance metrics are no more collected by the NFVO and the VNFM, e.g. by quering the performance metrics database (if any) or checking directly the Graphical User Interface (if applicable)			
IOP Verdict						

6.1.9.10 TD_NFV_PM_NS_DELETE_THRESHOLD_001

	Interoperability Test Description					
Identifier	TD_NFV _PM_NS_DELETE_THRESHOLD_001					
Test Purpose	Verify that performance monitoring thresholds can be deleted for one or more NS related performance metrics on the NFVO					
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM					

		SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
References			[SOL005] Clause 7.4.6 [SOL003] Clause 6.4.6				
Applicability		* [IFS_NFV_NFVO_11] NFVO supports receiving VNF performance metrics from VNFM (notifications) * [IFS_NFV_VNFM_11] VNFM supports receiving virtualised resource performance metrics from VIM * [IFS_NFV_VNFM_13] VNFM exposes VNF performance metrics towards NFVO (notifications)					
Pre-tes condition	-	* NS perfor	antiated (TD_NFV_NS_LCM_INSTANTIATE_001) mance monitoring threshold is created in the NFVO PM_NS_CREATE_THRESHOLD_001)				
	Cton						
	Step	Туре	Description	Result			
	1		Description Delete on the NFVO the performance monitoring threshold for the NS related monitored performance metric	Result			
	•	Stimulus	Delete on the NFVO the performance monitoring threshold for the NS related	Result			
Test Sequence	1	Stimulus IOP Check	Delete on the NFVO the performance monitoring threshold for the NS related monitored performance metric If applicable, verify that the NFVO deletes the related thresholds on VNF	Result			

6.1.10 VNF INDICATORS

6.1.10.1 TD_NFV_VNF_INDICATOR_QUERY_001

			Interoperability Test Description				
Identifie	r	TD_NFV_V	TD_NFV_VNF_INDICATOR_QUERY_001				
Test Purpo	ose	To verify th	To verify that a VNF indicator related to a NS instance can be monitored				
Configurat	ion	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION					
Reference	es	[SOL003] Clause 8.4.2, 8.4.3 [SOL002] Clause 8.4.2, 8.4.3, 8.4.4					
Applicabil	lity		/_NFVO_8] NFVO supports receiving VNF indicators from VNFM (query) /_VNFM_10] VNFM exposes VNF Indicators towards NFVO (query response)				
Pre-test conditions			antiated (TD_NFV_NS_LCM_INSTANTIATE_001) ore VNF indicators are defined in the related VNF Descriptors and referenced in t	he NS			
	Step	Туре	Description	Result			
Test Sequence	1	Stimulus	Issue the query to retrieve the values of one or more VNF indicators to the NFVO				

	3	IOP Check	Verify that the VNFM queries the VNF to retrieve the indicators selected by NFVO Verify that the VNF indicators values are properly retrieved and returned by the	
IOP Verdic	t	Check	NFVO, e.g. checking directly the NFVO Graphical User Interface (if applicable)	

6.1.10.2 TD_NFV_VNF_INDICATOR_SUBSCRIPTION_001

			Interoperability Test Description				
Identifie	r	TD_NFV_\	D_NFV_VNF_INDICATOR_SUBSCRIPTION_001				
Test Purpo	se	Verfiy that i	/erfiy that it is possible to suscribe to VNF indicator notifications related to value changes				
Configurat	ion	SUT_MULT SUT_S-VNI SUT_MULT	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference	es	[SOL003] C [SOL002] C					
Applicabil	ity	* [IFS_NFV	IFS_NFV_NFVO_9] NFVO supports receiving VNF indicators from VNFM (notifications) FS_NFV_VNFM_9] VNFM exposes VNF Indicators towards NFVO (notifications) FS_NFV_VNFM_7] VNFM supports receiving VNF indicators from VNF/EM (notifications)				
Pre-test condition		* NS is instantiated (TD_NFV_NS_LCM_INSTANTIATE_001) * One or more VNF indicators are defined in the related VNF Descriptors and referenced in the NS Descriptor					
	Step	Туре	Description	Result			
	1	Stimulus	Subscribe to the NFVO VNF indicator value change notifications related to indicators available in the NS description (i.e create new subscription resource)				
	2	IOP Check	Verify that a new subscription resource is created in the NFVO				
3		IOP Check	Verify that the NFVO is susbscribed on the VNFM to the VNF indicator value change notifications for being information of actual indicator value updates				
Test Sequence	4	IOP Check (Optional)	If applicable, verify that the VNFM in turn subscribes on the VNF (or EM) to the VNF indicator value change notifications				
IOP Verdict							

6.1.10.3 TD_NFV_VNF_INDICATOR_NOTIFICATION_001

Interoperability Test Description					
Identifier	TD_NFV_VNF_INDICATOR_NOTIFICATION_001				

Test Purpo	ose	Verify that a	a VNF indicator value change notification is properly exposed by the NFVO			
Configurat	ion	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_S-VNFM SUT_MULTISITE SUT_AUTO-LCM-VALIDATION				
Reference	es	[SOL003] C [SOL002] C				
Applicabil	lity	* [IFS_NFV_NFVO_9] NFVO supports receiving VNF indicators from VNFM (notifications) * [IFS_NFV_VNFM_9] VNFM exposes VNF Indicators towards NFVO (notifications) * [IFS_NFV_VNFM_7] VNFM supports receiving VNF indicators from VNF/EM (notifications)				
Pre-test condition	-	* VNF indic	antiated (TD_NFV_S-VNFM_NS_LCM_INSTANTIATE_001) ator subscription is created to collect indicator value change notifications (TD_NIF_INDICATOR_SUBSCRIPTION_001)	FV_S-		
Test Seguence	Step	Туре	Description	Result		
Coquemos	1	Stimulus	Trigger the VNF indicator value to change (e.g. by accessing the related VNF instance and manually stimulate a VNF indicator update)			
	2	IOP Check	Verify that the VNFM receives the related VNF indicator value change notification from the VNF and dispatch it to the NFVO			
3		IOP Check	Verify that a VNF indicator value change notification is collected from the VNFM by the NFVO (e.g. checking the Graphical User Interface, if applicable)			
IOP Verdict						

6.1.11 TERMINATE

6.1.11.1 TD_NFV_NS_LCM_TERMINATE_001

	Interoperability Test Description						
Identifier		TD_NFV_	NS_LCM_TERMINATE_001				
Test Purpo	se	To verify th	at a NS can be successfully terminated				
Configurat	ion	SUT_MUL7	LE-VENDOR_NS TI-VENDOR_NS D-LCM-VALIDATION NFM				
Reference	es		Clause 6.3.3 lause 7.3.1.5, 7.4.1.5,7.5.1.5				
Applicabil	ity						
Pre-test condition		* NS has be	een instantiated (TD_NFV_NS_LCM_INSTANTIATE_001)				
Test	Step	Туре	Description	Result			
Sequence	1	Stimulus	Trigger NS termination in NFVO				

	2	IOP Check	Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS	
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode:	
	4	IOP Check	Verify that the resources that were allocated to the NS and VNF(s) have been released by the VIM	
	5	IOP Check	Verify from the NFVO that the NS instance has been terminated (i.e. query or display the state of NS instance resource)	
IOP Verdict				

6.1.12 DELETE

6.1.12.1 TD_NFV_DELETE_NSD_001

			Interoperability Test Description				
Identifier		TD_NFV_	TD_NFV_DELETE_NSD_001				
Test Purpose		To delete a	o delete a NSD				
Configuration		SUT_MULT SUT_MULT SUT_AUTO	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_MULTI-SITE SUT_AUTO-LCM-VALIDATION SUT_S-VNFM				
Reference	es		FA013] Clause 7.2.6 SOL005] Clause 5.3.5				
Applicabili	ity						
Pre-test condi	itions		eated in NFVO (TD_NFV_ONBOARD_NSD_001) ssociated with the NSD have been terminated				
Test Sequence	Step	Туре	Description	Result			
ocquonoc	1	Stimulus	Trigger the deletion of NSD on NFVO (i.e. delete NSD and its content)				
2		IOP Check	Verify that the NSD information has been deleted in the NFVO (i.e. query or display NSD)				
IOP Verdict							

6.1.12.2 TD_NFV_ DELETE_VNF_PKG_001

	Interoperability Test Description						
Identifier	TD_NFV_DELETE_VNF_PKG_001						
Test Purpose	To delete a VNF Package						
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_MULTI-SITE SUT_S-VNFM						

		SUT_AUT	O-LCM-VALIDATION	
References		[IFA013] C [SOL005] (
Applicabil	ity			
Pre-test conditions		* VNF pack	kage has been on-boarded in NFVO (TD_NFV_ONBOARD_VNF_PKG _001)	
oomannon	.0			
Condition				
Test	Step	Туре	Description	Result
		Type Stimulus	Description Trigger the deletion of the VNF package on NFVO (i.e. delete VNF package resource and its related content)	Result
Test	Step		Trigger the deletion of the VNF package on NFVO (i.e. delete VNF package	Result

6.2 EPA

6.2.1 INSTANTIATE

6.2.1.1 TD_NFV_EPA_NS_LCM_INSTANTIATE_001

			Interoperability Test Description					
ldent	ifier	TD_	NFV_EPA_NS_LCM_INSTANTIATE_001					
Test Pu	ırpos	e To v	verify that a NS can be successfully instantiated with EPA requirem	nents				
Configu	uratio	SUT SUT SUT	_SINGLE-VENDOR_NS _MULTI-VENDOR_NS _MULTI-SITE _S-VNFM _AUTO-LCM-VALIDATION					
References		[IFA([IFA([IFA([SOL [SOL	013] Clause 7.3.3 005] Clause 7.3, 7.4, 7.5 006] Clause 7.3, 7.4, 7.5 007] Clause 7.2.3 005] Clause 6.3 0003] Clause 5.4.4 0002] Clause 9.4.2					
Applica	ability		S_NFV_VNFM_19] VNFM supports VNFs with EPA requirements S_NFV_VIM_NFVI_7] VIM supports EPA					
Pre-test co	onditi	TD_ * Th	D and VNF Package(s) have been on-boarded in NFVO (TD_NFV_ONBONFV_ONBONFV_ONBONFV_ONBONFV_ONBONFV (TD_NFV_ONBONFV) e software image is reachable by the VIM e required resources are available on the NFVI	DARD_NSD_001,				
Test	Step	Туре	Description	Result				
Sequence	1	Stimulus	Trigger NS instantiation in NFVO (i.e. create new NS instance resource and instantiate it)					

	2	IOP Check	Verify that the VNFM receives instantation requests for the VNFs composing the given NS	
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the VNFs composing the given NS in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the VNFs composing the given NS	
	4	IOP Check	Verify that the requested resources have been allocated in the VIM according to the descriptors	
	5	IOP Check	Verify that required EPA attributes have been configured as expected, e.g. checking configuration of: - SR-IOV - CPU pinning - NUMA topology - PCI passthrough	
	6	IOP Check	Verify that the VNF(s) are running and reachable through the management network	
	7	IOP Check	Verify that the initial VNF(s) configuration has been successfully applied	
	8	IOP Check	Verify that the VNF instances composing the given NS are considered INSTANTIATED by the VNFM	
	9	IOP Check	Verify that the NS instance is considered INSTANTIATED by the NFVO (i.e. query or display the NS instance resource)	
	10	IOP Check	Verify that the EPA requirements are matched in the NS instance and the running VNFs (e.g. performance check)	
	11	IOP Check	Verify that the NS is successfully instantiated by running the end-to-end functional test	
IOP Verdict				

6.2.2 SCALE NS

6.2.2.1 SCALE NS MANUALLY

6.2.2.1.1 TD_NFV_EPA_NS_LCM_SCALE_OUT_001

	Interoperability Test Description
Identifier	TD_NFV_EPA_NS_LCM_SCALE_OUT_001
Test Purpose	To verify that a NS can be successfully scaled out (Scale_NS) with EPA requirements by an operator
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_MULTI-SITE SUT_S-VNFM SUT_AUTO-LCM-VALIDATION
	[IFA013] Clause 7.3.4 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2.4 [SOL005] Clause 6.3 [SOL003] Clause 5.4.4 [SOL002] Clause 9.4.2
Applicability	* [IFS_NFV_NFVO_14] NFVO supports NS scaling by adding/removing VNF instances * [IFS_NFV_VNFM_19] VNFM supports VNFs with EPA requirements * [IFS_NFV_NS_10] NS can scale out/in by adding/removing VNF instances (Scale_NS)

			_VNF_9] VNF requires EPA _VIM_NFVI_7] VIM supports EPA					
		[o						
Pre-test conditions		* NS is insta	* NS is instantiated with EPA requirements (TD_NFV_EPA_NS_LCM_INSTANTIATE_EPA_001)					
Test Sequence	Step	Туре	Description	Result				
	1	Stimulus	Trigger NS scale out (Scale_NS) in NFVO with an operator request					
	2	IOP Check	Verify that the VNFM receives instantiation request for the additional VNF(s) to be deployed for the given NS					
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs					
	4	IOP Check	Verify that the requested resources have been allocated in the VIM according to the descriptors					
	5	IOP Check	Verify that required EPA attributes have been configured as expected, e.g. checking configuration of: - SR-IOV - CPU pinning - NUMA topology - PCI passthrough					
	6	IOP Check	Verify that the additional VNF instances(s) are running and reachable from the management network					
	7	IOP Check	Verify that the initial configuration for the additional VNF(s) has been successfully applied					
	8	IOP Check	Verify that the EPA requirements are matched in the scaled VNF(s) (e.g. performance check)					
	9	IOP Check	Verify that the additional VNF instance(s) in the NS are considered INSTANTIATED by the VNFM					
	10	IOP Check	Verify in the NFVO that the NS has been scaled out (i.e. query or display the NS instance resource)					
	11	IOP Check	Verify that NS is functional by running the end-to-end functional test					
IOP Verdict								

6.2.2.1.2 TD_NFV_EPA_NS_LCM_SCALE_IN_001

Interoperability Test Description					
Identifier	TD_NFV_EPA_NS_LCM_SCALE_IN_001				
Test Purpose	To verify that a NS can be successfully scaled in (Scale_NS) with EPA requirements by an operator				
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_MULTI-SITE SUT_S-VNFM SUT_AUTO-LCM-VALIDATION				
References	[IFA013] Clause 7.3.4 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2.4 [SOL005] Clause 6.3				

		ISOL 0031 C	Clause 5 4 8		
		[SOL003] Clause 5.4.8			
Applicability		* [IFS_NF\ * [IFS_NF\ * [IFS_NF\	/_NFVO_14] NFVO supports NS scaling by adding/removing VNF instances /_VNFM_19] VNFM supports VNFs with EPA requirements /_NS_10] NS can scale out/in by adding/removing VNF instances (Scale_NS) /_VNF_9] VNF requires EPA /_VIM_NFVI_7] VIM supports EPA		
Pre-tes condition			cantiated with EPA requirements (TD_NFV_EPA_NS_LCM_INSTANTIATE_001) ent NS deployment state allows for NS scale in operation		
Test Sequence	Step	Туре	Description	Result	
ocquence	1	Stimulus	Trigger NS scale in (Scale_NS) in NFVO with an operator request		
	2	IOP Check	Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS		
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs		
	4	IOP Check	Verify that EPA configurations of VNF(s) to be scaled-in have been deallocated/released as expected, e.g. checking de-configuration of: - SR-IOV - CPU pinning - NUMA topology - PCI passthrough		
	5	IOP Check	Verify that the impacted VNF related resources have been released in the VIM by the VNFM		
	6	IOP Check	Verify that the remaining VNF instances(s) are still running and reachable through the management network		
	7	IOP Check	Verify in the NFVO that the NS has been scaled in (i.e. query or display the NS instance resource)		
	8	IOP Check	Verify that NS is functional by running the end-to-end functional test		
IOP Verdict					

6.2.3 SCALE VNF

6.2.3.1 SCALE VNF MANUALLY

6.2.3.1.1 TD_NFV_EPA_NS_LCM_SCALE_OUT_VNF_001

Interoperability Test Description					
Identifier	TD_NFV_EPA_NS_LCM_SCALE_OUT_VNF_001				
Test Purpose	To verify that a VNF in a NS can be successfully scaled out with EPA requirements (Scale_VNF) by an operator				
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_MULTI-SITE SUT_S-VNFM SUT_AUTO-LCM-VALIDATION				

[IFA005] [IFA006] [IFA007] [SOL005] [SOL003] [SOL002] Applicability * [IFS_NI * [IFS_		[IFA006] Cla [IFA007] Cla [SOL005] C [SOL003] C * [IFS_NFV * [IFS_NFV * [IFS_NFV * [IFS_NFV * [IFS_NFV	ause 7.3, 7.4, 7.5 ause 7.3, 7.4, 7.5 ause 7.2.4 lause 6.3 lause 5.4.5	
Pre-tes conditio		* NS is insta	antiated (TD_NFV_EPA_NS_LCM_INSTANTIATE_001)	
Test Sequence	Step	Туре	Description	Result
ocquence	1	Stimulus	Trigger NS scale out (scale_VNF) in NFVO with an operator request	
	2	IOP Check	Verify that the VNFM receives from the NFVO scale out request for the impacted VNF in the given NS	
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s)	
	4	IOP Check	Verify that the requested resources have been allocated by the VIM according to the descriptors	
	5	IOP Check	Verify that required EPA attributes have been configured as expected, e.g. checking configuration of: - SR-IOV - CPU pinning - NUMA topology - PCI passthrough	
	6	IOP Check	Verify that the additional VNFC(s) are running and reachable from the management network	
	7	IOP Check	Verify that the initial configuration for the additional VNFC(s) has been successfully applied	
ı	8	IOP Check	Verify that the EPA requirements are matched in the scaled VNF(s) (e.g. performance check)	
	9	IOP Check	Verify from the NFVO that the VNF in the NS has been scaled out as requested (i.e. query or display the NS instance resource)	
	10	IOP Check	Verify that NS is functional by running the end-to-end functional test	
IOP Verdict				

6.2.3.1.2 TD_NFV_EPA_NS_LCM_SCALE_IN_VNF_001

Interoperability Test Description					
Identifier	TD_NFV_EPA_NS_LCM_SCALE_IN_VNF_001				
Test Purpose	To verify that a VNF in a NS can be successfully scaled in (Scale_VNF) with EPA by an operator				
Configuration	SUT_SINGLE-VENDOR_NS SUT_MULTI-VENDOR_NS SUT_MULTI-SITE				

	SUT_S-VNFM SUT_AUTO-LCM-VALIDATION					
References		IFA013 Clause 7.3.4 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2.4 [SOL005] Clause 6.3 [SOL003] Clause 5.4.5				
Applicability		* [IFS_NFV_VNFM_4] VNFM supports scaling out/in by adding/removing VNFC instances * [IFS_NFV_VNFM_19] VNFM supports VNFs with EPA requirements * [IFS_NFV_VNF_3] VNF can scale out/in by adding/removing VNFC instances * [IFS_NFV_VNF_9] VNF requires EPA * [IFS_NFV_VIM_NFVI_7] NFVI/VIM supports EPA attributes				
Pre-tes			antiated (TD_NFV_EPA_NS_LCM_INSTANTIATE_001) Int NS deployment state allows for NS scale_in operation (Scale_VNF)			
	T	T				
Test Sequence	Step		Description	Result		
-	1	Stimulus	Trigger NS scale in (Scale_VNF) in NFVO with an operator request			
	2	IOP Check	Verify that the VNFM receives from the NFVO scale in operation for the impacted VNF in the given NS			
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources related to the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling in of the impacted VNF(s)			
	4	IOP Check	Verify that EPA configurations of VNF(s) to be scaled-in in a NS have been deallocated/released as expected, e.g. checking de-configuration of: - SR-IOV - CPU pinning - NUMA topology - PCI passthrough			
	5	IOP Check	Verify that the impacted VNFCs related resources have been released by the VIM			
	6	IOP Check	Verify that the remaining VNFC(s) are still running and reachable through the management network			
	7	IOP Check	Verify from the NFVO that the VNF in the NS has been scaled in (i.e. query or display the NS instance resource)			
	8	IOP Check	Verify that NS is functional by running the end-to-end functional test			
IOP Verdict						

6.2.4 SCALE NS TO LEVEL

6.2.4.1 SCALE NS TO LEVEL MANUALLY

6.2.4.1.1 TD_NFV_EPA_NS_LCM_SCALE_TO_LEVEL_001

Interoperability Test Description				
Identifier	TD_NFV_EPA_NS_LCM_SCALE_TO_LEVEL_001			
	Verify that a NS can be successfully scaled to another existing instantiation levelwith EPA requirements (Scale_NS_to_level) by an operator			

Configuration References		SUT_MULT SUT_S-VN SUT_AUTO [IFA013] CII [IFA005] CII [IFA006] CII [IFA007] CII [SOL005] C	FM D-LCM-VALIDATION ause 7.3.4 ause 7.3, 7.4, 7.5 ause 7.3, 7.4, 7.5 ause 7.2 clause 6.3		
Applicability		* [IFS_NFV_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances * [IFS_NFV_NFVO_6] NFVO supports NS scale to level * [IFS_NFV_VNFM_19] VNFM supports VNFs with EPA requirements * [IFS_NFV_NS_11] NS supports scale to level * [IFS_NFV_VNF_9] VNF requires EPA * [IFS_NFV_VIM_NFVI_7] VIM supports EPA			
Pre-tes conditio		* The NS in	antiated with EPA requirements (TD_NFV_EPA_NS_LCM_INSTANTIA nitial deployment size should support scaling to or from a specified level tatus of NS supports scale to level	TE_EPA_001)	
Test	Step		Description	Result	
Sequence	1	Stimulus	Trigger NS scale to another existing instantiation level in NFVO with an operator request	Result	
	2	IOP Check	Verify that the VNFM receives instantiation or termination request (according to the target scale level) for the impacted VNF(s)		
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs		
	4	IOP Check	Verify that required EPA attributes have been configured as expected, e.g. checking configuration of: - SR-IOV - CPU pinning - NUMA topology - PCI passthrough		
	5	IOP Check	Verify that the virtualized resources have been allocated or deleted in the VIM according to the descriptors		
	6	IOP Check	Verify that all VNF instance(s) are running and reachable via the management network		
	7	IOP Check	Verify that the EPA requirements are met in the scaled VNF(s) (e.g. performance check)		
	8	IOP Check	Verify in the NFVO that the NS has been scaled as requested (i.e. query or display the NS instance resource)		
	9	IOP Check	Verify that NS is functional by running the end-to-end functional test		
IOP Verdict					

6.2.5 SCALE VNF TO LEVEL

6.2.5.1 SCALE VNF TO LEVEL MANUALLY

6.2.5.1.1 TD_NFV_EPA_NS_LCM_SCALE_TO_LEVEL_VNF_001

Interoperability Test Description						
Identifi	er	TD_NFV _E	TD_NFV_EPA_NS_LCM_SCALE_TO_LEVEL_VNF_001			
Test Purp			VNF in a NS can be successfully scaled to another existing instantiation level with an ments (Scale VNF to Level) by an operator			
Configura	ation	SUT_MULT SUT_MULT SUT_S-VNF				
References		[IFA013] Clause 7.3 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2 [SOL005] Clause 6.3 [SOL003] Clause 5.4.6				
Applicability		* [IFS_NFV_ * [IFS_NFV_ * [IFS_NFV_ * [IFS_NFV_	[IFS_NFV_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances [IFS_NFV_NFVO_6] NFVO supports NS scale to level [IFS_NFV_VNFM_19] VNFM supports VNFs with EPA requirements [IFS_NFV_NS_11] NS supports scale to level [IFS_NFV_VNF_9] VNF requires EPA [IFS_NFV_VIM_NFVI_7] VIM supports EPA			
Pre-tes conditio		 NS is instantiated (TD_NFV _NS_LCM_INSTANTIATE_001) The NS initial deployment size should support scaling to a specified level NS/VNF supports scale to level by adding/removing VNFC instances 				
Test Sequence	Step		Description	Result		
-	1	Stimulus	Trigger NS scale by scaling to another existing instantiation level a VNF in the NS (Scale_VNF_to_Level) in NFVO with an operator request			
	2	IOP Check	Verify that the VNFM receives scale to level request for the impacted VNF(s) in the given NS			
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate or delete (according to the target scale level) the virtualised resources for scaling the impacted VNF(s) If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scale to level operation on the impacted VNF(s)			
	4	IOP Check	Verify that required EPA attributes have been configured as expected, e.g. checking configuration of: - SR-IOV - CPU pinning - NUMA topology - PCI passthrough			
	5	IOP Check	Verify that the virtualized resources have been allocated or deleted in the VIM according to the descriptors			
	6	IOP Check	Verify that all VNFC instance(s) are running and reachable via the management network			
	7	IOP Check	Verify that the EPA requirements are matched in the scaled VNF(s) (e.g. performance check)			

IOP Verdict		1		
	9	IOP Check	Verify that the NS is fuctional by running the end-to-end functional test	
	8	IOP Check	Verify from the NFVO that the VNF in a NS has been successfully scaled (i.e. query or display the NS instance resource)	

6.3 SFC

6.3.1 INSTANTIATE

6.3.1.1 TD_NFV_SFC_NS_LCM_INSTANTIATE_001

	Interoperability Test Description					
Identifie	r					
		TD_NFV_	TD_NFV_SFC_NS_LCM_INSTANTIATE_001			
Test Purpose		To verify t	hat an NS with NSH based SFC can be successfully instantiated			
Configuration		SUT_MULT SUT_S-VI SUT_MULT				
References		[SOL002] (IETF RFC	Clause 6.3 lause 7.2 lause 7.2			
Applicabi	lity	* [IFS_NF\	/_NFVO_16] NFVO supports provisioning and configuration of network forwarding /_VIM_NFVI_6] NFVI/VIM supports NSH /_VNF_8] VNF supports Network Service Headers (NSH) encapsulation	g paths		
Pre-tes condition		TD_NFV_C * The softw	VNF Package(s) have been on-boarded in NFVO (TD_NFV_ONBOARD_NSD_0 ONBOARD_VNF_PKG_001) Pare image repository is reachable by the VIM Red resources are available on the NFVI	001,		
	Step	Туре	Description	Result		
	1	Stimulus	Trigger NS instantiation in NFVO (i.e. create new NS instance resource and instantiate it)			
	2	IOP Check	Verify that the VNFM receives instantation requests for the VNFs composing the given NS			
Test Sequence	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the VNFs composing the given NS in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the VNFs composing the given NS			
	4	IOP Check	Verify that the requested resources have been allocated in the VIM according to the descriptors			
	5	IOP Check	Verify that the VNF(s) in the NS are running and reachable through the management network			

	6	IOP Check	Verify that the initial VNF(s) configuration has been successfully applied	
	7	IOP Check	Verify that the VNF instance(s) composing the given NS are considered INSTANTIATED by the VNFM	
	8	IOP Check	Verify that the NS instance is considered INSTANTIATED by the NFVO (i.e. query or display the NS instance resource)	
	9	IOP Check	Verify that the NS is functional by running the end-to-end functional test (NSH Traffic)	
IOP Verdict				

6.4 MULTI SITE

6.4.1 INSTANTIATE

6.4.1.1 TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001

			Interoperability Test Description				
ldentifi	er	TD_NFV_	TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001				
Test Purp	ose	To verify the	nat an NS can be successfully instantiated across different sites	S			
Configura	ation	SUT_MULT	TI-SITE				
References		[IFA013] Clause 7.3 [IFA005] Clause 7.2 [IFA006] Clause 7.2 [IFA008] Clause 6.2 [IFA010] Clause 6.3 [IFA022] Clause 5.2 [SOL005] Clause 6.3 [SOL003] Clause 5.4.4 [SOL002] Clause 9.4.2					
Applicab	ility	* [IFS_NFV_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geographically distributed sites managed by different VIM instances)					
Pre-tes conditio		* NSD and VNF Package(s) have been on-boarded in NFVO (TD_NFV_ONBOARD_NSD_001, TD_NFV_ONBOARD_VNF_PKG_001) * The software image repository is reachable by the VIMs * The required resources are available on the NFVIs					
	Step	Туре	Description	Result			
	1	Stimulus	Trigger multi-site NS instantiation in NFVO (i.e. create new NS instance resource and instantiate it)				
	2	IOP Check	Verify that the VNFM receives instantation requests for the VNFs composing the given NS				
Test Sequence	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the VNFs composing the given NS in the VIMs If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the VNFs composing the given NS				
	4	IOP Check	Verify that the requested resources have been allocated in the VIMs according to the descriptors				

IOP Verdict				
	9	IOP Check	Verify that the NS is successfully instantiated by running the end-to- end functional test	
	8	IOP Check	Verify that the multi-site NS instance is considered INSTANTIATED by the NFVO (i.e. query or display the NS instance resource)	
	7	IOP Check	Verify that the VNF instances composing the given NS are considered INSTANTIATED by the VNFM	
	6	IOP Check	Verify that the initial VNF(s) configuration has been successfully applied	
	5	IOP Check	Verify that the VNF(s) have multi-site connectivity and are running and reachable through the management network	

6.4.2 SCALE NS MANUALLY

6.4.2.1 TD_NFV_MULTISITE_NS_LCM _SCALE_OUT_001

			Interoperability Test Description	
Identifi	Identifier TD_NFV_		MULTISITE_NS_LCM _SCALE_OUT_001	
Test Purpose		To verify the	at a multi-site NS can be successfully scaled out (Scale_NS) by an operator	
Configura	ation	SUT_MULT	TI-SITE	
References		[IFA008] Cla	auses 7.3, 7.4 ause 7.2 auses 6.2, 6.3 ause 5.4 ause 7.3.3 lause 6.3 lause 5.4.4	
Applicab		distributed s * [IFS_NFV * [IFS_NFV	_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geographical sites managed by different VIM instances) _NFVO_5] NFVO supports NS scaling by adding/removing VNF instances _NS_10] NS can scale out/in by adding/removing VNF instances (Scale_NS) NS is instantiated (TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001)	ly
conditio		Walti Site	NO IS INSTANTIALES (TB_NT V_INELTICITE_ING_EOW_INCT/NTTI/(TE_501))	
	Step	Туре	Description	Result
	1	Stimulus	Trigger multi-site NS scale out (Scale_NS) in NFVO with an operator request	
	2	IOP Check	Verify that the VNFM receives instantiation request for the additional VNF(s) to be deployed for the given NS	
Test Sequence	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for the additional VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the instantiation of the additional VNFs	
	4		Verify that the additional resources have been allocated in the VIM according to the descriptors and multi-site location constraints	
	5	IOP Check	Verify that the additional VNF instances(s) have multi-site connectivity, running and reachable from the management network	

	6	IOP Check	Verify that the initial configuration for the additional VNF(s) has been successfully applied	
	7	IOP Check	Verify that the additional VNF instance(s) in the NS are considered INSTANTIATED by the VNFM	
	8	IOP Check	Verify in the NFVO that the multi-site NS has been scaled out (i.e. query or display the NS instance resource)	
	9	IOP Check	Verify that multi-site NS is functional by running the end-to-end functional test	
IOP Verdict				

6.4.2.2 TD_NFV_MULTISITE_NS_LCM_SCALE_IN_001

	Interoperability Test Description						
Identifi	er	TD_NFV_	TD_NFV_MULTISITE_NS_LCM_SCALE_IN_001				
Test Purpose		To verify the	To verify that a multi-site NS can be successfully scaled in (Scale_NS) by an operator				
Configuration		SUT_MULT	TI-SITE				
References		[IFA008] Cla	auses 7.3, 7.4 ause 7.2 auses 6.2, 6.3 ause 5.4 ause 7.3.3 lause 6.3				
Applicab	ility	distributed : * [IFS_NFV	_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geo sites managed by different VIM instances) _NFVO_5] NFVO supports NS scaling by adding/removing VNF instance _NS_10] NS can scale out/in by adding/removing VNF instances (Scale	ces			
Pre-tes			* Multi-site NS is instantiated (TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001) * The current NS deployment state allows for NS scale_in operation				
	Step	Туре	Description	Result			
	1	Stimulus	Trigger multi-site NS scale in (Scale_NS) in NFVO with an operator request				
	2	IOP Check	Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS				
Test Sequence	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the termination of the impacted VNFs				
	4	IOP Check	Verify that the impacted VNF related resources have been released in the proper VIM site / VIM instance				
	5	IOP Check	Verify that the remaining VNF instances(s) are still running and reachable through the management network				
	6	IOP Check	Verify in the NFVO that the multi-site NS has been scaled in (i.e. query or display the NS instance resource)				

	7	Verify that multi-site NS is functional by running the end-to-end functional test	
IOP Verdict			

6.4.3 SCALE VNF MANUALLY

6.4.3.1 TD_NFV_MULTISITE_NS_LCM_SCALE_OUT_VNF_001

	Interoperability Test Description					
Identifi	er	TD_NFV_M	MULTISITE_NS_LCM_SCALE_OUT_VNF_001			
Test Purp	ose	To verify the operator	hat a VNF in a multi-site NS can be successfully scaled out (Scale	e_VNF) by an		
Configura	tion	SUT_MULT	TI-SITE			
References		[IFA013] Cla [IFA008] Cla [IFA010] Cla [IFA022] Cla [SOL005] C	auses 7.3, 7.4 ause 7.3 ause 7.2 auses 6.2, 6.3 ause 5.4 lause 5.4.5, 5.4.4			
Applicab	ility	distributed s * [IFS_NFV	_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geog sites managed by different VIM instances) _VNFM_4] VNFM supports VNF scaling in/out by adding/removing VNFC _VNF_3] VNF can scale out/in by adding/removing VNFC instances (Sca	Cinstances		
Pre-tes conditio		* Multi-Site	NS is instantiated (TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001)		
Test Sequence	Step	Туре	Description	Result		
•	1	Stimulus	Trigger multi-site NS scale out (Scale_VNF) in NFVO with an operator request			
	2	IOP Check	Verify that the VNFM receives from the NFVO scale out request for the impacted VNF in the given NS			
	თ	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate the virtualised resources required for scaling the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling out of the impacted VNF(s)			
	4	IOP Check	Verify that the additional resources have been allocated in the VIM according to the descriptors and multi-site location constraints			
	5	IOP Check	Verify that the additional VNFC instances(s) have multi-site connectivity,running and reachable from the management network			
	6	IOP Check	Verify that the initial configuration for the additional VNFC(s) has been successfully applied			
	7	IOP Check	Verify in the NFVO that the VNF in multi-site NS has been scaled out as requested (i.e. query or display the NS instance resource)			
	8	IOP Check	Verify that NS is functional by running the end-to-end functional test			
IOP Verdict						

6.4.3.2 TD_NFV_MULTISITE_NS_LCM_SCALE_IN_VNF_001

			Interoperability Test Description	
Identifie	r	TD_NFV_M	IULTISITE_NS_LCM_SCALE_IN_VNF_001	
Test Purpose		To verify the operator	nat a VNF in a multi-site NS can be successfully scaled in (Scale_VNF)	by an
Configuration		SUT_MULT	TI-SITE	
References		[IFA013 Cla [IFA008 Cla	uses 7.3, 7.4 use 7.3 use 7.2 uses 6.2, 6.3 use 5.4 lause 6.3	
Applicabi	lity	distributed: *[IFS_NFV_	_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geographical sites managed by different VIM instances) _VNFM_4] VNFM supports VNF scaling in/out by adding/removing VNFC instance _VNF_3] VNF can scale out/in by adding/removing VNFC instances (Scale_VNF_3)	ces
	Pre-test conditions * Multi-site NS is instantiated (TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001) * The current VNF deployment state allows for scale_in operation (Scale_VNF)			
Test	Step	Туре	Description	Result
Sequence	1	Stimulus	Trigger NS scale in (Scale_VNF) in NFVO with an operator request	
	2	IOP Check	Verify that the VNFM receives from the NFVO scale in operation for the impacted VNF in the given NS	
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources related to the impacted VNF If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scaling in of the impacted VNF(s)	
	4	IOP Check	Verify that the impacted VNFC related resources have been released by the proper VIM site / VIM instance	
	5	IOP Check	Verify that the remaining VNFC instances(s) have multi-site connectivity and are still running and reachable through the management network	
	6	IOP Check	Verify from the NFVO that the VNF in the NS has been scaled in (i.e. query or display the NS instance resource)	
	7	IOP Check	Verify that multi-site NS is functional by running the end-to-end functional test	
IOP Verdict				

6.4.4 SCALE NS TO LEVEL

6.4.4.1 SCALE NS TO LEVEL MANUALLY

6.4.4.1.1 TD_NFV_MULTISITE_NS_LCM_SCALE_TO_LEVEL_001

	Interoperability Test Description			
Identifier	TD_NFV_MULTISITE_NS_LCM_SCALE_TO_LEVEL_001			

Test Purp	ose	Verify that a multi-site NS can be successfully scaled to another existing instantiation level (Scale_NS_to_level) by an operator			
Configuration		SUT_MULTI-SITE			
References		[IFA013] Clause 7.3.4 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5 [IFA007] Clause 7.2 [SOL005] Clause 6.3 [SOL003] Clause 5.4.4, 5.4.8			
Applicability		* [IFS_NFV_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geographically distributed sites managed by different VIM instances) * [IFS_NFV_NFVO_5] NFVO supports NS scaling by adding/removing VNF instances * [IFS_NFV_NFVO_6] NFVO supports NS scale to level * [IFS_NFV_NS_11] NS supports scale to level			
Pre-test conditions		* The NS initi	S is instantiated (TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_00 all deployment size should support scaling to or from a specified level cus of NS supports scale to level	1)	
Test Sequence	Step		Description	Result	
	1	Stimulus	Trigger multi-site NS scale to another existing instantiation level in NFVO with an operator request		
	2	IOP Check	Verify that the VNFM receives instantiation or termination request (according to the target scale level) for the impacted VNF(s)		
	3	IOP Check	If VNFM is in direct mode: Verify that the VNFM is granted by the NFVO to allocate or delete the virtualised resources for the impacted VNFs in the VIM If VNFM is in indirect mode: Verify that the VNFM is granted by the NFVO to manage instantiation or termination of the impacted VNFs		
	4	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors		
	5	IOP Check	Verify that all VNF instance(s) are running and reachable via the management network		
	6	IOP Check	Verify in the NFVO that the multi-site NS has been scaled as requested (i.e. query or display the NS instance resource)		
	7	IOP Check	Verify that NS is functional by running the end-to-end functional test		
IOP Verdict					

6.4.5 SCALE VNF TO LEVEL

6.4.5.1 SCALE VNF TO LEVEL MANUALLY

6.4.5.1.1 TD_NFV _MULTISITE_NS_LCM_SCALE_TO_LEVEL_VNF_001

Interoperability Test Description			
Identifier	TD_NFV_MULTISITE_NS_LCM_SCALE_TO_LEVEL_VNF_001		
Test Purpose	Verify that a VNF in a multi-site NS can be successfully scaled to another existing instantiation level (Scale VNF to Level) by an operator		
Configuration	SUT_MULTI-SITE		
	[IFA013] Clause 7.3 [IFA005] Clause 7.3, 7.4, 7.5 [IFA006] Clause 7.3, 7.4, 7.5		

[IFA007] Clause 7.2 [SOL005] Clause 6.3 [SOL003] Clause 5.4.6 Applicability * [IFS_NFV_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geog distributed sites managed by different VIM instances) * [IFS_NFV_NFVO_5] NFVO supports NS scaling by adding/removing VNF instance * [IFS_NFV_NFVO_6] NFVO supports NS scale to level * [IFS_NFV_NS_4] VNF(s) in the NS can scale to level					
	Pre-test conditions * Multisite NS is instantiated (TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001) * The NS initial deployment size should support scaling to a specified level * NS/VNF supports scale to level by adding/removing VNFC instances				
Test	Step		Description	Result	
Sequence	1	Stimulus	Trigger multi-site NS scale by scaling to another existing instantiation level a VNF in the NS in NFVO with an operator request		
	2	IOP Check	Verify that the VNFM receives scale to level request for the impacted VNF(s) in the given NS		
	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to allocate or delete (according to the target scale level) the virtualised resources for scaling the impacted VNF(s) If VNFM is in indirect mode: • Verify that the VNFM is granted by the NFVO to manage the scale to level operation on the impacted VNF(s)		
	4	IOP Check	Verify that the virtualised resources have been allocated or deleted in the VIM according to the descriptors by the VNFM		
	5	IOP Check	Verify that all VNFC instance(s) are running and reachable via the management network		
	6	IOP Check	Verify from the NFVO that the VNF in a multi-site NS has been successfully scaled (i.e. query or display the NS instance resource)		
	7	IOP Check	Verify that the NS is fuctional by running the end-to-end functional test		
IOP Verdict					

6.4.6 TERMINATE

6.4.6.1 TD_NFV_MULTISITE_NS_LCM_TERMINATE_001

	Interoperability Test Description
Identifier	TD_NFV_MULTISITE_NS_LCM_TERMINATE_001
Test Purpose	To verify that a Multi Site NS can be successfully terminated
Configuration	SUT_MULTI-SITE
References	[IFA013] Clause 7.3 [IFA005] Clause 7.3, 7.4, 7.5 [IFA008] Clause 7.2 [SOL005] Clause 6.3
Applicability	* [IFS_NFV_NFVO_4] NFVO supports multi-site deployments (i.e. two or more geographically distributed sites managed by different VIM instances)
Pre-test conditions	* Multi Site NS has been instantiated (TD_NFV_MULTISITE_NS_LCM_INSTANTIATE_001)

	Step	Туре	Description	Result
	1	Stimulus	Trigger Multi Site NS termination in NFVO	
	2	IOP Check	Verify that the VNFM receives terminate request from the NFVO for the VNF(s) to be removed in the given NS	
Test Sequence	3	IOP Check	If VNFM is in direct mode: • Verify that the VNFM is granted by the NFVO to delete the virtualised resources in use by the impacted VNFs in the VIM If VNFM is in indirect mode:	
	4	IOP Check	Verify that the resources that were allocated to the Multi Site NS and VNF(s) have been released by the involved VIMs	
	5	IOP Check	Verify from the NFVO that the multi-site NS instance has been terminated (i.e. query or display the state of NS instance resource)	
IOP Verdict				

Annex A:Interoperability Feature Statements

A.1 IFS for MANO

IFS_ID	Description	Support
[IFS_NFV_NFVO_1]	NFVO provides generic VNFM functionality	
[IFS_NFV_NFVO_2]	NFVO supports specific VNFMs (external) in direct mode (resource management by VNFM)	
[IFS_NFV_NFVO_3]	NFVO supports specific VNFMs (external) in indirect mode (resource management by MANO)	
[IFS_NFV_NFVO_4]	NFVO supports multi-site deployments (i.e. two or more geographically distributed sites managed by different VIM instances)	
[IFS_NFV_NFVO_5]	NFVO supports NS scaling out/in by adding/removing VNF instances	
[IFS_NFV_NFVO_6]	NFVO supports NS scale to level	
[IFS_NFV_NFVO_7]	NFVO can change VNF Operational state	
[IFS_NFV_NFVO_8]	NFVO supports receiving VNF indicators from VNFM (query)	
[IFS_NFV_NFVO_9]	NFVO supports receiving VNF indicators from VNFM (notifications)	
[IFS_NFV_NFVO_10]	NFVO supports receiving VNF performance metrics from VNFM (query)	
[IFS_NFV_NFVO_11]	NFVO supports receiving VNF performance metrics from VNFM (notifications)	
[IFS_NFV_NFVO_12]	NFVO supports receiving VNF faults/alarms from VNFM (query)	
[IFS_NFV_NFVO_13]	NFVO supports receiving VNF faults/alarms from VNFM (notifications)	
[IFS_NFV_NFVO_14]	NFVO supports automatic NS scaling out/in triggered by VNF Indicators	
[IFS_NFV_NFVO_15]	NFVO supports automatic NS scaling out/in triggered by performance metrics	
[IFS_NFV_NFVO_16]	NFVO supports provisioning and configuration of network forwarding paths	
[IFS_NFV_NFVO_17]	NFVO supports interaction with WIM for provisioning Transport SDN networks	
[IFS_NFV_VNFM_4]	VNFM supports VNF scaling out/in by adding/removing VNFC instances	
[IFS_NFV_VNFM_6]	VNFM supports VNF scaling out/in request from VNF/EM	
[IFS_NFV_VNFM_7]	VNFM supports receiving VNF indicators from VNF/EM (notifications)	
[IFS_NFV_VNFM_8]	VNFM supports requesting VNF indicators from VNF/EM (query)	
[IFS_NFV_VNFM_11]	VNFM supports receiving virtualised resource performance metrics from VIM	
[IFS_NFV_VNFM_14]	VNFM supports receiving virtualised resource faults/alarms	

[IFS_NFV_VNFM_17]	VNFM supports automatic VNF scaling triggered by VNF indicators	
[IFS_NFV_VNFM_18]	VNFM supports automatic VNF scaling out/in triggered by performance metrics	
[IFS_NFV_VNFM_19]	VNFM supports VNFs with EPA requirements	

A.2 IFS for VIM/NFVI

IFS_ID	Description	Support
[IFS_NFV_VIM_NFVI_1]	VIM exposes OpenStack based NB APIs	
[IFS_NFV_VIM_NFVI_2]	VIM exposes other NB APIs (vCD,)	
[IFS_NFV_VIM_NFVI_3]	VIM exposes performance metrics	
[IFS_NFV_VIM_NFVI_4]	VIM exposes alarms	
[IFS_NFV_VIM_NFVI_5]	VIM offers network forwarding path functionality	
[IFS_NFV_VIM_NFVI_6]	NFVI/VIM supports NSH	
[IFS_NFV_VIM_NFVI_7]	NFVI/VIM supports EPA	

A.3 IFS for VNF

IFS_ID	Description	Support
[IFS_NFV_VNF_1]	VNF has its own VNFM	
[IFS_NFV_VNF_2]	VNF can work with generic VNFM	
[IFS_NFV_VNF_3]	VNF can scale out/in by adding/removing VNFC instances	
[IFS_NFV_VNF_4]	VNF supports scale to level	
[IFS_NFV_VNF_5]	VNF/EM can request scaling to VNFM	
[IFS_NFV_VNF_6]	VNF can send VNF Indicators to VNFM (notifications)	
[IFS_NFV_VNF_7]	VNF can send VNF Indicators to VNFM (query response)	
[IFS_NFV_VNF_8]	VNF supports Network Service Headers (NSH) encapsulation	
[IFS_NFV_VNF_9]	VNF requires EPA	

A.4 IFS for VNFM

IFS_ID	Description	Support
[IFS_NFV_VNFM_1]	VNFM supports direct mode (Resource management by VNFM)	

[IFS NFV VNFM 2]	
[IF3_NFV_VNFM_2]	VNFM supports in-direct mode (Resource management by NFVO)
[IFS_NFV_VNFM_3]	VNFM supports multi-site deployments (i.e. two or more geographically distributed sites managed by different VIM instances)
[IFS_NFV_VNFM_4]	VNFM supports VNF scaling out/in by adding/removing VNFC instances
[IFS_NFV_VNFM_5]	VNFM supports scale-to-level
[IFS_NFV_VNFM_6]	VNFM supports VNF scaling out/in request from VNF/EM
[IFS_NFV_VNFM_7]	VNFM supports receiving VNF indicators from VNF/EM (notifications)
[IFS_NFV_VNFM_8]	VNFM supports requesting VNF indicators from VNF/EM (query)
[IFS_NFV_VNFM_9]	VNFM exposes VNF Indicators towards NFVO (notifications)
[IFS_NFV_VNFM_10]	VNFM exposes VNF Indicators towards NFVO (query response)
[IFS_NFV_VNFM_11]	VNFM supports receiving virtualised resource performance metrics from VIM
[IFS_NFV_VNFM_12]	VNFM exposes VNF performance metrics towards NFVO (query response)
[IFS_NFV_VNFM_13]	VNFM exposes VNF performance metrics towards NFVO (notifications)
[IFS_NFV_VNFM_14]	VNFM supports receiving virtualised resource faults/alarms from VIM
[IFS_NFV_VNFM_15]	VNFM exposes VNF alarms towards NFVO (query response)
[IFS_NFV_VNFM_16]	VNFM exposes VNF alarms towards NFVO (notifications)
[IFS_NFV_VNFM_17]	VNFM supports automatic VNF scaling triggered by VNF indicators from VNF/EM
[IFS_NFV_VNFM_18]	VNFM supports automatic scaling out/in triggered by performance metrics from VIM
[IFS_NFV_VNFM_19]	VNFM supports VNFs with EPA requirements

A.5 IFS for NS

IFS_ID	Description	Support
[IFS_NFV_NS_1]	NS requires own VNFM(s)	
[IFS_NFV_NS_2]	NS can work with generic VNFM	
[IFS_NFV_NS_3]	VNF(s) in NS can scale out/in by adding/removing VNFC instances	
[IFS_NFV_NS_4]	VNF(s) in the NS can scale to level	
[IFS_NFV_NS_5]	VNF(s) in the NS can request scaling to VNFM	
[IFS_NFV_NS_6]	VNF(s) in NS can send VNF Indicators to VNFM (notifications)	
[IFS_NFV_NS_7]	VNF(s) in NS can send VNF Indicators to VNFM (query response)	
[IFS_NFV_NS_8]	VNF(s) in NS supports Network Service Headers (NSH) encapsulation	

[IFS_NFV_NS_9]	VNF(s) in NS requires EPA	
[IFS_NFV_NS_10]	NS can scale out/in by adding/removing VNF instances	
[IFS_NFV_NS_11]	NS supports scale to level	

History

Document history			
V1.0.0	30/08/2018	Publication	