

# Configure Scale-Out

Ericsson Service-Aware Policy Controller

## OPERATING INSTRUCTIONS

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# 1 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 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 CEE (Cloud Execution Environment) using both ECM (Ericsson Cloud Manager) or Atlas, 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 with Python 2.6 or 2.7 installed. In the following sections, the host is named "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 Procedure

To scale-out a VM:

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

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### 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.

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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 deployments over CEE 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 23.
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 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 CEE* 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.



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### Caution!

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

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



### 3 VM Creation in CEE 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), 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_scaleout.py` is the tool which creates VMs in ECM. To execute it, the following arguments are available:

**Note:** For the execution of the script, only the presence of the configuration file `SAPC.cfg` and the `orchlib/` directory 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.

- `--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_scaleout.py` execution is:

```
<PreparationServer># python SAPC_scaleout.py --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 in CEE using Atlas

The steps to be executed are:

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

```
<atlasvm># 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:

```
<atlasvm># 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 CEE 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`.

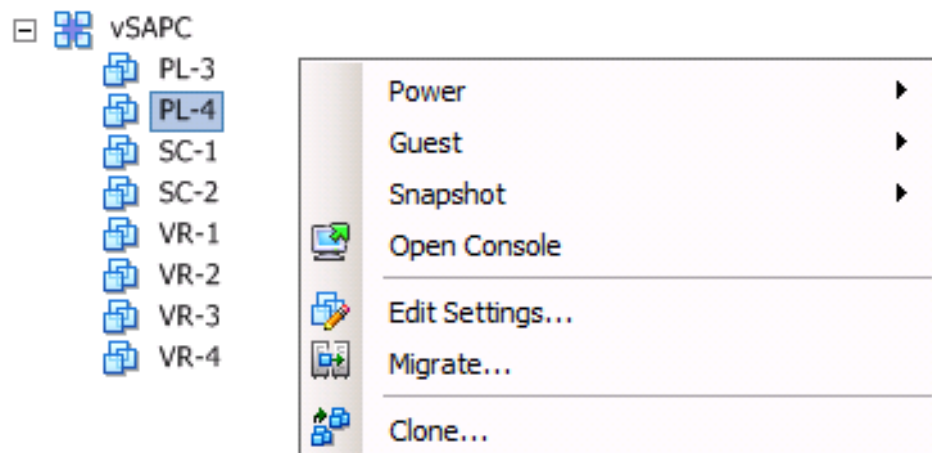




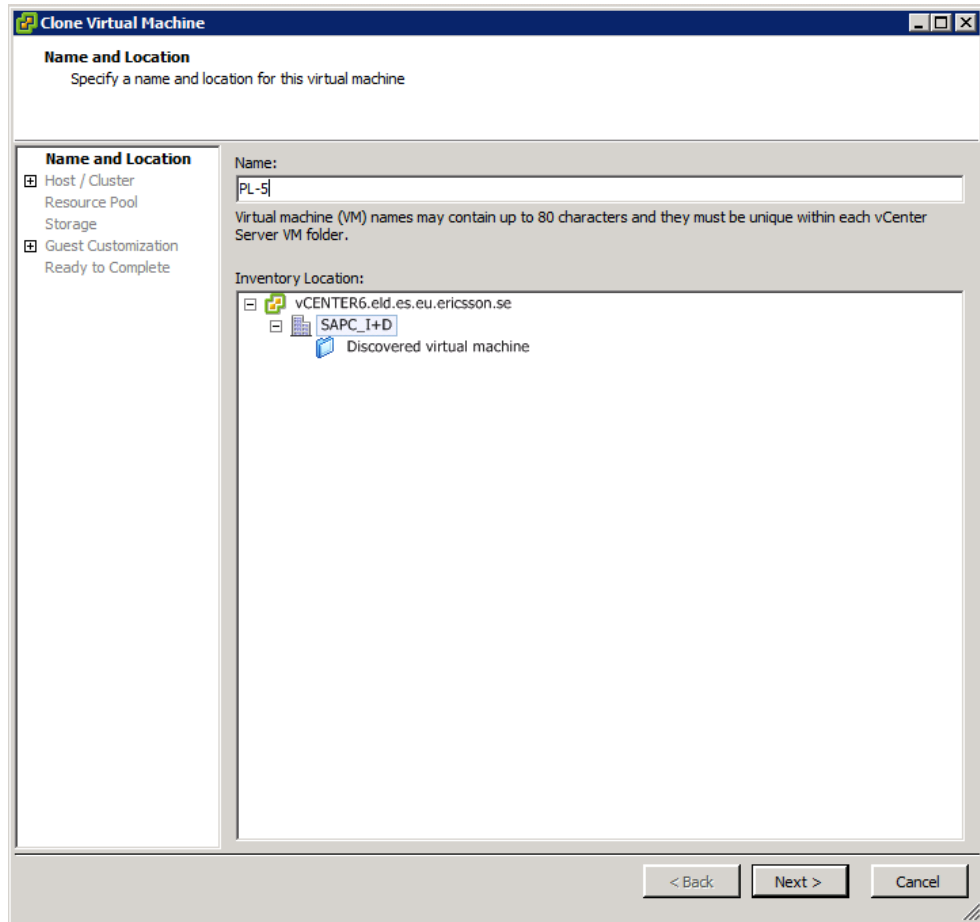
## 5 VM Creation in VMware vCenter using vSphere Client

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**.

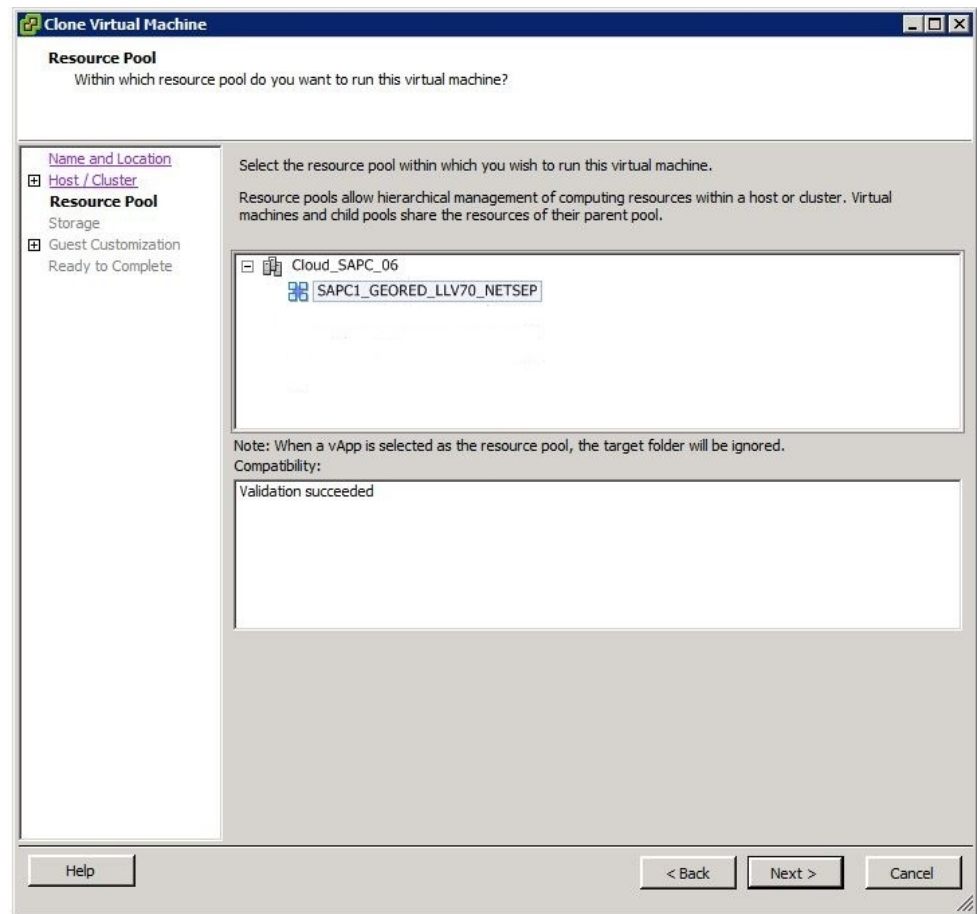


2. Rename the VM to PL-X.

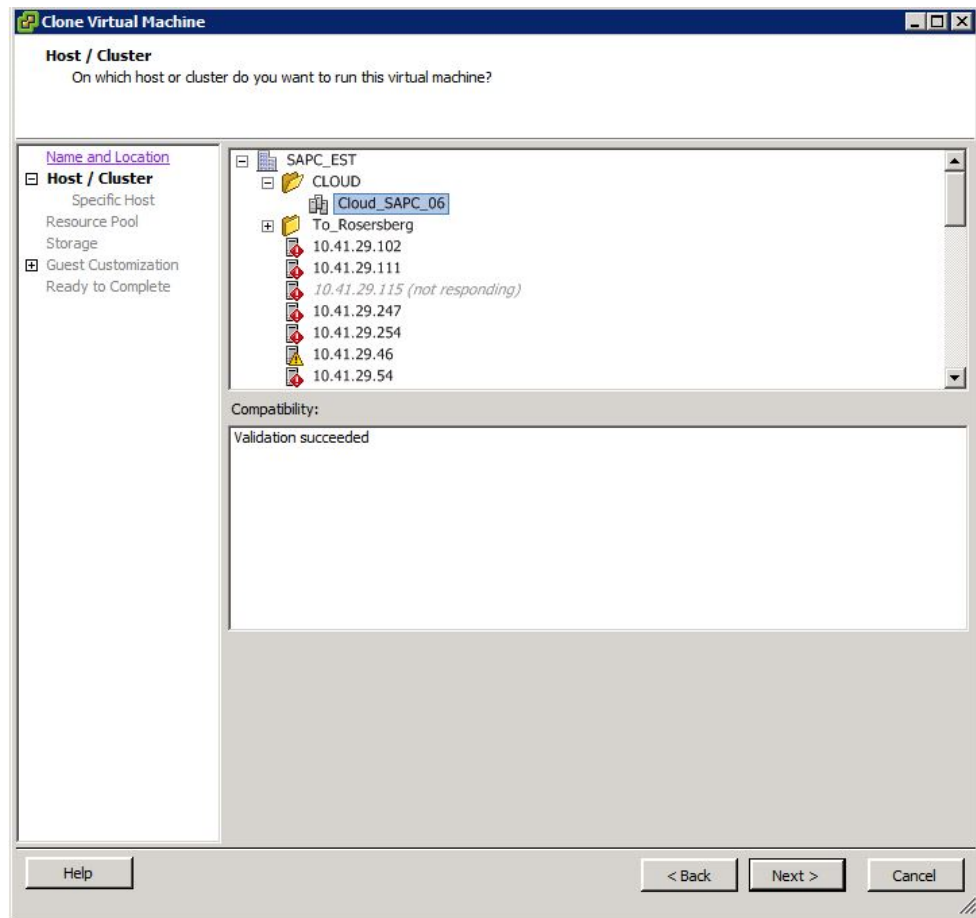


3. Include the new VM in the SAPC vApp.

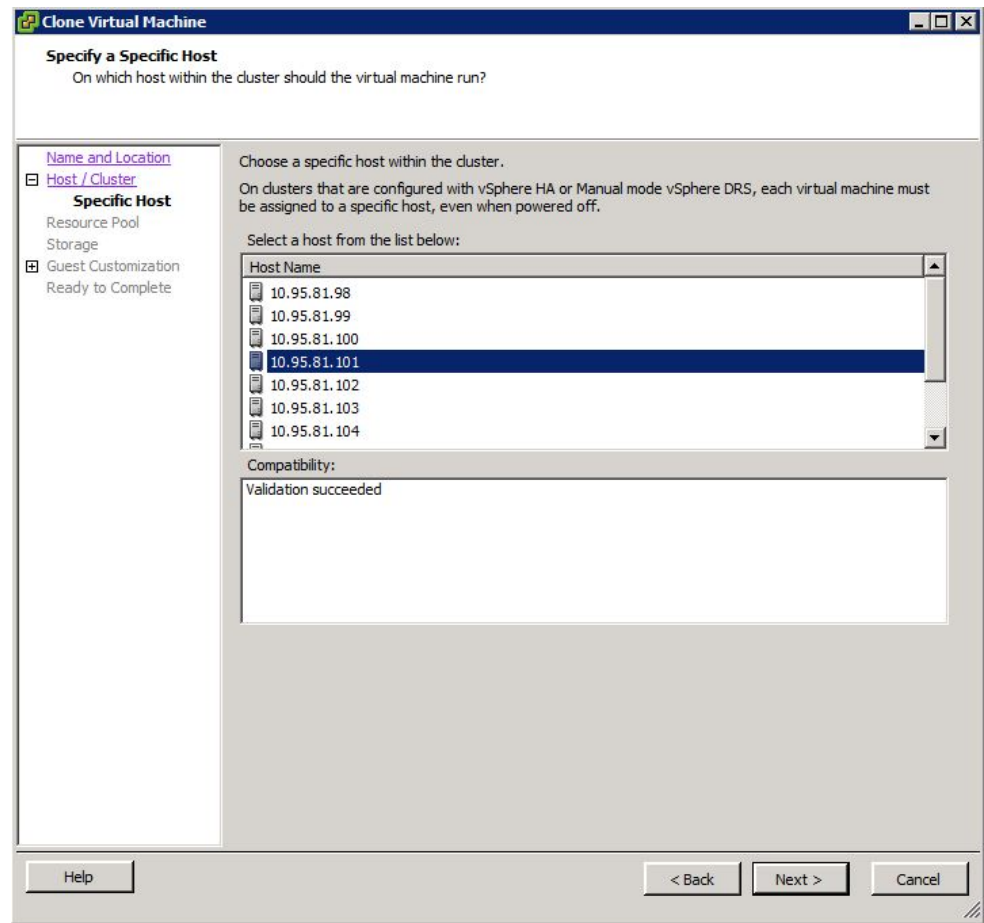




4. Choose the host and cluster in the SAPC vApp.



5. Choose a specific host within the cluster.



6. Select a destination storage for the VM files.



**Clone Virtual Machine**

**Storage**  
Select a destination storage for the virtual machine files

[Name and Location](#)  
[Host / Cluster](#)  
[Resource Pool](#)  
**Storage**  
[Guest Customization](#)  
Ready to Complete

Select a virtual disk format:  
Same format as source

Select a destination storage for the virtual machine files:  
VM Storage Profile: ⚠

| Name          | Drive Type | Capacity | Provisioned | Free    | Type | Storage DRS |
|---------------|------------|----------|-------------|---------|------|-------------|
| Cloud_SAPC_06 |            | 5.38 TB  | 842.47 GB   | 4.56 TB |      | Disabled    |

☒ Disable Storage DRS for this virtual machine

Select a datastore:

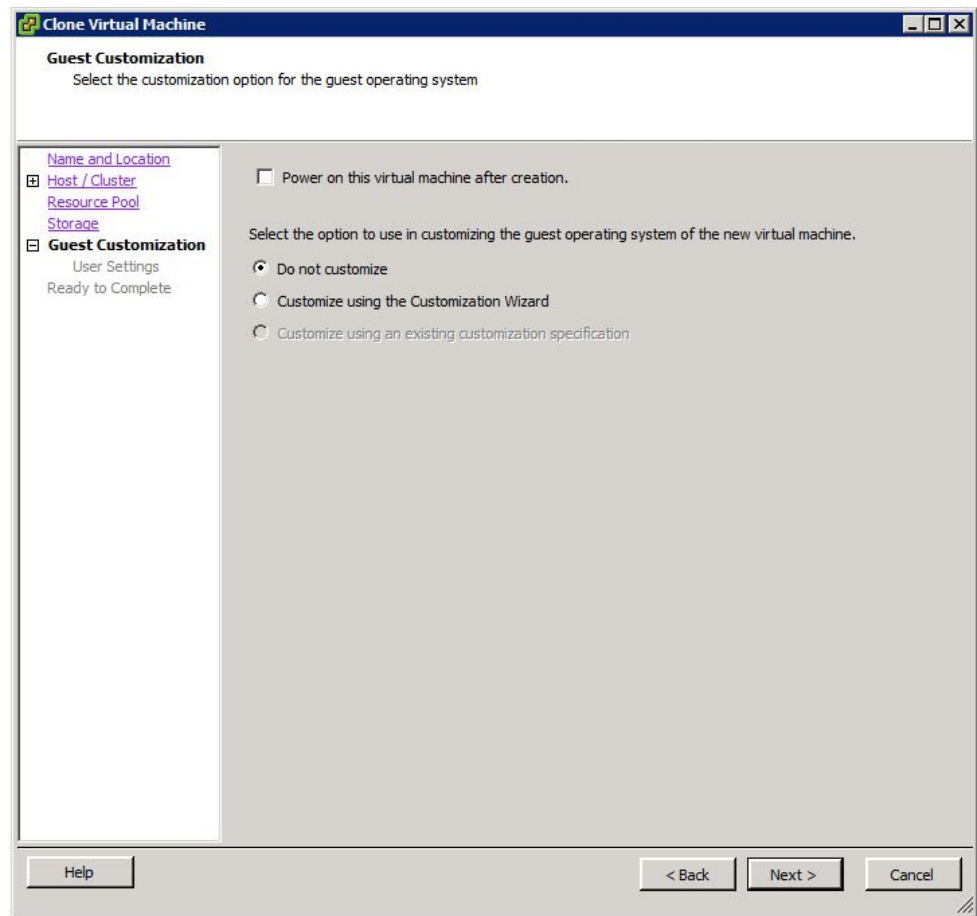
| Name              | Drive Type | Capacity  | Provisioned | Free      | Type  | Thin Provision |
|-------------------|------------|-----------|-------------|-----------|-------|----------------|
| datastore1 (13... | Non-SSD    | 551.25 GB | 33.80 GB    | 533.45 GB | VMFS5 | Supported      |

Advanced >>

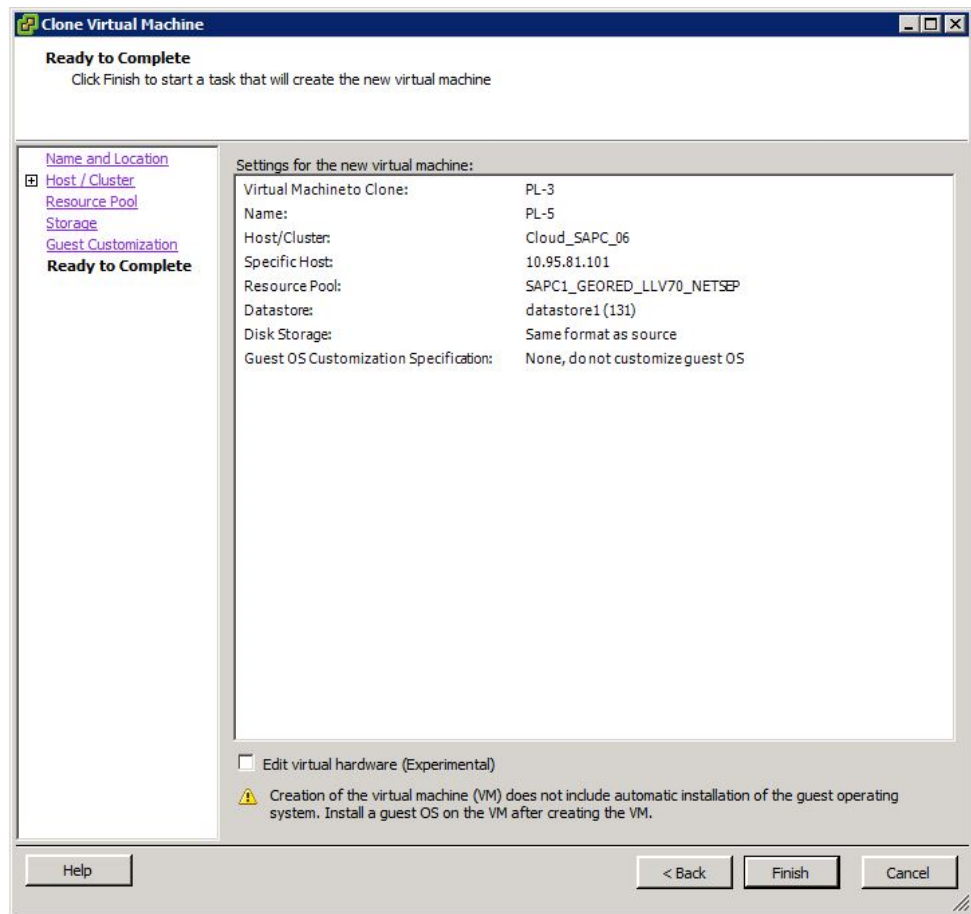
Compatibility:  
Validation succeeded

Help < Back Next > Cancel

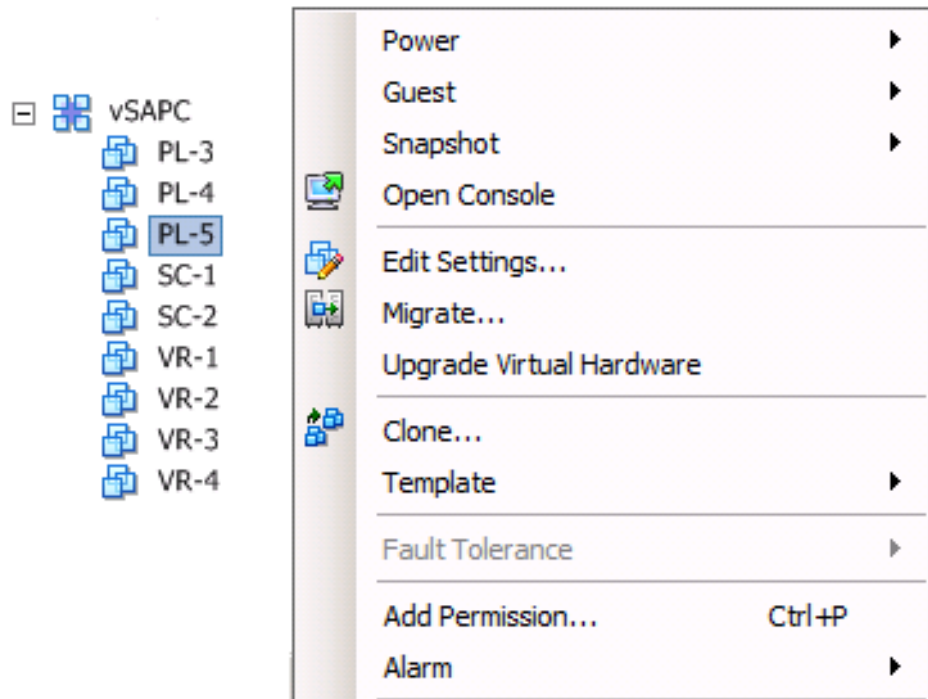
7. Select the customization option for the guest operating system.



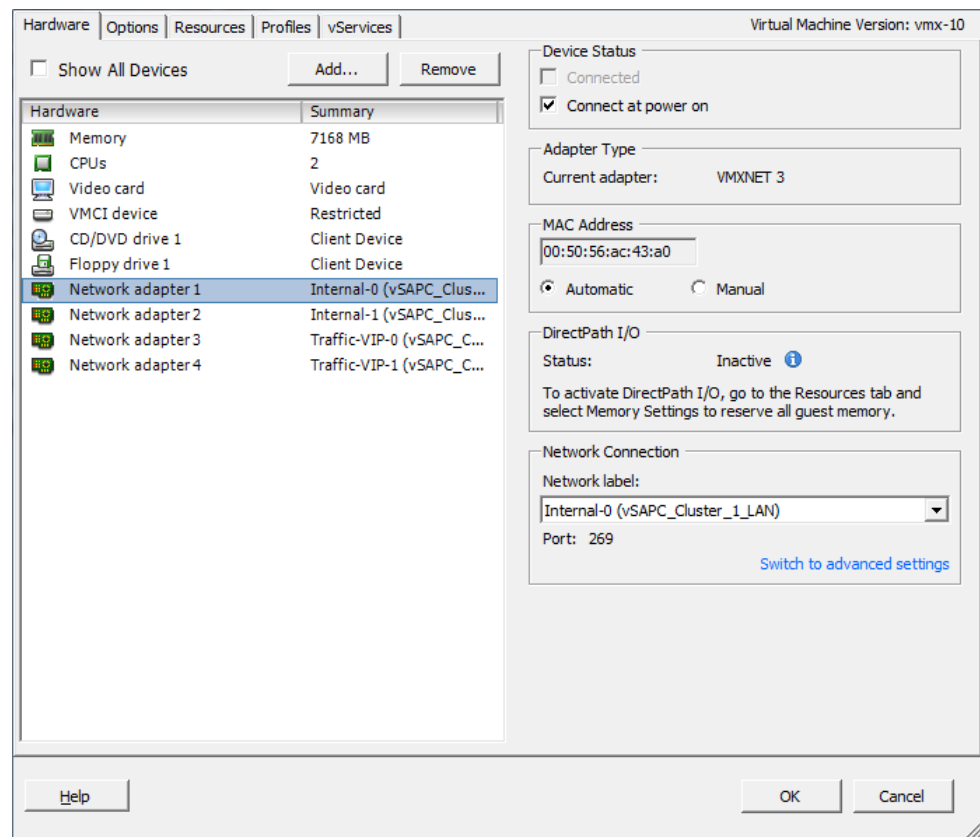
8. Ready to Complete. Click **Finish** to start a task that creates the new VM.



9. 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**.

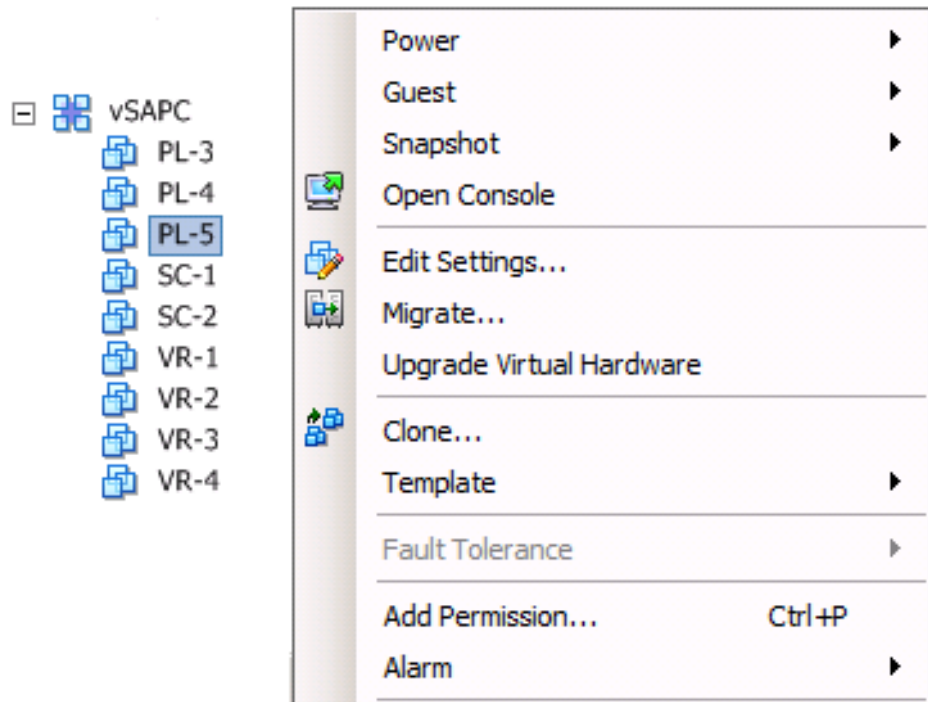


Once the **VM Properties** window is shown, position on each of the Network Adapters and select **Automatic**. Once all Network Adapters for **PL-X** VM have been set, click **OK** to confirm the changes.



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





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



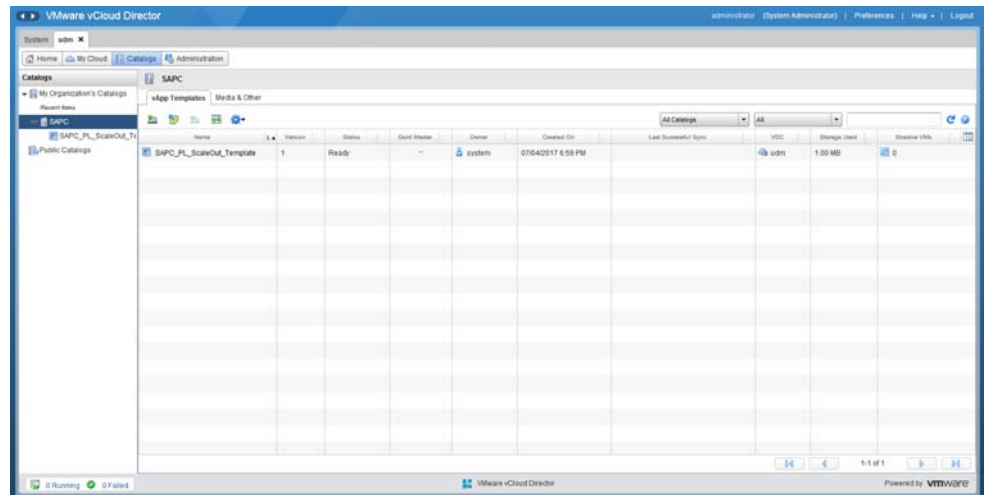


## 6 VM Creation in VMware vCenter using vCloud Director

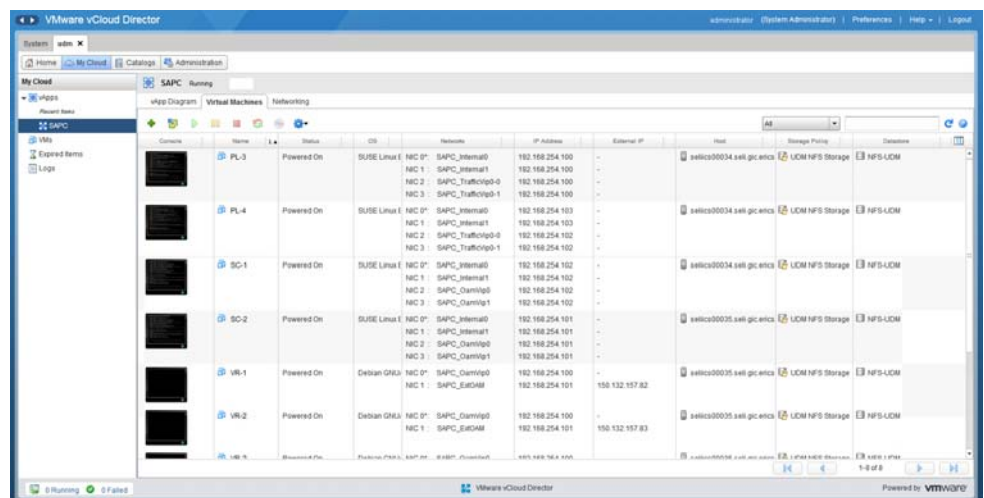
During the SAPC vApp deployment, the OVF package to be used as template to scale-out PL VMs was uploaded to the VMware vCloud Director Catalog. During this procedure it is used.

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 stored. Check that the mentioned OVF package is available in the catalog (default name is SAPC\_cxp9032850\_<revision>\_PL\_ScaleOut\_Template.ova).



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 instructions: '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.' Below this is a search bar with 'Look in:' set to 'My Organization's Catalogs' and a search term 'SAPC\_'. A table displays the search results:

| 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, navigation arrows, and a '1-1 of 1' indicator. At the bottom of the main area is a '+ New Virtual Machine...' button. The footer of the window contains '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<br><input type="radio"/> NIC 1<br><input type="radio"/> NIC 2<br><input type="radio"/> NIC 3 | None<br>None<br>None<br>None | <br><br><br><br> |
|                 |               |   |                              |                  |
|                 |               |   |                              |                  |

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 *  | <div><div><input checked="" type="radio"/> NIC 0</div><div><input type="radio"/> NIC 1</div><div><input type="radio"/> NIC 2</div><div><input type="radio"/> NIC 3</div></div> | <div><div> SAPC_Internal0</div><div> SAPC_Internal1</div><div> SAPC_TrafficVip0-0</div><div> SAPC_TrafficVip0-1</div></div> | <div><div>Static - IP Pool</div><div>Static - IP Pool</div><div>Static - IP Pool</div><div>Static - IP Pool</div></div> |
|                 |               |  |   |   |
|                 |               |  |   |   |

Back

Next

Finish

Cancel

7. Click **Next**.



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

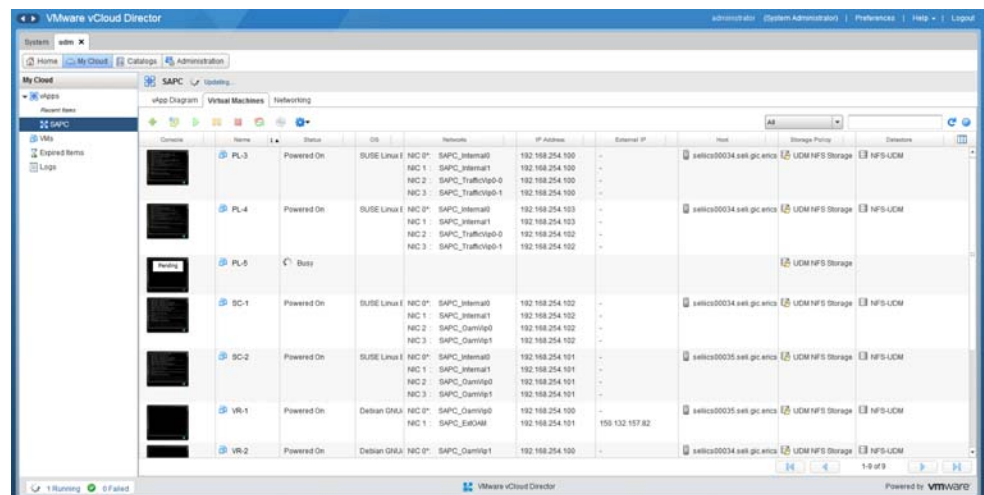
SAPC\_OamVip0

VMs to add - 1:

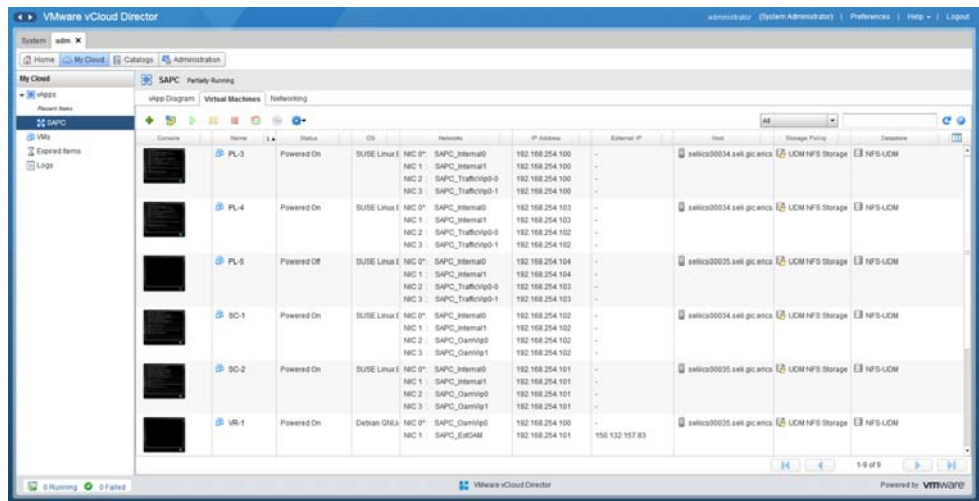
| Virtual Machine | Guest OS                          | Storage Policy  |
|-----------------|-----------------------------------|-----------------|
| PL-5            | SUSE Linux Enterprise 12 (64-bit) | UDM NFS Storage |

Back Next Finish Cancel

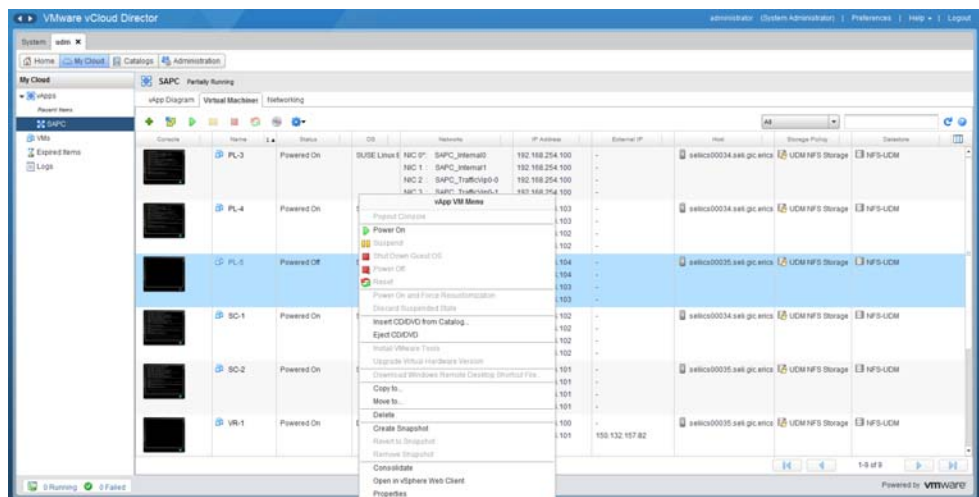
9. The newly created PL VM appears as part of the SAPC vApp. Initially, the SAPC vApp appears as **Updating...** and the new PL VM with status **Busy**.



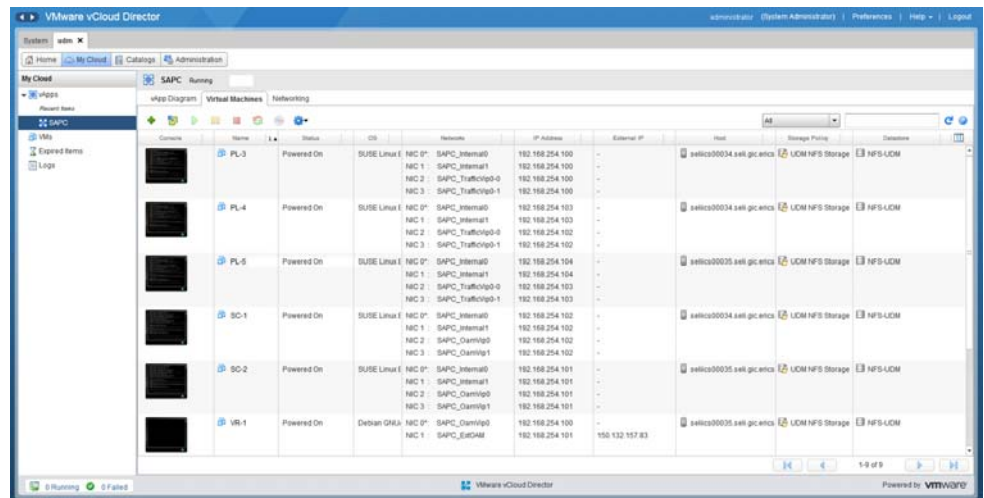
After some seconds, depending on the hardware used in the VMware environment, the SAPC vApp appears as **Partially Running**, given that the new PL VM is on **Powered Off** status.



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**.



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