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Appliance

Oracle Private Cloud Appliance: IMPLEMENTING ORACLE VM DR USING SITE GUARD

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Table of Contents

Introduction

What does it take to design and implement a complete Oracle VM disaster recovery solution with Oracle Private Cloud Appliance using Site Guard? This white paper provides a very high level look at the process of planning, implementing and validating Oracle VM disaster recovery with Oracle Private Cloud Appliance using Site Guard. It also presents a detailed example of how to configure Site Guard to switchover/failover Oracle VM guests to a Standby DR Site. The solution supports both switchover (planned movement of Oracle VM guests to a standby site) and failover (movement of Oracle VM guests to a standby site when the primary is out of service).

This paper discusses Oracle VM disaster recovery using Site Guard to orchestrate the transition of Oracle VM guests on Oracle Private Cloud Appliance between disaster recovery sites. It assumes a basic architecture where you want to stop and start applications manually. It does not discuss using Site Guard to orchestrate application-level disaster recovery.

Overview

Oracle VM DR using Oracle Site Guard is a disaster recovery solution that orchestrates the transition of Oracle VM guests running on Oracle Private Cloud Appliances between multiple sites.

This white paper is the starting point and your main guide throughout the entire planning, implementation and validation process. It will direct you to many other white papers explaining concepts, best practices and practical examples for complex topics.

Understanding the Solution

The major components of this solution are:

- Oracle Private Cloud Appliance 2.3 and higher
- Oracle Enterprise Manager Cloud Control 13c.
  - Site Guard is included with the base installation of Oracle Enterprise Manager Cloud Control 13c. Usage is available for Oracle VM Disaster Recovery running non-Oracle software only.
  - For Oracle software, usage of Site Guard requires additional licenses for either WebLogic Server Management Pack Enterprise Edition or Database Lifecycle Management Pack for Oracle Database.
  - See Oracle Private Cloud Appliance Licensing Information User Manual, Release 2.3 for more details

Figure 1 shows a basic disaster recovery environment using these components. The top box in the diagram represents the Oracle VM DR infrastructure that hosts Oracle VM guests and applications on Oracle Private Cloud Appliance. The bottom box represents the Oracle Enterprise Manager infrastructure to orchestrate switchovers and failovers of Oracle VM guests hosted within the Oracle VM DR infrastructure. These two infrastructures work in concert to achieve a complete DR solution.

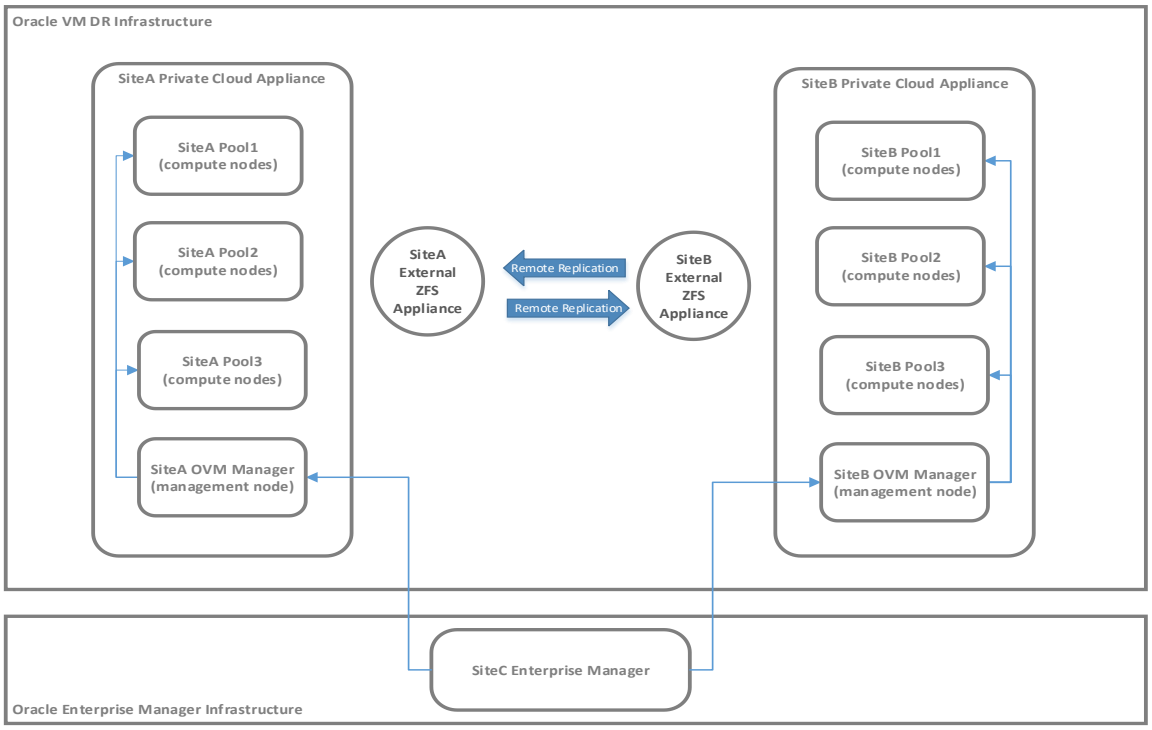


FIGURE 1: A BASIC DEPLOYMENT OF HARDWARE AND SOFTWARE FOR ORACLE VM DR USING SITE GUARD

The Software Products

The illustration shown in Figure 1 above includes three sites. This is a very basic deployment. As you progress through our series of white papers, you will come to understand that the solution can scale up to complex and extensive deployment architectures. Let us explore the basic solution above a little more.

The Oracle VM (OVM) DR infrastructure includes an Oracle Private Cloud Appliance (PCA) at each DR site. On each PCA, Oracle VM Manager runs on the management node. In this example, the management node also serves as the host that will execute Site Guard OVM DR operations. Compute nodes are pooled together in one or more OVM Server Pools. Although the illustration shows the same number of OVM Server Pools at each site, there is no requirement that the DR sites have the same number of server pools or incorporate a symmetrical hardware deployment.

Storage plays a central role in allowing Oracle VM guests to transition between sites during a switchover or failover. Storage replication enables site transitions and allows each of the sites to assume the role of alternate DR site for one another. The solution in this whitepaper utilizes an Oracle ZFS Storage Appliance (ZFSSA) external to the PCA. ZFSSA is the only storage platform supported “out-of-box” by Site Guard. Custom scripts are required to support other storage platforms. Please refer to **SN21811: Planning Storage for Oracle VM DR using Site Guard**.

The Oracle Enterprise Manager infrastructure shown in the lower box of Figure 1 above is

the engine of the DR solution. Enterprise Manager includes Site Guard. Notice in our simple example that Enterprise Manager is located at a third site and is only a single instance; our recommended deployment architecture is a bit more complex and both highly available and disaster tolerant. Please refer to **SN21812: Planning Site Guard Deployment for Oracle VM DR** for more information.

Site Guard supplies the Oracle VM DR scripts that orchestrate transition of Oracle VM guests between sites. Site Guard can also orchestrate the orderly shutdown and startup of Oracle and non-Oracle applications during switchovers; it can also coordinate recovery of Oracle and non-Oracle applications after a failover due to a catastrophic event at any DR site. The Oracle VM DR scripts have additional software requirements see Appendix C: Additional Software Requirements.

The Oracle VM DR infrastructure must be completed and validated before you attempt to integrate the two infrastructures together and implement any DR workflows. The integration of the two infrastructures is the last step in the entire process.

This is just a brief overview. Please refer to the white papers listed in the section entitled **Planning the Deployment Architecture** below for much more detailed information about planning the entire solution.

Solution can incorporate multiple sites

Your solution can include any number of disaster recovery sites, only limited by your available compute resources and capabilities of your storage infrastructure. Refer to the white papers listed in the section entitled **Planning the Deployment Architecture** below for more detailed information.

Keys to Success

Reading and understanding the contents of this white paper will ensure your complete understanding of the entire process from design through implementation and validation.

Follow our recommended methodology

When implementing Oracle VM disaster recovery, use a systematic methodology that forces you to accomplish and verify each step before proceeding to the next. These steps are well established and a known path already exists for a successful implementation of disaster recovery using Oracle VM.

Design Oracle VM networking and storage for Disaster Recovery

Oracle VM is built upon a solid foundation of storage and networking. Design Oracle VM networking and storage to facilitate Disaster Recovery. Please refer to SN21810: Planning Network for Oracle VM DR using Site Guard and SN21811: Planning Storage for Oracle VM DR using Site Guard

Oracle recommends automating application management

This paper describes Oracle VM DR with guest switchback/failover without automated management of applications. This paper assumes a basic architecture where you want to stop and start applications manually.

Understanding and planning your DR environment

Successful automation of disaster recovery using Site Guard is dependent on a well-planned Oracle VM DR environment. This is beyond the scope of this white paper. This section briefly outlines the steps and refers the reader to the related document for planning Oracle VM disaster recovery.

Organize customer applications and business systems

Refer to **SN21001: Getting Started with Oracle VM Disaster Recovery** for more information about organizing business systems. You should always organize storage repositories by business systems or group similar types of Oracle VM guests that have similar backup and site transition requirements.

Plan and document storage requirements for Oracle VM

Refer to **SN21811: Planning Storage for Oracle VM DR using Site Guard** for more information about planning storage.

Starting with Oracle Private Cloud Appliance X8 the internal ZFS Storage Appliance can now be used for user data (repositories, physical disks, etc.). To setup remote replication of the internal ZFS Storage Appliance for Site Guard use each ZFS Storage Appliance head must have one or more optional external facing ethernet cards installed. You may install one or two 4x10GbE, 2x25GbE, or 2x40GbE cards in each head for connection directly to the data center network. Additionally, hostnames must be created for the external IP addresses and configured in DNS.

Plan and document network requirements for Oracle VM

Refer to **SN21810: Planning Network for Oracle VM DR using Site Guard** for more information about organizing business systems.

VM guests configured with static IP addresses require a stretched VLAN network configuration across both the Primary and Standby sites to support Disaster Recovery.

Plan and document Oracle Site Guard deployment

Refer to **SN21812: Planning Site Guard Deployment for Oracle VM DR** for more information about planning Enterprise Manager for high availability.

In summary, these are the documents to read and understand before you can begin planning and designing a robust and scalable deployment architecture for the DR solution in your data center.

- SN21001: Getting Started with Oracle VM Disaster Recovery
- SN21705: Required Software for Oracle VM DR using Site Guard
- SN21809: Planning Hardware Deployment for Oracle VM DR
- SN21810: Planning Network for Oracle VM DR using Site Guard
- SN21811: Planning Storage for Oracle VM DR using Site Guard

» SN21812: Planning Site Guard Deployment for Oracle VM DR

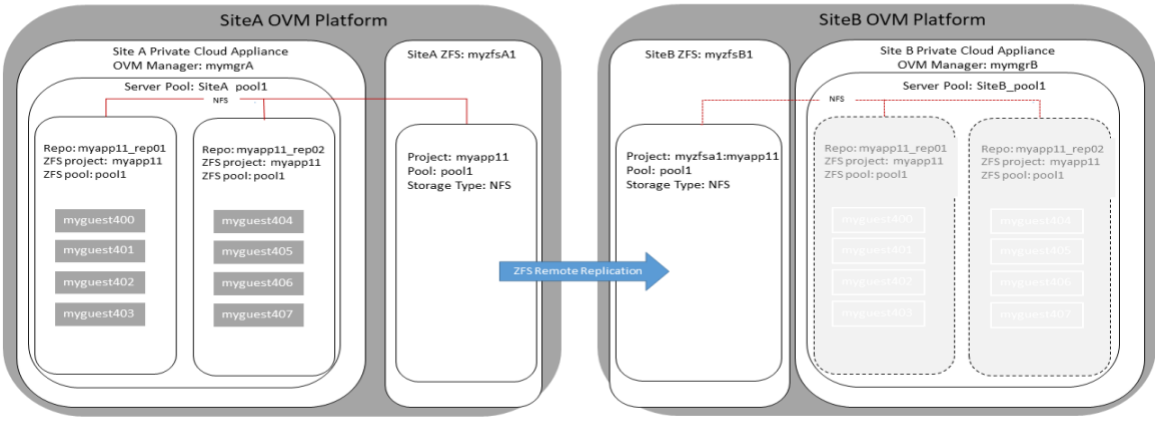
See My Oracle Support note “Oracle VM 3: Getting Started with Disaster Recovery using Oracle Site Guard (Doc ID: 1959182.1)” for the latest information on using Site Guard for Oracle VM DR.

Oracle VM Disaster Recovery using Site Guard

The following sections provide a detailed example of configuring Site Guard to automate switchover of Oracle VM guests from a primary to standby site. Refer to the *Oracle Site Guard Administrator's Guide* for details on concepts, terminology, installation, preparation and usage of Site Guard. Access this document by navigating to Enterprise Manager Documentation (http://docs.oracle.com/en/enterprise-manager) and then selecting the appropriate Oracle Enterprise Manager Cloud Control Online Documentation Library link.

Example Oracle VM Deployment

The following diagram illustrates the Oracle VM deployment architecture used in the example:



SiteA OVM Platform is the Primary site and *SiteB OVM Platform* is the Standby site. In this example, each OVM Platform consists of an Oracle Private Cloud Appliance and an external Oracle ZFS Storage Appliance.

- The Oracle VM Manager for *SiteA* is *mymgrA*.
- The Oracle VM repositories *myapp11_rep01* and *myapp11_rep02* contain the metadata and virtual disks for the VM guests shown in the diagram.
- Oracle VM repositories *myapp11_rep01* and *myapp11_repo2* are assigned to Server Pool *SiteA_pool1.*
- The Oracle ZFS Storage Appliance for *SiteA* is *myzfsA1*. The Oracle VM repositories reside as NFS shares in project *myapp11* on *myzfsA1.*
- Project *myapp11* on *myzfsA1* replicates to the *SiteB* Oracle ZFS Storage Appliance, *myzfsB1* using ZFS remote replication.
- The Oracle VM Manager for *SiteB* is *mymgrB*. The grayed OVM repositories and VM guests are a logical representation that *mymgrB* is in a Standby state.

Selecting the Host that will run Site Guard Operation Plans

Oracle VM DR using Site Guard works by executing operations that perform two kinds of activities:

- Connect to the Oracle VM Manager via the REST API to run various commands.
- Login to an available compute node in an Oracle VM Server Pool to manipulate storage and repository metadata.

There are two requirements for a host to execute Site Guard operations:

- The host must be an Enterprise Manager target. This installs the Enterprise Manager agent on the host.
- The host must have direct network access to compute nodes in the Oracle VM Server Pools that will participate in the DR operations.

To provide direct network access to compute nodes a management node can be configured as a bastion/service host:

- **The PCA Management Node cannot be used as a bastion/service host. Site Guard software components and dependencies can be lost during periodic upgrade or maintenance, requiring re-installation. In addition, Site Guard may have software pre-requisites that conflict with PCA Management Node software.**
- The bastion/service host could be an Oracle VM guest deployed in Oracle Private Cloud Appliance and managed by Oracle VM Manager. This deployment requires the addition of a management network to the bastion Oracle VM guest. See *How to Create Service Virtual Machines on the Private Cloud Appliance by using Internal Networks (Doc ID 2017593.1)*. Also see Appendix D. How to setup a service host for Site Guard use
- The bastion/service host could be a separate server independent of the Oracle Private Cloud Appliance. Typically, it is in a separate rack with a cable connecting it to the Oracle Private Cloud Appliance's internal Oracle Switch ES1-24.
- The bastion/service host could be an Oracle VM guest deployed on an Oracle VM Server independent of Oracle Private Cloud Appliance. Like the previous deployment, the physical server is in a separate rack with a cable connecting it to the Oracle Private Cloud Appliance's internal Oracle Switch ES1-24.

Another option is to add a Host Network to the Oracle Private Cloud Appliance. This would be a custom network configured to provide connectivity to Oracle VM servers from the public network. See the *Network Customization* section of the *Oracle® Private Cloud Appliance Administrator's Guide* for more information.

The host executing Site Guard OVM DR operations has additional software requirements:

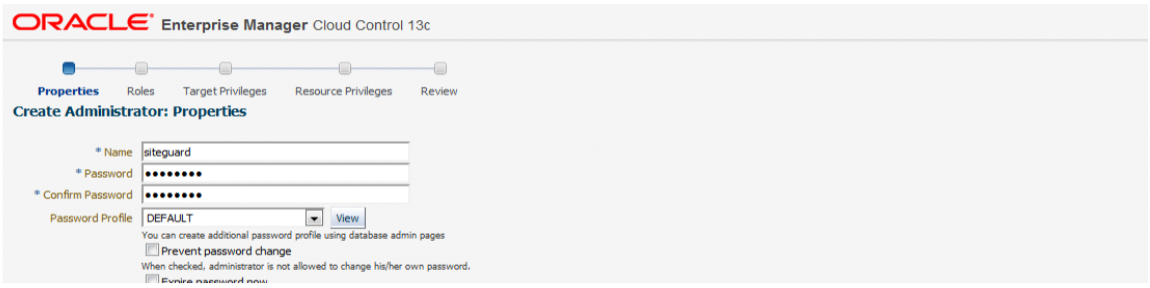
- Python 2 version 2.7 and higher or Python 3 version 3.4 and higher
- Python requests package
- Python pexpect package 4.x and higher

Step 1: Create an administrator account for Site Guard administration

It is best practice to create a separate administrator account so only authorized systems administrators have the ability to trigger site transitions. Create Site Guard administrator accounts using SYSMAN, the default administrator account, or an administrator account with like privileges.

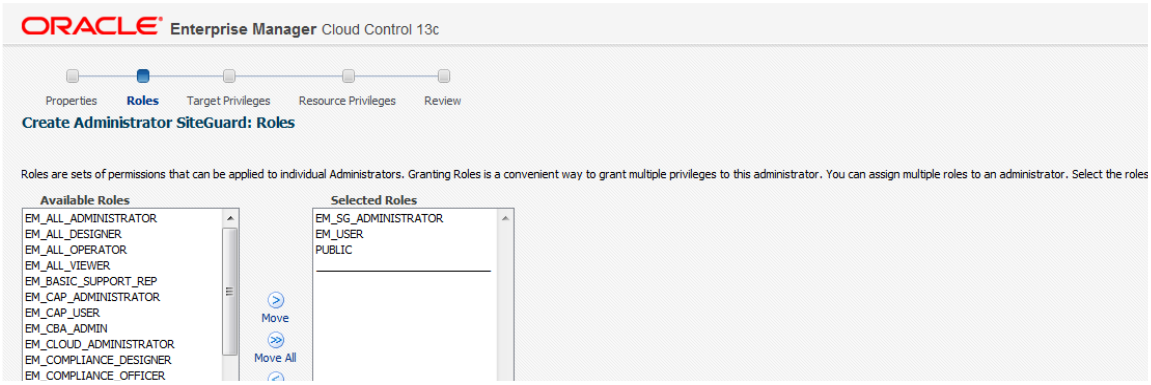
Step 1.1: Create account

Super Administrator access is not required for the Site Guard account.



Step 1.2: Add roles to Site Guard account

This is the minimum needed to create a valid account, but the operating standards for your data center may require other privileges and resources not covered in this document. Please consult your organization's standard operating procedures for more requirements specific to your data center.



Please ensure the Site Guard administrator has the following roles:

- EM_SG_ADMINISTRATOR: Site Guard Administrator
- EM_USER: Role has privilege to access Enterprise Manager Application
- PUBLIC: The role granted to all administrators. This role can be customized at site level to group privileges that need to be granted to all administrators

Step 1.3: Add target privileges

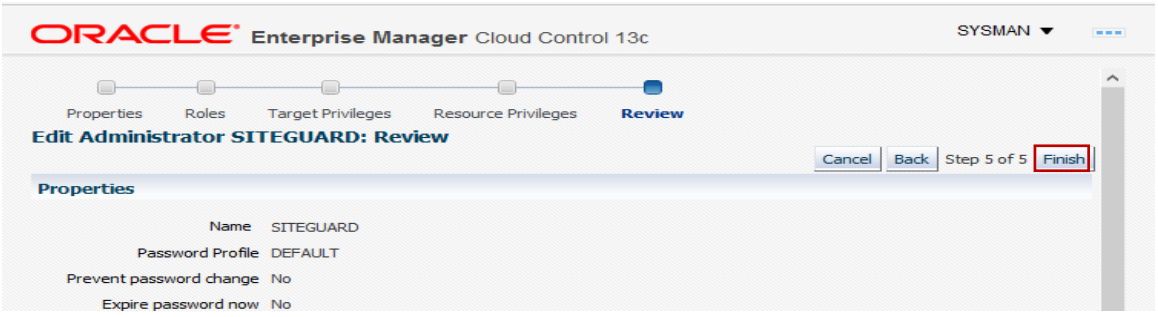
Skip this step, Click ‘Next’

Step 1.4: Add EM resource privileges

Skip this step, Click ‘Next’

Step 1.5: Review and accept account profile

Click ‘Finish’



Step 2: Prepare Oracle Site Guard

Log into Enterprise Manager using the Site Guard administrator account created in the previous step.

Step 2.1: Create named credentials

You will need to create the following named credentials. The names are examples; you may use any naming convention that makes sense in your data center.

» EM HOST: Provide the username and password for the host that will execute the OVM DR scripts. Refer back to Selecting the Host that will run Site Guard Operation Plans for details.

» OVM_MGR_ADMIN: Provide the Oracle VM Manager admin login name and password for the Oracle VM Manager.

» OVM_SRVR_ROOT: Provide the root login name and password for Oracle VM servers.

» ZFS_SITEA: Provide the root login name and password for the ZFS storage appliance at *SiteA*.

» ZFS_SITEB: Provide the root login name and password for the ZFS storage appliance at *SiteB*. You must create a named credential for *SiteB* even if you use the same login and password at both sites.

When creating the named credentials:

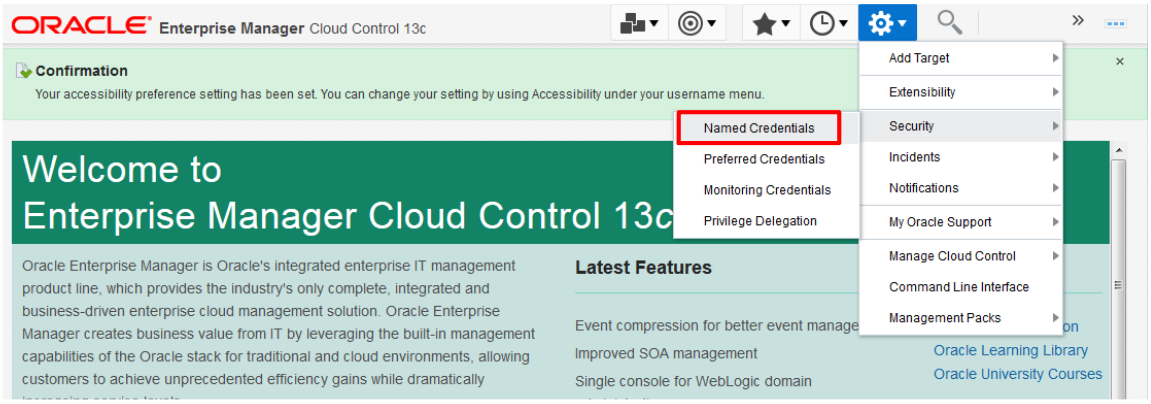
» Select 'Host' Authenticating Target Type

» Select 'Host Credentials' Credential Type

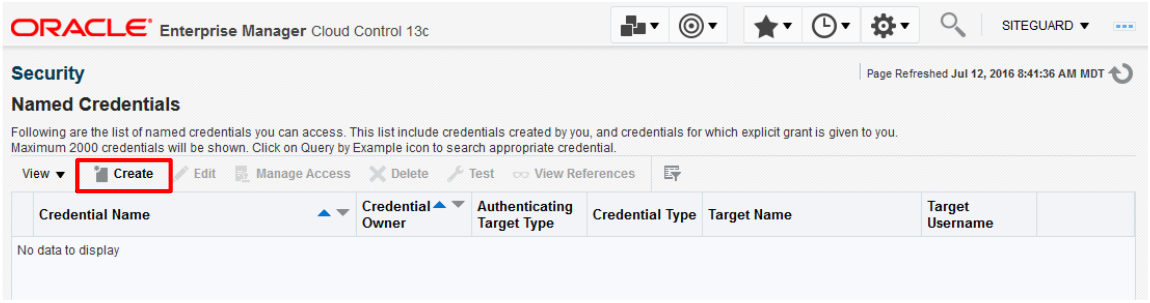
» Select 'Global' Scope

» Select 'Save' to complete, do not select 'Test and Save'

From the *Setup* menu, select *Security* then *Named Credentials* from the sub-menu

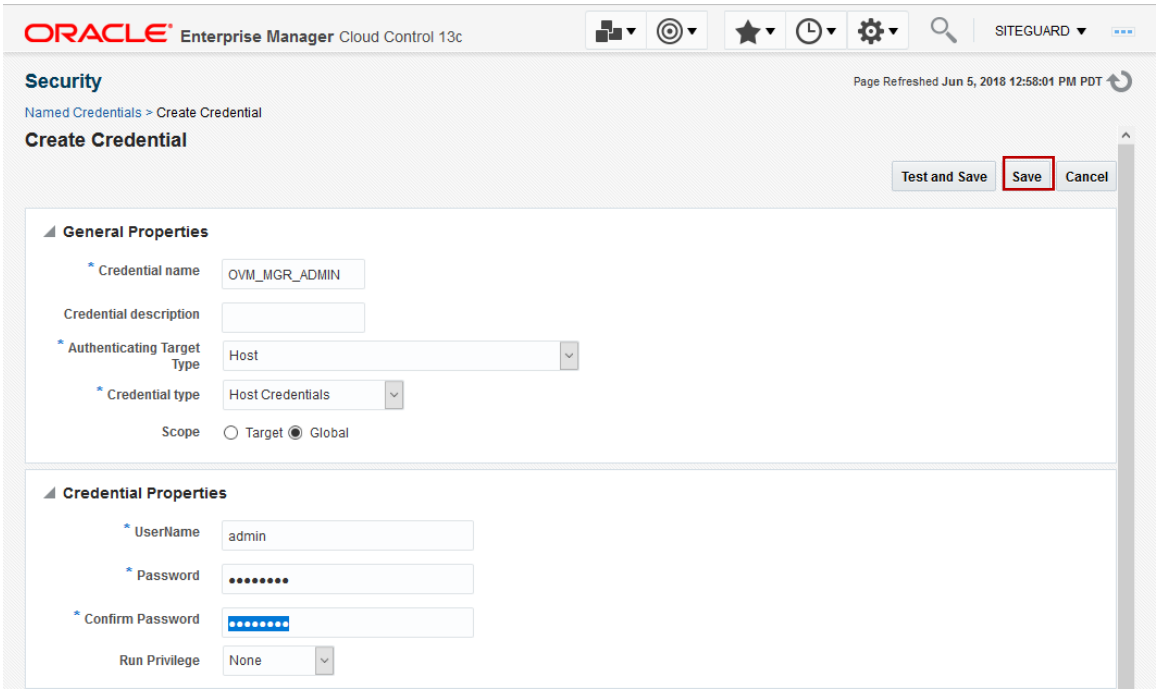


Click *Create*

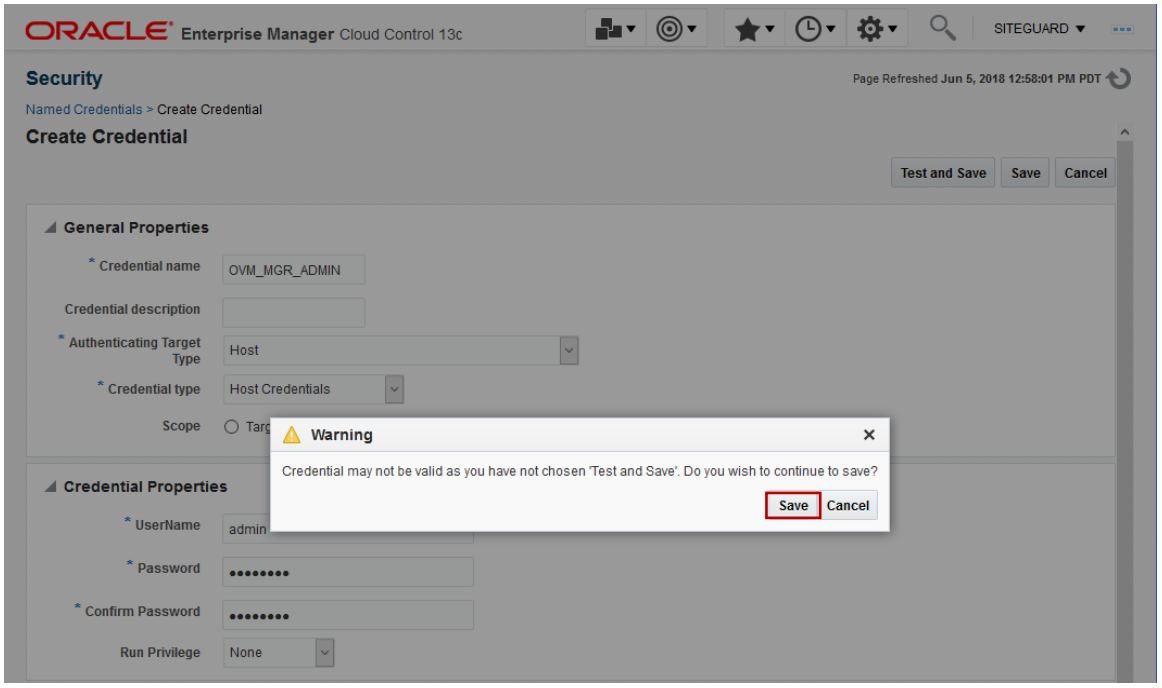


Step 2.1.1: **Create Site Guard OVM_MGR_ADMIN named credential**

Create a named credential that Site Guard will use to access the Oracle VM REST API. This will normally be the Oracle VM Manager Admin user. Click *Save.*

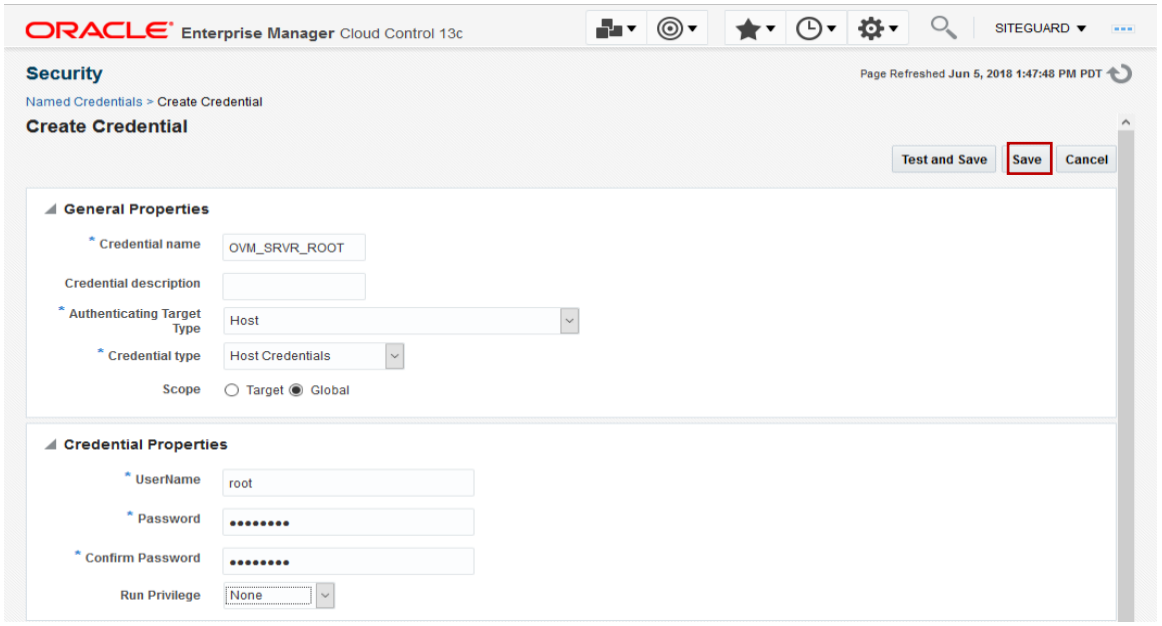


When creating Named Credentials for Site Guard always select *Save*.



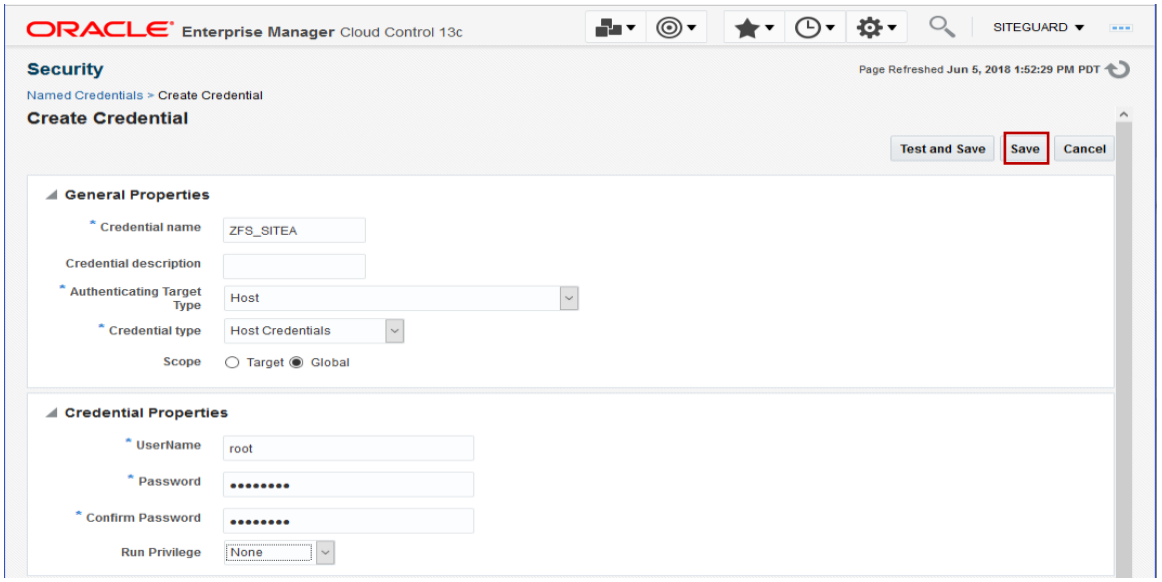
Step 2.1.2: **Create Site Guard OVM_SRVR_ROOT named credential**

Create a named credential that Site Guard will use to access an Oracle VM Server. Root access is required. Click *Save.*

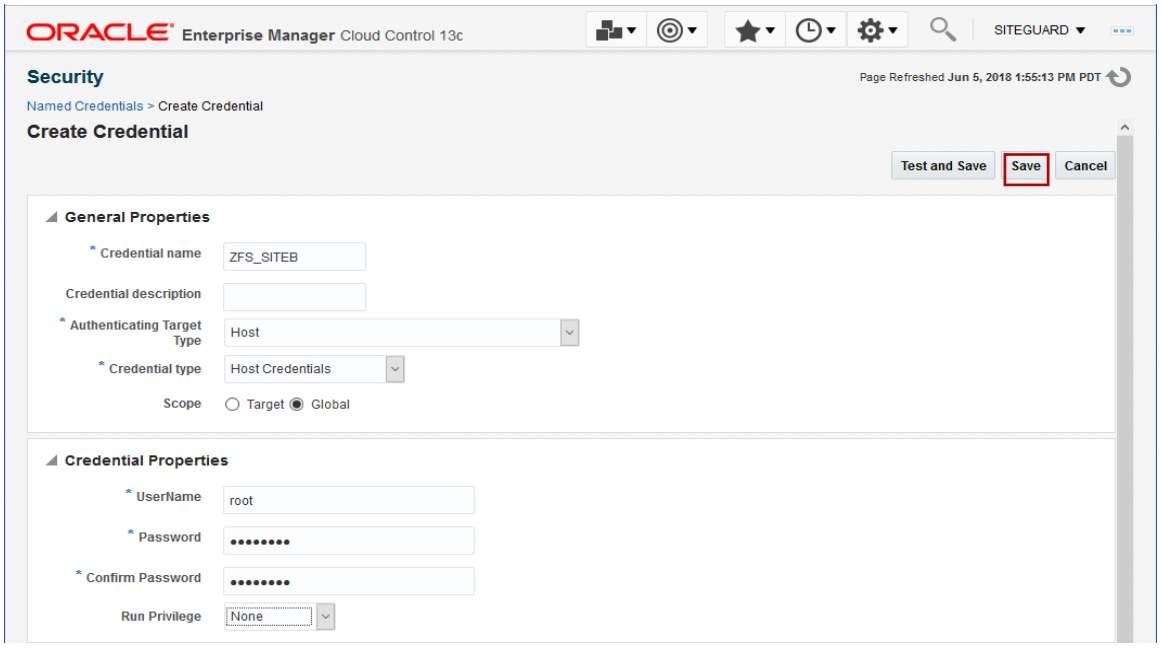


Step 2.1.3: **Create Site Guard ZFS Storage Appliance named credentials**

Create a named credential that Site Guard will use to access the ZFS Storage Appliance associated with the Oracle VM Management Server at *SiteA*. Root access is required. Click *Save.*



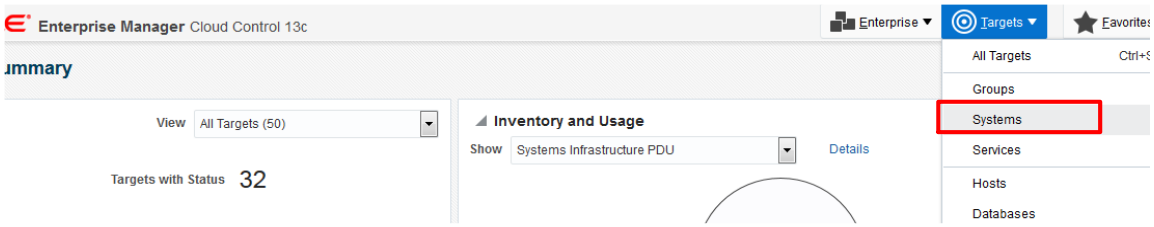
Create a named credential that Site Guard will use to access the ZFS Storage Appliance associated with the Oracle VM Management Server at *SiteB*. Root access is required. Click *Save*.



Step 2.2: Add a Generic System for Primary DR site

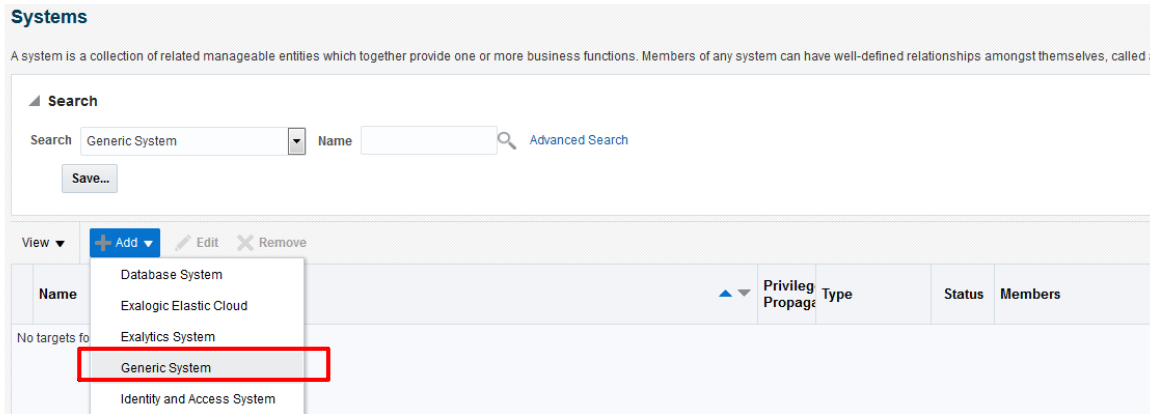
Step 2.2.1: **Navigate to systems management**

From the *Targets* menu, select *Systems*.

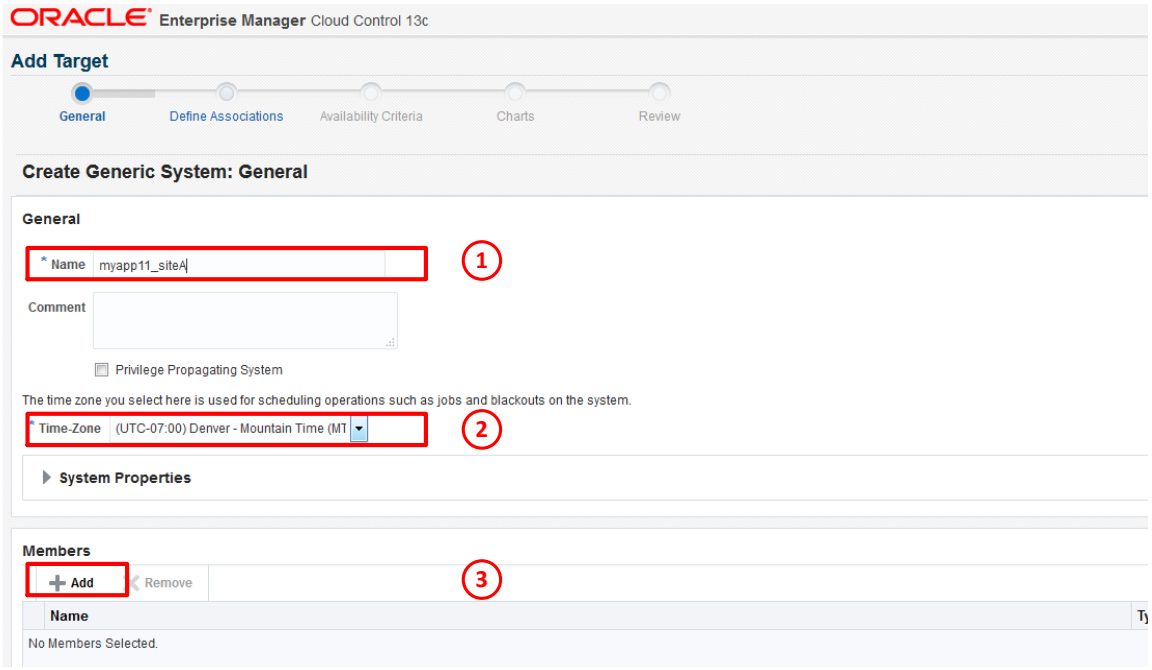


Step 2.2.2: **Add a Generic System for myapp11 at Primary DR site**

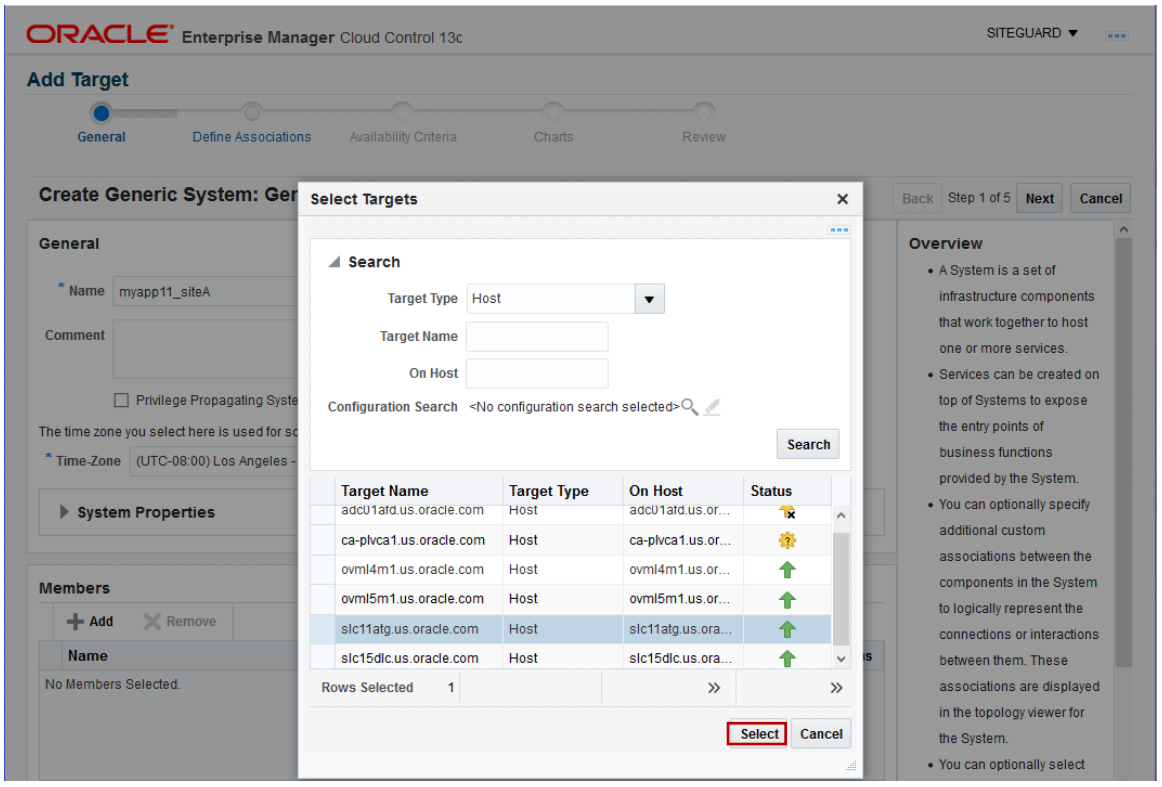
From the *Add* menu, select *Add Generic System*.



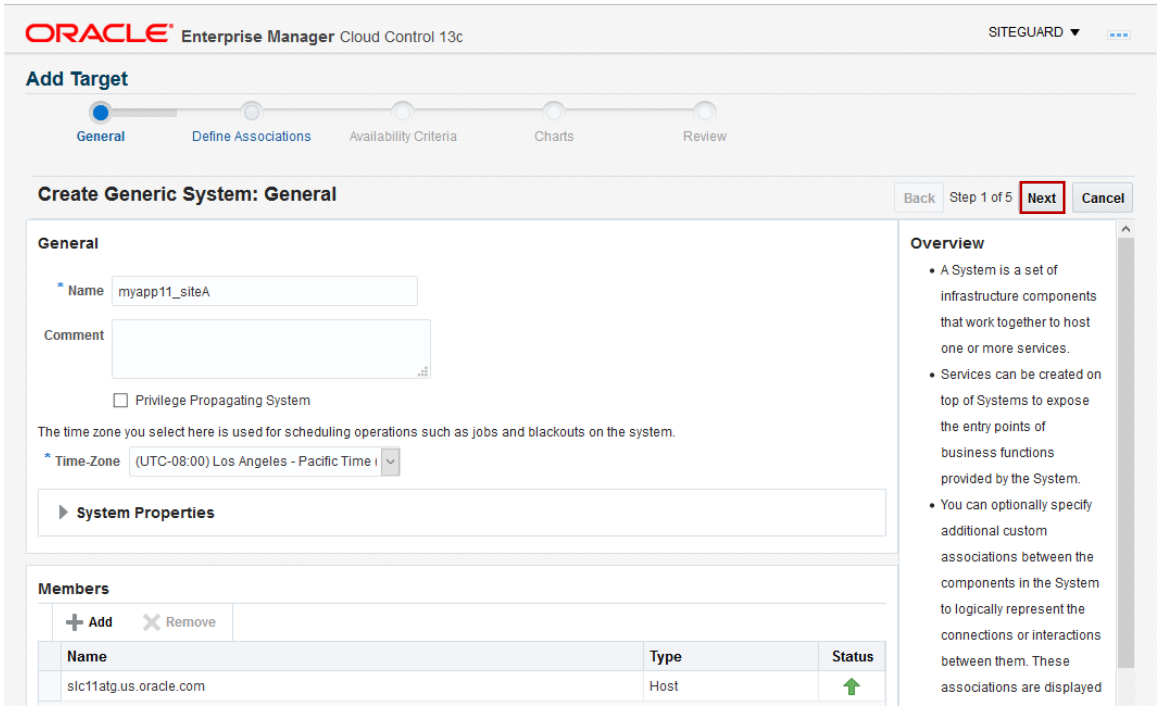
Enter System Name, select Time-Zone then click the *Add* menu.



Select the Host that will execute the Site Guard OVM DR scripts. Please refer to Selecting the Host that will run Site Guard Operation Plans for details.

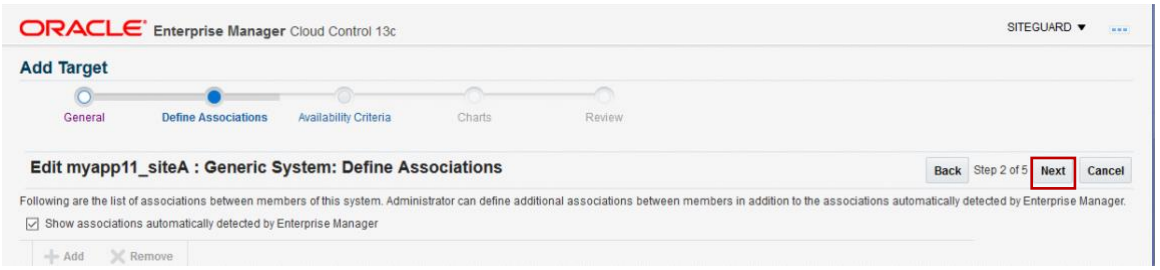


Click *Select* to add the target host as a member to the Generic System then click *Next*.



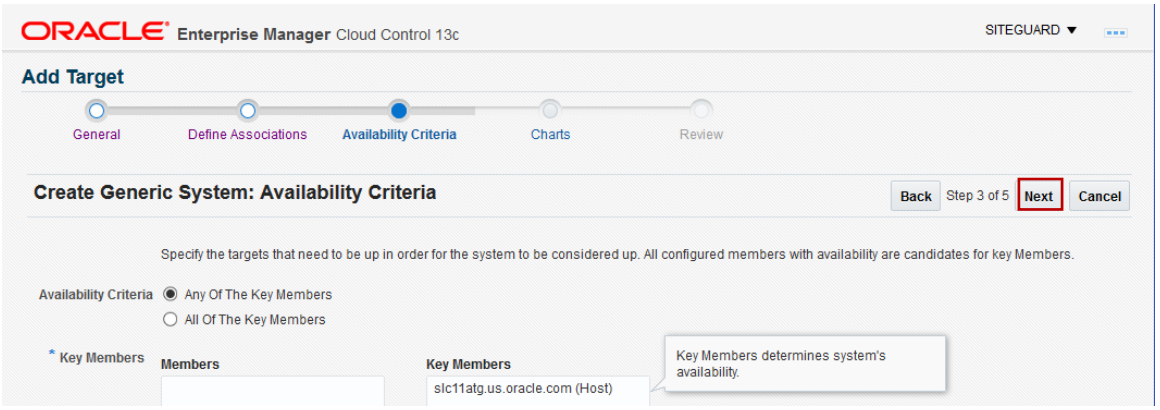
Step 2.2.3: **Define associations for myapp11 at primary DR site**

Skip this step. Click *Next.*



Step 2.2.4: **Availability Criteria for myapp11 at Primary DR site**

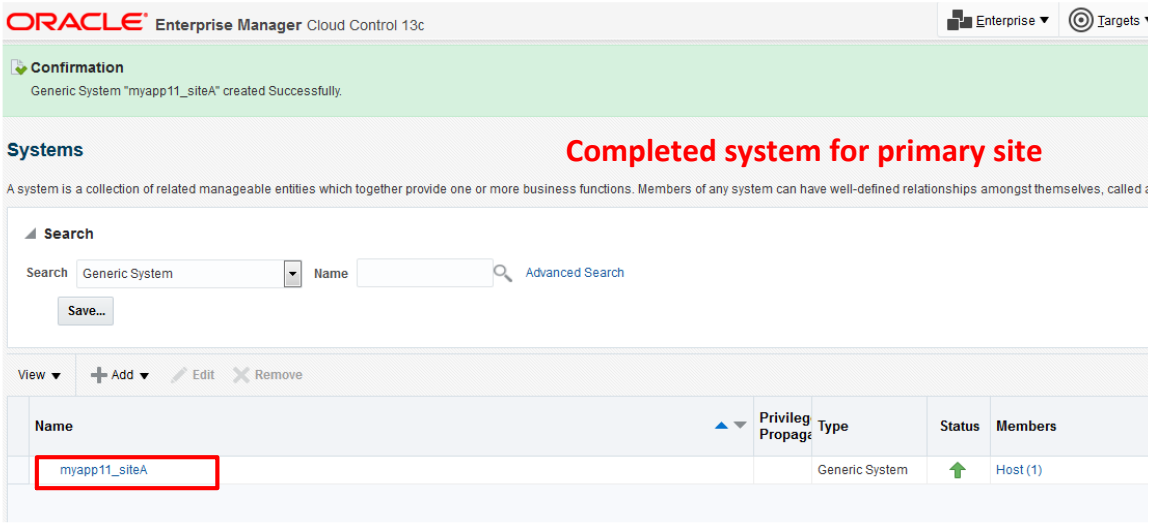
Select the host as a Key Member. This is simply allows Enterprise Manager to monitor the state of the host. It has nothing to do with allowing Enterprise Manager to manage Oracle VM resources. Click *Next.*



Step 2.2.5: **Complete system for myapp11 at primary DR site**

Click *Finish.*

You have successfully created an Enterprise Manager Generic System as shown below.

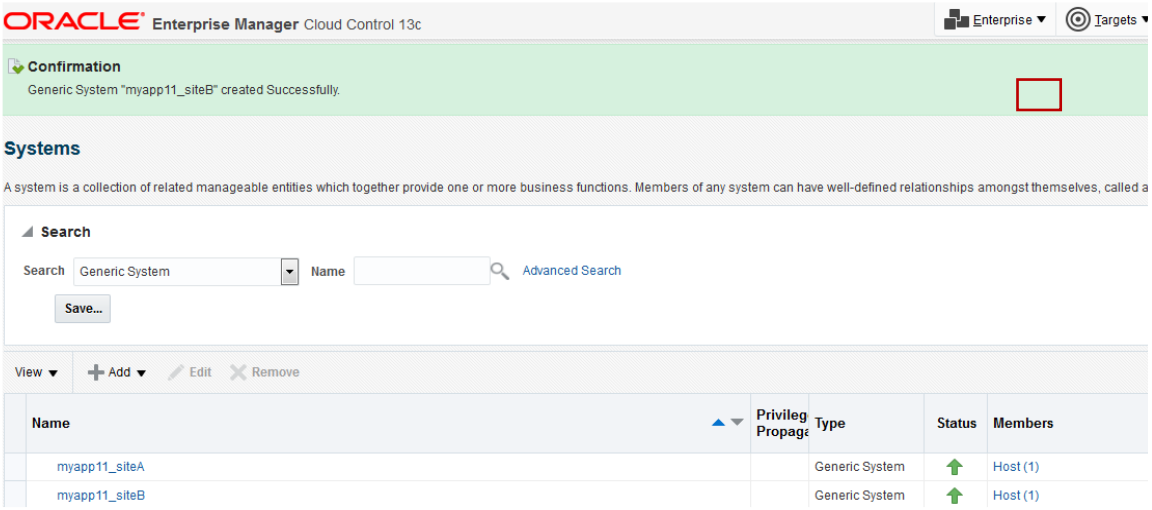


Step 2.3: Add a system for standby DR site

Repeat steps from 2.2 to add system for standby DR site.

Step 2.4: Review Primary and Standby systems

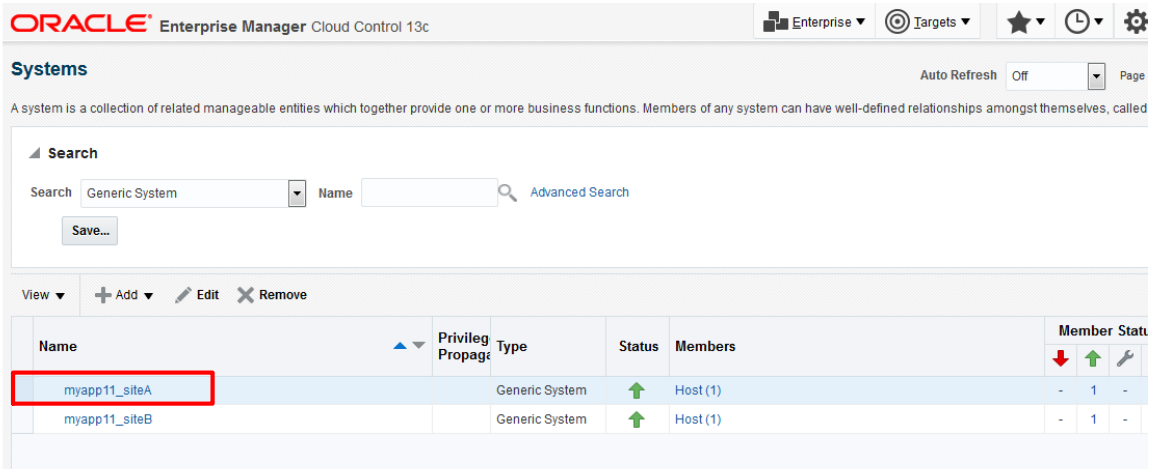
Site Guard will use the Primary and Standby system just created to control all site transitions for all Oracle VM guests, the applications, the storage repositories and any other storage associated with the business system called myapp11.



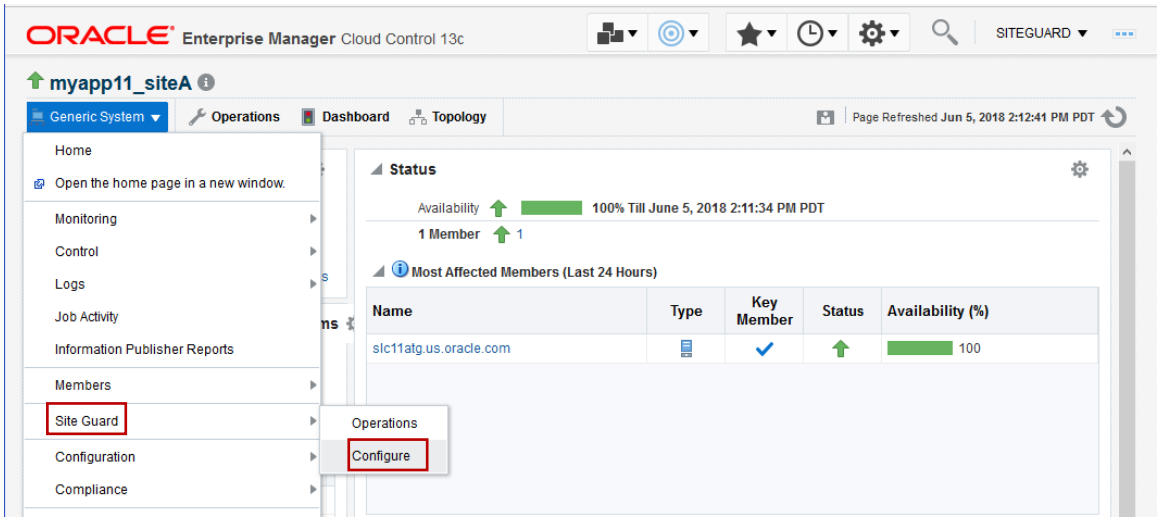
Step 3: Create Site Guard Configuration

Step 3.1: Setup Site Guard Configuration For Primary System

Select the primary site business system, *myapp11_SiteA.*

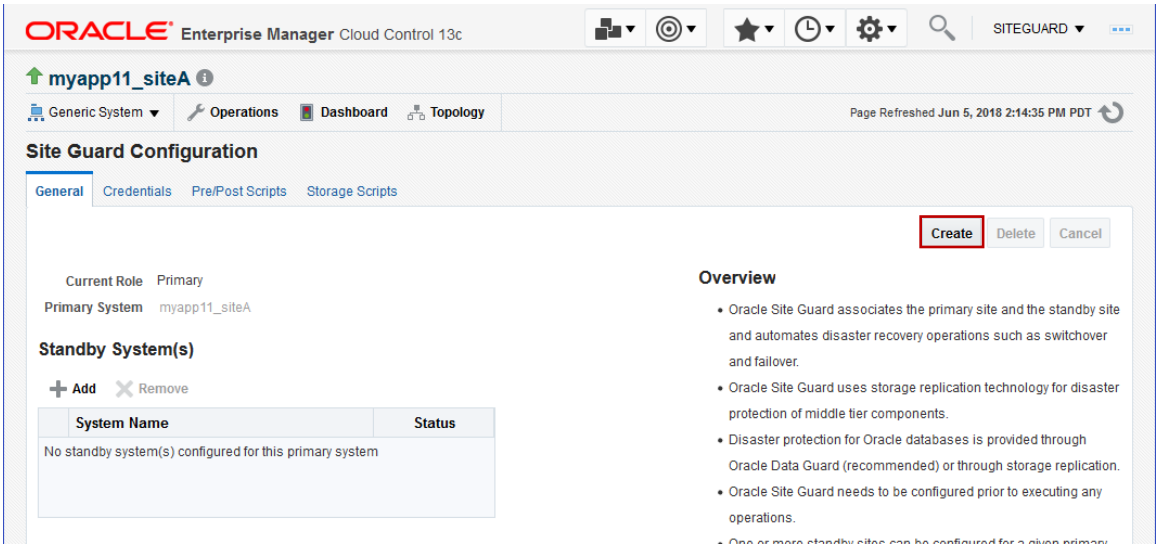


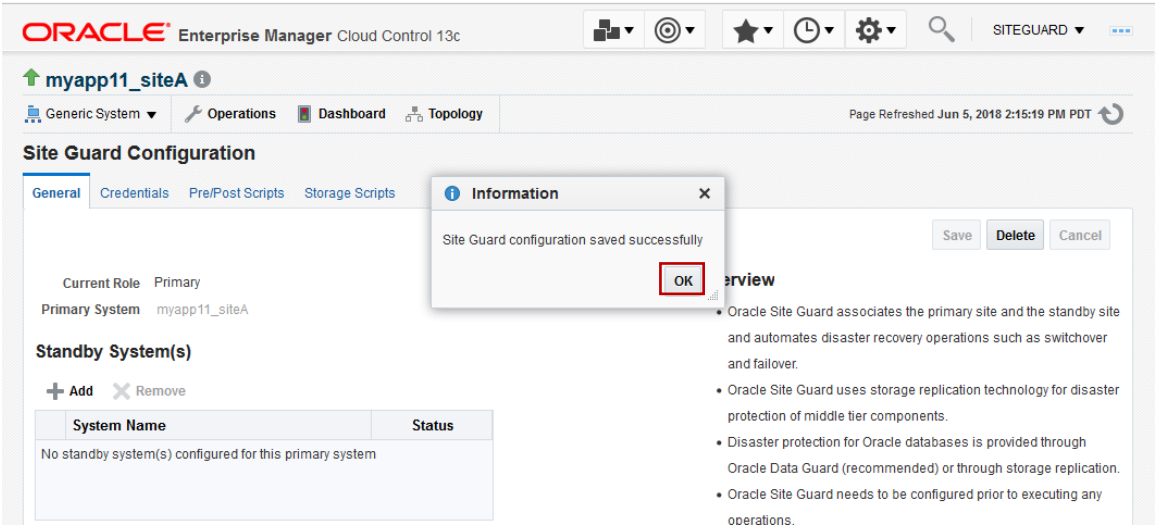
Select *Site Guard* from *Generic System* menu then select *Configure* from the sub-menu.



Step 3.1.1: **Create Site Guard Configuration**

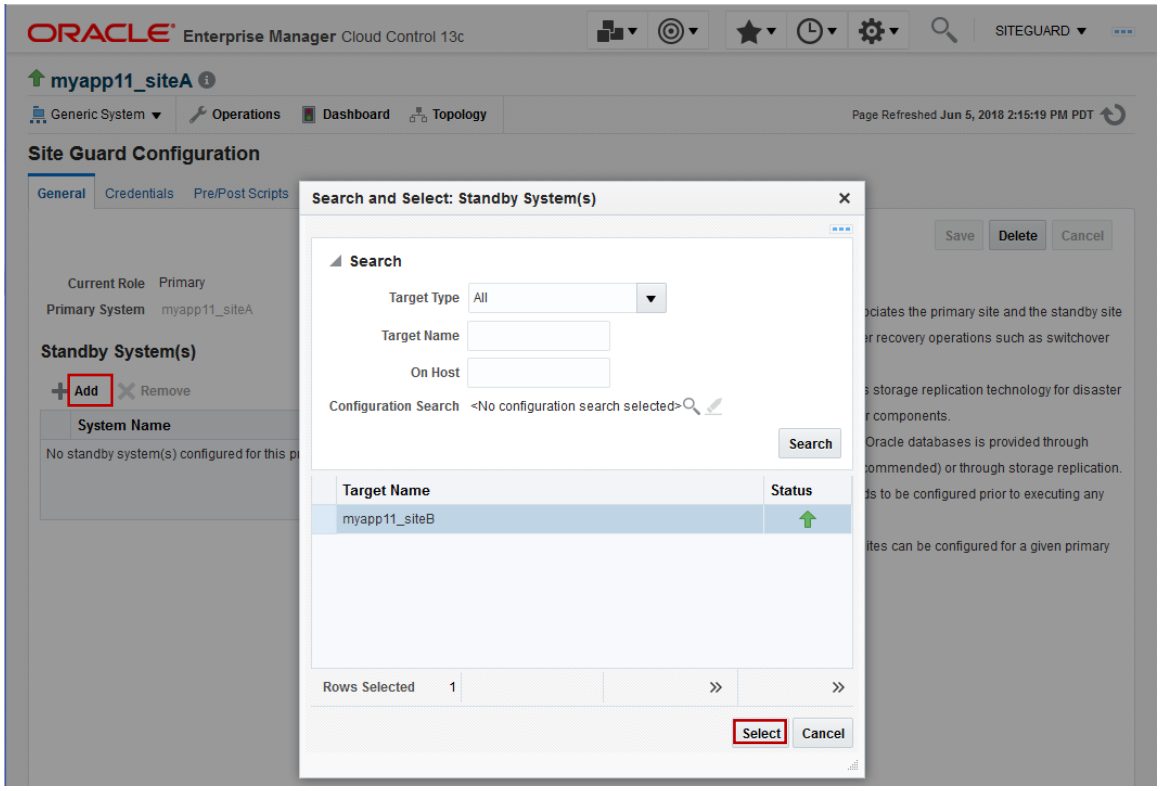
Click the *Create* button to create an initial Site Guard Configuration then click *OK*.



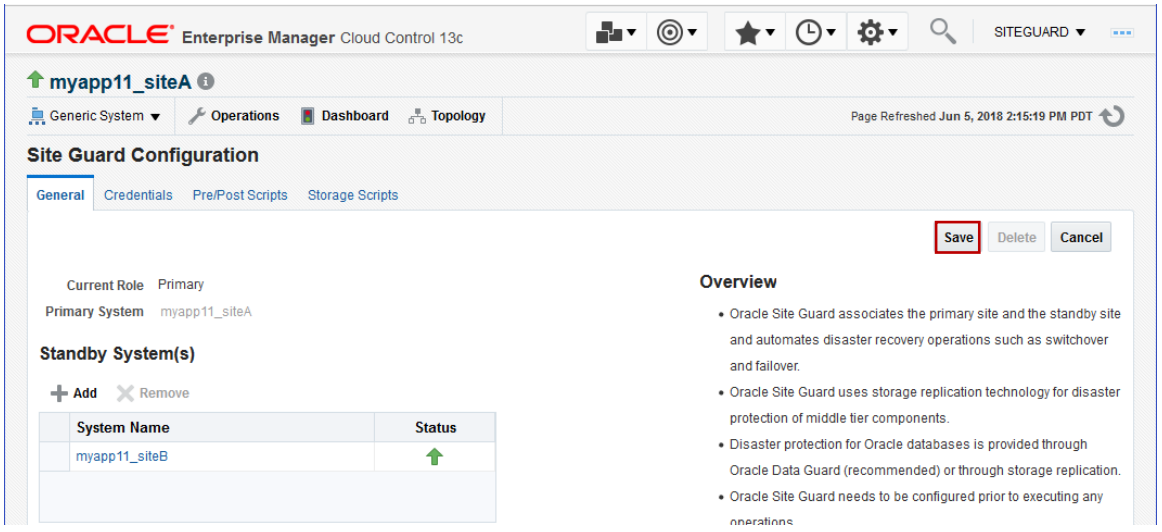


Step 3.1.2: **Create DR Primary/Standby relationship**

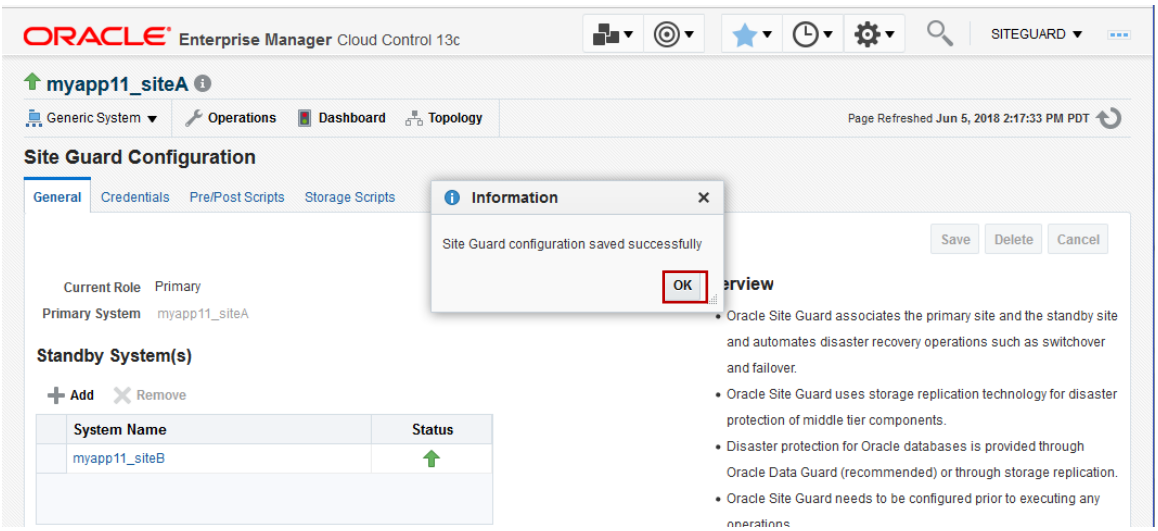
Add the *myapp11_siteB* as the Standby Site, then click *Select.*



Click *Save*

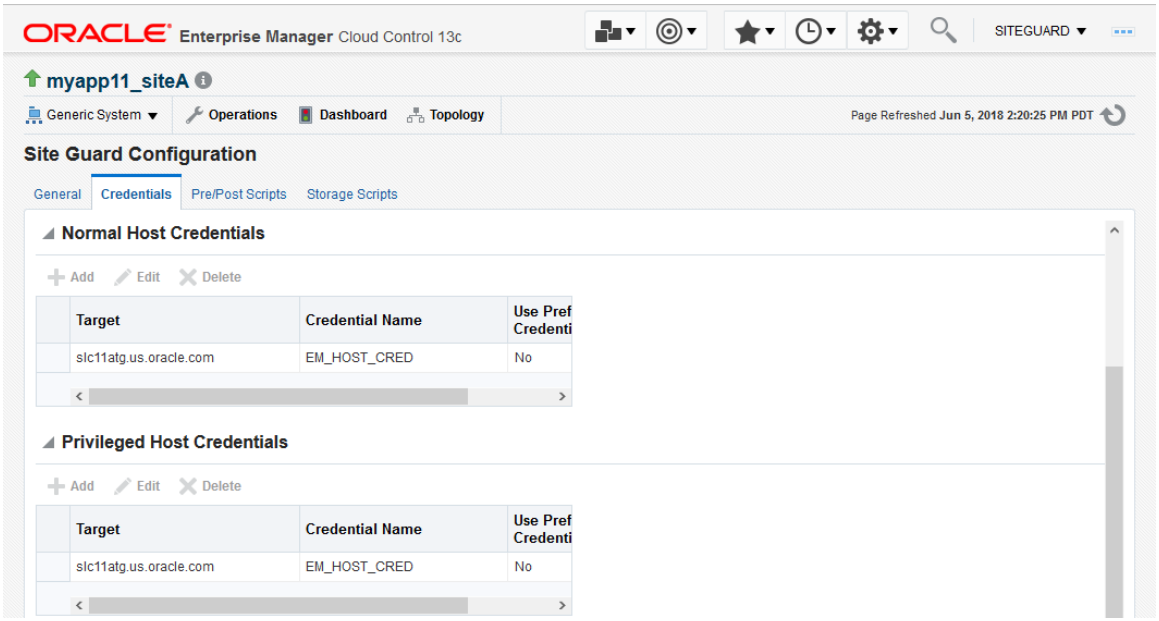


Click *OK*.



Step 3.1.3: **Add Primary System Named Credentials**

Add the previously created Normal Host and Privileged Host credentials for the *myapp11_siteA* host member that will execute the Site Guard scripts.



Step 4: Configure Site Guard for Switchover

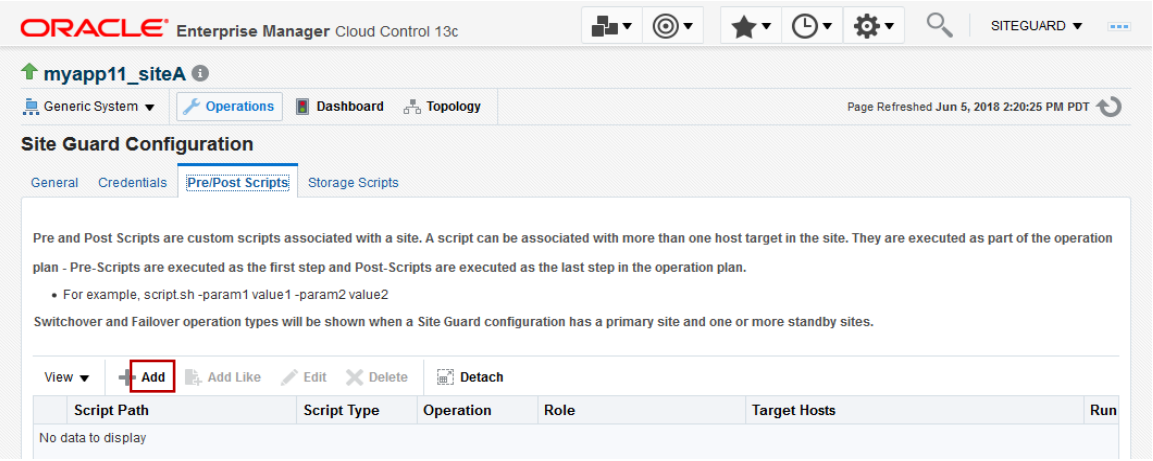
Switchover is the planned movement of Oracle VM guests to a standby site. In this section, we add Site Guard scripts to the configuration. These scripts will then populate Site Guard Oracle VM operation plans that switchover all VM guests in *myapp11_repo1* and *myapp11_repo2* from SiteA to SiteB. The high-level steps Site Guard will perform are:

- On *SiteA* Oracle VM Manager, '*mymgrA*'
  - Stop all VM guests in repositories '*myapp11_repo1'* and '*myapp11_repo2'*.
  - Unassign the VM guests from server pool *SiteA_pool1*.
  - Unpresent repositories '*myapp11_repo1'* and '*myapp11_repo2'* from server pool '*SiteA_pool1'*
  - Release ownership of repositories *myapp11_repo1* and *myapp11_repo2*.
- ZFS Role Reversal
  - Reverse remote replication such that the active ZFS shares that contain *myapp11_repo1* and *myapp1_repo2* are on the SiteB ZFS Storage Appliance, '*myzfsB1*' and the replicas are on the *SiteA* ZFS Storage Appliance, '*myzfsA1*'.
- On SiteB Oracle VM Manager, '*mymgrB*'
  - Take ownership of the *myapp11_repo1* and *myapp11_repo2* repositories
  - Present the repositories to server pool '*SiteB_pool1'*
  - Assign the VM guests to server pool '*SiteB_pool1'*
  - Start the VM guests

Also, see *Appendix A* for detailed steps to configure Oracle VM switchover using Site Guard.

Step 4.1: Add Primary System Switchover Scripts

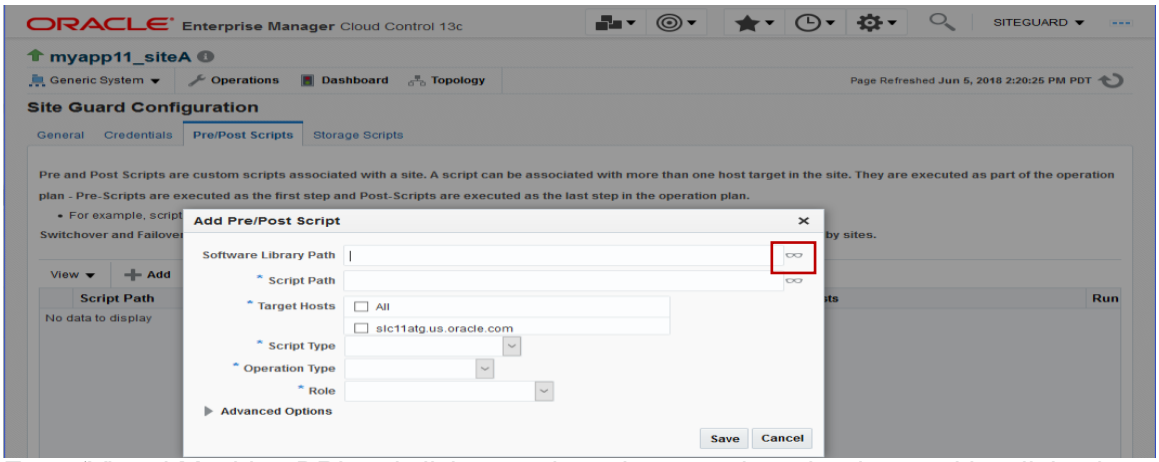
Select the *Pre/Post Scripts* and click *Add*.



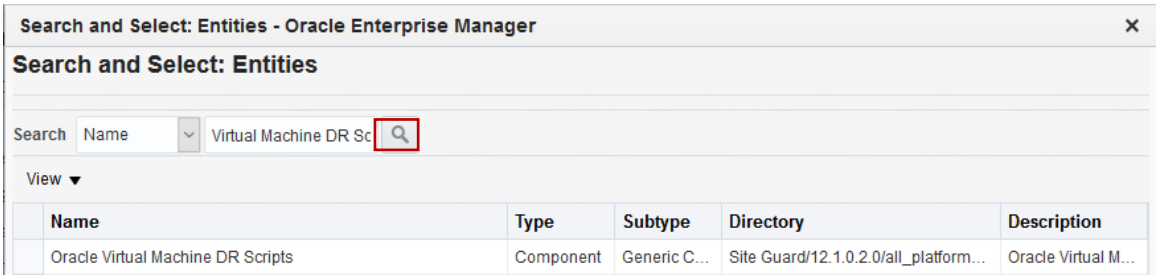
Step 4.1.1: **Select the Site Guard Scripts Software Library Path**

This step, shown in detail below, must be repeated for each script added.

Click *Search* by the *Software Library Path* edit box.

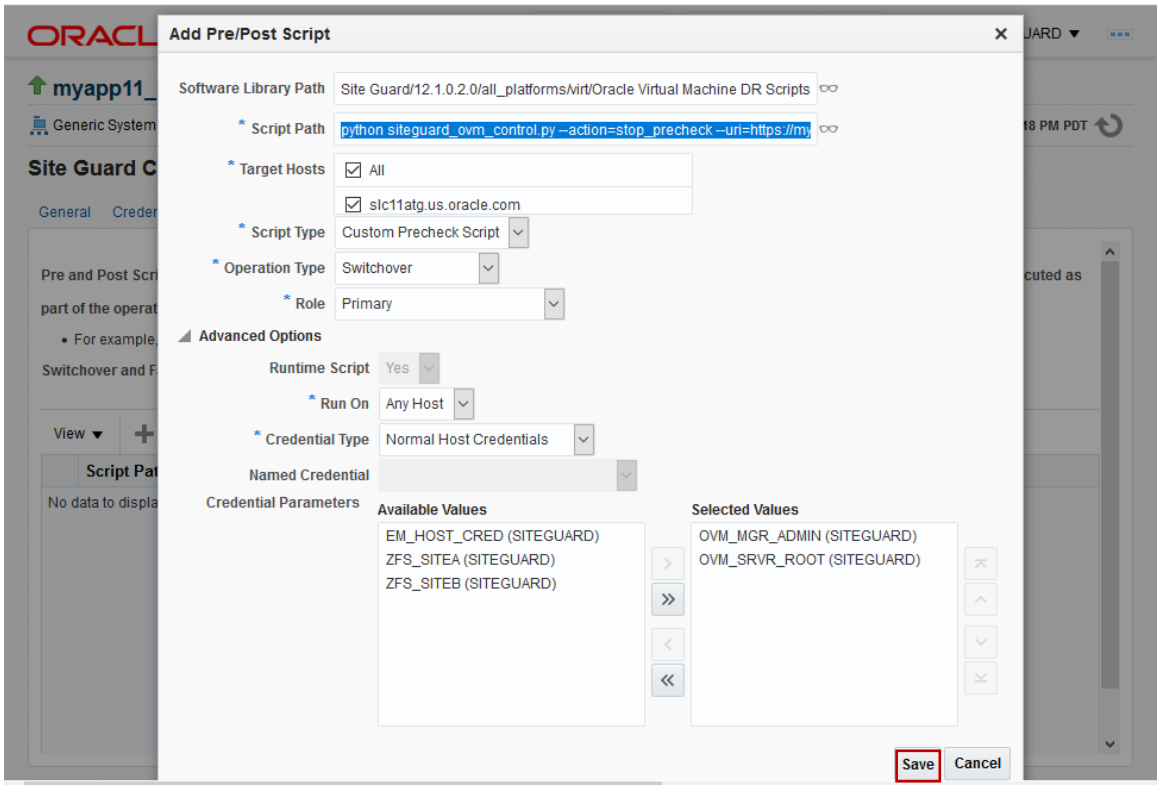


Enter 'Virtual Machine DR' and click *Search* on the *Search and Select Entities* dialog box. Upon return select 'Oracle Virtual Machine DR Scripts'



Step 4.1.2: **Add the stop_precheck Custom Precheck Script**

The stop_precheck script verifies that all conditions required to successfully stop the specified VM guests are met. Note the Credential Parameters specified in Advanced Options. The script requires credentials to access both the Oracle VM Manager and an Oracle VM Server. Add entries as show below and click *Save.*



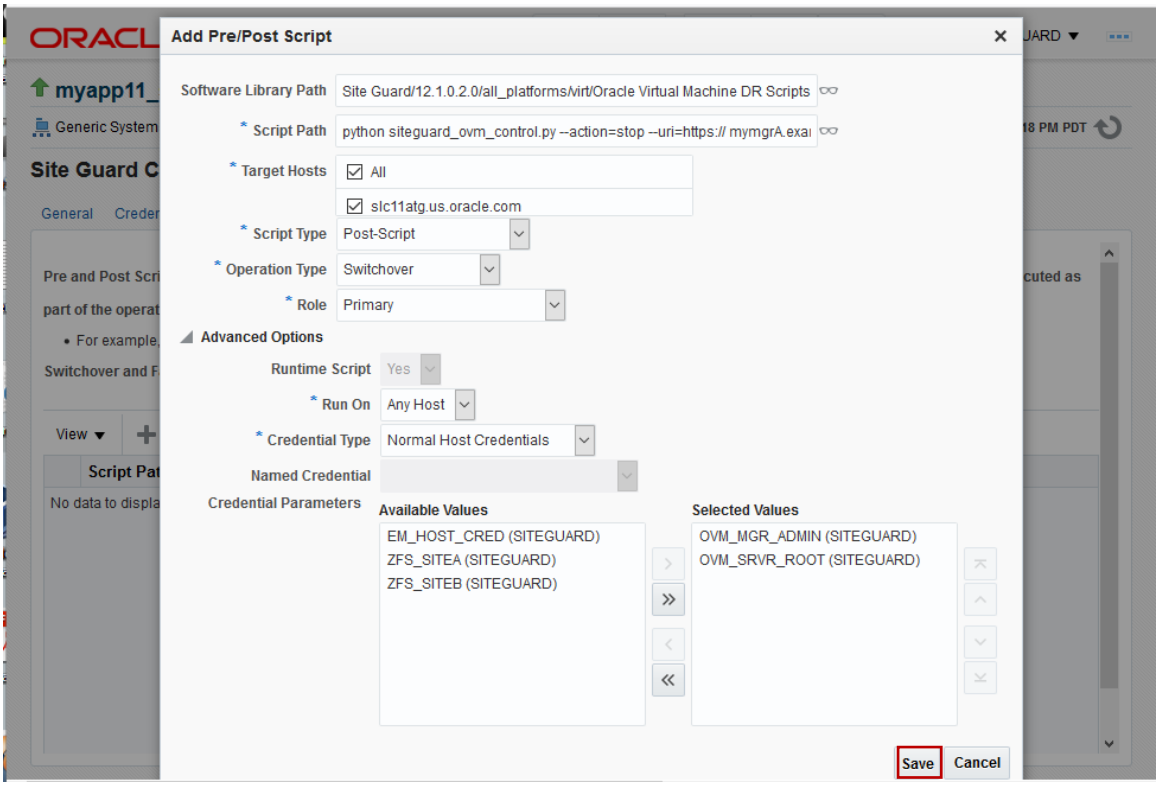

```
python siteguard_ovm_control.py --action=stop_precheck --
uri=https://mymgrA.example.com:7002/ovm/core/wsapi/rest --pool='SiteA_pool1' --
vm='*:myapp11_repo1,*:myapp11_repo2' –nocert
```

- --action: Perform stop_precheck on VM's specified in the –vm argument.
- --uri: The URL for SiteA OVM Manager REST requests.
- --pool: The OVM Server Pool that VM's are assigned to.
- --vm: list of VM/OVM repository pairs to precheck: <VM | *>:<OVM Repo>, '*' specifies all VM's in the OVM repository.
- --nocert: Do not check for certificates

Step 4.1.3: **Add Primary System Post Scripts**

Add Primary System Post Scripts to stop and cleanup VM guests selected for switchover. Repeat the steps from above to select the Software Library Path. This script also requires credentials to access both the Oracle VM Manager and an Oracle VM Server.

» Add the stop post script to stop the VM's selected for switchover:




```
python siteguard_ovm_control.py --action=stop --uri=https://
mymgrA.example.com:7002/ovm/core/wsapi/rest --pool='SiteA_ pool1' --
vm='*:myapp11_repo1,*:myapp11_repo2' –nocert
```

» --action: Stop VM's specified in the –vm argument.

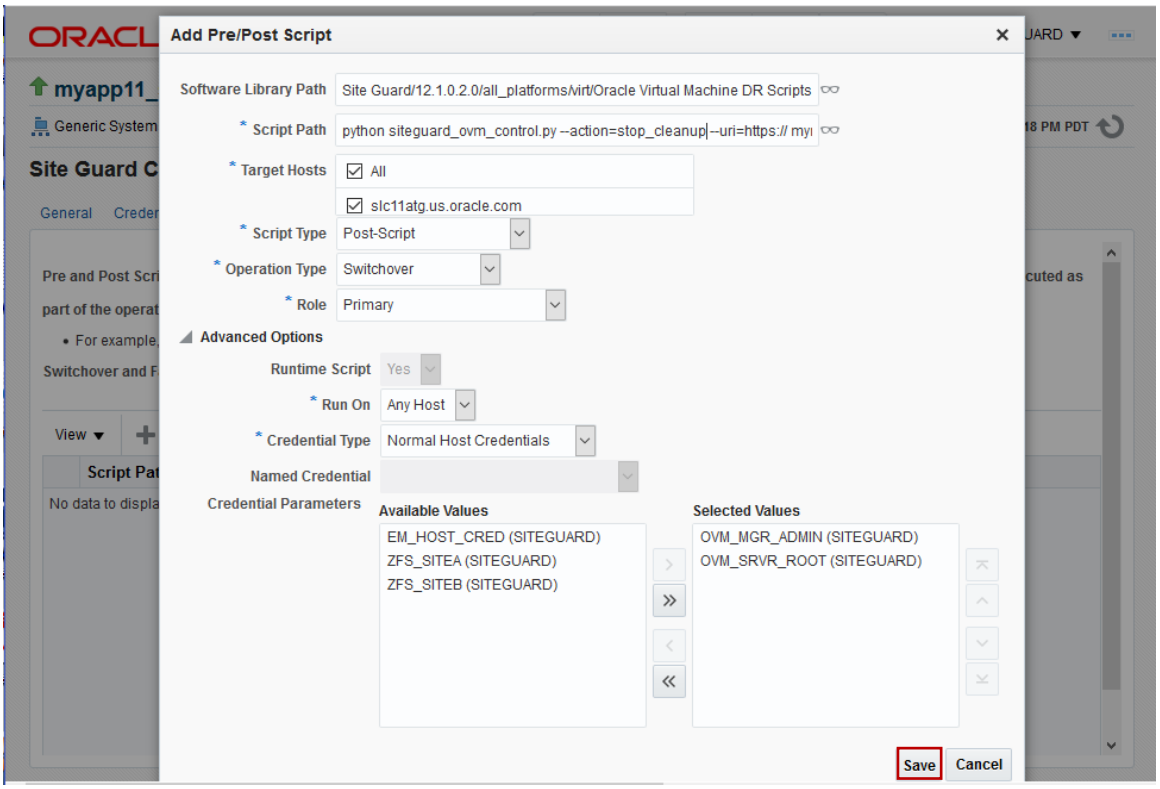
» --uri: The URL for SiteA OVM Manager REST requests.

» --pool: The OVM Server Pool that VM's are assigned to.

» --vm: list of VM/OVM repository pairs that will be stopped: <VM | *>:<OVM Repo>, '*' specifies all VM's in the OVM repository

» --nocert: Do not check for certificates

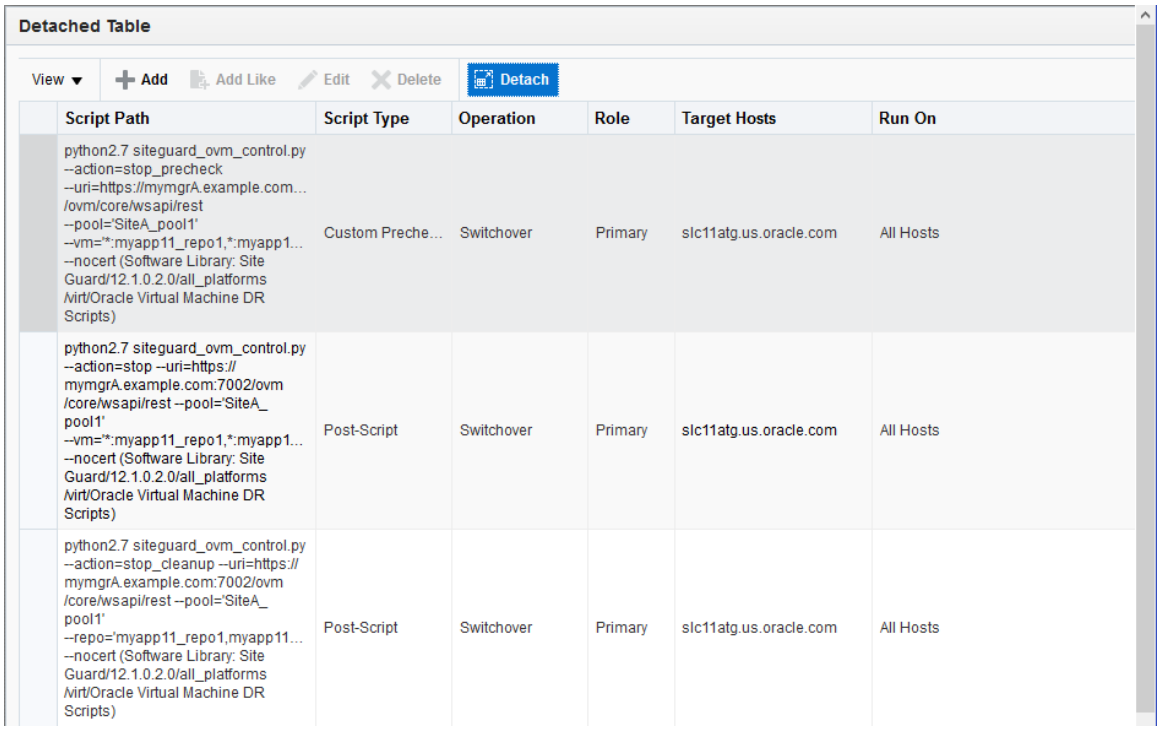
» Add the stop_cleanup post script. This script will unassign the VM guests in the specified repositories from the server pools on the Primary system. It will then release ownership and unpresent the specified repositories from the Primary Oracle VM Manager.



python siteguard_ovm_control.py --action=stop_cleanup --uri=https://mymgrA.example.com:7002/ovm/core/wsapi/rest --pool='SiteA_ pool1' --repo='myapp11_repo1:myzfsSiteA-nfs:nfs,myapp11_repo2:myzfsSiteA-iscsi:iscsi' –nocert

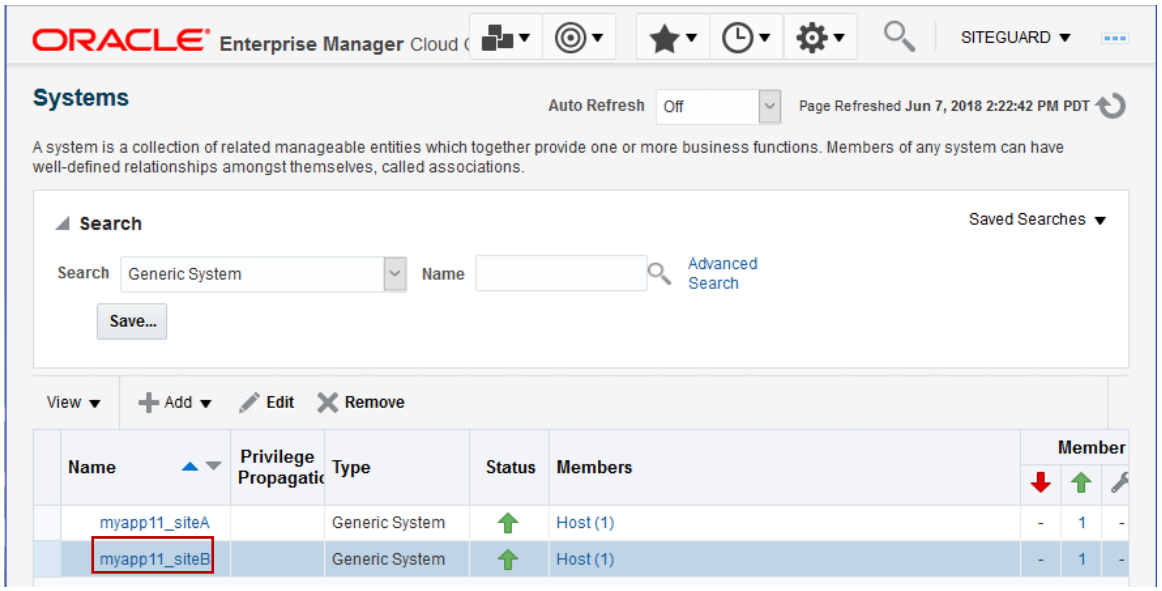
» --action: cleanup VM's specified in the –vm argument.
» --uri: The URL for SiteA OVM Manager REST requests.
» --pool: The OVM Server Pool that VM's are assigned to.
» --repo: list of OVM repositories to switchover to the new primary site: <OVM repo>:<OVM Storage Server>:<Storage Type>
» --nocert: Do not check for certificates

» After adding and saving all scripts selecting the *Detach* button will display all of the scripts and their properties for Primary system *myapp11_siteA*.

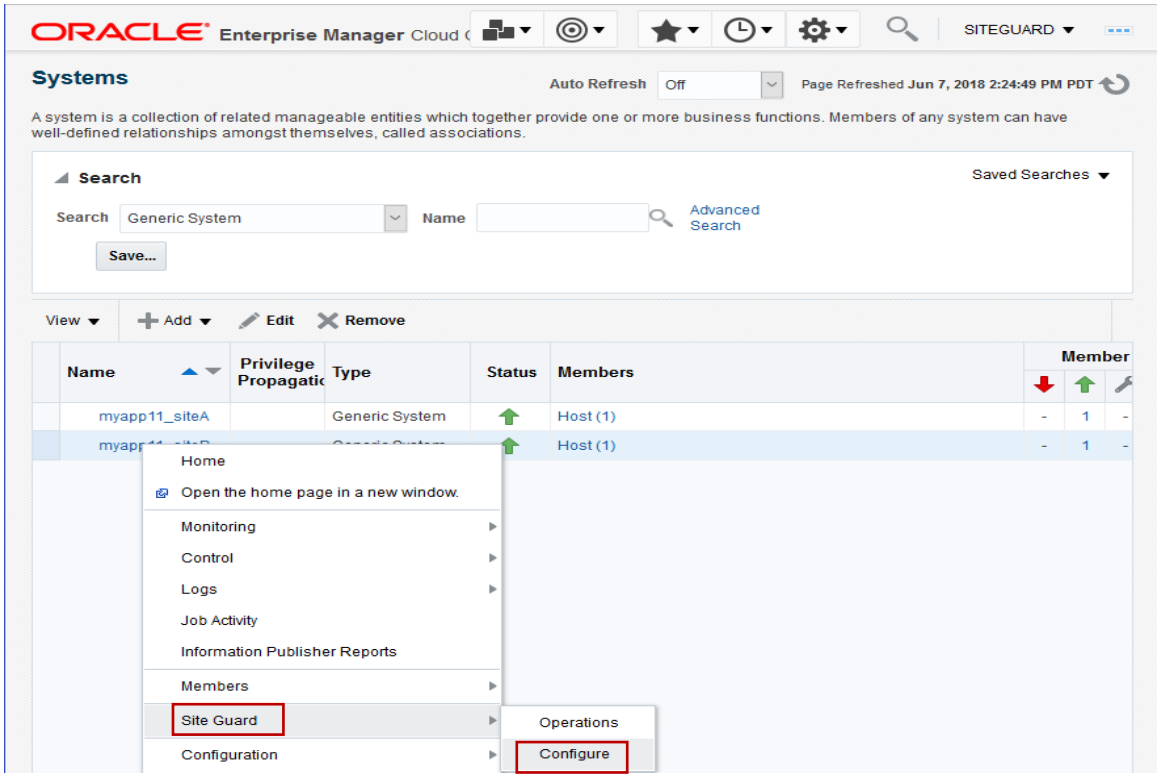


Step 4.2: Setup Site Guard Configuration For Standby System

Select the Standby System, *myapp11_siteB.*

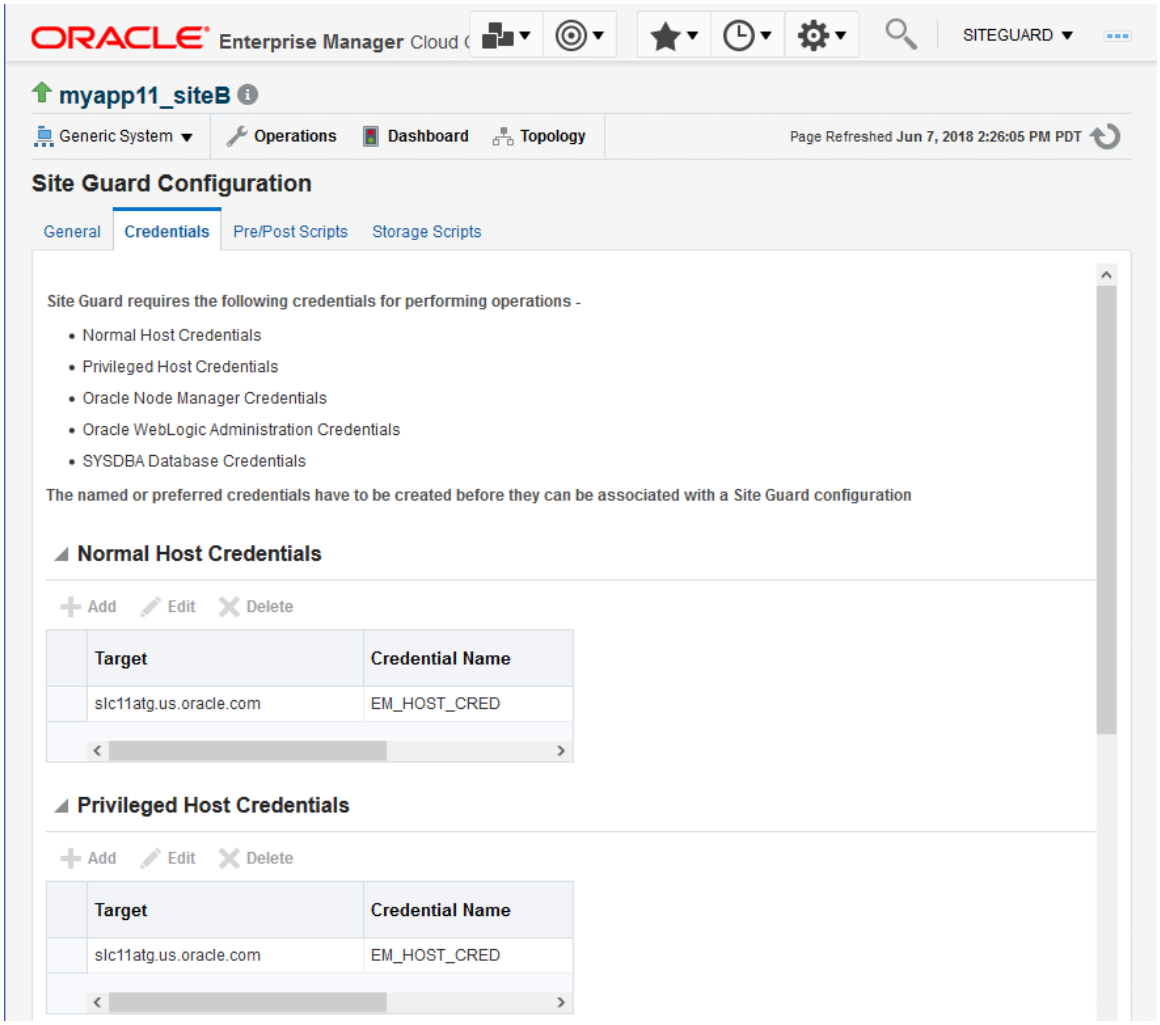


Right-click *myapp11_SiteB,* select *Site Guard* then *Configure* from the sub-menu.



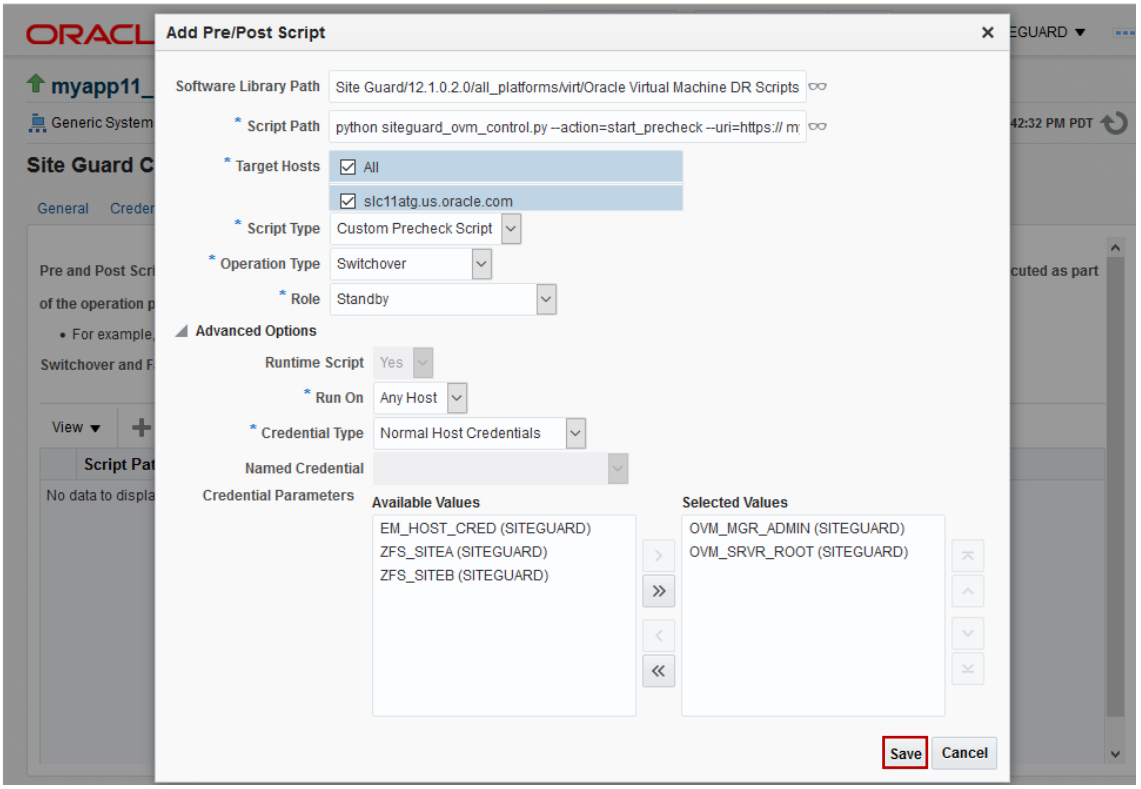
Step 4.2.1: **Add Standby System Named Credentials**

Add the Normal Host and Privileged Host credentials for the myapp11_siteB host member that will execute the Site Guard scripts.



Step 4.2.2: **Add Standby System Custom Precheck Script**

The start_precheck script verifies that all conditions required to successfully switchover the specified VM's are met. Note the Credential Parameters specified in Advanced Options. The script requires credentials to access both the Oracle VM Manager and an Oracle VM Server. Click *Save*

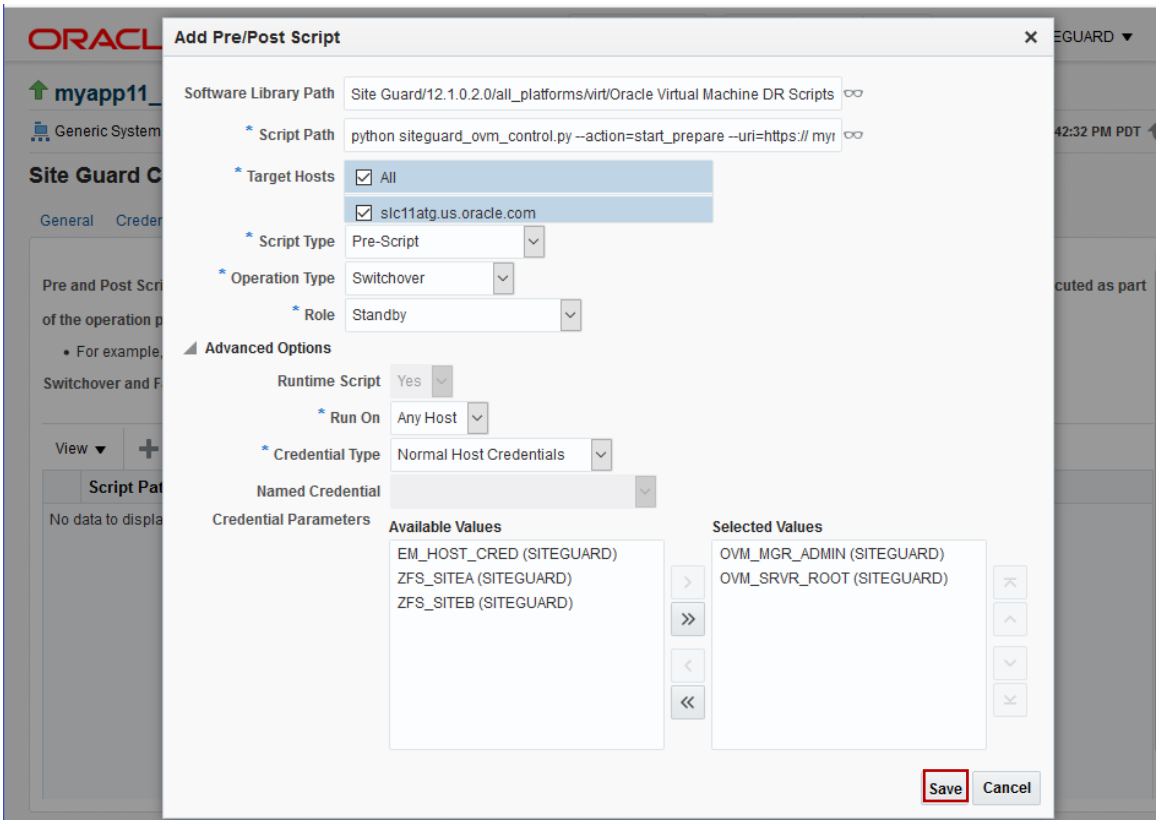


python siteguard_ovm_control.py --action=start_precheck --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB_pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' --nocert

- --action: start_precheck
- --uri: The URL for SiteB OVM Manager REST requests.
- --pool: The OVM Server Pool that VM's are assigned to
- --vm: list of VM/OVM repository pairs to precheck: <VM | *>:<OVM Repo>, '*' specifies all VM's in the OVM repository.
- --nocert: Do not check for certificates

Step 4.2.3: **Add Standby System Pre Scripts**

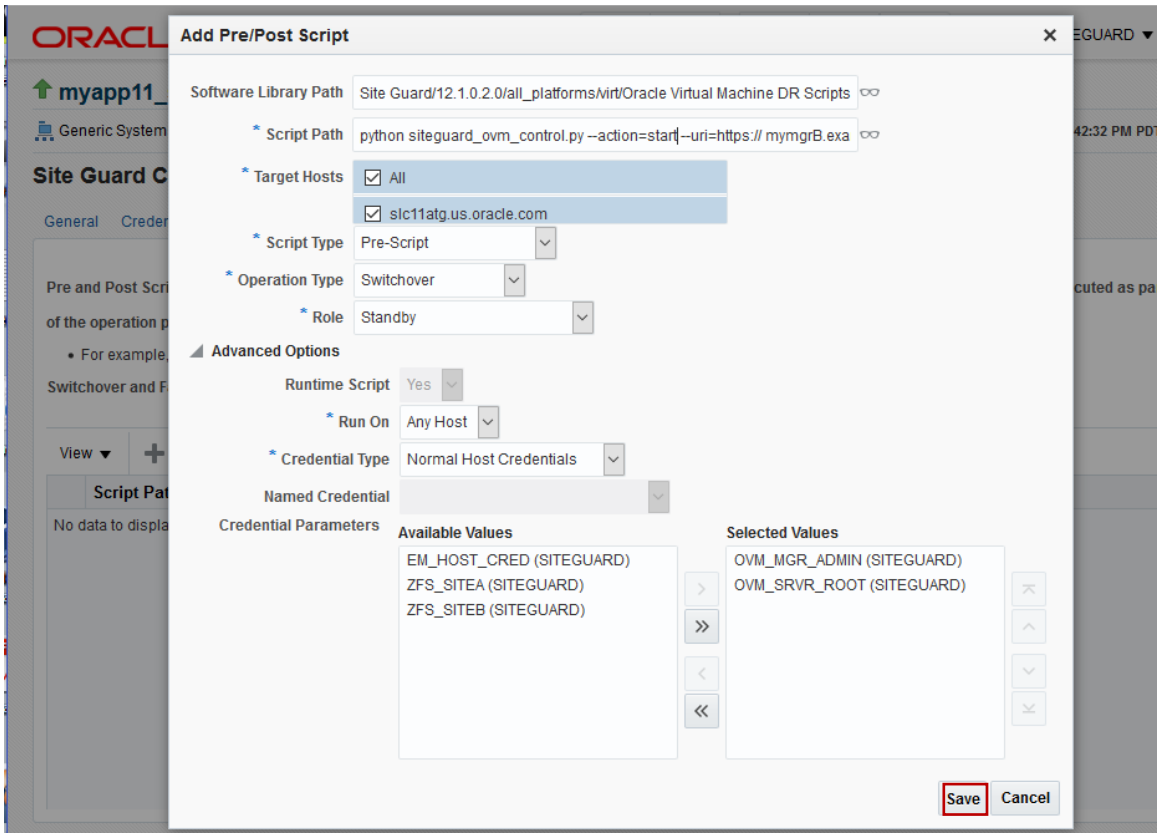
Add start_prepare script. This script performs all the steps required to switchover the Standby site to be the new Primary site. Click *Save.*



python siteguard_ovm_control.py --action=start_prepare --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB_pool1' --repo='myapp11_repo1:myzfsSiteB-nfs:nfs,myapp11_repo2:myzfsSiteB-iscsi:iscsi' --nocert

- --action: start_prepare
- --uri: The URL for SiteB OVM Manager REST requests.
- --repo: list of OVM repositories to switchover to the new primary site: <OVM repo>:<OVM Storage Server>:<Storage Type>
- --nocert: Do not check for certificates

Add start script. This script starts the switched over VM's on the new Primary site. Click *Save*.



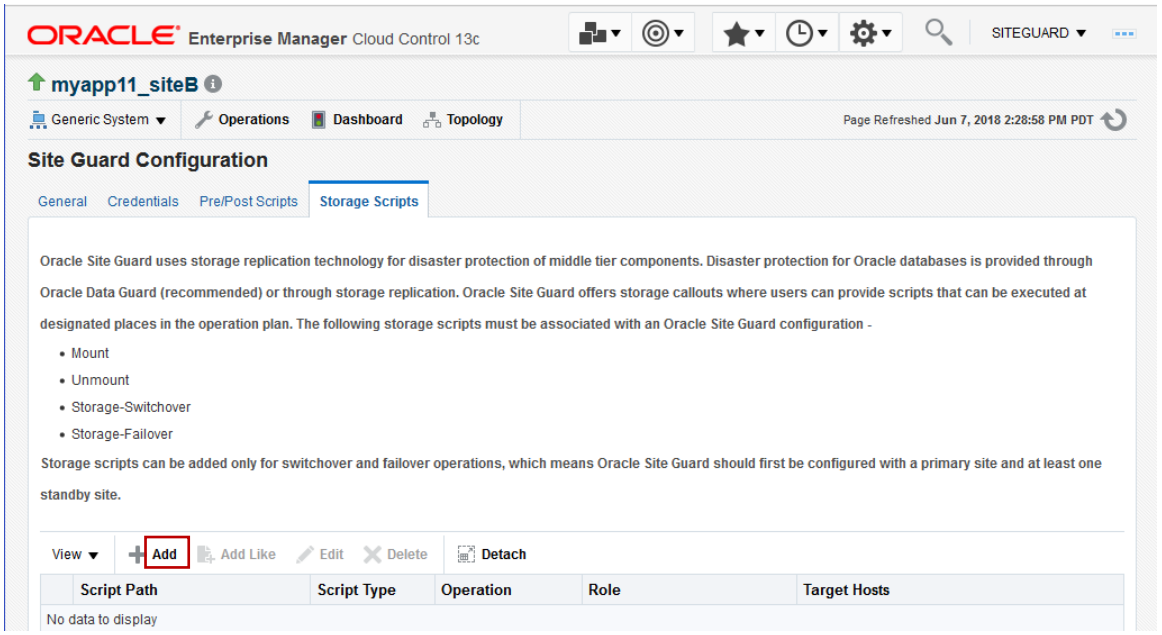
python siteguard_ovm_control.py --action=start --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB_pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' –nocert

- --action: start the VM's specified in the –vm argument.
- --uri: The URL for SiteB OVM Manager REST requests.
- --pool: The OVM Server Pool that VM's are assigned to.
- --vm: list of VM/OVM repository pairs to start: <VM | *>:<OVM Repo>, '*' specifies all VM's in the OVM repository.
- --nocert: Do not check for certificates

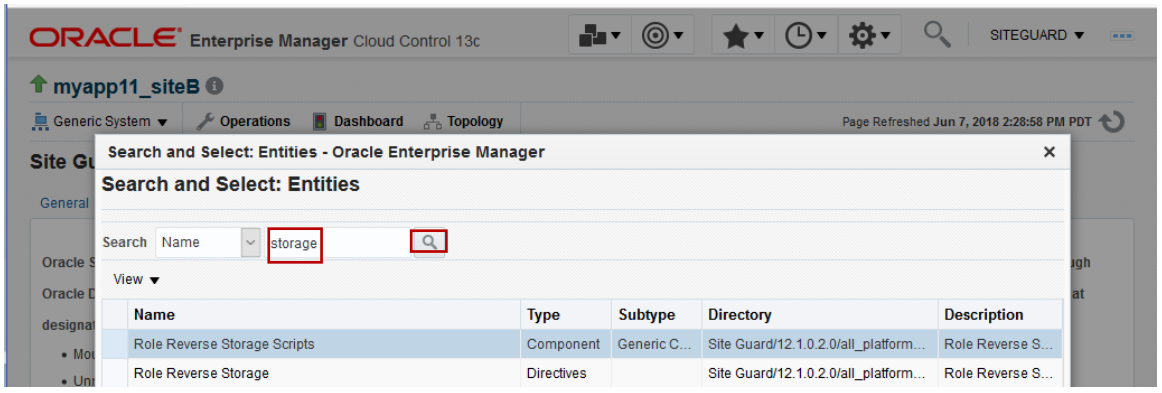
Step 4.2.4: **Add Storage Script for Storage Reversal**

Add zfs_role_reversal.sh storage script to change the Oracle ZFS Storage Appliance at *SiteB* from target to source in support of Primary to Standby Switchover operation plan.

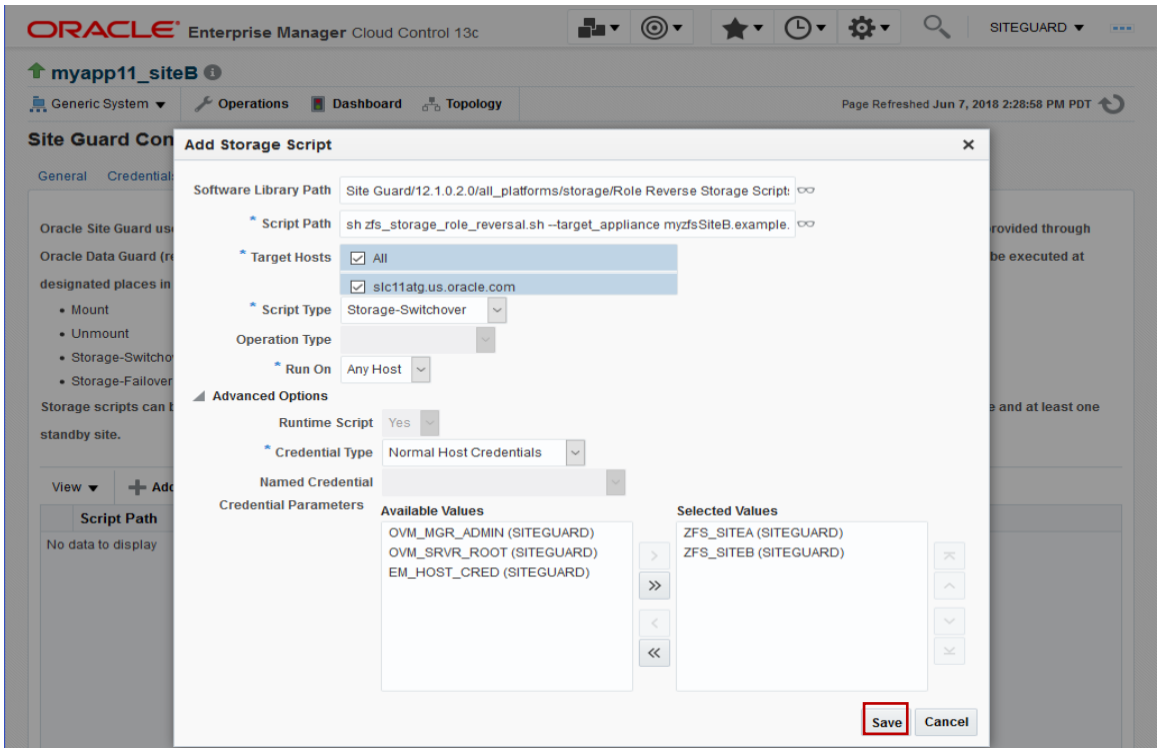
Select the *Storage Scripts* tab and click *Add.*



The storage scripts reside in the Site Guard Storage software library path. Enter ‘storage’ in the search edit box and click the search icon



Select the credentials to access both the SiteA and SiteB ZFS Storage Appliances in order. Click *Save.*



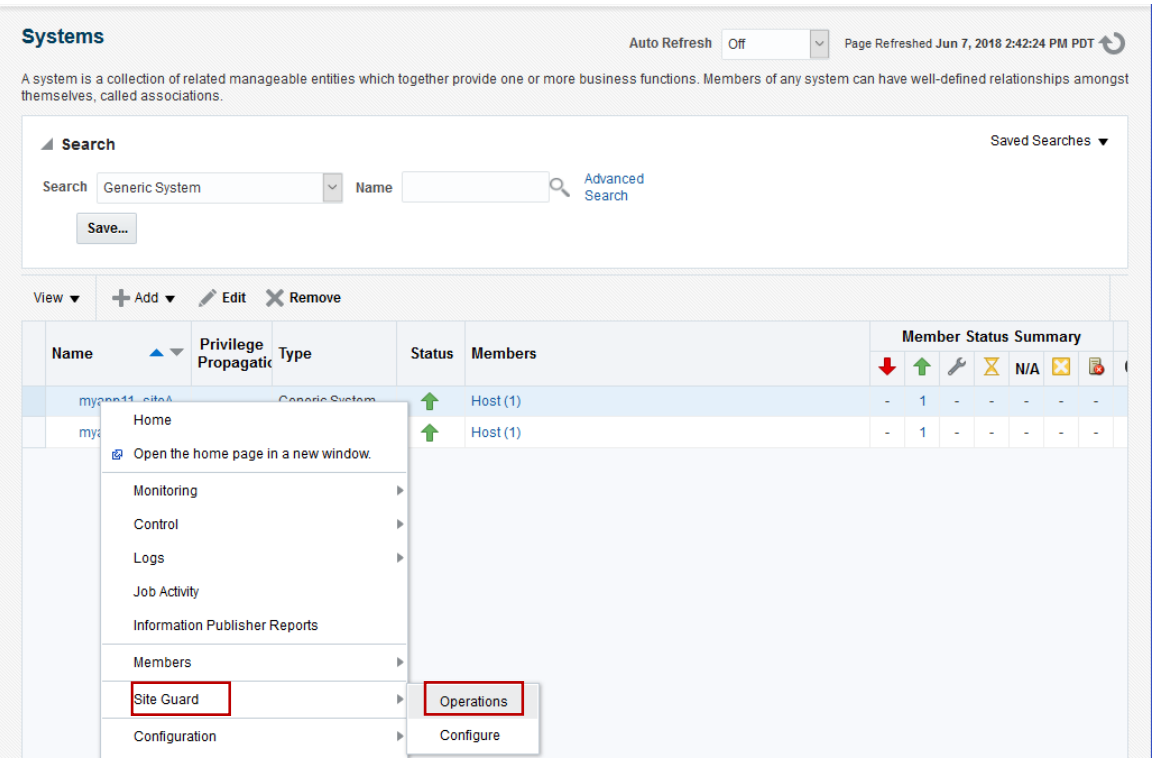
sh zfs_storage_role_reversal.sh --target_appliance myzfsB1.example.com --source_appliance myzfsA1.example.com --project_name myapp11 --target_pool_name pool1 --source_pool_name pool1 --is_sync_needed Y --continue_on_sync_failure N --sync_timeout 1800 --operation_type switchover

- --target_appliance: ZFS Storage Appliance with replicated storage prior to role reversal.
- --source_appliance: ZFS Storage Appliance with active storage prior to role reversal.
- --target_pool_name: The pool that contains the replicated storage on the target appliance.
- --source_pool_name: The pool that contains the active storage on the source appliance.
- --operation_type: switchover.
- Optional parameters
    - --is_sync_needed:
    - --continue_on_sync_failure:
    - --sync_timeout:

Step 4.3: Create Oracle Site Guard Operation Plans

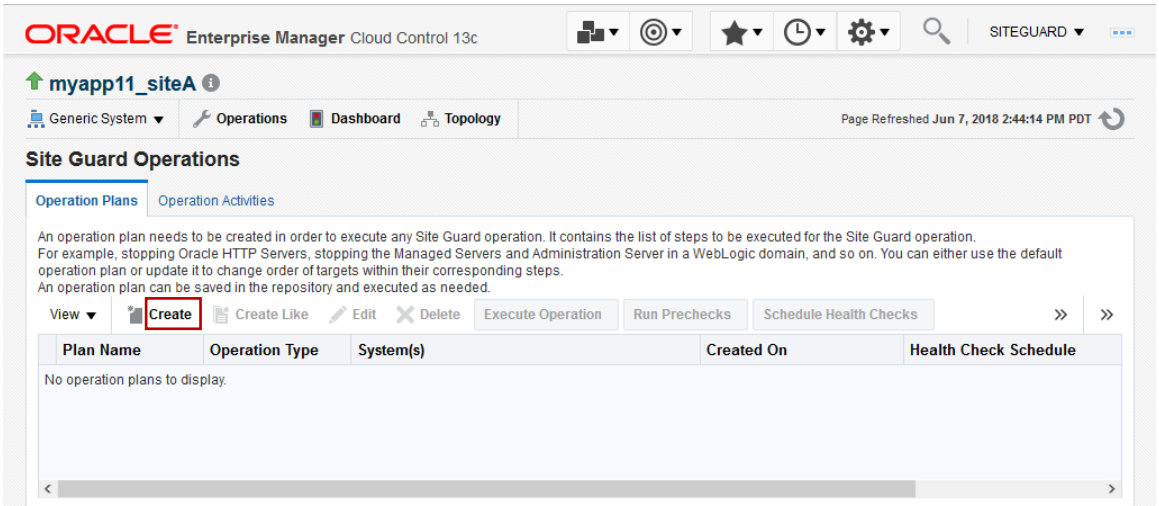
Step 4.3.1: **Create Operation Plans for Primary System**

From the *Systems* page right click on the Primary system, *myapp11_SiteA,* select *Site Guard* and select *Operations* from the sub-menu.



Step 4.3.2: **Create Primary to Standby Switchover Operation Plan**

Click the *Create* on the *Operation Plans* tab.



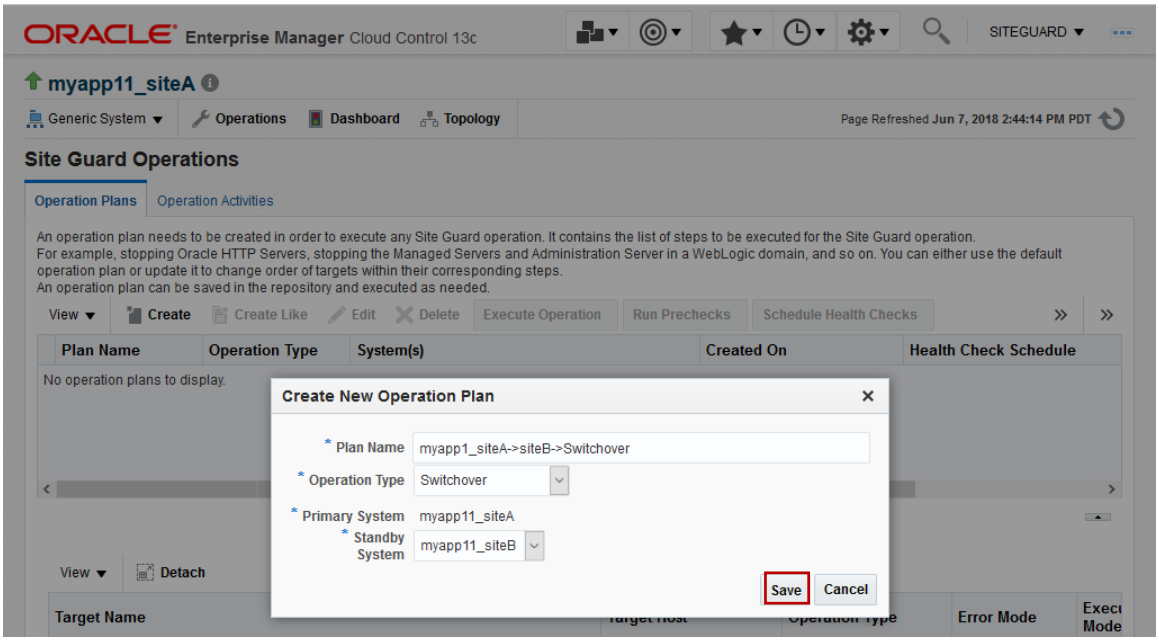
Enter Operation Plan parameters:

Plan name: myapp1_siteA->siteB->Switchover

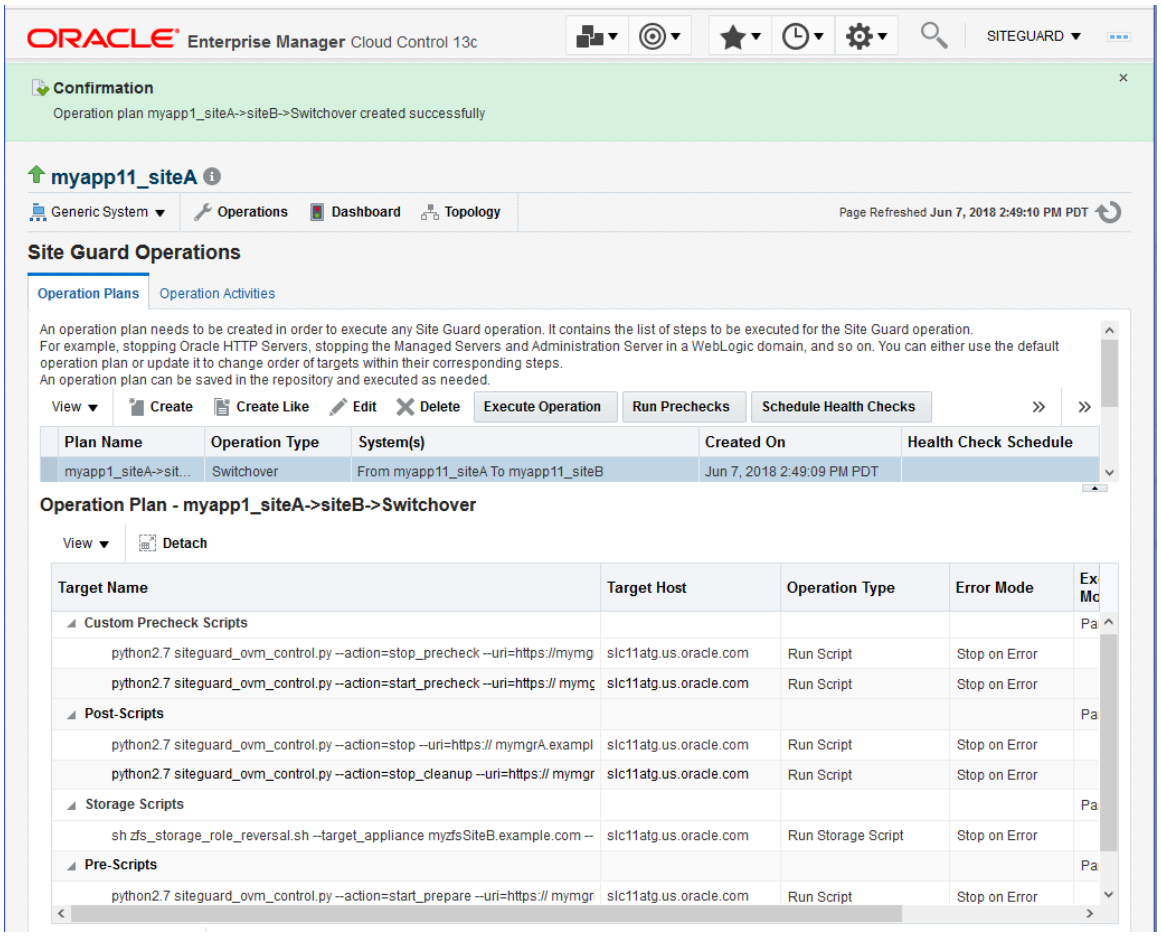
Operation Type: Switchover

Standby System: myapp11_siteB

Click *Save*



On successful creation, the Site Guard Operation Plans tab will display the all of the job steps configured to perform the switchover operation



Step 4.3.3: **Verify Operation Plan Step Run Mode and Sequence**

The plan steps will default to Run Mode of ‘Parallel’. For OVM DR each plan step must execute serially. Edit the operation plan and set the Run Mode of each plan step to ‘Serial’.

The Operation Plan Post-Scripts and Pre-Scripts must execute actions in this sequence:

» Post-Scripts
  » stop
  » stop_cleanup
» Pre-Scripts
  » start_prepare
  » start

If needed, you can edit the operation plan and use the ‘Move Up’ and ‘Move Down’ buttons to correct the sequence.

Site Guard Oracle VM Failover

Failover is the transition of Oracle VM guests to a standby site when the primary site is out of service. The detailed steps to configure Oracle VM failover using Site Guard are described in *Appendix B*. Site Guard operation plans are created that failover all VM guests in *myapp11_repo1* and *myapp11_repo2* from *SiteA* to *SiteB*. The high-level steps Site Guard will perform are:

- ZFS Role Reversal
  - Reverse remote replication such that the active ZFS shares that contain *myapp11_repo1* and *myapp1_repo2* are on the SiteB ZFS Storage Appliance, '*myzfsB1*'. Configuring remote replication to the SiteA ZFS Storage Appliance is not part of failover as it is not in service.
- On *SiteB* Oracle VM Manager, '*mymgrB*'
  - Take ownership of the *myapp11_repo1* and *myapp11_repo2* repositories
  - Present the repositories to server pool '*SiteB_pool1'*
  - Assign the VM guests to server pool '*SiteB_pool1'*
  - Start the VM guests

Validate DR environment using Site Guard

- Ensure Site Guard is able to successfully transition application workloads between DR sites.
- Practice Oracle VM Disaster Recovery using Site Guard under simulation conditions and ensure that it works in both directions.
- This whitepaper addresses the technical aspects of Oracle VM DR using Site Guard. Ensure that the non-technical aspects of Oracle VM DR are part of planning and included in practice scenarios.
- Turn Disaster Recovery environment over to operations

Appendix A: Primary to Standby Switchover Example

For Primary to Standby System Switchover, add these scripts to the Primary and Standby Systems:

TABLE 1: PRIMARY SYSTEM POST SCRIPT EXAMPLES FOR SWITCHOVER

Script Type	Example
custom precheck	python siteguard_ovm_control.py --action=stop_precheck --uri=https://mymgrA.example.com:7002/ovm/core/wsapi/rest --pool='SiteA_pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' --nocert
post-script	python siteguard_ovm_control.py --action=stop --uri=https:// mymgrA.example.com:7002/ovm/core/wsapi/rest --pool='SiteA_ pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' --nocert
post-script	python siteguard_ovm_control.py --action=stop_cleanup --uri=https:// mymgrA.example.com:7002/ovm/core/wsapi/rest --pool='SiteA_ pool1' --repo='myapp11_repo1:myzfsSiteA-nfs:nfs,myapp11_repo2:myzfsSiteA-iscsi:iscsi' --nocert

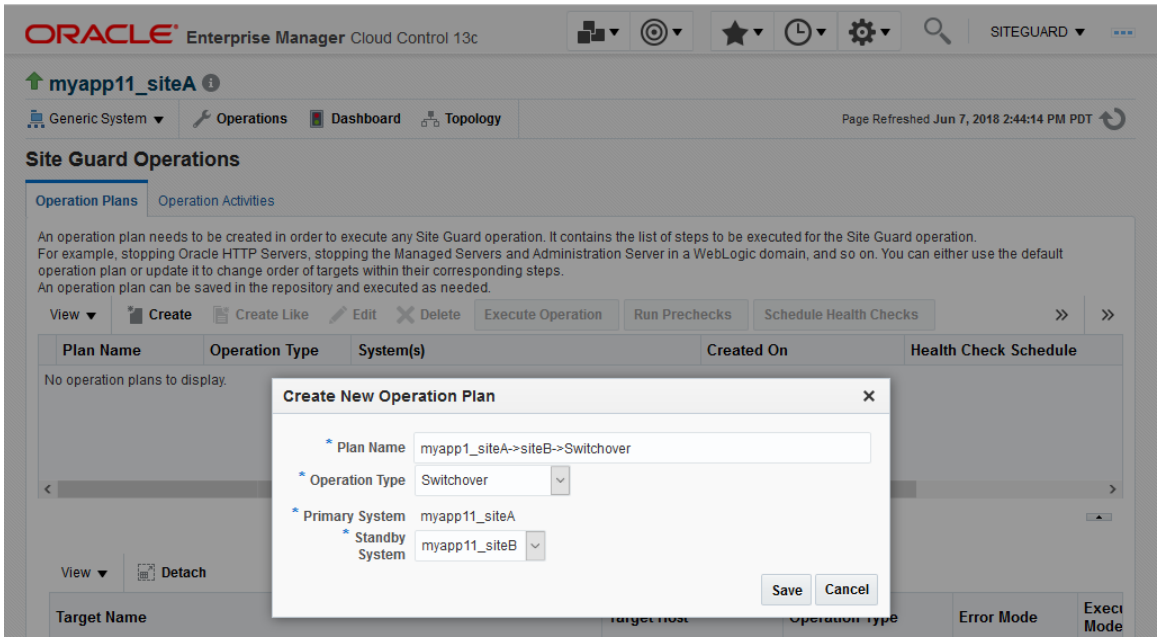
TABLE 2: STANDBY SYSTEM PRE SCRIPT EXAMPLES FOR SWITCHOVER

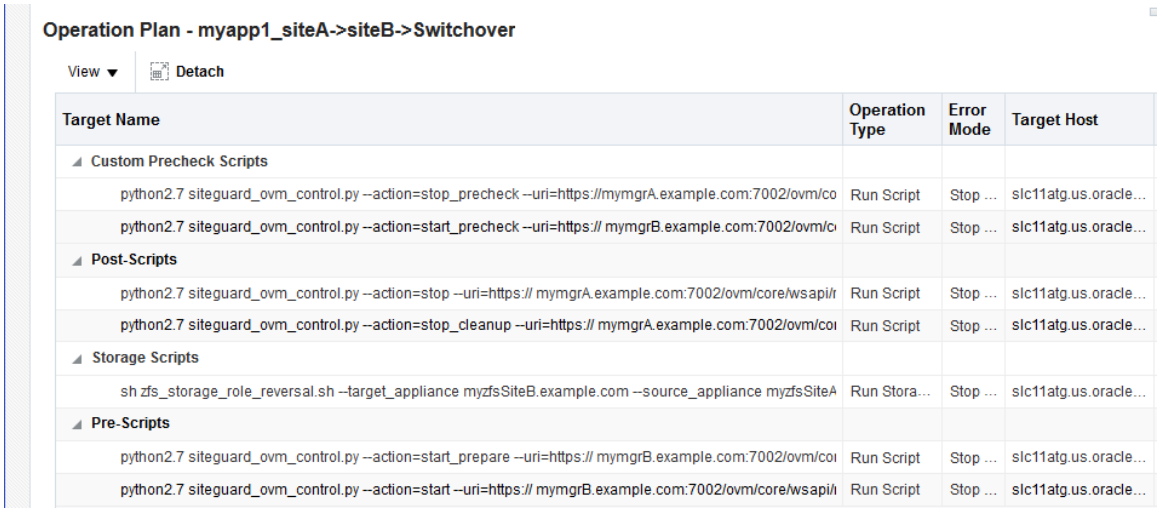
Script Type	Example
custom precheck	python siteguard_ovm_control.py --action=start_precheck --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB _pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' --nocert
pre-script	python siteguard_ovm_control.py --action=start_prepare --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB_pool1' --repo='myapp11_repo1:myzfsSiteB-nfs:nfs,myapp11_repo2:myzfsSiteB-iscsi:iscsi' --nocert
pre-script	python siteguard_ovm_control.py --action=start --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB_pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' --nocert

TABLE 3: STANDBY SYSTEM STORAGE SCRIPT EXAMPLES FOR SWITCHOVER

Script Type	Example
Storage-Switchover	sh zfs_storage_role_reversal.sh --target_appliance myzfsB1.example.com --source_appliance myzfsA1.example.com --project_name myapp11 --target_pool_name pool1 --source_pool_name pool1 --is_sync_needed Y --continue_on_sync_failure N --sync_timeout 1800 --operation_type switchover

Create the Switchover Operation Plan on the Primary System:





IMPORTANT: The plan steps will default to Run Mode of ‘Parallel’. For OVM DR each plan step must execute serially. Edit the operation plan and set the Run Mode of each plan step to ‘Serial’. The Operation Plan Post-Scripts and Pre-Scripts must also execute actions in a specific sequence, please refer to *Step 4.3.3*.

Appendix B: Primary to Standby Failover Example

For Primary to Standby System Failover add these scripts to the Standby System:

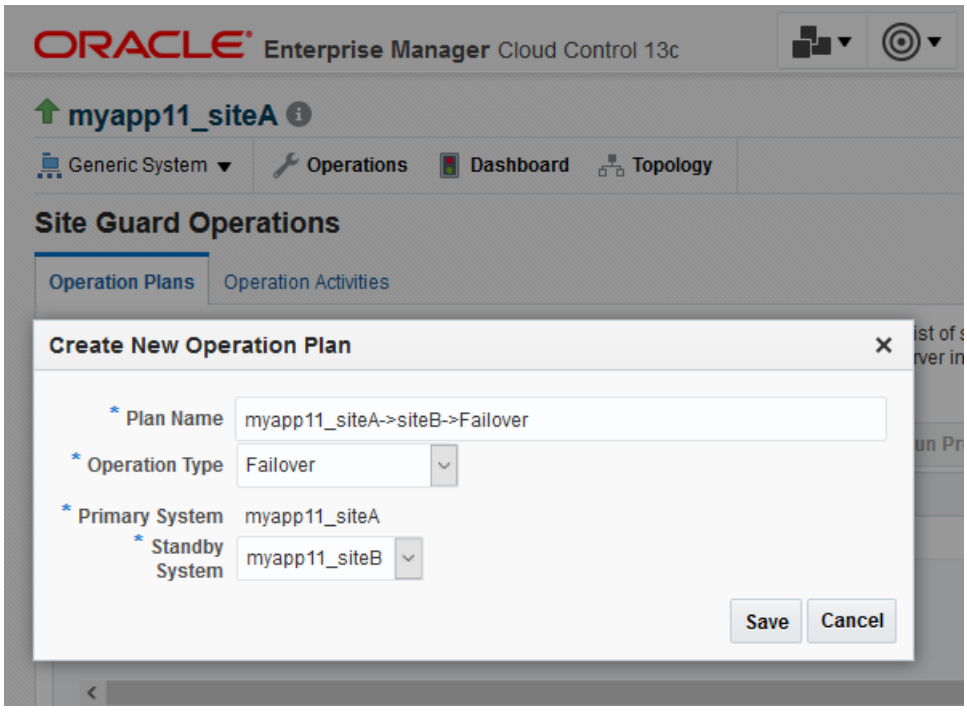
TABLE 1: STANDBY SYSTEM PRE SCRIPT EXAMPLES FOR SWITCHOVER

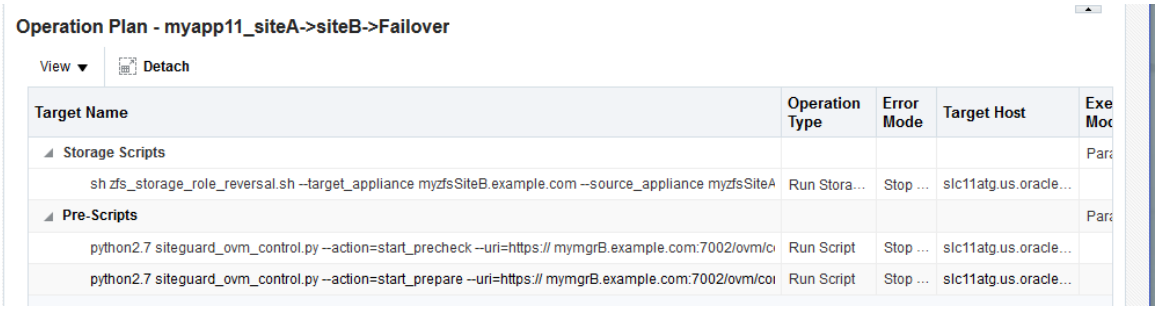
Script Type	Example
custom precheck	python siteguard_ovm_control.py --action=start_precheck --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB _pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' --nocert
pre-script	python siteguard_ovm_control.py --action=start_prepare --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB_pool1' --repo='myapp11_repo1:myzfsSiteB-nfs:nfs,myapp11_repo2:myzfsSiteB-iscsi:iscsi' --nocert
pre-script	python siteguard_ovm_control.py --action=start --uri=https:// mymgrB.example.com:7002/ovm/core/wsapi/rest --pool='SiteB_pool1' --vm='*:myapp11_repo1,*:myapp11_repo2' --nocert

TABLE 2: STANDBY SYSTEM STORAGE SCRIPT EXAMPLES FOR SWITCHOVER

Script Type	Example
Storage Failover	sh zfs_storage_role_reversal.sh --target_appliance myzfsB1.example.com --source_appliance myzfsA1.example.com --project_name myapp11 --target_pool_name pool1 --source_pool_name pool1 --is_sync_needed Y --continue_on_sync_failure N --sync_timeout 1800 --operation_type failover

Create the Failover Operation Plan on the Primary System:





IMPORTANT: The plan steps will default to Run Mode of ‘Parallel’. For OVM DR each plan step must execute serially. Edit the operation plan and set the Run Mode of each plan step to ‘Serial’. The Operation Plan Pre-Scripts must also execute actions in a specific sequence, please refer to *Step 4.3.3*.

Appendix C: Additional Software Requirements

The Site Guard OVM scripts have additional software requirements:

- Python 2 version 2.7 and higher or Python 3 version 3.4 and higher
- Python requests package (ex. pip install requests)
- Python pexpect package 4.x and higher

Install the additional software on the host that will execute the Site Guard OVM DR scripts. Learn about installing python packages here.

Appendix D. How to setup a service host for Site Guard use

These instructions will create a service host VM guest using an official Oracle 7 Linux VM assembly. If you create VM guests using an ISO image skip to step 3 after the virtual machine is created.

1. Download Oracle VM 3 Template for Oracle 7 Linux
   1.1. Go to Oracle Software Delivery Cloud
   1.2. Sign in using your Oracle account
   1.3. Choose 'Release' from the select list
   1.4. Search for 'Oracle VM 3 Templates for Oracle Linux 7'
   1.5. Add 'REL: Oracle VM3 Templates for Oracle 7 Linux' to the Cart
   1.6. Select Checkout and download the latest template
   1.7. Follow instructions to install the template into a Repository
2. Create a Virtual Machine
   2.1. From the Oracle VM Manager console click on the 'Create Virtual Machine' icon
   2.2. Select 'Clone from an existing VM Template'
   2.3. Select the Repository containing the Oracle VM 3 Template for Oracle Linux 7
   2.4. Select the Oracle Linux 7 VM assembly
      2.4.1. Example: OVM_OL7U6_x86_64_PVHVM.ova
   2.5. Click 'Finish'
3. Follow steps in MOS note 2017593.1 to add the 192.168.4.0 internal network to Oracle VM Manager
4. Update the service host networking
   4.1. Select the Virtual Machine from the Virtual Machines list
   4.2. Select the Edit icon
   4.3. Click on the Networks tab
   4.4. Select vm_public network for Slot 0
   4.5. Select 192.168.4.0 network and click 'Add VNIC' to create Slot 1
5. Complete network setup of the service host
   5.1. Start the Virtual Machine
   5.2. Open the Virtual Machine console
   5.3. Follow the prompts on the console to configure eth0
   5.4. When prompted for IP addresses for DNS, enter the 192.168.4.x name servers. You can get these from /etc/resolv.conf on one of the OVM Servers.
   5.5. Plumb the eth1 interface using 192.168.4.9x/24, where 9x is 90-99. The last octet must not already be in use.
6. Update to the latest Oracle 7 Linux

6.1. Setup up proxy if needed
6.2. Execute: yum update
6.3. Execute: ol_yum_configure.sh
6.4. Execute: reboot

7. After reboot log in as root and install the required Python packages:
   7.1. Execute: yum install bind-utils
   7.2. Execute: yum install oracle-epel-release-el7.x86_64
   7.3. Execute: yum update
   7.4. Execute: yum install python2-pip
   7.5. Execute: pip --proxy http://x.x.x.x:p install --upgrade pip
   7.6. Execute: pip --proxy http://x.x.x.x:p install pexpect
   7.7. Execute: pip --proxy http://x.x.x.x:p install requests
8. Disable iptables or add matching rules
   8.1. Example: systemctl stop iptables
9. Install an EM Agent on the service host from the controlling Oracle Enterprise Manager Infrastructure
   9.1. See Installing Oracle Management Agents

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Integrated Cloud Applications & Platform Services

Oracle VM 3: IMPLEMENTING ORACLE VM DR USING SITE GUARD
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