

VNF Life Cycle Management

Virtual Multimedia Resource Function

User Guide

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1 Introduction

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

VNF life cycle procedures are realized by executing ordered sequences of steps, called workflows. Each workflow must be provided with VNF-specific input parameters during execution.

This document covers the following life cycle management procedures:

- [Instantiate VNF](#) on page 7
- [Upgrade VNF](#) on page 12
- [Scale-out VNF](#) on page 16
- [Scale-in VNF](#) on page 18
- [Heal VNF](#) on page 20
- [Terminate VNF](#) on page 21



2 Prerequisites

This section provides information on the tools and conditions that apply to the procedures in this document.

Before performing any VNF-LCM procedure, ensure that the following conditions are met:

- The software delivery package including vIMS workflows, VNF-specific Heat Orchestration Template (HOT) files, example environment files, and the VNF-LCM scripts is available.
- VNF-LCM is available using either Operations Support System, Radio and Core (OSS-RC) or Ericsson Network Manager (ENM).
- One of the following Virtual Infrastructure Managers (VIMs) is used:
 - OpenStack Mitaka or newer
 - CEE R6 or newer
- The VIM is configured in VNF-LCM.

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

For more information on configuration and the command, refer to *VNF-Lifecycle Manager System Administration Guide*, Reference [1].

- The version of the LAF image used is 4.2.35 or higher.
- The cloud environment is prepared for the deployment of the VNF, that is, the following activities are performed:
 - Cloud hardware and software preparation and configuration
 - Flavor creation
 - Network topology creation
 - Subnet creation

For detailed instructions, refer to the relevant deployment instructions.



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.

Prerequisites

The VNF image is uploaded to the cloud environment. For more information, refer to the relevant [deployment instructions](#).

Steps

1. Install the RPM workflow bundle as described in the relevant network management system documentation.

For more information, refer to *VNF-Lifecycle Manager System Administration Guide*, Reference [1].

2. Create a directory for the VNF-specific files in `/vnflcm-ext/backups/workflows/vnfd/<VNFTYPE__VNFFVERSION>` and copy the **release-specific** HOT files provided in the software delivery package into it.

Note: Follow the naming convention as above: VNF type and VNF version separated by "__".

3. In `/vnflcm-ext/backups/workflows/vnfd/<VNFTYPE__VNFFVERSION>`, create a configurations subdirectory with write permission for the `jboss_user`, and a child directory for each VNF configuration. This allows for storing multiple VNF configurations.

Note: Each directory in configurations shall contain a VNF-specific `env.yaml` environment file. Each `env.yaml` file can be used for a different VNF instantiation, depending on, for example, network needs.

4. Copy the `lcmScripts` directory and its content into the directory created in [Step 2](#).

Note: The `lcmScripts` is provided in the software delivery package.

The example below shows a directory structure with two configurations stored.

Example

```
`-- vMRF__1.5.0
   |-- vnflcmOperationsConfiguration.json
   |-- configurations
   |   |-- example_config_1
```



```
| | `-- env.yaml
| `-- example_config_2
|   `-- env.yaml
|-- main.yaml
|-- scaling_group.yaml
`-- lcmScripts
```

5. Add the private SSH key to the `/home/jboss_user/.ssh/` folder, and the public SSH key in the `admin_authorized_key` parameter of the `env.yaml` file.

Note: If the SSH key is not available yet, create it using the `ssh-keygen -t rsa` command.



4 Prepare VNF Deployment Parameters

The VNF-LCM uses the parameters of the `env.yaml` file as input for VNF instantiation, therefore they must be defined to match your network environment.

Note: The `.yaml` files included in the `examples` folder of the software delivery package serve as examples for a possible network configuration. They can be modified to match your network environment.

Steps

1. Ensure that **all** deployment HOT file parameters specified in the `/vnflcm-ext/backups/workflows/vnfd/<VNFTYPE__VNFFVersion>/configurations/<example_configuration_1>/env.yaml` files are assigned a correct value.
2. Add any missing deployment parameters and their default values to the `env.yaml` file.



5 Procedures

The following sections describe how to perform LCM operations.

VNF-LCM procedures utilize workflow instances. [Figure 1](#) shows an 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.

It is not recommended to execute a workflow instance on a VNF while another one is in progress, as it can lead to unexpected behavior. If a new workflow procedure is needed, the ongoing one must be terminated before starting a new one.



Workflow Instance

[Cancel Execution](#)

Instantiate VNF_1496067991

Workflow Definition

Name Instantiate VNF

Version 0.0.8

Workflow Progress

In Progress

Not Available

[Workflow Diagram](#)[Workflow Log](#)

Instantiate VNF

Figure 1 Workflow Instance Overview

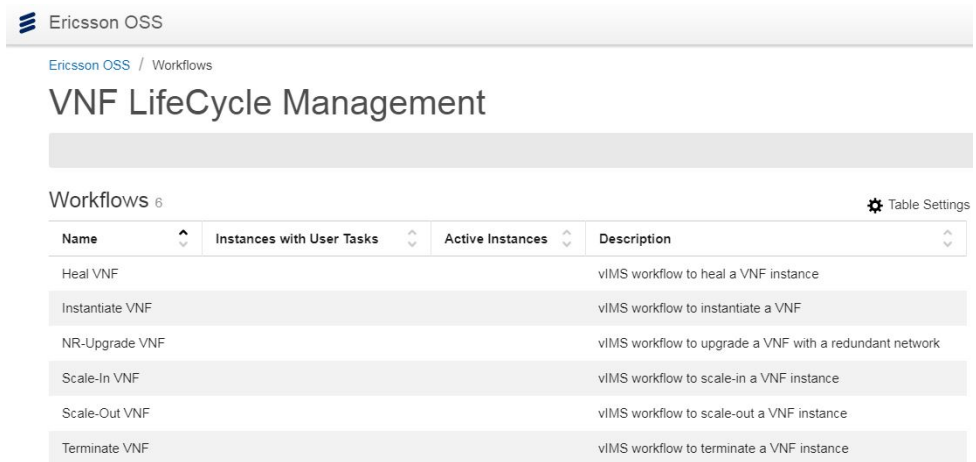
5.1 Instantiate VNF

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

Note: When instantiating a VNF on a VIM running on BSP, make sure there are no active Capture Jobs on BSP, or the instantiation fails.

Steps

1. In the VNF-LCM **Workflows** screen, select **Instantiate VNF**, and click the **Start a New Instance** button.



| Ericsson OSS | | | |
|---|---------------------------|------------------|---|
| Ericsson OSS / Workflows | | | |
| VNF LifeCycle Management | | | |
| Workflows 6 Table Settings | | | |
| Name | Instances with User Tasks | Active Instances | 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 Select Workflow

2. On the **Start a Workflow** screen, 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, add **VNF Name** and **VNF Instance Description**, select VNF to instantiate, and click **Submit**.

Select the **Add Network Element in ENM/OSS-RC** check box to add the new VNF in the network management application.

Note: The **VNF Name** is also used as the Heat stack name. It is not recommended to add version information in this field, as the name is unchanged after VNF upgrades.

The **Select VNF descriptor Id** field displays VNF releases available for instantiation in the `/vnflcm-ext/backups/workflows/vnfd/` directory.

Figure 3 Instantiate VNF



Task

Get VNF name and VNFD

Instantiate VNF

VMF name*

VMF instance description*

Select VMF descriptor ID*

☒ Add Network Element in ENM/OSS-RC

5. On the **Select VIM** screen, select the VIM to be used, and click **Submit**.

Task

Select VIM

Select VIM:*

Figure 4 Select VIM

6. On the **Select Tenant** screen, select the tenant to be used, and click **Submit**.

Figure 5 Select Tenant

7. On the **Get Instance Configuration** screen, select a VNF configuration to instantiate, and click **Submit**.

Note: The **Select Configuration for the VNF instance** field displays VNF configurations available for instantiation in the `/vnflcm-ext/backups/workflows/vnfd/<VNFTYPE__VNFFVersion>/configurations` directory.

Figure 6 Get Instance Configuration

8. If the ENM network management application is used, provide VNF-related parameters for ENM, and click **Submit**.

This step is optional. It is only required if the **Add Network Element in ENM/OSS-RC** check box was selected in [Step 4](#).

Note: To fill out the **Network element version supported by OSS/ENM** field, check the supported VNF version 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.*

Submit

Reset

Figure 7 Get OSS or ENM Parameters

Results

The VNF is instantiated, it starts handling traffic after configuration data is provided. For more information on providing configuration data, refer to [Deployment Guide for OpenStack](#) or [Deployment Guide for Cloud Execution Environment \(CEE\)](#), and [Initial Configuration Guide](#).



5.2 Upgrade VNF

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

To perform this procedure without traffic stoppage, it is required that two VNFs are available in parallel during normal operation. During the upgrade process, configuration data is exported from the VNF selected to be upgraded. The VNF then is locked and removed. A new version of the VNF is deployed with configuration data of the previously removed VNF.

Prerequisites

- All parameters are transferred from the old VNF, except for `mrf_image`.
- The configuration file (`env.yaml`) of the new VNF contains the parameter `mrf_image` with the new image version ID from OpenStack.
- Parameters introduced in the new VNF version are set in the configuration file.

Note: Other parameters in the target configuration file are overwritten by the exported ones.

Steps

1. In the VNF-LCM **Workflows** screen, select **NR-Upgrade VNF**, and click the **Start a New Instance** button.

| Ericsson OSS | | | |
|--|---------------------------|------------------|---|
| Ericsson OSS / Workflows | | | |
| VNF LifeCycle Management | | | |
| Workflows 6 ⚙️ Table Settings | | | |
| Name | Instances with User Tasks | Active Instances | 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 8 Select Workflow

2. On the **Start a Workflow** screen, 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, select the VNF to upgrade, termination options, and set automatic rollback timer, and click **Submit**.

Task

Select VNF to upgrade

Upgrade VNF

Stacks

Select VNF to upgrade*

vMRF-12 ▼

VNF Termination type:

Graceful

Graceful termination timeout (sec)

-1

Automatic rollback after upgrade(min)

-1

Submit **Reset**

Figure 9 Select VNF to Upgrade

The following termination options are available:

| | |
|-----------------|---|
| Graceful | The VMs in the cluster are gracefully locked, the VNF instance gradually stops processing traffic. The VNF is terminated after the expiration of the graceful termination period. |
| 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 all VMs stopped processing traffic.



5. On the **Set VNF and target VNF version** screen, add new VNF name, description, and version descriptor ID.

Task

Set VNF and target VNF version

Upgrade VNF

New VNF name*

VNF instance description*

Select new VNF version descriptor ID*

Figure 10 Set VNF and Target VNF Version

6. On the **Select Target Instance Configuration Data** screen, select configuration data for the new VNF.
7. If the ENM network management application is used, provide VNF-related parameters for ENM, and click **Submit**.

This step is optional. It is only required if the **Add Network Element in ENM/OSS-RC** check box was selected during VNF instantiation.

Note: To fill out the **Network element version supported by OSS/ENM** field, check the supported VNF version with the following command:

```
cmedit describe --netype <VNF_type>
```



Task

Get OSS/ ENM parameters

Enter the parameters required by OSS/ENM

VNF username*

mrsv-admin

VNF password*

Network element type in OSS/ENM*

vMRF

Network element version supported by OSS/ENM*

vMRF-1.5.0

Node IP address*

131.160.102.122

SNMP port used*

161

Netconf port used*

830

The Src type of network element*

CBA

The associated site.*

FINLAND

Submit

Reset

Figure 11

After this step, the old VNF is terminated according to the termination method chosen in [Step 4](#), and the new version is instantiated with the configuration data selected in [Step 6](#).

If the new VNF fails to instantiate, it is automatically terminated and the old VNF is recreated with the `_x` suffix in its stack name.

If the new VNF is instantiated successfully, the **Confirm upgrade** screen is displayed, and the automatic rollback timer set in [Step 4](#) is started.

8. Check that traffic processing in the new VNF version is working properly.
 - If the operation of the new version is considered acceptable, select **Confirm** and click **Submit**.
 - If there are problems with the new version that cannot be solved and that are considered unacceptable, select **Rollback** and click **Submit**. The rollback procedure terminates the VNF and recreates the old VNF with the `_x` suffix in its stack name.

Task

Confirm upgrade

Check the if the upgrade was successful. Rollback or finish?

Time left until automatical rollback (minute)

59

☐ Rollback

Submit

Reset

Figure 12 Confirm Upgrade or Rollback

Note: If neither option is chosen before the automatic rollback timer expires, the new VNF is removed and the old one is instantiated automatically.

Results

After the upgrade procedure is confirmed, the new version VNF continues accepting new incoming traffic.

5.3

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 was instantiated using the VNF-LCM.

Steps

1. In the VNF-LCM click **Start a Workflow**, and select **Scale-Out VNF**, and click the **Start a New Instance** button.



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Ericsson OSS / Workflows

VNF LifeCycle Management

Workflows 6 ⚙️ Table Settings

| Name | Instances with User Tasks | Active Instances | 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 13 Select Workflow

- On the **Start a Workflow** screen, fill out the **Instance Name** field, and click **Submit**.
- Select the newly created workflow from the **Instance Activity** panel.
- On the **Workflow Instance** screen, select the VNF to be scaled out, specify the number of VMs to be added to the VNF, and click **Submit**.

Task

Collect user data for Scale-Out

Scale-Out VNF instance

Scale-Out Data

Select VNF instance*

vMRF-12

Number of additional VMs*

2

Submit Reset

Figure 14 Scale-out VNF Instance

Results

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



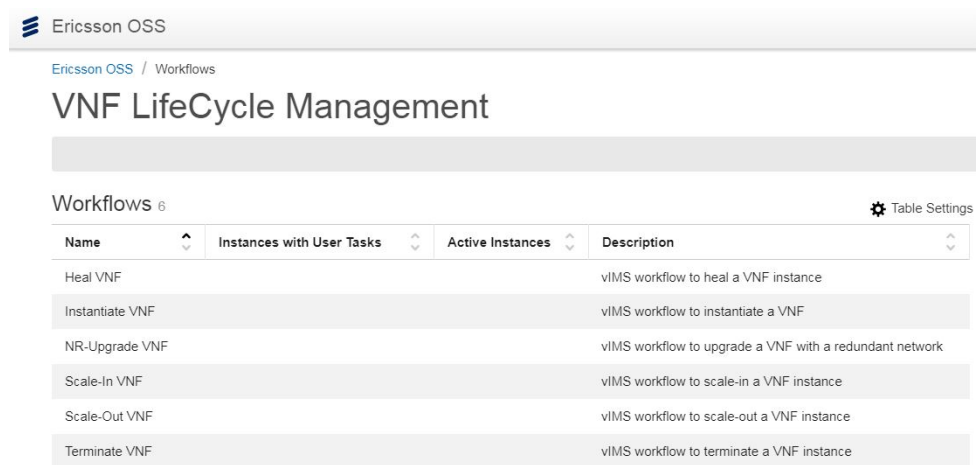
5.4 Scale-in VNF

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.

Steps

1. In the VNF-LCM click **Start a Workflow**, and select **Scale-In VNF**, and click the **Start a New Instance** button.



The screenshot shows the Ericsson OSS VNF LifeCycle Management interface. At the top, there is a header with the Ericsson OSS logo and the text 'Ericsson OSS / Workflows'. Below this is the title 'VNF LifeCycle Management'. A table titled 'Workflows 6' is displayed, with a 'Table Settings' icon to its right. The table has four columns: 'Name', 'Instances with User Tasks', 'Active Instances', and 'Description'. The rows list various workflows: 'Heal VNF', 'Instantiate VNF', 'NR-Upgrade VNF', 'Scale-In VNF', 'Scale-Out VNF', and 'Terminate VNF'. Each row has a corresponding description in the 'Description' column.

| Name | Instances with User Tasks | Active Instances | 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 15 Select Workflow

2. On the **Start a Workflow** screen, 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, select the VNF to be scaled in, specify the number of VMs to be removed from the VNF, and click **Submit**.

Figure 16 Scale-in VNF Instance



Task

Collect user data for Scale-In

Scale-In VNF instance

Scale-In Data

Select VNF instance*

vMRF-12 ▼

Number of VMs to Scale-In*

1

Submit **Reset**

- On the **Collect extra parameters** screen, specify the needed parameters, and click **Submit**.

Note: This step is optional, leave the fields blank if none of these parameters is needed.

Figure 17 Scale-in VNF Instance

Task

Collect extra parameters

Input additional parameters for workflow

Optional: List of VM UUIDs to scale-in

Scale-in type

GRACEFUL ▼

Optional: Graceful scale-in timeout

-1

Submit **Reset**

The following optional scale-in parameters are available:



- Specific VMs to be scaled-in
- VM locking method, that is, graceful or forceful
- If VMs are locked gracefully, a timer for graceful lock

Results

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

Note: If any UUID was specified in [Step 5](#), the VMs with the specified UUID are removed, otherwise VMs with the highest index.

5.5 Heal VNF

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

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

Steps

1. In the VNF-LCM **Workflows** screen, select **Heal VNF**, and click the **Start a New Instance** button.

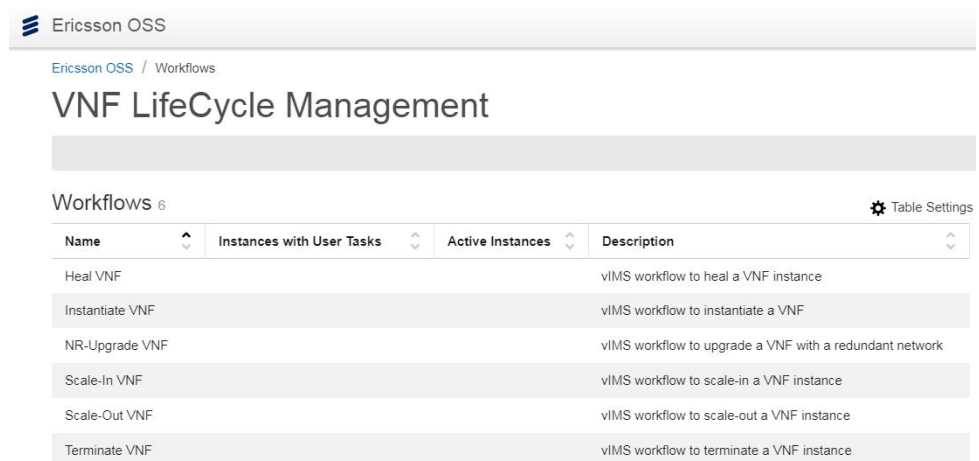


Figure 18 Select Workflow

2. On the **Start a Workflow** screen, 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, select the VNF to be healed, and click **Submit**.



Task

Collect user data for Healing

Heal VNF instance

Healing Data

Select VNF instance *

vMRF-12 ▼

Submit **Reset**

Figure 19 Heal VNF

- On the **Input additional parameters for workflow** screen, specify VMs to be removed from the cluster, and click **Submit**.

Task

Collect extra parameters

Input additional parameters for workflow

List of VM UUIDs to heal *

335705df-98ad-4b8f-b379-33dc5af679

Submit **Reset**

Figure 20

Results

The VNF instance is scaled-in, the specified VMs are forcefully removed from the cluster. After this, the VNF instance is scaled-out, the same number of VMs is added to the cluster.

5.6 Terminate VNF

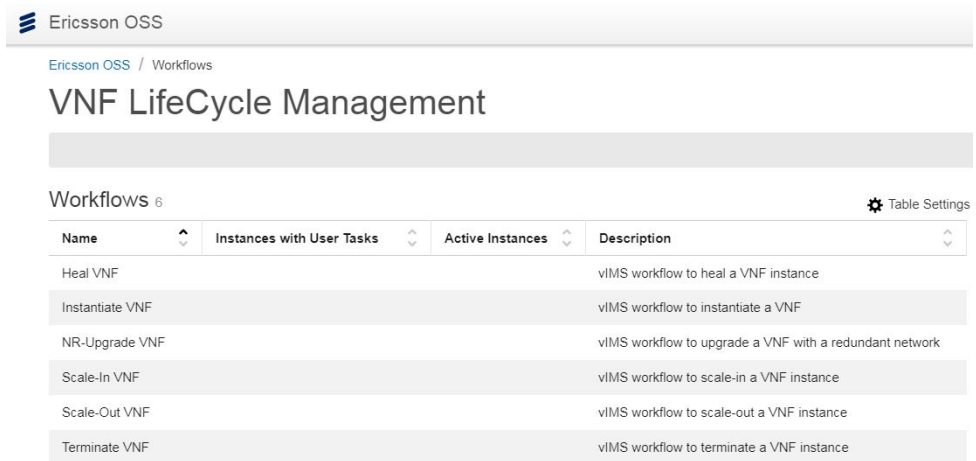
This section describes how to terminate a VNF using VNF-LCM.

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



Steps

1. In the VNF-LCM **Workflows** screen select **Terminate VNF**, and click the **Start a New Instance** button.



Ericsson OSS

Ericsson OSS / Workflows

VNF LifeCycle Management

Workflows 6 ⚙ Table Settings

| Name | Instances with User Tasks | Active Instances | 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 21 Select Workflow

2. On the **Start a Workflow** screen, 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, select the VNF to terminate, termination options, and click **Submit**.



Task

Collect user data for Terminate

Terminate VNF instance

Termination Data

Select VNF instance *

vMRF-12 ▼

Termination type:

Graceful

Graceful termination timeout (sec)

-1

Submit Reset

Figure 22 Terminate VNF

The following termination options are available:

| | |
|-----------------|---|
| Graceful | The VMs in the cluster are gracefully locked, the VNF instance gradually stops processing traffic. The VNF is terminated after the expiration of the graceful termination period. |
| 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 all VMs stopped processing traffic.

Results

The VMs in the cluster are terminated with the method selected in [Step 4](#), the VNF instance stops processing traffic, and is terminated.



Reference List

- [1] *VNF-Lifecycle Manager System Administration Guide*, 1543-APR 901 0578