

Configure Scale-Out

Ericsson Service-Aware Policy Controller

OPERATING INSTRUCTIONS

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1 Configure Scale-Out Introduction

This document describes how to perform scale-out operation, which adds one Virtual Machine (VM), acting as PayLoad (PL), to the SAPC vApp.

1.1 Configure Scale-Out Prerequisites

This section describes the prerequisites, which must be fulfilled before using the procedure.

1.1.1 Conditions

The following conditions must apply:

- Other upgrade operations are not ongoing, for example, software upgrade.
 - An Ericsson Command-Line Interface (ECLI) session in Exec mode is in progress.
 - For the specific case of deployments over OpenStack based NFV Infrastructure (NFVI) using ECM (Ericsson Cloud Manager), Atlas or Director, the collocation of the new scaled-out PL with the SAPC VMs already deployed, depends on the deployment type defined in the `SAPC.cfg` configuration file:
 - **compact**: the scaled PLs belong to the same anti-affinity group that the PLs of the initial deployment. Therefore, they cannot be deployed together in the same physical host.
 - **single_box**: the scaled PLs belong to the same affinity group that the remaining VMs of the SAPC. Therefore, all VMs are deployed together in the same physical host.
 - **multiple_host**: the scaled PLs belong to the same anti-affinity group that the remaining VMs of the SAPC. Therefore, every VM is deployed in a different physical host.
 - **custom**: user-defined affinity rules, There are some limitations, depending on the cloud environment chosen for deployment.
- Note:** Additional information about the `SAPC.cfg` configuration file can be found on the [SAPC VNF Descriptor Generator Tool](#).
- For the specific case of deployments using ECM, to run the scale-out script for adding VMs, it is required to have a host acting as "preparation server". This preparation server must have connectivity towards the ECM server.
 - For the specific case of deployments using VMware vCloud Director, during the SAPC vApp deployment, the OVF package to be used as template to scale-out



PL VMs was uploaded to the catalog. The OVF package for scale-out already uploaded to the catalog is required during this procedure.



2 Configure Scale-Out Procedure

To scale-out a VM:

1. Use the specific Cloud Manager to create one VM that act as PL.

Caution!

The VM must have the same number of Virtual CPUs (vCPUs), the same amount of RAM, and the same number of ports as the other PLs in the vApp.

The SAPC offers procedures for four different Cloud Managers:

- a. For ECM deployments over CEE environments, follow the procedure described in Section 3 on page 7.
 - b. For Atlas/Director deployments over OpenStack environments, follow the procedure described in Section 4 on page 9.
 - c. For VMware vSphere Client deployments over VMware environments, follow the procedure described in Section 5 on page 11.
 - d. For VMware vCloud Director deployments over VMware environments, follow the procedure described in Section 6 on page 19.
2. Wait until the new VM automatically PXE boot from the System Controller (SC) node VMs.

3. Navigate to the CrM managed object, for example:

```
> dn ManagedElement=1, SystemFunctions=1, SysM=1, CrM=1
```

4. Verify that the scale-out process has started:

```
(CrM=1)> show -r
```

The following is an example output:

Note: PL - 3 is the first PL of the SAPC vApp. As the two first PLs (PL - 3 & PL - 4) belong to the initial deployment, the number of the scaled-out PLs is PL - 5 onwards.



```

CrM=1
  autoRoleAssignment=ENABLED

  ComputeResourceRole=PL-3
    adminState=UNLOCKED
    instantiationState=INSTANTIATED
    operationalState=ENABLED
    provides="ManagedElement=1,SystemFunctions=1,SysM=1,CrM=1,Role=Default-Role"
    uses="ManagedElement=1,Equipment=1,ComputeResource=PL-3"
  ComputeResourceRole=PL-4
    adminState=UNLOCKED
    instantiationState=INSTANTIATED
    operationalState=ENABLED
    provides="ManagedElement=1,SystemFunctions=1,SysM=1,CrM=1,Role=Default-Role"
    uses="ManagedElement=1,Equipment=1,ComputeResource=PL-4"
  ComputeResourceRole=PL-5
    adminState=UNLOCKED
    instantiationState=INSTANTIATING
    operationalState=DISABLED
    provides="ManagedElement=1,SystemFunctions=1,SysM=1,CrM=1,Role=Default-Role"
    uses="ManagedElement=1,Equipment=1,ComputeResource=PL-5"
  Role=SYSTEM
    isProvidedBy
      scalability=NON_SCALABLE
  Role=Default-Role
    isProvidedBy
      "ManagedElement=1,SystemFunctions=1,SysM=1,CrM=1,ComputeResourceRole=PL-3"
      "ManagedElement=1,SystemFunctions=1,SysM=1,CrM=1,ComputeResourceRole=PL-4"
    scalability=SCALABLE

```

This example shows that `instantiationState` has changed to `INSTANTIATING` for node `PL-5`. It means that the Scale out has started for node `PL-5`.

5. Continue to check the progress until the scale-out process has ended and the added node has joined the cluster:

```
(CrM=1)>show -m ComputeResourceRole -p instantiationState,operationalState
```

The following example output shows the final result:



```

ComputeResourceRole=PL-3
  instantiationState=INSTANTIATED
  operationalState=ENABLED
ComputeResourceRole=PL-4
  instantiationState=INSTANTIATED
  operationalState=ENABLED
ComputeResourceRole=PL-5
  instantiationState=INSTANTIATED
  operationalState=ENABLED

```

This example shows that `instantiationState` has changed to `INSTANTIATED` for node `PL-5`. It means that `PL-5` is added to the cluster.

The example also shows that `operationalState` has changed to `ENABLED` for node `PL-5`. It means that node `PL-5` has joined the cluster.

6. Perform a health check specific for the scaling procedure of the PL. The use is shown:

```
sapcadmin@SC-X:~>sapcScaleOutHealthCheck <PL-X>
```

Usage `sapcHealthCheck PL-Num PL-Num`: mandatory argument. It indicates the new PL machine scaled out in the cluster during the whole procedure. Example: `PL-5`.

The next example shows the script output for a succeed state:

```
sapcadmin@SC-X:~>sapcScaleOutHealthCheck PL-5
```

```

Checking PL-5 node becomes up at TIPC level...
The new neighbor 5 is up at TIPC level.

```

```
DBS is Started in PL-5. DBS level...
```

```
Scale-Out for PL-5 has been successfully performed.
```

```

It is recommended to perform a whole SAPC Health Check:
sapcHealthCheck

```

7. Perform a health check, refer to Health Check chapters available in the Deployment Instruction documents: [SAPC VNF Deployment Instruction for OpenStack](#) and [SAPC VNF Deployment Instruction for VMware](#).
8. The new PL starts processing traffic automatically.
9. Repeat the procedure as many times as new PLs are needed.



Caution!

It is not supported to start a new PL scale-out procedure while there is another PL scaling ongoing.

10. Perform a system data backup following the produce described in [System Backup and Restore](#).



3 VM Creation using ECM

The steps to be executed are:

1. From the preparation server, a tool to create automatically VMs in ECM, delivered as part of the Virtual Delivery Package (VDP) for OpenStack (`vdp_sapc_qcow2_cxp9032849_<revision>.tar.gz`) must be executed. Before the execution, the following information must be provided in the "ecm" and "scaling" sections of the configuration file `SAPC.cfg`:

Note: Detailed description of the parameters contained on the scaling section of `SAPC.cfg` can be found on the [SAPC VNF Descriptor Generator Tool](#).

— The name of the SAPC Virtual Application (vApp).

Note: In case, more than one SAPC vApps are deployed on the same Virtual Data Center (VDC), a prefix is added to the name of the additional instances. This prefix must be also provided as part of the name of the vApp to scale-out.

— VDC where the vApp is deployed.

— Tenant of the VDC where the vApp is deployed.

— ECM server hostname or IP Address.

— User to connect with the ECM server. Password is optional, in case it is not provided in the configuration file, the user is prompted.

— Number of PLs to scale-out: 1.

The rest of the parameters of the configuration file `SAPC.cfg` can be ignored.

2. The `SAPC_orchestrator`, located in the `bin/` directory of the VDP, is the tool which creates VMs in ECM. To execute it, the following arguments are available:

Note: For the execution of the script from the bin directory of the VDP, only the presence of the configuration file `SAPC.cfg` and the `--option` argument with the operation to perform is needed.

— `--help` or `-h`: if this argument is present, an explanation for every argument is shown and the execution finishes.

— `--version`: if this argument is present, the version is shown and the execution finishes.

— `--option`: mandatory argument. It indicates the operation to perform. Possible values are: `onboarding`, `instantiation`, `scaleout`, `scalein`, `termination`.



- **--vdp**: mandatory argument for onboarding option. It indicates the path to the VDP.
- **--cfg <CFG>** or **-c <CFG>**: mandatory argument. It indicates where the `SAPC.cfg` configuration file is. The default `SAPC.cfg` configuration file is placed in the root directory of the Virtual Delivery Package explained in *SAPC VNF Descriptor Generator Tool*.
- **--debug**: optional argument for debugging and troubleshooting purposes.
- **--log <LOG>**: optional argument to log the messages to a file instead of showing them into the standard output.

Then, an example of the `SAPC_orchestrator` execution is:

```
<PreparationServer># SAPC_orchestrator --option scaleout --cfg  
SAPC.cfg
```

3. Once the ECM has received the order from the previous script, a new VM is displayed on ECM belonging to the SAPC vApp.
4. After some minutes, the new VM will be operational and integrated as a new PL in the SAPC vApp.



4 VM Creation using Atlas/Director

The steps to be executed are:

1. Connect by SSH to the machine running Atlas/Director using the provided credentials.
2. Execute the following command to obtain the current value of the parameter `pls`.

```
heat stack-show <stack_name> | grep -i '"pls": '
```

Note: For all the commands to be executed, it is needed to set up the following environment variables:

- `OS_AUTH_URL` points to Keystone service.
- `OS_CACERT` for the verification of the server certificate.
- `OS_TENANT_NAME` contains the name of the tenant where the stack was created.
- `OS_USERNAME`: user with delete rights.
- `OS_PASSWORD`: password for `OS_USERNAME`.

3. Execute the following command to add the latest `<PL-N>` to the desired stack. The value of `N` is the number of `pls` obtained in previous command:

```
heat stack-update -f <stack_yaml_file> -e <stack_params_file>  
-r <stack_name> -P 'pls=N+1'
```

Note: See [SAPC VNF Deployment Instruction for OpenStack](#) for description of other parameters.

4. Run the command "`<atlasvm># heat stack-list`"; the status for the stack changes to `UPDATE_IN_PROGRESS`, until operation is finished and the status changes to `UPDATE_COMPLETED`.

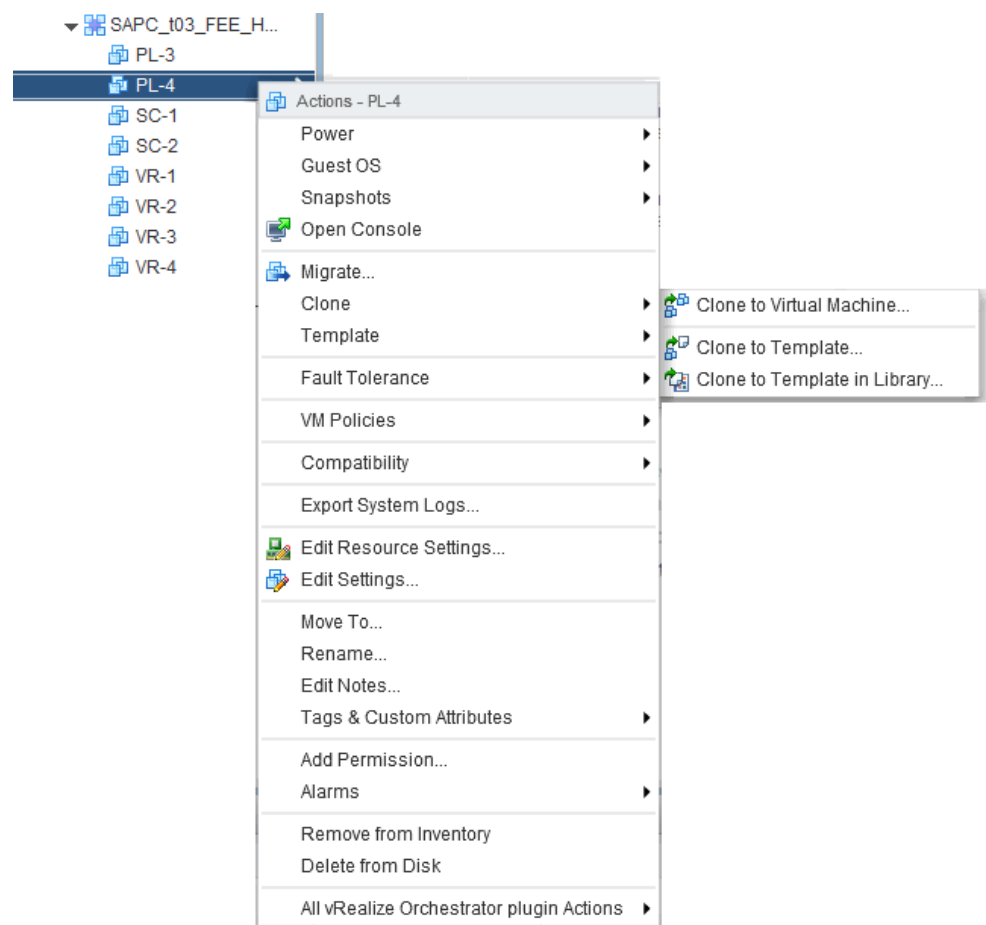




5 VM Creation using VMware vSphere Web Client

The steps to be executed are:

1. Clone one of the PLs that is running in the SAPC vApp, selecting the VM from the **Host and Clusters** view, right mouse click it and select **Clone...** and **Clone to Virtual Machine....**



2. Rename the VM to PL-X.



The screenshot shows the 'PL-4 - Clone Existing Virtual Machine' wizard. The left sidebar indicates the current step is '1a Select a name and folder'. The main area is titled 'Select a name and folder' and 'Specify a unique name and target location'. It contains a text box for the VM name with 'PL-5' entered. Below this is a tree view showing the folder structure: 'VCenter6ROS.elid.es.eu.ericsson.se' > 'CLOUD_SAPC01' > 'SAPC'. A message states: 'Virtual machine names can contain up to 80 characters and they must be unique within each vCenter Server VM folder.' At the bottom are 'Back', 'Next', 'Finish', and 'Cancel' buttons.

3. Include the new VM in the SAPC vApp.

The screenshot shows the 'PL-4 - Clone Existing Virtual Machine' wizard at step '1b Select a compute resource'. The left sidebar highlights this step. The main area is titled 'Select a compute resource' and 'Select the destination compute resource for this operation'. It features a tree view where 'SAPC_I03_FEE_HA_test' is selected under 'CLOUD_SAPC01'. A message says: 'Select a cluster, host, vApp or resource pool to run this virtual machine.' Below the tree view, a 'Compatibility' section shows a green checkmark and the text 'Compatibility checks succeeded.' At the bottom are 'Back', 'Next', 'Finish', and 'Cancel' buttons.

4. Select a destination storage for the VM files.



PL-4 - Clone Existing Virtual Machine

1 Edit settings

- ✓ 1a Select a name and folder
- ✓ 1b Select a compute resource
- ✓ **1c Select storage**
- ✓ 1d Select clone options

2 Ready to complete

Select storage
Select the datastore in which to store the configuration and disk files

Select virtual disk format: Same format as source

VM Storage Policy: Datastore Default

The following datastores are accessible from the destination resource that you selected. Select the destination datastore for the virtual machine configuration files and all of the virtual disks.

Name	Capacity	Provisioned	Free	Type	Storage DRS
datastore1 (2)	551.25 GB	306.12 GB	367.72 GB	VMFS	

Compatibility:

✓ Compatibility checks succeeded.

Back Next Finish Cancel

5. Select the customization option for the guest operating system.

PL-4 - Clone Existing Virtual Machine

1 Edit settings

- ✓ 1a Select a name and folder
- ✓ 1b Select a compute resource
- ✓ 1c Select storage
- ✓ **1d Select clone options**

2 Ready to complete

Select clone options
Select further clone options

☐ Customize the operating system

☐ Customize this virtual machine's hardware (Experimental)

☐ Power on virtual machine after creation

Back Next Finish Cancel

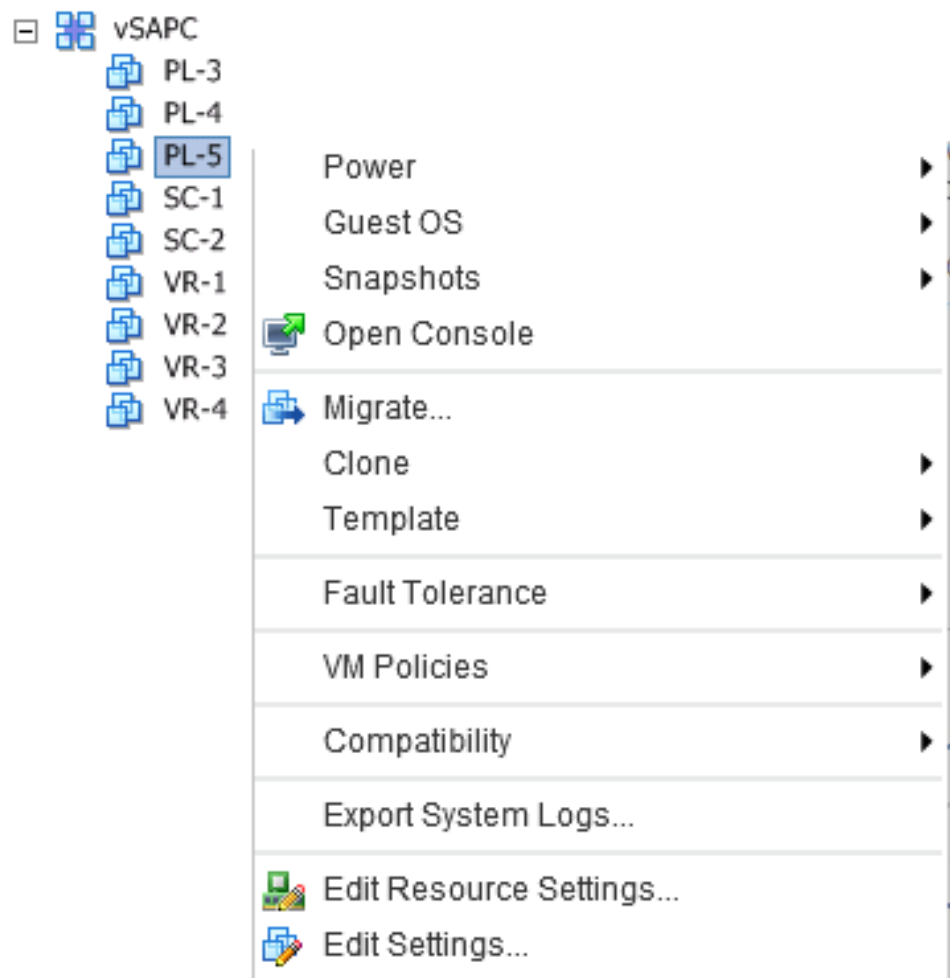
6. Ready to Complete. Click **Finish** to start a task that creates the new VM.



PL-4 - Clone Existing Virtual Machine	
1 Edit settings	Provisioning type: Clone an existing virtual machine
1a Select a name and folder	Source virtual machine: PL-4
1b Select a compute resource	Virtual machine name: PL-5
1c Select storage	Resource pool: SAPC_t03_FEE_HA_test
1d Select clone options	Datastore: datastore1 (2)
2 Ready to complete	Disk storage: Same format as source

Back Next Finish Cancel

7. Once the VM is cloned, edit its settings to ensure that the MAC assignment of every vNIC of the new VM is automatic. Select **PL-X** VM from the **Host and Clusters** view, right mouse click it and select **Edit Settings**.



Once the **VM Properties** window is shown, position on each of the Network Adapters and verify that **Automatic** option is selected in **MAC Address** field. Once all Network Adapters for **PL-X** VM have been verified, click **OK** to confirm the changes.



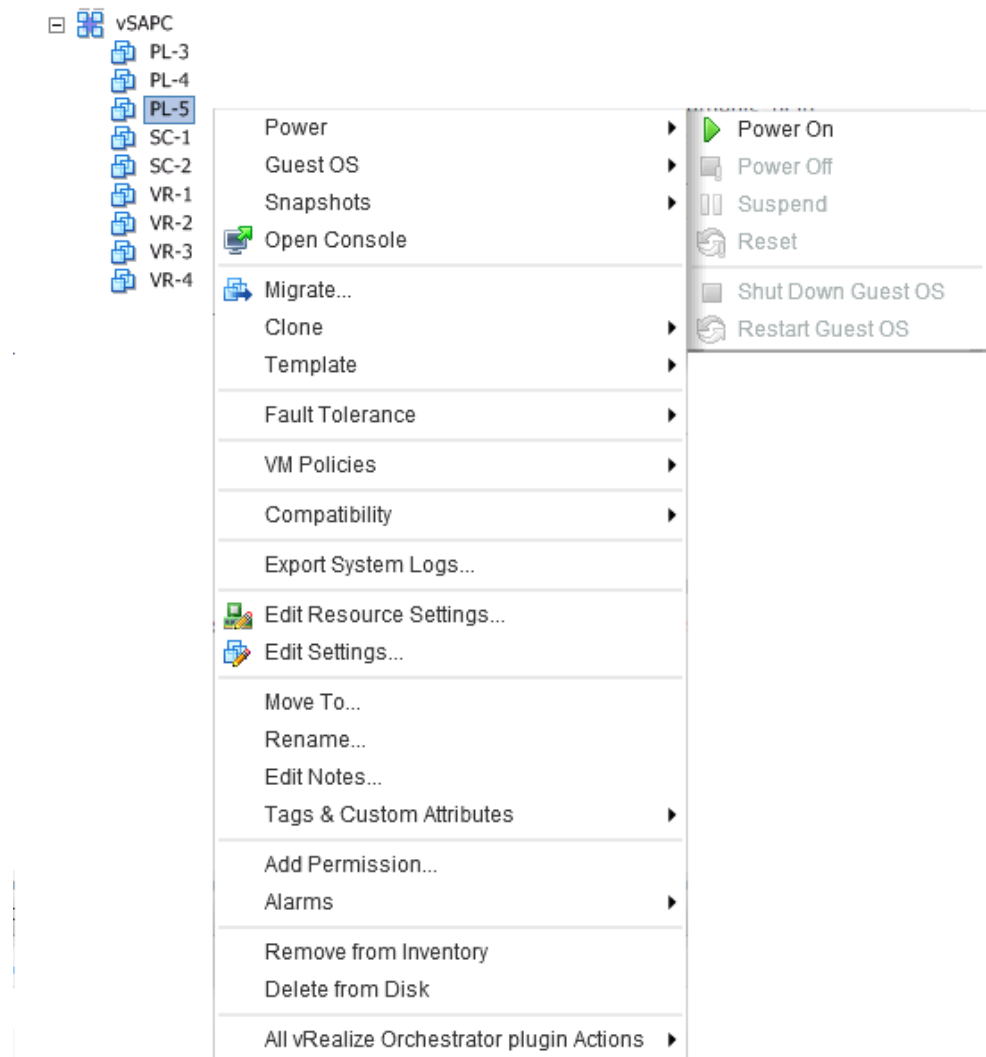
Virtual Hardware	VM Options	SDRS Rules	vApp Options
▶ CPU	2		
▶ Memory	10240		MB
▶ Hard disk 1	1		MB
▶ Network adapter 1	tenant03_Internal0 (SAPC01)		
Status	<input checked="" type="checkbox"/> Connect At Power On		
Port ID	4376		
Adapter Type	VMXNET 3		
DirectPath I/O	<input checked="" type="checkbox"/> Enable		
MAC Address	00:50:56:a1:7c:5c		Automatic
▶ Network adapter 2	tenant03_Internal1 (SAPC01)		<input checked="" type="checkbox"/> Connect..
▶ Network adapter 3	tenant03_TrafficVip0 (SAPC01)		<input checked="" type="checkbox"/> Connect..
▶ Network adapter 4	tenant03_TrafficVip1 (SAPC01)		<input checked="" type="checkbox"/> Connect..
▶ Video card	Specify custom settings		
▶ VMCI device			
▶ Serial port 1	Use output file		<input type="checkbox"/> Connect..
▶ Other Devices			

New device: ----- Select ----- Add

Compatibility: ESXi 6.0 and later (VM version 11)

OK Cancel

8. Power on the new VM, selecting **PL-X VM** from the SAPC vApp, right mouse click it and select **Power > Power On** .



9. After some minutes, the new VM is operational and integrated as a new PL in the SAPC vApp.



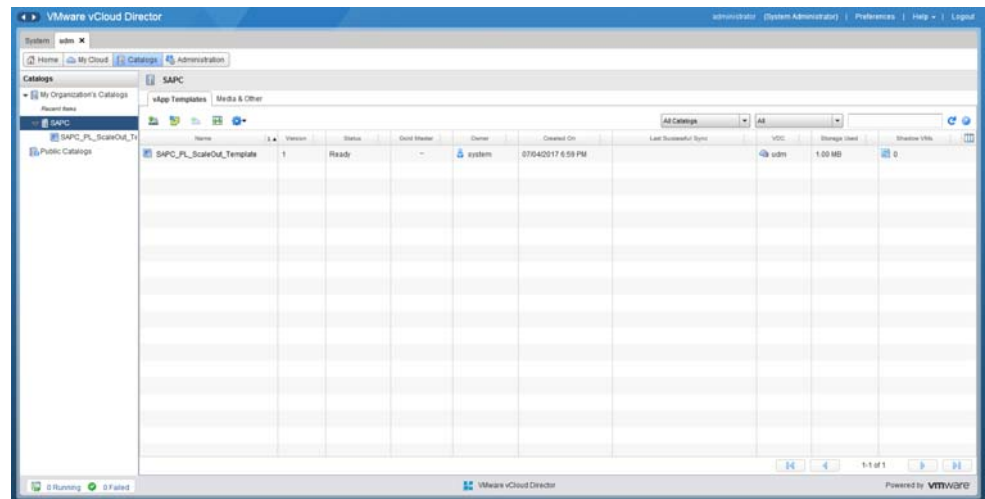


6 VM Creation in using VMware vCloud Director

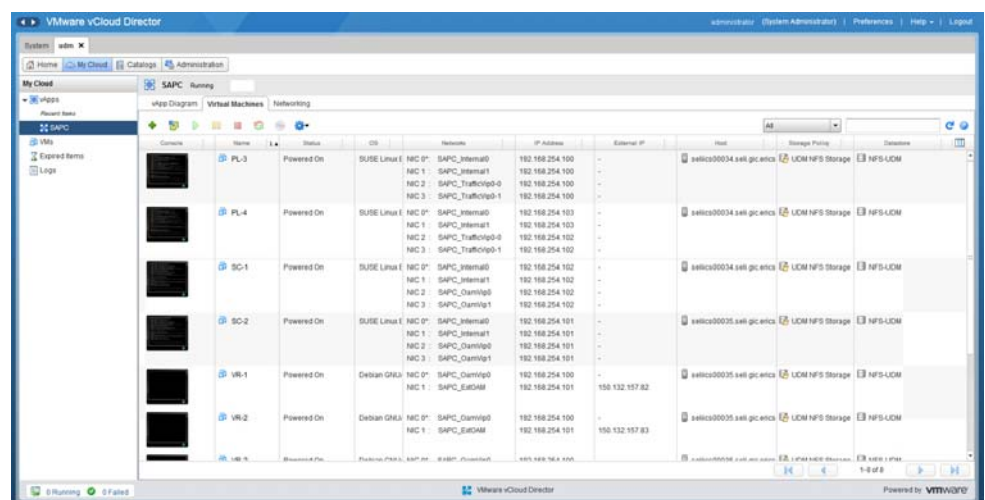
During the SAPC vApp deployment, the OVF package to be used as template to scale-out PL VMs was uploaded to the VMware vCloud Director Catalog. During this procedure it is used.

The steps to be executed are:

1. Go to the VMware vCloud Director Catalog where the OVF package to be used as template for the scale-out of PL VMs was uploaded. Check that the ScaleOut of PL is available in the catalog (the default name is SAPC_PL_ScaleOut_Template).



2. Go to the SAPC vApp View, and click on the VMs tab. Then, click on the + icon.





3. In the window pop-up, look for the template to be used for the PL scale-out. It contains just one VM whose name is **PL-X**. Click on the **PL-X** VM.

The screenshot shows the 'New Virtual Machine' window. On the left is a sidebar with navigation options: 'Add Virtual Machines' (highlighted), 'Configure Resources', 'Configure Virtual Machines', 'Configure Networking', and 'Ready to Complete'. The main area is titled 'Add Virtual Machines' and contains a search bar with 'Look in: My Organization's Catalogs' and a search input field containing 'SAPC_'. Below the search bar is a table with the following data:

Name	OS	Gold Mas...	vApp	Catalog	Created On	Disk Info
PL-X	SUSE Linux E	-	SAPC_PL_Scale	SAPC	07/04/2017 6:59 PM	1.00 MB

Below the table are 'Add' and 'Remove' buttons, and a pagination indicator '1-1 of 1'. At the bottom of the window are 'Back', 'Next', 'Finish', and 'Cancel' buttons.

4. Click on the **Add** button below, and then, click **Next**.



New Virtual Machine

Add Virtual Machines

You can search the catalog for virtual machines to add to this vApp or add a new, blank VM. Once the vApp is created, you can power on the new VM and install an operating system.

Look in: My Organization's Catalogs All SAPC_

Name	OS	Gold Mas...	vApp	Catalog	Created On	Disk Info
PL-X	SUSE Linux E	-	SAPC_PL_Scale	SAPC	07/04/2017 6:59 PM	1.00 MB

Add Remove 1-1 of 1

Name	OS	Gold Mas...	vApp	Catalog	Created On	Disk Info
PL-X	SUSE Linux E	-	SAPC_PL_Scale	SAPC	07/04/2017 6:59 PM	1.00 MB

New Virtual Machine...

Back Next Finish Cancel

5. Edit properly the name of the new PL VM to be added to the SAPC vApp. In this example, considering that the initial deployment has just been done, and PL-3 and PL-4 are the only PL VMs that exist, the next PL to be added is PL-5. Select also the desired storage for the VM, and click on **Next**.



New Virtual Machine

[Add Virtual Machines](#)

Configure Resources

Configure Virtual Machines

Configure Networking

Ready to Complete

Configure Resources

Select what Storage Policies this vApp's virtual machines will use when deployed.

Virtual Machine	Storage Policy	Template VM Default Storage Policy
PL-5	UDM NFS Storage	

Back Next Finish Cancel

6. The virtual networks for the PL are now shown.

New Virtual Machine

[Add Virtual Machines](#)

[Configure Resources](#)

Configure Virtual Machines

Configure Networking

Ready to Complete

Configure Virtual Machines

Name each virtual machine and select the network to which you want it to connect. You can configure additional properties for virtual machines after you complete this wizard.

☐ Show network adapter type
Adapter choice can affect both networking performance and migration compatibility. Consult the VMware KnowledgeBase for more information on choosing among the network adapter support for various guest operating systems and hosts.

Virtual Machine	Computer Name	Primary NIC	Network	IP Assignment
PL-5	PL-X-001-0	<input checked="" type="radio"/> NIC 0 <input type="radio"/> NIC 1 <input type="radio"/> NIC 2 <input type="radio"/> NIC 3	None None None None	

Back Next Finish Cancel



Configure the virtual networks in the proper order, according to SAPC VNF Network Configuration Guide (and also according to the order presented in the OVF descriptor content). Then, click **Next**.

New Virtual Machine

Add Virtual Machines

Configure Resources

Configure Virtual Machines

Configure Networking

Ready to Complete

Configure Virtual Machines

Name each virtual machine and select the network to which you want it to connect. You can configure additional properties for virtual machines after you complete this wizard.

☐ Show network adapter type
 Adapter choice can affect both networking performance and migration compatibility. Consult the VMware KnowledgeBase for more information on choosing among the network adapter support for various guest operating systems and hosts.

Virtual Machine	Computer Name	Primary NIC	Network	IP Assignment
PL-5	PL-X-001-0 *	<input checked="" type="radio"/> NIC 0 <input type="radio"/> NIC 1 <input type="radio"/> NIC 2 <input type="radio"/> NIC 3	<div>SAPC_Internal0</div> <div>SAPC_Internal1</div> <div>SAPC_TrafficVip0-0</div> <div>SAPC_TrafficVip0-1</div>	<div>Static - IP Pool</div> <div>Static - IP Pool</div> <div>Static - IP Pool</div> <div>Static - IP Pool</div>

Back

Next

Finish

Cancel

7. Click **Next**.

[illegible]

8. Review the details shown in the summary, and click **Finish**.



New Virtual Machine

Ready to Complete

You are about to add VMs with these specifications. Review the settings and click Finish.

Name: SAPC

Description:

Owner: system

Virtual datacenter: udm_sandbox_organization

Runtime lease: Never Expires

Runtime lease expiration: Never

Storage lease: Never Expires

Storage lease expiration: Never

Networks - 8:

SAPC_OamVip1

SAPC_Internal1

SAPC_Internal0

SAPC_TrafficVip0-0

SAPC_TrafficVip0-1

SAPC_ExtOAM

SAPC_ExtTraffic0

SAPC_OamVip0

VMs to add - 1:

Virtual Machine	Guest OS	Storage Policy
PL-5	SUSE Linux Enterprise 12 (64-bit)	UDM NFS Storage

Back Next Finish Cancel

9. The newly created PL VM appears as part of the SAPC vApp. Initially, the SAPC vApp appears as **Updating...** and the new PL VM with status **Busy**.

VMware vCloud Director

System: admin

Home My Cloud Catalogs Administration

My Cloud

SAPC

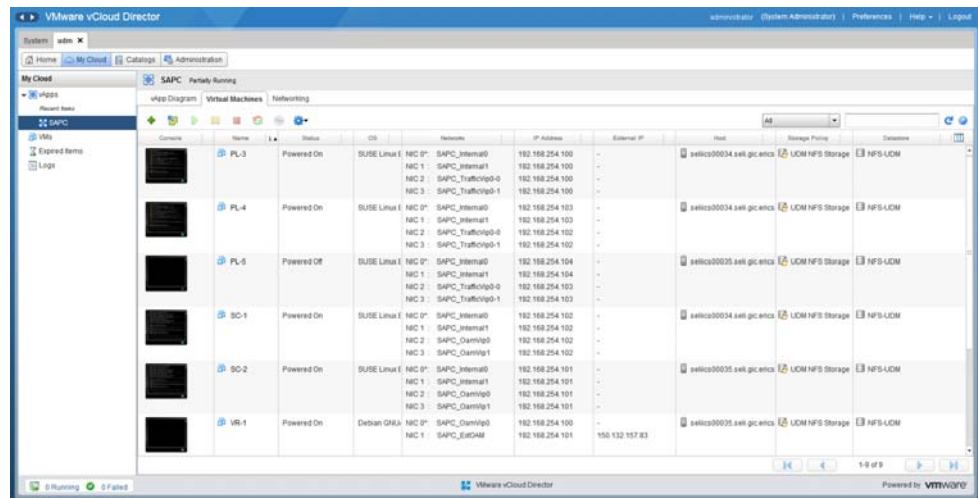
Virtual Machines

Name	Status	OS	Networks	IP Address	External IP	Host	Storage Profile	Disks
PL-3	Powered On	SUSE Linux E	NIC 0: SAPC_Internal0 NIC 1: SAPC_Internal1 NIC 2: SAPC_TrafficVip0-0 NIC 3: SAPC_TrafficVip0-1	192.168.254.100 192.168.254.100 192.168.254.100 192.168.254.100	-	selkcs00034.sell.gic.enca	UDM NFS Storage	NFS-UCM
PL-4	Powered On	SUSE Linux E	NIC 0: SAPC_Internal0 NIC 1: SAPC_Internal1 NIC 2: SAPC_TrafficVip0-0 NIC 3: SAPC_TrafficVip0-1	192.168.254.103 192.168.254.103 192.168.254.102 192.168.254.102	-	selkcs00034.sell.gic.enca	UDM NFS Storage	NFS-UCM
PL-5	Busy						UDM NFS Storage	
BC-1	Powered On	SUSE Linux E	NIC 0: SAPC_Internal0 NIC 1: SAPC_Internal1 NIC 2: SAPC_OamVip0 NIC 3: SAPC_OamVip1	192.168.254.102 192.168.254.102 192.168.254.102 192.168.254.102	-	selkcs00034.sell.gic.enca	UDM NFS Storage	NFS-UCM
BC-2	Powered On	SUSE Linux E	NIC 0: SAPC_Internal0 NIC 1: SAPC_Internal1 NIC 2: SAPC_OamVip0 NIC 3: SAPC_OamVip1	192.168.254.101 192.168.254.101 192.168.254.101 192.168.254.101	-	selkcs00035.sell.gic.enca	UDM NFS Storage	NFS-UCM
VR-1	Powered On	Debian GNU	NIC 0: SAPC_OamVip0 NIC 1: SAPC_ExtOAM	192.168.254.100 192.168.254.101	159.132.157.82	selkcs00035.sell.gic.enca	UDM NFS Storage	NFS-UCM
VR-2	Powered On	Debian GNU	NIC 0: SAPC_OamVip1	192.168.254.100	-	selkcs00034.sell.gic.enca	UDM NFS Storage	NFS-UCM

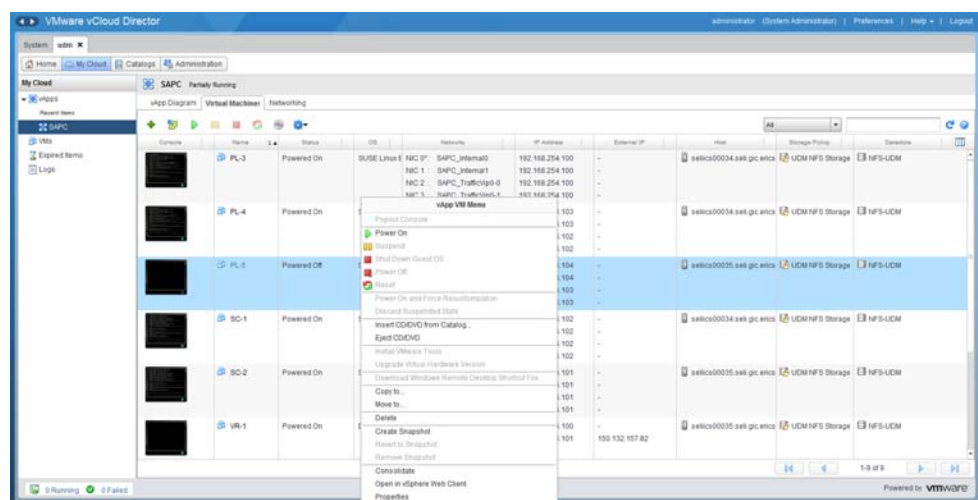
1 Running 0 Failed

Powered by VMware

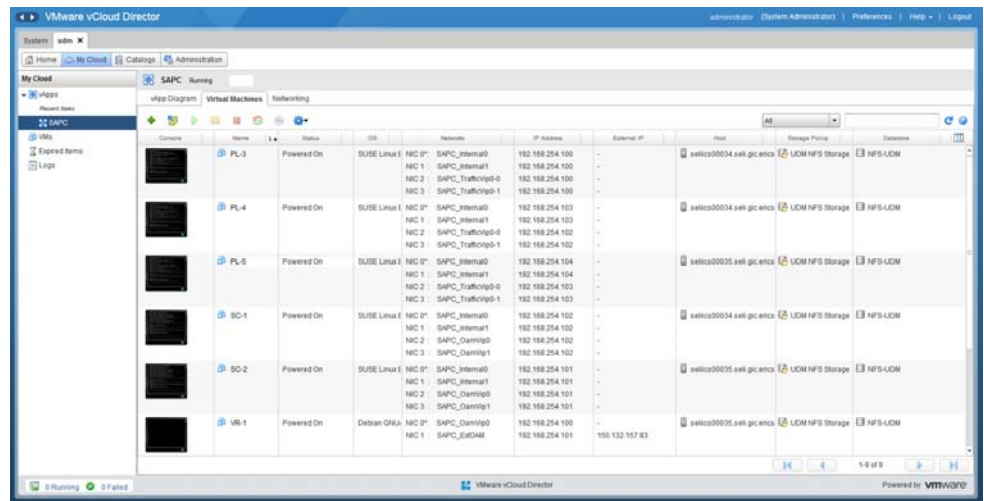
After some seconds, depending on the hardware used in the VMware environment, the SAPC vApp appears as **Partially Running**, given that the new PL VM is on **Powered Off** status.



10. Right mouse click over the new PL VM, and then click on **Power On**.



11. Finally, the new PL VM status becomes **Powered On**, and the SAPC vApp appears as **Running**.



- After some minutes, the new VM is operational and integrated as a new PL in the SAPC vApp.