# VMware Adapter for SAP Landscape Management Administration Guide for LaMa Administrators

VMware Adapter for SAP Landscape Management 1.8

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# About This Guide

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This chapter includes the following topics:


- Introduction
- Target Audience
- Prerequisites


## Introduction

VMware Adapter for SAP Landscape Management, part of the VMware private cloud solution for SAP, is a virtual appliance that integrates SAP Landscape Management with VMware management software (VMware vCenter Server and VMware vRealize Automation). This integration of SAP Landscapes with VMware's market leading SDDC solutions lead to delivering unique automation capabilities, high scalability, improved performance and advanced storage and network management. All this helps to radically simplify the provisioning and management of SAP landscapes.

This procedural guide describes the user functions of SAP LaMa as it pertains to VMware Adapter for SAP Landscape Management. It discusses several features, how they work, what each feature does and the steps to execute the respective feature.

## Target Audience

The user guide is written for administrators who deploy *SAP LaMa* in a VMware virtualized environment and use the VMware adapter for SAP Landscape Management to provide better integration and faster / easier management operations. Such administrators are either *SAP BASIS* administrators or VMware vSphere administrators (typically VMware Certified Professionals - VCPs).

## Prerequisites

To use this guide effectively, readers must have experience as a *SAP BASIS* administrator using *SAP LaMa*. For documentation related to *SAP LaMa* and / or training on *SAP LaMa*, please contact your SAP representative.

# Introduction to VMware Adapter for SAP Landscape Management

2

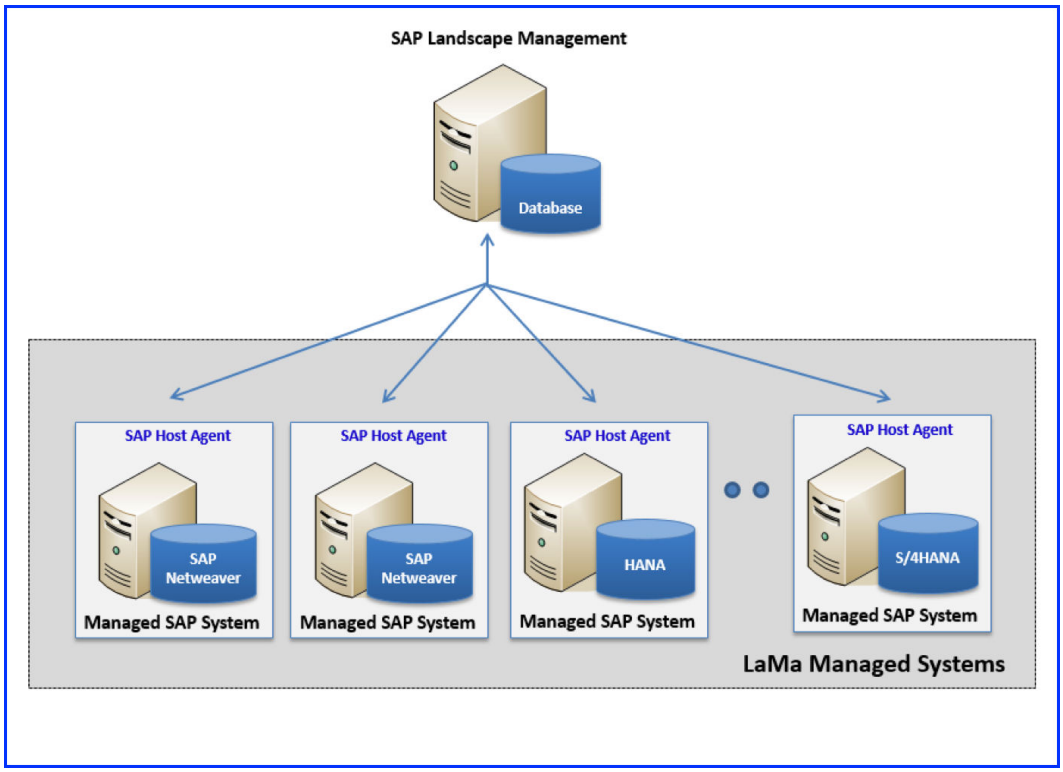
This chapter includes the following topics:

- Product Overview
- Features and Benefits
- Reference Architecture

## Product Overview

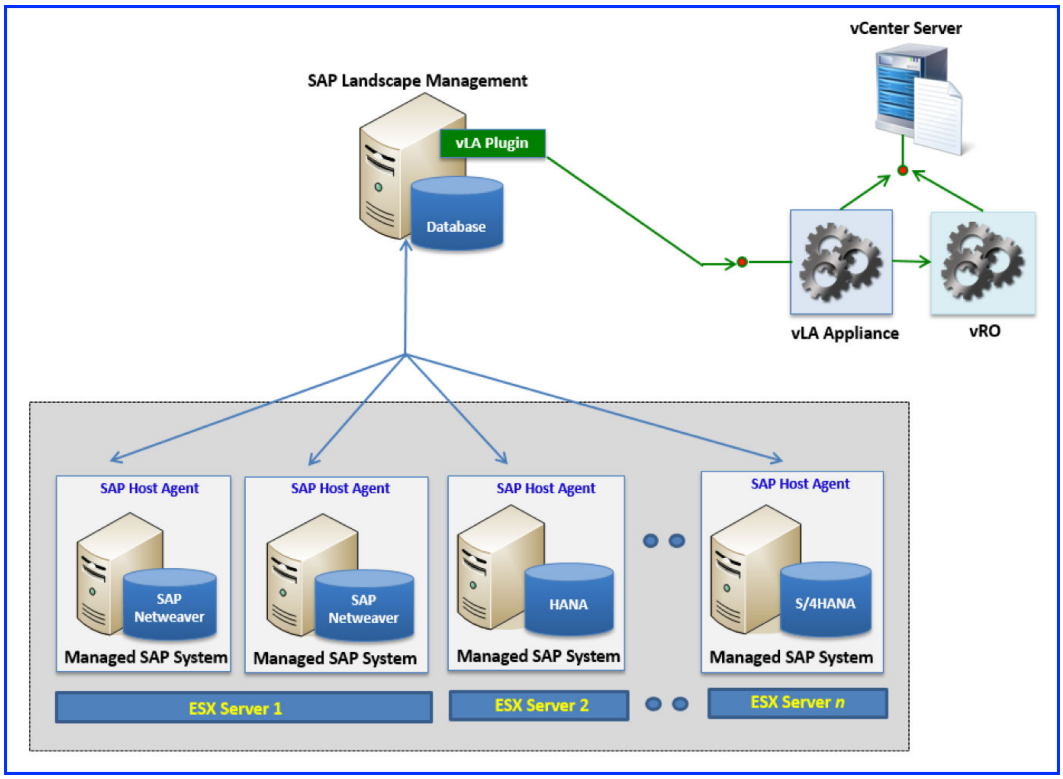
SAP Landscape Management is a solution to centrally manage and provision SAP landscapes running in physical, virtual and cloud infrastructures. It provides a central dashboard for monitoring the hosts (physical servers or virtual machines) and SAP application services in even very complex infrastructures. Additionally, administrators can use the SAP Landscape Management console for performing centralized operations like starting or stopping instances of an SAP service or apply operations simultaneously to complex groups of systems on the entire landscape through predefined single and mass operations. Another aspect of SAP Landscape Management is the ability to support Enterprise Edition SAP System Clone, System Copy or Refresh and System Rename operations. This highly automated and unified IT landscape management capabilities apply not only to SAP Netweaver based applications but also to SAP HANA and SAP S/4HANA systems. All the described features of SAP Landscape Management are based on a communication with the SAP Host Agent of the respective SAP system in the landscape as shown in the following figure:

Figure 2-1. SAP Landscape Management




With virtualized SAP Systems on VMware vSphere, the list of use cases can be extended and enhanced with even more features. By using the VMware Adapter for SAP Landscape Management, SAP Landscape Management can now monitor and manage all the virtual machines used for the SAP Systems running on virtualized and non-virtualized infrastructure from a single pane. The Basis admin can now start or stop VMs, deploy VMs from templates and perform online or offline SAP System Clone, System Copy or Refresh and System Rename operations on VMs without changing tools. Additionally, live migrations of VMs or datastores for workload balancing, creating a snapshot of an SAP system before a critical change takes place are possible out of one interface. Thus, combining SAP Landscape Management with the advanced use cases of virtualized infrastructures give SAP customers the highest degree of convenience in terms of automation and control and also significantly saves operational costs. The following figure depicts the SAP Landscape Management along with the components of VMware Adapter for SAP Landscape Management installed:

Figure 2-2. SAP Landscape Management in virtualized environment




As depicted in the preceding figure, VMware Adapter for SAP Landscape Management is a virtual appliance that integrates SAP Landscape Management (LaMa) with VMware's Software Defined Data Center (SDDC) technologies, delivering unique automation capabilities that radically simplify how SAP basis admins and end users provision and manage SAP Landscapes. The results are faster time to market, and reduction in both TCO and operational errors while managing SAP Landscapes.

VMware Adapter for SAP Landscape Management appliance accepts application calls from SAP Landscape Management (LaMa), then uses vRealize Automation or VMware vRealize Orchestrator workflows to execute commands to VMware vCenter Server for VMware related operations, such as starting and stopping a virtual machine.

# Features and Benefits

**Note** Key Features:

VMware Adapter for SAP Landscape Management dramatically simplifies and automates the life-cycle management of SAP landscapes on VMware virtualized infrastructure:

- Provisioning — System Cloning, Copying and System Refresh
  - Automate key SAP Basis provisioning tasks such as system cloning, copying, and system refresh directly in VMware vCenter Server with SAP Landscape Management

    - Leverage SA-API to provision SAP systems from templates in vRealize Automation
- Operations — SAP Hosts, Storage, and Network Migration
    - Migrate VM, switch its data set and network to stand up SAP hosts, move environments, and deploy disaster recovery solutions - all through the SAP Landscape Management interface
- Delivery — Self-Service Through vRealize Automation
    - Enable end users to self-provision SAP Landscapes in vRealize Automation through blueprints created by SA-API

**Note** Key Benefits:

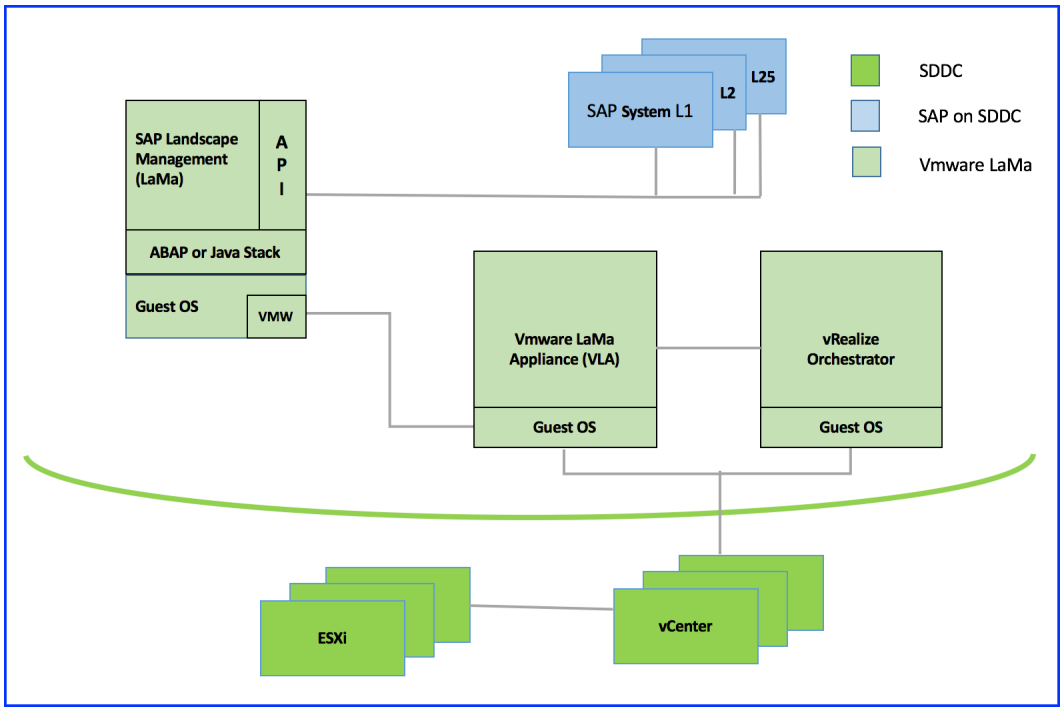
Following are the key benefits of deploying VMware Adapter for SAP Landscape Management:

- Greater operational continuity through centralized management, visibility and control of your entire SAP landscape using a single console
- Increased operational agility by accelerating application life-cycle management operations and faster response to workload fluctuations
- Reduced time, effort and cost to manage and operate your SAP systems through automation of SAP BASIS tasks and leveraging adapter's functions such as VMware vSphere Storage vMotion, network migration and linked online clone and copy
- Increases SAP BASIS and IT admin productivity by automating manual operational tasks and enabling self-service capability
- Lowers total cost of ownership since reduced OpEx leads to increased cost savings

# Reference Architecture

The following diagram illustrates the components of a VLA execution environment and their relationship to one another:

Figure 2-3. VLA Execution Environment




The key components in this diagram are:

- SAP Systems (Managed SAP Systems) – Each of these systems consist of software running on one or more machines that perform some business function, such as order processing, accounts payable, general ledger, inventory management, etc. Each SAP System consists of one or more components like a database service, SAP instance or SAP Host Agent service. When all of the components are up and running, the SAP System is running. When all of the components are stopped, the SAP system is stopped. If some systems are running and some are not, the SAP system is in an intermediate state.
- The *SAP Landscape Management (LaMa)* – The SAP Landscape Management (LaMa) application runs on ABAP or Java stack in a Linux based guest OS. It provides a web-based user interface for SAP BASIS administrators to create / destroy / configure / and otherwise operate on and provision SAP Systems and their underlying machinery (bare metal or virtualized).

  The *SAP Landscape Management (LaMa)* has an extensible architecture that allows SAP and third-party vendors, for example VMware, to create plugins in order to extend certain features.

  The VMware Adapter for SAP Landscape Management uses Key Storage service of SAP NetWeaver to store trusted certificates. During installation VMware Adapter for SAP Landscape Management creates an unsecure custom keystore view **VMware-VASL**. If some error with the mentioned view occurs during installation, the public view **DEFAULT** is used.

- The VMware Adapter for SAP Landscape Management — This is a plugin to LaMa that extends how LaMa integrates with the underlying systems virtualized with VMware vSphere (see next bullet), optimizing and extending the functionality for certain operations, such as activating (powering on) and deactivating (powering off), copying and cloning systems, and automation of these copying and cloning operations.
- ESXi and vCenter Server (collectively called vSphere) – ESXi is VMware's premier hypervisor product. VI administrators typically install it on server-class computers, with VMs running guest operating systems (OSes) with SAP Systems as applications within the guests. vCenter Server is VMware's premier product for managing environments virtualized with ESXi. Collectively called vSphere, these products provide an enterprise-class environment with features for creating clusters, load balancing VMs between host systems (ESXi instances), fault tolerance, virtual networking, virtual storage, and more. In VLA environments, the VLA appliance (next bullet) runs in a VM on this infrastructure.
- VMware vRealize Orchestrator™ – This VMware product helps VI administrators automate their environments by creating workflows (essentially scripts) that perform VI administrative actions, including complex actions that may take multiple steps, involve loops, conditions, etc. VMware vRealize Orchestrator workflows can handle exceptions automatically or can pause waiting for a VI administrator to mitigate an issue. See the next bullet for how VLA uses VMware vRealize Orchestrator.
- VMware Landscape Management Appliance (VLA) – This part of the VLA product is a virtual appliance. It maintains connection with one or more vCenters, contains a repository of inventory data and user credentials and executes operations at VMs, ESX hosts, datastores or networks by utilizing VMware vRealize Orchestrator (vRO). Collectively, it consists of one or more web services that accepts commands from (previously discussed) *LaMa* VLA Adapter and take appropriate actions to implement the commands, typically with the help of the (previously discussed) VMware vRealize Orchestrator. For example:
  - When a SAP BASIS administrator activates (powers on) a SAP System via LaMa, the VLA Adapter sends commands to the `vla-service` (discussed later in this topic) to power on the underlying VMs. The `vla-service` in turn invokes a VLA-specific workflow on the VMware vRealize Orchestrator to turn on the VMs in the underlying vSphere infrastructure. An analogous action occurs when a SAP BASIS administrator deactivates (powers off) a SAP System.
  - When a SAP BASIS administrator copies a SAP System, the VLA Adapter sends commands to the `vla-service` which in turn invokes a VLA-specific VMware vRealize Orchestrator workflow to create vSphere copies of the VMs on which the SAP Systems reside, configuring the VMs according to the parameters provided by the SAP BASIS administrator in the LaMa web user interface.

  The VLA Appliance contains several components, including:

  - A purpose-configured and hardened operating system (OS)

- A minimalist set of OS utilities and VLA-specific programs and configuration files required to provide the functionality described here. These include:
  - The `vla-service` — A web service running in `tomcat` that receives and processes commands from the VLA Adapter. It also serves out the VLA dashboard web UI. By default, this server listens on port 8443.
  - Tomcat user database — Database with usernames / passwords used to authenticate access to that instance's services. VI Administrators create an entry in the database for the VLA instance during deployment of the VLA environment using the `vla_user` command as detailed later in this document.
  - A credentials store to securely store credentials and certificated needed for the communication with infrastructure components in the environment. The credentials store is managed using the `vla_credentials` command as detailed later in this document.

# Environment Setup

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In this chapter we discuss various environment setup that you should have in place in order for you to be able to perform various operations in your existing SAP system infrastructure. The operations themselves are discussed in chapter Chapter 5 Operations Overview. From this chapter you will learn how to configure the VMware adapter for SAP Landscape Management to be able to connect to the VLA server. You know that the SAP LaMa manages the hosts and instances on the SDDC. The VMware Adapter for SAP Landscape Management receives LaMa commands and forwards them to the VLA for execution.

This chapter includes the following topics:

- The VMware Adapter for SAP Landscape Management installation
- Configure LaMa to use the VMware Adapter for SAP Landscape Management

## The VMware Adapter for SAP Landscape Management installation

The VMware Adapter for SAP LaMa installation is done in 2 phases:

1 Downloading the VMware Adapter for SAP LaMa file from the dashboard to a server which runs application server instance of SAP Netweaver AS Java with installed LaMa add-on. This server will be referred to as SAP Server.

2 The VMware Adapter for SAP LaMa deployment.

### Download the VMware Adapter for SAP Landscape Management

**Procedure**

1 Launch a browser window.

2 Enter the URL for the VLA Dashboard, for example:

*https://<vla_hostname_or_IP>:8443/vla/dashboard*, where `<vla_hostname>` is the FQDN or IP address of the VLA.

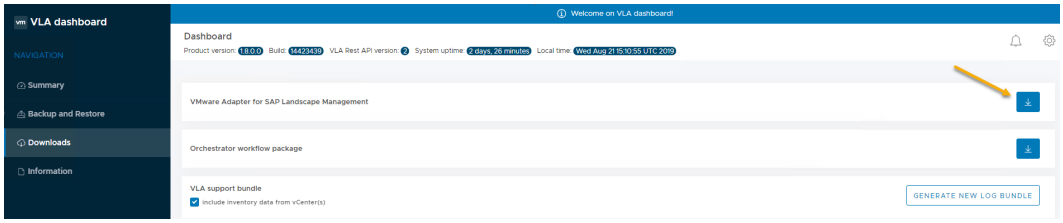
3 If you are prompted with a certificate warning, just accept the warning and proceed to the dashboard landing page.

4 The dashboard should be displayed after you enter the username and password.

5 Click on the **Downloads** section in the **NAVIGATION** pane.

6 Click on the download button opposite VMware Adapter for SAP Landscape Management

Figure 3-1. Download VMware Adapter for SAP Landscape Management




7 Copy `VMwareLVM.ear` to the scripts directory in the SAP Server.

- for Windows: `C:\usr\sap\<SID>\J<Instance>\j2ee\deployment\scripts`
- for Linux: `/usr/sap/<SID>/J<instance>/j2ee/deployment/scripts/`

## Deploy the VMware Adapter for SAP Landscape Management

**Note** SAP Note 2462712 contains detailed information on how to deploy applications to SAP NetWeaver Application Server.

### Prerequisites

The SAP NetWeaver AS Java is running.

### Procedure

1 Log into the SAP Server and run terminal.

2 Change the directory to:

- for Windows: `C:\usr\sap\<SID>\J<Instance>\j2ee\deployment\scripts`
- for Linux: `/usr/sap/<SID>/J<instance>/j2ee/deployment/scripts/`

3 Run the following command:

- for Windows: `make_SDA.bat VMwareLVM.ear`
- for Linux: `./make_SDA.csh VMwareLVM.ear`

4 Connect to SAP NetWeaver Application Server for Java using the Telnet to port 5<NN>08 where <NN> is a SAP NetWeaver Application Server instance number. For example:

```
# telnet localhost 50008
```

5 Enter the SAP J2EE administrator user and password.

6 Run the following command to deploy the VMware Adapter for SAP LaMa:

- for Windows:

```
> deploy C:\usr\sap\<SID>\J<instance>\j2ee\deployment\SDA\VMwareLVM.ear
```

- for Linux:

```
> deploy /usr/sap/<SID>/J<instance>/j2ee/deployment/SDA/VMwareLVM.ear
```

7 Exit from Telnet session by executing the `quit` command.

### Results

You successfully deployed the VMware Adapter for SAP Landscape Management.

# Configure LaMa to use the VMware Adapter for SAP Landscape Management

The VMware Adapter for SAP Landscape Management receives LaMa commands and forwards them to the VLA for execution. Therefore an adapter instance must be connected to the VLA server. Once the connection is established, the LaMa manages the hosts and instances that reside on the SDDC.

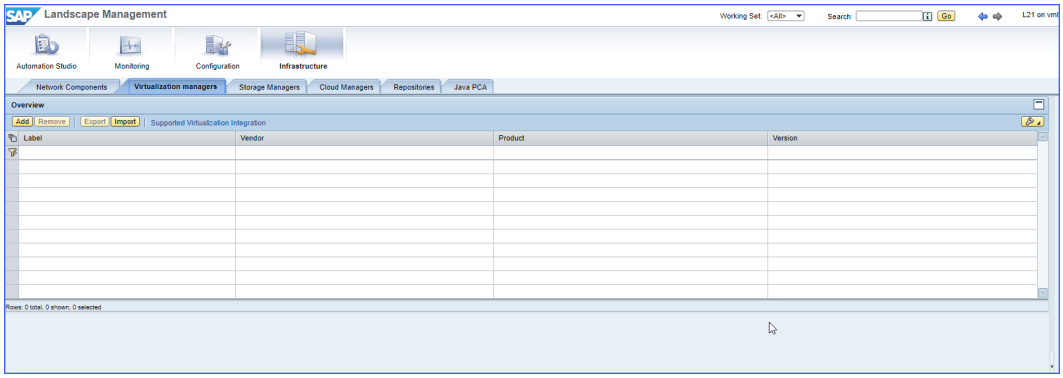
### Procedure

1 Login to LaMa web user interface with credentials that have administrator rights.

2 Click **Infrastructure**, and click **Virtualization managers**.

The browser displays a page similar to the following:

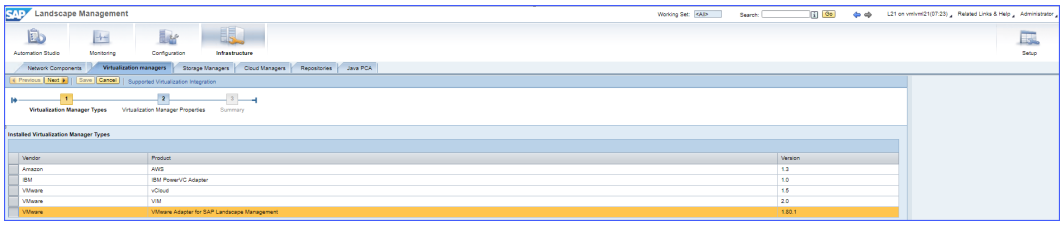
Figure 3-2. LaMa-Virtualization managers




3 Click **Add**.

The browser displays a wizard to configure a new Virtualization Manager, starting with the **Virtualization Manager Types** page similar to the following:

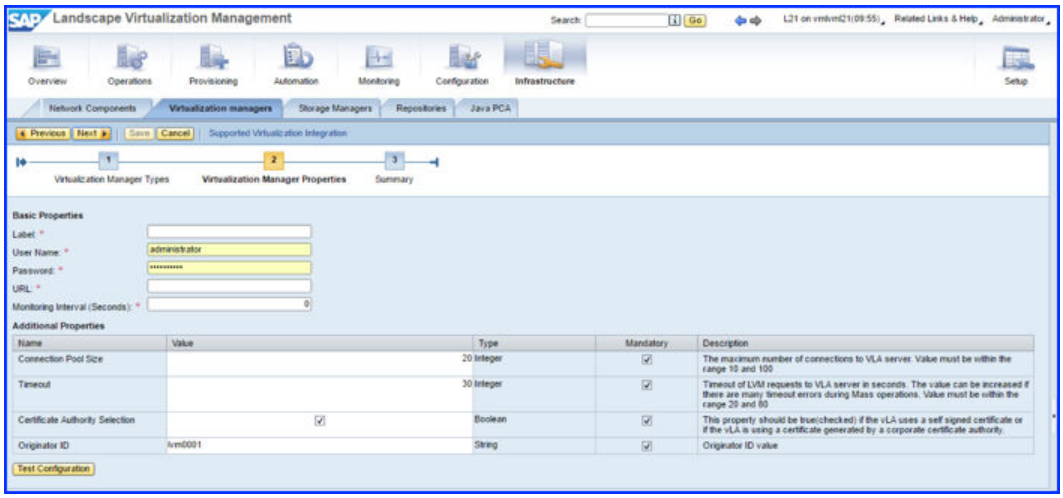
Figure 3-3. LaMa-Add-Virtualization Manager Types




4 Select the entry (highlighted above for emphasis) with VMware Adapter for SAP Landscape Management in the Product column and version of the VLA Adapter you deployed in the version column and then click **Next**.

The browser displays the **Virtualization Manager Properties** page similar to the following:

Figure 3-4. LaMa-VMware Adapter for SAP Landscape Management




5 Enter a name for this instance of the VLA Adapter in the **Label** field.

6 Enter the User Name and Password of the VLA user.

7 Enter the URL for the VLA. This should be *https://<vla_hostname_or_IP>:8443/vla*, where `<hostname_or_IP_address>` is the FQDN or IP address of VLA.

8 Enter a Monitoring Interval between 30 and 60 seconds. This is, how often the adapter gathers inventory updates from the VLA.

9 There are four **Additional Properties**:

a **Connection pool size** sets the maximum connection between the adapter and the VLA.

b Timeout sets the timeout duration (in seconds) between the adapter and the VLA

c A checkbox for **Certificate Authority Selection**. Select this if the VLA contains a self-signed certificate or a certificate that is generated by a corporate certificate authority.

d Originator ID – Unique Id used for transaction logging. This ID is a string and will identify this instance of the adapter in the system logs. We recommend you use LaMa-001 for the first instance in your enterprise, LaMa-002 for your second, etc.

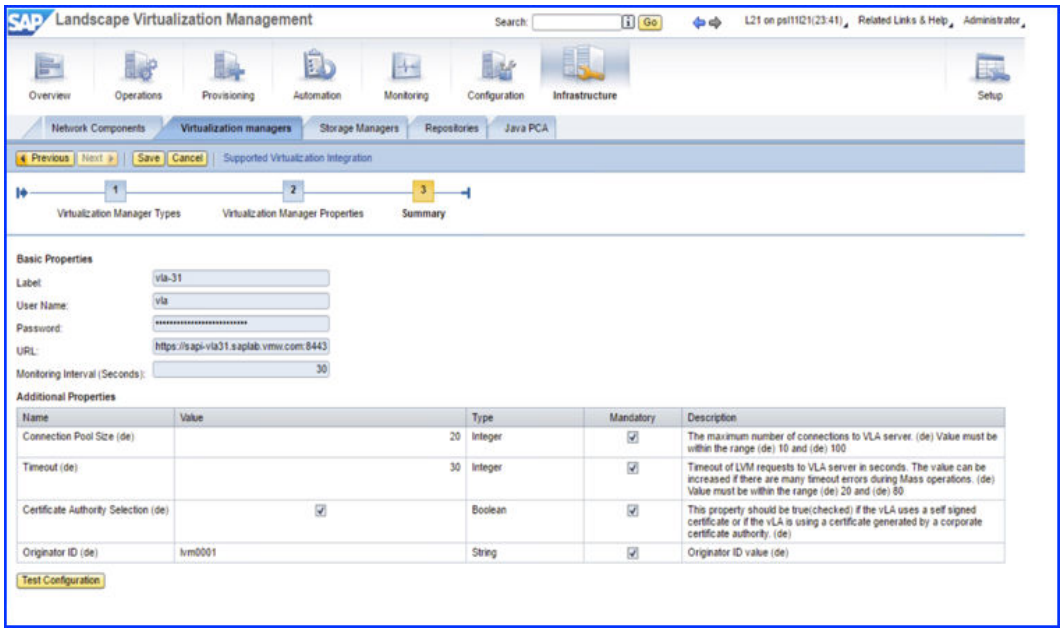
10 After all properties are entered, click **Test Configuration**. If the test succeeds, the configuration is correct (the VLA Adapter was able to communicate with the VLA Appliance)

The browser displays Connection Successful in the status bar.

11 Click **Next**.

The browser displays the Summary step of the wizard, similar to the following:

Figure 3-5. LaMa-Test Configuration




12 Click **Save**.

This saves the configuration of the adapter.

### Results

The VMware Adapter for SAP Landscape Management should now appear as configured in the LaMa web user interface.

**Note** The VMware Adapter for SAP Landscape Management uses the SAP NetWeaver Key Store Service. During registration, it creates its own key store view, *VMware-VASL*. To manage this key store view manually, open SAP Landscape Manager and navigate to SAP NetWeaver Administrator > Certificates and Key > Key Storage.

# Undeploy the VMware Adapter for SAP Landscape Management

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**Note** SAP Note 2462712 contains detailed information on how to undeploy applications from SAP NetWeaver Application Server.

### Prerequisites

The SAP NetWeaver AS Java is running.

### Procedure

1. Log into the SAP Server and run terminal.
2. Connect to SAP NetWeaver Application Server for Java using the Telnet to port 5<NN>08 where <NN> is a SAP NetWeaver Application Server instance number. For example:

   ```
   # telnet localhost 50008
   ```
3. Enter the SAP J2EE administrator user and password.
4. Run the following command to see if the VMware Adapter for SAP LaMa is deployed:

   ```
   > list_app | grep VMwareLVM
   ```

   If the VMware Adapter for SAP LaMa appears in the list, then it has been deployed.
5. Run the following command to uninstall the VMware Adapter for SAP LaMa:

   ```
   > undeploy name=VMwareLVM vendor=JavaEE on_undeploy_error=stop
   ```
6. Run the following command to verify that the VMware Adapter for SAP LaMa is undeployed:

   ```
   > list_app | grep VMwareLVM
   ```

   If the VMware Adapter for SAP LaMa does not appear in the list, then it has been undeployed.
7. Exit from Telnet session by executing the `quit` command.

### Results

You successfully udeployed the VMware Adapter for SAP Landscape Management.

# Operations Overview

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VMware Adapter for SAP Landscape Management extends the basic operations available in SAP LaMa and integrates VMware vSphere infrastructures into the available workflows. SAP LaMa provides the following basic features:

- Dashboards and Pods— Get a quick high level overview of your current landscape state
- Single/Mass Operations— Centralize operations for your entire landscape using a single console
- Landscape Visualization— Visualize systems and underlying infrastructure and identity relationships
- Provisioning Systems— Automate complex provisioning activities such as system copy/ refresh
- Post-Copy Automation— Automate post copy and refresh processing tasks and customize the task lists
- Managing SAP HANA— Managing and provisioning your SAP systems powered by SAP HANA
- Custom Provisioning— Integrate and use your own replication technology for system provisioning
- Custom Operations/Hooks— Integrate your own procedures and tailor it to your specific needs
- Task Scheduling— Schedule and execute mass or sequential tasks during planned maintenance

This chapter includes the following topics:


- Operations
- Forced Operations
- Non-Forced Operations
- Migrate
- Provisioning

# Operations

Operations in *SAP LaMa* execute features to existing SAP systems and infrastructure. Some examples of these operations are activating and deactivating SAP systems. With the VMware Adapter for SAP Landscape Management there are three types of operations that you can perform —

1. **Forced Operations** — Forced operations ignore system services and daemons on the target SAP system and are generally non-graceful operations. The three forced operations that are supported are —
   a. Forced Deactivate (Shutdown OS)
   b. Forced Deactivation (Power Off)
   c. Forced Suspend
2. **Non-Forced Operations** — Non-Forced operations execute on the target SAP system and generally get executed in a graceful manner. The four Non-Forced operations that are supported are —
   a. Activate
   b. Deactivation
   c. Deactivate
   d. Suspend
3. **Migrate Operation** — The migrate operation allows you to migrate a SAP virtual machine onto another host / network / datastore.

# Forced Operations

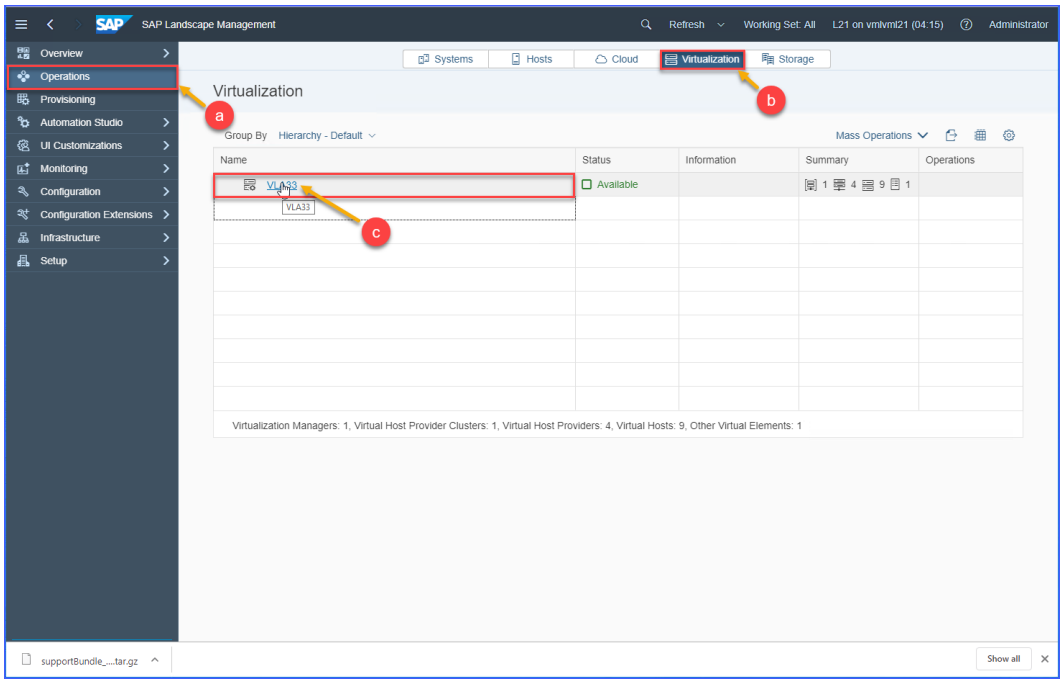
There are three forced operations that are supported —

1. Forced Deactivate (Shutdown OS) — used to shut down the operating system.
2. Forced Deactivation (Power Off) — used to power off the operating system.
3. Forced Suspend — used to suspend the SAP system virtual machine.

> **Note** When a virtual machine(VM) is suspended, the current system memory of the VM is written to the disk. Then the VM is powered off. When the VM is restarted from vCenter Server Appliance, the VM continues from exactly the same state as it was when it was suspended, including executing any running transactions.

To access these features login to the LaMa web user interface and navigate to the **Operations** view and choose the **Virtualization** view. Click on VLA Adapter instance name and further in its hierarchy.

Figure 5-1. Navigation to Operations




To execute a forced operation follow instruction below

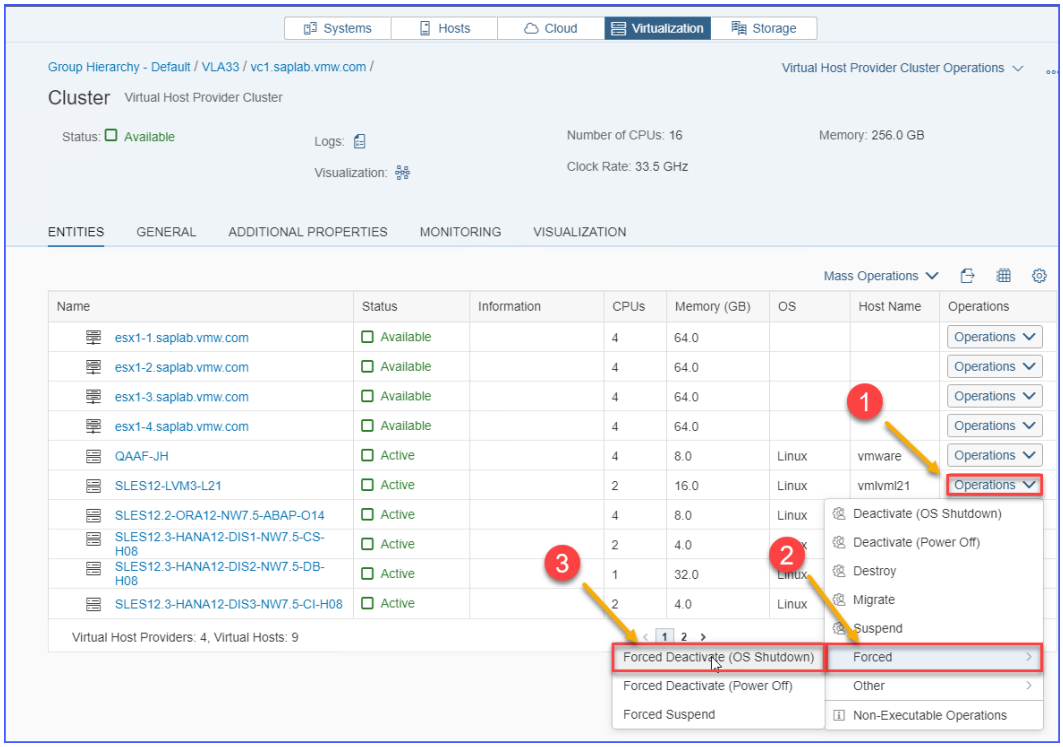
### Procedure

1 Find the SAP system virtual machine and click on the **Operations** for the selected SAP system virtual machine.

2 Select **Forced** from the dropdown list.

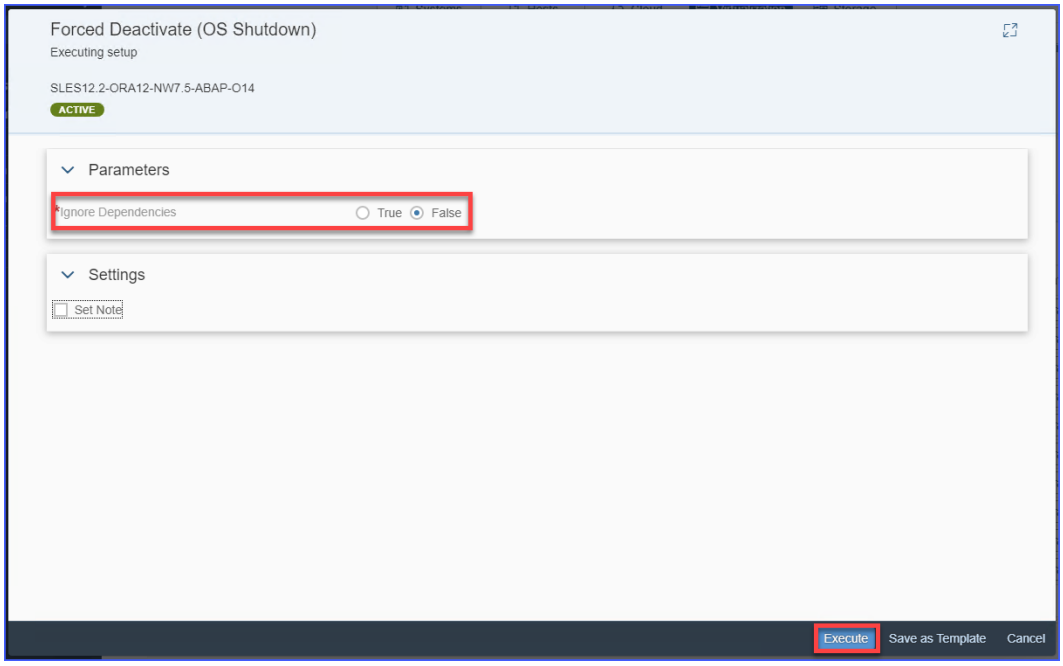
3 Select the option that you intend to execute from the list.

Figure 5-2. Forced operations



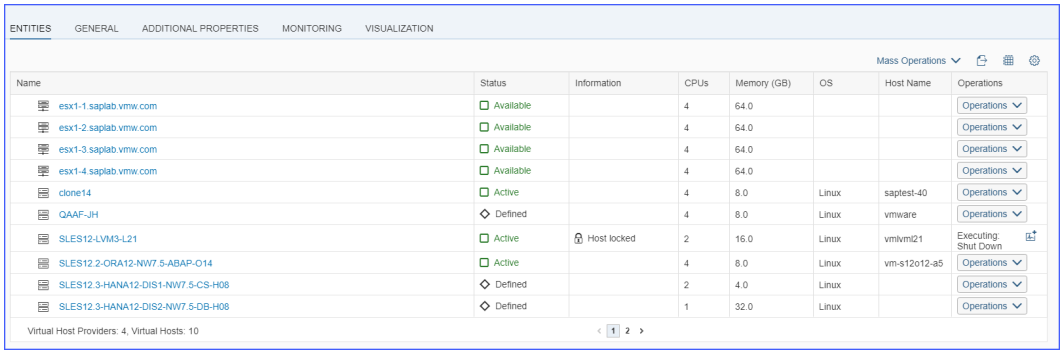

4 In the pop-up window set **True** for the **Ignore Dependencies** parameter if you want to ignore any instances that might be running on the virtual host. Then click on the **Execute** button.

Figure 5-3. Execution setup dialog



5 The host will be marked as locked until the end of the operation.

Figure 5-4. Locked host




# Non-Forced Operations

There are four Non-Forced operation features that you can execute —

1 **Activate** — You use this feature to power on the virtual machine, operating system and then the SAP system.

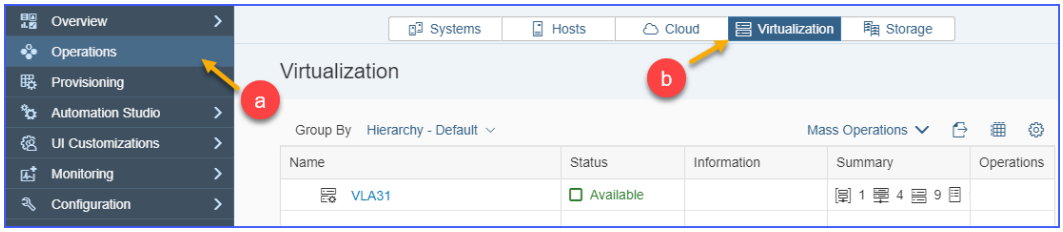
2 **Deactivation** — You use this feature to gracefully shut down the SAP system and then the operating system.

3 **Deactivate** — You use this feature to gracefully shut down the SAP system, operating system and then the virtual machine too.

4 **Suspend** — You use this feature to gracefully shutdown the SAP system and then suspend the virtual machine.

To access these features login to the LaMa web user interface and navigate to the **Operations** view and choose the **Virtualization** view.

Figure 5-5. Navigation to Operations




# Activate

**Activate** is a Non-Forced operation feature. You use it to gracefully power on the virtual machine, the operating system and the SAP system.

Prerequisites

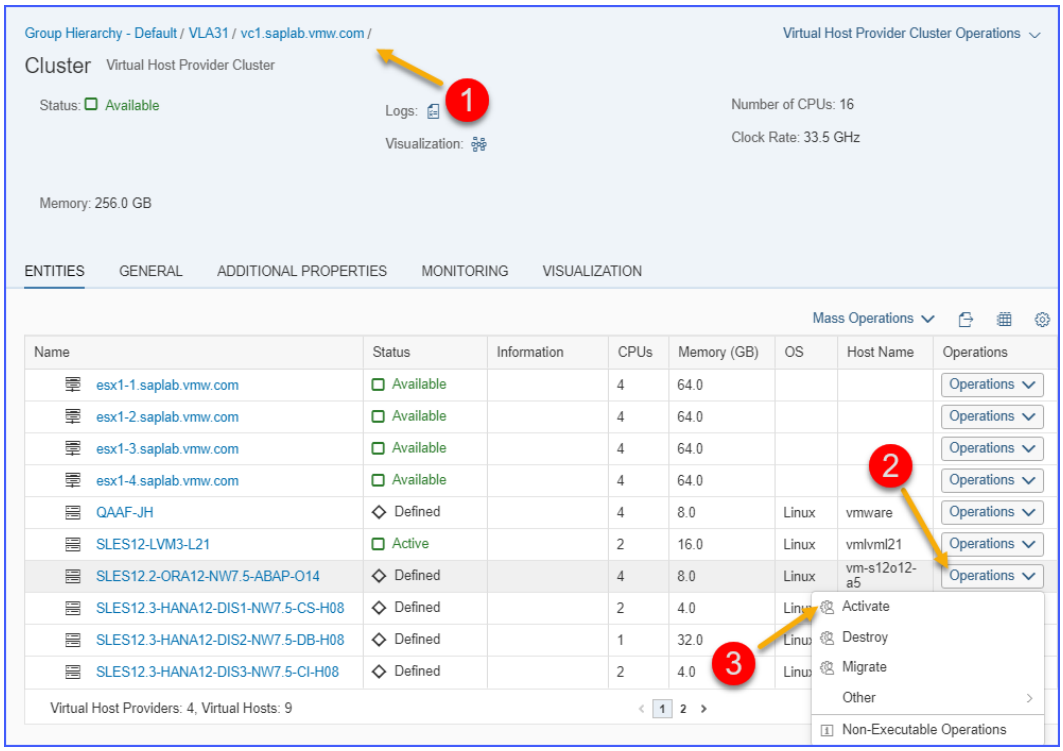
Procedure

1 Find the SAP system virtual machine by clicking on VLA Adapter instance name and further in its hierarchy.

2 Click on the **Operations** for the selected SAP system virtual machine.

3 Select **Activate** from the dropdown list.

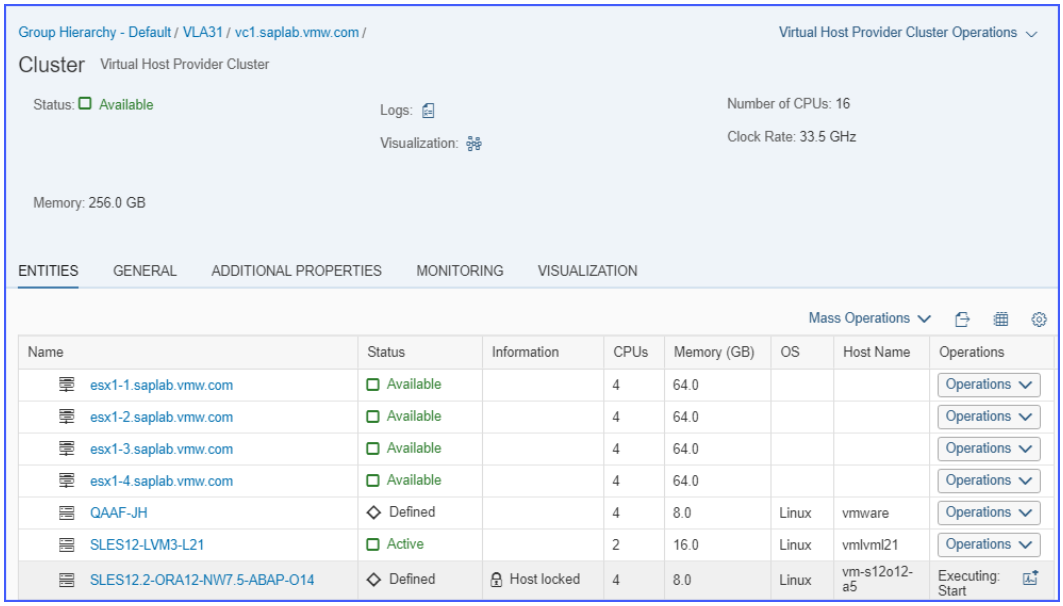
Figure 5-6. Activate operation




4 In the pop-up window click on the **Execute** button.

5 The host will be marked as locked until the end of the operation.

Figure 5-7. Activation - locked host




## Deactivation / Deactivate

**Deactivate (OS shutdown)** is a Non-Forced operation that causes a graceful shut down of the SAP system and also the operating system, and deactivates the virtual host. **Deactivate (Power Off)** is a Non-Forced operation that causes a graceful shut down of the SAP system, and disconnects the virtual systems from the power supply.

### Prerequisites

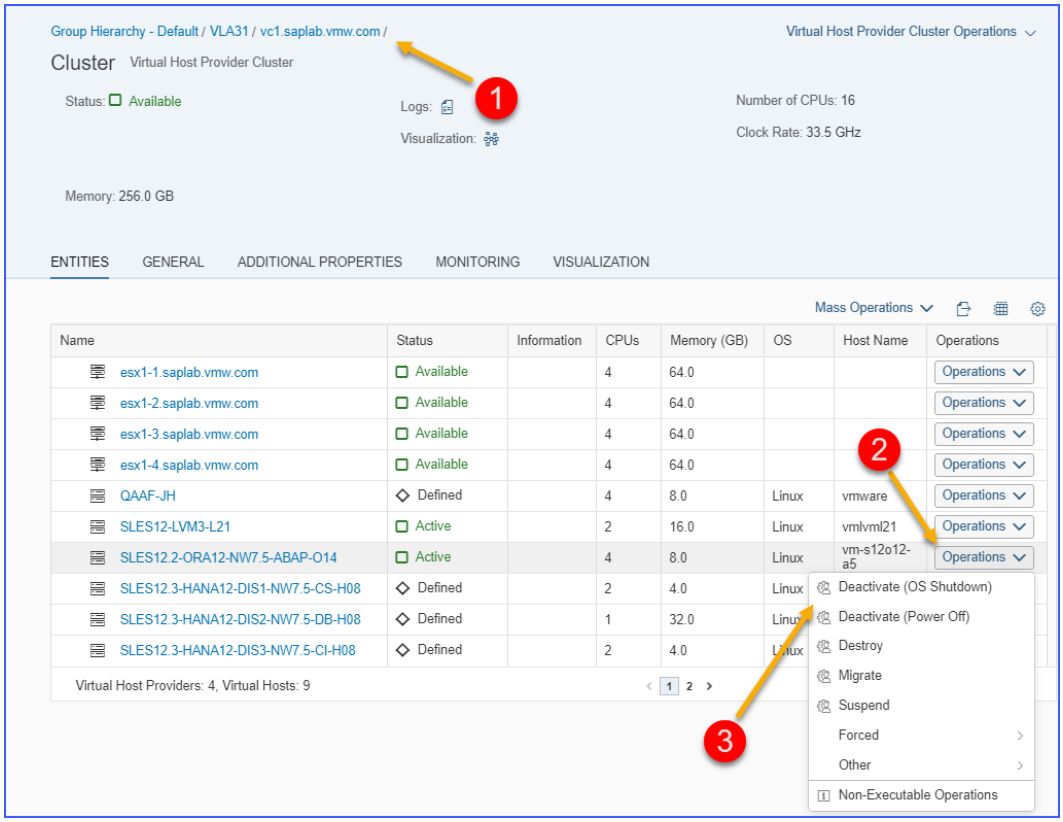
### Procedure

1 Find the SAP system virtual machine by clicking on VLA Adapter instance name and further in its hierarchy.

2 Click on the **Operations** for the selected SAP system virtual machine.

3 Select **Deactivate (OS Shutdown)** or **Deactivate (Power Off)** from the dropdown list.

Figure 5-8. Deactivate operations




4 In the pop-up window click on the **Execute** button.

5 The host will be marked as locked until the end of the operation.

## Suspend

**Suspend** is a Non-Forced operation that causes a graceful shutdown of the SAP system and then the suspension of the virtual machine.

### Prerequisites

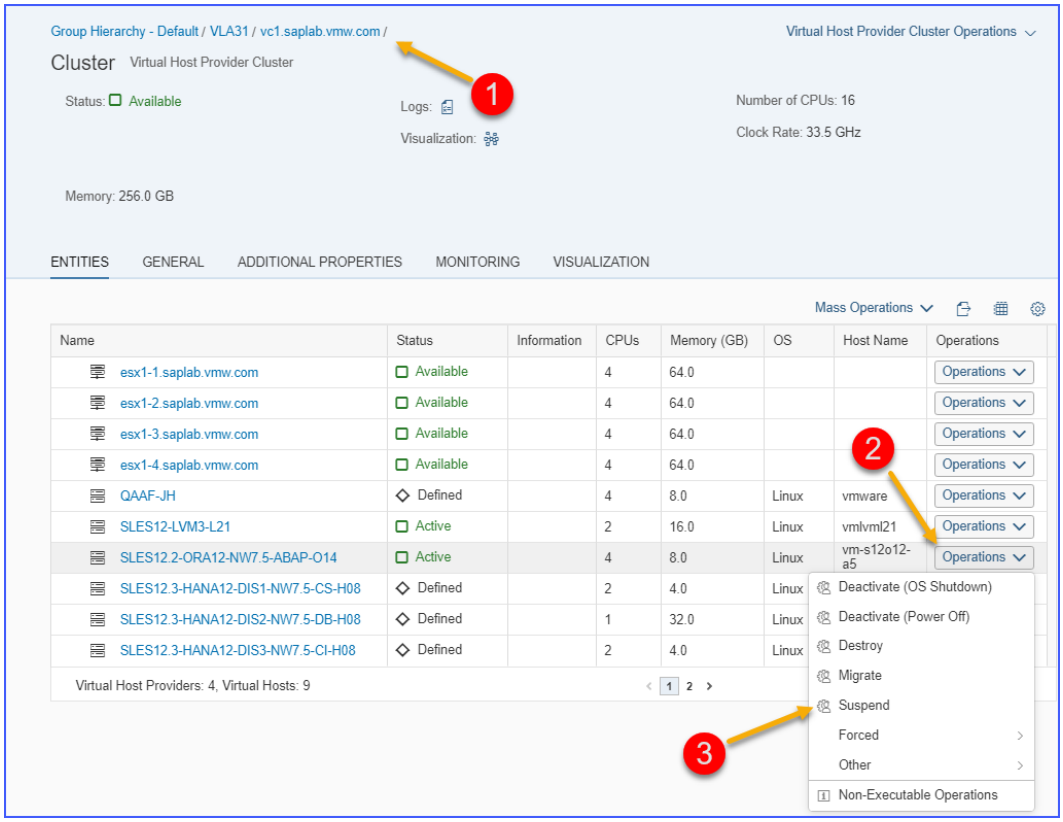
### Procedure

1 Find the SAP system virtual machine by clicking on VLA Adapter instance name and further in its hierarchy.

2 Click on the **Operations** for the selected SAP system virtual machine.

3 Select **Suspend** from the dropdown list.

Figure 5-9. Suspend operation




4 In the pop-up window click on the **Execute** button.

5 The host will be marked as locked until the end of the operation.

# Migrate

**Migrate** operation feature enables you to migrate a SAP system virtual machine —

1 From one host onto another host

2 From one datastore onto another datastore

3 From one resource pool onto another resource pool

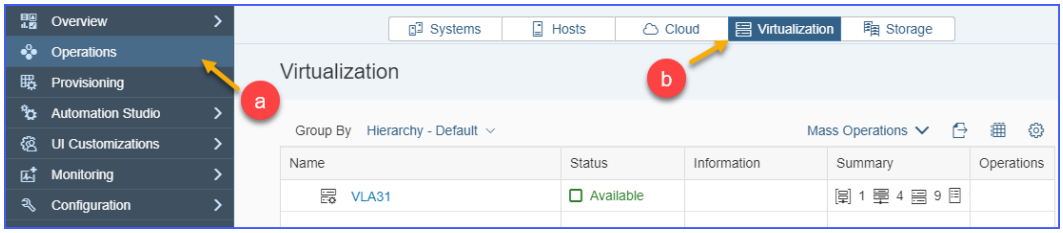
**Note** You can choose any combination of the above options to do the migration

Migration is a powerful tool that can be used to move a system or isolate a system thereby making it easy to support project, patching, development or IT objectives.

Procedure

1 Login to LaMa web user interface and navigate to the **Operations** view and choose the **Virtualization** view.

Figure 5-10. Navigation to Operations

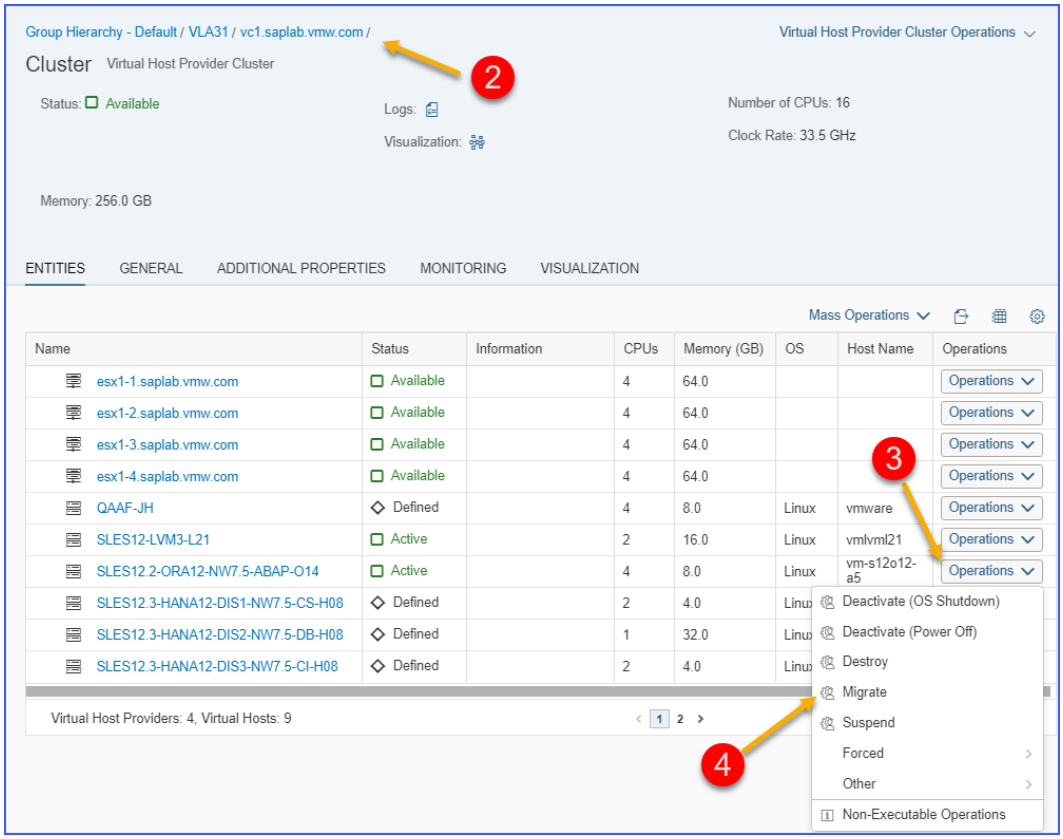



2 Find the SAP system virtual machine by clicking on the VLA Adapter instance name and further in its hierarchy.

3 Click on the **Operations** for the selected SAP system virtual machine.

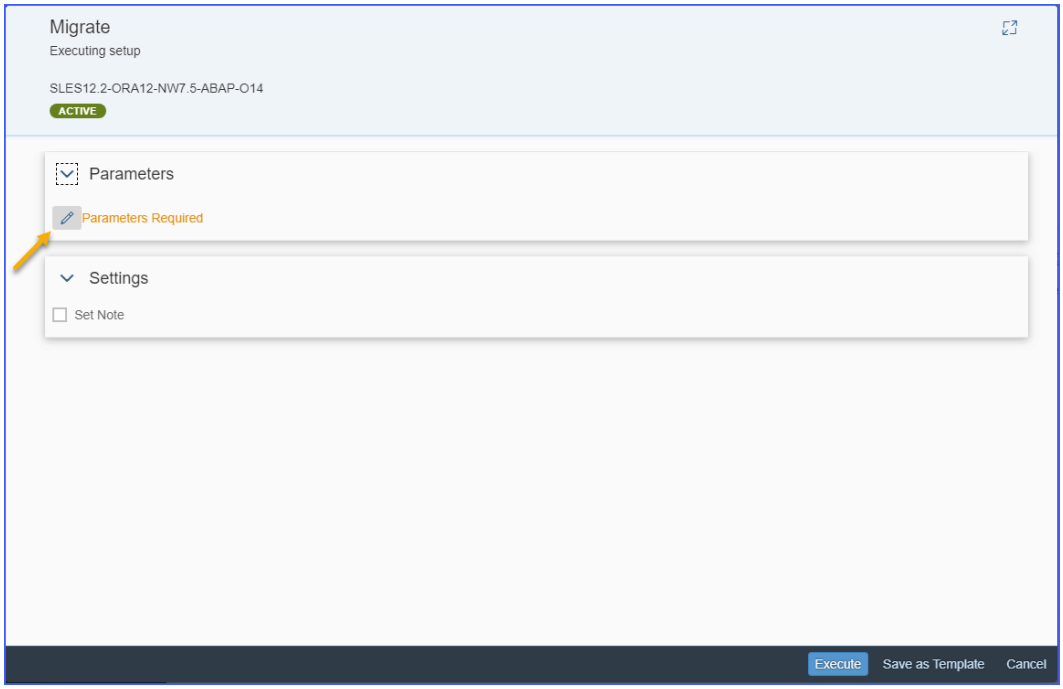
4 Select **Migrate** from the dropdown list.

Figure 5-11. Migrate operation



5 In the pop-up window click on the pencil icon to enter required parameters.

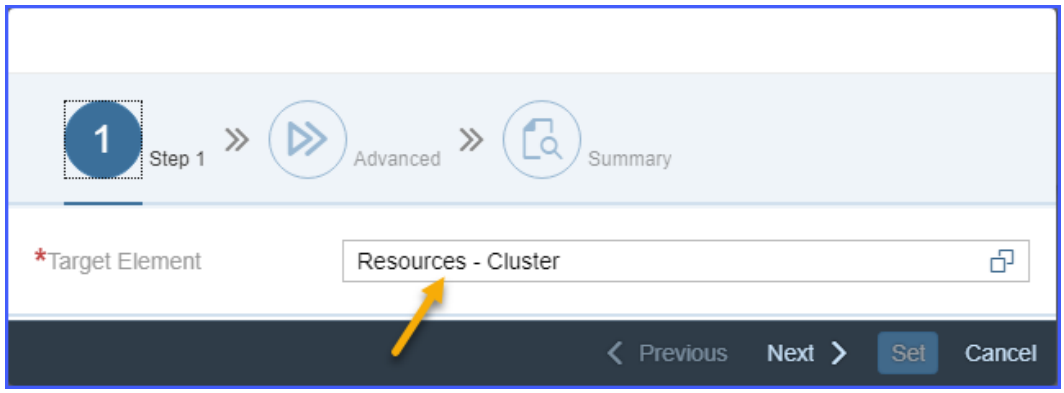
Figure 5-12. Execution setup



6 In the pop-up window select the target resource pool:

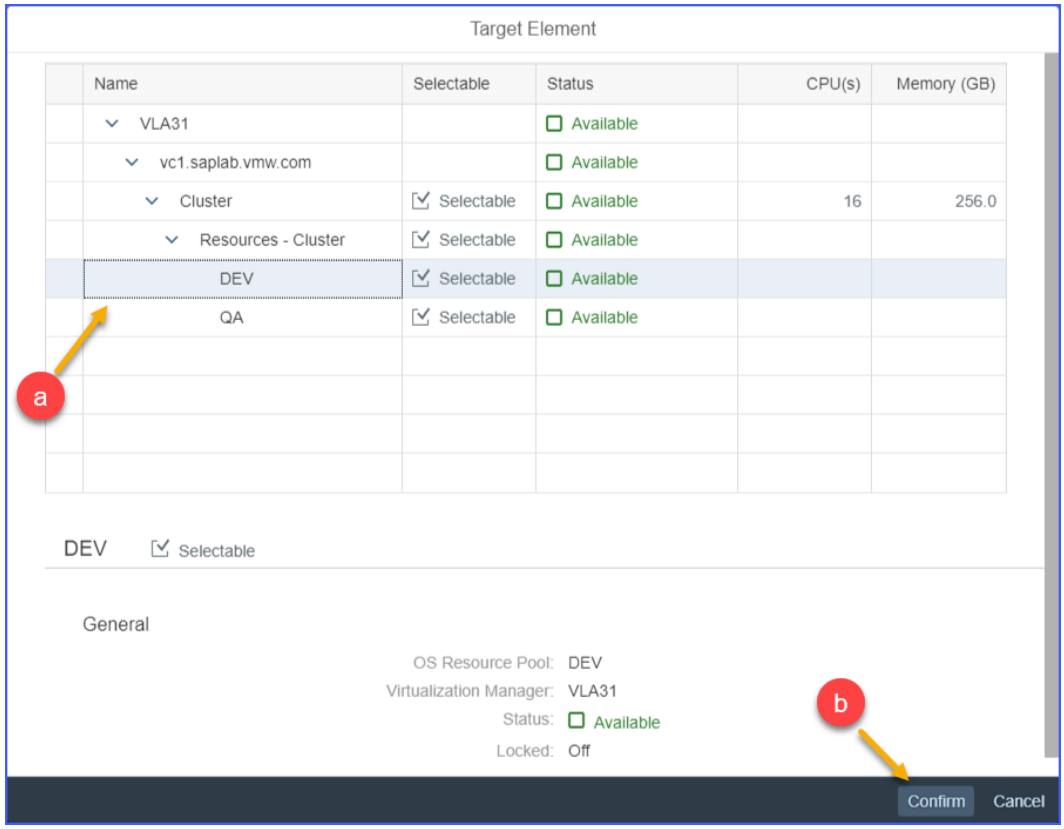
a Click on the **Target Element** field.

Figure 5-13. Parameters setting - Step 1




b Go down through the inventory objects hierarchy and click on a resource pool. Click **Confirm**.

Figure 5-14. Resource pool setting

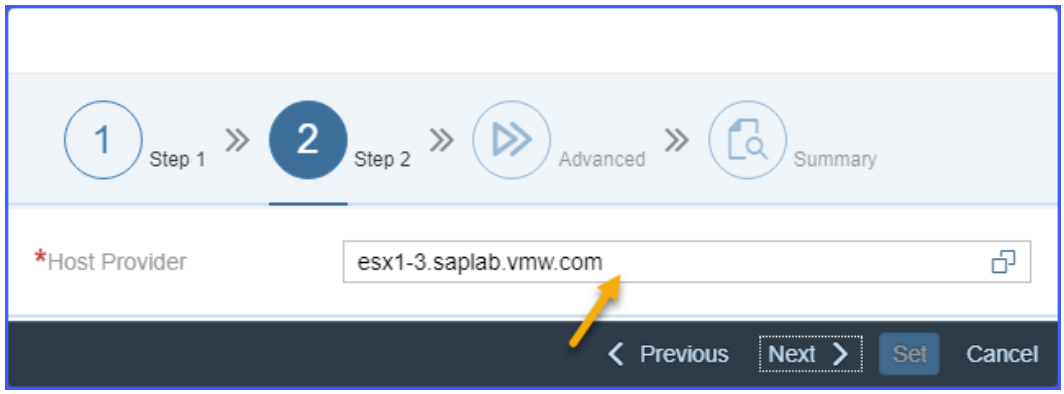



7 Click **Next**.

8 Select the target host where you want to migrate the SAP system virtual machine:

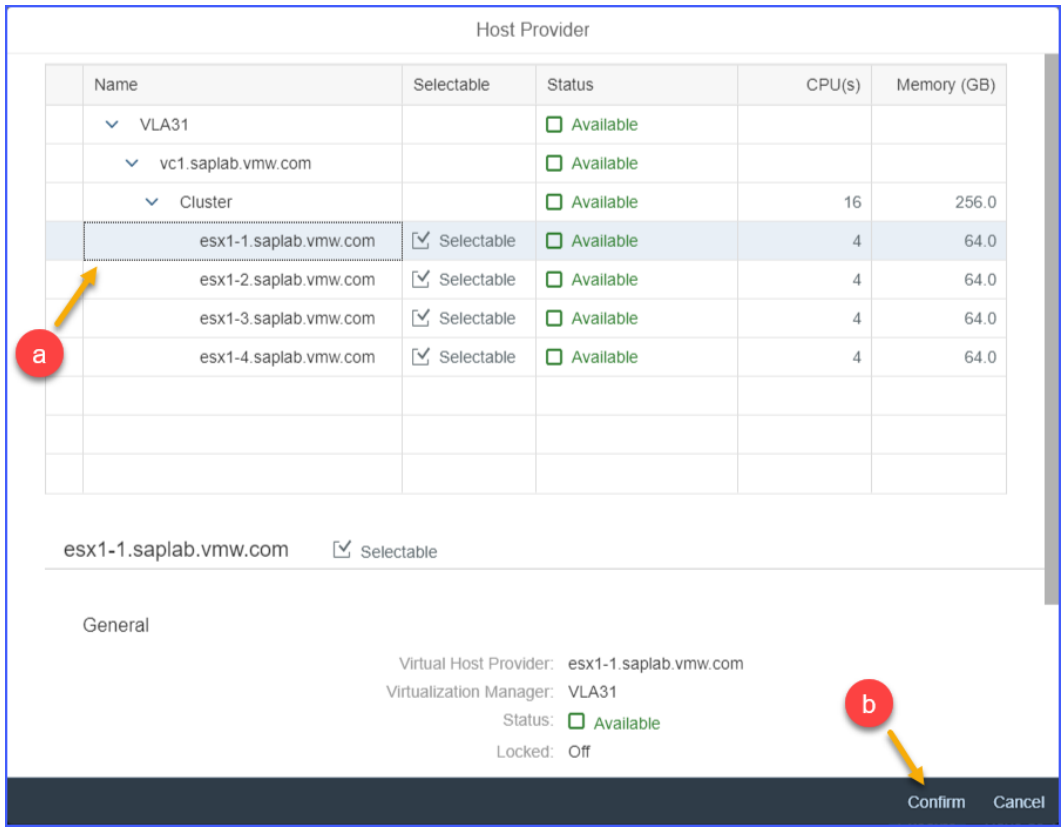
a Click on the **Host Provider** field.

Figure 5-15. Parameters setting - Step 2




b Go down through the inventory objects hierarchy and click on a host. Click **Confirm**.

Figure 5-16. Host setting

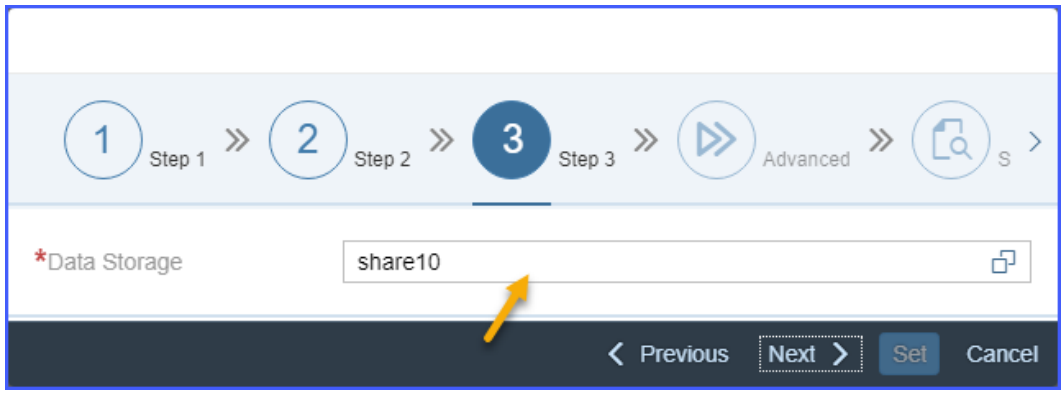



9 Click **Next**.

10 Select the target Data Storage:

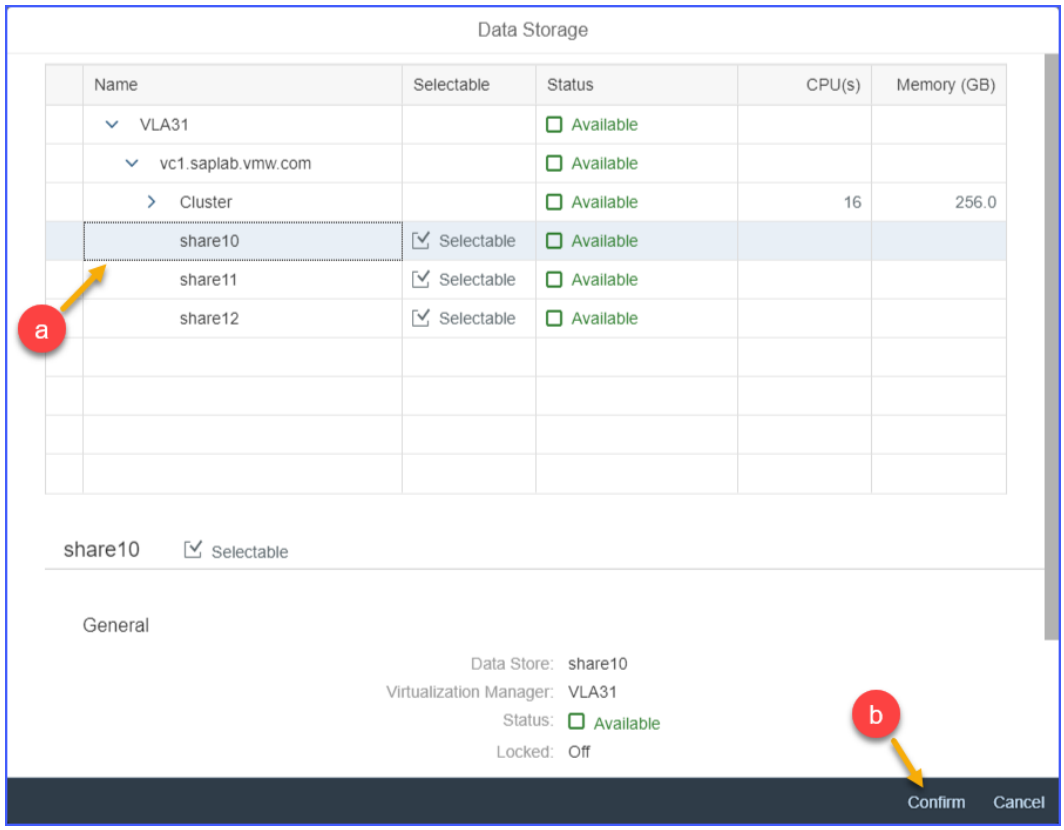
a Click on the **Data Storage** field.

Figure 5-17. Parameters setting - Step 3




b Go down through the inventory objects hierarchy and click on a datastore. Click **Confirm**.

Figure 5-18. Datastore setting




11 Click **Next**.

The **Summary** step is displayed and selected changes can be reviewed now.

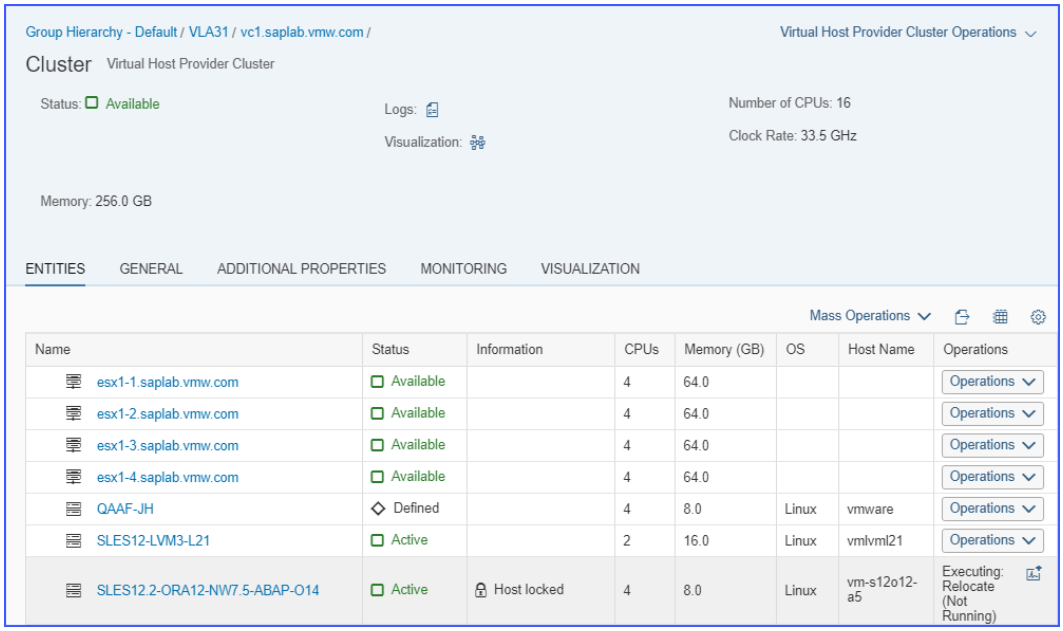
Figure 5-19. Summary


12 Click on the **Set** button.

13 Click on the **Execute** button to start the migration operation.

14 The host will be locked until the operation completes.

Figure 5-20. Lock




### Results

You have successfully migrated the SAP system virtual machine

# Provisioning

**Provisioning** with the VMware Adapter for SAP Landscape Management allows the user to take source SAP systems and either **clone** or **copy** the system to create new target SAP systems.

**Note** During SAP workload provisioning operations, copy or clone, the classic naming scheme for network interfaces can cause target clone system being unavailable for LaMa and as result failed provisioning operation. This can happen in a multi network interfaces setup if LaMa is not connected to all networks of the source system. Due to changed MAC addresses the target clone system may have different mapping of network interface names to networks compared to source system. In order to keep the same network interface names on the target clone system it is necessary to enable Consistent Network Device Naming in the source system. For more information see Consistent Network Device Naming (CNDN).

## Clone System

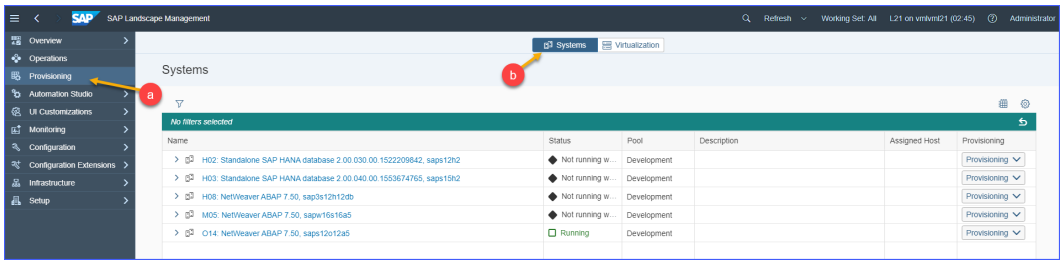
Clone operation creates an exact duplicate of the source system into a new target system. The most common use case is to take a source development system and create a clone of that system for separate development work. Other use cases may apply.

To clone a system follow the instruction below.

### Procedure

1 Login to LaMa web user interface and navigate to the **Provisioning** view and choose **Systems** view.

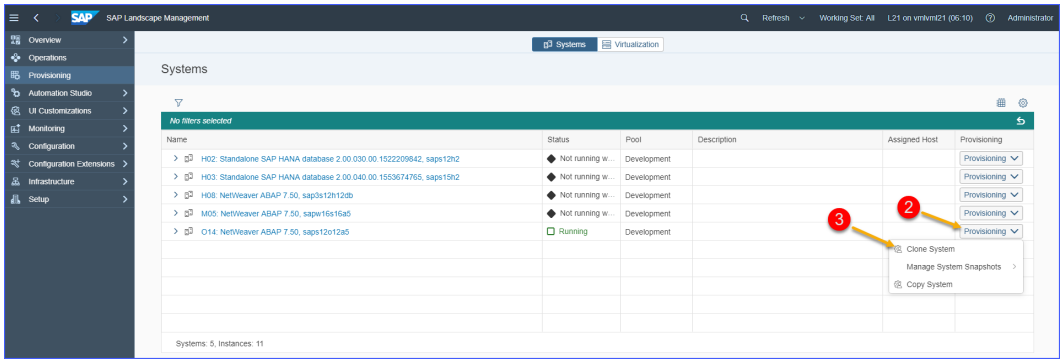
Figure 5-21. Navigation to Provisioning




2 Click on the **Provisioning** button for the selected SAP system virtual machine.

3 Select **Clone System** from the dropdown list.

Figure 5-22. Clone operation




4 In the pop-up window do the following:

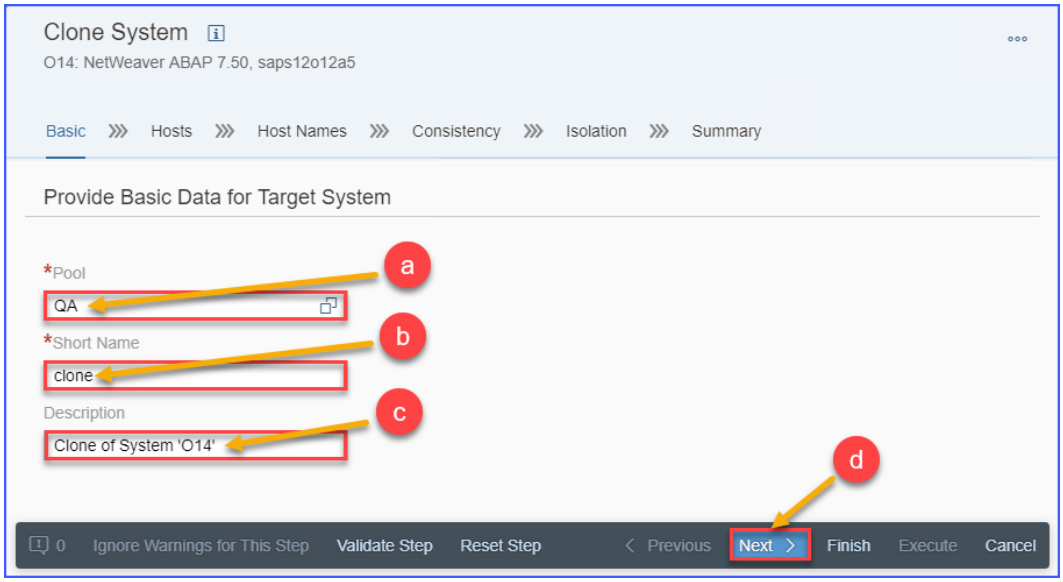
a Select the **Pool** where the target system will be provisioned.

b Specify the **Short Name** for the new target host (the clone that you are creating).

c Provide an optional **Description** of the new Clone System that you are about to create.

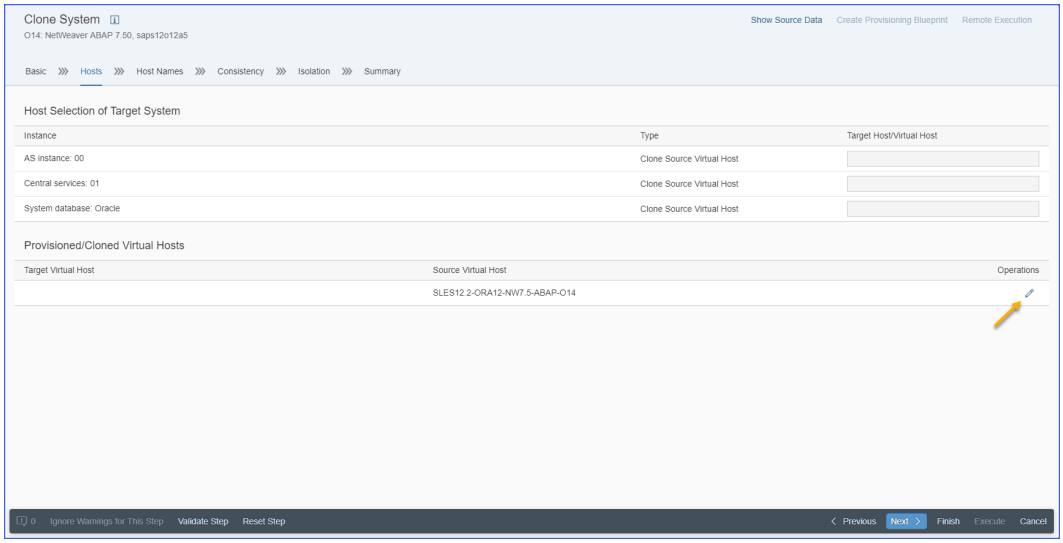
d Click on the **Next** button.

Figure 5-23. Basic Data



5 Click on the pencil icon to enter required parameters.

Figure 5-24. Host Selection

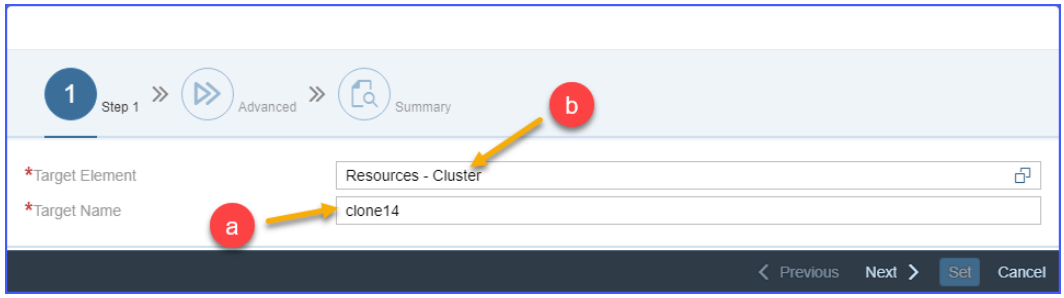



6 In the pop-up window do the following:

a Provide the **Target Name** for the clone SAP system virtual machine.

b Click on the **Target Element** field.

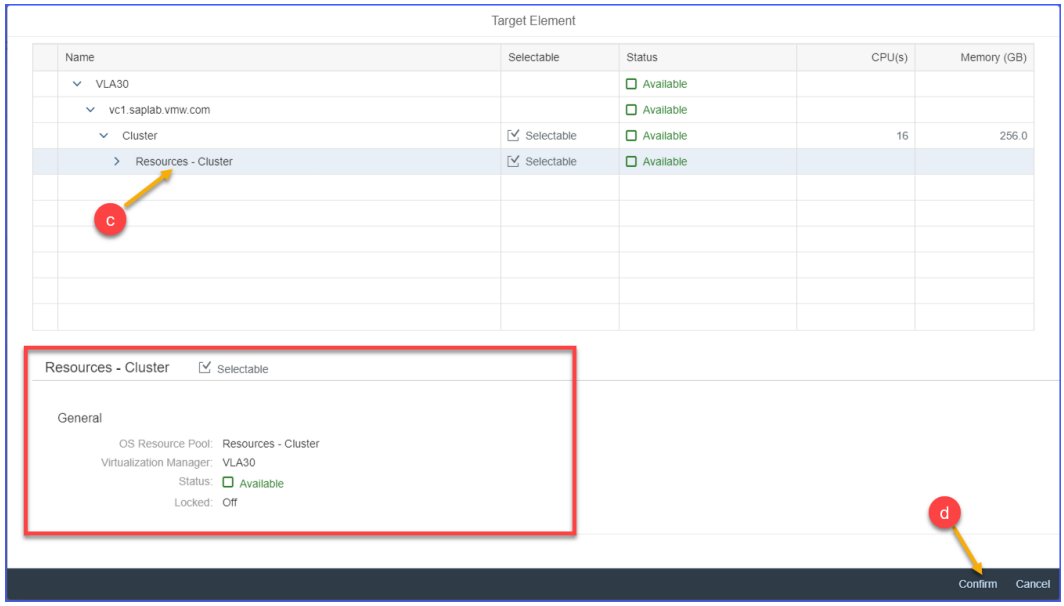
Figure 5-25. Target Selection




c In the **Target Element** window select the target resource pool or ESXi host. The dialog window presents useful information like current utilization levels for either the resource pool or host. This should enable you to take informed decision with regards to the resource pool / ESXi host to be used for placing the target clone system.

d Click on the **Confirm** button to close the **Target Element** window.

Figure 5-26. Resource Pool Information

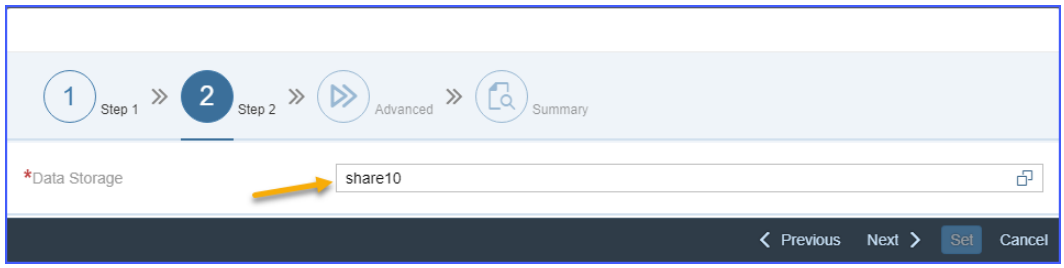



e Click on the **Next** button.

7 Specify a Data Storage:

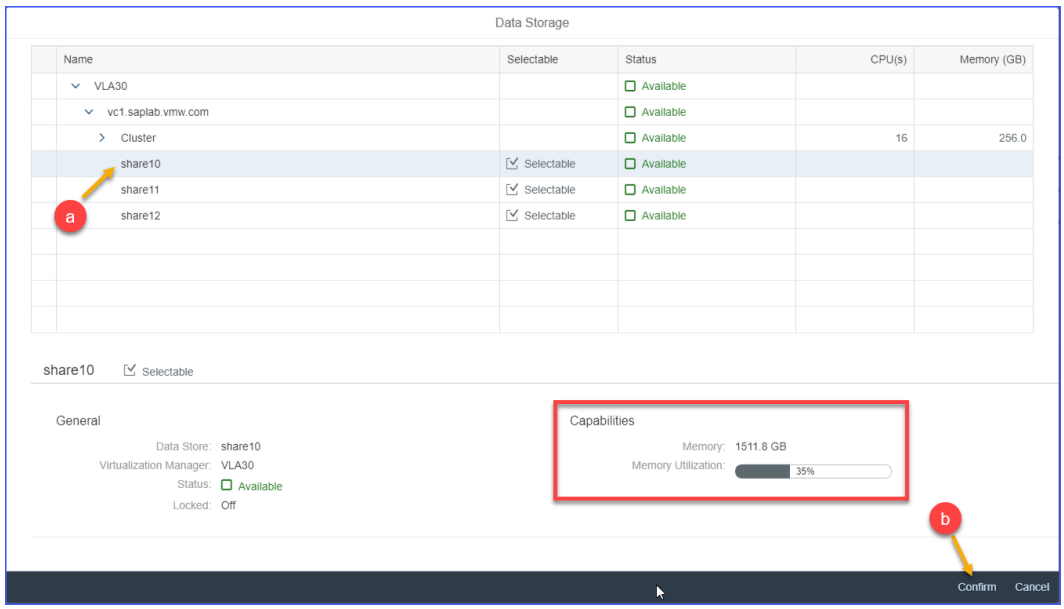
a Click on the **Data Storage** field.

Figure 5-27. Data Storage




b In the **Data Storage** window select a Data Storage to store the new clone system. The dialog provides useful information like the size and current utilization levels for various available datastores. This allows you to take an informed decision on the appropriate Data Storage to use for the new clone system. Click on the **Confirm** button.

Figure 5-28. Data Storage Information




c Click on the **Next** button.

8 For the next step do the following:

a Select **Customization specification for guest OS**.

- Guest Customization Specifications are created in the VMware vCenter Server and are made available via the VMware Adapter for SAP Landscape Management. You will need a Guest Customization Specification in order to copy a system.
- Work with your VMware Administrator to create a Guest Customization Specification if none is present in the SAP LaMa.

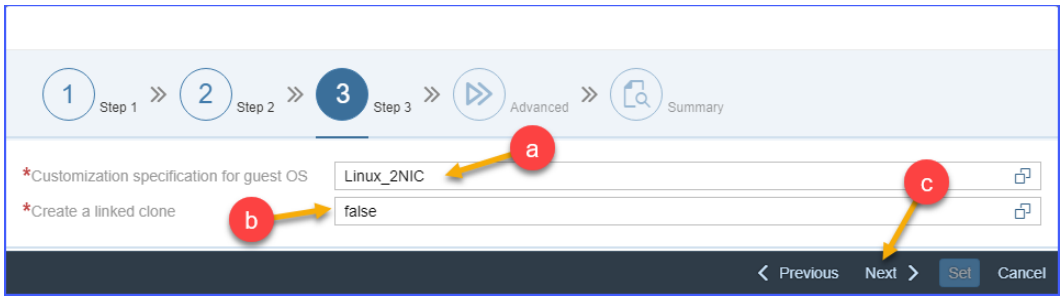
**Note** DHCP customization specifications may cause an inconsistent /etc/hosts file contents in the target system. PROMPT customization specifications is a more reliable option.

b Choose whether you want to create either a linked clone or a full clone.

- A Linked Clone creates a target system that has a file link to the original source system. This reduces the utilized storage for the target system. It is most commonly used in development and sandbox systems. Linked Clones creation completes substantially faster than Full Clones.
- A Full Clone creates a target system that has the same disk structure and size as the source system. There is no link between the source and target systems. Full clones are most often used to create production systems and /or systems that can be exported to be used in other datacenters.

c Click on the **Next** button.

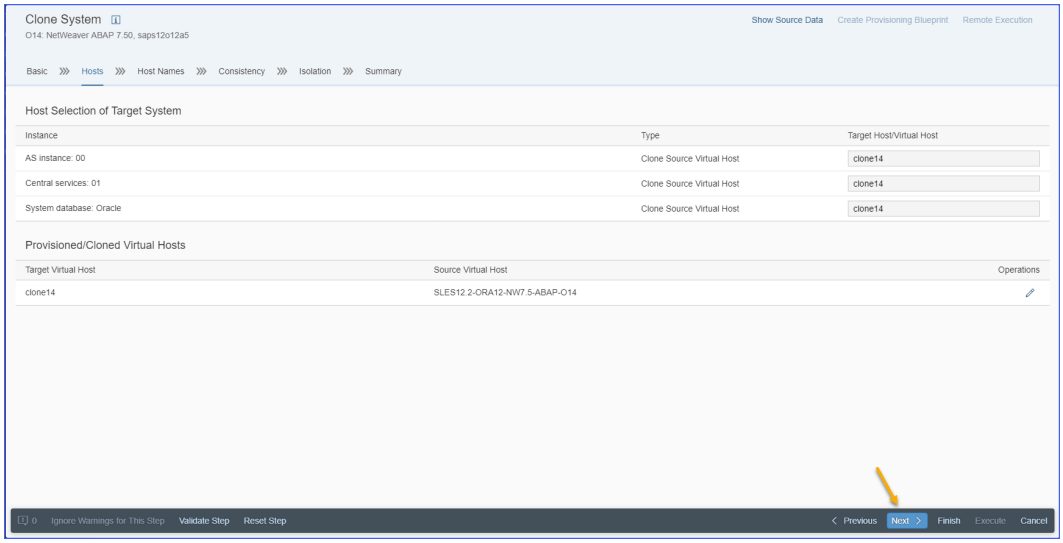
Figure 5-29. Customization Specification




9 Review the various settings that you have chosen so far. Use the **Previous** button to go back and make appropriate changes, if required. When you are satisfied with the settings and are ready to proceed further, click on the **Set** button.

10 Click on the **Next** button.

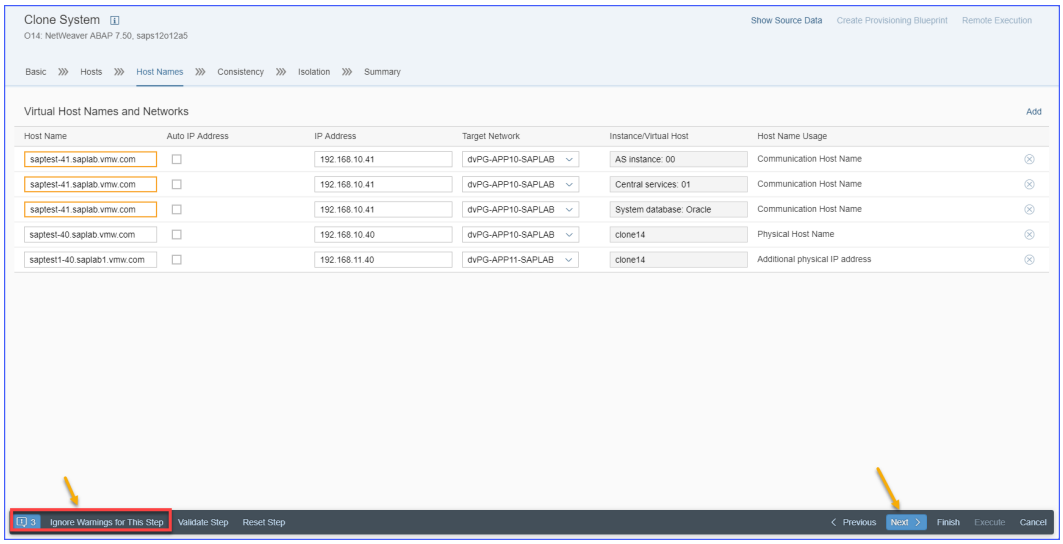
Figure 5-30. Hosts




11 Choose a different network for each component of the target SAP system and click on the **Next** button.

**Note** If the host is not configured as adaptive instance you will see warnings that you need to ignore by pressing **Ignore Warnings for This Step** button, and clicking on the **Next** button again.

Figure 5-31. Host Names and Networks



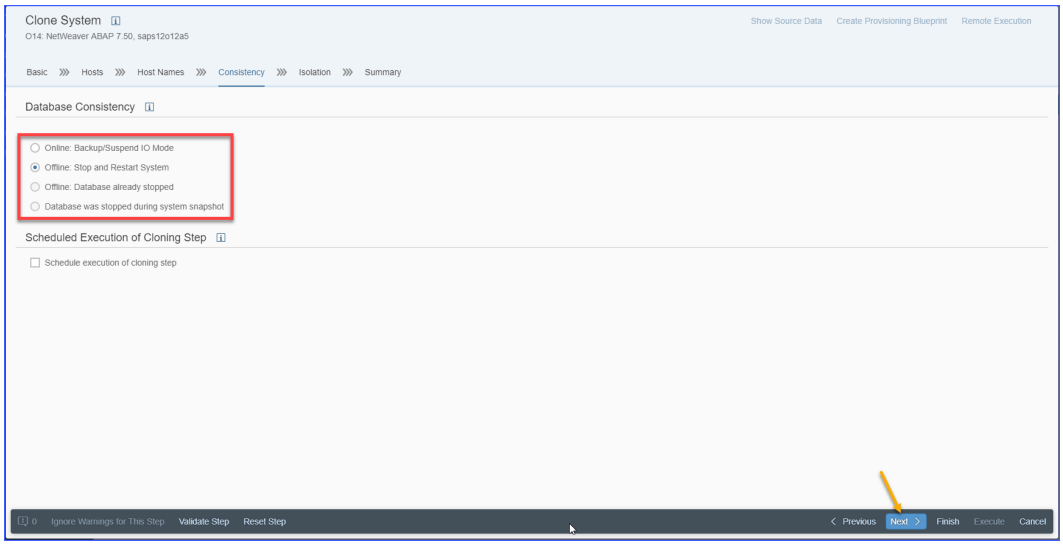

12 Select the appropriate database consistency method, depending on what state the database is in. Click on the radio button against one of the following options:

- **Online: Backup/Suspend IO Mode** with a timeout value — Use this option typically for cloning production systems to prevent system outages. A **Timeout** value in seconds is provided to ensure that consistency is done in a timely manner.

- **Offline: Stop and Restart System** — When you select this option the SAP LaMa will stop the system, make a clone of the system and then restart the system.
- **Offline: Database already stopped** — Use this option when the database is already stopped.
- **Database was stopped during system snapshot** — Use this option when the database has already been snapshotted prior to this process starting.
- **Scheduled Execution of Cloning Step** — Use this option to schedule the cloning operation at a specific date/time of your choice. Need to input the date and time when you want to schedule the cloning operation. This option is useful, for example if you want to ensure that the current ongoing system activity is not impacted.

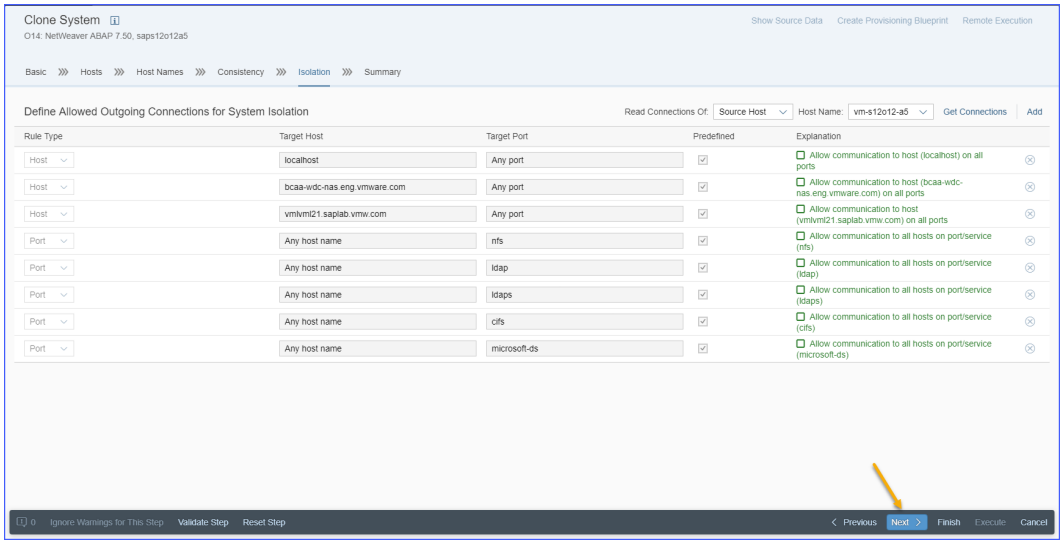
Click on the **Next** button.

Figure 5-32. Consistency



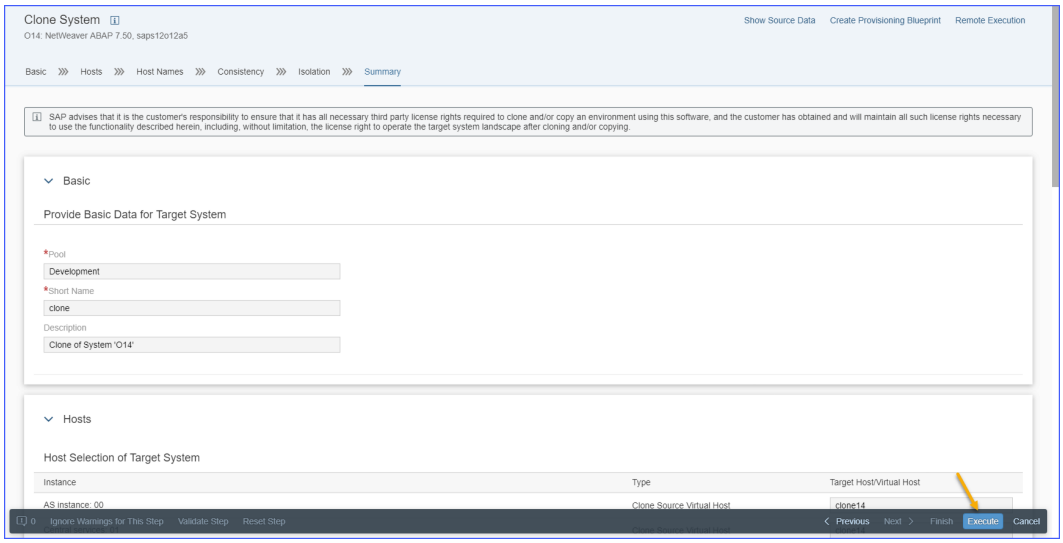
13 Choose to isolate the new target system. By doing so the new target system will not be able to even accidentally communicate as the source system. Click on the **Next** button.

Figure 5-33. Isolation



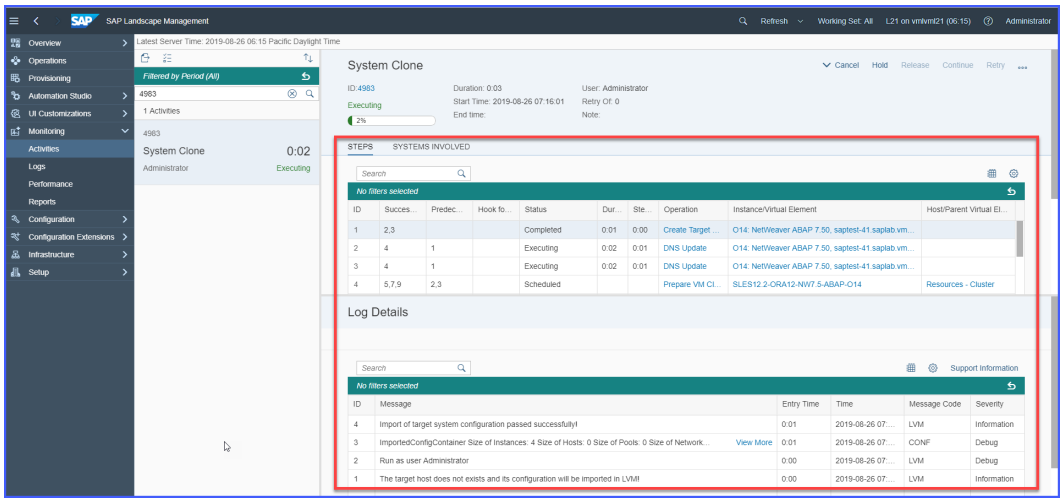

14 Review all settings you have made so far. When you are done reviewing the settings, click on the **Execute** button.

Figure 5-34. Summary



15 You will be redirected to the **Activity** view under **Monitoring** view where you can monitor the system cloning progress.

Figure 5-35. Monitoring




Each activity in the cloning process has a corresponding line item and a respective log entry. Click on the particular operation line item to read its corresponding log entry for more details.

### Results

At the end of these tasks you should be able to successfully create a clone of an existing SAP system.

## Copy System

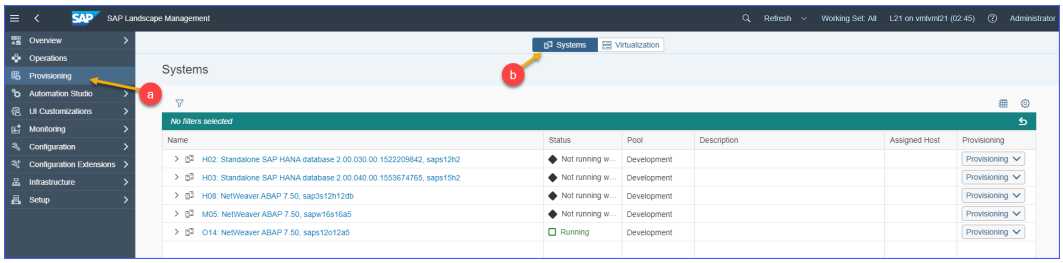
When you copy a system, you create a copy of the source system as a new target system. The most common use of copy function is to take a source production system and create a copy of that system for quality assurance or project work. Other use cases may also apply.

To copy a system follow the instruction below.

### Procedure

1 Login to LaMa web user interface and navigate to the **Provisioning** view and choose the **Systems** view.

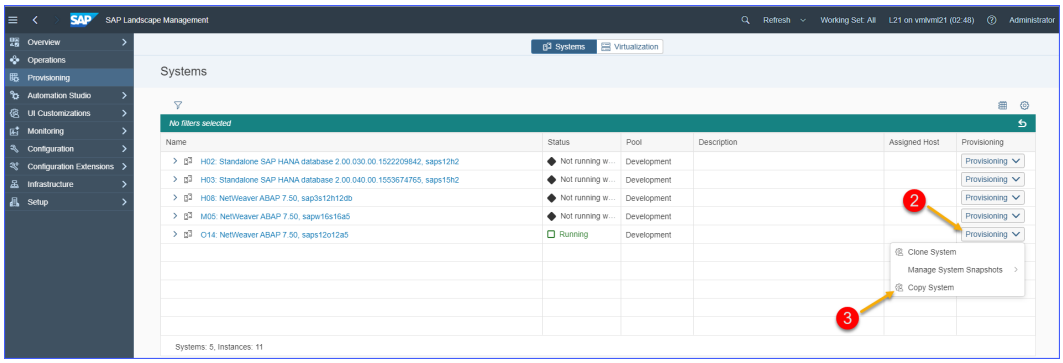
Figure 5-36. Navigation to Provisioning



2 Click on the **Provisioning** button for the selected SAP system virtual machine.

3 Select **Copy System** from the dropdown list.

Figure 5-37. Copy operation



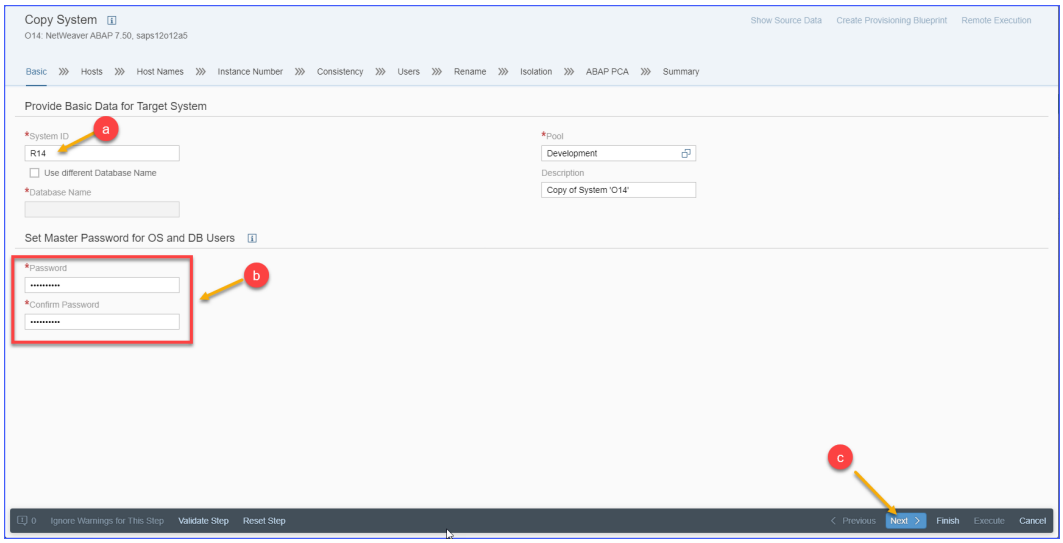

4 In the pop-up window do the following:

a Provide the new **System ID** in the corresponding field.

b Provide a password for the new system that you are going to create as a result of Copy operation. Re-enter the password to confirm the same.

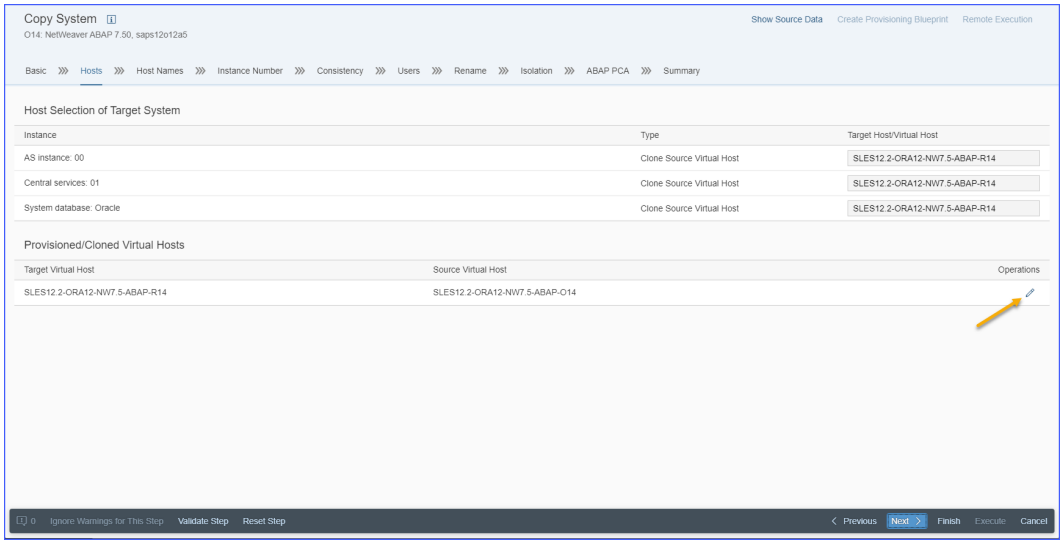
c Click on the **Next** button.

Figure 5-38. Basic Data



5 Click on the pencil icon to enter required parameters.

Figure 5-39. Host Selection

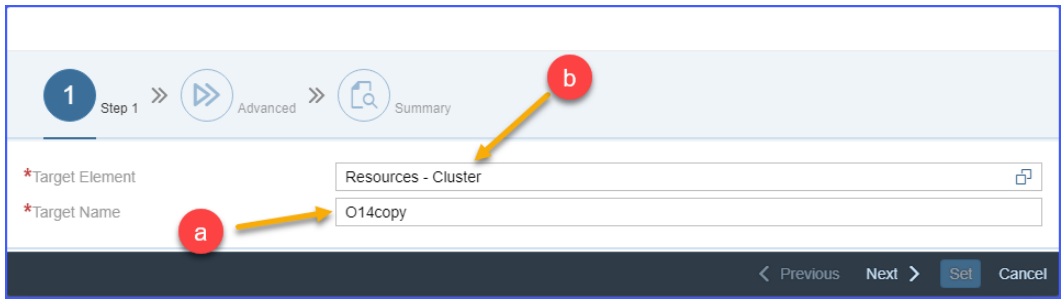



6 In the pop-up window do the following:

a Provide the **Target Name** for the new SAP system virtual machine.

b Click on the **Target Element** field.

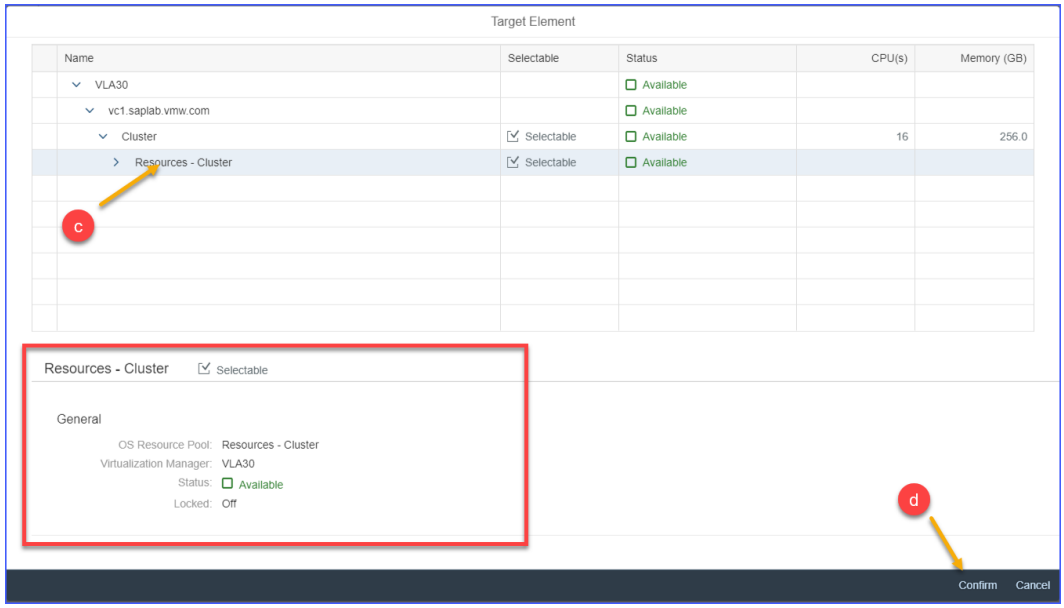
Figure 5-40. Target Selection




c In the **Target Element** window select the target resource pool or ESXi Host on which to place the new copied system. The dialog presents useful information like the current utilization levels for either the resource pool or host. This will help you to take informed decision on where to place the new copied system.

d Click on the **Confirm** button to close the **Target Element** window.

Figure 5-41. Resource Pool Information

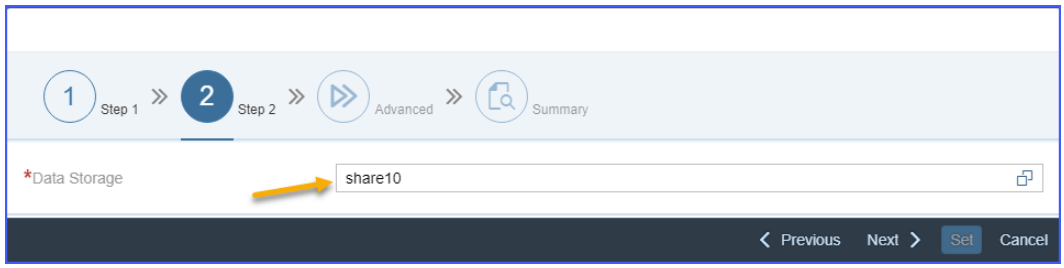



e Click on the **Next** button.

7 Specify a Data Storage:

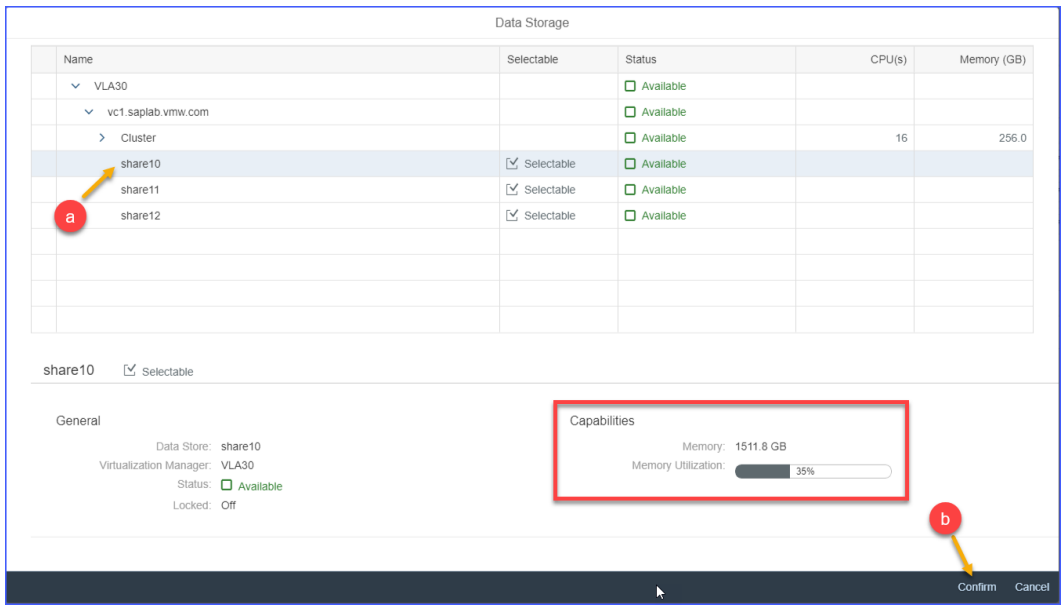
a Click on the **Data Storage** field.

Figure 5-42. Data Storage




b In the **Data Storage** window select a Data Storage to store the new copied system. The dialog provides useful information like the size and current utilization levels for various available datastores. This allows you to take an informed decision of choosing the right Data Storage. Click on the **Confirm** button.

Figure 5-43. Data Storage Information




**Note** Linked copies can only use the same Data Storage as the source system.

c Click on the **Next** button.

8 For the next step do the following:

a Select **Customization specification for guest OS**.

- Guest Customization Specifications are created in the VMware vCenter Server and are made available via the VMware Adapter for SAP Landscape Management. You will need a Guest Customization Specification in order to copy a system.
- Work with your VMware Administrator to create a Guest Customization Specification if none is present in the SAP LaMa.

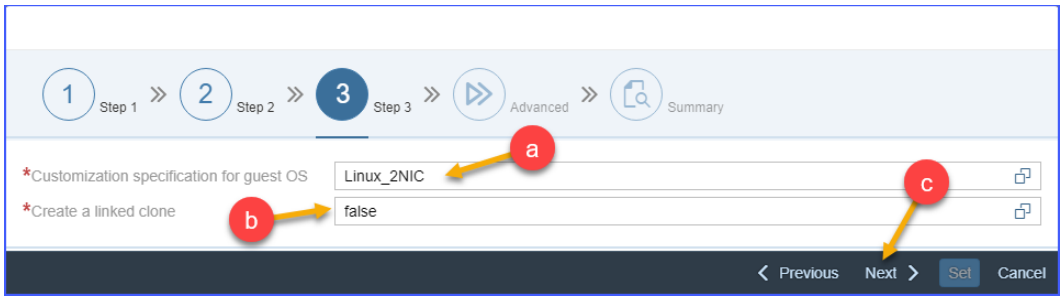
**Note** DHCP customization specifications may cause an inconsistent /etc/hosts file contents in the target system. PROMPT customization specifications is a more reliable option.

b Choose whether you want to create either a linked copy or a full copy.

- A linked copy creates a target system that has a file link to the original source system. This reduces the utilized storage for the target system. Linked copy is most commonly used in development or sandbox systems. Linked copy operation completes substantially faster than full copy
- A full copy creates a target system that has exactly the same disk structure and size as the source system. There is no link between the source and target systems here. For example, you can use Full copies to create production systems and/or systems that can be exported to be used in other datacenters.

c Click on the **Next** button.

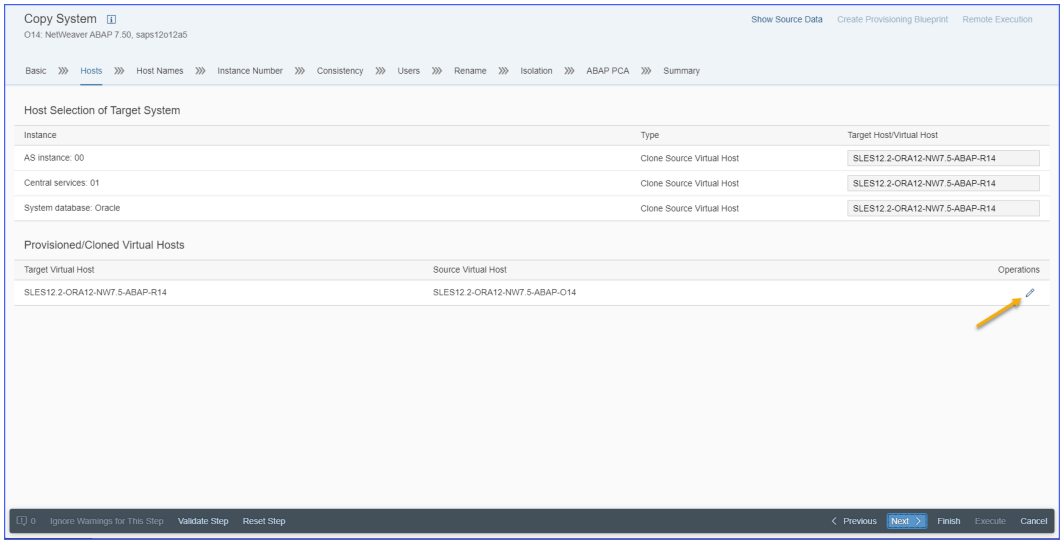
Figure 5-44. Customization Specification




9 Review the various settings that you have chosen so far. Use the **Previous** button to go back and make appropriate changes, if required. When you are satisfied with the settings and are ready to proceed further, click on the **Set** button.

10 Click on the **Next** button.

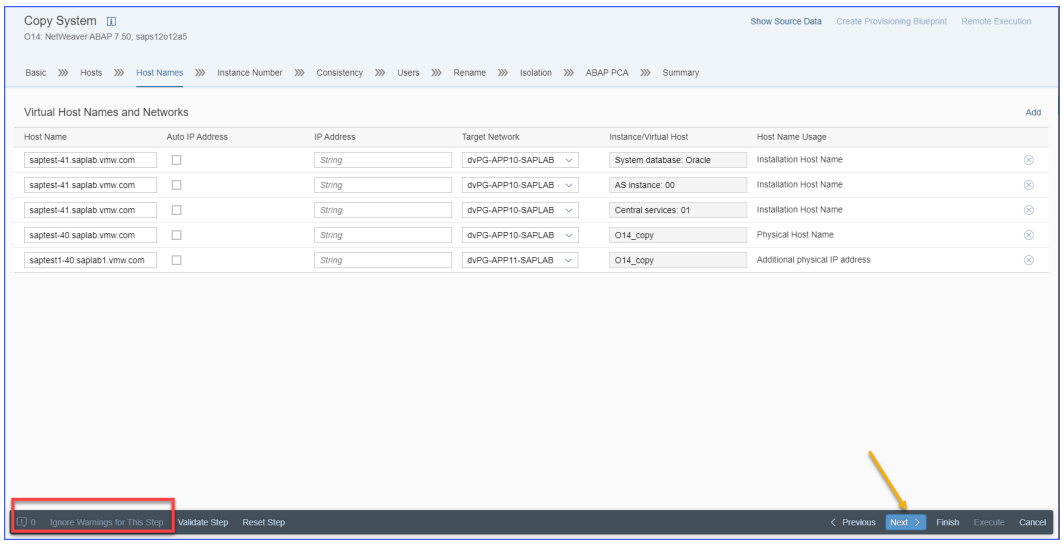
Figure 5-45. Host Selection




11 Choose a different network for each component of the target SAP system and clicking on the **Next** button.

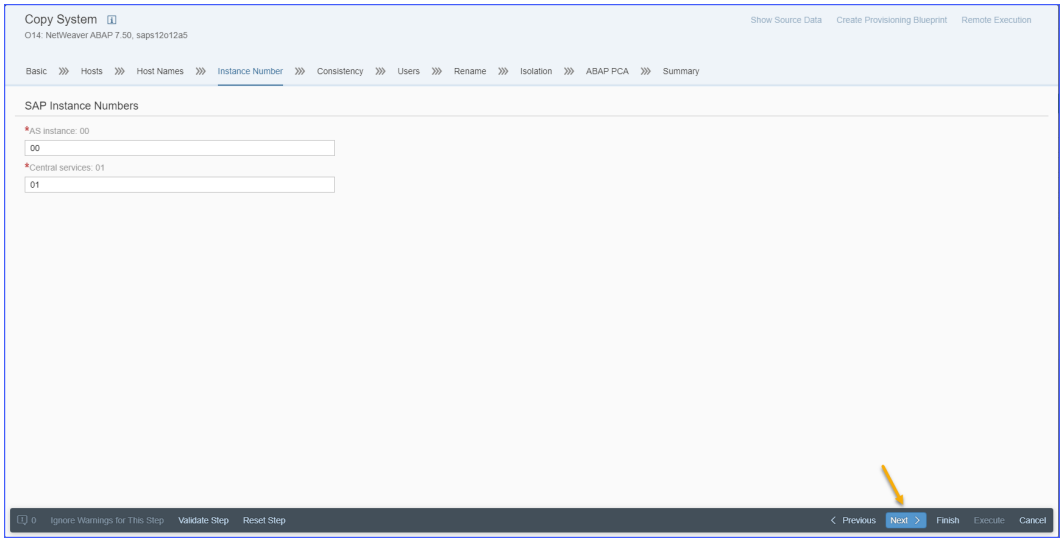
**Note** If the host is not configured as adaptive instance you will see warnings that you need to ignore by pressing **Ignore Warnings for This Step** button, and clicking on the **Next** button again.

Figure 5-46. Host Names and Networks



12 Specify the instance number for the SAP instances and click on the **Next** button.

Figure 5-47. Instance Number



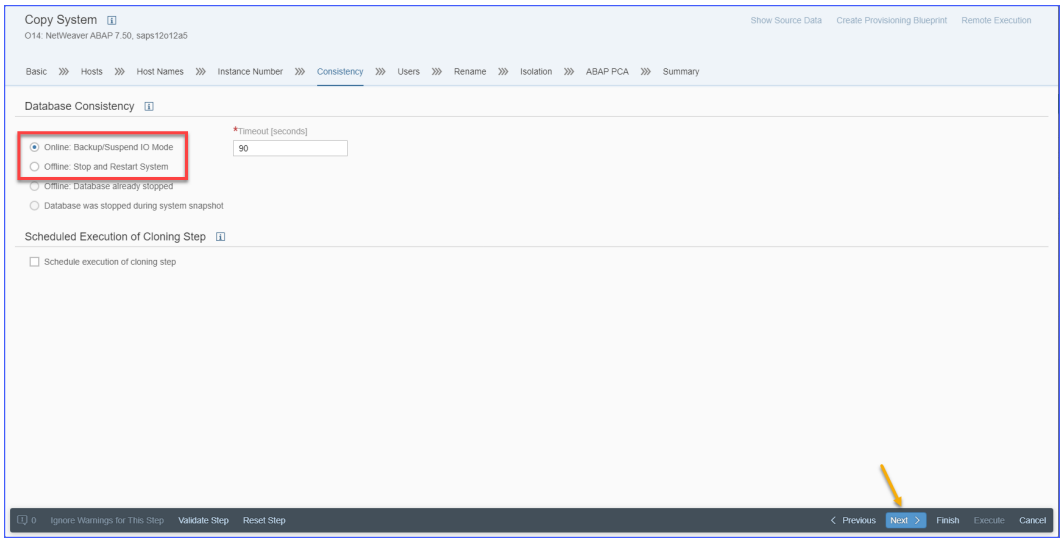

13 Select the appropriate database consistency method, depending on what state the database is in. Click on the radio button against one of the following options:

- **Online: Backup/Suspend IO Mode** with a timeout value — Use this option typically for copying production systems to prevent system outages. A timeout value is provided to ensure database consistency is done in a timely manner
- **Offline: Stop and Restart System** — When you select this option, the SAP LaMa will stop the system, take the copy and then restart the system after the copy completes.
- **Offline: Database already stopped** — Use this option when the database is already stopped.
- **Database was stopped during system snapshot** — Use this option when the database has already been snapshotted prior to initiating the copy process.
- **Scheduled Execution of Cloning Step** — Use this option to schedule the cloning operation at a specific date/time of your choice. Need to input the date and time when you want to schedule the cloning operation. This option is useful, for example if you want to ensure that the current ongoing system activity is not impacted.

Click on the **Next** button.

**Note** Offline linked copy of SAP HANA on SLES must be performed with closed hbdstudio on source machine.

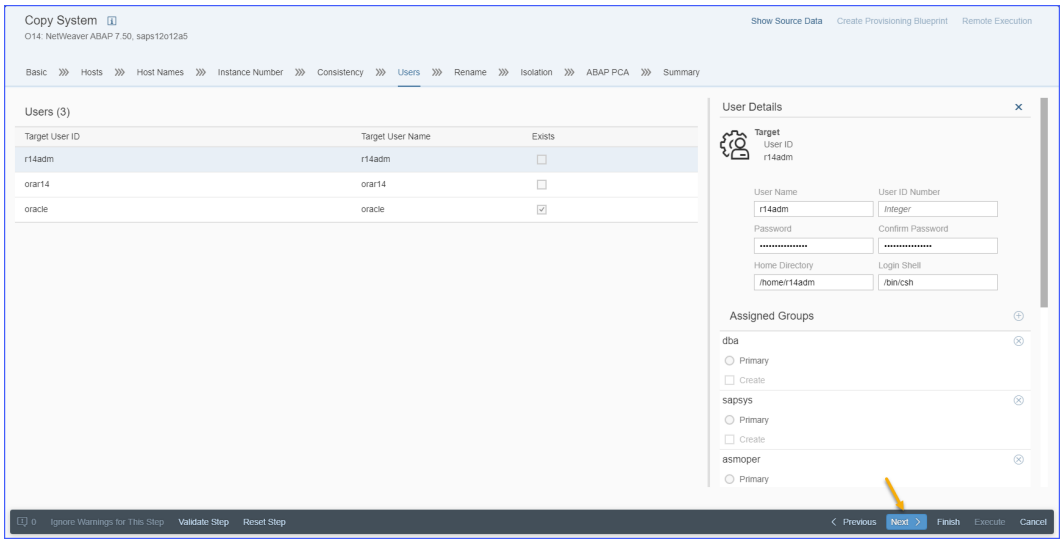
Figure 5-48. Consistency




14 Review the new users that will be created on the target system and click on the **Next** button.

**Note** For the Copy process the SAP LaMa copies the users from the source system over to the target system changing them to match with the new System ID.

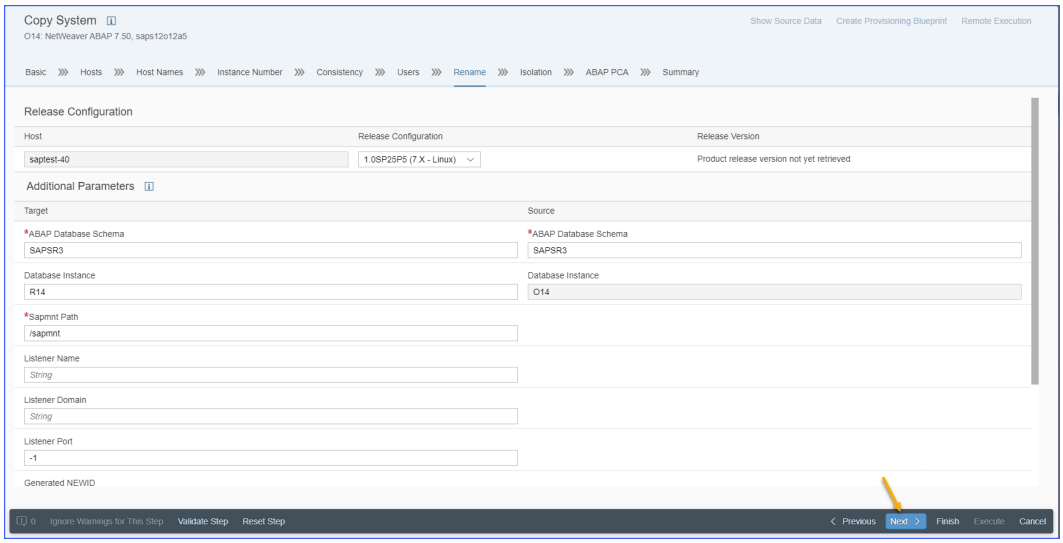
Figure 5-49. Users



15 Review the target system naming convention and click on the **Next** button.

**Note** Observe that the SAP LaMa takes the source system ID and swaps it out for the new target system ID.

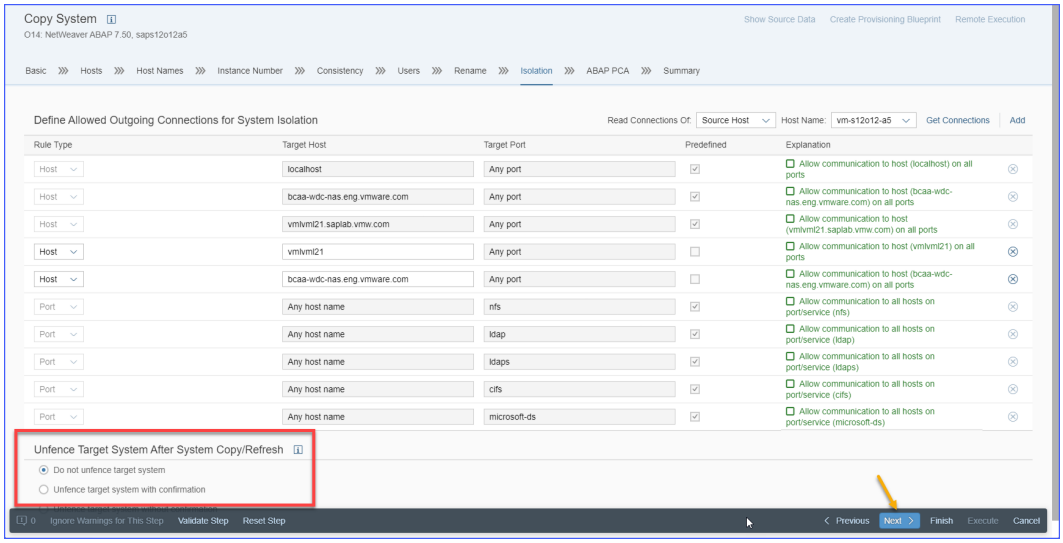
Figure 5-50. Rename




16 You can choose to isolate the new target system from the source system. You do this by selecting the appropriate radio button under section **Unfence Target System After System Copy/Refresh**. This will prevent it from accidentally communicating as the source system.

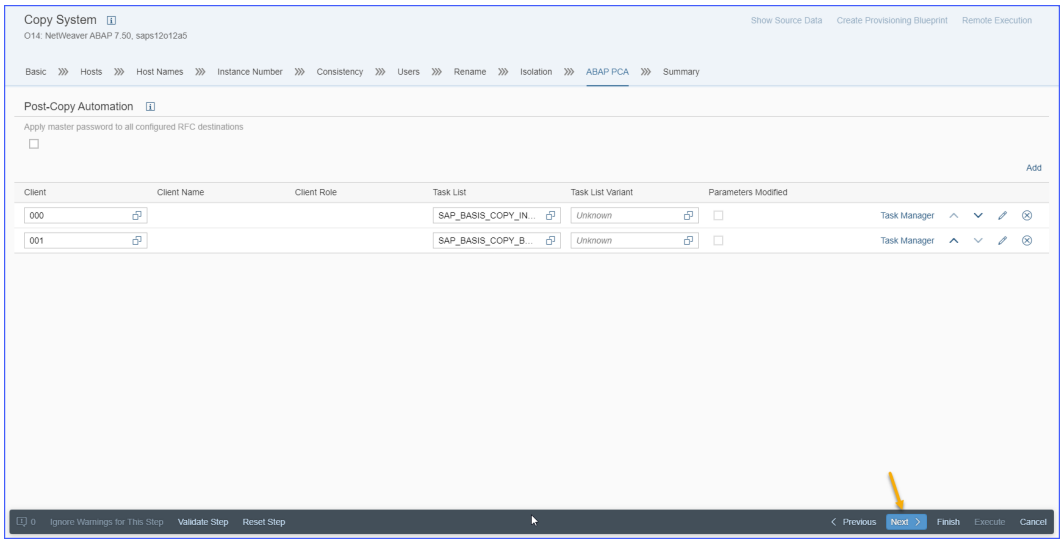
Click on the **Next** button.

Figure 5-51. Isolation



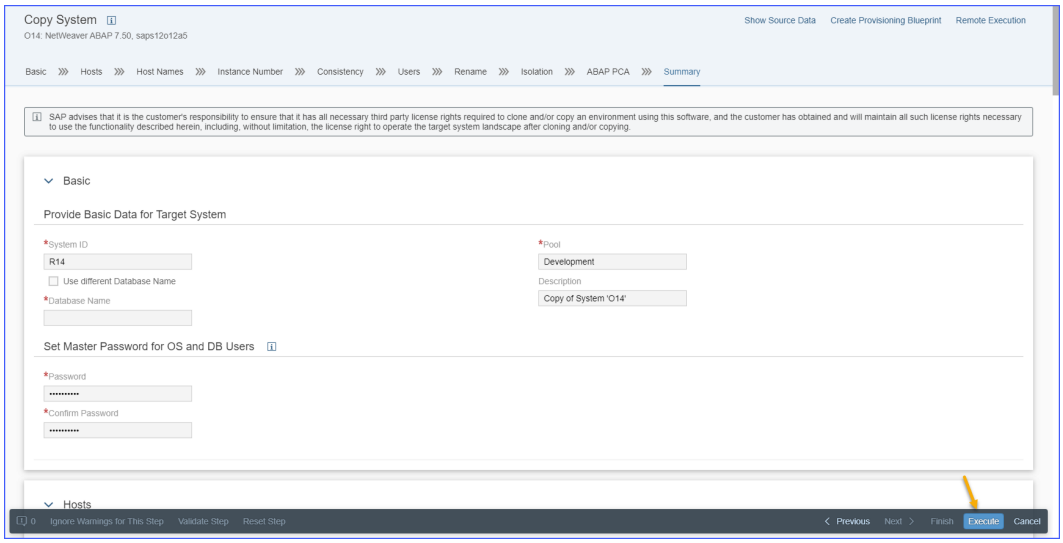
17 Choose to either enact ABAP PCA or by-pass it. If you indeed plan to use PCA, choose the appropriate parameters to apply. If no PCA will be used, then you must uncheck that option and further click the **Ignore Warnings for This Step** to proceed. Click on the **Next** button.

Figure 5-52. ABAP PCA



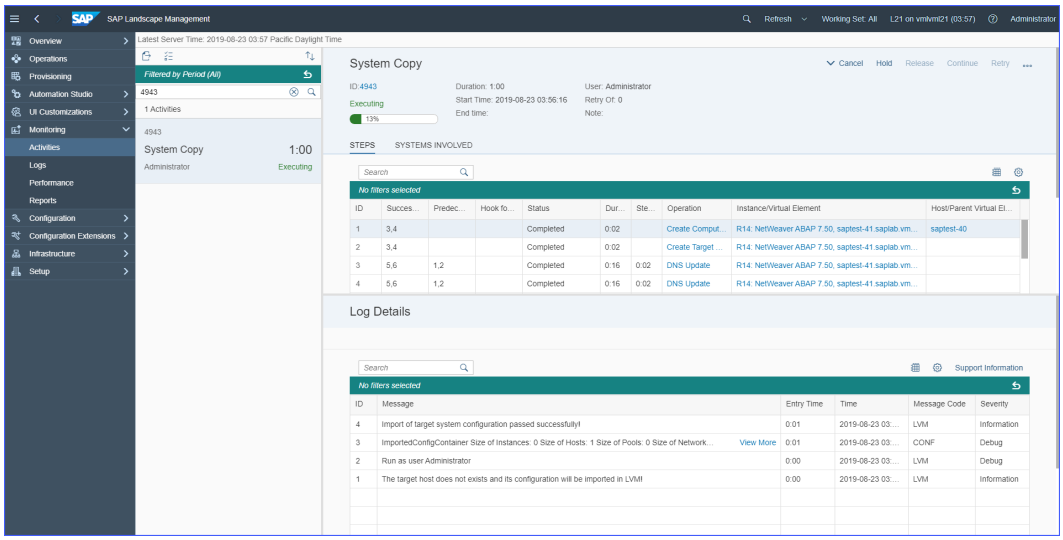

18 Review all settings you have made so far. When you are done reviewing the settings, click on the **Execute** button.

Figure 5-53. Summary



19 You will be redirected to the **Activity** view under **Monitoring** view where you can monitor the system copy progress.

Figure 5-54. Monitoring




Each activity in the copy process has a corresponding line item and a respective log entry. Click on the particular operation line item to read its corresponding log entry for more details.

### Results

Successful completion of these tasks enables you to copy a source system into a new target system.

**Note** Consider a system with two network interfaces, wherein one network interface is an actual vNIC and the second is an IP alias on the said vNIC. If you successfully clone or copy this system via LaMa, after you reboot or restart the network you will see that the target system has only one network interface. The alias disappears. For systems that are not adaptively installed or those that cannot be relocated, it is not possible to change the host name. SAP Landscape Management (LaMa) activates Internet Protocol (IP) addresses only in a transient way. When the host is rebooted, the IP addresses are no longer active.

# Troubleshooting

6

This chapter includes the following topics:


- Log Files and Traces
- Log Configurations in SAP LaMa
- Existing Limitations
- Possible Misconfigurations / Issues
- Protocol version mismatch
- Consistent Network Device Naming (CNDN)


## Log Files and Traces

The most important log and trace files for the operation of the VMware Adapter for SAP Landscape Management are located on the VLA appliance. The following table shows these log and trace files:

Table 6-1. Log Locations

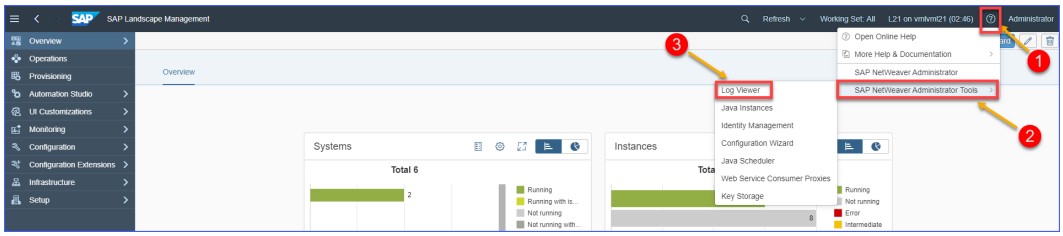
| Log File Name | Log File Location |
|---|---|
| VLA server access log file | /var/log/vmware/vla-server/access.vla-server.log |
| VLA server Java log files | /var/log/vmware/vla-server/catalina.vla-server.log<br>/var/log/vmware/vla-server/localhost.vla-server.log |
| VLA server manager log file | /var/log/vmware/vla-server/manager.vla-server.log |
| VLA server application console log files | /var/log/vmware/vla-server/catalina.vla-server.out<br>/var/log/vmware/vla-server/vla-server.log |
| SA server access log file | /var/log/vmware/sa-server/access.sa-server.log |
| SA server Java log files | /var/log/vmware/sa-server/catalina.sa-server.log<br>/var/log/vmware/sa-server/localhost.sa-server.log |
| SA server manager log file | /var/log/vmware/sa-server/manager.sa-server.log |
| SA server application console log files | /var/log/vmware/sa-server/catalina.sa-server.out<br>/var/log/vmware/sa-server/sa-server.log |

# Log Configurations in SAP LaMa

Log configuration menu is available in SAP NetWeaver Administrator — **Troubleshooting -> Logs and Traces -> Log Configuration**

You can also navigate to — **Related Links & Help -> SAP NetWeaver Administrator Tools ->Log Viewer**

Figure 6-1. LaMa - Log Viewer




In the log configuration menu there are two configurations — **Logging catagories** and **Tracing location**

- Log level is configured at Logging categories
- Trace level is configured at Tracing location

In Logging categories there is a configuration for the whole adapter —

- Located in Applications/LVM/InfrastructPlugins

In Tracing location, trace level is configured for each package separately —

- For VMware Adapter for SAP Landscape Management it is com.vmware.vlvma.*

VMware Adapter for SAP Landscape Management log and trace messages begin with prefix VLVMA, hence they can be easily filtered in LaMa Log Viewer.

# Existing Limitations

**Provisioning** —

- A linked clone of a SAP system can be performed to the same data storage only
- A SAP system can be cloned to a DRS cluster only
- Customization Specifications having the same Guest Operating System type and number of network adapters as the Source Virtual Host are available for SAP system cloning
- For provisioning from virtual host template, a cloned system hostname must be resolvable to an IP address before executing the operation

- Network interfaces bonding is not supported by vCenter Server Customization Specifications. Currently, if the source system has a bond interface (2+ interfaces bonded to 1), it will also be present on the destination system after the vCenter Server Clone operation. In order to apply a vCenter Server Customization Specification a user should choose the specification which contains the same number of network adapters and not the same number of bond interfaces. That is the reason the destination system contains the same bond interface with the same IP address as the source system. vCenter Server applies the provided Customization Specification on the secondary interfaces which are not being used outside the bond as far as they are connected to it. So the resulting configuration on the destination system is not changed as intended.

**Migrate** —

- Virtual host can be migrated between DRS clusters only
- Virtual host can be migrated inside one vCenter Server only

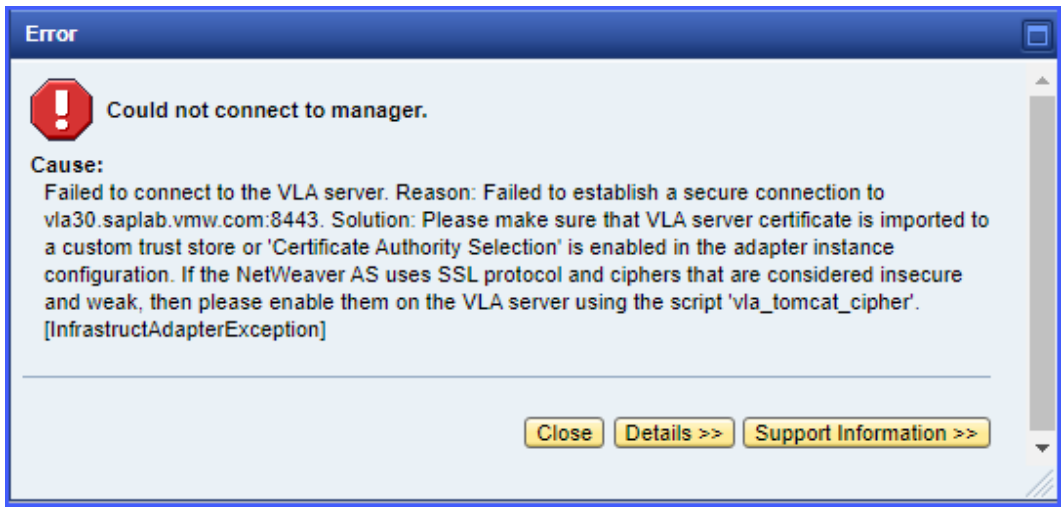
## Possible Misconfigurations / Issues

Following are some of the Errors that you may encounter along with the possible reasons —

1 Error — peer not authenticated [SSLPeerUnverifiedException], this could occur during a connection test or infrastructure retrieval

- Possible reasons are invalid vLA server certificate, disabled Trusted Server option or a certificate that was changed after the adapter configuration.

Figure 6-2. Error — Failed to connect to manager



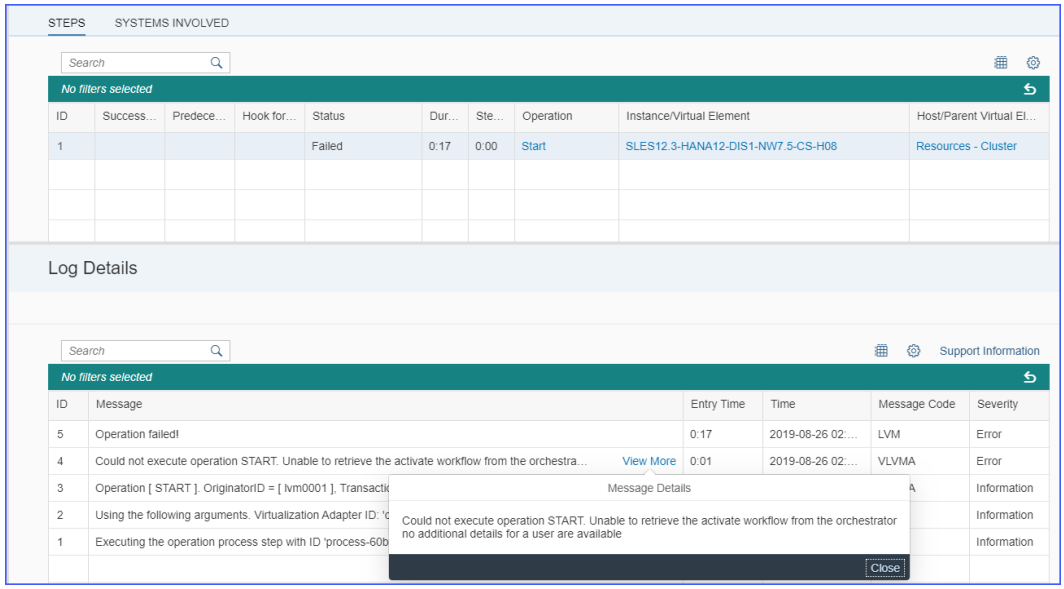

2 Error — Could not execute operation ***

- Possible reasons are —
  - VMware vRealize Orchestrator is unavailable
    - Check the state of the VMware vRealize Orchestrator server.

- An overloaded VMware vRealize Orchestrator
  - Check the CPU and Memory utilization for the VMware vRealize Orchestrator server.

3 Error — Could not execute operation ***. Workflow not found

- **Figure 6-3. Error —Workflow not found**

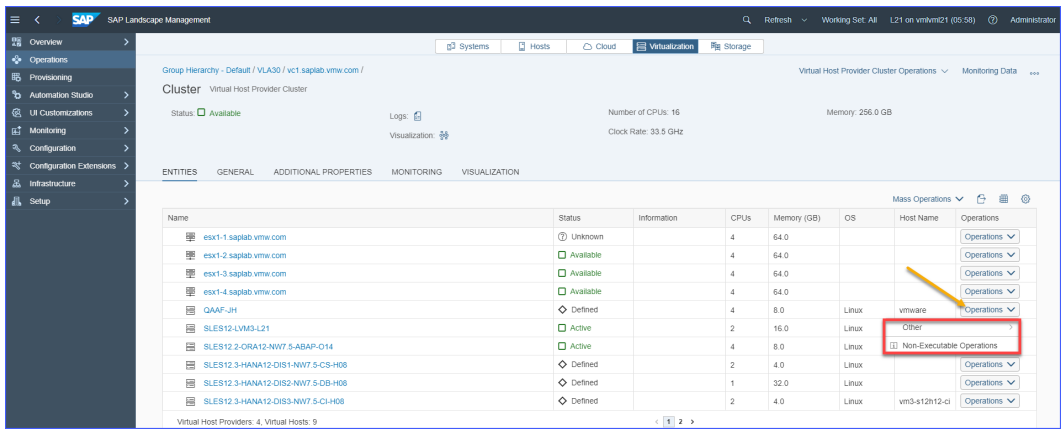



Possible reasons for the error — Workflow unavailable on VMware vRealize Orchestrator

- Check the workflow status in the vLA dashboard - https://<vla_hostname>:8443/vla/dashboard
- Check the workflow availability on the VMware vRealize Orchestrator
- Reinstall the VMware vRealize Orchestrator package or corred the vLA config file

4 All actions are unavailable for Virtual Host in Operations / Virtualization. The **Details** property field shows up the virtual host status as **disconnected** under the Virtual Host tab.

- **Figure 6-4. Virtual Host - Disconnected**



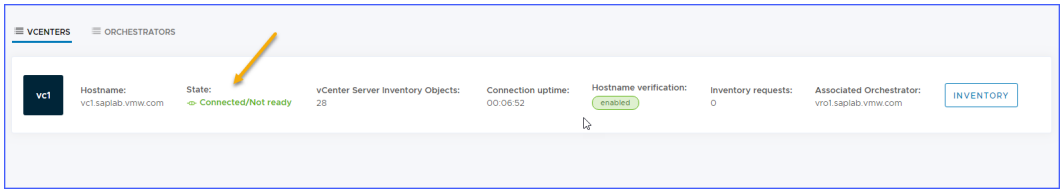
Possible reason — ESXi host unavailable

- Check the ESXi host status on the VMware vCenter Server. Make it available to the VMware vCenter Server.

5 VMware vCenter Server is not displaying in the LaMa Adapter

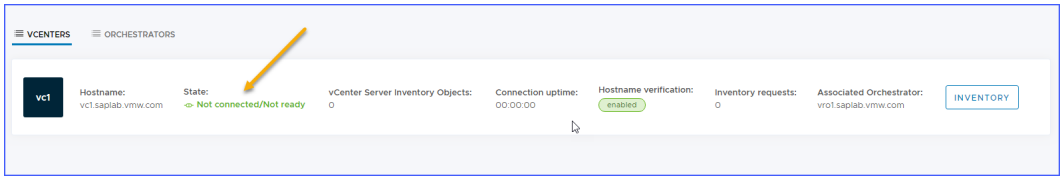
- Possible reason for the error — VMware vCenter Server unavailable to the vLA
  - Check the status of the VMware vCenter Server in the vLA dashboard. Make the VMware vCenter Server available to the vLA.
    - **Connected / Not ready** — means that the vLA is unable to fetch the inventory data from the VMware vCenter Server or the inventory data retrieval is in progress.

Figure 6-5. Errors —Not ready/Configuration missing



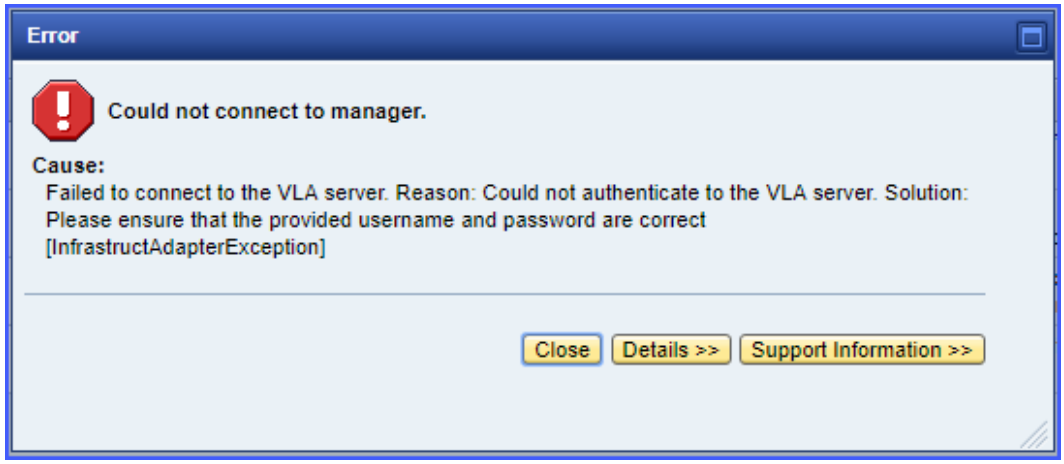

    - **Not Connected / Not ready** — means that the vLA is unable to connect to the VMware vCenter Server.

Figure 6-6. Errors —Not connected/Not ready




6 Error — HTTP Status Code 401

- Figure 6-7. Error - Could not authenticate

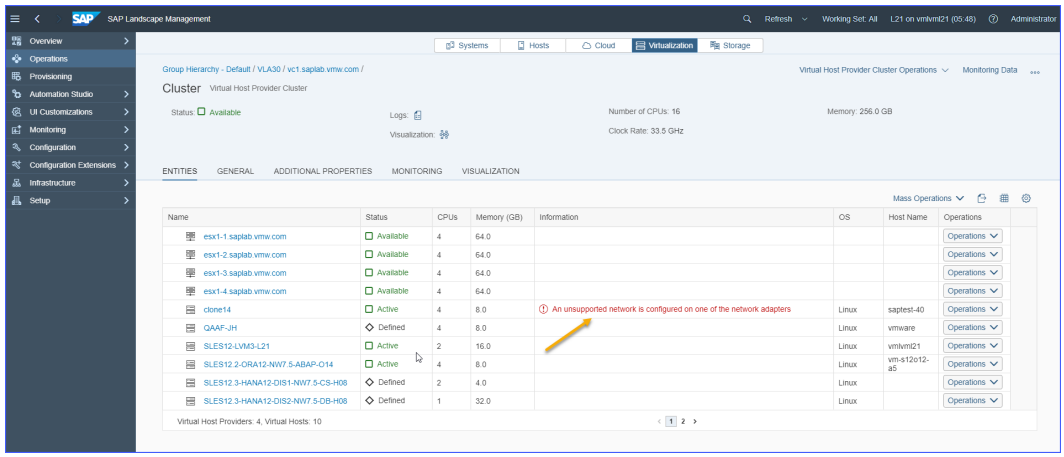


Possible reasons — The adapter was configured with the wrong credentials (username or password) or hostname. Password on the vLA Server was changed after adapter configuration.

- Correct the password to the application server, or reset it to a known password on the vLA with the `vla_user` command.

7 Alert —**Unsupported network is configured on one of the network adapters**.

- Figure 6-8. Unsupported Network Alert

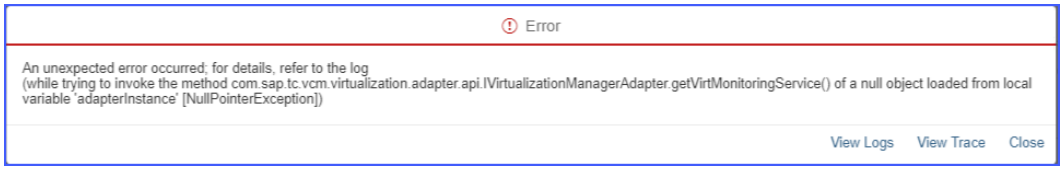


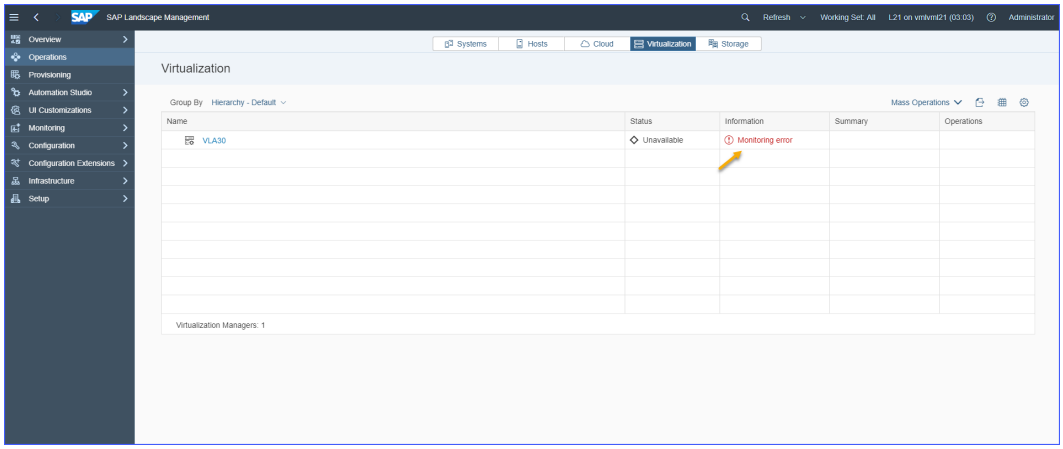

Possible reasons — vSphere Distributed Switch Uplink is assigned as a network to VM or assigned network is related to unsupported third party switch (neither vSS nor vDS switch)

- Re-assign networks for network adapters on VM. Assign only networks related to vSphere Standard Switch or vSphere Distributed Switch Portgroup

8 **Monitoring Error** in LaMa Virtualization pane —

Figure 6-9. Monitoring Error






Possible reason — You are using an older version of the LaMa adapter (1.3.x or older). VLA and LaMa communication protocol version mismatch occurs.

- Update to the latest version of the LaMa adapter (1.4.0 or higher).

## Protocol version mismatch

Error message: Could not connect to manager. Cause: Protocol version mismatch.

**Figure 6-10. Protocol version mismatch**


This error occurs when the LaMa adapter is incompatible with the VLA server. This may happen either after deploying a new VLA appliance and installing the adapter from the appliance, whereas IP address of an old appliance is mistakenly specified instead of the new one. Another reason could be that after deploying a new VLA appliance the installation of new adapter from the appliance had been forgotten. To fix this issue you need to upgrade /deploy the VLA server correspondingly.

## Consistent Network Device Naming (CNDN)

Modern server platforms support an increasing number of network interface ports on the motherboard (Lan-on-Motherboard or LOM) in addition to numerous add-in (single and multiport) adapters. Traditionally, network interfaces are enumerated as eth0, eth1, eth2, etc, but these names do not necessarily correspond to the actual labels as seen on the chassis. This new naming convention assigns names to network interfaces based on their physical location, whether embedded or in PCI slots. By converting to this naming convention, system administrators will no longer have to guess at the physical location of a network port, or modify each system to rename them into some consistent order.

In this classic naming scheme for network interfaces, the kernel simply assigns the names beginning with "eth0, "eth1", ... to all the interfaces as they are probed by the device drivers during the system boot process. As the driver probing is generally not predictable, in a multi network interfaces setup, a given network interface that for example, got a name assignment "eth0" in the first boot may end up with a different name on the next boot. This is undesirable and can have serious security implications, for example in firewall rules which are coded for certain naming schemes and which are hence very sensitive to unpredictable changing names. Also, this naming scheme gives no clue whatsoever of the interface's physical location on the system (for example, whether it is on the system's motherboard or if it is on an add-in card or if it is on an add-in card with multiple ports and which port on the card it is located). Hence you need a consistent device naming scheme that can provide the following benefits:

- Stable network interface names across reboots
- Stable network interface names when you add or remove hardware
- Stable network interface names when you update/change the kernel or device drivers
- Stable network interface names when you replace a broken/defective ethernet card for example, with a new one
- The network interface names automatically get determined without user configuration and they just work
- The network interface names are predictable

During SAP workload provisioning operations, like cloning a VM, it is essential to keep the same network interface names on the target clone system as is available on the source system. In order to do this, you need to enable Consistent Network Device Naming in the source operating system. The next 3 sub-sections describe the specific steps to enable Consistent Network Device Naming on SLES, RHEL and Windows operating systems respectively.

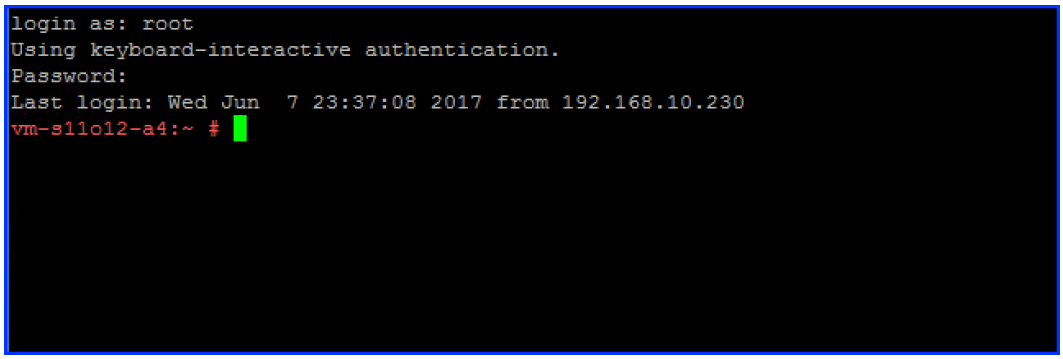
## SLES 11 and SLES 12 - Consistent Network Device Naming

On SLES based systems you can use the `biosdevname` program that inturn uses information from the system's BIOS to enable Consistent Network Device Naming on the target system as is on the source system. Execute the following steps to enable Consistent Network Device Naming on the source operating system.

Procedure

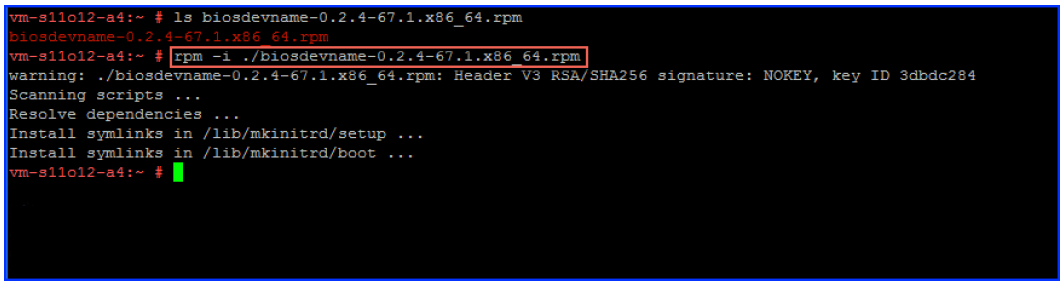
1 SSH to the source system as **root**.

Figure 6-11. SSH as **root**



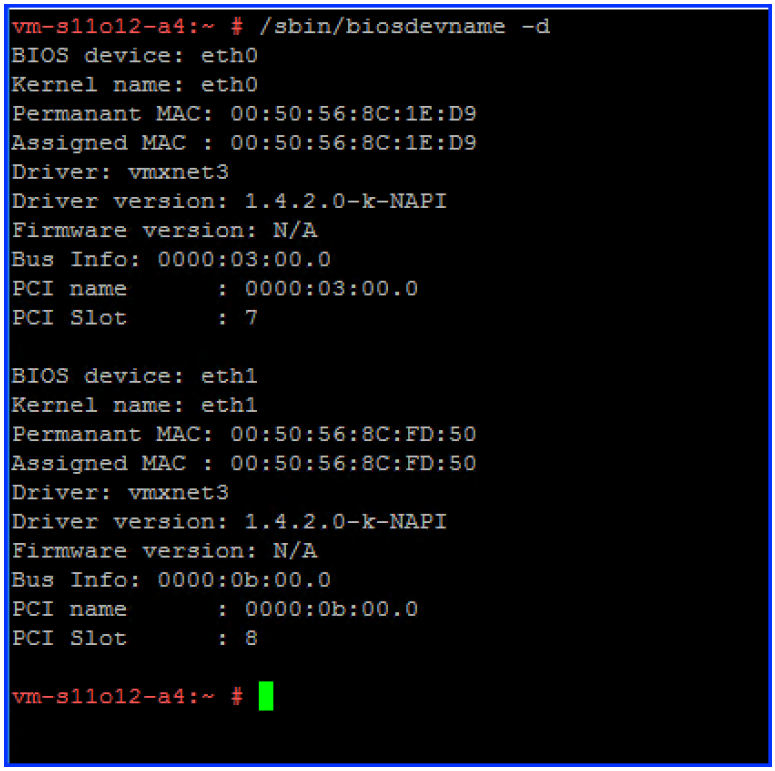

2 Install the `biosdevname` utility. You can use any available package manager. The following figure depicts installing `biosdevname` using `rpm`:

Figure 6-12. Install `biosdevname`



3 Verify your `biosdevname` installation done in the previous step and also list out information about the current system network adapters.

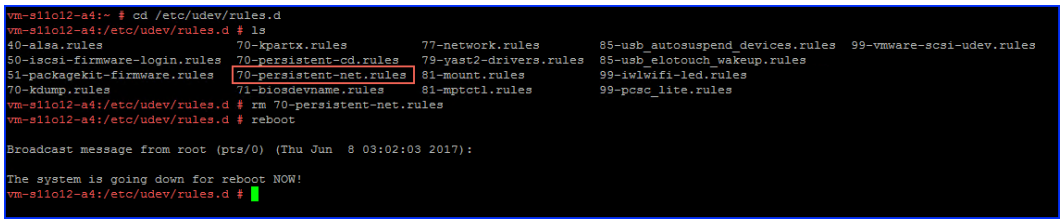
Figure 6-13. List all available network adapter information




4 Remove the `70-persistent-net-rules` file from the `/etc/udev/rules.d` directory, if it already in there.

5 Reboot the operating system as depicted in the following figure:

Figure 6-14. Reboot the OS




**Results**

After rebooting the operating system all the current network interfaces on the system will be renamed according to the Consistent Network Device Naming scheme.

## RHEL 7 and RHEL 6 - Consistent Network Device Naming

RHEL based systems receive new network device interfaces with new IP settings applied along with incremented indexes in the interface names. For example, if the source system has two network interfaces eth0 and eth1, then the target system will obtain the network interface names as eth2 and eth3 respectively.

**RHEL 7** — In RHEL 7, Consistent Network Device Naming is enabled by default. Thus no additional actions are required from a user/administrator perspective.

**RHEL 6** — The `biosdevname` utility does not work in operating system hosted on virtual machine. Hence you are required to execute the following workaround:

**Note** This option requires that the system is not using NetworkManager (i.e `NM_CONTROLLED=no` in `ifcfg-*` files) (Source: https://access.redhat.com/solutions/112643)

Procedure

1 SSH to the source system as **root**.

2 Identify the PCI address of your Ethernet interfaces with `lspci` command as depicted in the following figure:

Figure 6-15. Login as root and execute `lspci`

```
login as: root
root@192.168.10.231's password:
Last login: Thu Jun  8 23:33:31 2017 from 192.168.10.230
[root@vm-r65o11-a4 ~]# lspci -D | grep Ethernet
0000:0b:00.0 Ethernet controller: VMware VMXNET3 Ethernet Controller (rev 01)
0000:13:00.0 Ethernet controller: VMware VMXNET3 Ethernet Controller (rev 01)
[root@vm-r65o11-a4 ~]#
```

3 Create the `/etc/udev/rules.d/60-persistent-net.rules` file and fill it with the following type of network device NAME mapping, highlighted for reference as depicted in the following figure:

Figure 6-16. Create `60-persistent-net.rules` file

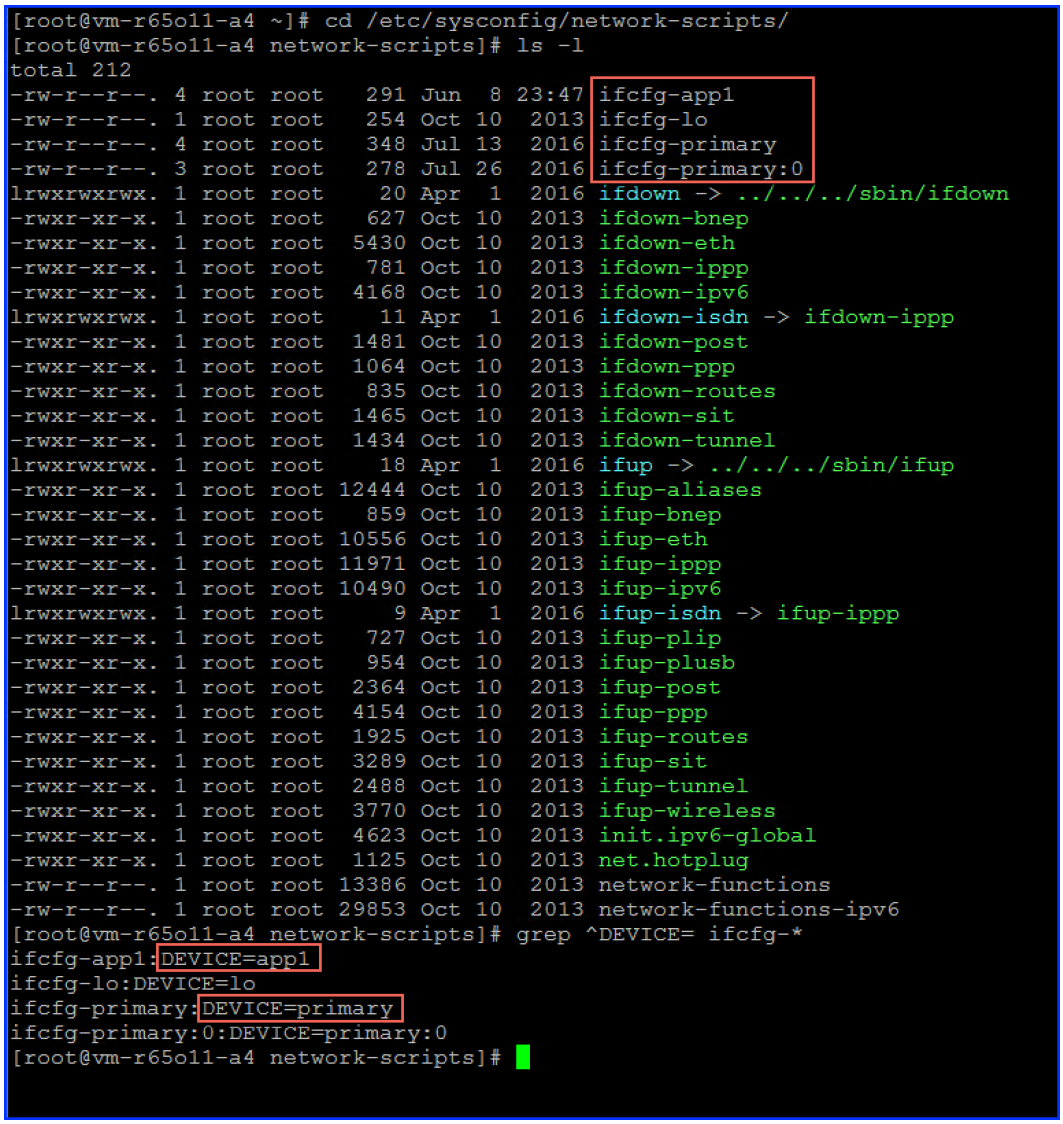
```
[root@vm-r65o11-a4 ~]# cd /etc/udev/rules.d
[root@vm-r65o11-a4 rules.d]# ls -l
total 52
-rw-r--r--. 1 root root 1652 Aug 25  2010 60-fprint-autosuspend.rules
-rw-r--r--. 1 root root  153 Feb  1  2013 60-ipath.rules
-rw-r--r--. 1 root root 1060 Jun 29  2010 60-pcmcia.rules
-rw-r--r--. 1 root root  318 Apr  6  2016 60-persistent-net.rules
-rw-r--r--. 1 root root  316 Aug  6  2013 60-raw.rules
-rw-r--r--. 1 root root  789 Apr  1  2016 70-persistent-cd.rules
-rw-r--r--. 1 root root  256 Jun 28  2016 70-persistent-net.rules
-rw-r--r--. 1 root root  320 Sep 12  2012 90-alsa.rules
-rw-r--r--. 1 root root   83 Apr  1  2011 90-hal.rules
-rw-r--r--. 1 root root 2486 Jun 30  2010 97-bluetooth-serial.rules
-rw-r--r--. 1 root root  308 Oct 21  2013 98-kexec.rules
-rw-r--r--. 1 root root   54 Nov  3  2011 99-fuse.rules
-rw-r--r--. 1 root root  341 Apr  4  2016 99-vmware-scsi-udev.rules
[root@vm-r65o11-a4 rules.d]# cat 60-persistent-net.rules
# 0000:0b:00.0 Ethernet controller: VMware VMXNET3 Ethernet Controller (rev 01) was eth0
ACTION=="add", SUBSYSTEM=="net", KERNELS=="0000:0b:00.0", NAME:="primary"

# 0000:13:00.0 Ethernet controller: VMware VMXNET3 Ethernet Controller (rev 01)
ACTION=="add", SUBSYSTEM=="net", KERNELS=="0000:13:00.0", NAME:="app1"

[root@vm-r65o11-a4 rules.d]#
```

4 Rename and modify (using any editor of your choice), `/etc/sysconfig/network-scripts/ifcfg-*` files to use the new names in the `DEVICE=value` fields. The following figure depicts the DEVICE values after modifying the corresponding `ifcfg-*` files (highlighted for reference).

Figure 6-17.




5 Ensure that you have console access in case there are some network connectivity issues. Reboot the system by executing the `reboot` command.

### Results

After rebooting the operating system all the current network interfaces on the system will be renamed according to the Consistent Network Device Naming scheme.

## Windows - Consistent Network Device Naming

Windows based systems running either Windows 2008 R2 or Windows 7 guest operating system configured with the VMXNET3 virtual network device in vCenter Server have one known issue. When a provisioning operation is done like cloning a VM, the target system gets new device and interface names (this name is the original name as is on the source system but with an incremented index suffix, like `Local Area Connection #2` instead of just `Local Area Connection`). In order to prevent such issues and keep the original device and interface names as is, following the provisioning operation, you need to apply the Microsoft hot fixes for the specific operating system type that you are using.

1 For Windows 2008 R2 or Windows 7 versions prior to Service Pack 1, install the hot fix described in the Microsoft Knowledge Base article 2344941 (https://support.microsoft.com/en-us/help/2344941/-0x0000007b-stop-error-when-you-replace-an-iscsi-or-pci-express-network-adapter-or-a-motherboard-with-an-identical-device-on-a-windows-server-2008-r2-based-or-windows-7-based-computer), before deploying the template.

2 For Windows 2008 R2 or Windows 7 versions post Service Pack 1, install the hot fix described in the Microsoft Knowledge Base article 2550978 (https://support.microsoft.com/en-in/help/2550978/-0x0000007b-stop-error-after-you-replace-an-identical-iscsi-network-adapter-in-windows-server-2008-r2-sp1-or-in-windows-7-sp1) before deploying the template.