

# MTAS VNF Life Cycle Management Guide

## MTAS

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### USER GUIDE

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# 1 Introduction

This document describes system administration tasks performed in the VNF life cycle Manager (VNF-LCM). The VNF-LCM provides a workflow execution environment and a web-based application for managing VNF life cycle procedures.

In this document, the term “vMTAS” refers to the product and the term “MTAS” refers to the MTAS application, independent of being deployed in a native or virtual environment.

This document covers the following workflow-based life cycle management procedures:

- Instantiate VNF
- Scale-out VNF
- Scale-in VNF
- Heal VNF
- Terminate VNF
- Upgrade VNF

**Note:** The Upgrade VNF Work Flow (WF) is not available in the current release.





## 2 Prerequisites

This section describes the prerequisites which must be fulfilled before the MTAS can be installed.

### 2.1 Hardware and Software

The following hardware (virtual and physical), and software is required:

- The software delivery package (so called MTAS Workflow pack) including vIMS workflow bundle, and the MTAS LCM scripts is available.
- VNF-LCM is available using either Operations Support System for Radio and Core (OSS-RC) or Ericsson Network Manager (ENM).
- Openstack Mitaka (or newer) release-based cloud environment is used. For example: Ericsson Cloud Execution Environment (CEE) R6 or newer.
- The Tenant(s) in which the VNF instance(s) resides and the connected Virtualized Infrastructure Manager(s) (VIM) are configured in VNF-LCM.

The VIM configuration in VNF-LCM can be checked with the `vnflcm vim list` command.

For more information on VIM/Tenant configuration, refer to ENM/OSS-RC documentation.

- OSS-RC/ENM related parameters are configured properly on VNF-LCM.

For more information, refer to ENM/OSS-RC documentation.

- The version of the used VNF-LCM is 18.03 (- 4.1.16), or higher.







## 3 Onboarding

This section describes how to prepare for workflow-based VNF operations using VNF-LCM. Performing this procedure is a prerequisite for life cycle operations.

**Note:** The following commands are to be executed on the VNF-LCM's Services VM.

1. Decompress the vMTAS workflow pack `CXP9034815_1-<R-state>.tar.gz` where `<R-state>` defines the revision state of the package.

```
cd /home/cloud-user
```

```
tar -zxvf CXP9034815_1-<R-state>.tar.gz
```

2. Install the vIMS workflow bundle:

- a. Log on to vnflaf-services VM as cloud-user and switch to root user.
- b. Verify that the bundle is not already installed by running the List command.

```
wfmgr bundle list
```

If the version of vIMSWorkflows is older than the version included in the vMTAS Workflow Pack `CXP9034815_1-<R-state>.tar.gz`, install the newer version.

- c. Install the workflow bundle package by running the install command.

```
wfmgr bundle install --package=\
<workflow_bundle_rpm_file_path>
```

For more information on workflow bundle installation in VNF-LCM, refer to ENM/OSS-RC documentation.

3. Decompress vMTAS LCM scripts `CXP9034788_1-<R-state>.tar.gz` where `<R-state>` defines the revision state of the package:

```
mkdir /vnflcm-ext/backups/workflows/vnfd/\
<VNFTYPE__VNFFVersion>
```

```
cd /vnflcm-ext/backups/workflows/vnfd/\
<VNFTYPE__VNFFVersion>
```

```
tar -zxvf /home/cloud-user/CXP9034788_1-<R-state>.tar
.gz
```



**Note:** Follow the naming convention: VNF type and VNF version separated by \_\_. (Where “\_\_” is a double underscore.)

4. In `/vnflcm-ext/backups/workflows/vnfd/<VNFTType__VNFVersion>`, create a configurations subdirectory with write permission for the `jboss_user` and a child directory for each VNF configuration (that is, VNF instance), and copy the VNF configuration to the child directory:

```
mkdir /vnflcm-ext/backups/workflows/vnfd/\
<VNFTType__VNFVersion>/configurations

mkdir /vnflcm-ext/backups/workflows/vnfd/\
<VNFTType__VNFVersion>/configurations/<VNF_1 configuration>

cd /vnflcm-ext/backups/workflows/vnfd/\
<VNFTType__VNFVersion>/configurations/<VNF_1 configuration>

cp -r /home/cloud-user/<VNF_1 configuration> .
```

**Note:** Each directory in configurations contains a VNF instance-specific `env.yaml` environment (HOT) file, configuration files `evip_cli.txt` for eVIP, `ss7.conf` for SS7, and `pdb_bundle.zip` for application configuration. Each directory also contains `id_rsa.pub` public key of the VNF-LCM's `jboss_user`. The files `evip_cli.txt`, `ss7.conf`, and `pdb_bundle.zip` are optional.

5. Upload the HOT template and the scaling template into the `/vnflcm-ext/backups/workflows/vnfd/<VNFTType__VNFVersion>` directory.

```
cp -r /home/cloud-user/main.yaml /vnflcm-ext/backups/\
workflows/vnfd/<VNFTType__VNFVersion>

cp -r /home/cloud-user/MTAS_HOT_scaling.yaml
/vnflcm-ext/\
backups/workflows/vnfd/<VNFTType__VNFVersion>
```

6. If the SSH key is not available yet for `jboss`, create it using the following commands:

```
su jboss_user

ssh-keygen -t rsa

exit
```

**Note:** The use of encrypted private keys is not supported in the current release (that is, do not use passphrase).

7. Copy the public SSH key into the configuration directory of VNF instance:



```
cp /home/jboss_user/.ssh/id_rsa.pub /vnflcm-ext/backups
/workflows/vnfd/<VNFTType__VNFFVersion>\
/configurations/<VNF_1 configuration>/
```

**Note:** The public key must be added in the configuration directory for each instance.

8. Verify that the structure of the /vnflcm-ext/backups/workflows/vnfd/<VNFTType\_\_VNFFVersion> directory is as follows:

```
|-- vMTAS__<x.y>
|   |-- vnflcmOperationsConfiguration.json
|   |-- configurations
|   |   |-- <VNF_1 configuration>
|   |   |   |-- env.yaml
|   |   |   |-- id_rsa.pub
|   |   |   |-- evip_cli.txt*
|   |   |   |-- ss7.conf*
|   |   |   |-- instancel_pdb_bundle.zip*
|   |   |-- <VNF_2 configuration>
|   |   |   |-- env.yaml
|   |   |   |-- id_rsa.pub
|   |   |   |-- evip_cli.txt*
|   |   |   |-- ss7.conf*
|   |   |   |-- instancel_pdb_bundle.zip*
|   |-- main.yaml
|   |-- MTAS_HOT_scaling.yaml
|-- lcmScripts
```

The files marked with \* are optional.

9. In case automatic invocation of Heal VNF WF (so called auto-heal WF) shall be enabled:

**Note:** For CEE deployments, this step is not necessarily needed since CEE's CM-HA feature can be primary used to Heal a VNF.

- a. Verify the presence of file vIMS-autostart-rules.xml in services VM of VNF-LCM:

```
ll /vnflcm-ext/current/workflows/auto-start-rules
/vIMS-autostart-rules.xml
```

- b. If the file is not present, copy the template autostart-rule file to the above mentioned directory and remove all existing template workflowTriggerRule:

```
sed '24,45d' /etc/opt/ericsson/ERICvnflafautostar
tservice_CXP9032572/vIMS-autostart-rules.xml \

> /vnflcm-ext/current/workflows/auto-start-rules/
vIMS-autostart-rules.xml
```

**Note:** It can be needed to verify that the first template workflowTriggerRule starts in line 24 and the last workflowTriggerRule ends in line 45.

- c. The file /vnflcm-ext/current/workflows/auto-start-rules/vIMS-autostart-rules.xml must contain the following workflowTriggerRule:

```
<wft:workflowTriggerRule name="vMTAS-AutoHealing" id="vMTAS-AutoHealing" type="FM_ALARM">
  <wft:triggerCondition>
    <wft:attributeName>specificProblem</wft:attributeName>
    <wft:triggerConditionOperator>EQUALS</wft:triggerConditionOperator>
    <wft:attributeValue>COM SA, CLM Cluster Node Unavailable</wft:attributeValue>
  </wft:triggerCondition>
  <wft:triggerAction WorkflowDefinitionName="Heal VNF"
    WorkflowBundleName="vIMSWorkflows">
    <wft:param />
  </wft:triggerAction>
</wft:workflowTriggerRule>
```

- d. Verify that the content of /vnflcm-ext/current/workflows/auto-start-rules/vIMS-autostart-rules.xml is similar to the following example: (it can contain additional workflowTriggerRule):

```
<?xml version="1.0" encoding="UTF-8"?>
<!--
*****
Brief description for the elements of the sample rule shown below:
*****
<wft:workflowTriggerRule> : This is the rule element, which can have multiple triggerConditions and a triggerAction.
And its mandatory attributes are id, name, type.
<wft:triggerCondition> : Defines the condition, based on which the action will be performed. Each triggerCondition
has the attributeName, triggerConditionOperator, attributeValue as child elements.
<wft:attributeName> : This element is mapped with the Alarms/Event attributes.
<wft:triggerConditionOperator>: Describes the condition matching operation on the attribute values specified. Valid values
for the element are EQUALS, NOTEQUALS and CONTAINS.
<wft:attributeValue> : The exact values to be evaluated.
<wft:triggerAction> : Defines the action to be taken when the condition is matched. Its mandatory attributes are
WorkflowDefinitionName, and WorkflowBundleName.
*****
For more details, follow the below link :
https://arm101-eiffel004.lmera.ericsson.se:8443/nexus/content/sites/tor/vnflaf-sdk/latest/workflow-log-feature.html
*****
-->
<wft:workflowTriggerRules name="vIMS-AutoTrigger-rules" type=""
version="" xmlns:wft="urn:com:ericsson:schema:xml:oss:wft" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:com:ericsson:schema:xml:oss:wft auto-start-wf-rules.xsd">
  <wft:workflowTriggerRule name="vMTAS-AutoHealing" id="vMTAS-AutoHealing" type="FM_ALARM">
    <wft:triggerCondition>
      <wft:attributeName>specificProblem</wft:attributeName>
      <wft:triggerConditionOperator>EQUALS</wft:triggerConditionOperator>
      <wft:attributeValue>COM SA, CLM Cluster Node Unavailable</wft:attributeValue>
    </wft:triggerCondition>
    <wft:triggerAction WorkflowDefinitionName="Heal VNF"
      WorkflowBundleName="vIMSWorkflows">
      <wft:param />
    </wft:triggerAction>
  </wft:workflowTriggerRule>
</wft:workflowTriggerRules>
```

**Note:** If the user wants to enable auto-healing only for a particular VNF instance, the workflowTriggerRule can be refined by adding additional triggerCondition(s) to it.

- Update the VNF-LCM's database with VNF instance-specific information for VNF instances instantiated with vIMSWorkflows version lower than 1.4.0. If it is acceptable, it is recommended to re-Instantiate those VNF instances instead of manually updating the database.



For more information on adding existing VNF instance to VNF-LCM's database, refer to ENM/OSS-RC documentation.



## 4 Procedures

The following sections describe how to perform LCM operations.

VNF-LCM procedures use workflow instances. Figure 1 shows the example of a workflow instance, where workflow progress can be tracked in the **Workflow Diagram** view. The **Workflow Diagram** only represents stages of the various procedures, operations are performed in the **Task** view.

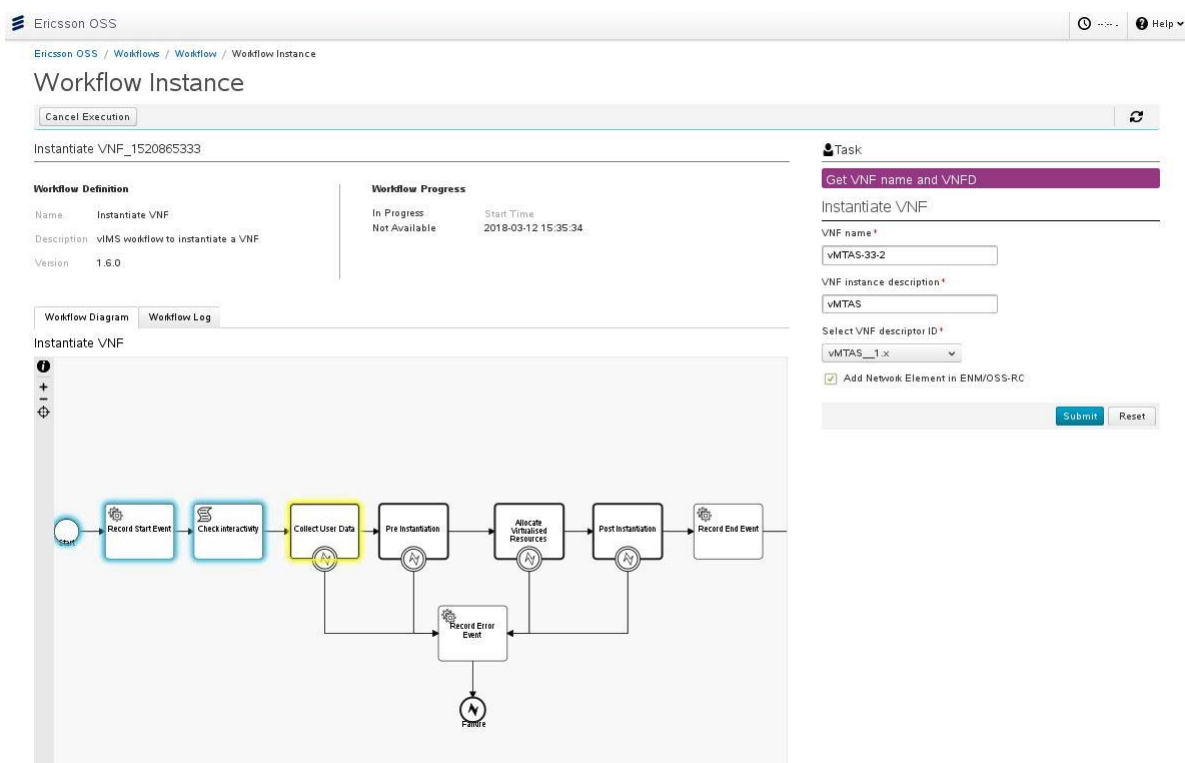


Figure 1 Workflow Instance Overview

### 4.1 Instantiate VNF

This section describes how to instantiate a VNF using VNF-LCM.

**Note:** In case the HEAT stack has to be updated manually, make sure that the `--tags` argument is used during the stack update, otherwise the VNF does not show up in the **Workflow Instance** screen.

Use the following command on a stack created using the VNF-LCM to find out what value to set the `--tags` argument to:

```
heat --os-tenant-name <tenant name> stack-show <MTAS
stack name that is name of VNF> |grep -A 2 tags
```

To instantiate a VNF:

1. Navigate to the VNF-LCM **Workflows** > **Instantiate VNF** > **Start a New Instance**. See Figure 2.

Name	Instances with User Tasks	Active Instance...	Description
Heal VNF			vIMS workflow to heal a VNF instance
Instantiate VNF			vIMS workflow to instantiate a VNF
NR-Upgrade VNF			vIMS workflow to upgrade a VNF with a redundant network
Scale-In VNF			vIMS workflow to scale-in a VNF instance
Scale-Out VNF			vIMS workflow to scale-out a VNF instance
Terminate VNF			vIMS workflow to terminate a VNF instance

Figure 2 Workflows

2. In **Start a Workflow**, fill out the **Instance Name**, and click **Submit**.
3. Select the newly created workflow from the **Instance Activity** panel.
4. On the **Workflow Instance**, add **VNF Name**, **VNF Instance Description**, and **Select VNF descriptor id\***, and click **Submit**. See example in Figure 3.

**Note:** The **Select VNF descriptor id\*** displays VNF configurations available for instantiation in the `/vnflcm-ext/backups/workflows/vnfd/` directory.

Task

Get VNF name and VNFD

### Instantiate VNF

VNF name\*

vMTAS-33-2

VNF instance description\*

vMTAS

Select VNF descriptor ID\*

vMTAS\_\_1.x

☒ Add Network Element in ENMWOSS-RC

Submit Reset

Figure 3 Instantiate VNF

5. In **Select VIM**, choose **Select VIM** to be used, and click **Submit**. See example in Figure 4.





Task

Select VIM

Select VIM:

mtas-33

Submit Reset

Figure 4 Select VIM

6. In **Select Tenant**, choose **Select Tenant** to be used, and click **Submit**. See example in Figure 5.

Task

Select Tenant

Select Tenant

mtas-33-2

Submit Reset

Figure 5 Select Tenant

7. In **Zone and Region Details**, fill in **cloud region id** and **cloud zone id**, and click **Submit**. See Figure 6.

**Note:** This step is optional (parameters can be left empty).

Task

Provide Zone & Region Info

Zone And Region Details

cloud region id.

cloud zone id.

cloud vim zone name.

cloud vim zone info id.

Submit Reset

Figure 6 Zone and Region Details

8. In **Get Instance Configuration**, choose **Select Configuration for the VNF instance\***, and click **Submit**. See example in Figure 7.

**Note:** The **Select Configuration for the VNF instance\*** displays VNF configurations available for instantiation in the `/vnflcmext/backups/workflows/vnfd/<VNFTType__VNFVersion>/configurations` directory.



Figure 7 Get Instance Configuration

9. If the ENM/OSS-RC network management application is used, provide VNF instance-specific parameters for ENM/OSS-RC topology update, and click **Submit**. See example in Figure 8.

**Note:** To fill out the **Network element version supported by OSS-RC/ENM \***, check the supported VNF version on OSS-RC/ENM. For example: on ENM, the supported VNF version can be checked with the following command: `cmedit describe --netype <VNF_type>`



Task

**Get OSS/ ENM parameters**

Enter the parameters required by OSS/ENM

VNF username \*

VNF password \*

Network element type in OSS/ENM \*

Network element version supported by OSS/ENM \*

Node IP address \*

SNMP port used \*

Netconf port used \*

The Src type of network element \*

The associated site. \*

*Figure 8 Enter the Parameters Required by OSS/ENM*

**Note:** In case of failed installation, remove the VNF instance by means of Terminate VNF WF (FORCEFUL). If the user cannot select the VNF instance in Step 4, the VNF instance-specific Heat stack shall be manually deleted from OpenStack.

## 4.2 Scale-out VNF

This section describes how to scale-out a VNF using VNF-LCM.

Continue with this procedure only if the VNF to be scaled-out is instantiated using the VNF-LCM.

To scale-out a VNF:

1. In the VNF-LCM, click **Start a Workflow > Scale-Out VNF > Start a New Instance**. See Figure 2.
2. In **Start a Workflow**, fill out **Instance Name**, and click **Submit**.
3. Select the newly created workflow from the **Instance Activity**.
4. In **Workflow Instance**, choose **Select VNF instance\***, specify the number of VMs to be added to the VNF, and click **Submit**. See example in Figure 9.

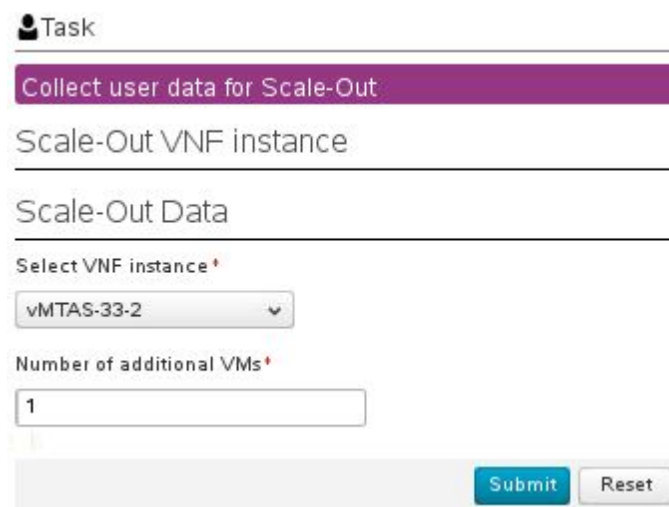


Figure 9 Collect User Data for Scale-Out

The VNF instance is scaled-out, new VMs are added to the cluster.

## 4.3 Scale-In VNF

This section describes how to scale-in a VNF using VNF-LCM.

Continue with this procedure only if the VNF to be scaled-in was instantiated using the VNF-LCM.

### Prerequisites

To gracefully scale-in a node, the system status must meet the following conditions:

- The system has sufficient memory. If the system has insufficient memory, the *DBS, Memory Limit Reached* alarm appears.
- One of the following CM parameters is in TRUE state:



```
ManagedElement=1,MtasFunction=MtasFunction,MtasSupportFunctions=0,
CarSelApplication=CarrierSelect,CarSelDialedStringAnalysisTable=0,
carSelDialedStringAnalysisTableSynchronization
ManagedElement=1,MtasFunction=MtasFunction,MtasSupportFunctions=0,
CarSelApplication=CarrierSelect,CarSelCarrierTable=0,
carSelCarrierTableSynchronization
ManagedElement=1,MtasFunction=MtasFunction,MtasSupportFunctions=0,
NumAnaApplication=NumberAnalysis,NumAnaLocalCallTable=0,
numAnaLocalCallTableSynchronization
ManagedElement=1,MtasFunction=MtasFunction,MtasSupportFunctions=0,
NumberNormalisation=NumberNormalisation,
numberNormalisationTableSync
```

For more information, refer to *MTAS Troubleshooting Guideline*.

To scale-in VNF:

1. In the VNF-LCM, click **Start a Workflow > Scale-In VNF > Start a New Instance**. See Figure 2.
2. In **Start a Workflow**, fill out **Instance Name**, and click **Submit**.
3. Select the newly created workflow from the **Instance Activity** panel.
4. In **Workflow Instance**, choose **Select VNF Instance\*** to be scaled in, specify **Number of VMs to Scale-In\***, and click **Submit**. See example in Figure 10.

Task

Collect user data for Scale-In

Scale-In VNF instance

Scale-In Data

Select VNF instance \*

vMTAS-33-2

Number of VMs to Scale-In \*

1

Submit Reset

Figure 10 Collect User Data for Scale-In

The VNF instance is scaled-in, the specified number of VMs is removed from the cluster.

5. On the Collect extra parameters screen, select **Scale-in type** and optionally specify the list of VM UUIDs to be Scale-in with, and click **Submit**. See example in Figure 11.

**Note:** FORCEFUL Scale-in is a disruptive action therefore it is only to be used for Scale-in unavailable/failed PL(s). (The virtual resources reserved for the PL(s) are freed up first and then the MTAS cluster is “cleaned”.)

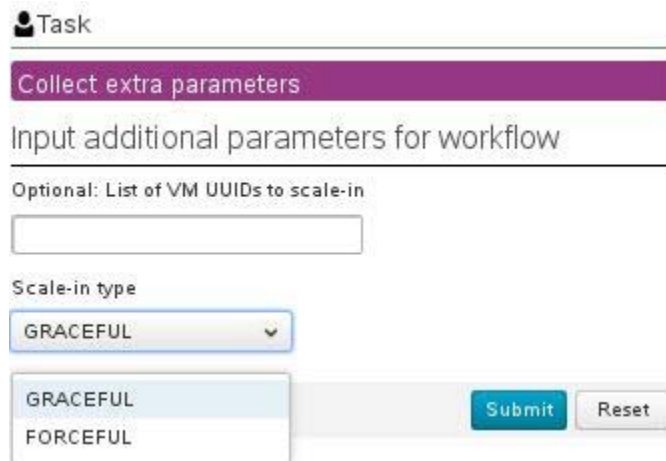


Figure 11 Collect Extra Parameters

The VNF instance is scaled-in, the specified number of PLs is removed from the cluster.

**Note:** If any UUID was specified in Step 5, the VMs with the specified UUIDs are removed, otherwise VMs with the highest index in their name in OpenStack are removed.

## 4.4 Heal VNF

This section describes how to heal a VNF from compute resource or network resource (for instance Neutron port) failure using VNF-LCM.

Heal VNF WF can be started two ways:

- Manually from VNF-LCM User Interface (UI)
- Automatically, triggered on the reception of the CLM Cluster Node Unavailable alarm from the VNF instance

To enable the use of auto-heal VNF WF, set up an autostart-rule as it is specified in Step 9 of Onboarding.

The progress of auto-heal VNF WF can be tracked on the **Instance Activity** panel of VNF-LCM. The Heal VNF WF consists a FORCEFUL Scale-in and a Scale-out operation so that three WF instances are visible for the auto-heal VNF WF (Heal VNF, Scale-in (Heal VNF) and Scale-out (Heal VNF)) on the **Instance Activity** panel.



**Note:**

- It is recommended to lower the node (VM) alarm timeout on the VNF instance from 15 minutes to 5 minutes in order to trigger the CLM Cluster Node Unavailable alarm, if a VM has lost contact with the remaining cluster members for more than 5 minutes. To lower the value of the node (VM) alarm timeout, use command: `cmw-node-alarm-timeout 300`
- The Heal VNF WF can only heal the VNF if sufficient compute resource is available for OpenStack's Nova scheduler.
- Healing of non-scalable VMs (SC-1, SC-2, PL-3, PL-4) is not possible.

Continue with this procedure only if the VNF to be healed was instantiated using the VNF-LCM and the Heal VNF WF shall be started manually.

To heal the VNF manually:

1. In the VNF-LCM **Workflows**, select **Heal VNF**, and click **Start a New Instance**. See Figure 2.
2. In **Start a Workflow**, fill out **Instance Name**, and click **Submit**.
3. Select the newly created workflow from the **Instance Activity** panel.
4. In **Workflow Instance**, choose **Select VNF instance\***, and click **Submit**. See example in Figure 12.

The screenshot shows a web form titled 'Task'. The main heading is 'Collect user data for Healing'. Below this is a sub-heading 'Heal VNF instance'. Underneath is a section titled 'Healing Data'. Within this section, there is a label 'Select VNF instance\*' followed by a dropdown menu. The dropdown menu currently displays 'vMTAS-33-2'. At the bottom right of the form, there are two buttons: 'Submit' and 'Reset'.

*Figure 12 Collect User Data for Healing*

5. In **Input additional parameters for workflow**, specify UUID of VM to be removed from the cluster, and click **Submit**. See example in Figure 13.

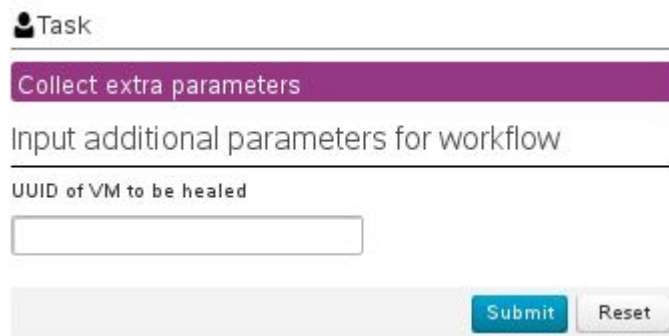


Figure 13 Collect Extra Parameters

6. Get UUID of unavailable/failed PL(VM) from ECLI using command:  
`show -r ManagedElement=1,Equipment=1`

The VNF instance is scaled-in, the specified VM is forcefully removed from the cluster. After this, the VNF instance is scaled-out, and a PL is added to the cluster.

## 4.5 Terminate VNF

This section describes how to terminate a VNF using VNF-LCM.

Continue with this procedure only if the VNF to be terminated is instantiated using the VNF-LCM.

### Steps

1. In the VNF-LCM **Workflows**, select **Terminate VNF**, and click **Start a New Instance**. See Figure 2.
2. In **Start a Workflow**, fill out the **Instance Name** field, and click **Submit**.
3. Select the newly created workflow from the **Instance Activity** panel.
4. On the **Workflow Instance** screen, choose **Select VNF instance** and click **Submit**. See example in Figure 14.





Task

Collect user data for Terminate

Terminate VNF instance

Termination Data

Select VNF instance \*

vMTAS-33-2

Termination type:

Graceful

Graceful termination timeout (sec)

-1

Submit Reset

Figure 14 Collect User Data for Terminate

### Graceful

The VNF instance is gracefully locked (by setting `mtasFunctionAdministrativeState` to `SHUTTING DOWN(2)`), it gradually stops processing traffic. The VNF is terminated after the expiration of the graceful termination period or even earlier when all ongoing sessions have stopped on the node.

### Forceful

The VNF is terminated immediately, all ongoing traffic is lost. This option must be confirmed on the next screen, as it stops all traffic.

### Graceful termination timeout (sec)

The graceful termination timeout value defines after how many seconds the VNF is terminated when graceful termination has been applied but there is still ongoing traffic. Default value: -1, meaning that there is no graceful termination period, that is, the VNF is terminated only after the VNF stopped processing traffic.

The VNF instance is terminated. In case of Graceful termination, the VNF instance stops processing traffic gracefully and then is terminated.

## 4.6 Upgrade VNF

The Upgrade VNF WF is not supported by the current release.





## 5 Logging

In case of an unsuccessful workflow execution, find more information on the cause of the failure:

- In the **Workflow Log** view.
- In the Jboss Server log:

```
/ericsson/3pp/jboss/standalone/log/server.log
```

It is recommended to increase the log level from INFO to DEBUG during troubleshooting of the unsuccessful Workflow execution. More information on the procedure can be found in VNF-LCM documentation.