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# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

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## About this document

This guide provides a comprehensive documentation of the considerations and configuration steps required for using [VMware® Live Site Recovery™ \(VLSR\)](#) to protect and recover a reference multi-tiered set of business-critical applications from a source VMware datacenter (on-premises or cloud-based) to a supported target VMware datacenter (on-premises or cloud-based), with the least cost (time, financial, and administrative intervention) possible.

## Audience

Technical architects, administrators, or operators can use this guide as a foundation to build similar solutions for their own enterprise infrastructure.

## What we don't include in this document

This guide demonstrates how to use VMware Live Site Recovery to protect virtualized business critical applications on VMware vSphere® installed on-premises or in a hybrid cloud. Because we assume you're familiar with the general concepts of business continuity and recovery, we don't define or explain such concepts in detail. We also don't discuss or explain the setup, configuration, operation, or administration of VMware Live Site Recovery, virtualization, a VMware hybrid cloud or the applications and services hosted on or provided by the protected workloads.

We assume you've configured the infrastructure to perform these tasks:

- [Installation, setup, configuration and/or administration of VMware vSphere infrastructure](#)
- [Installation, setup, configuration and/or administration of specific VMware vSphere-based Cloud infrastructure](#)
- [Installation, setup, configuration and/or administration of VMware Live Site Recovery](#)
- [Virtualizing Active Directory Domain Services on VMware vSphere](#)
- [Architecting Microsoft SQL Server on VMware vSphere](#)
- [Installation, setup, configuration and/or administration of Microsoft Active Directory Domain Services or Domain Controllers](#)
- [Installation, setup, configuration and/or administration of Microsoft SQL Server, Windows Failover Cluster or Always On](#)
- [VMware vSphere Client](#)

This document doesn't include detailed descriptions of these topics.

## Before you begin

### Requirements

You should complete the following tasks before continuing with the instructions in this guide:

- Set up network connectivity for:
  - The **protected site**: This is the source infrastructure.
  - The **recovery site**: A new or existing VMware Cloud Foundation® environment or any of the publicly available brands of the VMware cloud infrastructure options, such as Azure VMware Solution (AVS), or Google Cloud VMware Engine (GCVE).

**Note:** The VMware cloud brand and version dictates the type of network connectivity type required for VMware Live Site Recovery. Consult the cloud provider's guides for more information.

- Install VMware Live Site Recovery on both the protected and recovery sites.
- On each of the sites, install VMware vSphere Replication appliances in the same VMware vCenter® where the VMware Live Site Recovery instance is registered.
- Configure the VM IP addresses, DNS server IP addresses, network segment, and datastore required to complete the protection and recovery plans.
- Make sure all the VMs that will be protected and recovered have an up-to-date version of VMware Tools installed

**Note:** This is a standard recommendation, but it's especially relevant if the VMs will be reconfigured or customized as part of the recovery process.

### Terms to know

#### Cold site recovery

Distributing servers and services over multiple datacenters is a common business continuity and disaster recovery (BCDR) strategy, but a cloud-based solution can reduce the associated costs of maintaining a dedicated disaster recovery (DR) site like staffing, cooling, heat, and duplicate hardware. You can further reduce these associated costs by minimizing the actual utilization of the cloud-located resources until it is necessary to do so: when an actual disaster event has happened, or during a simulation, testing, or validation exercise. This type of "use only when needed" utilization is commonly described as having a cold site for BCDR. In this configuration, live (hot) devices, servers, and services aren't hosted in the target DR site. This saves you money and resources in your BCDR systems. We demonstrate how VMware Live Site Recovery achieves this cost-saving objective while providing a simplified, flexible, automated, and repeatable BCDR solution for your enterprise.

#### Application high availability

The ability of an application to function and deliver services even when one or more of its components fail is the focus of **application high availability (HA)**. The resilience of this application—whether native or through the use of

third-party solutions or add-ons—determines its capacity to withstand and recover from failures. The combination of Microsoft SQL Server Always On and Windows Server Failover Clustering (WSFC) provides application-level resilience in the scenario described in this guide. Because of these features, Microsoft SQL Server services can remain available after a brief interruption even when the original server providing the service has become unavailable for any reason. WSFC restores its resources on a functioning node in the event of the original server failure, typically without the need for administrative intervention.

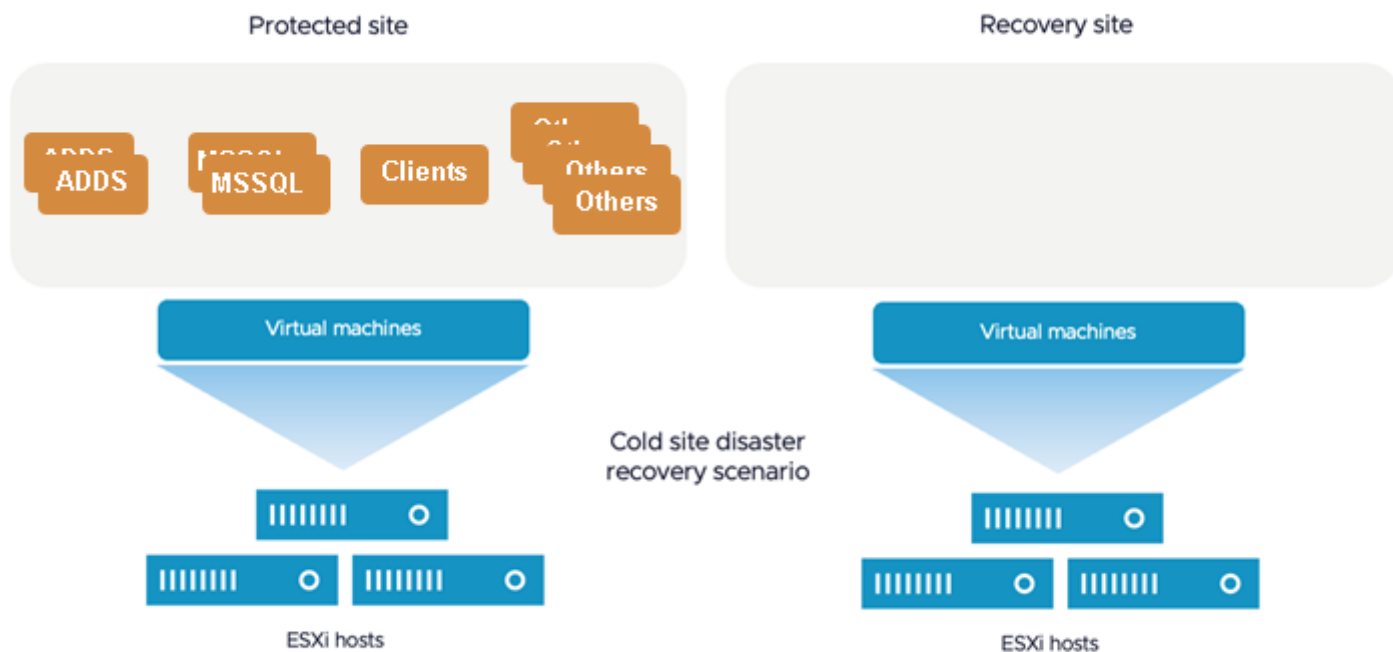
## Disaster recovery event

A **disaster recovery (DR) event** is a failure that affects more than one server or part of the system. A DR event is a collection of multiple HA events that can't be easily fixed by the resilience of an application, component, or service. Because it's not usually transient in nature, the effects of a DR event are more impactful, disruptive, and destructive. Recovering from a DR event is more difficult, more expensive, and slower than recovering from a HA event. This is because multiple layers of the infrastructure are affected. In turn, this means that planning and getting ready for a DR event costs more.

## Architecture

We configured a VCF-based protected site on-premises with several VMs. These VMs are part of a multi-tiered mission-critical workloads. Some VMs are Domain Controllers providing Active Directory Domain Services (ADDS) for the infrastructure, and the rest are VMs running Microsoft SQL Server instances (MSSQL). We are replicating these VMs to a remote VCF-based infrastructure, configured as our cold DR site. The protected site could be on-premises, or in a VMware-supported cloud environment. The same is true for the recovery site.

The following figure shows our setup. For the exercises in this guide, your setup will be similar.



## Applications

We chose three applications that show the capabilities of automation, orchestration, and the recovery tasks possible with VMware Live Site Recovery:

- Windows Active Directory Domain Controllers
- Microsoft SQL Server
- Windows client

### Windows Active Directory Domain Controllers

Most BCDR plans include considerations and provisions for Domain Controllers because most applications depend on the services they provide, so they are common in most enterprise network infrastructure. Recovering modern versions of Windows Domain Controllers (anything newer than Windows Server 2008 R2) in the event of a disaster is somewhat difficult and can be complicated in our DR scenario. This is partly due to the security features Microsoft introduced into virtualized Domain Controllers beginning in Windows Server 2012. This guide addresses this issue and shows how VMware Live Site Recovery helps minimize these challenges.

## Microsoft SQL Server

Because of its integration with so many front-end applications, services, and solutions, Microsoft SQL Server is one of the most prevalent business-critical applications found in any Microsoft-based corporate IT infrastructure. SQL Server has native, built-in resilience to maximize its availability and minimize the possibility of service disruption in the event of an outage. Combining Windows Server Failover Cluster (WSFC) with the SQL Server Always On feature is a high availability option that ensures faster service availability, particularly for databases, in the event of a node failure. Even then, this resilience is more useful and intended for high availability (which protects against component or service failures) rather than for disaster recovery events.

## Windows client

We chose an ordinary Windows client from which we tested connectivity and access to the servers and services we recovered in our failure scenarios.

## How to set up the business continuity/disaster recovery environment and workflow

Let's jump into the VMware Live Site Recovery configuration. For most exercises in this section, you'll need access to the [vSphere Client](#). You'll also confirm the functionality of the recovered workloads inside these applications: Windows OS, Active Directory domain services (ADDS), and SQL Server.

Make sure you read the **Before you begin > Requirements** section above. This includes [installing and configuring VMware Live Site Recovery](#).

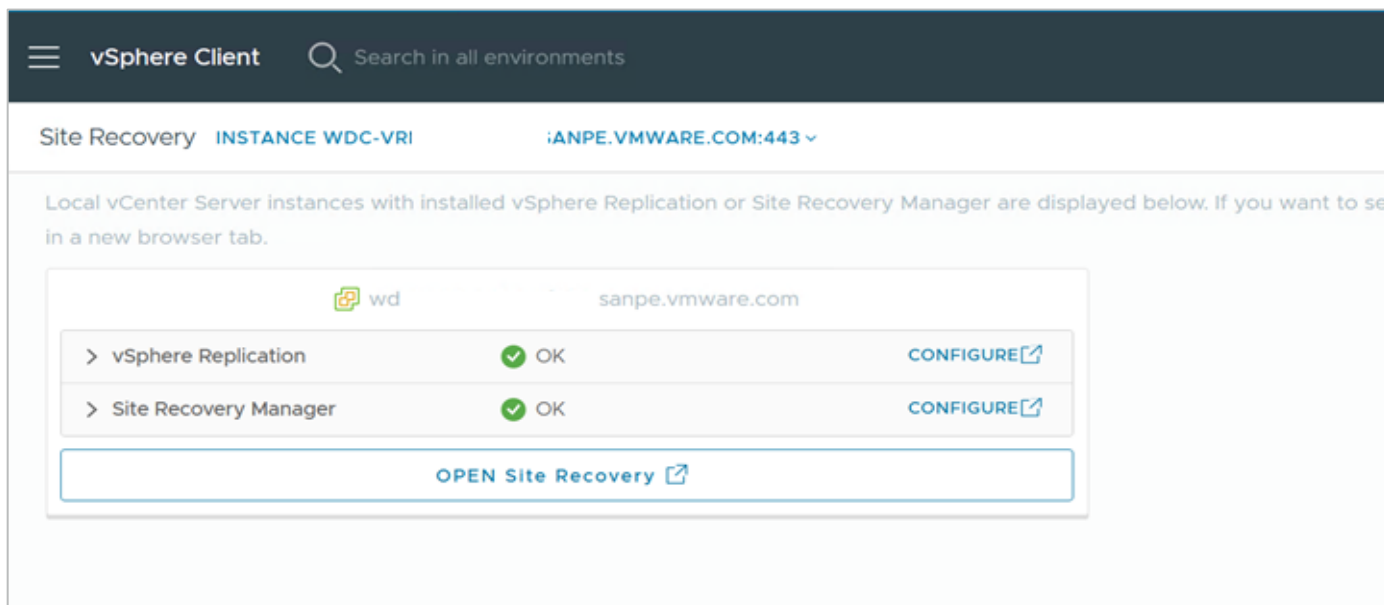
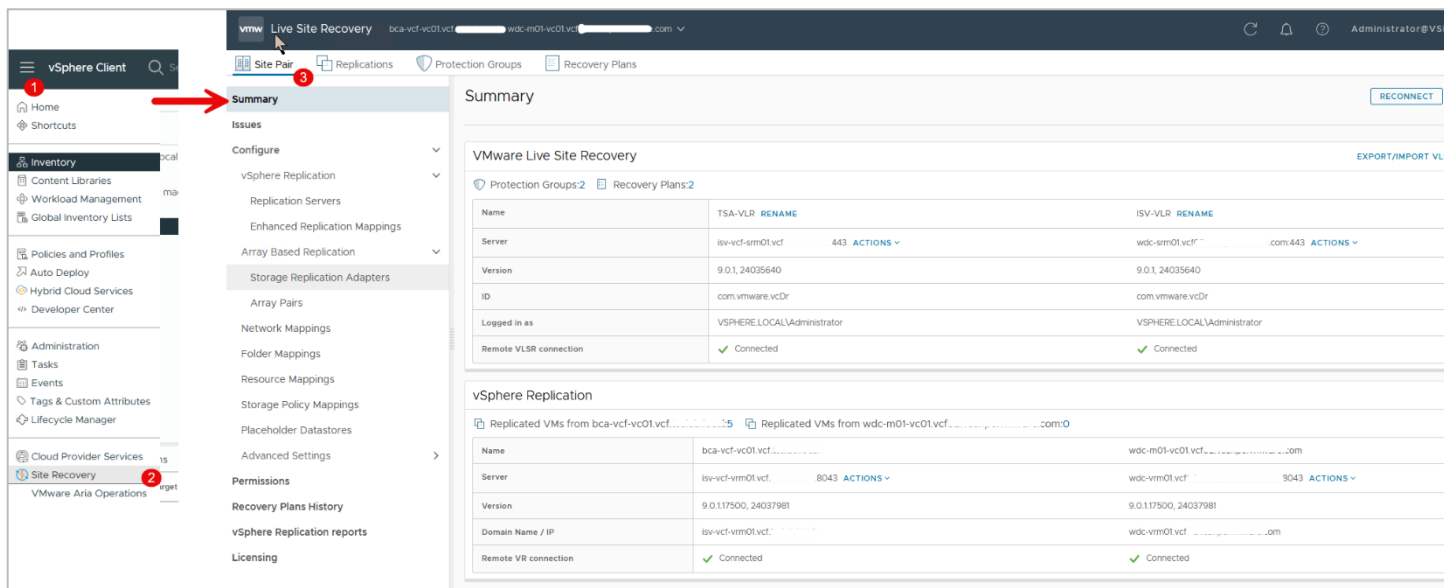
## Pair the recovery and protected sites

Here, we'll connect the vCenter and VMware Live Site Recovery instances on each site to one another. This is called pairing the sites.

1. In the vSphere Client on the recovery site's vCenter, select **Site Recovery**. The **Summary** page appears, as shown below.

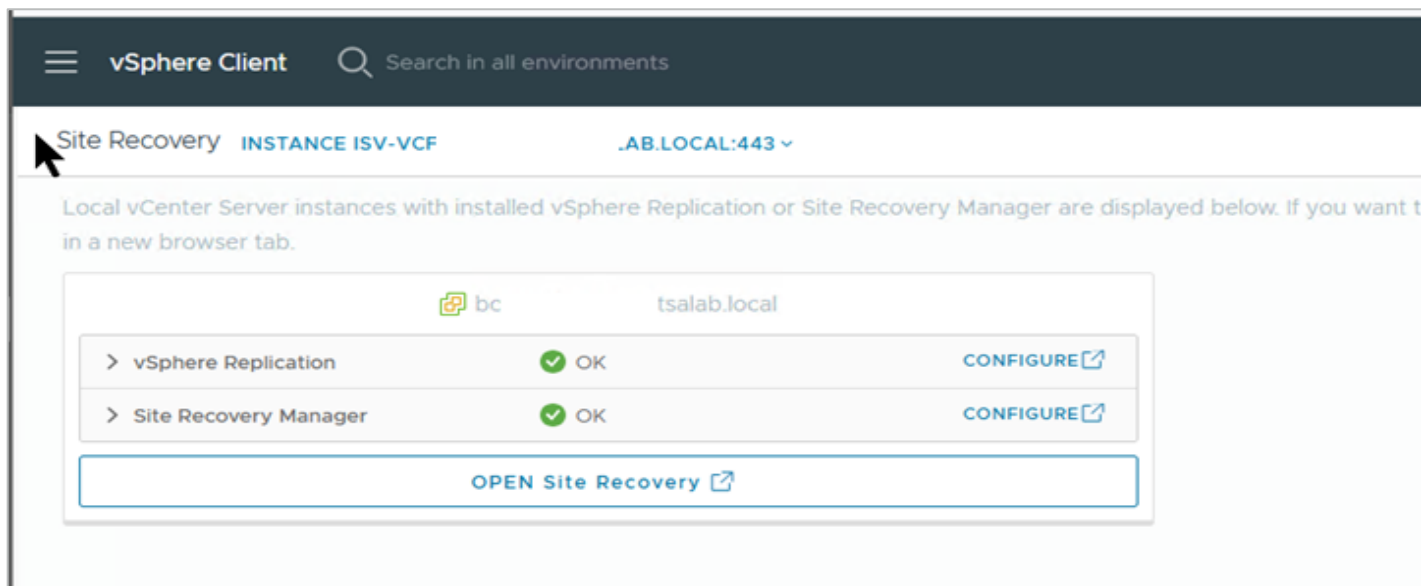


# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

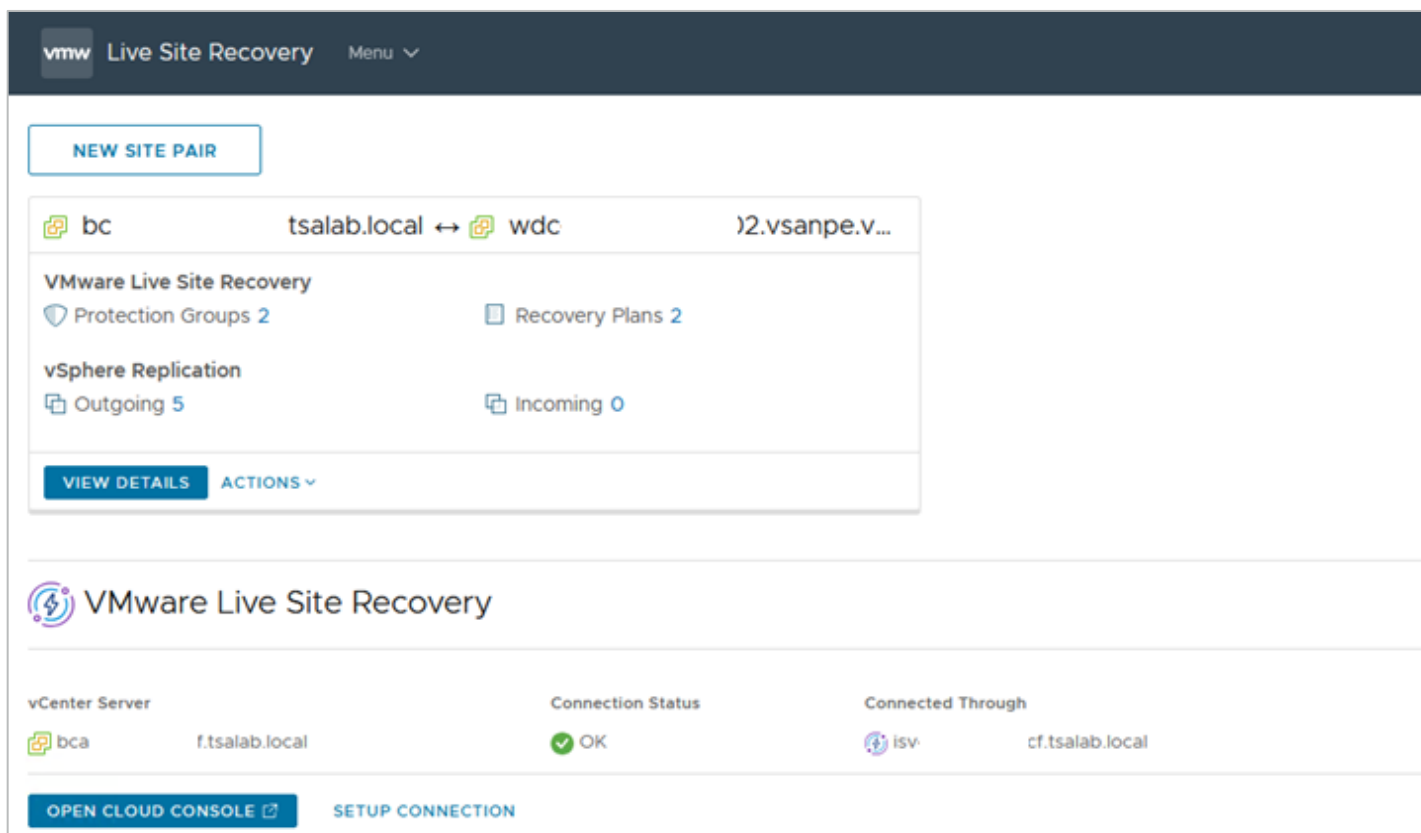


2. Click **OPEN Site Recovery** to access the protected site.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

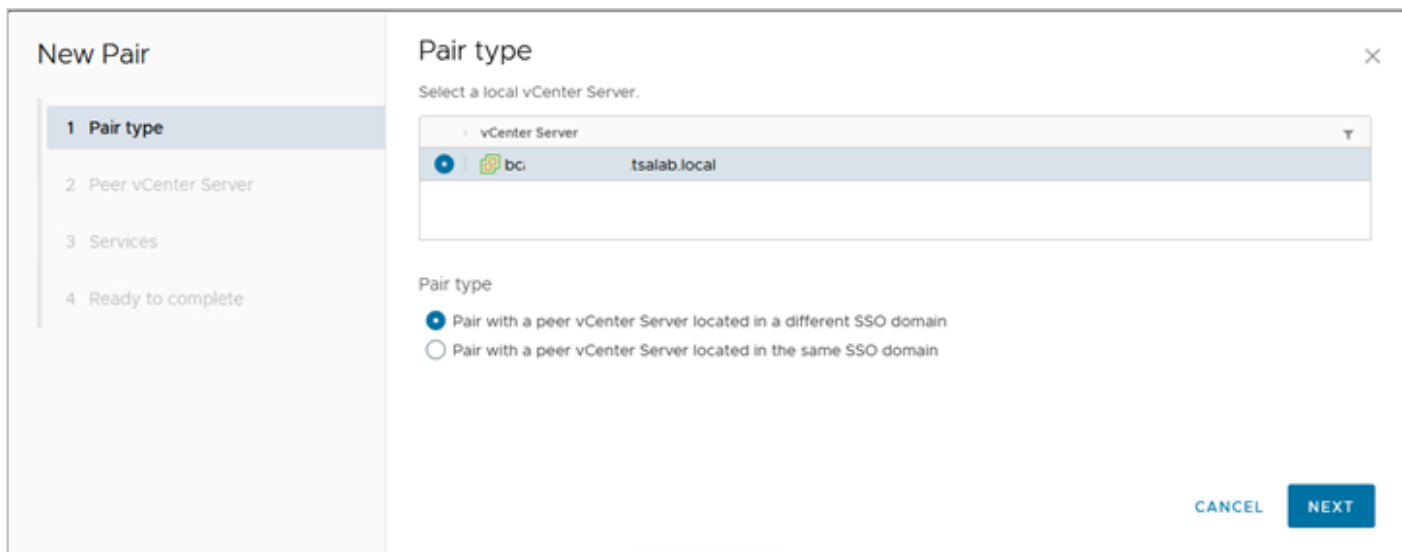


3. Click NEW SITE PAIR.



4. On the Pair type screen, select the applicable SSO domain and click NEXT.

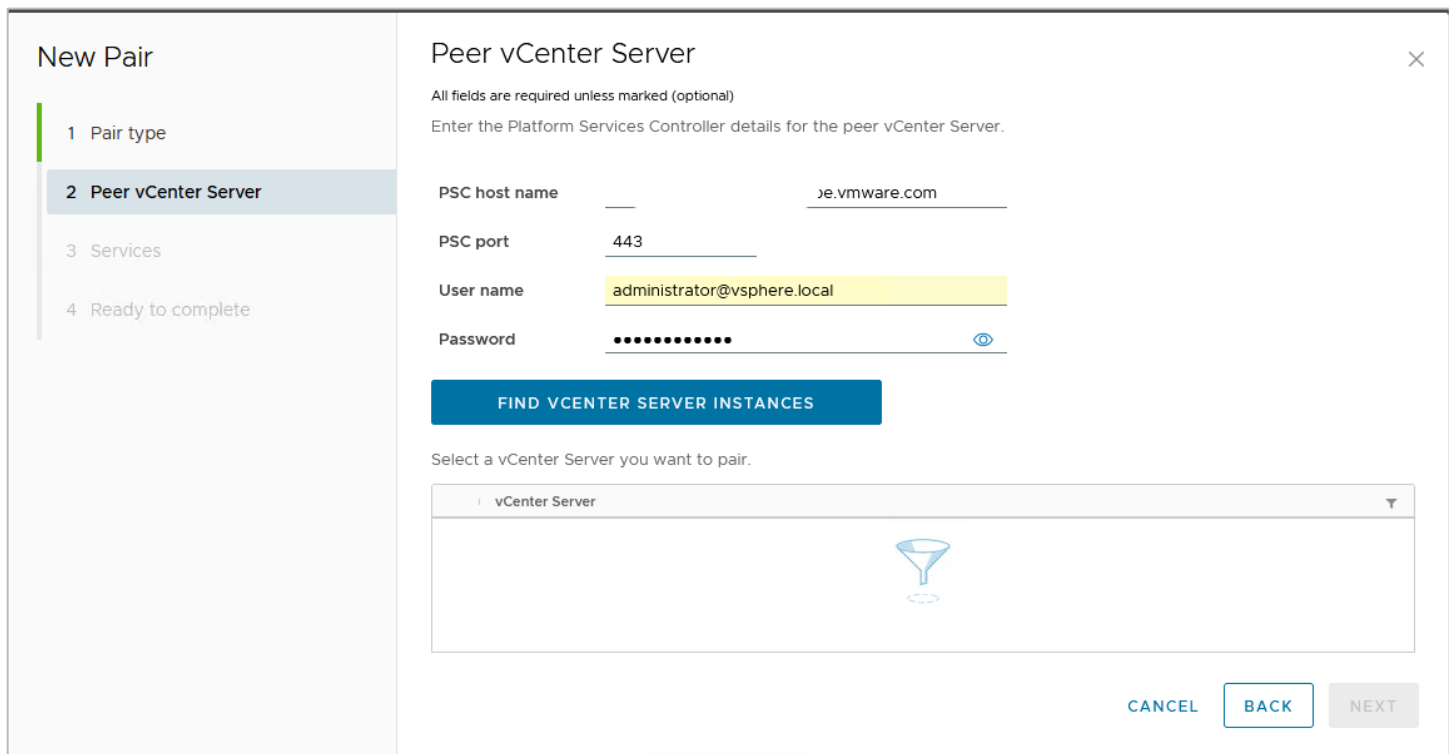
# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



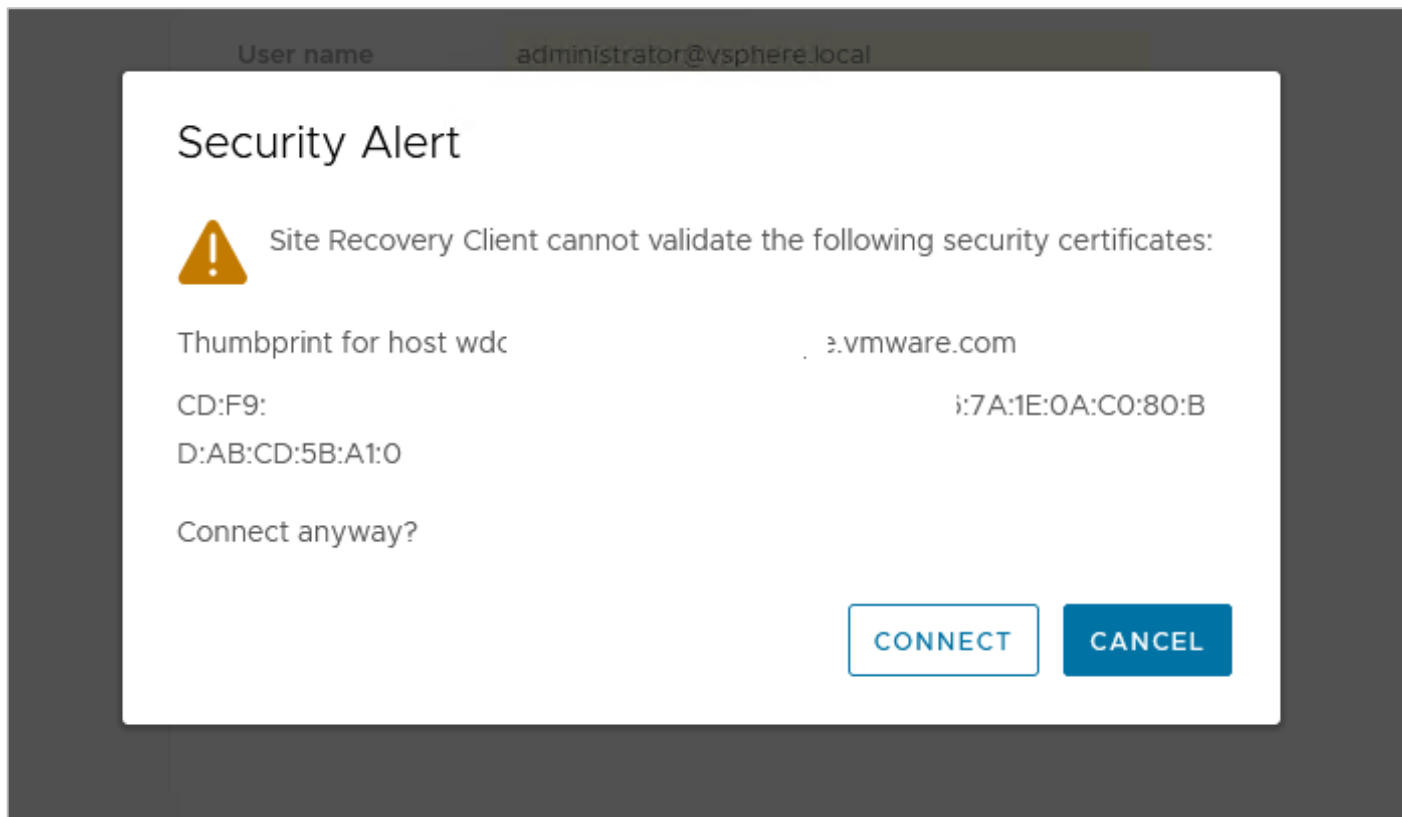
You'll be prompted for the vCenter credentials.

Because we're doing this from the recovery site's vCenter instance, the credentials we provide here will be for the **protected** site's vCenter instance.

5. Provide the remote vCenter's information and credentials, click **FIND VCENTER SERVER INSTANCES**, and click **NEXT**.



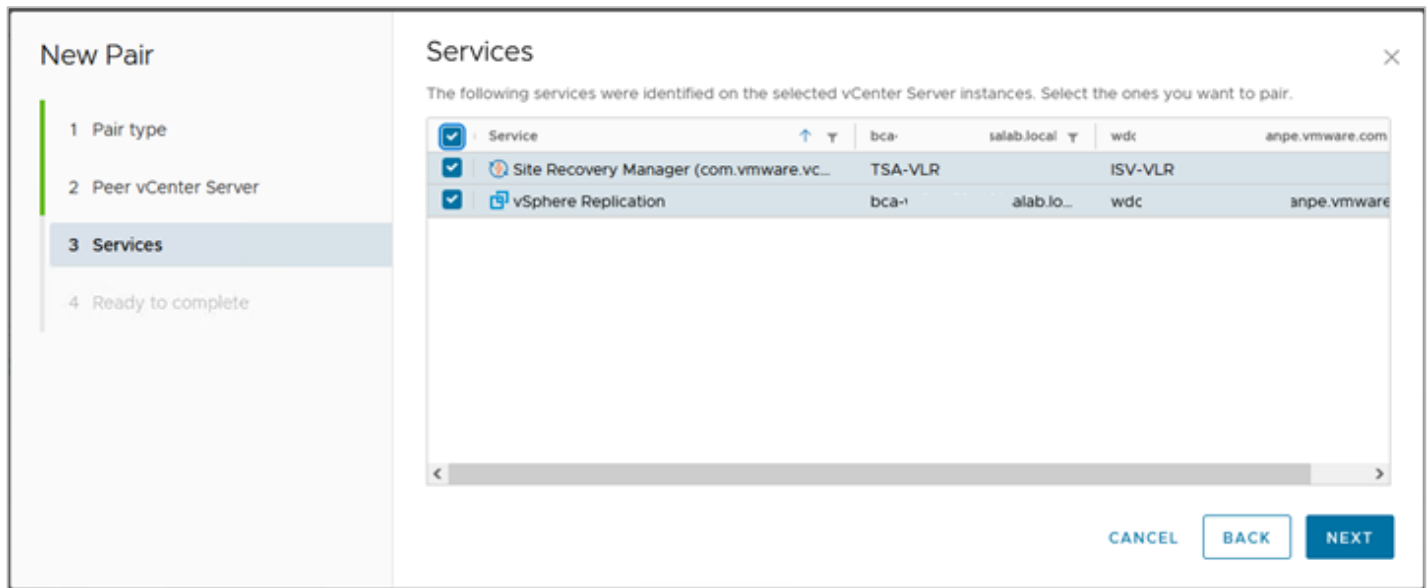
**Note:** If you're using default self-signed certificates in your environment, you'll need to click **Connect** to ignore the vCenter's self-signed certificate security warning to proceed.



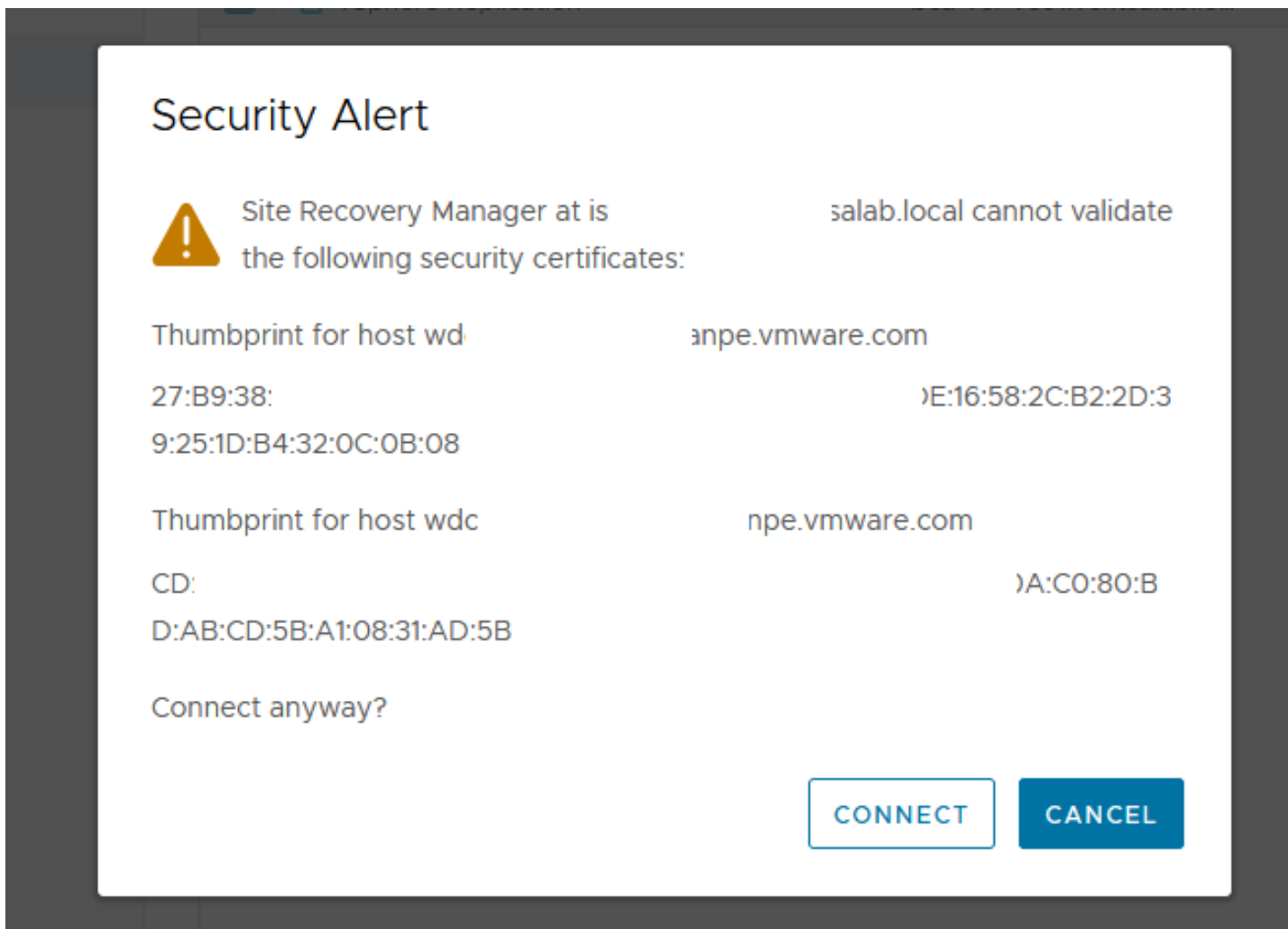
We used VMware vSAN for the storage subsystem in our environments. vSAN is the default storage option for all VMware vSphere cloud infrastructure. In this configuration, we see that the VMware Live Site Recovery and the VMware vSphere Replication appliance are both registered on our vCenter.

6. Click **Next** to continue.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

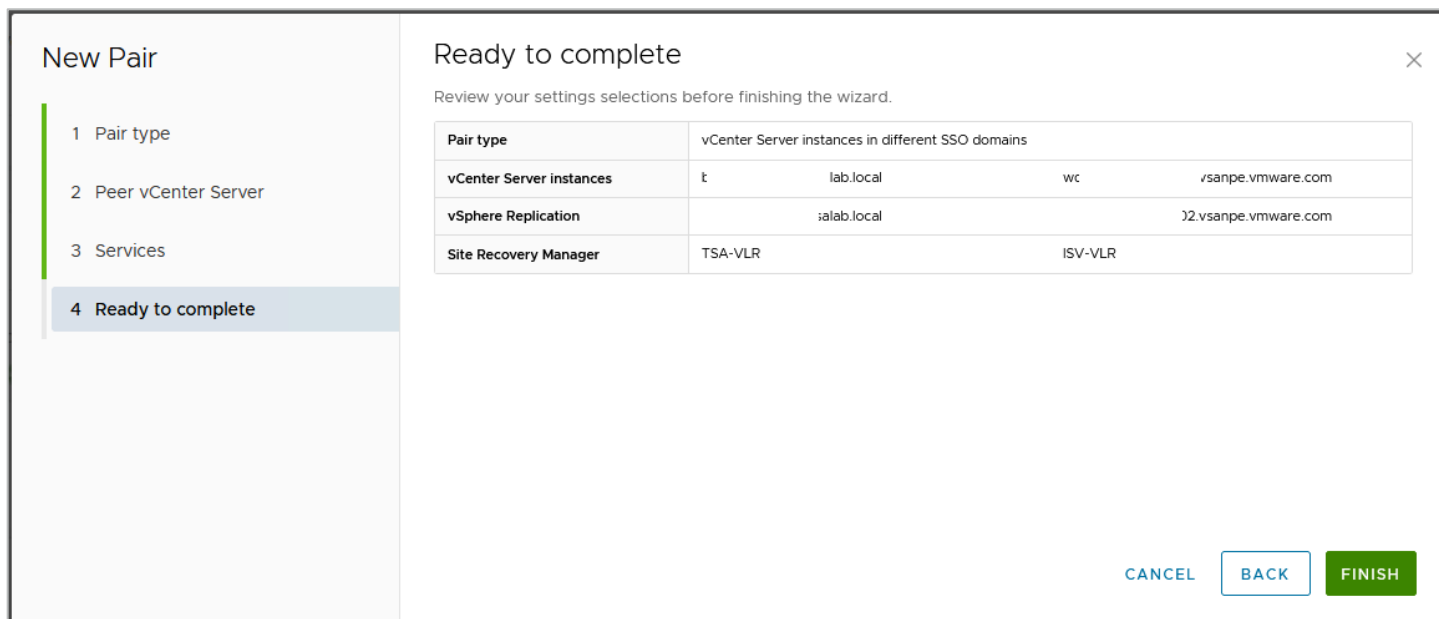


**Note:** You'll need to click **Connect** to ignore the vCenter's self-signed certificate security warnings if you're using them before you can proceed.

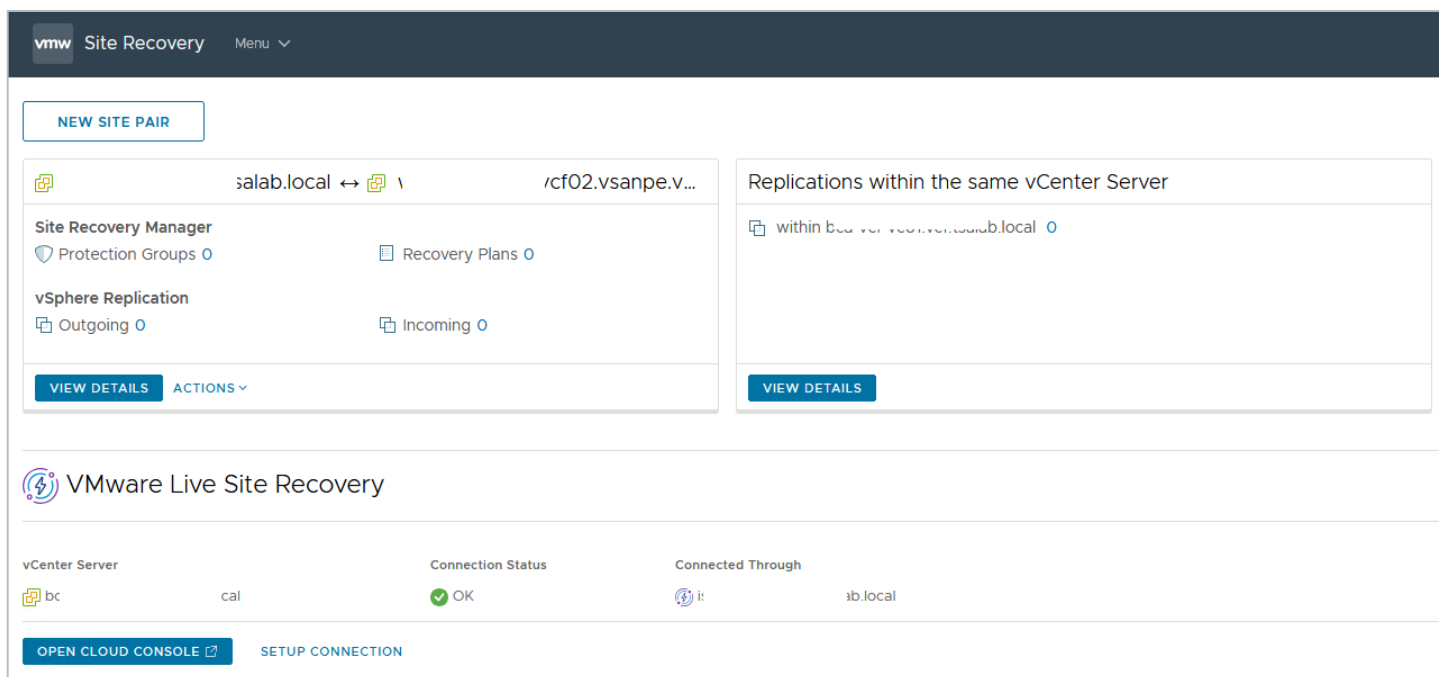


7. Click **Finish** to complete the site pairing process.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



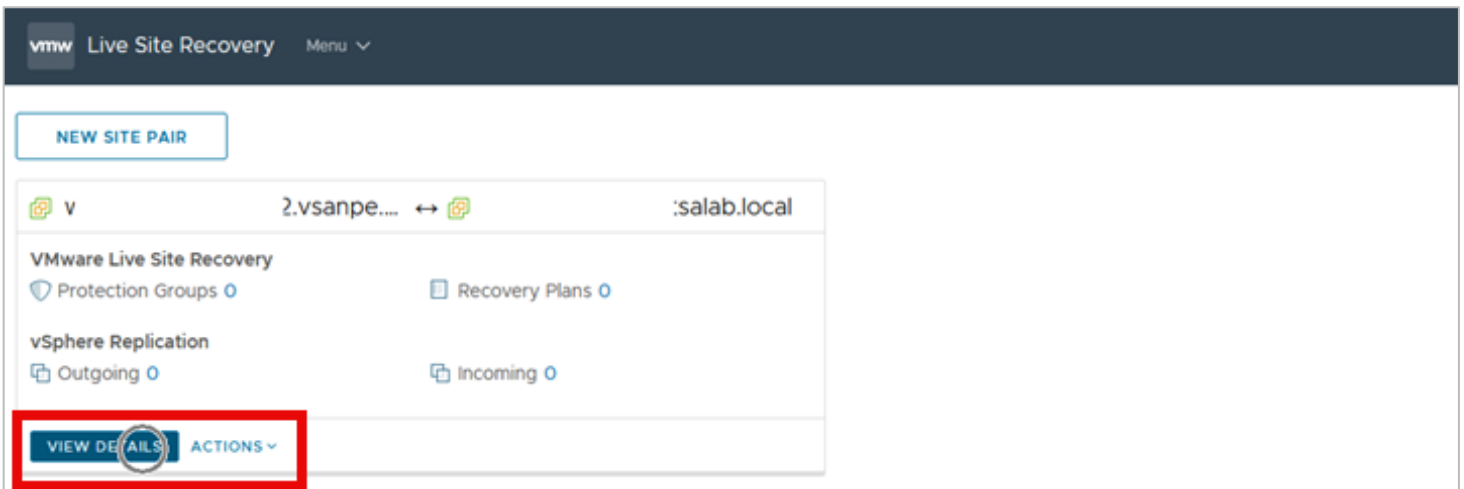
Now we're done with the site pairing exercise. We're ready to starting protecting our mission-critical workloads. The Site Recovery page will look like this screenshot.



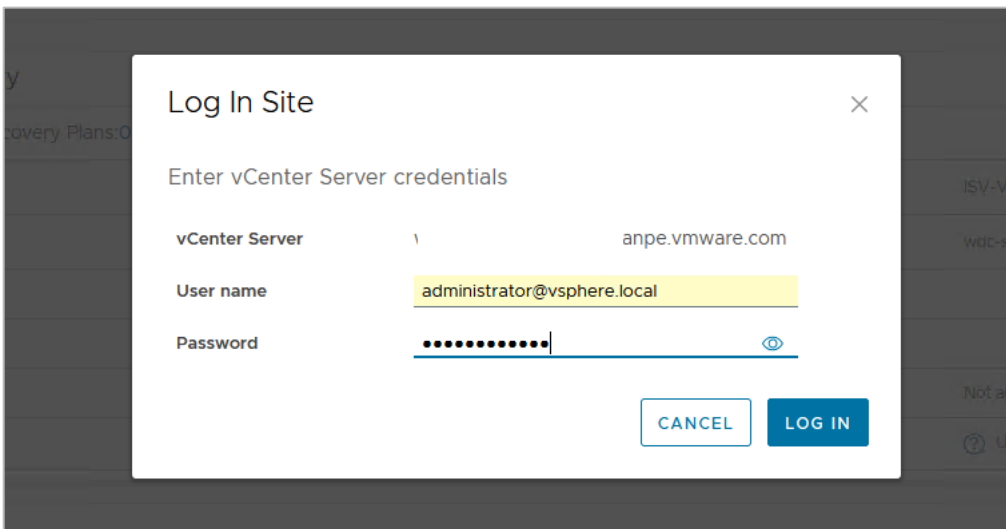
### Set up site recovery protection

1. From the site pairing page, click **View Details**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



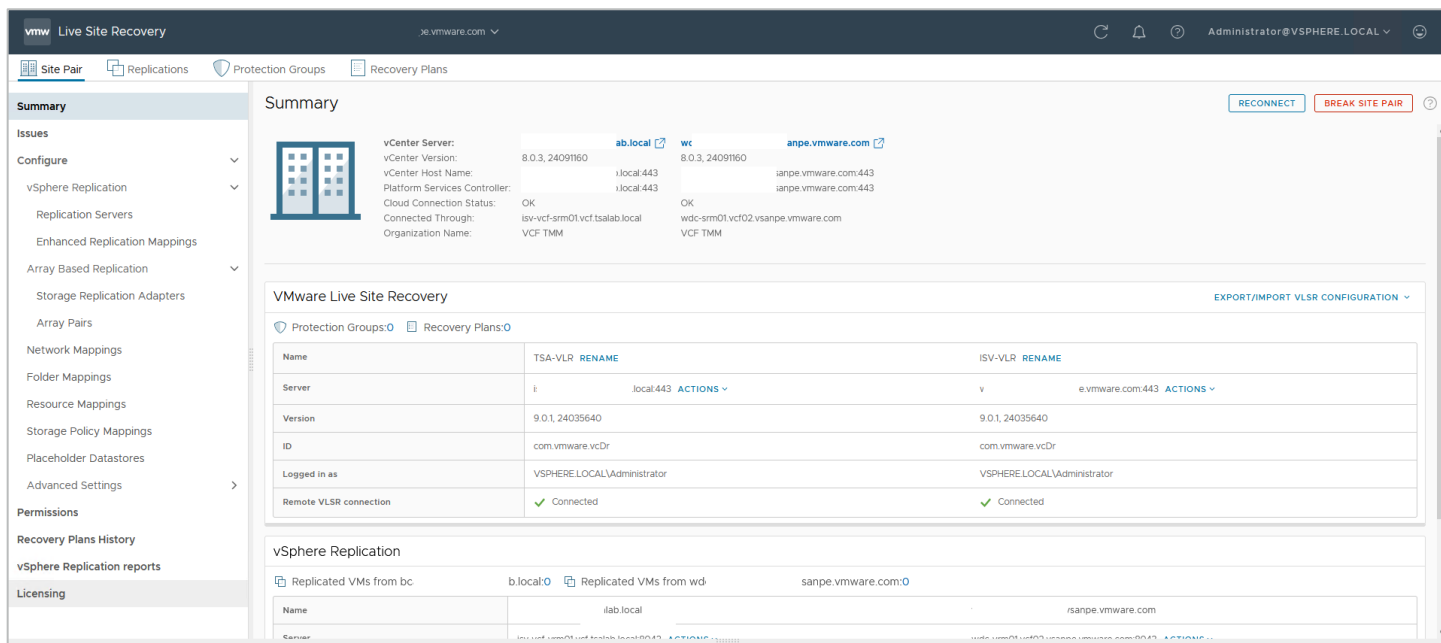
2. Provide the admin credentials for the **protected site's vCenter**, and then click **Login** to complete the initial pairing.



Here is our Live Recovery configuration and administration landing page.



# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



## Factors influencing our design and configuration choices

VMware Live Site Recovery allows you to configure an orchestrated workflow of all the actions and steps required to recover a VM, including the guest operating system, applications, processes, and other components. VMware Live Site Recovery does this by using the features and capabilities of the VCF infrastructure and the storage subsystem to create a point-in-time copy of the VM from the source (protected site) to the target (recovery site). VMware Live Site Recovery can use either array-based replication or vSphere Replication to replicate VM data from the source site to the target site. For this paper, we used vSphere Replication.

## vSphere Replication can replicate VMs between different storage types

Because vSphere Replication is host-based, it doesn't depend on the underlying storage, so it works with a variety of storage types, including vSAN, traditional SAN, NAS, and direct-attached storage (DAS). Unlike many array replication solutions, vSphere Replication can replicate VMs between the same or even different storage types, like vSAN to DAS, SAN to NAS, and SAN to vSAN, to name a few.

## VMware Live Site Recovery can pre-configure recovery plans

When a real or simulated failure occurs at the protected site, admins can initiate the pre-configured recovery steps and actions in their recovery plans. These steps include, among others:

- The order in which VMware Live Site Recovery recovers the protected VMs.
- The network to which the recovered VMs are connected.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

- Whether to customize or change the IP addresses for the recovered VM, or let them obtain such addresses from an available/accessible DHCP server.
- In-guest configuration scripts to run on the recovered VMs.

When an admin initiates this recovery plan, VMware Live Site Recovery prepares the VMs for recovery using the vSphere Replication-created copy of the VM data. The VMs are added to inventory, connected to the necessary resources (networks, folders, resource pools, and storage policies), powered on in the specified order, and customized as needed. If the workflow includes running scripts inside the VMs, the guest operating system is instructed to call and execute the scripts (of course, the scripts must exist on the VMs and be accessible during the recovery process).

Here's a description of the protection and recovery workflow you'll configure for the exercise:

- The SQL Server instances run on Windows VMs and are joined to the Active Directory domain services (ADDS) infrastructure. For this reason, you should have the Domain Controllers available and functional before powering on the SQL Server VMs.
- The SQL Server instances are clustered in a 3-node, Always-on Availability Group configuration. Clustering SQL Servers requires the use of a Windows Server Failover Cluster (WSFC). You'll use a file share witness (a folder located on one of the Domain Controllers) as the quorum option for this configuration.
- We specifically use availability groups in this guide and demonstration because (at the time of this writing):
  - The default storage option for VMware clouds is vSAN.
  - The default replication option for vSAN is vSphere Replication.
  - vSphere Replication doesn't currently have the capabilities to replicate disks used for shared-disk Windows clustering.
  - Although the scripts and all other required steps are similar, the factors mentioned above preclude the use of the steps documented in this guide for protecting and recovering Microsoft SQL Servers configured in shared-disk mode—Always On Failover Clustering Instance (FCI).
- In steady-state operation, applications, scripts, and processes access the SQL Server instance and the database through a common name: the **listener**. The listener is a host name that resolves to a specific IP address (or set of IP addresses). The Domain Controllers provide the DNS service, which manages this resolution. The listener must be available and accessible to the services provided by the SQL servers.
- Usually, the IP address segments in the protected site are different from the ones used in the recovery site.
- It is possible to extend the network segments from the protected site to the recovery site. Because the mechanism for achieving this configuration differs among the various VMware cloud brands, including it in this guide is impractical. For simplicity, the exercise includes a workflow for changing the IP addresses of recovered VMs to match those available at the recovery site.
- This IP address change means that you'll need to change the IP addresses of the VM (a trivial task in VMware Live Site Recovery) and the listener.
- VMware Live Site Recovery can't automatically change VM application configurations because it doesn't have knowledge of the applications that run inside the VM. For this purpose, you'll use the VMware Live Site

Recovery script-triggering feature to instruct the guest operating system to run a script that will change the IP address of the listener and update the DNS record after the recovery.

## Stability and security of virtualized Domain Controllers

Around 2012, with compute resources growing and virtualization becoming mainstream in IT environments, dedicating a physical server to running a Domain Controller became impractical and inefficient from a cost and ROI perspective. But there were some issues with the stability and security of virtualized Domain Controllers. To address these problems, Microsoft implemented measures to make virtualized Domain Controllers safer and more stable, including guardrails to prevent a malicious actor from cloning or copying them.

### VM-Generation ID makes Domain Controller virtualization safer

At a high level, a Domain Controller has a complete copy of the domain's users, passwords, and other secrets, making it difficult to minimize or mitigate an attack. VM-Generation ID (among other capabilities) helps protect virtualized Domain Controllers in several ways:

- It stores and tracks a unique counter for every copy of a virtualized Domain Controller. The hypervisor assigns a counter to the VM. In vSphere, this is the **VM Gen-IDx** value you see in a Windows VM's .vmx file.
- When the Domain Controller boots up, it reads this counter from its configuration file and then stores it internally.
- This counter persists over the lifetime of the VM unless a [specific type of operation](#) is performed on it. These actions alter the state and identity of the VM, so whenever any are performed, the hypervisor changes the counter.
- The next time the Domain Controller is powered on, Windows reads its generation ID, compares it to what was previously stored, and discovers there is a mismatch.
- When this happens, Windows immediately performs several steps in response to the disparity and triggers the VM-Generation ID safety measures. Refer to the following document for a more detailed discussion of virtualization-based safeguards: [Safely virtualizing Active Directory Domain Services \(AD DS\)](#).

### Restoring a Domain Controller triggers VM-Generation ID change

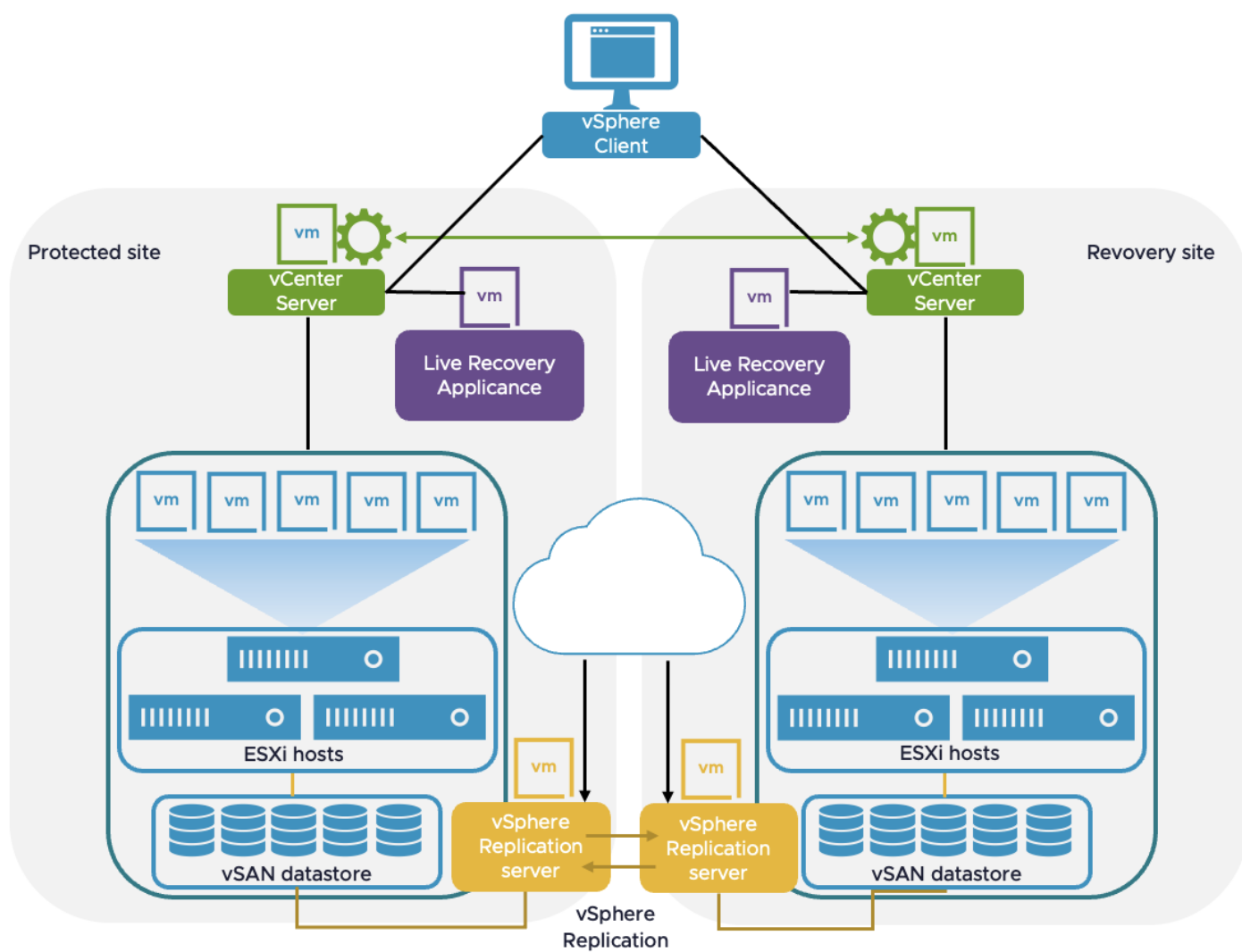
- VLSR recovery workflow includes bringing up A REPLICATED COPY of a Protected VM at the Recovery Site when (in a real Disaster event) the real Domain Controller is unavailable) or in a simulated DR exercise (when the VM is recovered to a fenced-off "Test" network). Recovering a Domain Controller requires us to instantiate a replicated copy of a real Domain Controller. Such a "Copy" operation automatically changes the VM-generation ID of the Domain Controller, which then automatically triggers the Domain Controller safety responses from Windows.
- One of the responses is an instruction to the Domain Controller to (among other things) reset its InvocationID and discard its RID Pool. For all practical purposes, the Domain Controller is no longer a Domain Controller at this point, due to the change in its VM-generation ID. Windows then updates the VM-generation ID it had stored previously to match the new one provided by the hypervisor. The VM then obtains a new set of RID

Pool from the RID Master, and life is good. Well, we have abbreviated the complete narrative for our purposes, but what is of relevance to us for this Guide is that, in spite of the fact that recovering a Domain Controller with VLSR triggers Windows to invoke the Virtualized Domain Controller Safety feature, doing so is a supported, repeatable, more efficient, reliable, and faster option than anything else available as of the time of this writing.

## Logical topology of the VMware Live Site Recovery infrastructure

Now that we know our desired outcome and the considerations governing our ability to achieve it, we are ready to proceed.

Here's an approximate representation of the logical topology of our VMware Live Site Recovery infrastructure:



## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

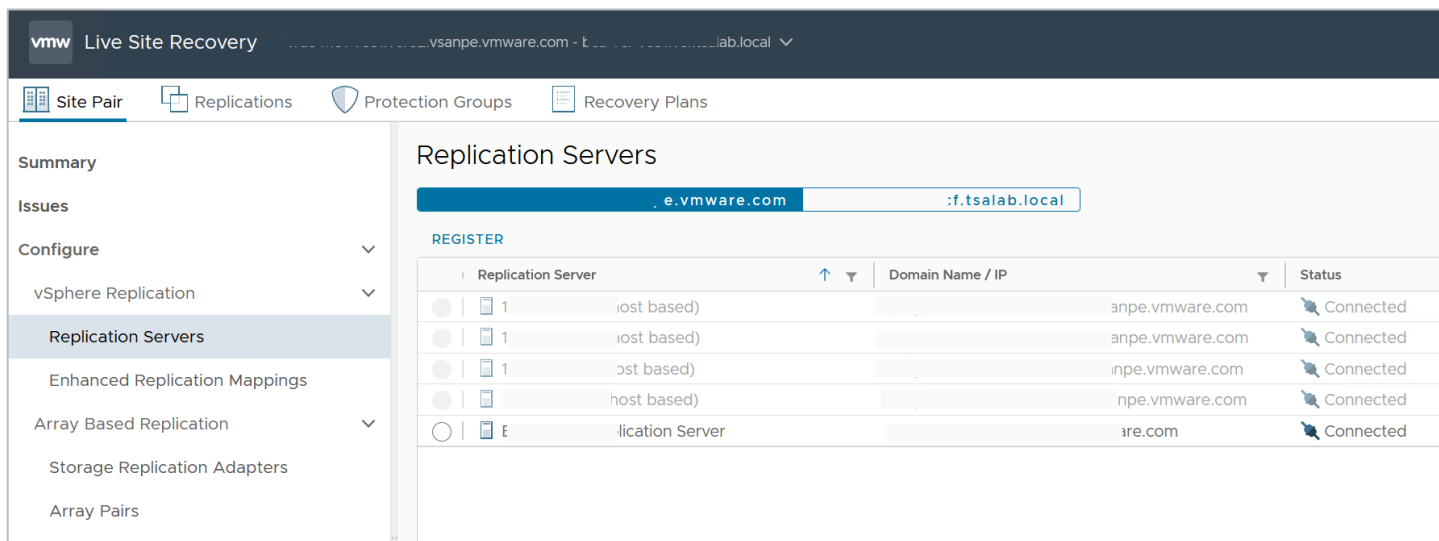
In our example, our storage platform is vSAN (the default option for vSphere-based Cloud platforms), so the VMware vSphere Replication Server will be responsible for replicating our protected VMs from the Protected Site to the Target Site (and vice versa). No special configuration is required for this part at this point.

### Create mappings with network pairing

We'll ignore Array Based Replication because it doesn't apply to vSAN, which is the default storage option for VCF and all vSphere-based cloud offerings.

**NOTE:** VLSR supports non-vSAN platforms which provide their own VLSR-compatible storage replication adapters.

1. Select **Replication Servers**.



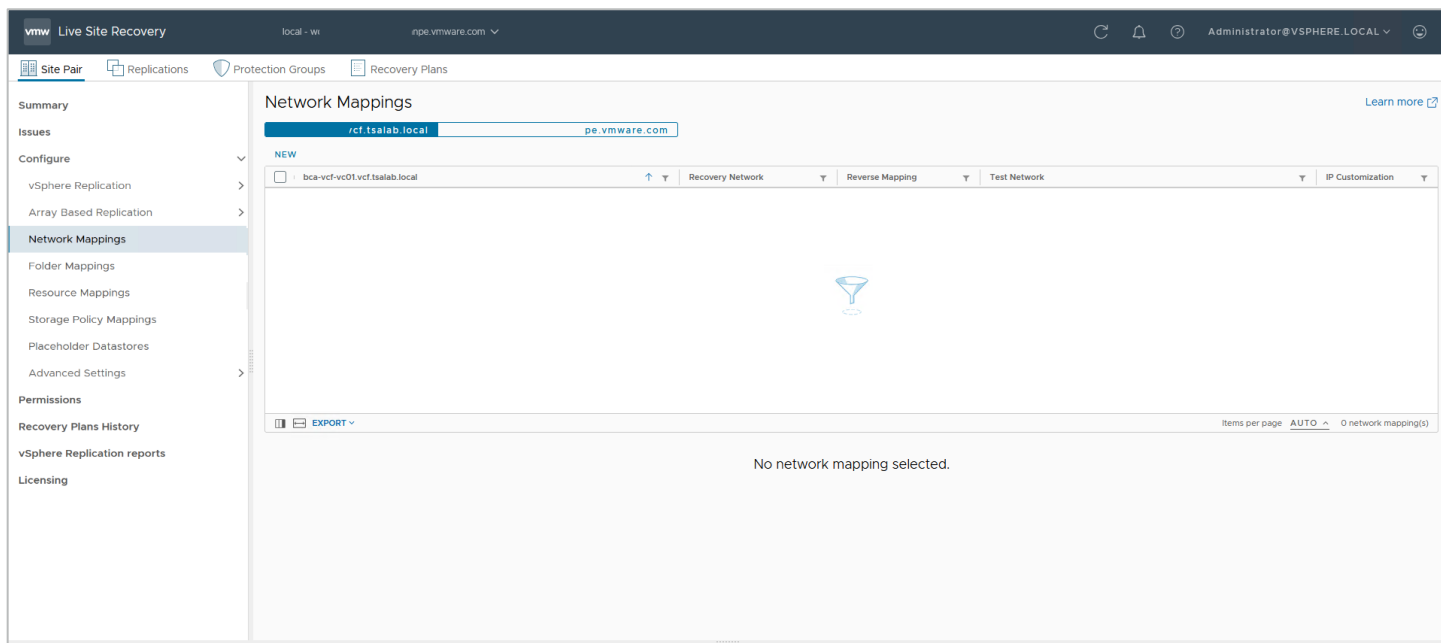
The screenshot shows the VMware Live Site Recovery interface. The left sidebar contains a navigation menu with options: Summary, Issues, Configure (with a dropdown arrow), vSphere Replication (with a dropdown arrow), **Replication Servers** (highlighted), Enhanced Replication Mappings, Array Based Replication (with a dropdown arrow), Storage Replication Adapters, and Array Pairs. The main content area is titled 'Replication Servers' and features a search bar with the text 'e.vmware.com' and ':f.tsalab.local'. Below the search bar is a 'REGISTER' button. A table lists the registered replication servers:

Replication Server	Domain Name / IP	Status
1 (host based)	anpe.vmware.com	Connected
1 (host based)	anpe.vmware.com	Connected
1 (ost based)	inpe.vmware.com	Connected
host based)	npe.vmware.com	Connected
lication Server	are.com	Connected

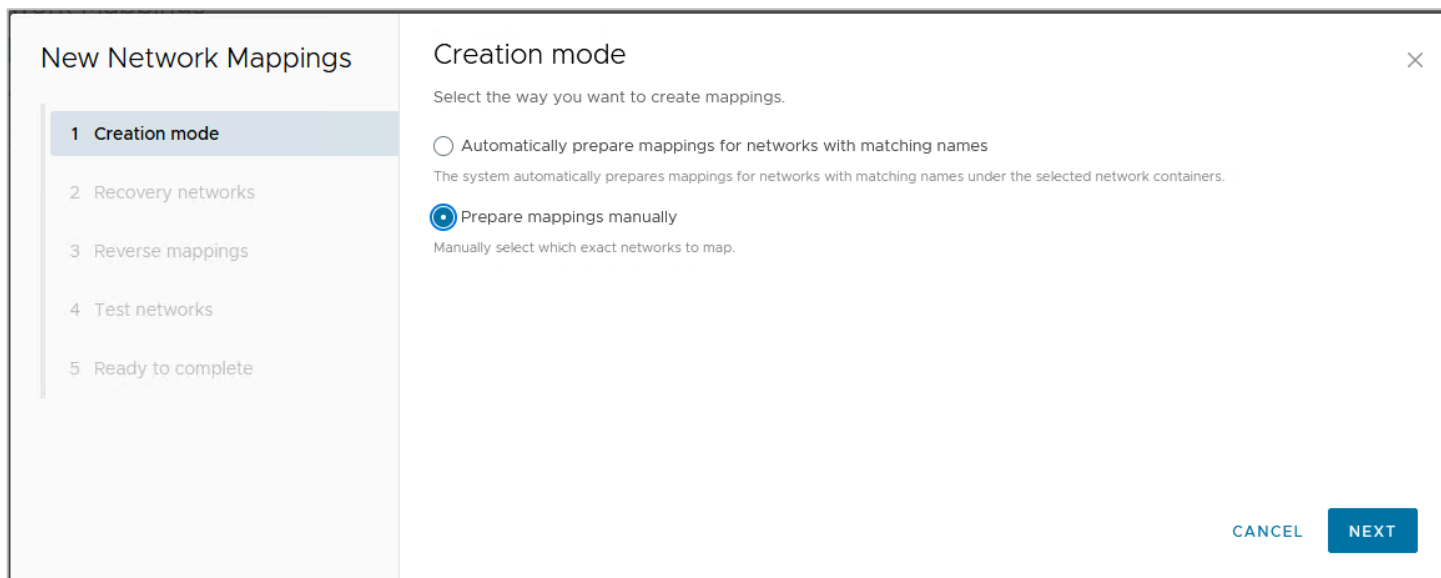
Network pairing lets you map the network segments on one side to a corresponding segment on the other.

2. Click **New** to begin creating a mapping.

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3. Select **Prepare mappings manually** and click **Next**.



You have the option to create a mapping of the networks at either the virtual distributed switch (vDS) level as a unit, or you can create a mapping at the individual port group level. We'll demonstrate the fine-grained flexibility in VMware Live Site Recovery by mapping select port groups from the protected site to corresponding port groups on the recovery site.

4. Select the check box near each port group on the protected site and the corresponding port group on the recovery site you want to map each to. Then click **Add Mappings** and **Next**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

**New Network Mappings**

- 1 Creation mode
- 2 Recovery networks**
- 3 Reverse mappings
- 4 Test networks
- 5 Ready to complete

**Recovery networks**

Configure recovery network mappings for one or more networks. The mappings for objects marked with \* are already created or prepared.

**Source Networks:**

- bca-vcf-dc01
  - Management Networks
    - bca-vcf-cl01-vds01
      - VN-RegA
      - VN-xReg
      - 1-pg-mgmt
      - 1-pg-vm-mgmt
      - 1-pg-vm-next
      - 1-pg-vmotion
      - 1-pg-vsan
      - y-Segment

**Target Networks:**

- w
  - wdc-m01-dc01
    - Management Networks
      - Segment
      - i01-pg-mgmt
      - i01-pg-vm-mgmt
      - i01-pg-vmotion
      - i01-pg-vsan

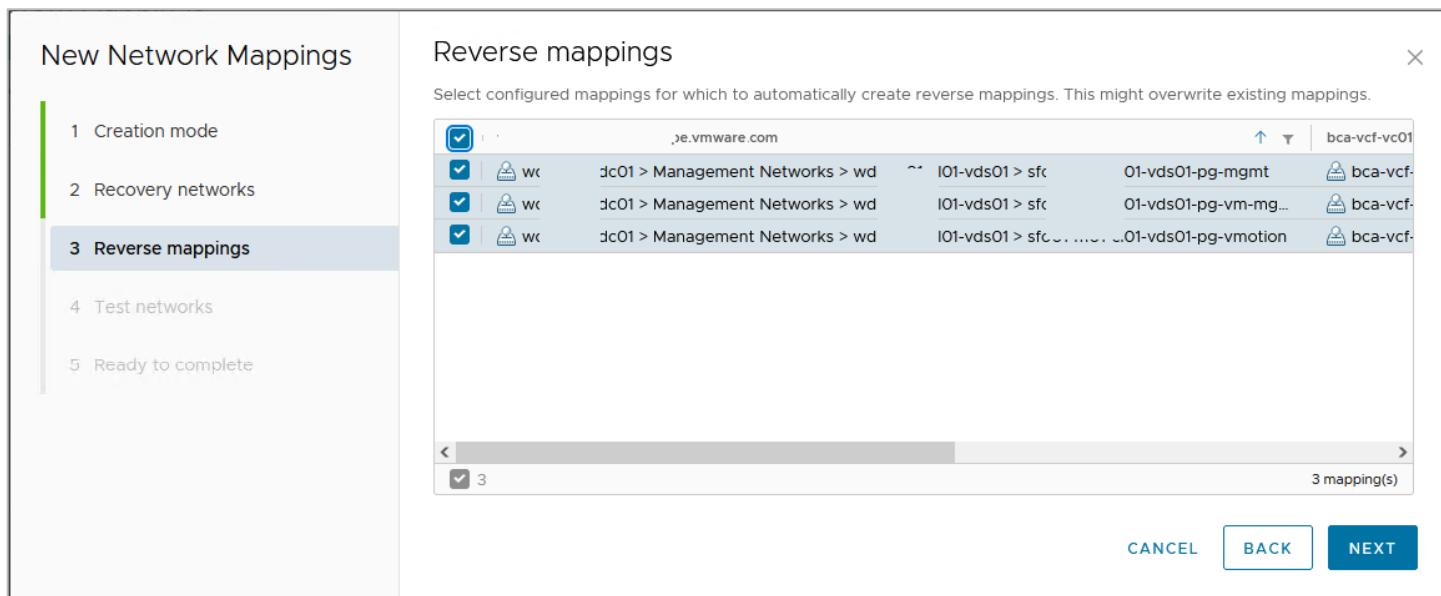
**ADD MAPPINGS**

Source	Target	Mapping
bca .vcf.tsalab.local	w c01.vcf0	
-dc01 > Management Networks >	-vds01 > b	-pg-vm-mg...
-dc01 > Management Networks >	-vds01 > b	-pg-mgmt
-dc01 > Management Networks >	-vds01 > b	-pg-vmotion

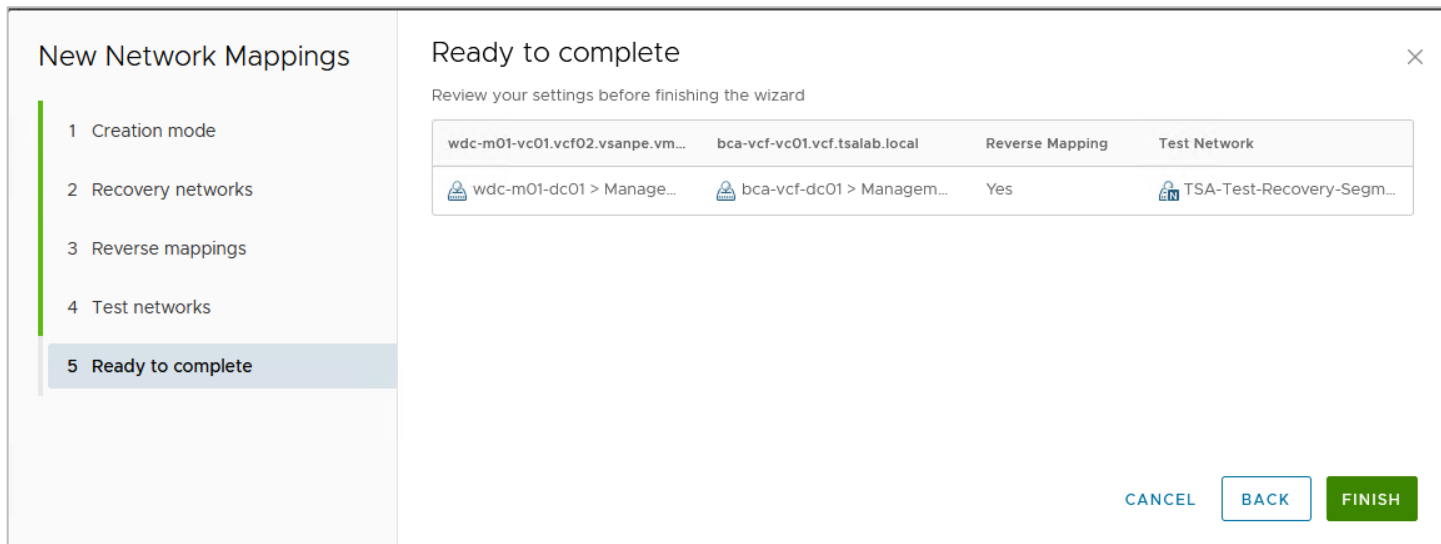
3 mapping(s)

**CANCEL** **BACK** **NEXT**

5. Check the option to automatically create a reverse mapping (so you don't have to do it manually) and click **Next**.

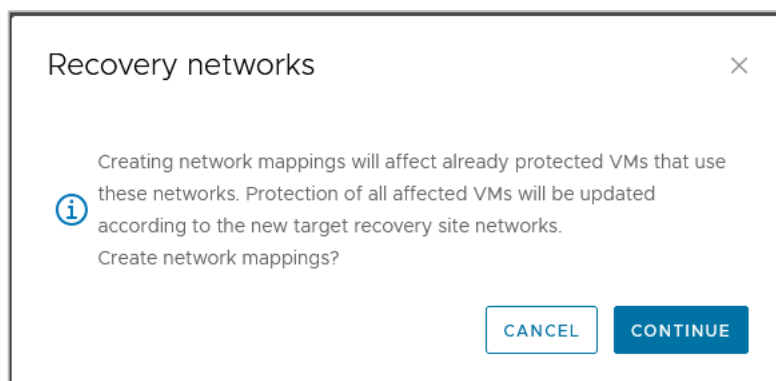


6. Click **Finish** to complete the configuration.



7. Click **Continue** to acknowledge and dismiss the warning about possible impact to existing protected VMs.





## Create a test recovery network

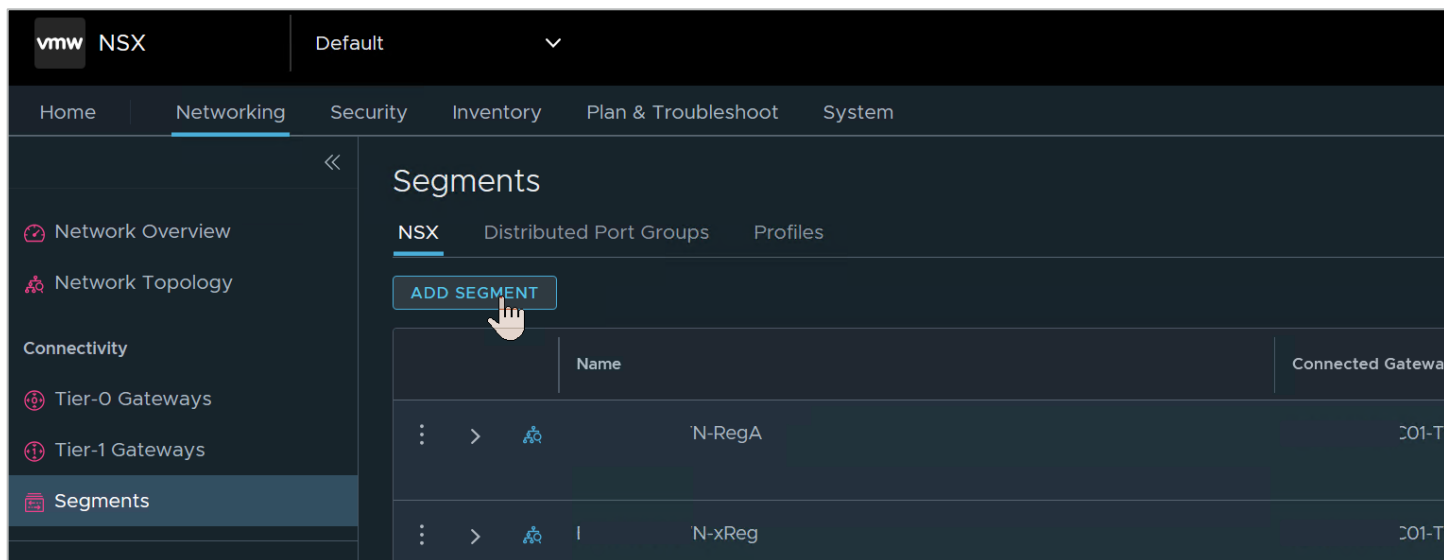
One of the most compelling features in VMware Live Site Recovery and why it is much preferred over competing BDCR orchestration solutions (or a manual option) is being able to conduct simulated/test disaster recovery exercises without impacting the production environment. Admins can demonstrate and prove their infrastructure disaster recovery readiness by conducting a recovery of the protected workloads into the recovery site while the protected workloads continue to provide uninterrupted services at the protected site. VMware Live Site Recovery does this by bringing up a copy of the protected workload in an isolated network segment at the recovery site. VMware Live Site Recovery creates this isolated network by default, but admins can specify their own recovery test (aka "bubble") network. The default isolated network is inaccessible to anything outside of the bubble. But what if admins want to demonstrate the functionality and accessibility of recovered workloads to their auditors? They can do this by recovering the workloads into a specific network of their choice (assuming they have such a controlled network in place).

## Create an isolated network port group

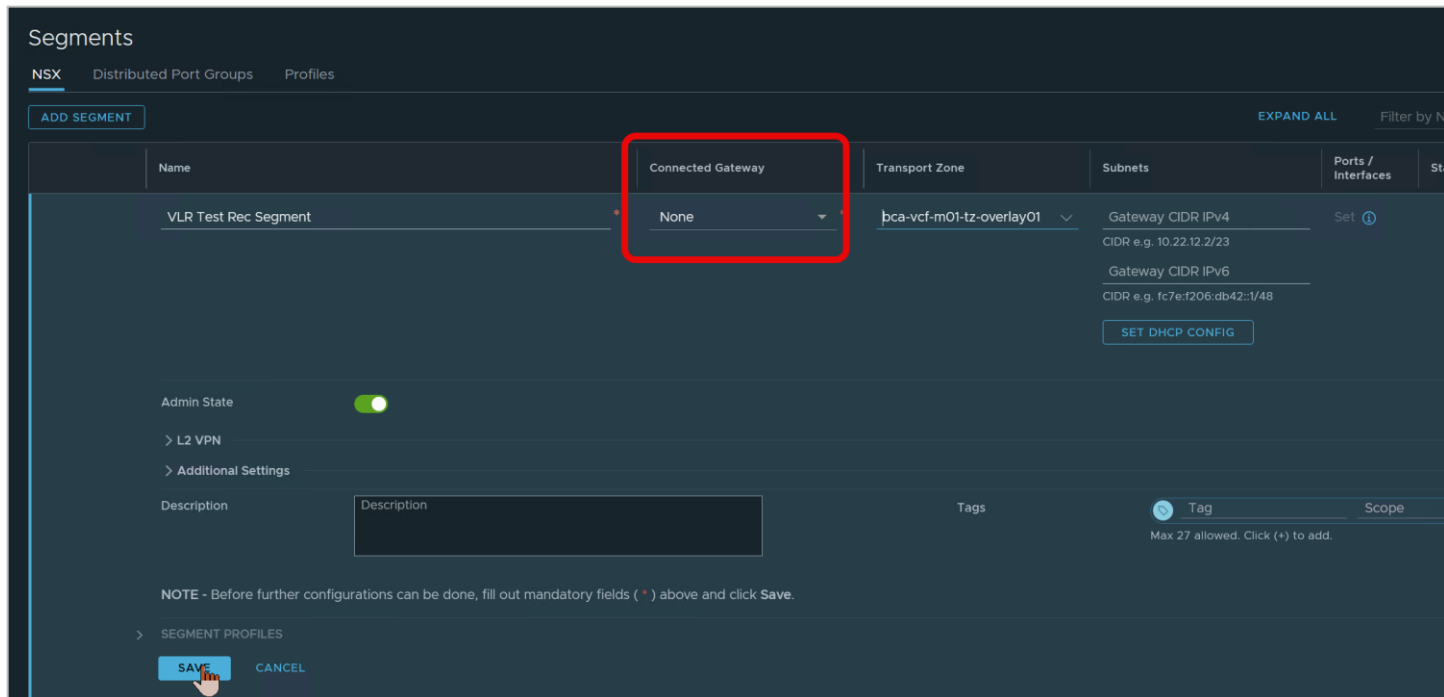
Creating an isolated network port group in a VCF infrastructure is a simple operation. Although NSX administrative tasks are outside the scope of this paper, let's briefly describe how to create such isolated segments for ease of reference and completeness.

1. In NSX Manager, from **Segments**, click **Add Segment**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



2. Give the new segment a descriptive name.
3. Don't specify a gateway in the **Connected Gateway** menu.
4. Select an appropriate **Overlay Transport Zone** for the segment.
5. Click **Save**.



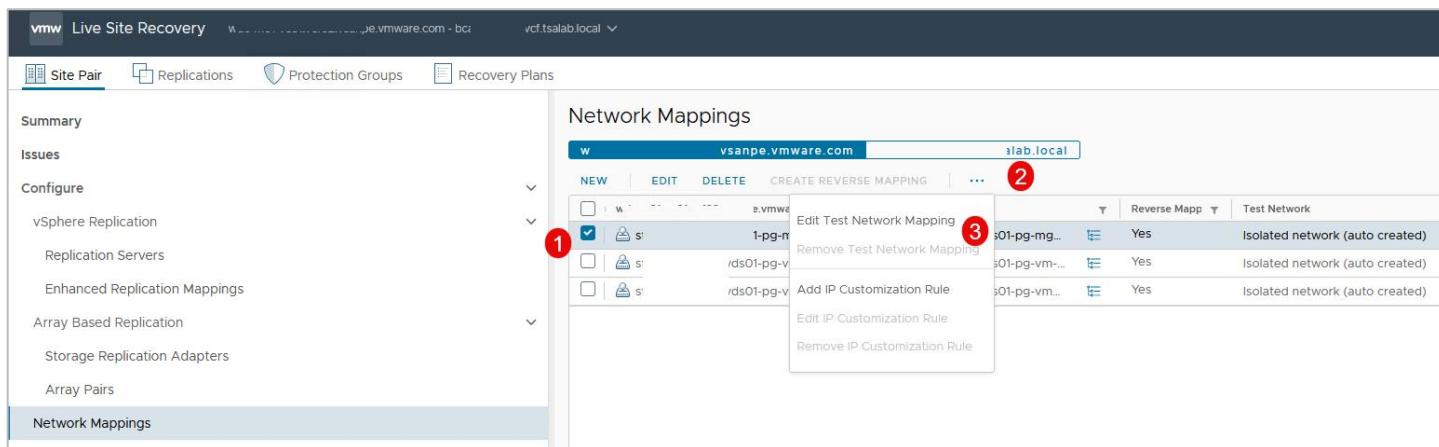
## Specify the test recovery network

The segment you created in the previous section will appear as a port group on all the connected ESXi hosts in the cluster. Because it is unrouted, network traffic over the port group will be restricted to only the VMs directly connected to it.

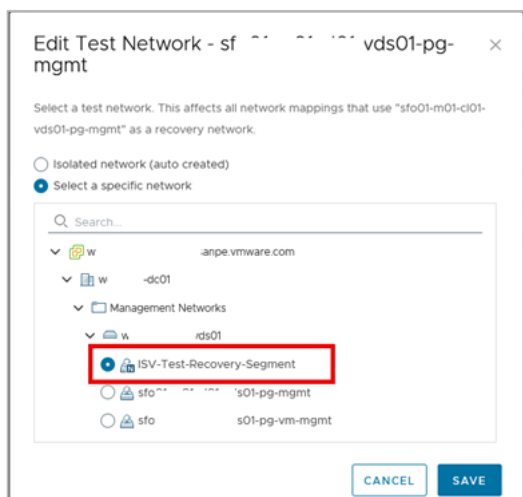
You'll use this unrouted segment/port group to manually specify your desired isolated test recovery network in VMware Live Site Recovery.

By default, VMware Live Site Recovery automatically creates an internal, isolated network for test failovers. You'll change these.

1. Select the network mapping for which you want to specify a desired routed network.
2. Select the elipses (...) menu.
3. Select **Edit Test Network Mapping**.



4. Select the **Select a specific network** option.
5. Select the pre-configured isolated network/segment and click **Save**.



6. When done, click **Next**.

The screenshot shows the 'Test networks' configuration step. On the left, a sidebar lists five steps: 1 Creation mode, 2 Recovery networks, 3 Reverse mappings, 4 Test networks (highlighted), and 5 Ready to complete. The main area is titled 'Test networks' and includes a note: 'Test networks are used instead of the recovery networks while running tests. Isolated networks are automatically created and used during tests for all networks.' Below this is a table with columns for 'Recovery Network' and 'Test Network'. The table contains three rows of network mappings, each with a 'CHANGE' button. At the bottom right, there are 'CANCEL', 'BACK', and 'NEXT' buttons.

Recovery Network		Test Network	
w	:lc01 > sfr	j-mgmt	ISV-Test-Recovery-Segment
w	:lc01 > sfr	j-vm-mgmt	ISV-Test-Recovery-Segment
w	:lc01 > sfr	j-vmotion	ISV-Test-Recovery-Segment

7. Click **Finish** to proceed.

The screenshot shows the 'Ready to complete' step. The sidebar on the left now highlights step 5, 'Ready to complete'. The main area is titled 'Ready to complete' and includes a note: 'Review your settings before finishing the wizard'. Below this is a table with columns for 'Reverse Mapping' and 'Test Network'. The table contains three rows of network mappings, each with a 'CHANGE' button. At the bottom right, there are 'CANCEL', 'BACK', and 'FINISH' buttons.

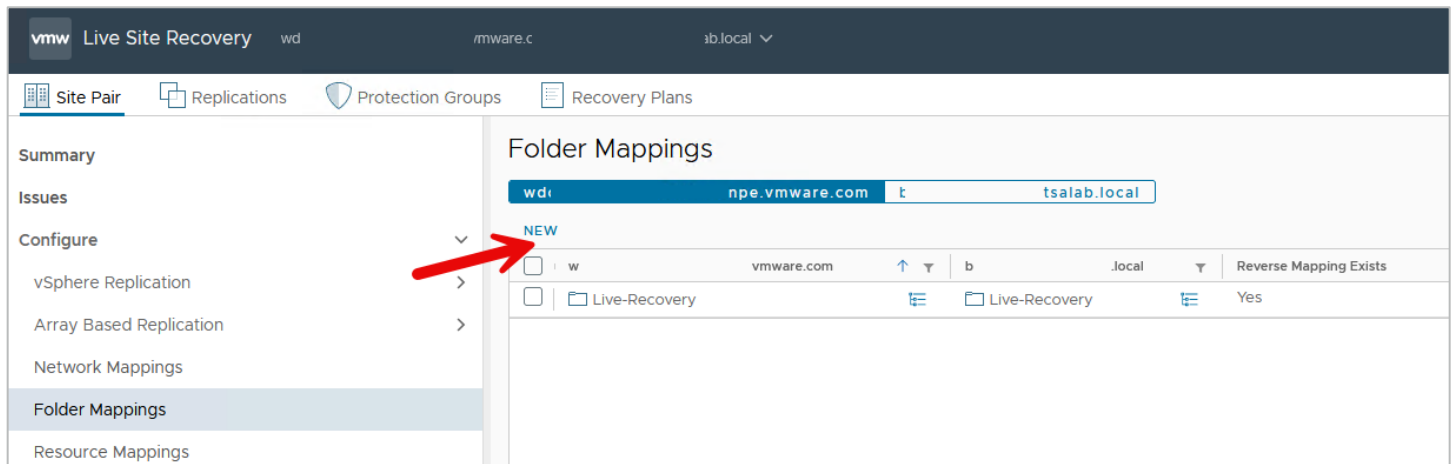
Reverse Mapping		Test Network	
b	c01 > Managem...	w	-dc01 > Manage...
b	c01 > Managem...	w	-dc01 > Manage...
b	c01 > Managem...	w	-dc01 > Manage...

## Create folder mappings

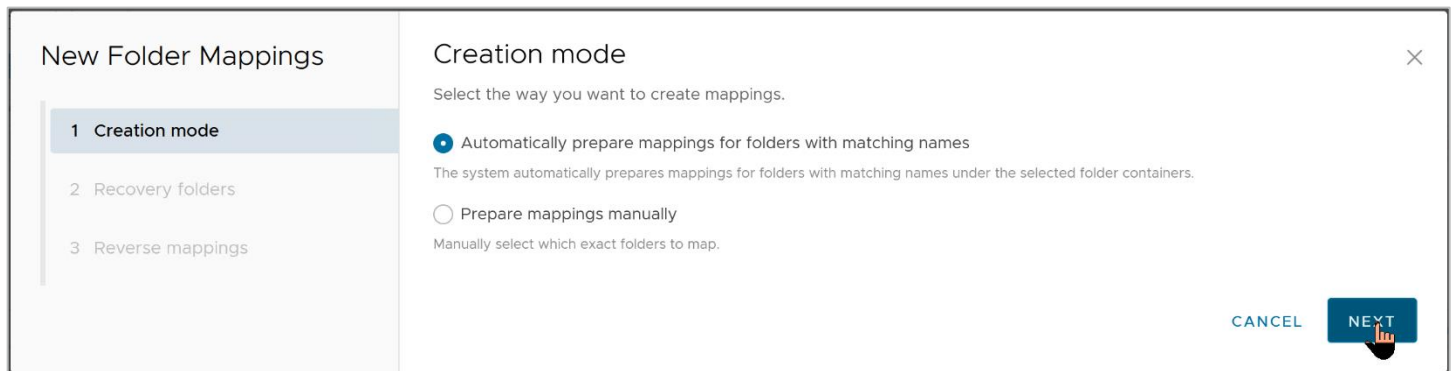
Folder mappings help to organize protected and recovered VMs in a logical and intuitive fashion, so let's create one:

1. Click **New** to begin.

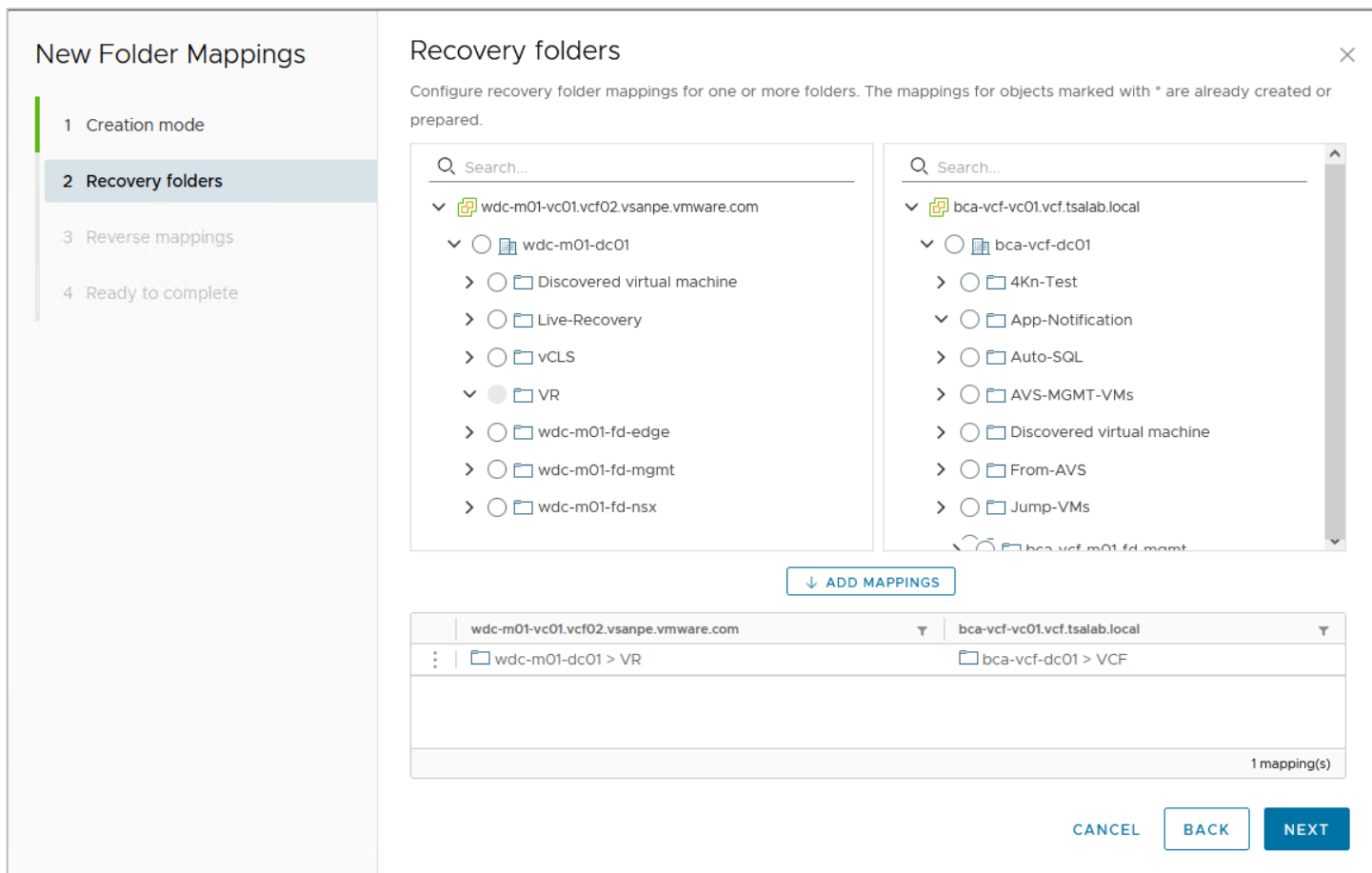
# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



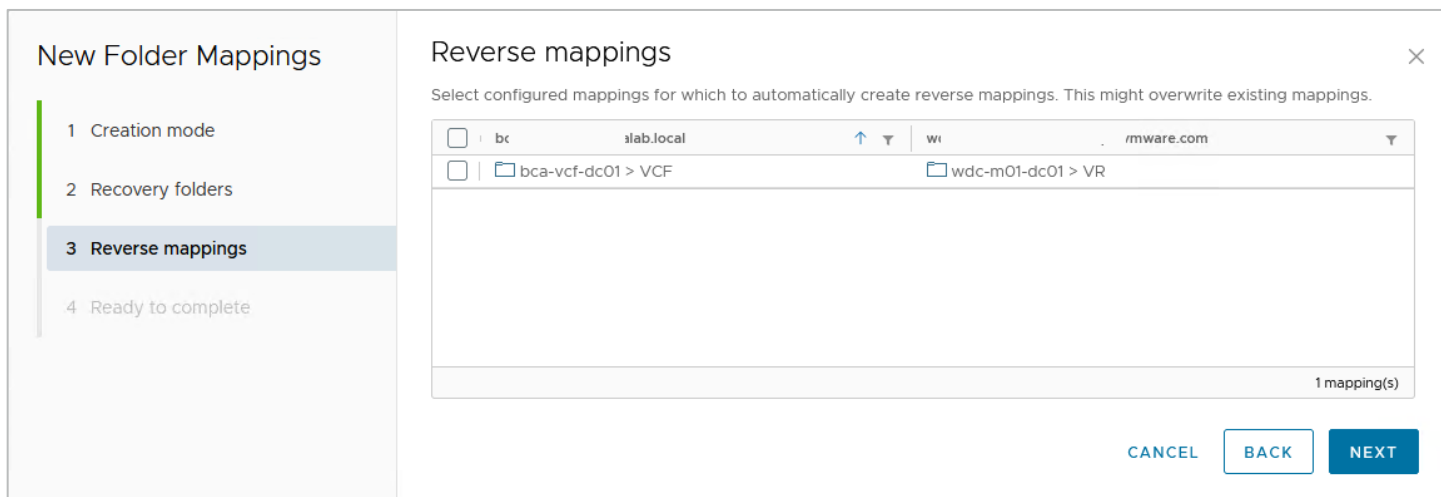
2. Click **Next**.



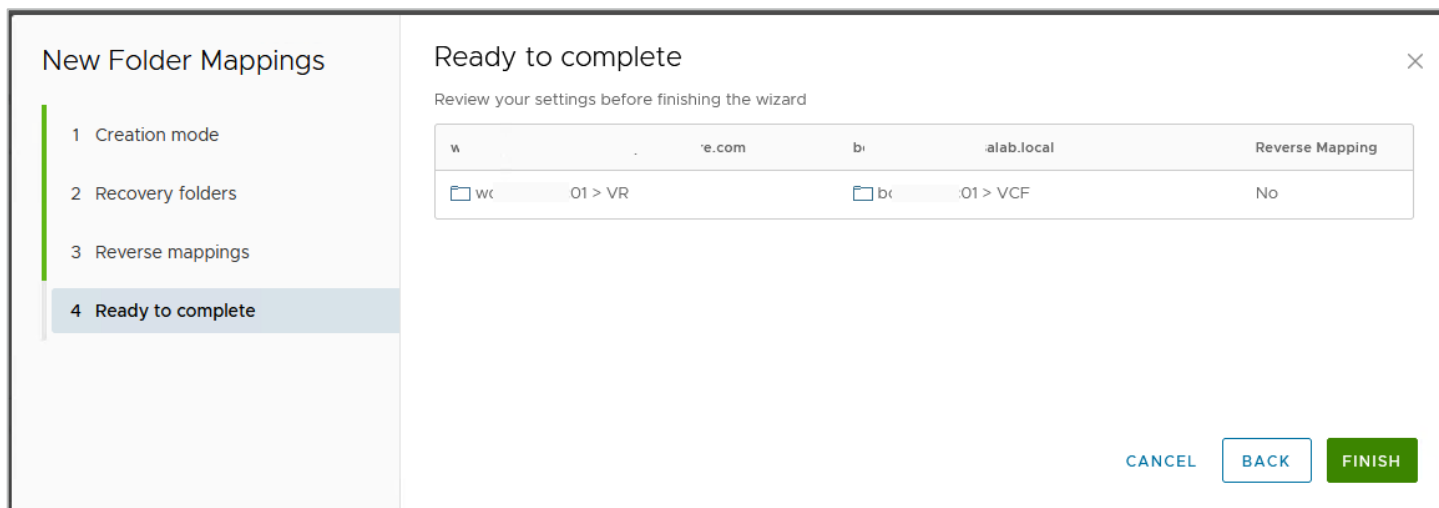
3. Select the VM folders to match up and click **Next**.



4. Select the check box or boxes to accept the option to create a matching folder map in the opposite direction automatically.
5. Click **Next**.



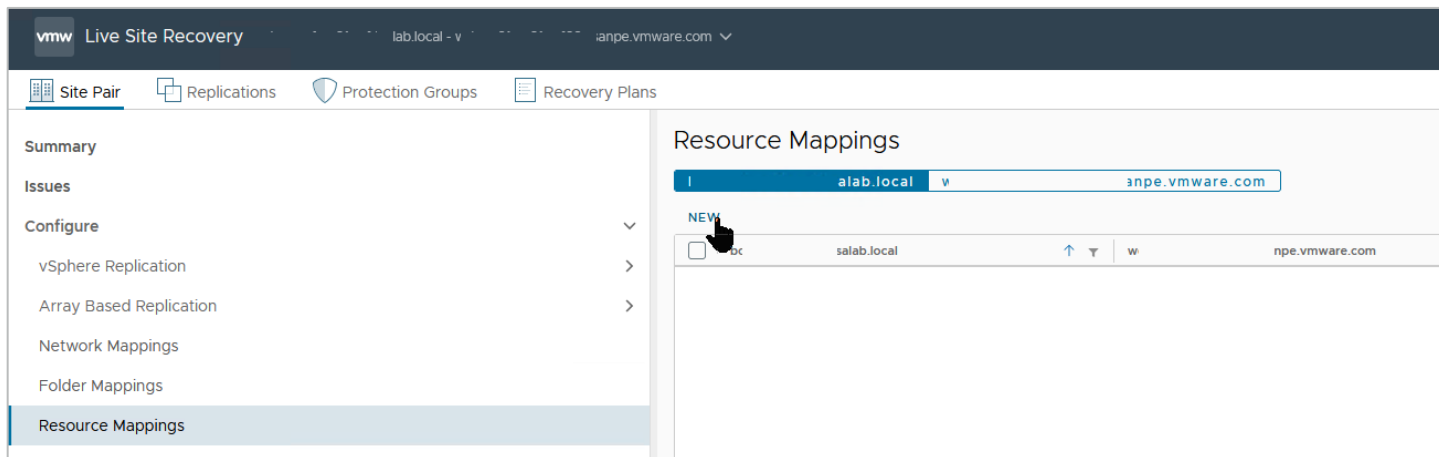
6. Click **Finish**.



## Create resource mappings

You'll map resources at the highest level possible (cluster level, in this case).

1. Click **New** to begin.



2. Select the cluster containing your protected workloads and map it to the cluster you would like them placed in at the recovery site.
3. Click **Add Mappings** and click **Next**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

The screenshot shows the 'New Resource Mappings' dialog with the 'Recovery resources' step selected. The left sidebar contains three items: '1 Recovery resources' (highlighted), '2 Reverse mappings', and '3 Ready to complete'. The main area is titled 'Recovery resources' and contains a search bar and two lists of resources. The first list shows a folder 'b' containing 'bc'. The second list shows a folder 'w' containing 'wc'. Below the lists is an 'ADD MAPPINGS' button. A table below the button shows the resulting mapping: 'bc' from 'f.tsalab.local' mapped to 'wc' from 'anpe.vmware.com'. The table has columns for source and target, and a '1 mapping(s)' summary at the bottom right. 'CANCEL' and 'NEXT' buttons are at the bottom right, with a hand cursor pointing to 'NEXT'.

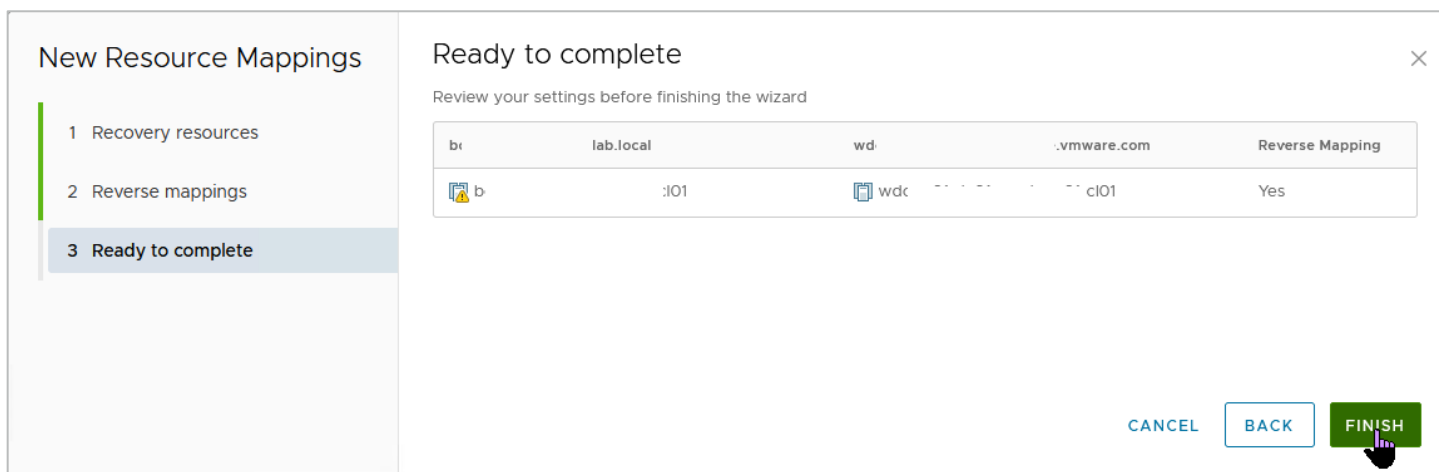
4. Accept the option to auto-configure a reverse mapping and click **Next**.

The screenshot shows the 'New Resource Mappings' dialog with the 'Reverse mappings' step selected. The left sidebar contains three items: '1 Recovery resources', '2 Reverse mappings' (highlighted), and '3 Ready to complete'. The main area is titled 'Reverse mappings' and contains a search bar and a table of mappings. The table has two rows: the first row shows 'wc' from 'anpe.vmware.com' mapped to 'bc' from 'f.tsalab.local'; the second row shows 'w' from 'm01-cl01' mapped to 'bc' from 'f-cl01'. Below the table is a '1' with a checkmark and a '1 mapping(s)' summary at the bottom right. 'CANCEL', 'BACK', and 'NEXT' buttons are at the bottom right, with a hand cursor pointing to 'NEXT'.

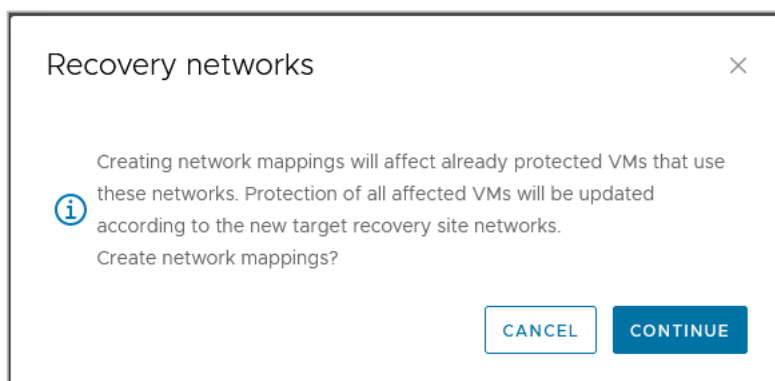
5. Click **Finish** to complete the process.



## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



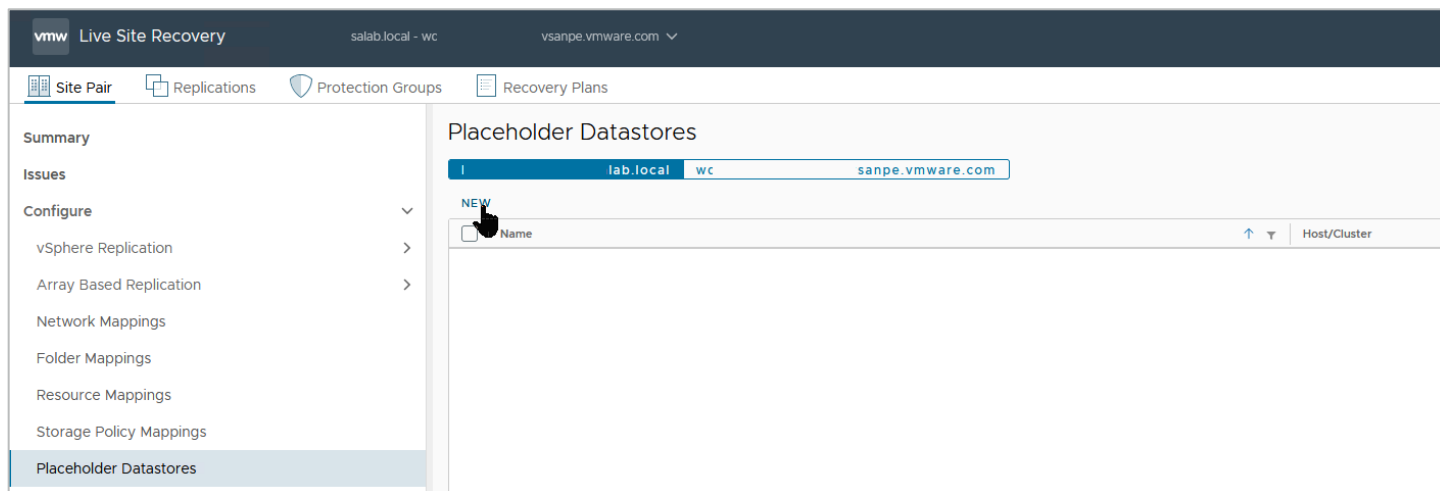
6. Click **Continue** to acknowledge and dismiss the warning about a possible impact on existing protected VMs.



When VMware Live Site Recovery uses vSphere Replication to replicate a protected VM to the recovery site, it also creates a representation of the VM in the vCenter at the recovery site. This representation is somewhat similar to the .vmx file that describes the running VM at the protected site. The major difference is that this representation is just a placeholder (aka "stub"), which can't be powered on. This placeholder file is stored in a designated datastore, which might not necessarily be the datastore with the full replicated copy of the protected VM. The "placeholder" datastore must exist on both sides for VMware Live Site Recovery to protect workloads in either direction.

7. From the **Placeholder Datastores** menu, click **New**.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



8. Select the datastore you want to use to store the placeholders and click **Add**.






**Note:** VMware Live Site Recovery requires the specified datastore to have a minimum of 6GB of free space.

## New Placeholder Datastore ✕

Select non-replicated datastores in which VLSR creates placeholder virtual machines. To enable planned migration and reprotect, you must select placeholder datastores at both sites.

**It is recommended to select a datastore with a minimum free capacity of 6 GB.** For more details, see the VMware Live Site Recovery documentation section "How VMware Live Site Recovery interacts with vSphere Cluster Services".

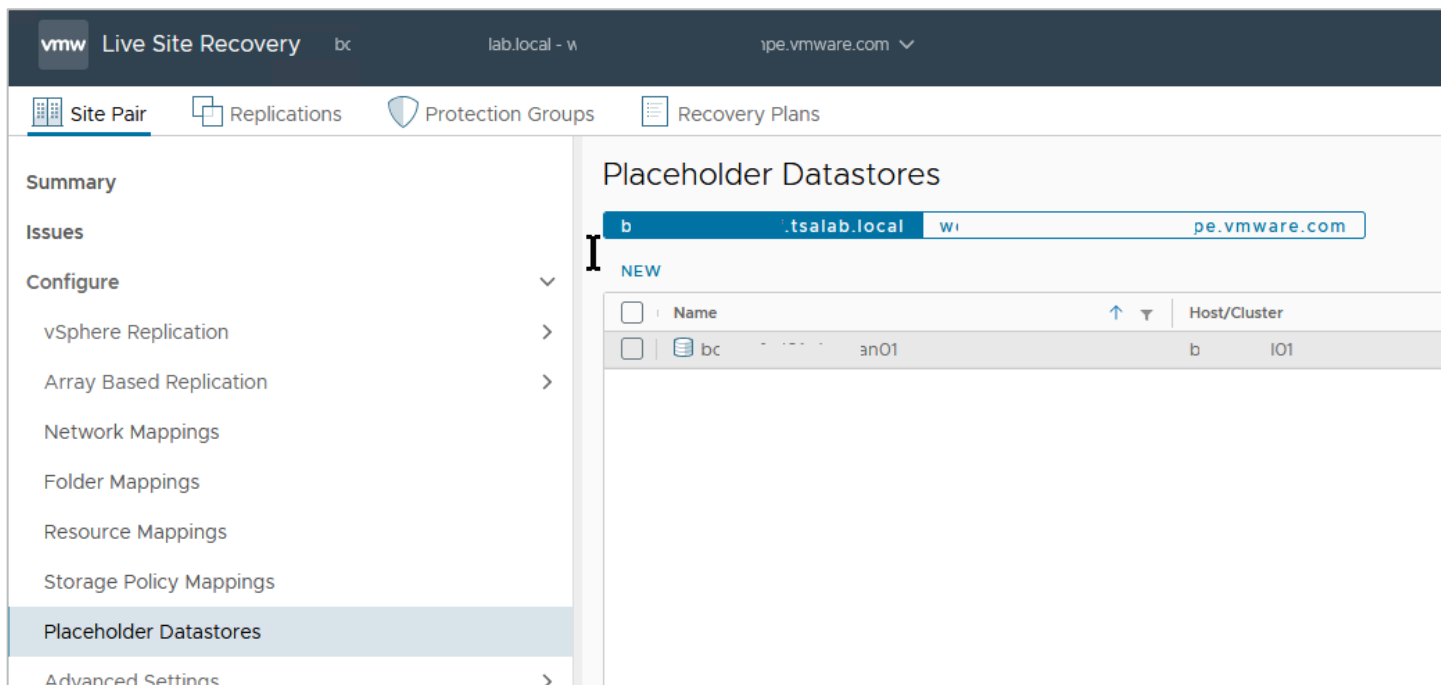
[SELECT ALL](#) [CLEAR SELECTION](#)

<input type="checkbox"/>	Name	↑	▼
<input checked="" type="checkbox"/>	 bca-vcf-cl01-ds-vsan01		
<input type="checkbox"/>	 datastore1		
<input type="checkbox"/>	 datastore1 (1)		
<input type="checkbox"/>	 datastore1 (2)		
<input type="checkbox"/>	 datastore1 (3)		
<input checked="" type="checkbox"/>	1	9 datastore(s)	

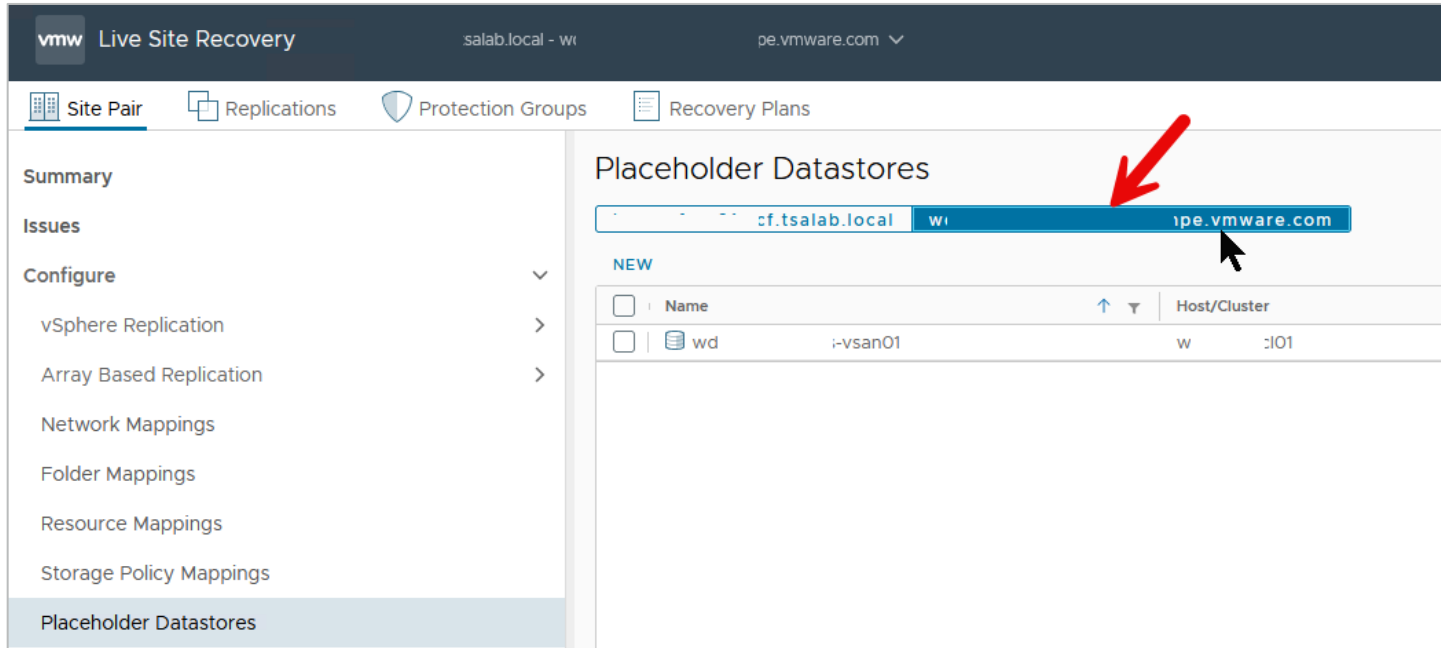
[CANCEL](#) [ADD](#)

Here is the placeholder datastore at the protected site:

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



From this menu, you can click on the recovery site (see the arrow below) to specify the corresponding placeholder datastore for that site. Here's the placeholder datastore at the recovery site:



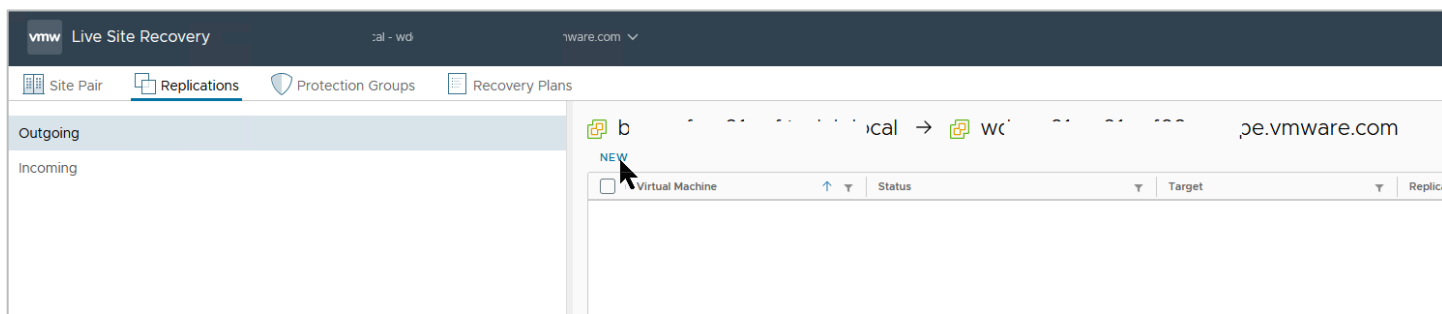
## Replicate protected VMs

For VMware Live Site Recovery to protect and recover a VM, a copy of that VM must make its way from the protected site to the recovery site. Let's set up the replication part of the exercise now.

### Create an outgoing replication

In this guide, the source (the protected site) is the on-premises VCF infrastructure, so let's switch to that and create an **Outgoing** replication.

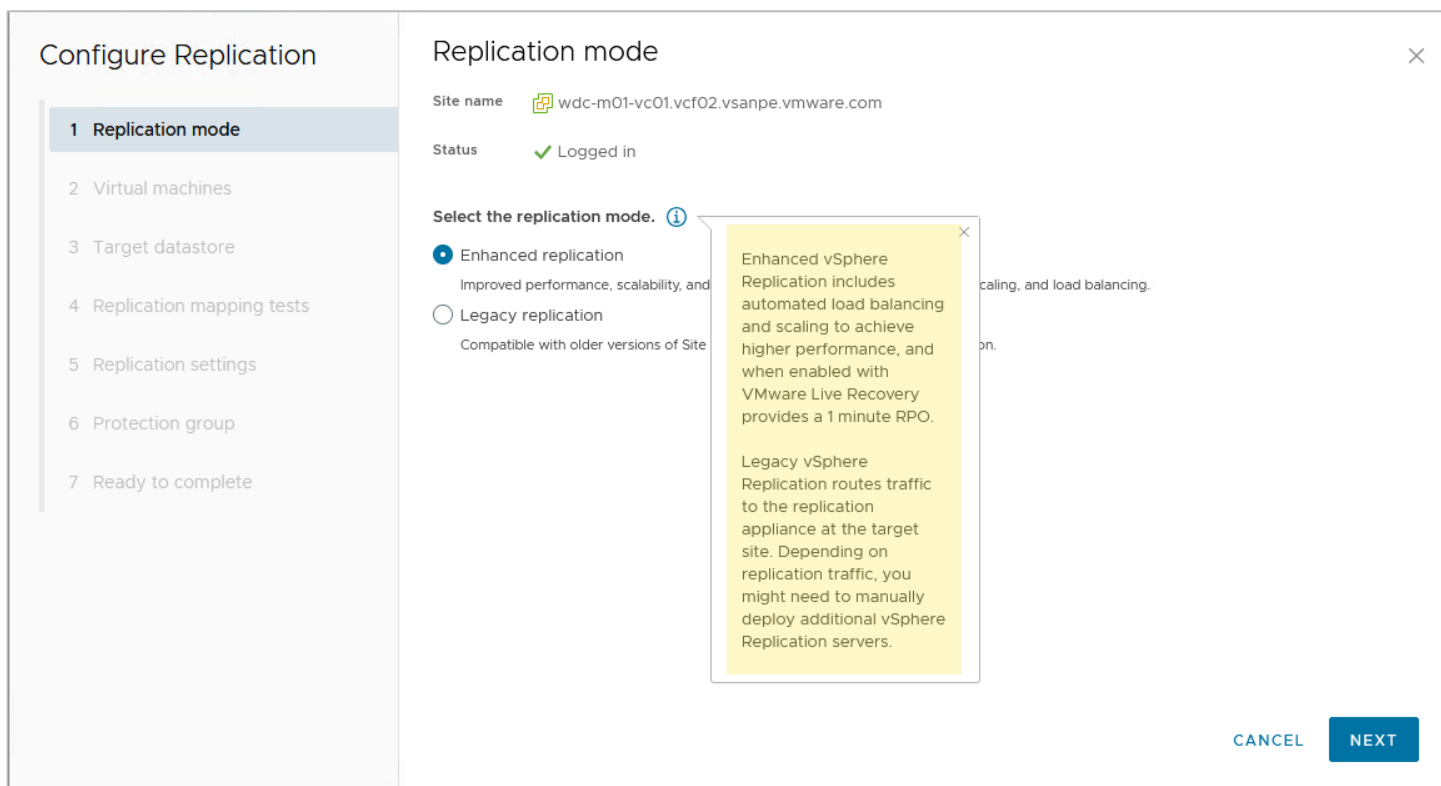
1. Click **New**.



VMware Live Site Recovery introduces an enhanced replication feature, which enables automatic load-balancing of the replication engines to ensure high performance and more fine-grained replication schedules. With enhanced replication, VMware Live Site Recovery can provide up to a 1-minute recovery point objective (RPO), ensuring protected workloads are up to date.

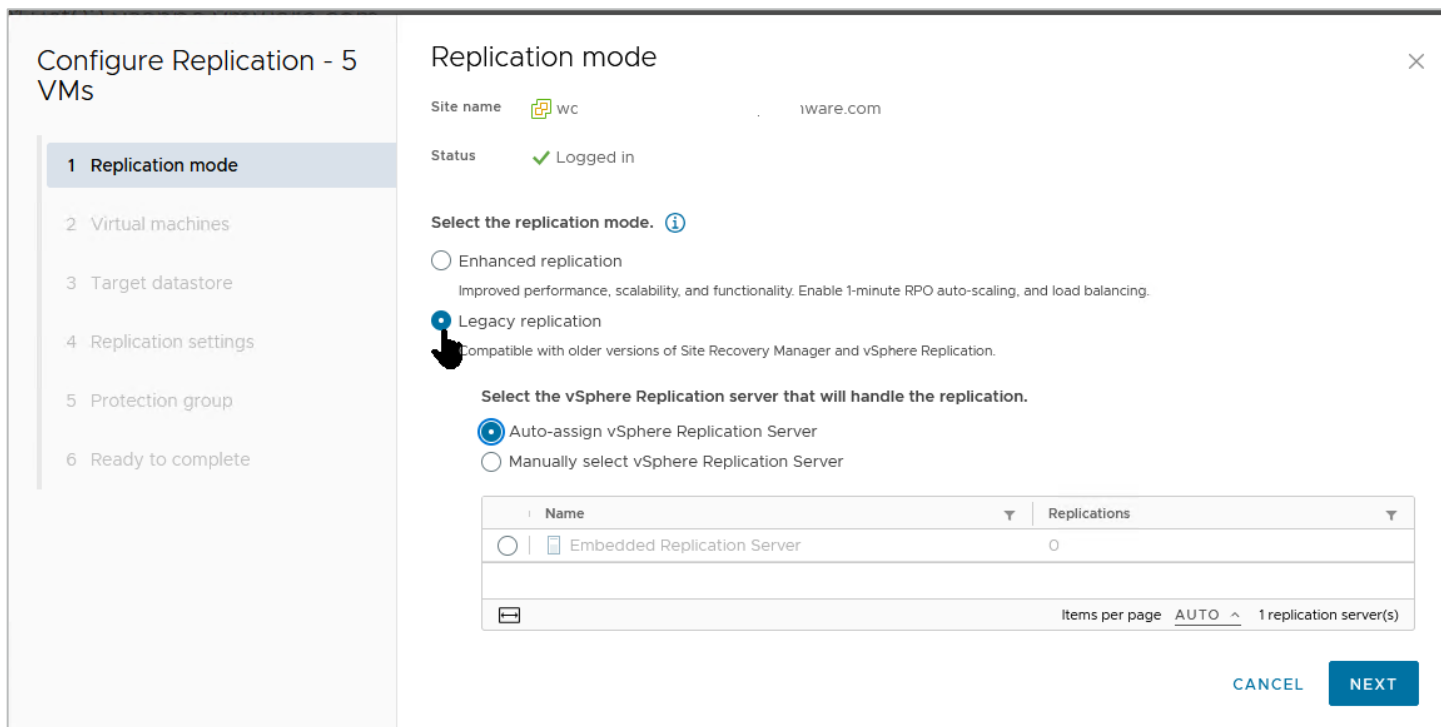
2. If your storage arrays and infrastructure support such high replication frequencies, choose **Enhanced Replication**. Otherwise, select the **Legacy Replication** option and click **Next**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



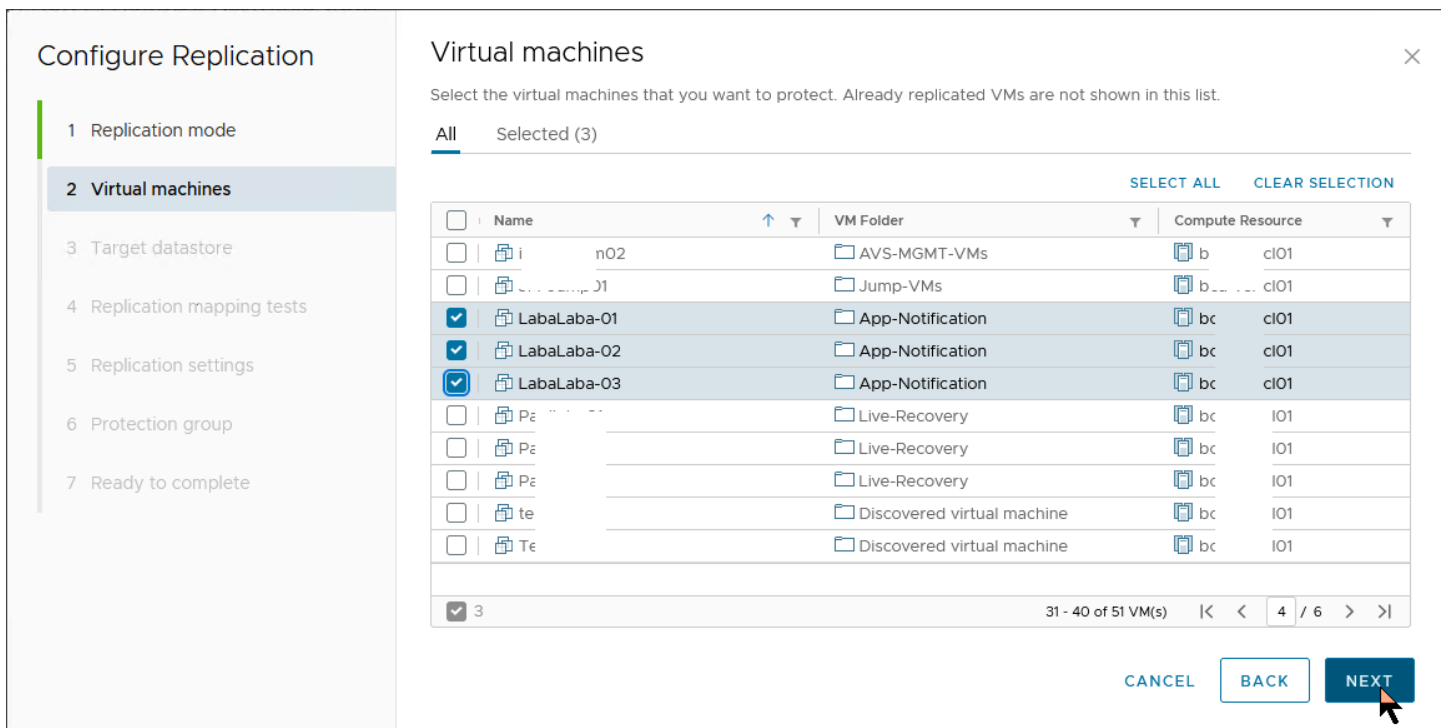
**Note:** If you selected the **Legacy Replication** option, and your replication engine is the VMware vSphere Replication server (or servers), you'll be prompted to select the applicable replication server or accept an automatic selection.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



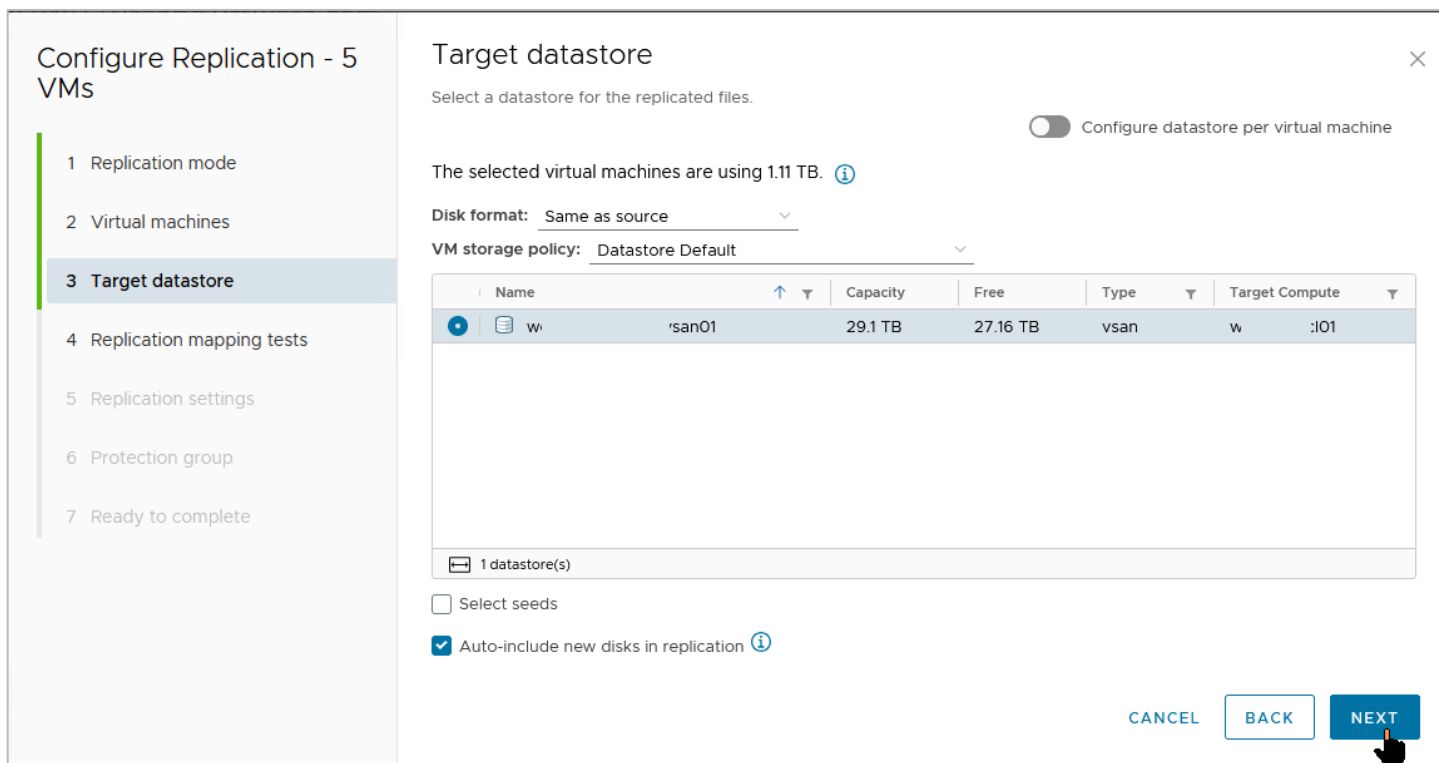
3. Select the VMs you want to protect with VMware Live Site Recovery and click **Next**.

**Note:** You can add or remove VMs from replication (and, consequently, protection) at will, so just select a few for now.



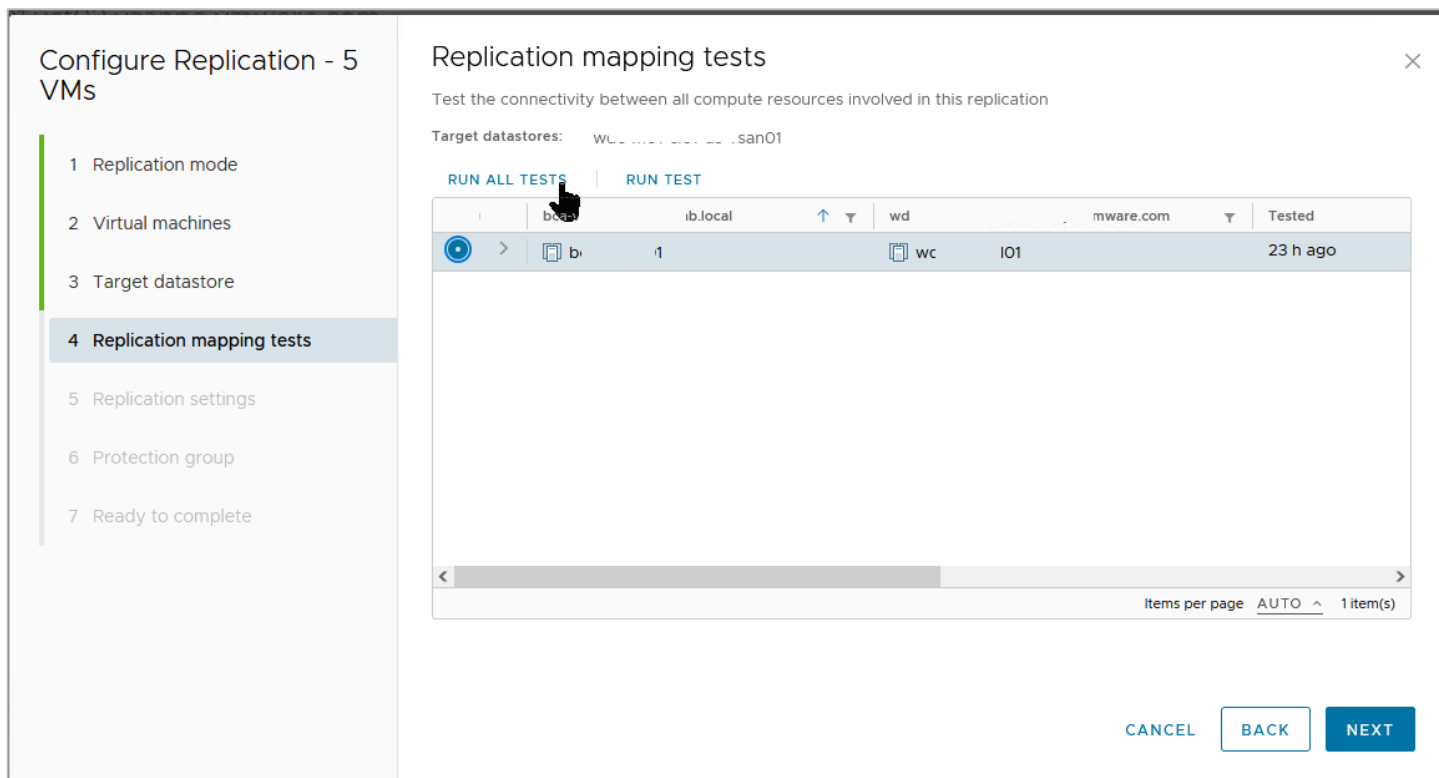
4. Select the datastore where you want to store the replicated VM copies at the target (recovery site).

**Note:** The target/recovery site is another VCF infrastructure that the process auto-identifies because it's already paired.



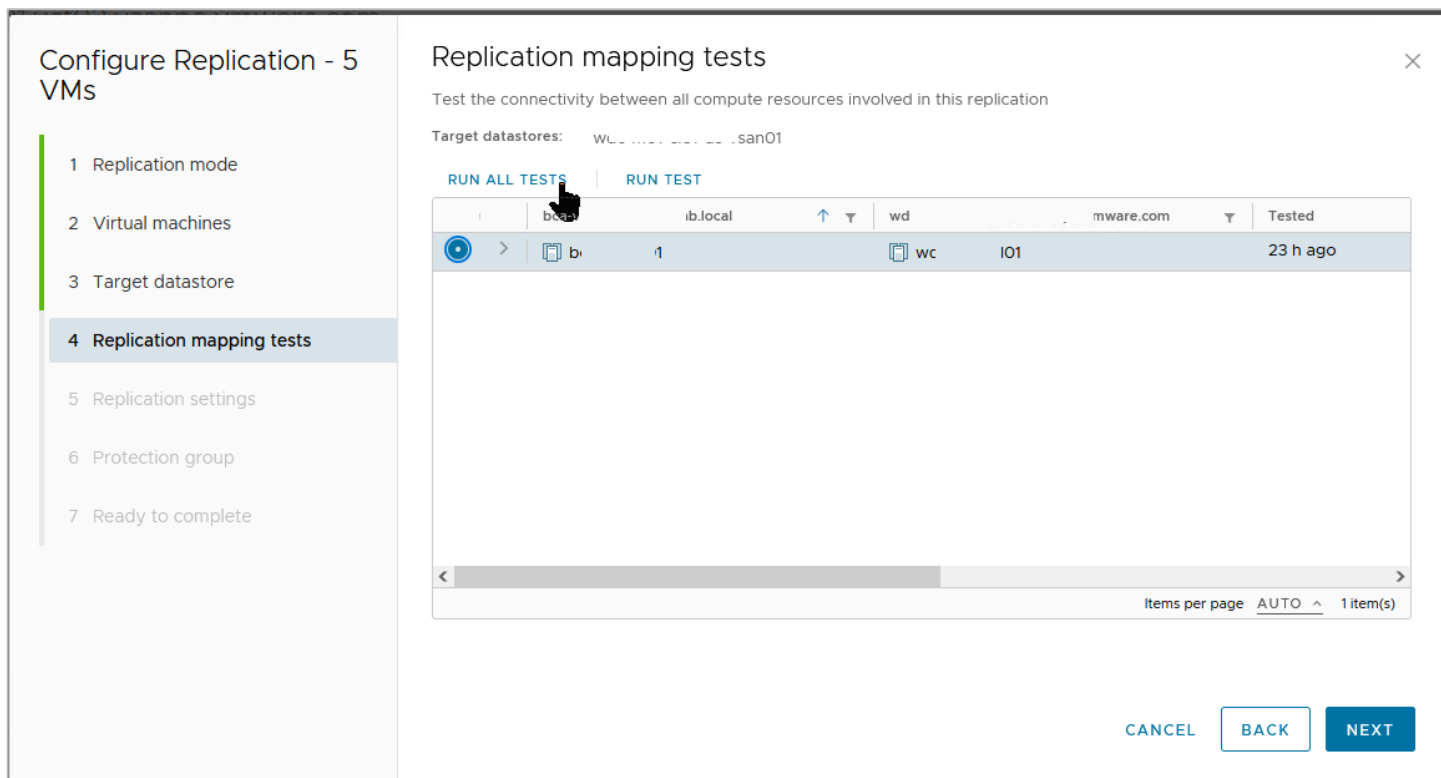
The option **Auto-include new disks in replication** is one of the amazing things about vSphere Replication. It anticipates situations where a protected VM's configuration could change after we set up the disaster recovery plans. With this option, vSphere Replication automatically incorporates the changes into the replication tasks.



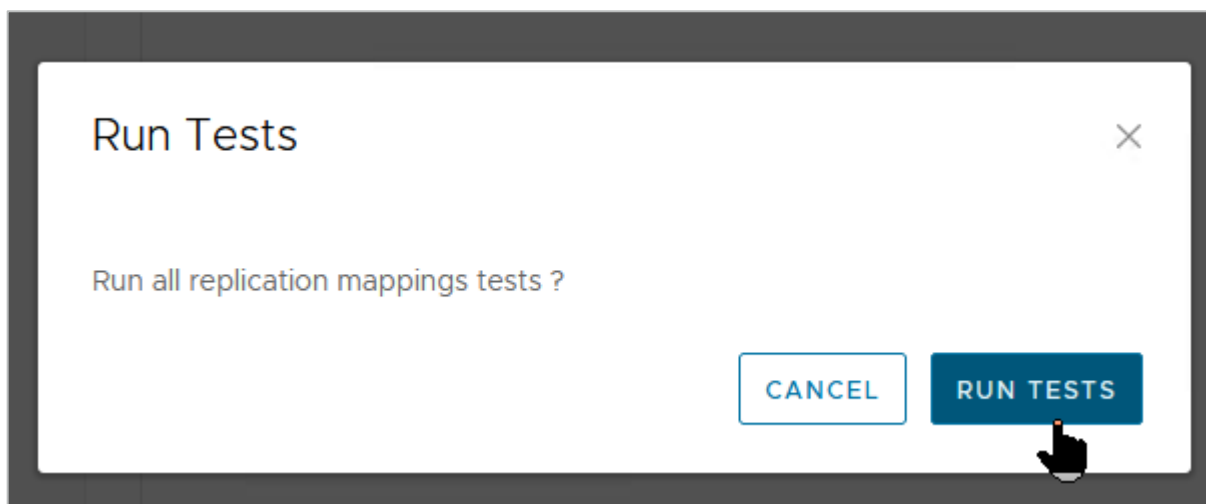


Remember the mapping tasks you performed a while back? Here's where they begin to come into play. VMware Live Site Recovery will now perform the necessary steps required to verify the connectivity and availability of the mappings.

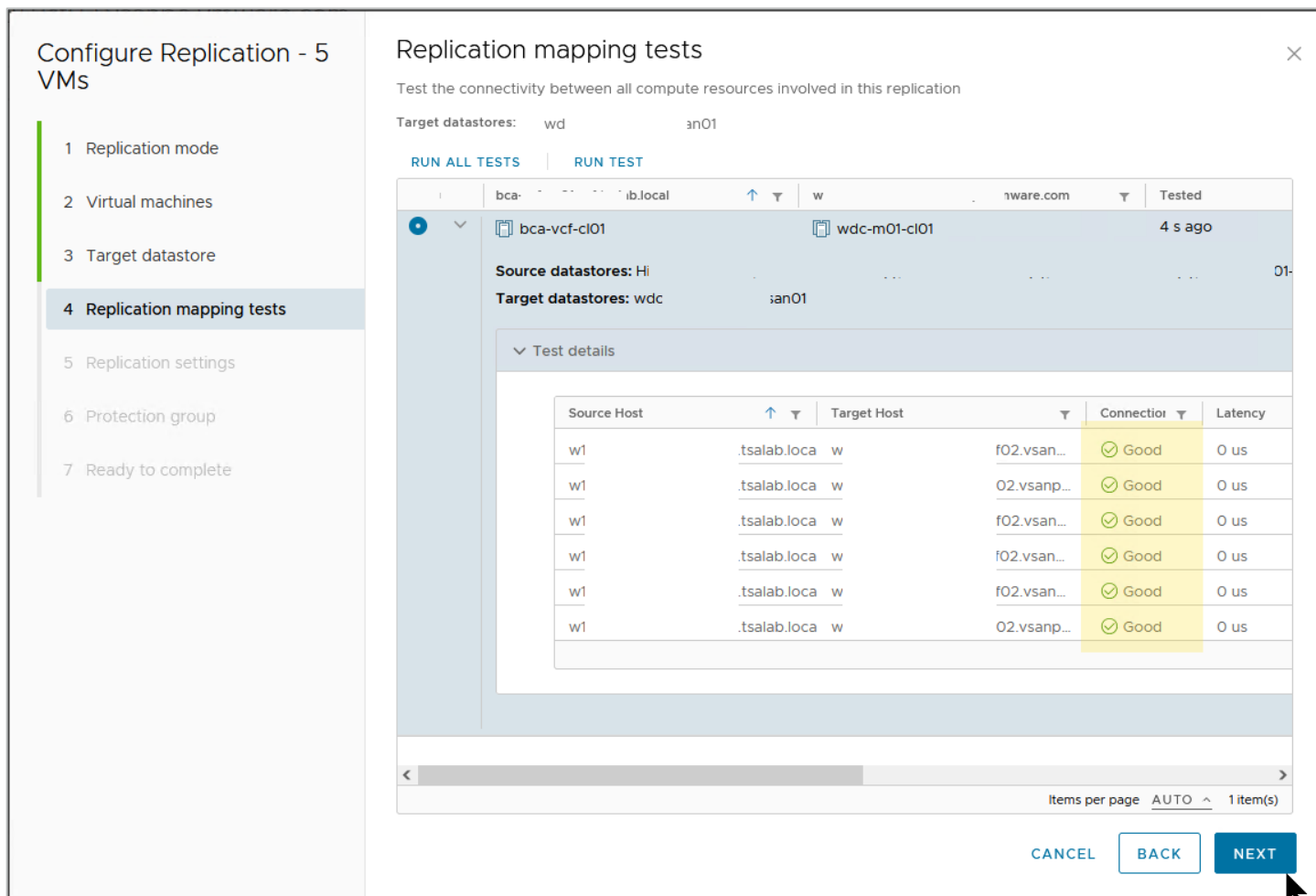
5. If this is the first time you're doing this, select **Run All Tests** and click **Next**. If you've previously validated these, skip this or run a specific test.



6. Click **Run Tests** on the pop-up window.



7. If all of the results come back good, click **Next**. Otherwise, review and fix any reported errors before proceeding.



## RPO/RTO, run book, protection group, and recovery plan defined

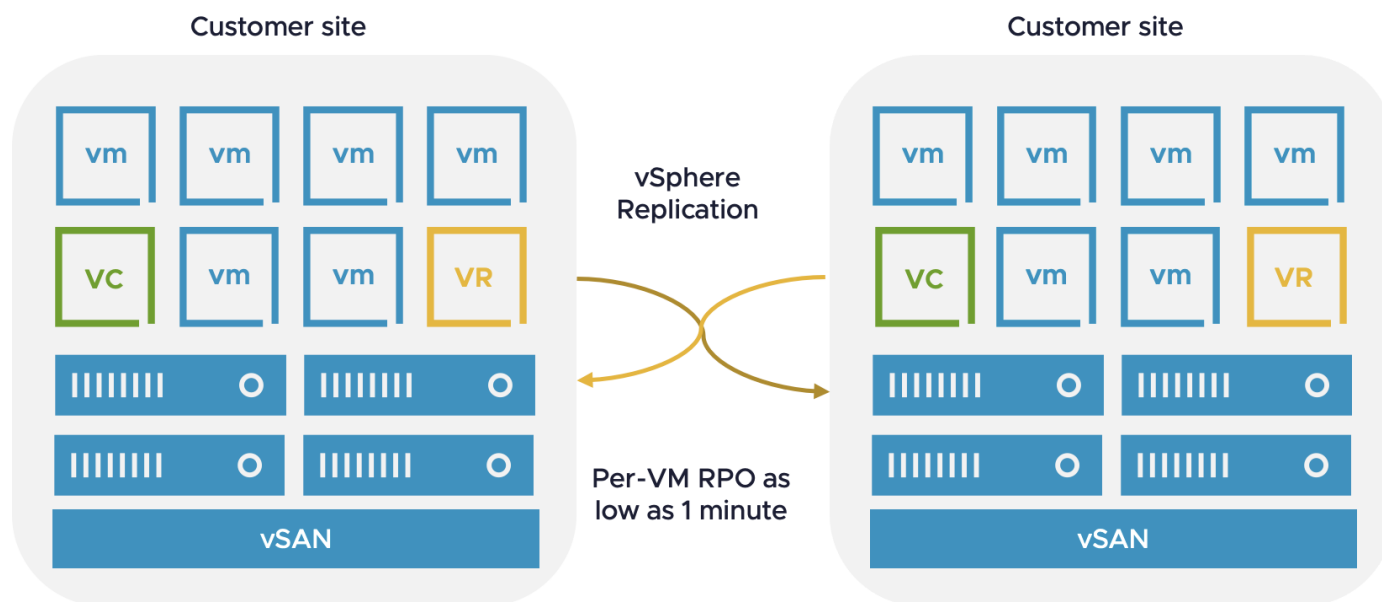
RPO and RTO might be two of the most overused acronyms when discussing disaster recovery of mission-critical applications in the enterprise. We've consciously avoided mentioning them until now because they deserve book-length attention, which we can't accommodate in this guide. Simply put:

- A **recovery time objective (RTO)** specifies the acceptable duration required for an IT infrastructure to recover from a disaster event and resume operations. The objective is to make this window as short as possible. Several external, environmental, and infrastructural factors influence an RTO, so we won't demonstrate this concept here.
- A **recovery point objective (RPO)** specifies the acceptable loss of services or data in a disaster event. It measures how up to date the enterprise data is after such an event. Admins, operators, and business owners/stakeholders want an RPO of 0, but financial, human, and technological constraints make this difficult to attain.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

vSphere Replication provides RPO options from as low as 1 minute and as high as 24 hours, ensuring greater flexibility in recovery targets and allowing you to fine-tune your DR plans based on your infrastructural constraints. This means vSphere Replication attempts to synchronize and replicate every state change in the protected VM site as frequently as every minute. At any point, the copy of the VMs at the recovery site is identical to the original protected VM no more than 1 minute ago. On the extreme end of the spectrum, vSphere Replication can maintain a 24-hour RPO.

Consult your storage vendor for official guidance for RPOs supported by your non-vSAN arrays.



The [vSphere Replication Admin Guide](#) provides comprehensive documentation for the other capabilities and features on this screen, so we won't duplicate that information here.

8. For this exercise, select a 15-minute replication frequency and click **Next**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

The screenshot shows the 'Replication settings' step of the 'Configure Replication - 5 VMs' wizard. On the left, a navigation pane lists steps 1 through 7, with '5 Replication settings' selected. The main area is titled 'Replication settings' and includes a close button (X) in the top right. Below the title is the instruction: 'Configure the replication settings for the virtual machines.' The 'Recovery point objective (RPO)' is set to 15 minutes on a slider ranging from 1 minute to 24 hours. Below the slider are options for 'Enable point in time instances', 'Instances per day' (set to 3), and 'Days' (set to 5). There are also checkboxes for 'Enable guest OS quiescing', 'Enable network compression for VR data' (checked), 'Enable network encryption for VR data' (checked), and 'Enable DataSets replication' (checked). A warning icon and text state: 'Enhanced vSphere Replication requires network encryption. [LEARN MORE](#)'. At the bottom right are 'CANCEL', 'BACK', and 'NEXT' buttons.

We'll talk about **Protection group** and other configurations later.

9. Select **Do not add to protection group now** and click **Next**.

The screenshot shows the 'Protection group' step of the 'Configure Replication - 5 VMs' wizard. On the left, the navigation pane shows '6 Protection group' selected. The main area is titled 'Protection group' and includes a close button (X) in the top right. Below the title is the instruction: 'You can add these virtual machines to a protection group.' There are three radio button options: 'Add to existing protection group', 'Add to new protection group', and 'Do not add to protection group now', which is selected. At the bottom right are 'CANCEL', 'BACK', and 'NEXT' buttons.

10. Review and verify the configuration settings and click **Finish** if it looks good, or click **Back** to make some modifications.

**Configure Replication - 5 VMs**

- 1 Replication mode
- 2 Virtual machines
- 3 Target datastore
- 4 Replication mapping tests
- 5 Replication settings
- 6 Protection group
- 7 Ready to complete**

**Ready to complete**

Review your selected settings.

Target site	wd.vare.com
Replication server	Enhanced replication
Auto-replicate new disks	Enabled
VMs to be replicated	5
Quiescing	Disabled
Network compression	Enabled
Network encryption	Enabled
Recovery point objective	15 minutes
Points in time recovery	Disabled
DataSets replication	Enabled
Protection group	none

**CANCEL** **BACK** **FINISH**

You're finished with the replication setup.

vmware Live Site Recovery bc .local - wd .com

Site Pair **Replications** Protection Groups Recovery Plans

Outgoing Incoming

bc .local → wc .vmware.com

NEW RECONFIGURE PAUSE RESUME REMOVE SYNC NOW

<input checked="" type="checkbox"/>	Virtual Machine	Status	RPO	Target	Replication Server
<input checked="" type="checkbox"/>	Papilolo-01	✓ OK	15 minutes	wd	vsanpe.v... Enhanced replication
<input checked="" type="checkbox"/>	Papilolo-02	✓ OK	15 minutes	wd	vsanpe.v... Enhanced replication
<input checked="" type="checkbox"/>	Papilolo-03	✓ OK	15 minutes	wd	vsanpe.v... Enhanced replication
<input checked="" type="checkbox"/>	VLR-DC01	✓ OK	15 minutes	wd	vsanpe.v... Enhanced replication
<input checked="" type="checkbox"/>	VLR-DC02	✓ OK	15 minutes	wd	vsanpe.v... Enhanced replication

## Create protection groups and recovery plan

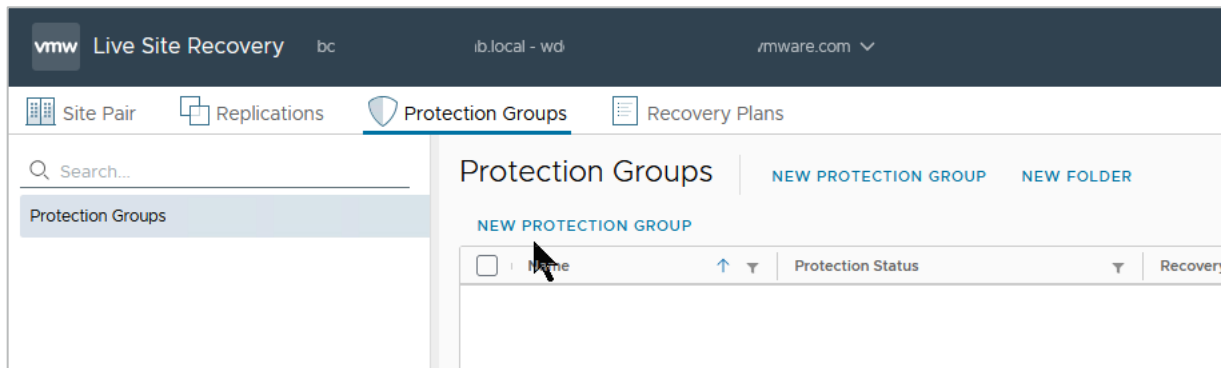
Critical enterprise applications typically don't exist or function independently. They depend on other services and workloads, and others depend on them. When designing a BCDR plan, these dependencies influence configuration and workflow choices and options. VMware Live Site Recovery provides a feature called protection groups, which contain VMs you want to recover together as a unit. Many factors, such as the type of storage and the unit of replication, influence the decision-making processes involved in creating and using protection groups.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

For this exercise, you'll create protection groups based on the services and characteristics of the VMs we want to protect and recover. There are three categories: Domain Controllers, SQL Server, and a Windows client. This is the primary influence on your configuration choice.

### Create a protection group for the Domain Controller VMs

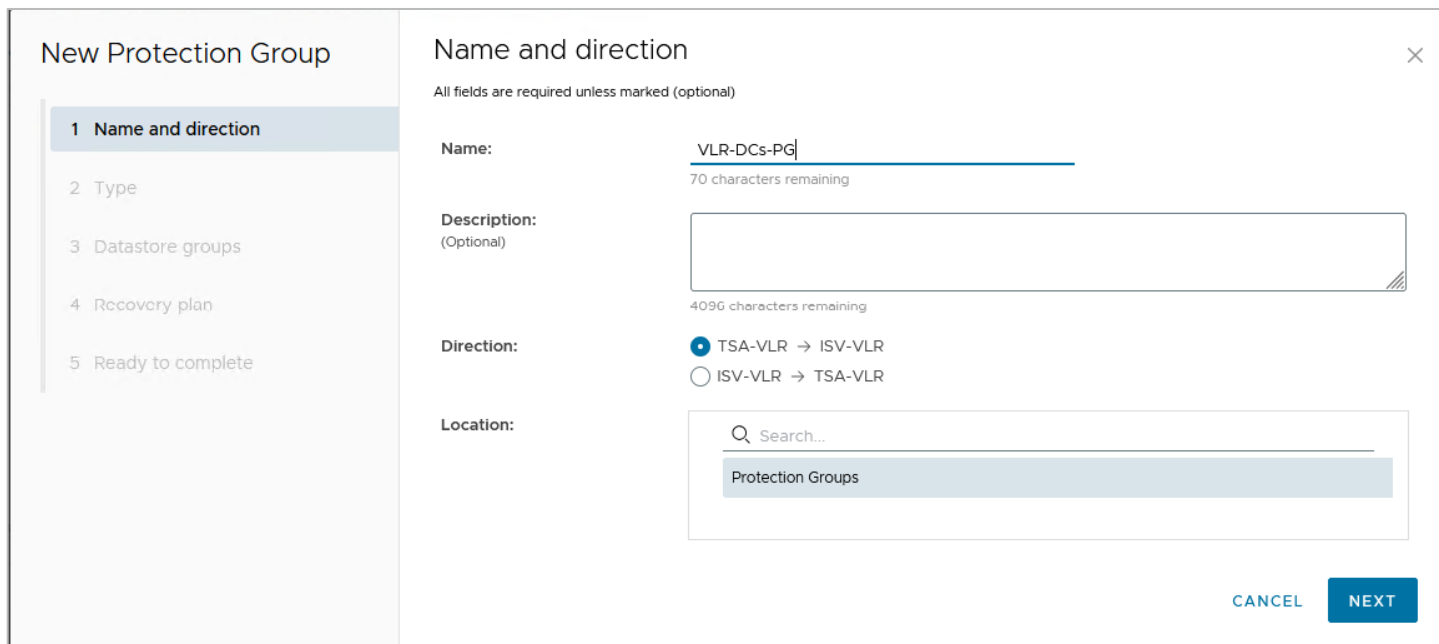
1. Go to the **Protection Groups** tab and select **New Protection Group**.



2. Give the group a descriptive name. The description is optional.

Next to **Direction**, select the option that shows your protected site → recovery site.

3. Click **Next**.



4. Because you're using vSphere Replication, select **Individual VMs (vSphere Replication)** and click **Next**.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

**New Protection Group**

- 1 Name and direction
- 2 Type**
- 3 Virtual machines
- 4 Recovery plan
- 5 Ready to complete

**Type**

Select the type of protection group you want to create:

- Datastore groups (array-based replication)  
Protect all virtual machines which are on specific datastores.
- Individual VMs (vSphere Replication)**  
Protect specific virtual machines, regardless of the datastores.
- Virtual Volumes (vVol replication)  
Protect virtual machines which are on replicated vVol storage.

CANCEL BACK NEXT

5. This protection group is for the Domain Controllers, so select those VMs and click **Next**.

**New Protection Group**

- 1 Name and direction
- 2 Type
- 3 Virtual machines**
- 4 Recovery plan
- 5 Ready to complete

**Virtual machines**

Select the virtual machines to include in the protection group

All Selected (2)

<input type="checkbox"/>	Virtual machine	↑ ↓	Status	▼	Protection Status	▼
<input type="checkbox"/>	Papilolo-01		OK			
<input type="checkbox"/>	Papilolo-02		OK			
<input type="checkbox"/>	Papilolo-03		OK			
<input checked="" type="checkbox"/>	VLR-DC01		OK		Add to this protection group	
<input checked="" type="checkbox"/>	VLR-DC02		OK		Add to this protection group	

2 Items per page AUTO 5 VM(s)

CANCEL BACK NEXT

## Create a recovery plan for the Domain Controller VMs

A recovery plan defines and configures the steps, plans, and actions guiding your BCDR plan. Imagine it as the run book an admin would typically refer to and follow if they were to perform a disaster recovery operation manually.

In VMware Live Site Recovery, a recovery plan contains the logic and workflow of getting the copy of the protected VMs up and running in the recovery site when a disaster is declared and the recovery is initiated. You must add at least one recovery plan to the protection group. Because you don't already have a recovery plan, you'll create one now.

6. Select **Add to a new recovery plan**.



# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

7. Next to **Recovery plan name**, type an intuitive and descriptive name and click **Next**.

The screenshot shows the 'New Protection Group' wizard in the VMware Live Site Recovery console. The left sidebar lists five steps: 1 Name and direction, 2 Type, 3 Virtual machines, 4 Recovery plan (highlighted), and 5 Ready to complete. The main area is titled 'Recovery plan' and contains the following text: 'You can optionally add this protection group to a recovery plan.' Below this are three radio buttons: 'Add to existing recovery plan', 'Add to new recovery plan' (which is selected), and 'Do not add to recovery plan now'. A text input field for 'Recovery plan name' contains 'VLR-DCs-RP' and shows '70 characters remaining'. At the bottom right are three buttons: 'CANCEL', 'BACK', and 'NEXT'.

8. Review the result and click **Finish**.

The screenshot shows the 'New Protection Group' wizard in the VMware Live Site Recovery console, now at the 'Ready to complete' step. The left sidebar highlights step 5. The main area is titled 'Ready to complete' and contains the text 'Review your selected settings.' Below this is a table with the following data:

Name	VLR-DCs-PG
Description	
Protected site	TSA-VLR
Recovery site	ISV-VLR
Location	Protection Groups
Protection group type	Individual VMs (vSphere Replication)
Total virtual machines	2
Recovery plan	VLR-DCs-RP (new)

At the bottom right are three buttons: 'CANCEL', 'BACK', and 'FINISH'.

You're done creating the protection group and recovery plan for the Domain Controllers.

The screenshot shows the VMware Live Site Recovery console interface. The top navigation bar includes 'Site Pair', 'Replications', 'Protection Groups', and 'Recovery Plans'. The 'Protection Groups' page is active, showing a table with the following data:

Name	Protection Status	Recovery Status	Protection Type	Protected Site	Recovery Site
VLR-DCs-PG	OK	Ready	Individual VMs	TSA-VLR	ISV-VLR

## Create a protection group for the SQL Server VMs

Go ahead and create another protection group and recovery plan, this time for the SQL Server VMs.

**Note:** Because the process is similar, we won't describe every step here.

9. Give the protection group a descriptive name.

The screenshot shows the 'New Protection Group' dialog box with the 'Name and direction' step selected. The left sidebar lists five steps: 1 Name and direction, 2 Type, 3 Datastore groups, 4 Recovery plan, and 5 Ready to complete. The main area contains the following fields:

- Name:** VLR-SQL-PG (70 characters remaining)
- Description:** (Optional) (4096 characters remaining)
- Direction:**  TSA-VLR → ISV-VLR,  ISV-VLR → TSA-VLR
- Location:** Search... (Protection Groups)

Buttons: CANCEL, NEXT

10. Select Individual VMs (vSphere Replication).

The screenshot shows the 'New Protection Group' dialog box with the 'Type' step selected. The left sidebar lists five steps: 1 Name and direction, 2 Type, 3 Virtual machines, 4 Recovery plan, and 5 Ready to complete. The main area contains the following options:

- Datastore groups (array-based replication)  
Protect all virtual machines which are on specific datastores.
- Individual VMs (vSphere Replication)  
Protect specific virtual machines, regardless of the datastores.
- Virtual Volumes (vVol replication)  
Protect virtual machines which are on replicated vVol storage.

Buttons: CANCEL, BACK, NEXT

11. Select the SQL Server VMs.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

The screenshot shows the 'New Protection Group' wizard in the VMware vSphere interface. The left sidebar contains a progress indicator with five steps: 1 Name and direction, 2 Type, 3 Virtual machines (highlighted), 4 Recovery plan, and 5 Ready to complete. The main panel is titled 'Virtual machines' and contains the instruction 'Select the virtual machines to include in the protection group'. Below this, there are tabs for 'All' and 'Selected (3)'. A table lists three virtual machines: Papilolo-01, Papilolo-02, and Papilolo-03, all with a status of 'OK' and a 'Protection Status' of 'Add to this protection group'. At the bottom of the table, it shows '3' items selected and 'Items per page AUTO 3 VM(s)'. Navigation buttons 'CANCEL', 'BACK', and 'NEXT' are located at the bottom right.

Virtual machine	Status	Protection Status
<input checked="" type="checkbox"/> Papilolo-01	OK	Add to this protection group
<input checked="" type="checkbox"/> Papilolo-02	OK	Add to this protection group
<input checked="" type="checkbox"/> Papilolo-03	OK	Add to this protection group

## Create a protection group for the SQL Server VMs

12. Create a corresponding Recovery Plan for it.

The screenshot shows the 'New Protection Group' wizard in the VMware vSphere interface, now at the 'Recovery plan' step. The left sidebar shows the progress indicator with step 4 'Recovery plan' highlighted. The main panel is titled 'Recovery plan' and contains the instruction 'You can optionally add this protection group to a recovery plan.' Below this, there are three radio button options: 'Add to existing recovery plan', 'Add to new recovery plan' (which is selected), and 'Do not add to recovery plan now'. A text input field for 'Recovery plan name:' contains the text 'VLR-SQL-RP' and shows '70 characters remaining'. Navigation buttons 'CANCEL', 'BACK', and 'NEXT' are located at the bottom right.

That's it.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

The screenshot shows the 'New Protection Group' wizard in VMware Live Site Recovery. The 'Ready to complete' step is active, showing a summary of the configuration. On the left, a navigation pane lists steps: 1 Name and direction, 2 Type, 3 Virtual machines, 4 Recovery plan, and 5 Ready to complete (highlighted). The main area displays the following details:

Name	VLR-SQL-PG
Description	
Protected site	TSA-VLR
Recovery site	ISV-VLR
Location	Protection Groups
Protection group type	Individual VMs (vSphere Replication)
Total virtual machines	3
Recovery plan	VLR-SQL-RP (new)

At the bottom right, there are three buttons: CANCEL, BACK, and FINISH.

Here's what the protection group list looks like now:

The screenshot shows the 'Protection Groups' list in the VMware Live Site Recovery console. The list contains three entries:

Name	Protection Status	Recovery Status	Protection Type	Protected Site	Recovery Site
VLR-DCs-PG	OK	Ready	Individual VMs	TSA-VLR	ISV-VLR
VLR-SQL-PG	OK	Ready	Individual VMs	TSA-VLR	ISV-VLR

## Modify the recovery plan

One of the most common tasks of a recovery plan is to configure the specific test (“bubble”) network you’d like to recover VMs into during a test recovery exercise.

We previously discussed the importance and use of a bubble network. We also configured a site-wide bubble network for all test recovery operations in previous steps.

The screenshot shows the 'Network Mappings' configuration screen in the VMware Live Site Recovery console. The left sidebar shows a navigation menu with 'Network Mappings' selected. The main area displays a table of network mappings:

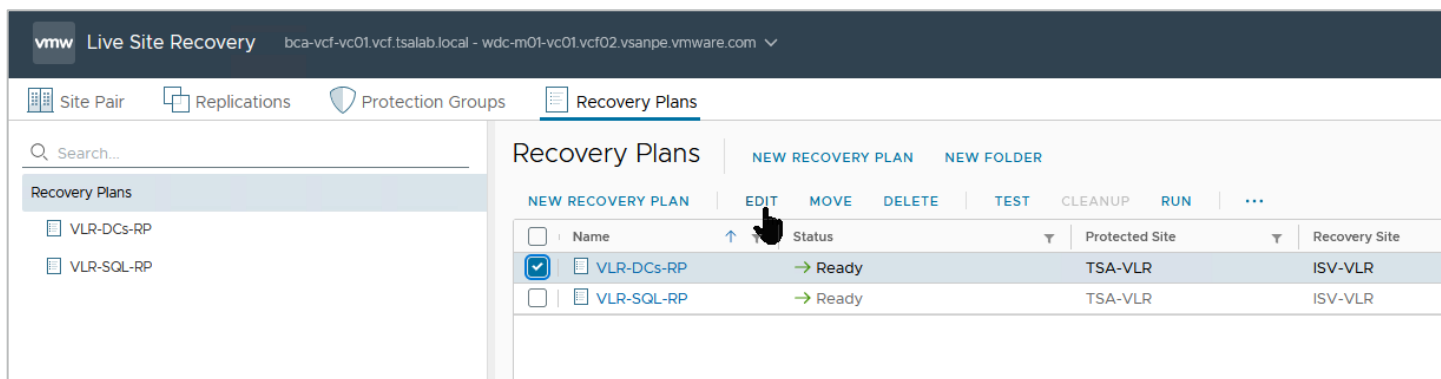
Recovery Network	Reverse Mapping	Test Network
bc: >g-mgmt	Yes	ISV-Test-Recovery-Segment
bc: >g-vm-mgmt	Yes	ISV-Test-Recovery-Segment
bc: . -vmotion	Yes	ISV-Test-Recovery-Segment
bc: . -vsan	No	Isolated network (auto created)

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

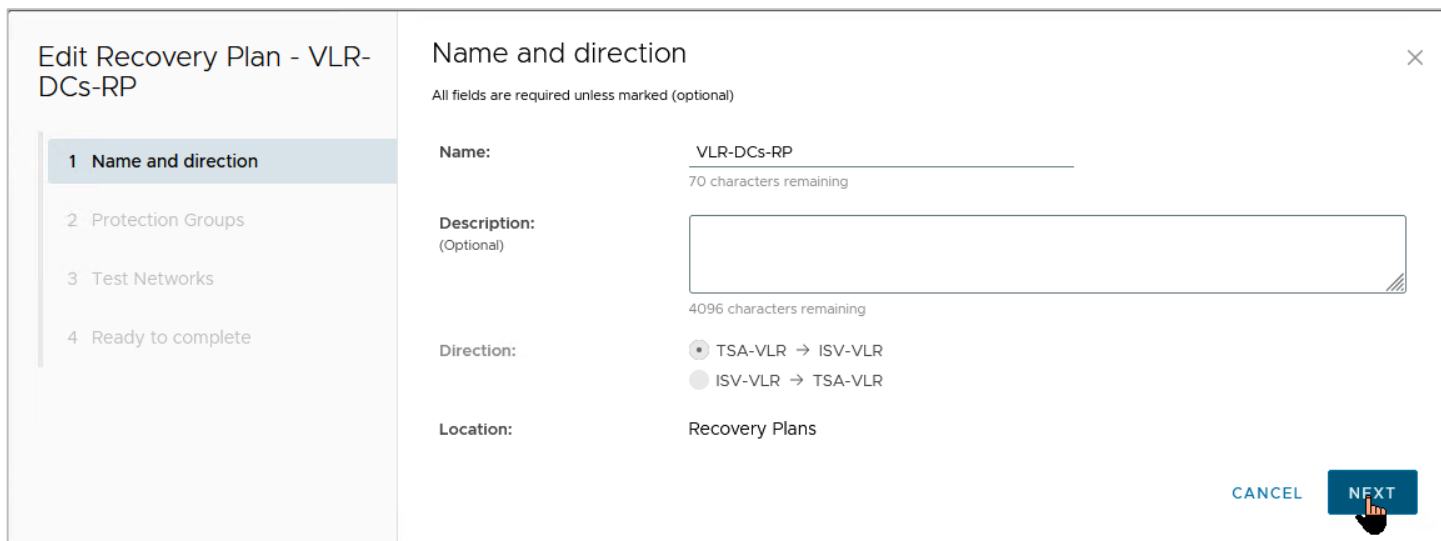
However, the flexibility of VMware Live Site Recovery also gives us the ability to configure the test recovery network at the recovery plan level. This way, you can specify different test networks for different classes of protected workloads.

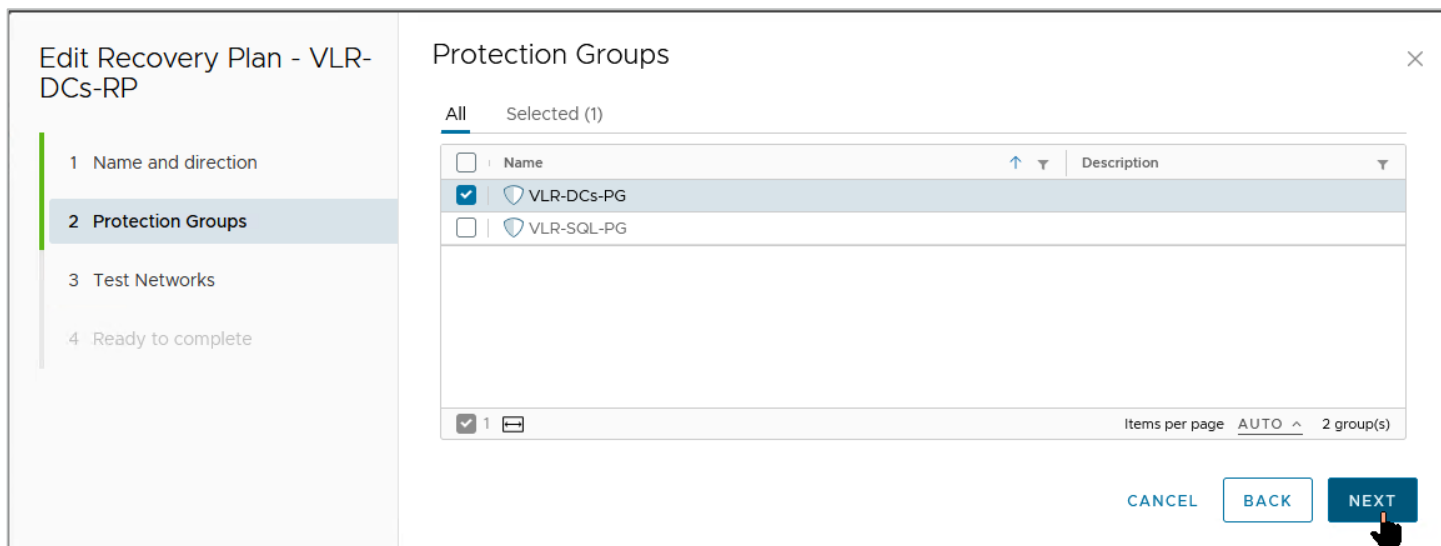
You'll modify the recovery plan to see how you can control the fencing required for test recovery operations.

1. Select the recovery plan you want to modify and click **Edit**.



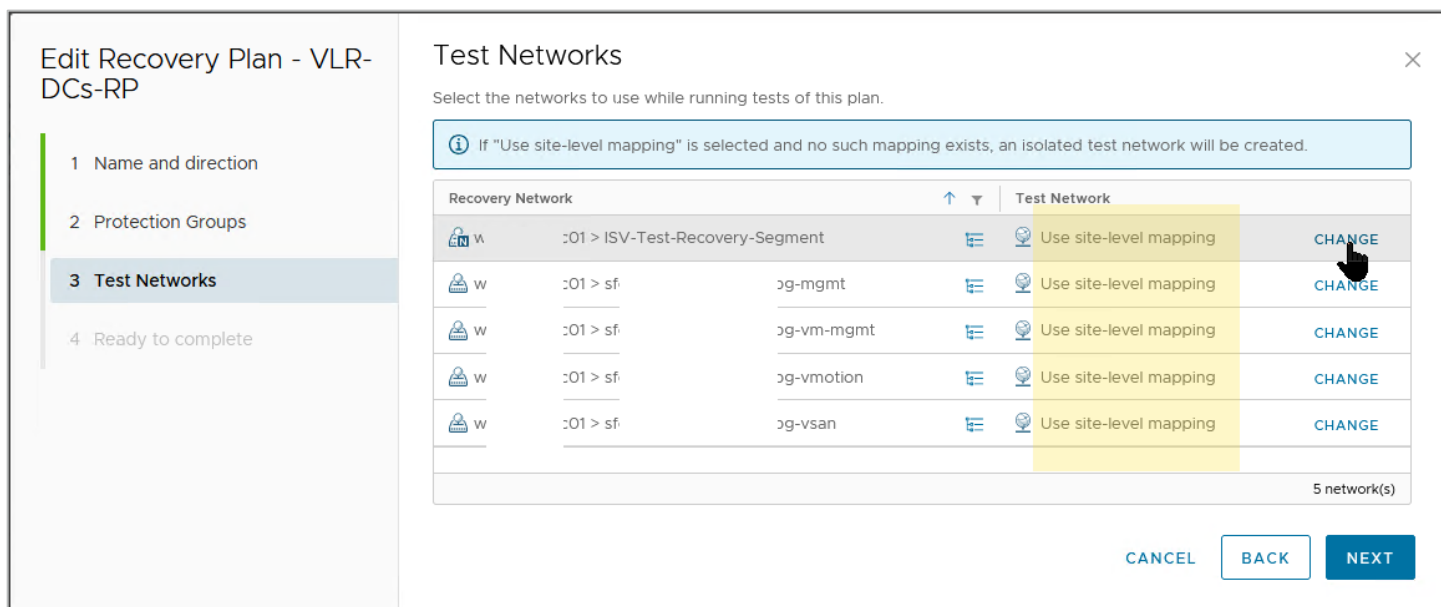
2. You'll only modify the test network settings, so click **Next** on the next two screens.





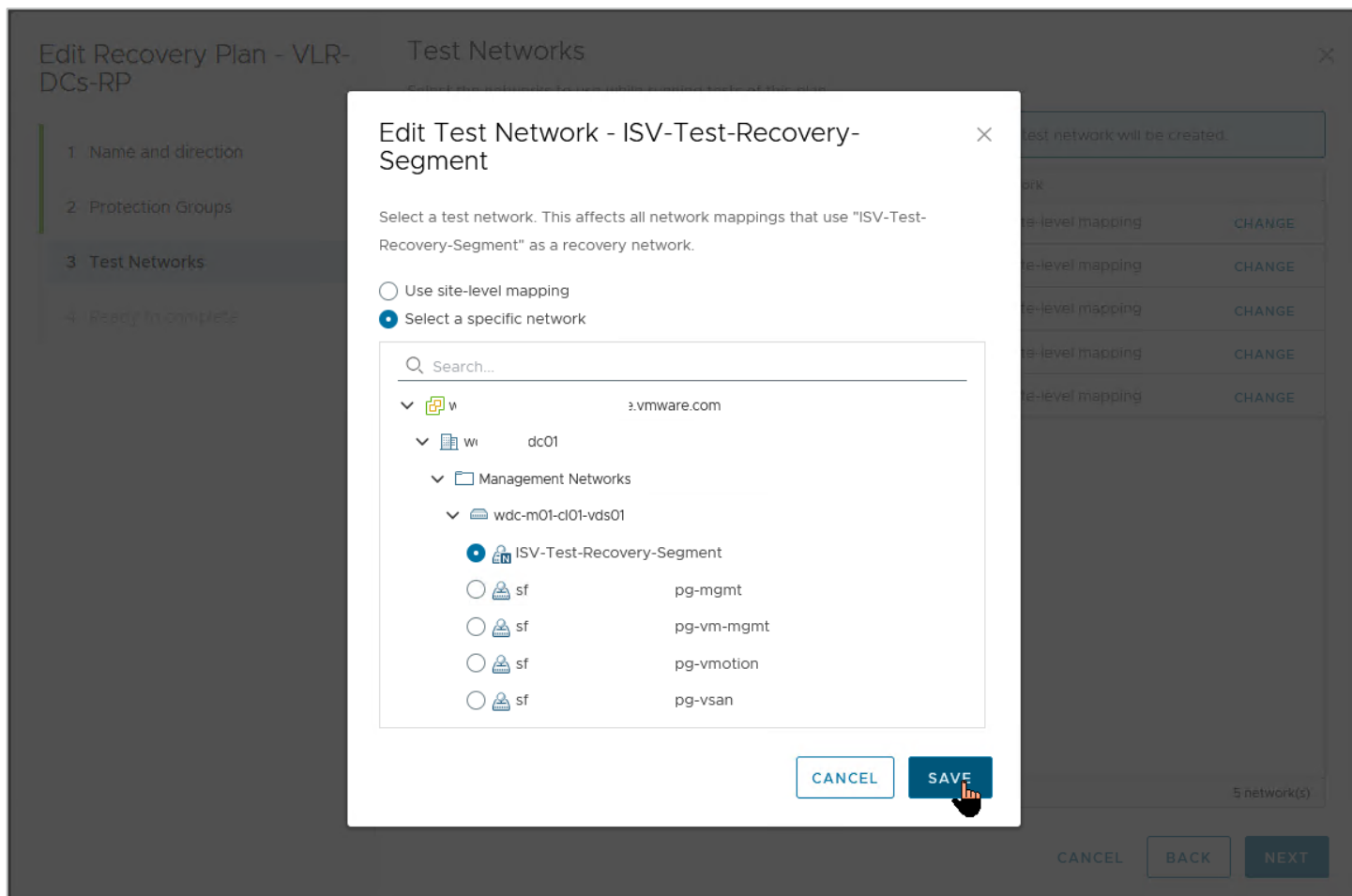
Notice how the test network options default to **Use site-level mapping**? You'll change that now.

3. Click **Change** on each of them.

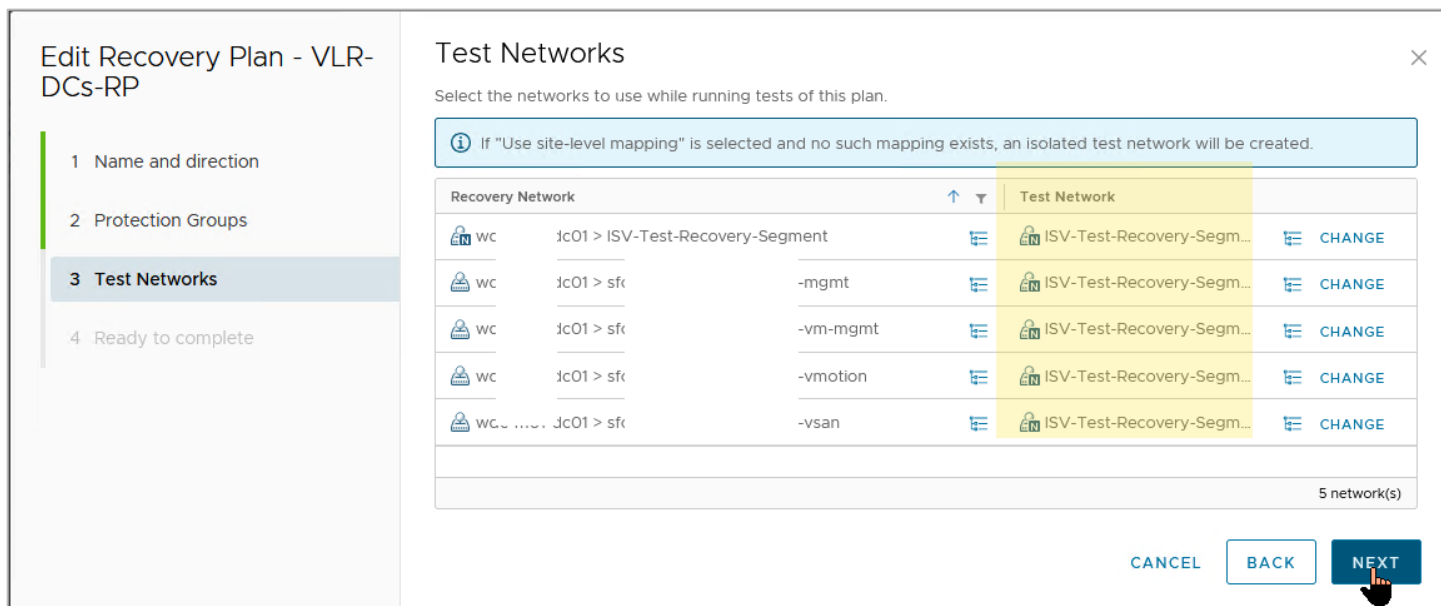


4. Select the fenced-off test network you created in prior steps and click **Save**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



5. Repeat the process for additional mappings you want for other test networks.



6. Click **Finish** when you're done.

**Edit Recovery Plan - VLR-DCs-RP**

1 Name and direction  
2 Protection Groups  
3 Test Networks  
4 Ready to complete

**Ready to complete** ×

Review your selected settings.

<b>Name</b>	VLR-DCs-RP
<b>Description</b>	
<b>Protected site</b>	TSA-VLR
<b>Recovery site</b>	ISV-VLR
<b>Location</b>	Recovery Plans
<b>Total protection groups</b>	1
<b>Test networks</b>	ISV-Test-Recovery-Segment, ISV-Test-Recovery-Segment, ISV-Test-Recovery-Segment, ISV-Test-Recovery-Segment

[CANCEL](#) [BACK](#) [FINISH](#)

## Define the actions in the recovery plans

You created a corresponding recovery plan for each of the protected groups. This was to ensure that one group of protected VMs (the Domain Controllers, for example) becomes completely available before the other VMs are brought online. You want to initiate the recovery of each group of VMs separately.

Here are the recovery plans:

vmware Live Site Recovery bca | local - wdc | je.vmware.com

Site Pair Replications Protection Groups **Recovery Plans**

Search...

Recovery Plans

- VLR-DCs-RP
- VLR-SQL-RP

**Recovery Plans** [NEW RECOVERY PLAN](#) [NEW FOLDER](#)

**NEW RECOVERY PLAN**

<input type="checkbox"/>	Name	Status	Protected Site	Recovery Site
<input type="checkbox"/>	VLR-DCs-RP	→ Ready	TSA-VLR	ISV-VLR
<input type="checkbox"/>	VLR-SQL-RP	→ Ready	TSA-VLR	ISV-VLR

We've mentioned that recovery plans are like a run book for BCDR projects in VMware Live Site Recovery. Next, you'll define the elements of the run book in each of the recovery plans.

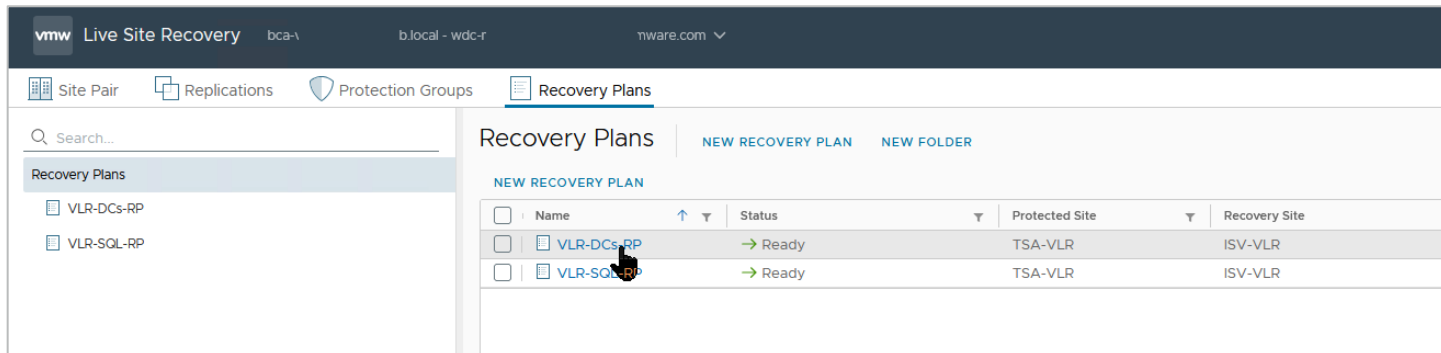
## Configure the actions for the Domain Controller VMs

First, you'll configure the VMware Live Site Recovery Domain Controller recovery plan: **VLSR-DCs-RP**.

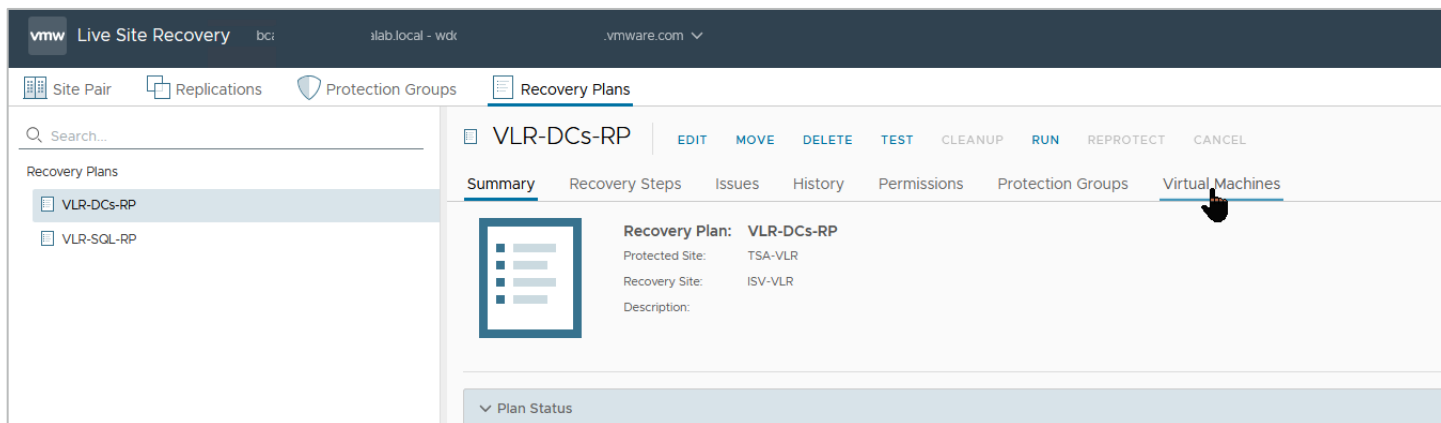


# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

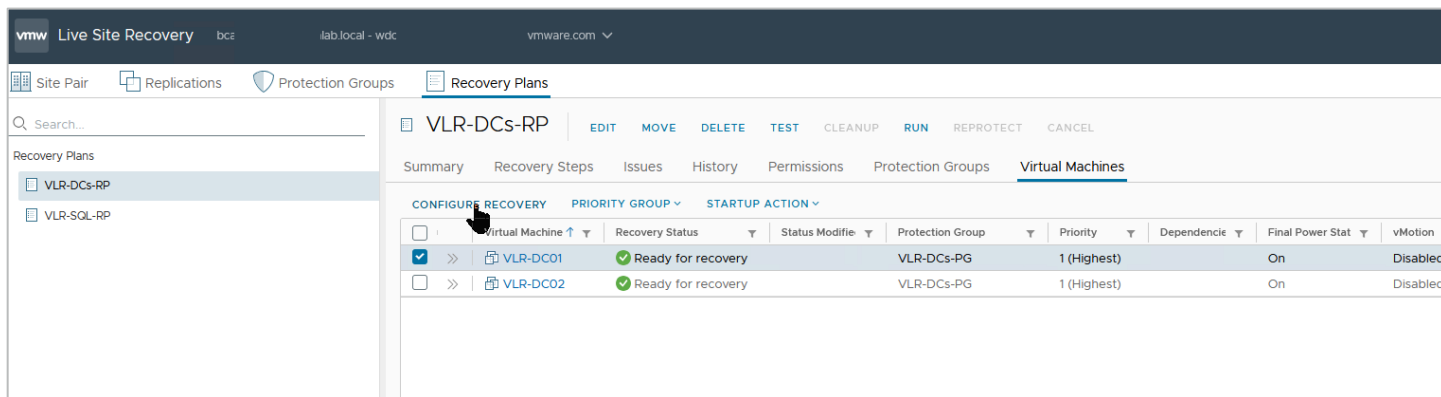
1. Click on the name to select it.



2. Select the **Virtual Machines** tab to display the VMs covered by the plan.



3. Select the checkbox next to the VM you want to configure and click **Configure Recovery**.



Recovery plans give you many configuration options and flexibility for controlling the desired outcomes for your DR run book. As you'll see, you can configure VMware Live Site Recovery to change the IP address and other necessary IP configurations of the recovered VM.

**A warning about the virtualized Domain Controller safety feature:** One of the challenges to overcome in recovering Domain Controllers is specifying the order for them to come up to ensure safeguards are correctly in

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

place. Since restoring a Domain Controller from a backup copy forces the Domain Controller to discard its RID pool, you are likely wondering, "Where does it get a new pool of RIDs if the RID Master is unavailable?" This is a legitimate question in a disaster event where we assume everything in the protected site (including the RID Master itself) is unavailable. Luckily, the Domain Controller safety feature accounts for this scenario by allowing the restored/recovered Domain Controller to regain services after multiple reboots or by manually forcing the Domain Controller's NTDS to run `restart-service NTDS-force` if it can communicate with another Domain Controller.

Start by ensuring that you're recovering the Domain Controller holding the FSMO roles first—the other Domain Controllers shouldn't be recovered until this one has been fully recovered. This is done in VMware Live Site Recovery by using the **VM Dependencies** option, which we'll talk about later in this guide).

Here is how you do this for **VLSR-DC02**, which depends on **VLSR-DC01** (the FSMO role holder).

4. Select **VLSR-DC02** and click **Configure Recovery**.

	Virtual Machine	Recovery Status	Status Modified	Protection Group	Priority	Dependence	Final Power Stat	vMotion
<input type="checkbox"/>	>> VLR-DC01	Ready for recovery		VLR-DCs-PG	1 (Highest)		On	Disabled
<input checked="" type="checkbox"/>	>> VLR-DC02	Ready for recovery		VLR-DCs-PG	1 (Highest)		On	Disabled

5. Expand **VM Dependencies** and select **View all**. This will show you all the VMs in the recovery plan.
6. Select the other VM you want this VM to depend (or wait) on and click **OK**.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

VM Recovery Properties - VLR-DC02

Changes to these properties will apply to this VM in all recovery plans.

Recovery Properties IP Customization

Priority Group **1 (Highest)**   
 All virtual machines within a priority group will be started before proceeding to the next priority group. The startup order of virtual machines within a priority group may be specified by adding VM dependencies. The virtual machines within a priority group will start in parallel, unless ordered by VM dependencies.

VM Dependencies

View all **1**

Select the VMs which will be started before this VM: SELECT ALL CLEAR SELECTION

<input checked="" type="checkbox"/>	Virtual Machine	Status	Priority Group	Protection Group
<input checked="" type="checkbox"/>	VLR-DC01	OK	1 (Highest)	VLR-DCs-PG

1 Items per page AUTO 1 VM(s)

VM dependencies are ignored if the VMs are not in the same priority group. If VM dependencies fail, a warning will be displayed, but the recovery plan will continue.

CANCEL OK **3**

Next, you'll add a **Post Power On Step** task to **VLSR-DC01** which calls a script to reboot the VM after it has been fully recovered. This is a `shutdown -r -t 0` command—nothing fancy. This reboot allows **VLSR-DC01** to self-heal and start its relevant services, which allows it to be available to heal **VLSR-DC02**, which depends on it, and to also provide Active Directory domain services to all the other domain-joined VMs to be recovered.

7. Select **VLSR-DC01** and click **Configure Recovery**.

vmw Live Site Recovery bc alab.local - wd :vmware.com

Site Pair Replications Protection Groups **Recovery Plans**

Search...

Recovery Plans

- VLR-DCs-RP
- VLR-SQL-RP

VLR-DCs-RP EDIT MOVE DELETE TEST CLEANUP RUN REPROTECT CANCEL

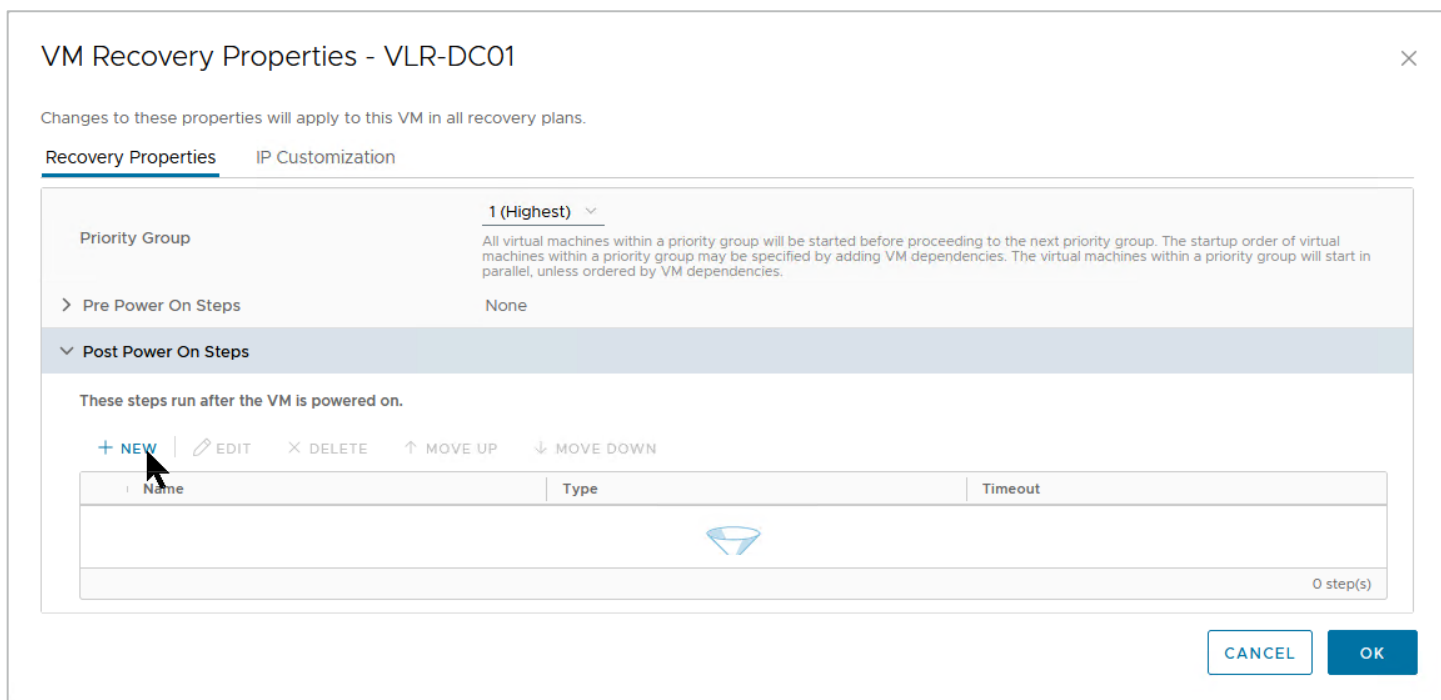
Summary Recovery Steps Issues History Permissions Protection Groups **Virtual Machines**

CONFIGURE RECOVERY PRIORITY GROUP STARTUP ACTION

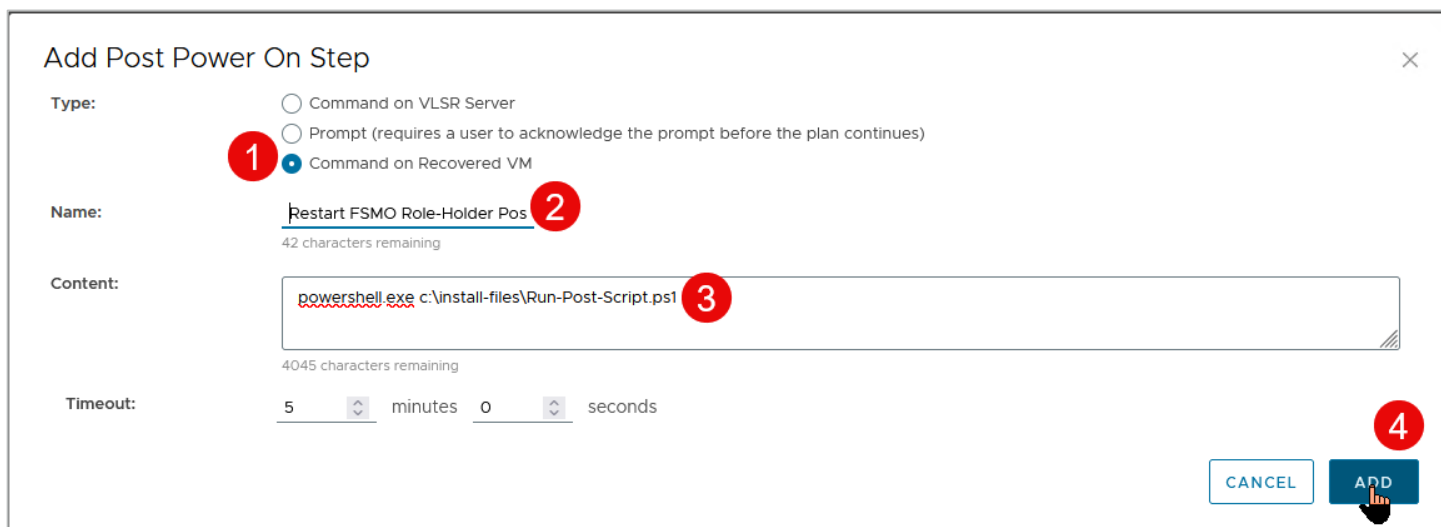
<input type="checkbox"/>	Virtual Machine
<input checked="" type="checkbox"/>	VLR-DC01
<input type="checkbox"/>	VLR-DC02

8. Expand **Post Power On Steps** and click **New**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

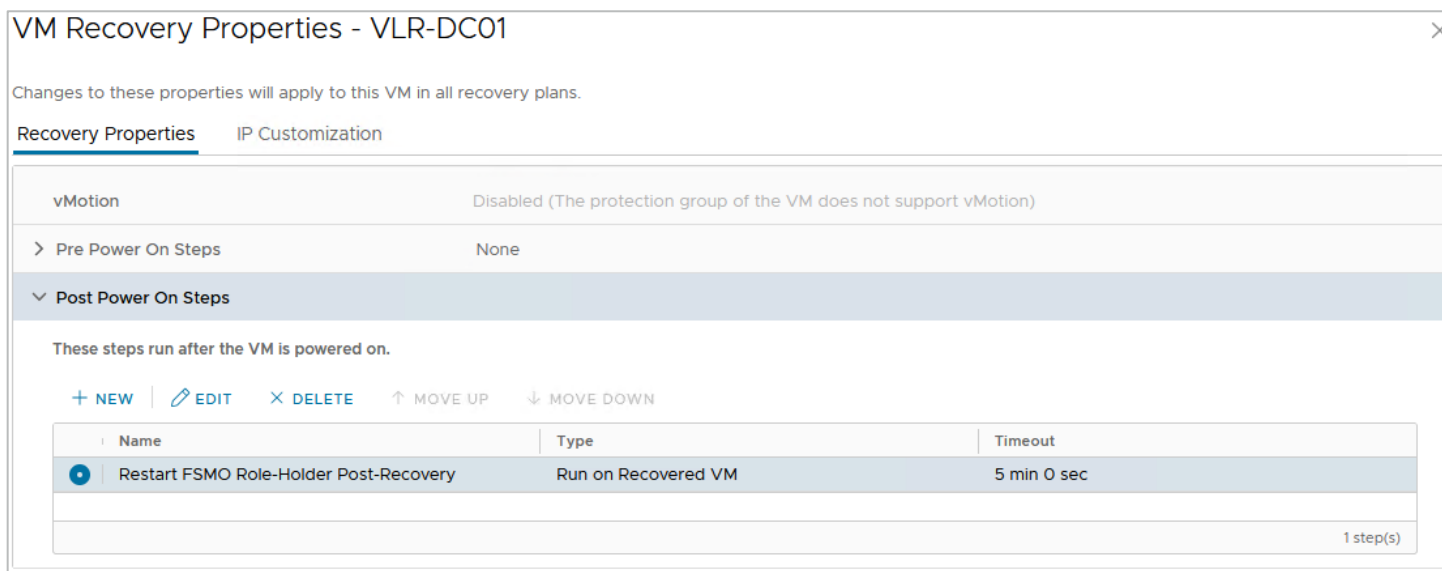


9. Select **Command on Recovered VM**.
10. Give it a descriptive name.
11. Type in the command to run (in our case, we're calling a PowerShell Script named **Run-Post-Script.ps1**, located in the **C:\Install-Files** folder).
12. Click **Add**.

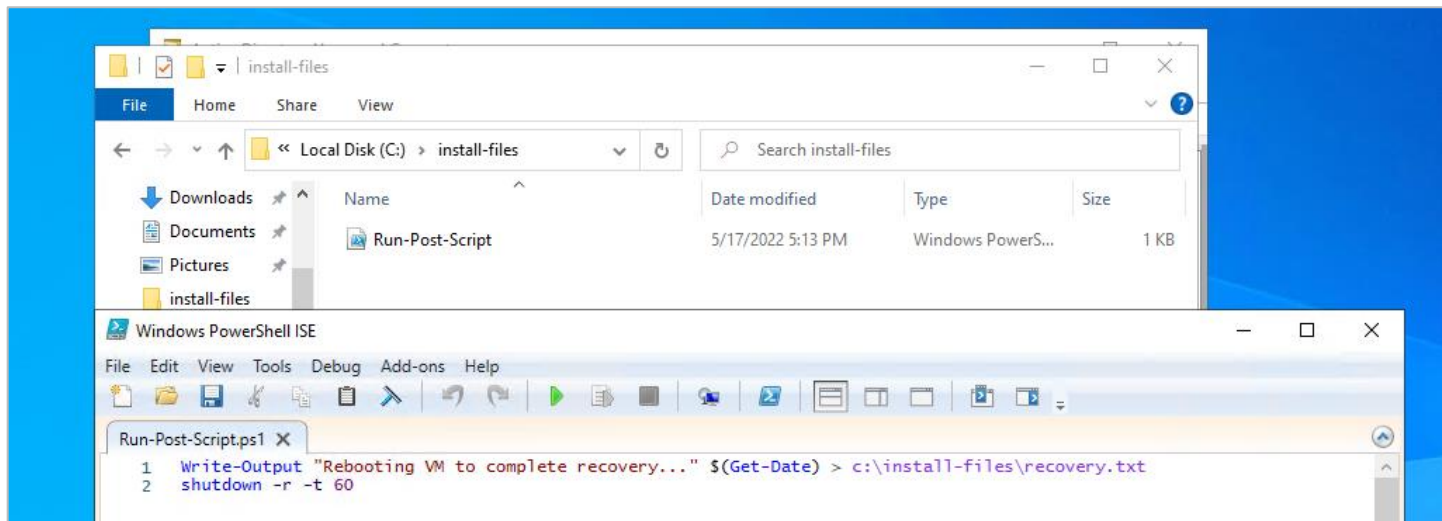


This brings you back to the **VM Recovery Properties** menu.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



Here is the content `Run-Post-Script.ps1`:

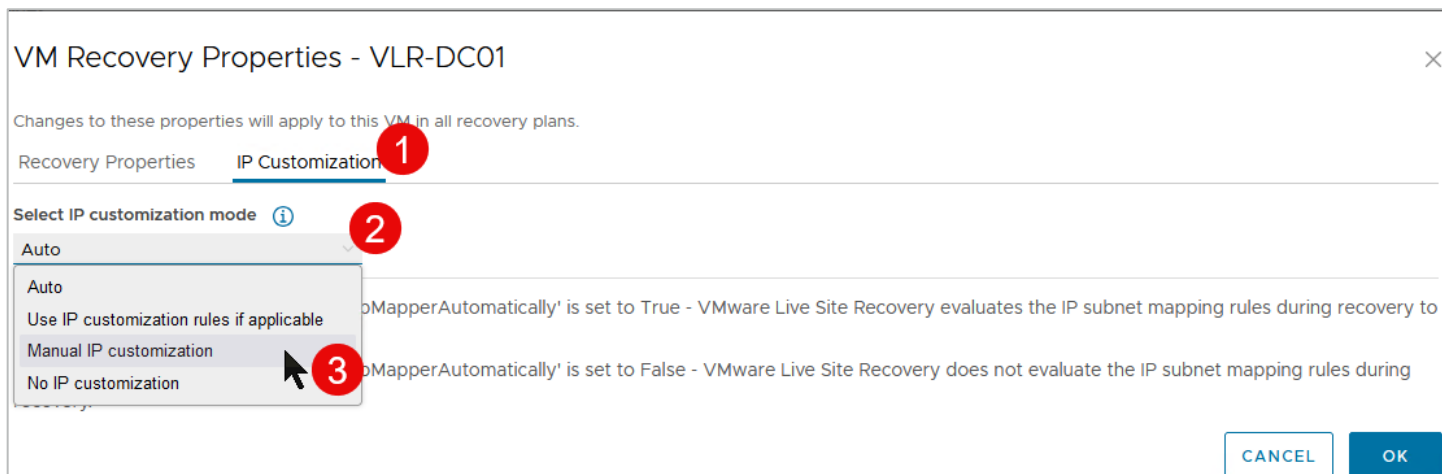


### Change the recovered VMs' IP settings

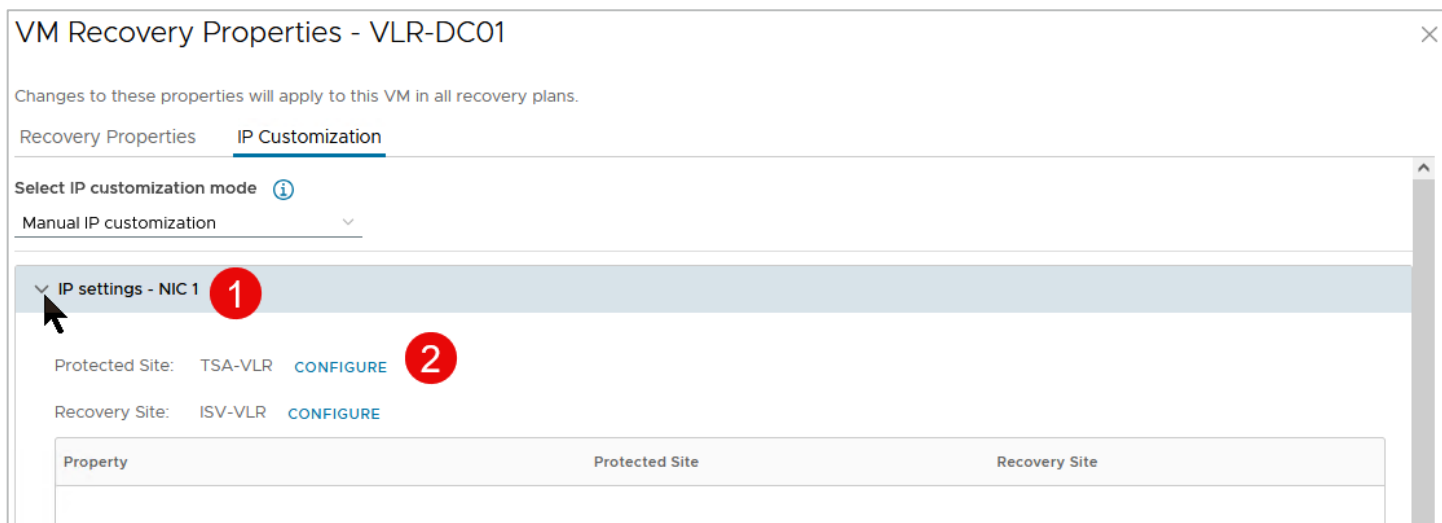
Now, you'll configure the TCP/IP settings for your protected VMs.

1. Go back to the **VM Recovery Properties** menu and click on the **IP Customization** tab.
2. Select the drop-down button in **Select IP customization mode**.
3. Select **Manual IP customization**.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

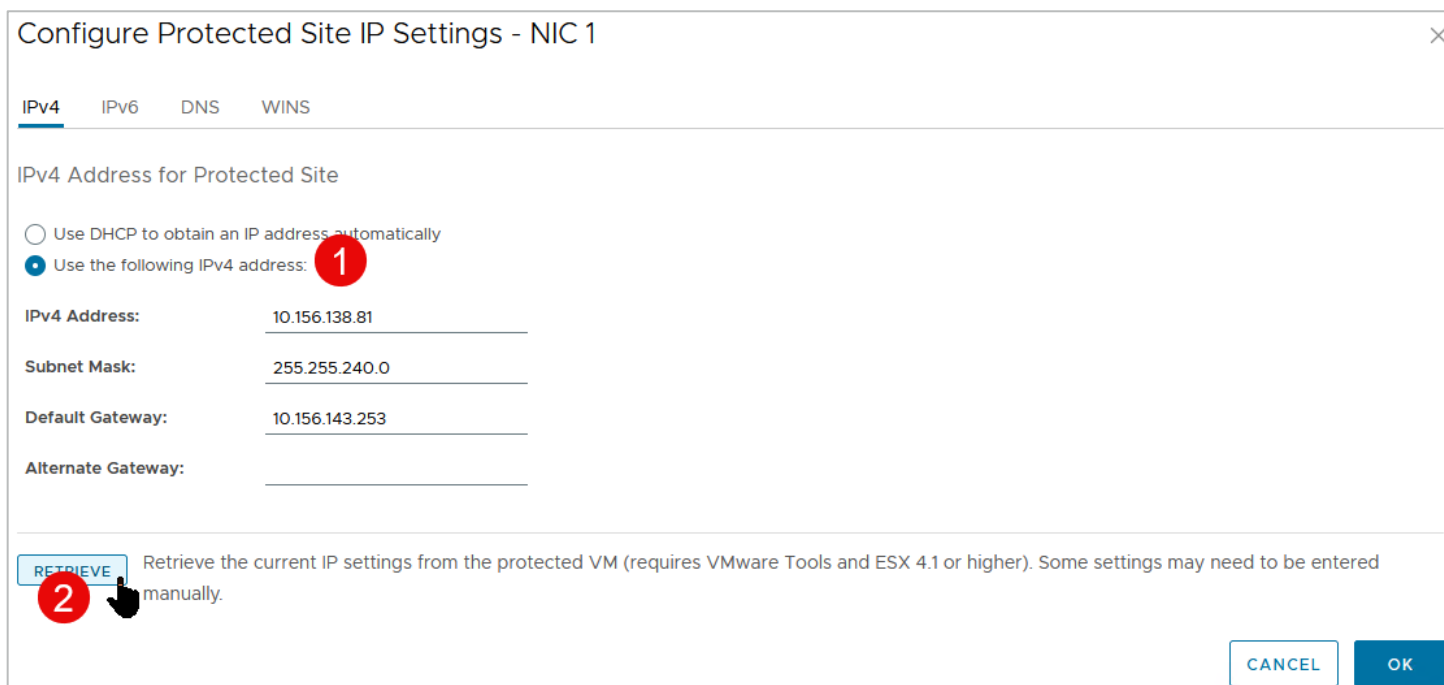


4. Click on IP Settings - NIC 1 and then **Configure** next to **Protected Site**.



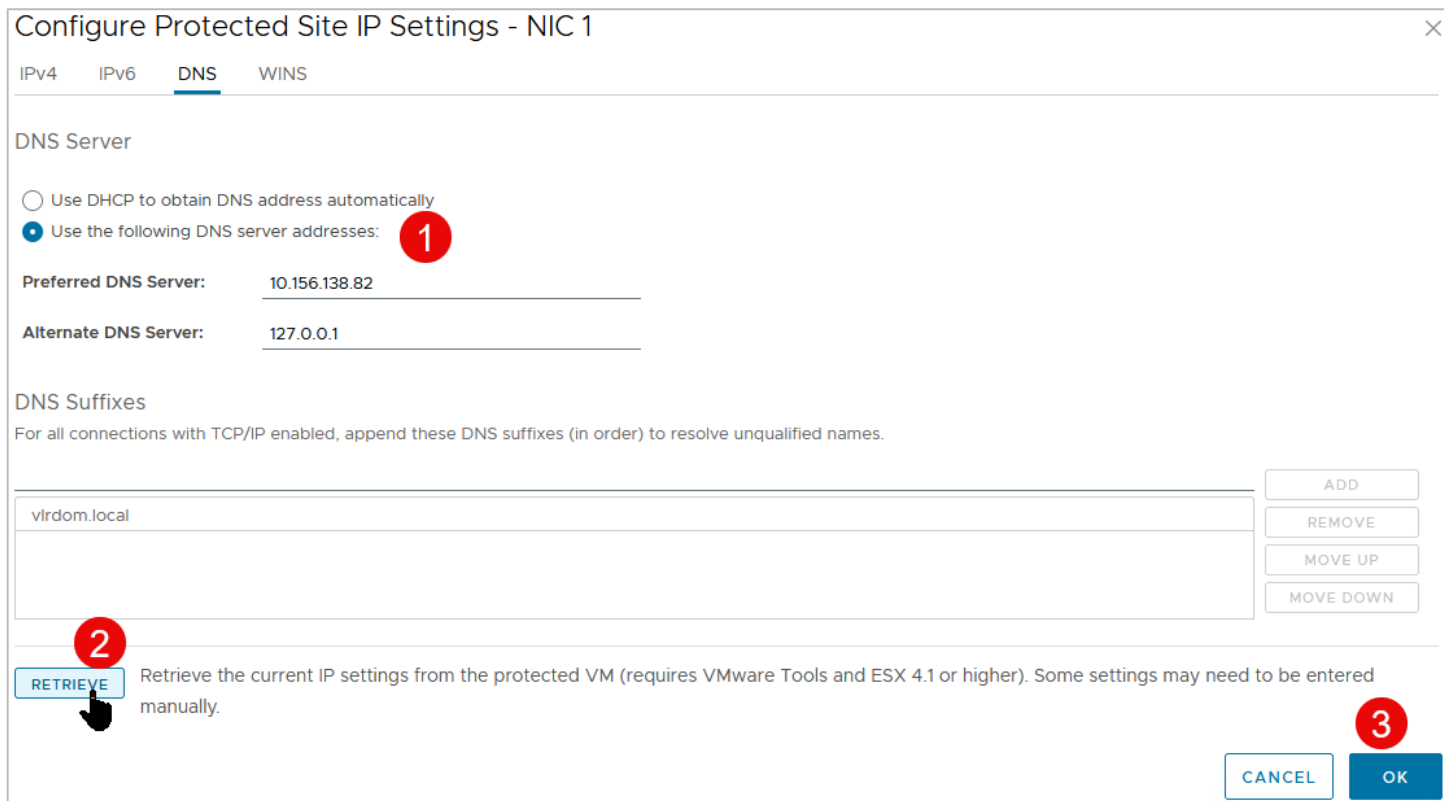
5. Click on **Use the following IPv4 address** and click **Retrieve**. This auto-populates the fields with the VM's current IP address.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



6. Repeat the process for the DNS information. Skip IPv6 and WINS for this exercise.

7. Click **OK** to complete the configuration.



## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

This brings you back to the **VM Recovery Properties** → **IP Customization** screen.

8. Next to **Recovery Site**, click on **Configure** to specify the IP address information you want to apply to the VM upon recovery.

You'll notice that the **Retrieve** option isn't available on this screen—the values don't currently exist on the VM.

9. Go through the same steps you did for the **Protected Site** values and click **OK** to complete the configuration.

VM Recovery Properties - VLR-DC01

Changes to these properties will apply to this VM in all recovery plans.

Recovery Properties **IP Customization**

Select IP customization mode ⓘ  
Manual IP customization

IP settings - NIC 1

Protected Site: TSA-VLR [CONFIGURE](#)

Recovery Site: ISV-VLR [CONFIGURE](#)

Property	Protected Site	Recovery Site
IPv4 Configuration	Static	Static
IP address	10.156.138.81	10.156.139.81
Subnet mask	255.255.240.0	255.255.240.0
Default gateway	10.156.143.253	10.156.143.253
Alternate gateway		
IPv6 Configuration	DHCP	DHCP
DNS Configuration	Static	Static
Preferred DNS	10.156.138.82	127.0.0.1
Alternate DNS	127.0.0.1	10.156.138.82

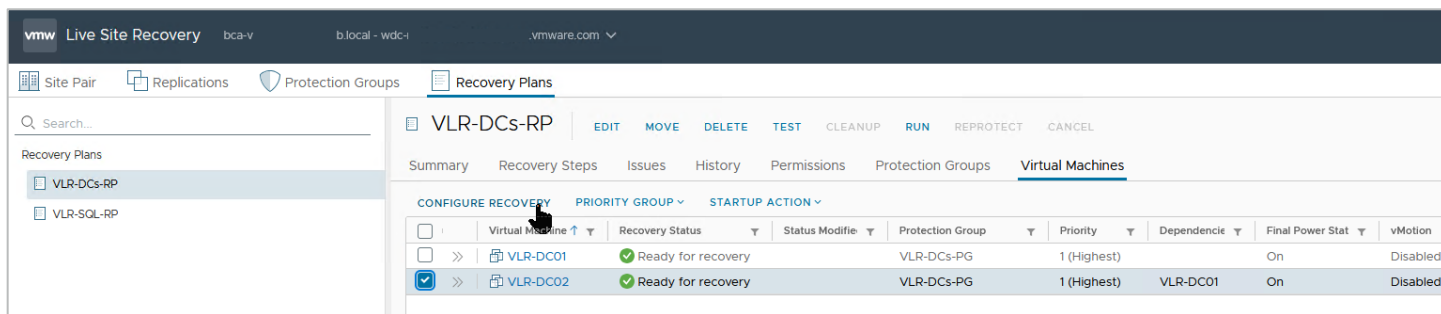
[CANCEL](#) [OK](#)

10. Complete this process for all the VMs in all recovery groups unless you want them to:

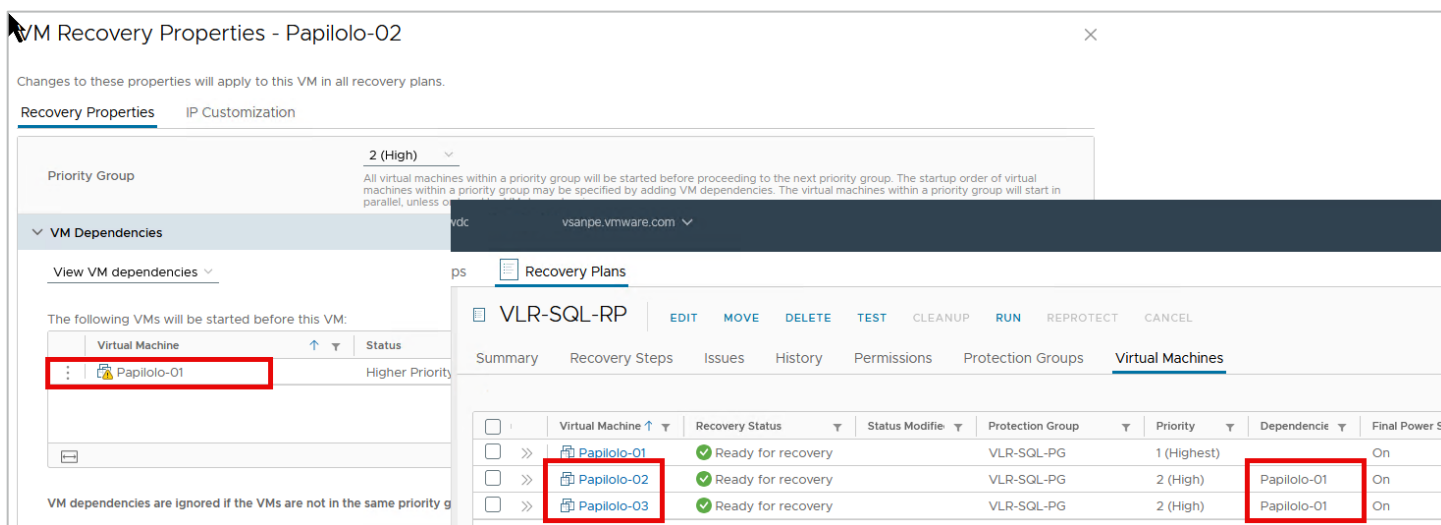
- Get their IP address configuration information from a DHCP server/IPAM at the recovery site.
- Keep the same IP address because you've stretched the protected site's network segments to the recovery site.



# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



In this example, we create a recovery group for three SQL servers in a protection group. We create a dependency among them such that Papilolo-02 and Papilolo-03 aren't recovered and powered on before Papilolo-01 is fully recovered.



**Why create a dependency?** This is so the other 2 SQL Server VMs aren't recovered until the listener and cluster virtual IP configurations are normalized after recovering the first SQL Server VM. The parameters for these two Windows/SQL Server clustering configuration settings must be correct and available for the cluster and its resources to become available after recovery.

The recovery process changes the IP address of the recovered VMs and connects them to a different network segment in the recovery site. Consequently, the listener's and cluster virtual IP's IP addresses must also change. This is something that VMware Live Site Recovery can't do natively because it's application-agnostic.

11. Use VMware Live Site Recovery's in-guest script initiation capability to make the changes, just as you did for the operations master Domain Controller. You only need to do this once for the cluster, so only place the script inside Papilolo-01. This ensures the Papilolo-01 VM is recovered first and its configuration changes are completed before Papilolo-02 and Papilolo-03 are recovered.

Here's what that configuration looks like on Papilolo-01:

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

### VM Recovery Properties - Papilolo-01

Changes to these properties will apply to this VM in all recovery plans.

**Recovery Properties** | IP Customization

Priority Group: **1 (Highest)**  
All virtual machines within a priority group will be started before proceeding to the next priority group. The startup order of virtual machines within a priority group may be specified by adding VM dependencies. The virtual machines within a priority group will start in parallel, unless ordered by VM dependencies.

> Pre Power On Steps: None

▼ Post Power On Steps

These steps run after the VM is powered on.

+ NEW | EDIT | DELETE | MOVE UP | MOVE DOWN

Name	Type	Timeout
Reconfigure AG VIP	Run on Recovered VM	5 min 0 sec

1 step(s)

CANCEL OK

Here's the guest-side command that calls the in-guest PowerShell Script `Change-Cluster-AG-VIP.ps1`, located in the `E:\Install-Files` folder on the Papilolo-01 VM.

**Note:** Please follow your internal corporate security practices for storing and running in-guest scripts when deciding where to place these sample scripts.

### Edit Post Power On Step

Type:

- Command on SRM Server
- Prompt (requires a user to acknowledge the prompt before the plan continues)
- Command on Recovered VM

Name: Reconfigure-Cluster-AG-V  
53 characters remaining

Content:  
`powershell.exe E:\Install-Files\Change-Cluster-AG-VIP.ps1`  
4039 characters remaining

Timeout: 5 minutes 0 seconds

CANCEL SAVE

Here's a screenshot of the script itself. You can find this sample script in the appendix: "Change-Cluster-AG-VIP.ps1."

```
# Change-Cluster-AG-VIP.ps1 (For reconfiguring recovered MS SQL Server cluster properties)
Import-Module FailoverClusters

# Let's Force-Start our Cluster first

# Immediately post-recovery, the whole Cluster is down

Start-ClusterNode -FQ

# Let's define our new IP address and subnet mask for the Cluster IP Address
$newClusIP = "10.156.139.87" # Replace with your new IP address
$newClusMask = "255.255.240.0" # Replace with your subnet mask

# Get the IP Address of the Cluster resource
$setNewClusIP = Get-ClusterResource -Name "SRM-AG01_Clus_IP"

# Set the new IP address and subnet mask for the Cluster resource
$setNewClusIP | Set-ClusterParameter -Name Address -Value $newClusIP
$setNewClusIP | Set-ClusterParameter -Name SubnetMask -Value $newClusMask

##### Next, we modify the AG VIP
# Let's define our new IP address and subnet mask for the AG VIP Address
$newAGIP = "10.156.139.88" # Replace with your new IP address
$newAGMask = "255.255.240.0" # Replace with your subnet mask

# Get the IP Address of the AG resource
$setNewAGIP = Get-ClusterResource -Name "SRM-AG01-IP"

# Set the new IP address and subnet mask for the AG resource
$setNewAGIP | Set-ClusterParameter -Name Address -Value $newAGIP
$setNewAGIP | Set-ClusterParameter -Name SubnetMask -Value $newAGMask

# Bring the resources offline
Stop-ClusterResource "SRM-AG01_Clus_IP"
Stop-ClusterResource "SRM-AG01_SRM-AG-List"
Stop-ClusterResource "Cluster Name"
Stop-ClusterResource "SRM-AG01"
Stop-ClusterResource "SRM-AG01-IP"

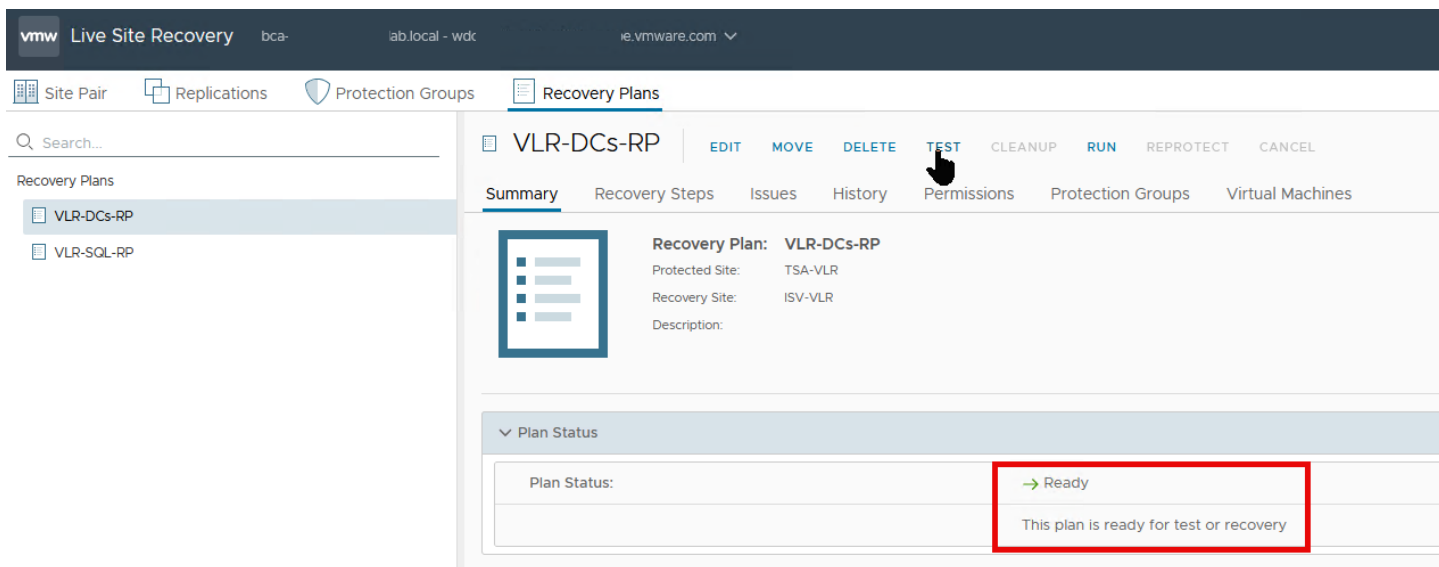
# We now start up everything
Start-ClusterResource "SRM-AG01"
Start-ClusterResource "SRM-AG01-IP"
Start-ClusterResource "SRM-AG01_SRM-AG-List"
Start-ClusterResource "SRM-AG01_Clus_IP"
Start-ClusterResource "Cluster Name"
```

## Test the disaster recovery plan

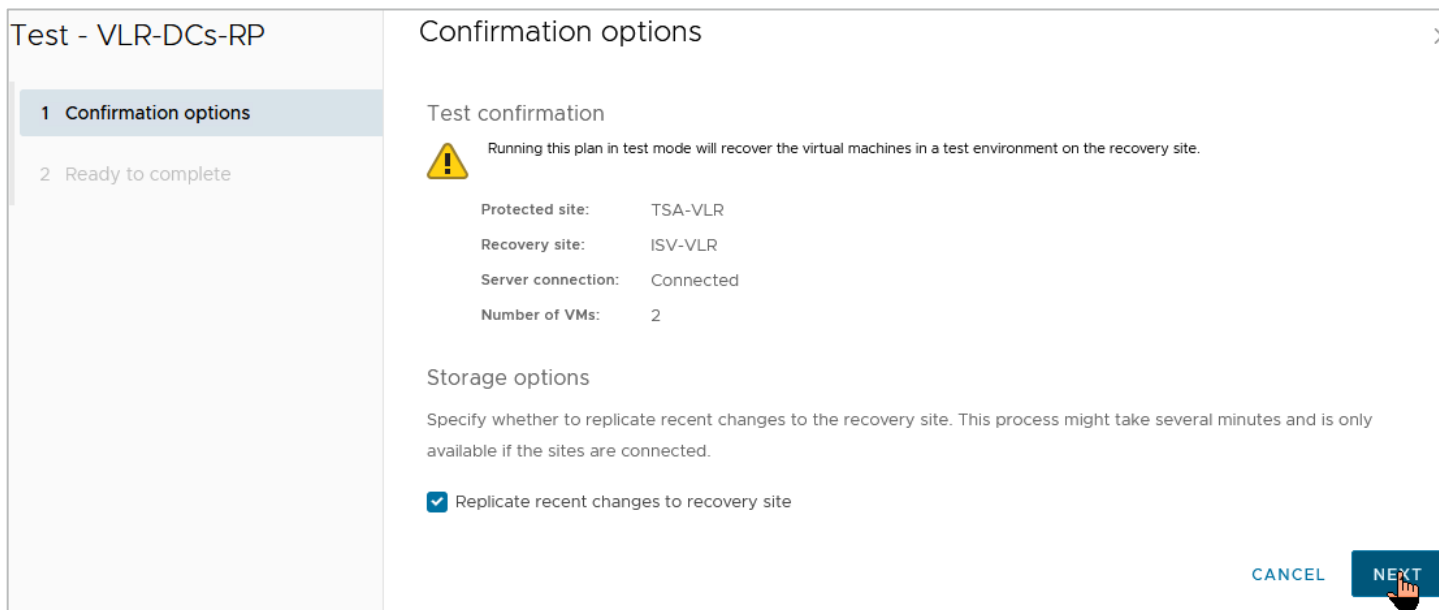
You have all the configuration pieces in place. Now you're ready to test your disaster recovery plan. Testing is essential because you don't want to discover that your DR plan doesn't do what you want during an actual disaster.

1. From the **Recovery Plans** tab, click on **Test**.
2. Notice that the **Plan Status** shows **Ready**. This indicates the recovery plan is ready to run.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



3. Confirm that "Replicate recent changes to recovery site" is checked, then click "Next"



4. Click **Finish** to begin the test recovery process.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

### Test - VLR-DCs-RP

- 1 Confirmation options
- 2 Ready to complete**

### Ready to complete

Review your selected settings.

Name	VLR-DCs-RP
Protected site	TSA-VLR
Recovery site	ISV-VLR
Server connection	Connected
Number of VMs	2
Storage synchronization	Replicate recent changes to recovery site

[CANCEL](#) [BACK](#) [FINISH](#)

**Recovery Steps** shows detailed information about actions taken during recovery. Also, notice that DC02 was powered on only after DC01 was fully recovered and the in-guest script was run. This is the dependency you previously configured in the recovery plan.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

Recovery Plans

VLR-DCs-RP

Summary Recovery Steps Issues History Permissions Protection Groups Virtual Machines

Plan status: ✔ Test complete

Description: The virtual machines have been recovered in a test environment at the recovery site. Review the plan history to

Recovery Step	Status	Step Started	Step Completed
1. Synchronize storage	✔ Success	Wednesday, September 11, 2024 2:01:01 PM	Wednesday, September 11, 2024 2:01:01 PM
2. Restore recovery site hosts from standby	✔ Success	Wednesday, September 11, 2024 2:01:01 PM	Wednesday, September 11, 2024 2:01:01 PM
3. Suspend non-critical VMs at recovery site			
4. Create writable storage snapshot	✔ Success	Wednesday, September 11, 2024 2:01:01 PM	Wednesday, September 11, 2024 2:01:05 PM
5. Configure test networks	✔ Success	Wednesday, September 11, 2024 2:01:04 PM	Wednesday, September 11, 2024 2:01:05 PM
6. Power on priority 1 VMs	✔ Success	Wednesday, September 11, 2024 2:01:04 PM	Wednesday, September 11, 2024 2:04:50 PM
6.1. VLR-DC02	✔ Success	Wednesday, September 11, 2024 2:01:04 PM	Wednesday, September 11, 2024 2:04:50 PM
6.1.1. Guest startup	✔ Success	Wednesday, September 11, 2024 2:01:04 PM	Wednesday, September 11, 2024 2:02:00 PM
6.1.2. Customize IP	✔ Success	Wednesday, September 11, 2024 2:02:00 PM	Wednesday, September 11, 2024 2:02:16 PM
6.1.3. Guest shutdown	✔ Success	Wednesday, September 11, 2024 2:02:16 PM	Wednesday, September 11, 2024 2:02:30 PM
6.1.4. Power on	✔ Success	Wednesday, September 11, 2024 2:03:52 PM	Wednesday, September 11, 2024 2:03:54 PM
6.1.5. Wait for VMware tools	✔ Success	Wednesday, September 11, 2024 2:03:54 PM	Wednesday, September 11, 2024 2:04:50 PM
6.2. VLR-DC01	✔ Success	Wednesday, September 11, 2024 2:01:05 PM	Wednesday, September 11, 2024 2:03:51 PM
6.2.1. Guest startup	✔ Success	Wednesday, September 11, 2024 2:01:05 PM	Wednesday, September 11, 2024 2:01:59 PM
6.2.2. Customize IP	✔ Success	Wednesday, September 11, 2024 2:01:59 PM	Wednesday, September 11, 2024 2:02:28 PM
6.2.3. Guest shutdown	✔ Success	Wednesday, September 11, 2024 2:02:28 PM	Wednesday, September 11, 2024 2:02:49 PM
6.2.4. Power on	✔ Success	Wednesday, September 11, 2024 2:02:49 PM	Wednesday, September 11, 2024 2:02:53 PM
6.2.5. Wait for VMware tools	✔ Success	Wednesday, September 11, 2024 2:02:53 PM	Wednesday, September 11, 2024 2:03:48 PM
6.2.6. Command: Restart FSMO Role-Holder Post-Recovery	✔ Success	Wednesday, September 11, 2024 2:03:48 PM	Wednesday, September 11, 2024 2:03:51 PM
7. Power on priority 2 VMs			
8. Power on priority 3 VMs			
9. Power on priority 4 VMs			
10. Power on priority 5 VMs			

Notice that the recovered Domain Controller VMs are powered on and running in the vCenter on the recovery site.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

The screenshot displays the VMware vSphere interface for a 'Live-Recovery' environment. At the top, there are navigation tabs for 'Summary', 'Monitor', 'Configure', 'Permissions', 'VMs', and 'Updates'. Below these are sub-tabs for 'Virtual Machines', 'VM Templates', 'vApps', and 'VM Folders'. A 'Quick Filter' field is present. The main table lists several VMs:

Name	State	Status	Provisioned Space	Used Space	Host CPU	Host Mem
VLR-DC02	Powered On	Normal	492.89 GB	29.42 GB	107 MHz	1.84 GB
VLR-DC01	Powered On	Normal	492.9 GB	32.98 GB	53 MHz	1.83 GB
Papilolo-03	Powered Off	Normal	18.24 GB	1.01 KB	0 Hz	0 B
Papilolo-02	Powered Off	Normal	18.24 GB	1.01 KB	0 Hz	0 B
Papilolo-01	Powered Off	Normal	18.24 GB	1.01 KB	0 Hz	0 B

Below the table, two detailed views for VMs VLR-DC02 and VLR-DC01 are shown. Both VMs are in a 'Protected' state (indicated by a red box in the original image). The details for VLR-DC02 include:

- Power Status: Powered On
- Guest OS: Microsoft Windows Server 2022 (64-bit)
- VMware Tools: Running, version:12416 (Current)
- Managed By: VMware vCenter Site Recovery Manager Extension
- DNS Name (1): VLR-DC02.vlrdm.local
- IP Addresses (1): 10.156.139.82
- Encryption: Not encrypted

The details for VLR-DC01 include:

- Power Status: Powered On
- Guest OS: Microsoft Windows Server 2022 (64-bit)
- VMware Tools: Running, version:12416 (Current)
- Managed By: VMware vCenter Site Recovery Manager Extension
- DNS Name (1): VLR-DC01.vlrdm.local
- IP Addresses (1): 10.156.139.81
- Encryption: Not encrypted

The same Domain Controller and SQL Server VMs are still running uninterrupted at the protected site.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

The screenshot displays the VMware Live-Recovery console. At the top, there's a navigation bar with 'Live-Recovery' and 'ACTIONS'. Below it, a menu includes 'Summary', 'Monitor', 'Configure', 'Permissions', 'VMs', and 'Updates'. The 'VMs' tab is active, showing a list of virtual machines. A table lists VMs with columns for Name, State, Status, Provisioned Space, Used Space, Host CPU, and Host Mem. The VMs listed are Papiolo-01, Papiolo-02, Papiolo-03, VLR-DC01, and VLR-DC02. Below the table, two detailed views for VLR-DC01 and VLR-DC02 are shown. Each view includes a 'Guest OS' section with a console launch button and a 'Virtual Machine Details' section with fields for Power Status, Guest OS, VMware Tools, DNS Name, IP Addresses, and Encryption.

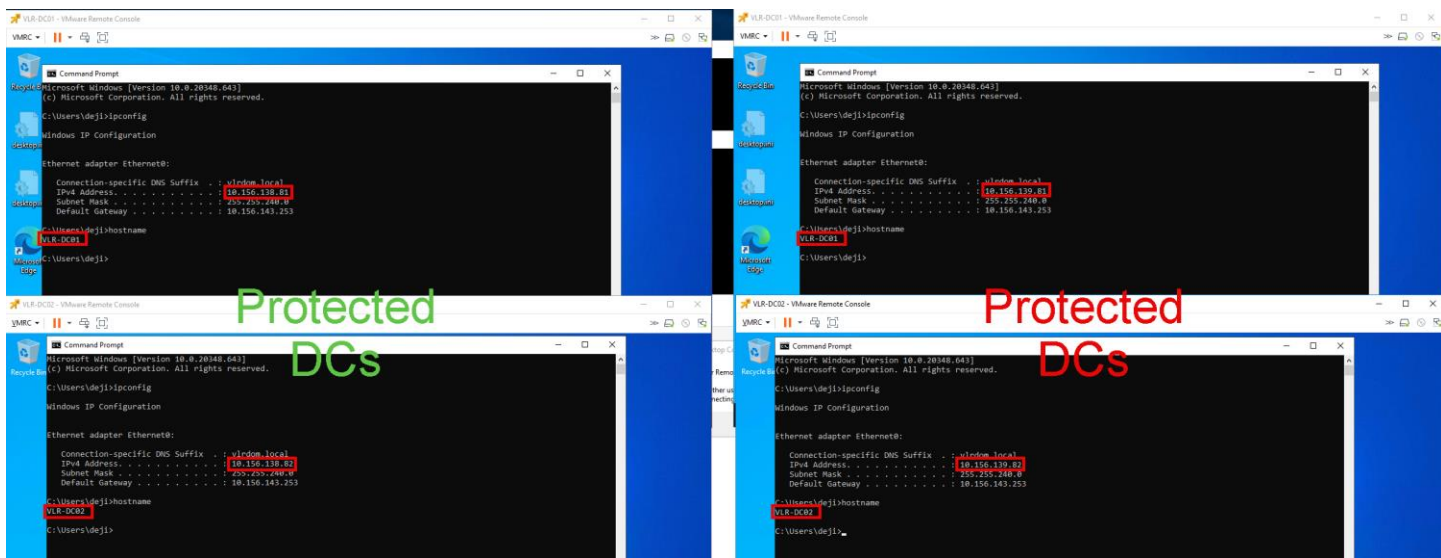
Name	State	Status	Provisioned Space	Used Space	Host CPU	Host Mem
Papiolo-01	Powered On	✓ Normal	2.04 TB	378.88 GB	77 MHz	11.18 GB
Papiolo-02	Powered On	✓ Normal	2.04 TB	348.28 GB	103 MHz	10.3 GB
Papiolo-03	Powered On	✓ Normal	2.04 TB	348.97 GB	103 MHz	12.46 GB
VLR-DC01	Powered On	✓ Normal	373.24 GB	30.17 GB	51 MHz	6.91 GB
VLR-DC02	Powered On	✓ Normal	373.11 GB	29.39 GB	51 MHz	4.84 GB

5. Log into the protected and recovered VMs to verify they are both accessible.

This demonstrates the unparalleled on-demand DR plan verification capabilities of VMware Live Site Recovery. You can leverage the test failover feature to satisfy internal and external regulatory compliance or SLA conformance requirements without interrupting their production infrastructure or scheduling an outage.



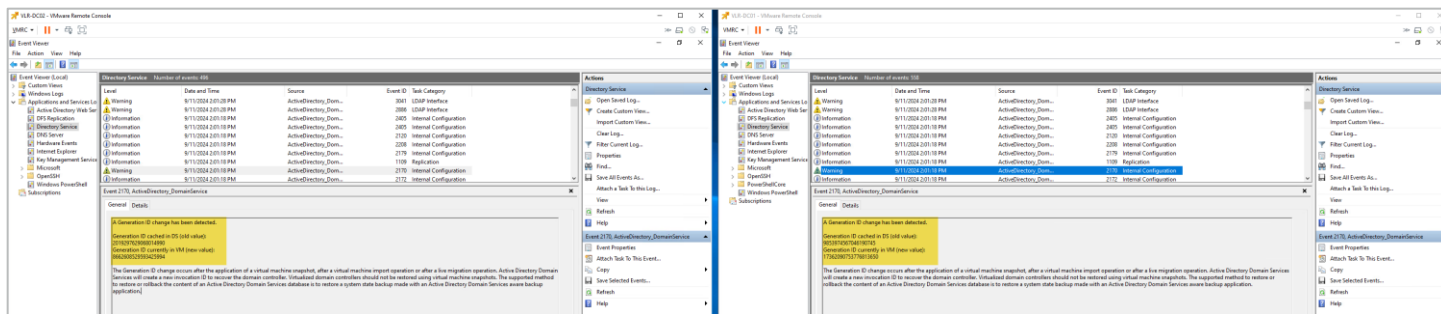
# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



## Safe Active Directory Domain Controller recovery in action

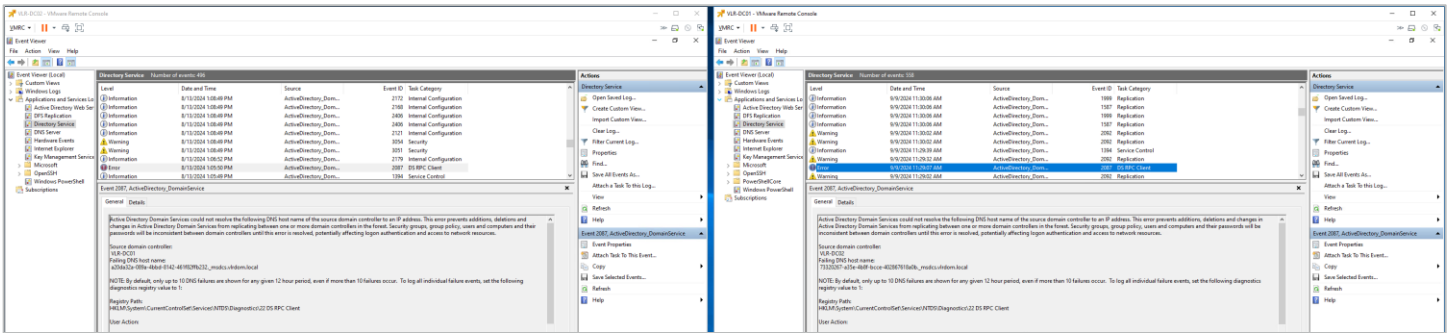
Let's take a look at what happened to our protected Active Directory infrastructure after a simulated disaster recovery event completed using VMware Live Site Recover.

The first time the recovered Domain Controllers boot up, Windows automatically detects the change in their VM-Generation ID.

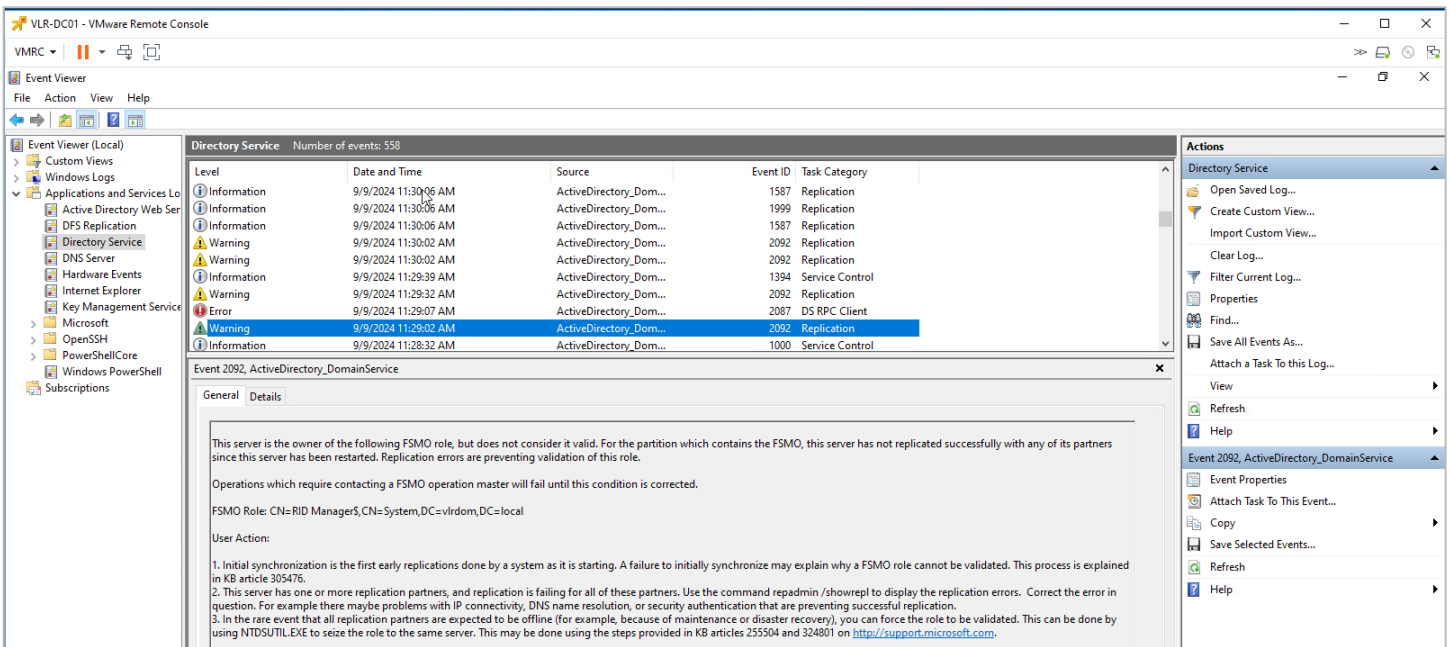


The Windows Domain Controller safety feature immediately kicks in, and the recovered Domain Controller VMs are taken through the remediation process. Among other effects discussed in previous sections, Netlogon, DNS, and other services cannot start during this remediation process.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

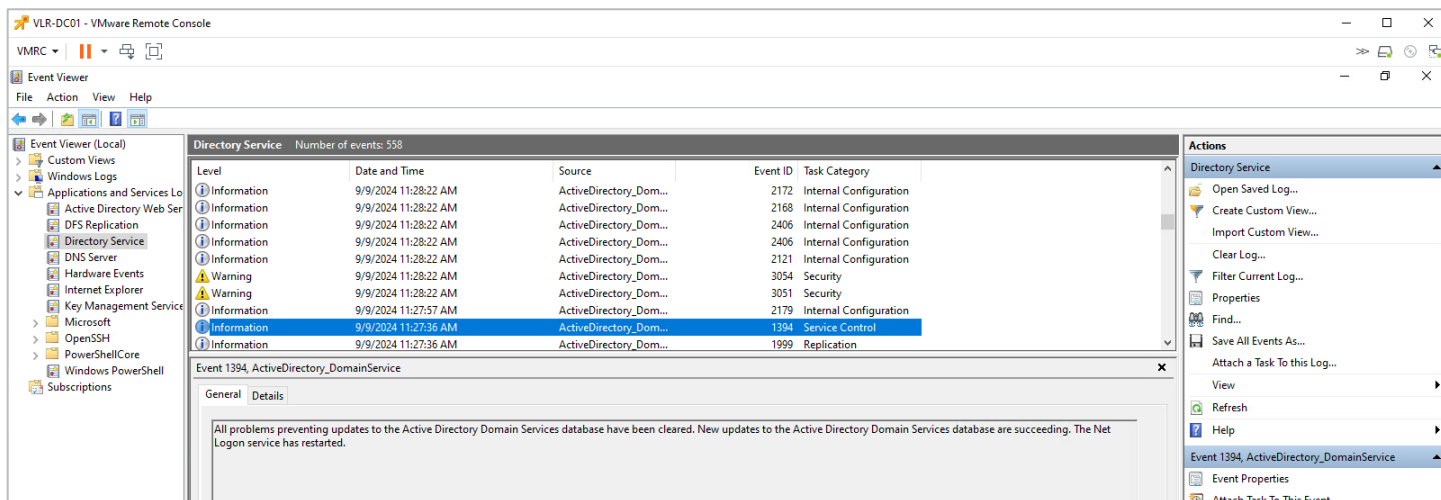


The FSMO role holder (DC01) isn't considered a [working?] Domain Controller now.

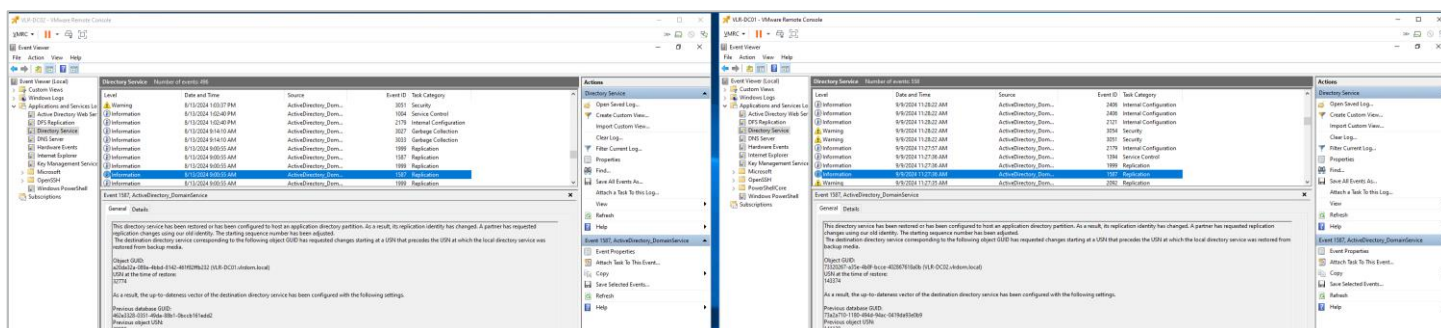


After rebooting the FSMO role holder (DC01) the second time with our in-guest script, things begin to look better.

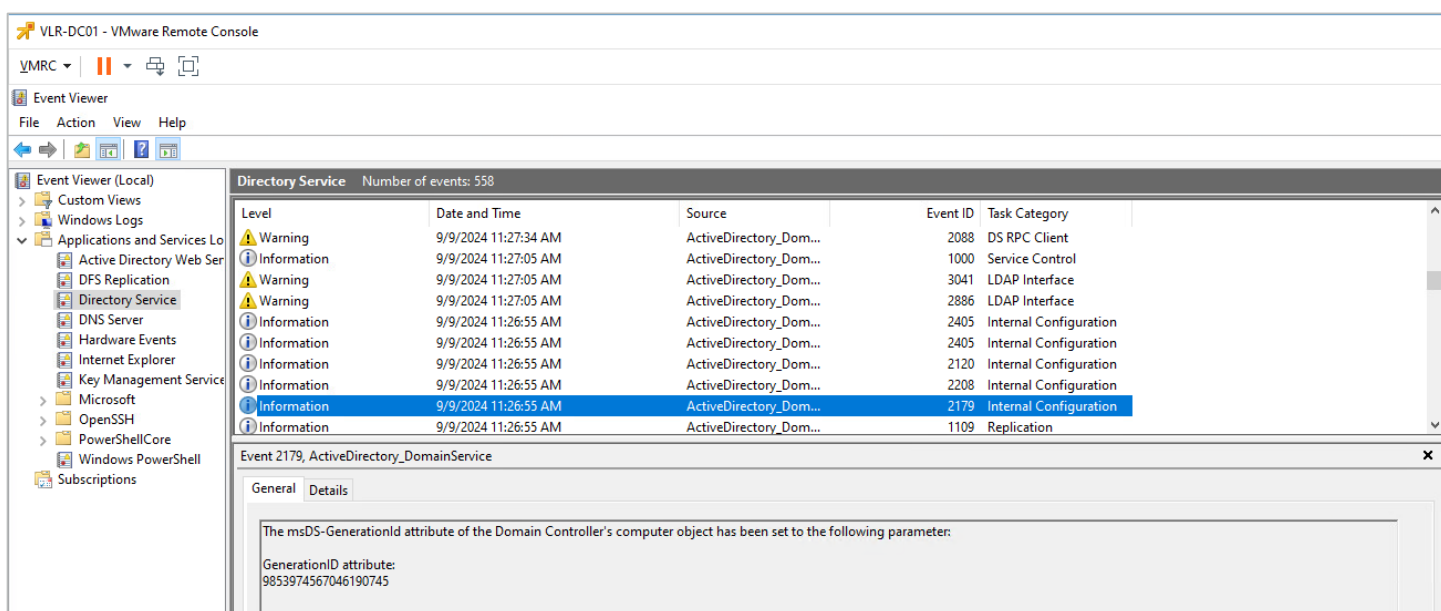
# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



At this point, the Domain Controllers have discarded their old RID pools and obtained a new set, have a new Invocation ID, and can begin to use the new batch of USNs.

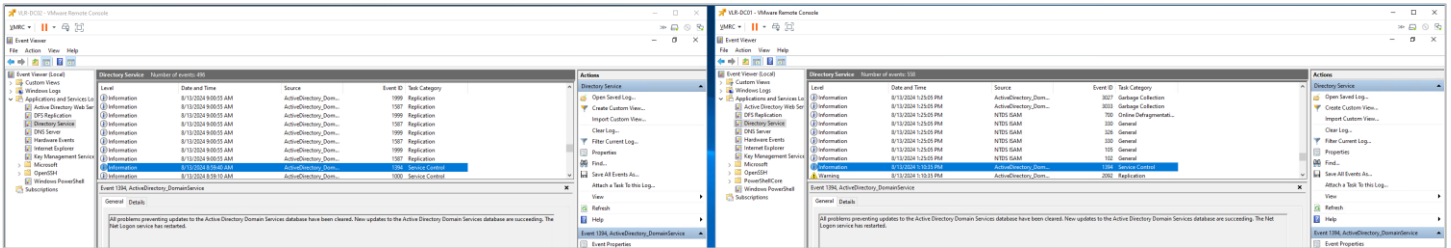


Windows has also accepted the new VM-Generation ID created for the VM by our VMware Live Site Recovery exercise. Windows will now store this for subsequent comparison next time the VM is rebooted.



## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

DC02 has also been successfully remediated. Because it's not the FSMO role holder, part of its healing process (for example, obtaining a new RID pool) was supported by the availability of the Role holder.



## Recover the SQL Server availability group

Now that the Domain Controllers have been recovered, you're ready to recover the SQL Server availability group cluster. Remember that our objective here is to ensure that we don't just recover the individual VMs. We also want to recover the services they provide. This means that, upon recovery, the cluster service and resources (databases, jobs, scripts) also must be available, accessible, and operational.

1. Start by following the same process you did above for the Domain Controller recovery plan.

Notice the startup sequence of the two VMs in your recovery plan. VMware Live Site Recovery doesn't begin to power on Papilolo-02 and Papilolo-03 until Papilolo-01 has completed bootup and the in-guest script has been called. This is a combination of dependency and recovery priority at work.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

VLR-SQL-RP				
EDIT MOVE DELETE TEST CLEANUP RUN REPROTECT CANCEL				
Summary Recovery Steps Issues History Permissions Protection Groups Virtual Machines				
Recovery Step	Status	Step Started	Step Completed	
> 1. Synchronize storage	✓ Success	Wednesday, September 11, 2024 3:56:48 PM	Wednesday, September 11, 2024 3:56:48 PM	
> 2. Restore recovery site hosts from standby	✓ Success	Wednesday, September 11, 2024 3:56:48 PM	Wednesday, September 11, 2024 3:56:48 PM	
> 3. Suspend non-critical VMs at recovery site				
> 4. Create writable storage snapshot	✓ Success	Wednesday, September 11, 2024 3:56:48 PM	Wednesday, September 11, 2024 3:56:52 PM	
> 5. Configure test networks	✓ Success	Wednesday, September 11, 2024 3:56:52 PM	Wednesday, September 11, 2024 3:56:53 PM	
> 6. Power on priority 1 VMs	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 3:59:47 PM	
6.1. Papiolo-01	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 3:59:47 PM	
6.1.1. Guest startup	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 3:57:39 PM	
6.1.2. Customize IP	✓ Success	Wednesday, September 11, 2024 3:57:39 PM	Wednesday, September 11, 2024 3:57:43 PM	
6.1.3. Guest shutdown	✓ Success	Wednesday, September 11, 2024 3:57:43 PM	Wednesday, September 11, 2024 3:58:20 PM	
6.1.4. Power on	✓ Success	Wednesday, September 11, 2024 3:58:20 PM	Wednesday, September 11, 2024 3:58:22 PM	
6.1.5. Wait for VMware tools	✓ Success	Wednesday, September 11, 2024 3:58:22 PM	Wednesday, September 11, 2024 3:59:09 PM	
6.1.6. Command: Reconfigure AG VIP	✓ Success	Wednesday, September 11, 2024 3:59:09 PM	Wednesday, September 11, 2024 3:59:47 PM	
> 7. Power on priority 2 VMs	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 4:00:41 PM	
7.1. Papiolo-02	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 4:00:30 PM	
7.1.1. Guest startup	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 3:57:40 PM	
7.1.2. Customize IP	✓ Success	Wednesday, September 11, 2024 3:57:40 PM	Wednesday, September 11, 2024 3:57:44 PM	
7.1.3. Guest shutdown	✓ Success	Wednesday, September 11, 2024 3:57:44 PM	Wednesday, September 11, 2024 3:58:30 PM	
7.1.4. Power on	✓ Success	Wednesday, September 11, 2024 3:59:47 PM	Wednesday, September 11, 2024 3:59:50 PM	
7.1.5. Wait for VMware tools	✓ Success	Wednesday, September 11, 2024 3:59:50 PM	Wednesday, September 11, 2024 4:00:30 PM	
> 7.2. Papiolo-03	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 4:00:41 PM	
7.2.1. Guest startup	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 3:57:40 PM	
7.2.2. Customize IP	✓ Success	Wednesday, September 11, 2024 3:57:40 PM	Wednesday, September 11, 2024 3:57:44 PM	
7.2.3. Guest shutdown	✓ Success	Wednesday, September 11, 2024 3:57:44 PM	Wednesday, September 11, 2024 3:58:30 PM	
7.2.4. Power on	✓ Success	Wednesday, September 11, 2024 3:59:47 PM	Wednesday, September 11, 2024 3:59:50 PM	
7.2.5. Wait for VMware tools	✓ Success	Wednesday, September 11, 2024 3:59:50 PM	Wednesday, September 11, 2024 4:00:41 PM	
> 8. Power on priority 3 VMs				
> 9. Power on priority 4 VMs				
> 10. Power on priority 5 VMs				

The recovery is complete.

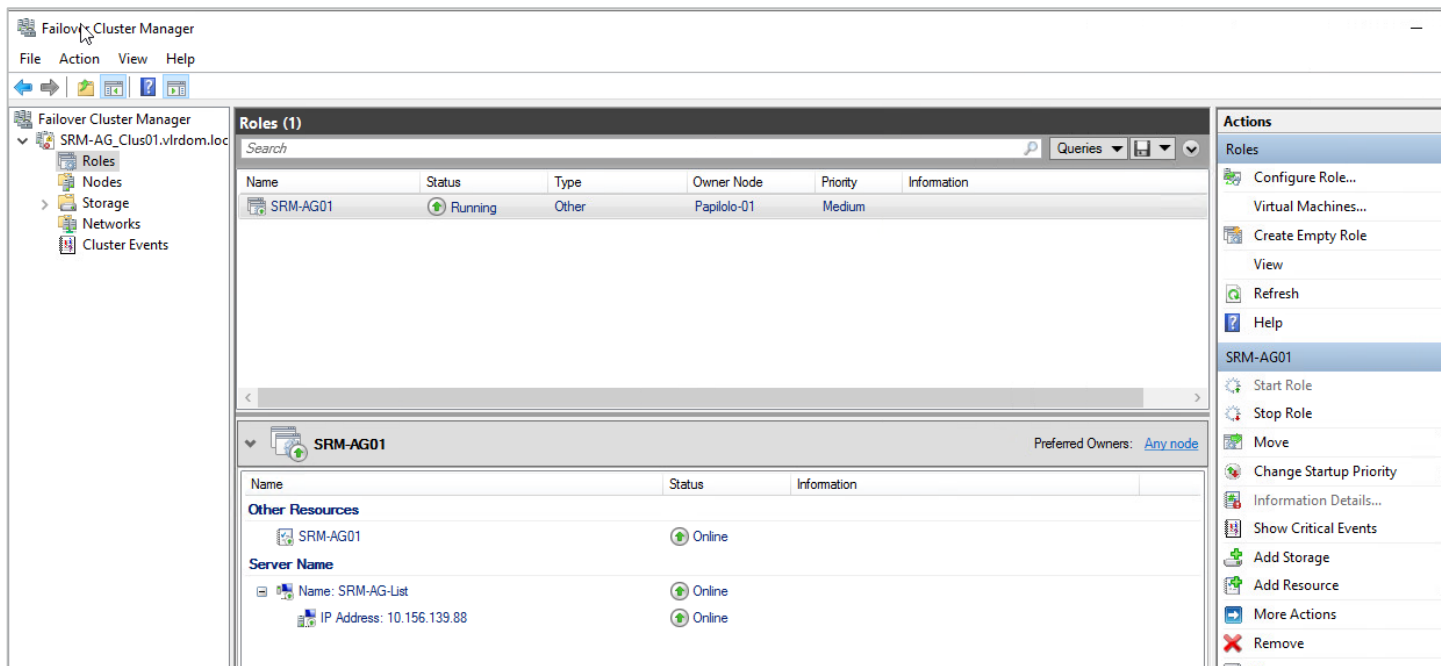
The screenshot shows the VMware Live Site Recovery interface. At the top, the navigation bar includes 'Site Pair', 'Replications', 'Protection Groups', and 'Recovery Plans'. The 'Recovery Plans' section is active, showing a list of plans with 'VLR-SQL-RP' selected. The main view displays the details for 'VLR-SQL-RP', including a 'Plan status' of 'Test complete' (highlighted with a red box) and a description: 'The virtual machines have been recovered in a test environment at the recovery site. Review the recovery logs for more details.' Below this, a table lists the recovery steps, all of which are marked as 'Success'.

Recovery Step	Status	Step Started	Step Completed
> 1. Synchronize storage	✓ Success	Wednesday, September 11, 2024 3:56:48 PM	Wednesday, September 11, 2024 3:56:48 PM
> 2. Restore recovery site hosts from standby	✓ Success	Wednesday, September 11, 2024 3:56:48 PM	Wednesday, September 11, 2024 3:56:48 PM
> 3. Suspend non-critical VMs at recovery site			
> 4. Create writable storage snapshot	✓ Success	Wednesday, September 11, 2024 3:56:48 PM	Wednesday, September 11, 2024 3:56:52 PM
> 5. Configure test networks	✓ Success	Wednesday, September 11, 2024 3:56:52 PM	Wednesday, September 11, 2024 3:56:53 PM
> 6. Power on priority 1 VMs	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 3:59:47 PM
> 7. Power on priority 2 VMs	✓ Success	Wednesday, September 11, 2024 3:56:53 PM	Wednesday, September 11, 2024 4:00:41 PM
> 8. Power on priority 3 VMs			

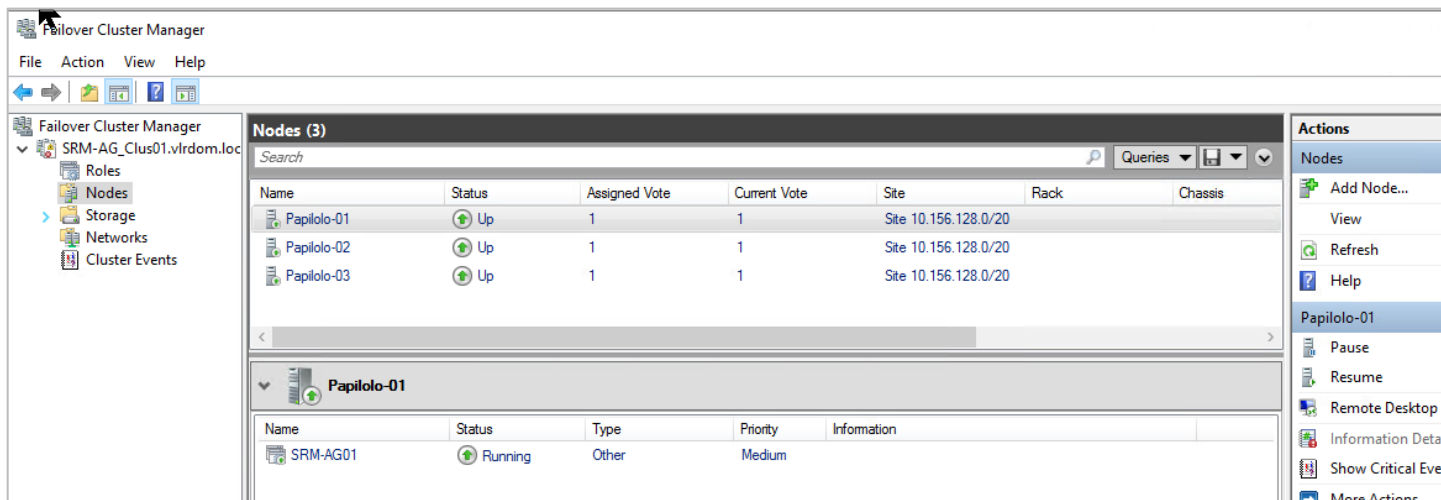
## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

2. Log into Windows and check the SQL Server availability group cluster.

The Windows Server Failover Cluster supporting the SQL Server availability group should be fully functional.

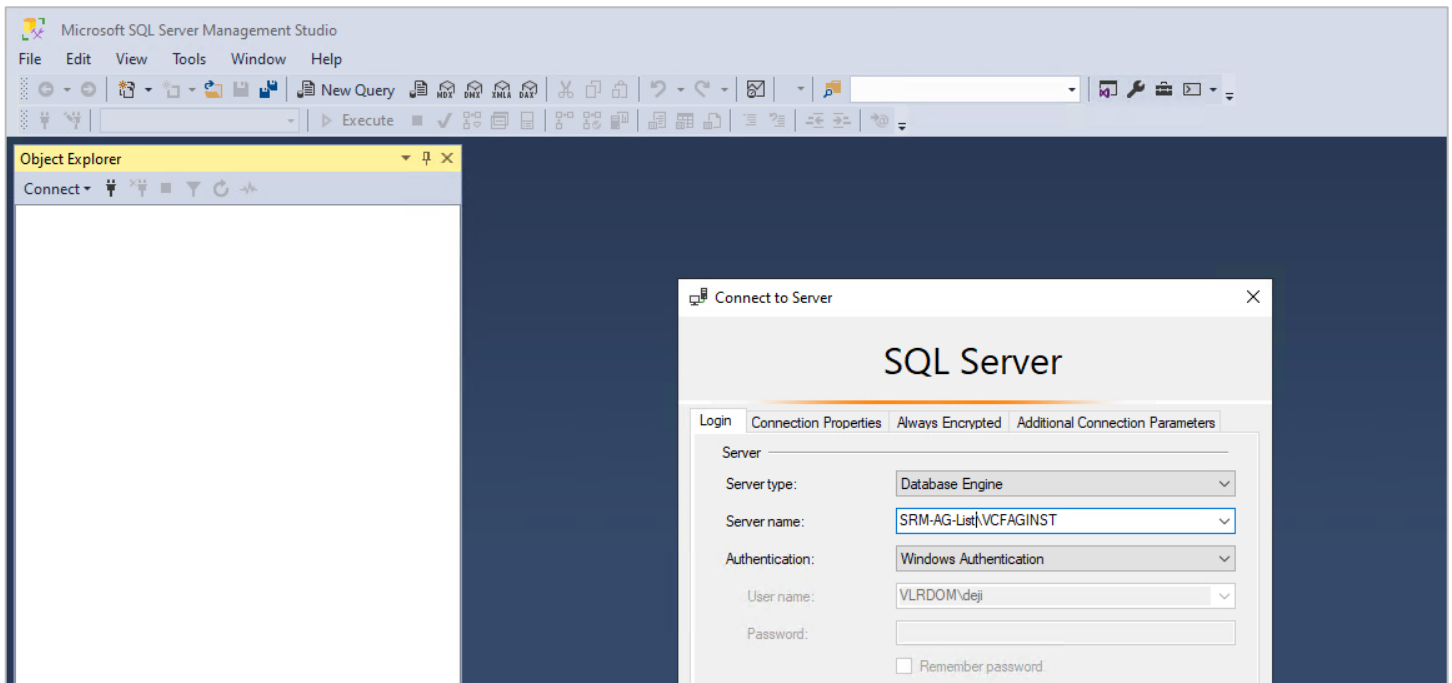


All the participating nodes should be up and operational.



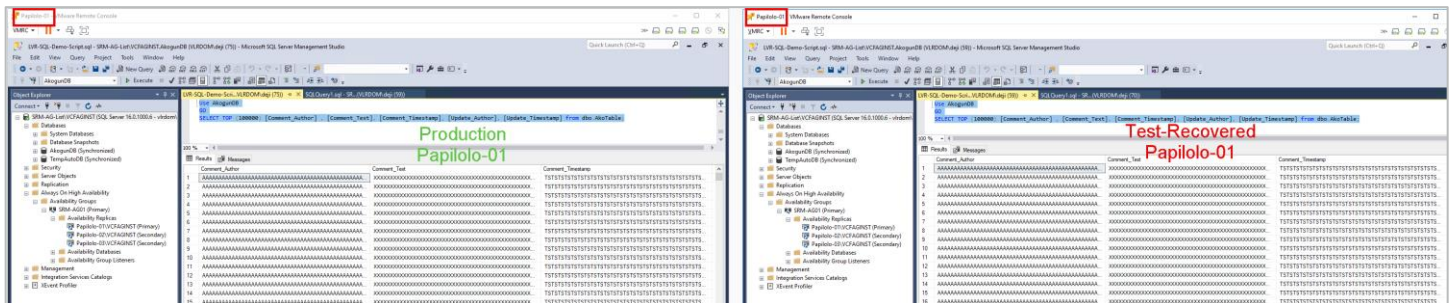
The Microsoft SQL Server listener resource should also be up and available.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



3. Because this is a test recovery exercise, confirm that your production SQL Server cluster is still up and functional at the protected site.

Here's the production SQL Server instance and its recovered copy, side-by-side. They should both be operational and processing queries.

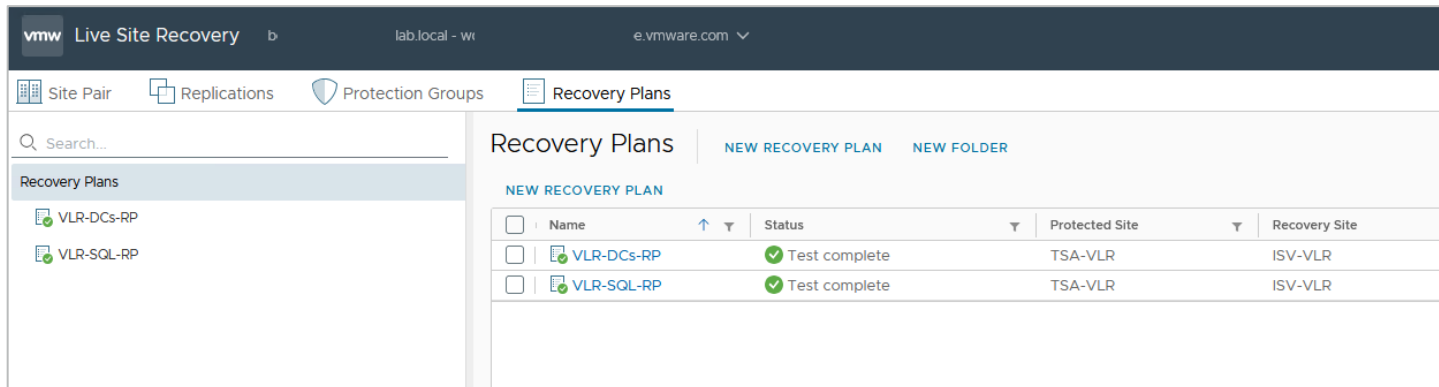


In a test recovery exercise, the recovered workloads should not be able to communicate with the production environment because they are recovered into the VMware Live Site Recovery test network we specified in previous steps. However, all workloads recovered into this test network can communicate with each other. This allows the admins and operators to more robustly test and verify the integrity of the recovery process and ascertain the availability and accessibility of their services.

Admins can fail over a client VM to the test network in VMware Live Site Recovery, or they can connect a regular client VM to the fenced-off port group in vCenter and connect to the recovered workloads to perform any validation or integrity tests required for their disaster recovery plans.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

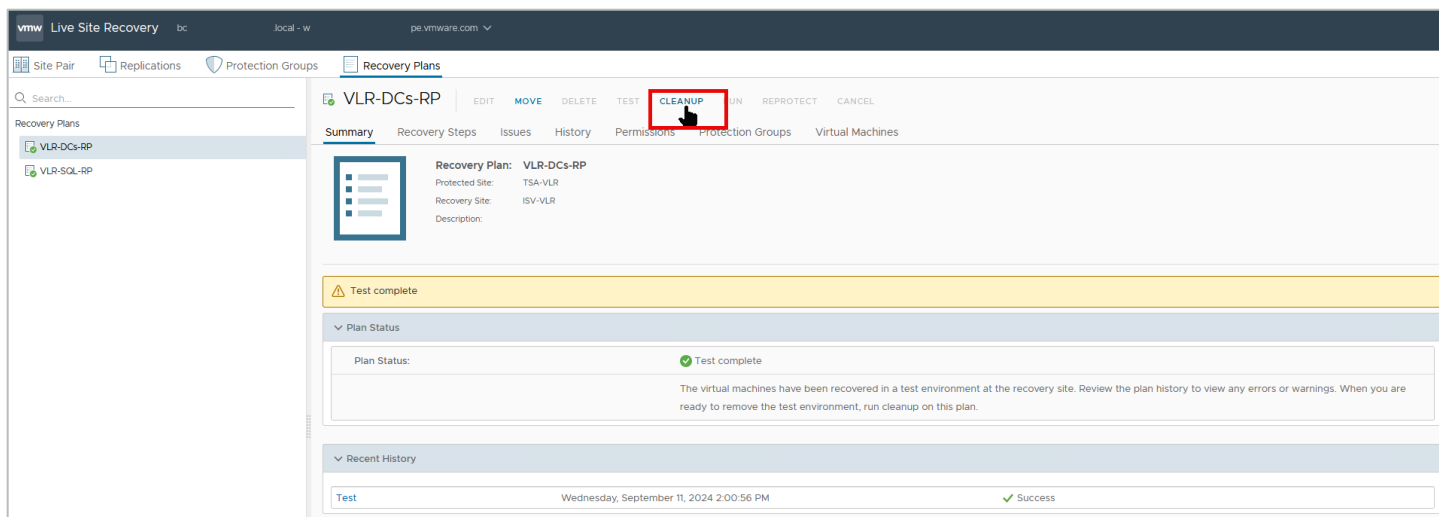
You have successfully performed test recovery of the recovery plan. If there were any failures, misconfigurations, or unexpected behaviors, you could correct them by editing the plan and retesting the changes without disrupting services in production.



## Clean up after the test recovery

Now that you're done with the test recovery, you need to clean up the test environment.

1. Select each tested recovery plan and click **Cleanup**.



2. Click **Next** to confirm.



# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

**Cleanup - VLR-DCs-RP**

- 1 Confirmation options
- 2 Ready to complete

### Confirmation options

**Cleanup confirmation**

Running a cleanup operation on this plan will remove the test environment and reset the plan to the Ready state.

Protected site: TSA-VLR  
Recovery site: ISV-VLR  
Server connection: Connected  
Number of VMs: 2

**Cleanup options**

If you are experiencing errors during cleanup, you can choose the Force Cleanup option to ignore all errors and return the plan to the Ready state. If you use this option, you might need to clean up your storage manually, and you should run another test as soon as possible.

Force cleanup

CANCEL NEXT

3. Click **Finish** to commit the changes.

**Cleanup - VLR-DCs-RP**

- 1 Confirmation options
- 2 Ready to complete

### Ready to complete

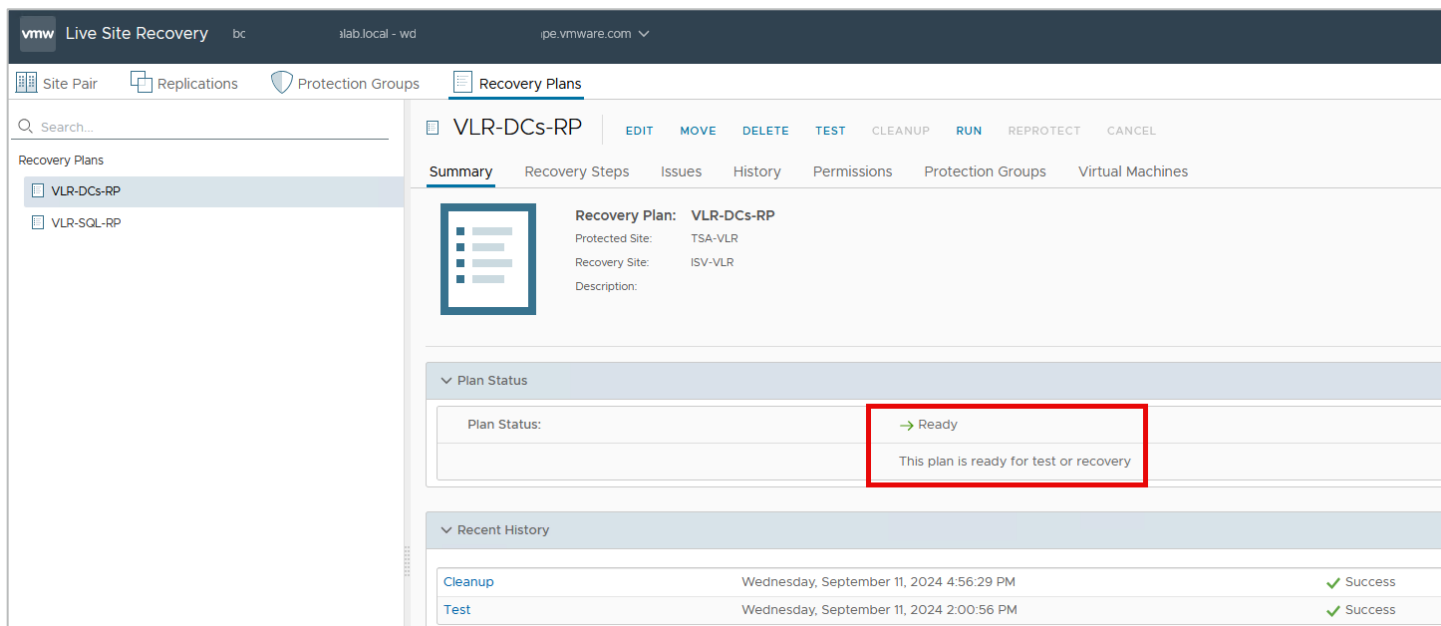
Review your selected settings.

Name	VLR-DCs-RP
Protected site	TSA-VLR
Recovery site	ISV-VLR
Server connection	Connected
Number of VMs	2
Force cleanup	Do not ignore cleanup warnings

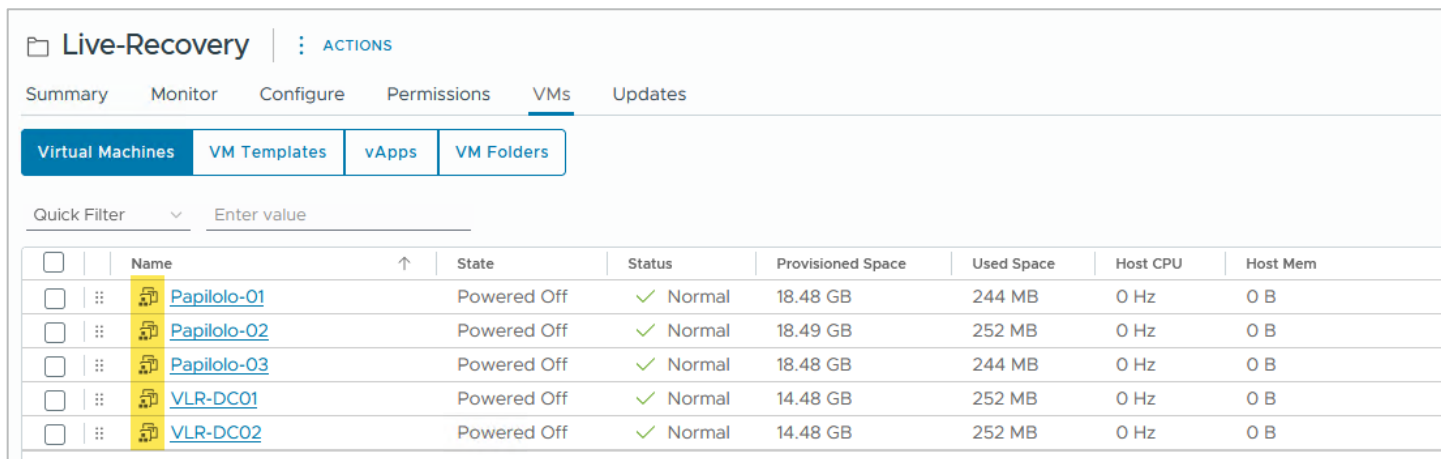
CANCEL BACK FINISH

The recovery plans have returned to **Ready** for another test or invoke in an actual disaster event.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery



Also, the recovered VMs are powered off and restored to their previous placeholder states.



## Perform a real disaster recovery

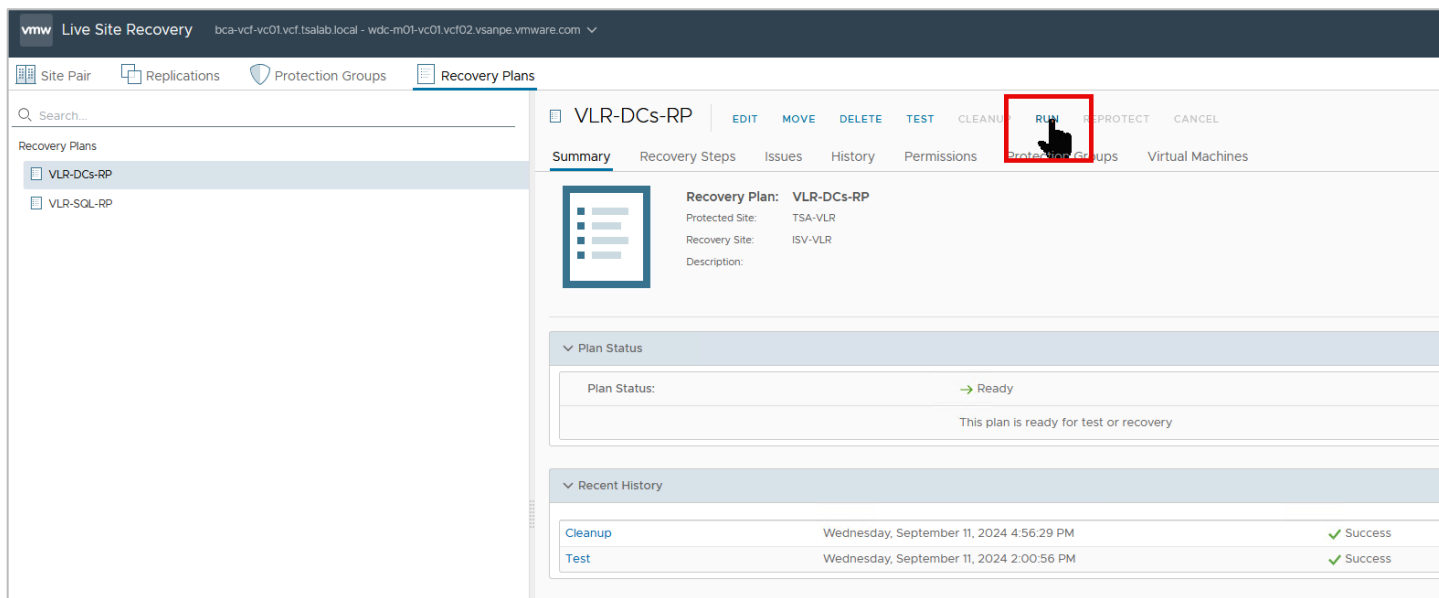
Performing mocked-up or simulated disaster recovery exercises is one of the best features of VMware Live Site Recovery. Knowing that you're adequately prepared to recover an infrastructure in real disaster events gives you peace of mind. It also helps your organization satisfy compliance, regulatory, and other legal requirements. A simulated failure and recovery isn't usually the desired outcome for investment in a robust BCDR solution like VMware Live Site Recovery, though. What the solution can do for you in a real disaster event is always the end goal. We'll now demonstrate VMware Live Site Recovery's capabilities in a disaster event.

A disaster event is a catastrophic event that impacts IT services in a production environment. It implies that all servers and services in that specific environment are unavailable and must be reinstated or reinstated in another environment for business continuity.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

Except for a few considerations and cosmetic differences, the process of performing real disaster recovery exercises is not much different from the test disaster recovery process you previously conducted. We'll highlight those differences in this section.

1. Select the recovery plan and click **Run** to initiate a disaster recovery exercise.



VMware Live Site Recovery provides two types of disaster recovery operations:

- **Planned recovery:** This is good for proactively relocating business-critical workloads from one datacenter to another for any business reasons. For example, if a natural disaster event is predicted for the area where the workloads are currently located, you can invoke the recovery plans to move them to another site in a controlled fashion. In this mode, the recovery operation will (among other things) perform an up-to-date synchronization between the two sites to ensure that changes in flight are committed to the replicated copies of the workloads at the recovery site. The process will also attempt to power off the workloads at the protected site to avoid service collision. If these attempts fail, the recovery will be stopped.
  - **Disaster recovery:** This is for situations where the workloads at the protected sites are no longer available. When this option is invoked, VMware Live Site Recovery attempts a last-minute replication and a controlled power-off of the VMs at the protected site. The recovery continues even if VMware Live Site Recovery cannot successfully perform these steps. When you indicate a disaster recovery, the system assumes an actual disaster event makes the protected site unreachable, and the services or servers there are unavailable.
2. Select the checkbox to acknowledge you understand the action is disruptive. If you miss this checkbox, you're prompted to acknowledge the disaster recovery to make sure you don't accidentally initiate one.

⚠ Confirm that you understand that this process will permanently alter the virtual machines and infrastructure of both the protected and recovery datacenters. ✕

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

3. Select **Disaster recovery**.
4. Click **Next**.

Recovery - VLR-DCs-RP

1 Confirmation options

2 Ready to complete

### Confirmation options

Recovery confirmation

Running this plan in recovery mode will attempt to shut down the VMs at the protected site and recover the VMs at the recovery site.

Protected site: TSA-VLR

Recovery site: ISV-VLR

Server connection: Connected

Number of VMs: 2

I understand that this process will permanently alter the virtual machines and infrastructure of both the protected and recovery datacenters.

#### Recovery type

Planned migration

Replicate recent changes to the recovery site and cancel recovery if errors are encountered. (Sites must be connected and storage replication must be available.)

Disaster recovery

Attempt to replicate recent changes to the recovery site, but otherwise use the most recent storage synchronization data. Continue recovery even if errors are encountered.

CANCEL NEXT

5. Click **Finish** to begin the disaster recovery.

Recovery - VLR-DCs-RP

1 Confirmation options

2 Ready to complete

### Ready to complete

Review your selected settings.

Name	VLR-DCs-RP
Protected site	TSA-VLR
Recovery site	ISV-VLR
Server connection	Connected
Number of VMs	2
Recovery type	Disaster recovery
Forced recovery	Do not force recovery

CANCEL BACK FINISH

Here, you'll see VMware Live Site Recovery powering off the protected VMs at the protected site before it starts to recover them at the recovery site. The power-off and synchronization attempts succeeded because your

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

protected site wasn't offline. If it were, these tasks wouldn't succeed, and the recovery process would continue.

Plan status: Recovery in progress (81%)

Description: Recovery in progress

Virtual Machines	VM Templates	vApps	VM Folders
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Name	State	Status	Provisioned Space	Used Space
VLR-DC02	Powered Off	✓ Normal	253.58 GB	30.15 GB
VLR-DC01	Powered Off	✓ Normal	253.6 GB	31.08 GB
Papiolo-03	Powered On	✓ Normal	2.04 TB	348.97 GB
Papiolo-02	Powered On	✓ Normal	2.04 TB	348.28 GB
Papiolo-01	Powered On	✓ Normal	2.04 TB	379.45 GB

Recovery Steps:

- Restore hosts from standby for live migration
- Suspend non-critical VMs at recovery site for live migration
- Prepare stretched storage consistency groups for VM migration at protecte...
- Live migration of VMs
- Pre-synchronize storage
- Shut down VMs at protected site
  - 6.1. Shut down the priority 5 VMs
  - 6.2. Shut down the priority 4 VMs
  - 6.3. Shut down the priority 3 VMs
  - 6.4. Shut down the priority 2 VMs
  - 6.5. Shut down the priority 1 VMs
    - 6.5.1. VLR-DC02 (Success)
    - 6.5.2. VLR-DC01 (Success)

The recovery was successfully completed.

Plan status: Recovery complete

Description: The recovery has completed. Review the plan history to view any errors or warnings. virtual machines to the original site.

The Domain Controllers in your recovery plan are now running and providing services in the recovery site. Business continuity is restored with just a few mouse clicks.

## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

The screenshot shows the 'Live-Recovery' interface with the 'VMs' tab selected. A table lists several virtual machines. The first two, VLR-DC02 and VLR-DC01, are highlighted in yellow and are in a 'Powered On' state. The other three, Papilolo-03, Papilolo-02, and Papilolo-01, are in a 'Powered Off' state. All VMs have a status of 'Normal' and a checkmark icon.

Name	State	Status	Provisioned Space	Used Space	Host CPU	Host Mem
VLR-DC02	Powered On	✓ Normal	252.92 GB	29.41 GB	80 MHz	1.9 GB
VLR-DC01	Powered On	✓ Normal	252.93 GB	30.65 GB	26 MHz	1.78 GB
Papilolo-03	Powered Off	✓ Normal	18.48 GB	244 MB	0 Hz	0 B
Papilolo-02	Powered Off	✓ Normal	18.49 GB	252 MB	0 Hz	0 B
Papilolo-01	Powered Off	✓ Normal	18.48 GB	244 MB	0 Hz	0 B

6. Go ahead and invoke the rest of your recovery plans.

The VMs are now powered on at the recovery site and powered off at the protected site.

This block contains two side-by-side screenshots of the VMware Live-Recovery interface. The left screenshot is labeled 'Protected Site' and shows all VMs in a 'Powered Off' state. The right screenshot is labeled 'Recovery Site' and shows all VMs in a 'Powered On' state. Both screenshots show the same set of VMs: VLR-DC02, VLR-DC01, Papilolo-03, Papilolo-02, and Papilolo-01.

Site	Name	State	Status	Provisioned Space	Used Space	Host CPU	Host Mem
Protected Site	VLR-DC02	Powered Off	✓ Normal	253.58 GB	30.15 GB	0 Hz	0 B
	VLR-DC01	Powered Off	✓ Normal	253.6 GB	31.08 GB	0 Hz	0 B
	Papilolo-03	Powered Off	✓ Normal	2.04 TB	349.12 GB	0 Hz	0 B
	Papilolo-02	Powered Off	✓ Normal	2.04 TB	348.27 GB	0 Hz	0 B
	Papilolo-01	Powered Off	✓ Normal	2.04 TB	379.42 GB	0 Hz	0 B
Recovery Site	VLR-DC02	Powered On	✓ Normal	252.94 GB	29.46 GB	53 MHz	2.63 GB
	VLR-DC01	Powered On	✓ Normal	252.93 GB	30.68 GB	26 MHz	2.58 GB
	Papilolo-03	Powered On	✓ Normal	1.36 TB	347.7 GB	1.72 GHz	2.11 GB
	Papilolo-02	Powered On	✓ Normal	1.36 TB	347.48 GB	1.72 GHz	2.12 GB
	Papilolo-01	Powered On	✓ Normal	1.36 TB	378.73 GB	0 Hz	2.15 GB

## Reprotect business-critical applications after a disaster event

What is Reprotect needed as shown in the Recovery Plans tab?

The screenshot shows the 'Recovery Plans' tab in the VMware Live Site Recovery interface. Two recovery plans are listed: VLR-DCs-RP and VLR-SQL-RP. Both plans have a yellow button labeled 'Reprotect needed' next to them. The status for both is 'Recovery complete'. The protected site is 'TSA-VLR' and the recovery site is 'ISV-VLR'. A mouse cursor is pointing at the 'Reprotect needed' button for the VLR-SQL-RP plan.

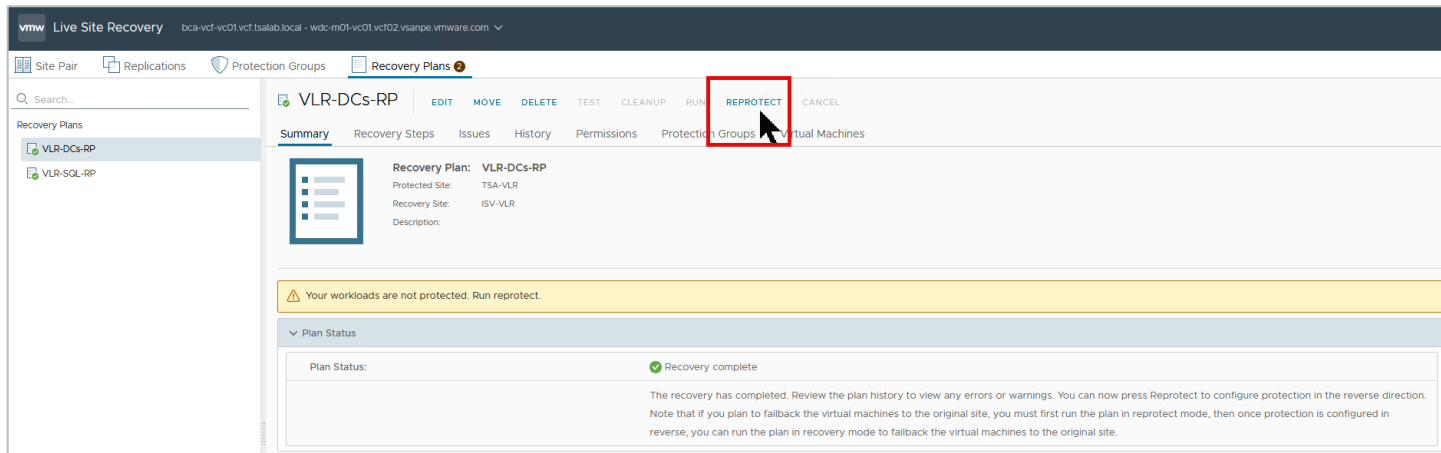
Name	Reprotect needed	Status	Protected Site	Recovery Site
VLR-DCs-RP	Reprotect needed	✓ Recovery complete	TSA-VLR	ISV-VLR
VLR-SQL-RP	Reprotect needed	✓ Recovery complete	TSA-VLR	ISV-VLR

VMware Live Site Recovery makes it easy to quickly configure protection for the VMs after a disaster recovery operation. In the immediate aftermath of a real disaster event, the recovered VMs don't have any protection (because the original site is unavailable). After the disaster is over and you're ready to resume operations at that site, you simply reprotect the VMs.

7. Select the recovery plan containing the VMs you want to protect.

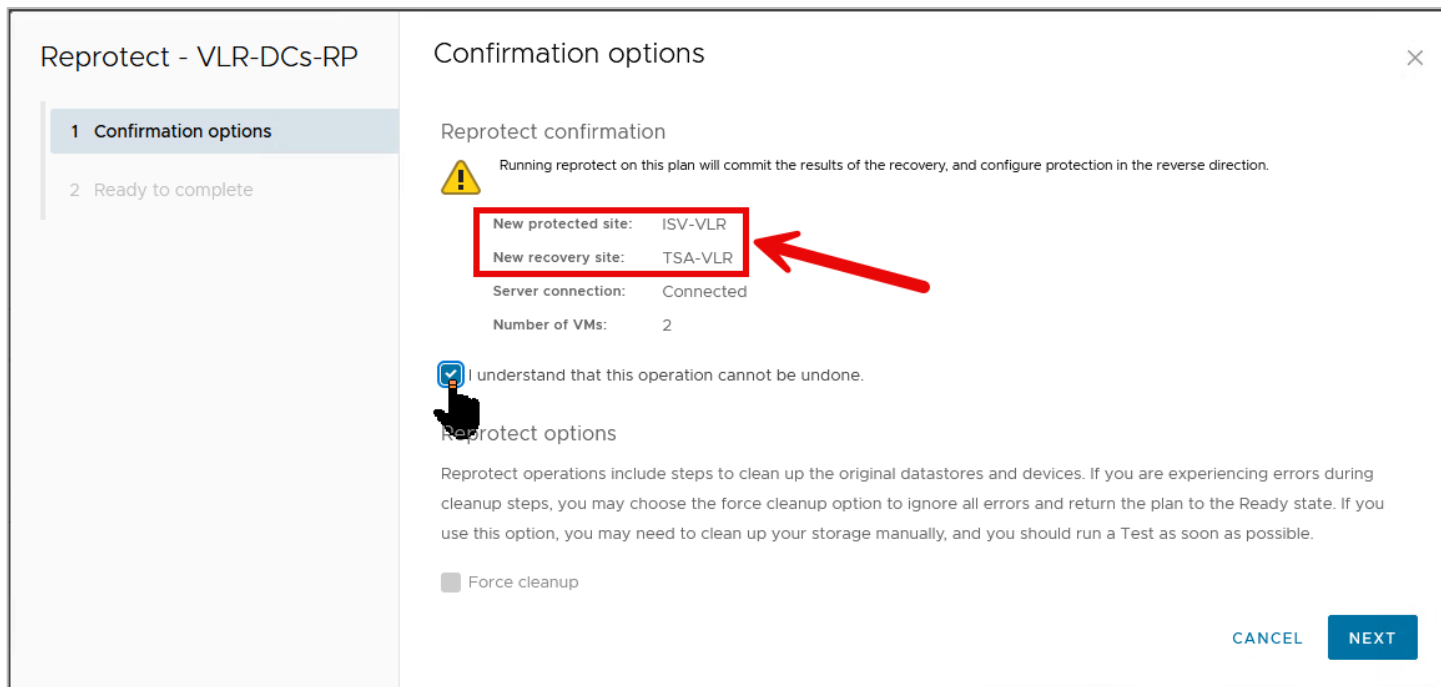
# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

8. Click on **Reprotect**.

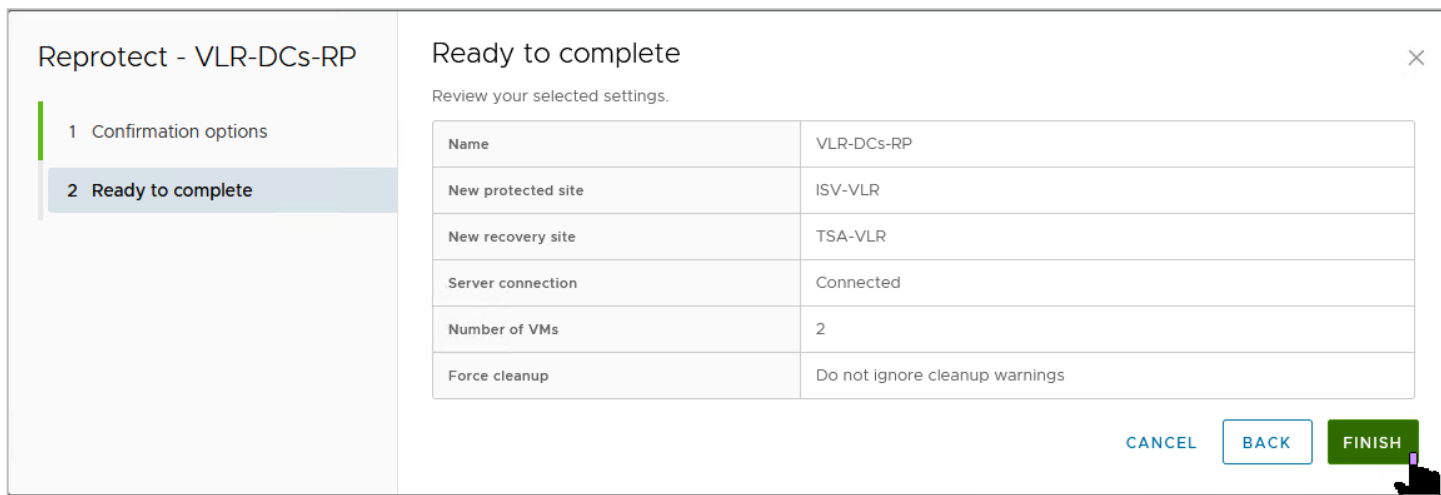


You'll notice that the source → target direction has now been automatically reversed. The original recovery site is now the protected site (and vice versa) because the VMs are now running at the original recovery site.

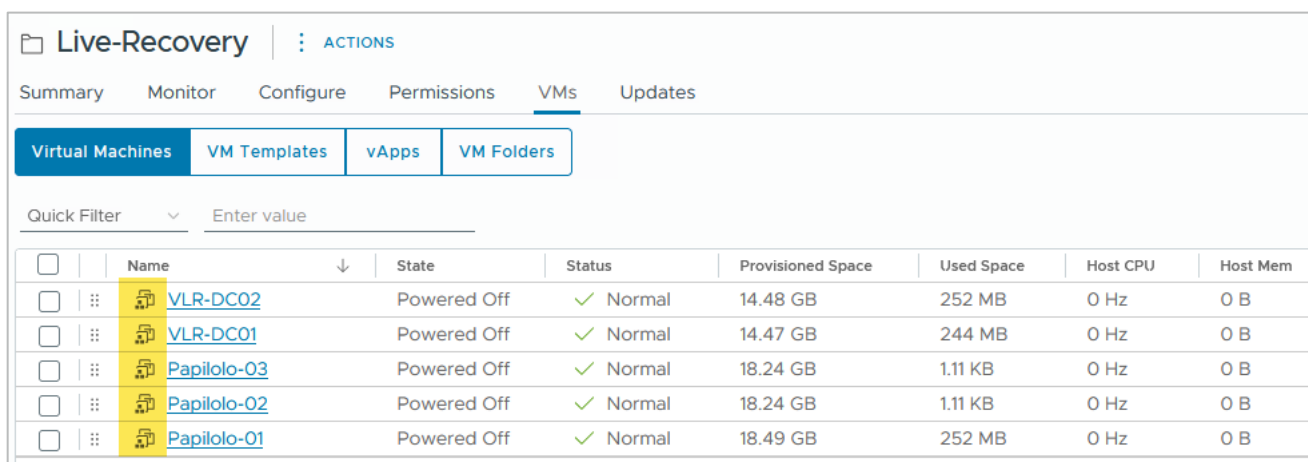
9. Select **I understand that this operation cannot be undone** to signal that you understand the effects and implications of the action you're about to perform.



10. Click **Next** and then **Finish** on the next screen.



When the VMs are reprotected, they're converted to placeholders at the new recovery site (formerly the protected site).



## Modify the in-guest script after a disaster recovery operation

You previously configured a **Run Command on Recovered VM** task in the **Post Power On Steps** section for the Domain Controller and SQL Server recovery plans.

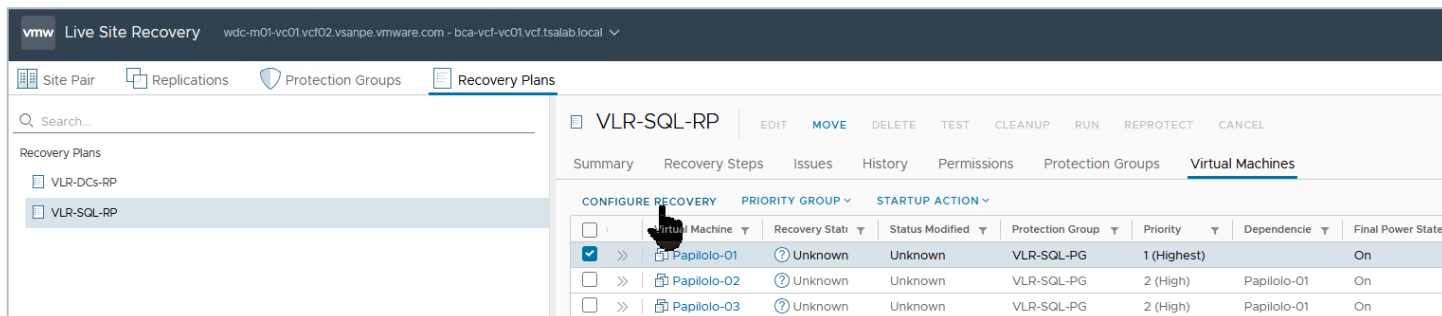
We called a script to reboot the Domain Controller recovery plan. No modification is necessary for this step when we reprotect these VMs. However, the SQL Server recovery plan deserves some attention because the script must make site/subnet-specific configuration changes to both the Windows cluster and SQL Server Always On. Therefore, you need to modify the original script with the correct information:

- Now that the VM is running in the recovery site, you can log in and edit the script itself.
- Or, you can edit the recovery [lan and specify a different script to be used in the post power-on steps as you did previously. You'll do this process below.

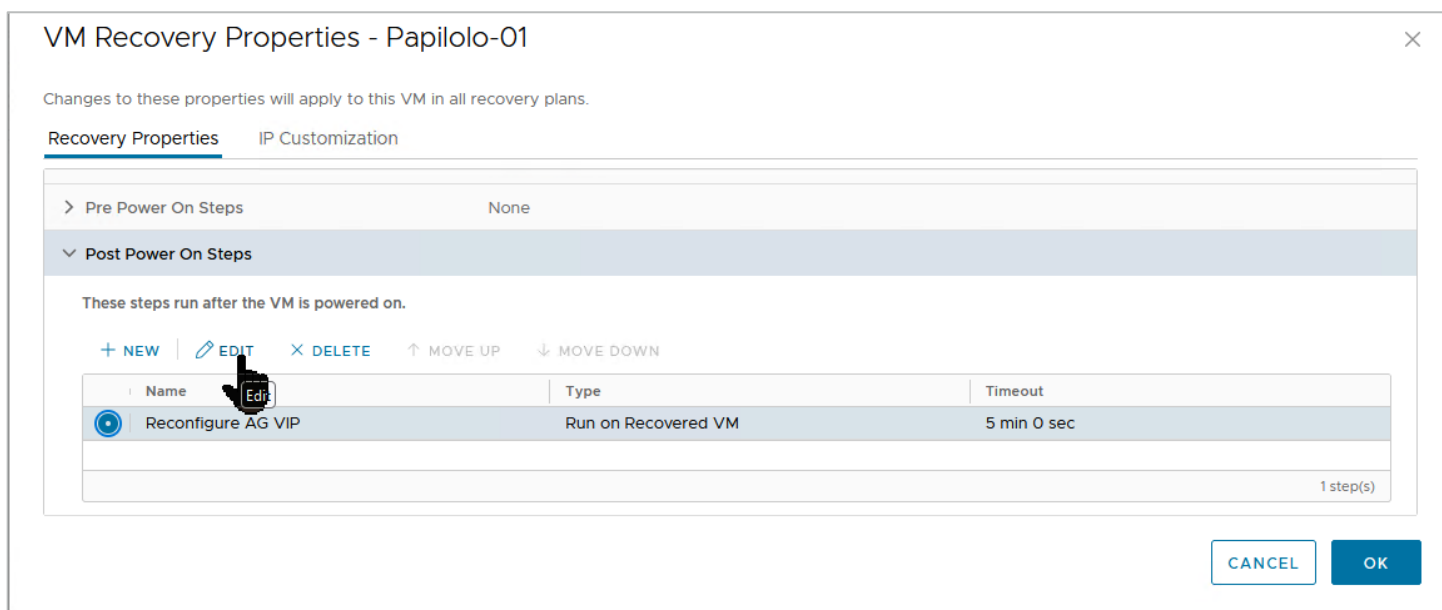


## Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

11. Connect and log into VMware Live Site Recovery on the new recovery site.
12. Select the recovery plan, click the **Virtual Machines** tab, and then select the VM with the recovery steps to modify.
13. Click **Configure Recovery**.



14. Select the step to modify (here, it's **Post Power On Steps**), and then click **Edit**.



15. Type in the command to run. In our case, we're calling another script: **Change-Cluster-AG-VIP-Reverse.ps1**. This is also located in the VM.
16. Click **Save**.

# Protecting and Recovering Mission-Critical Applications in a VMware Hybrid Cloud with VMware Live Site Recovery

### Edit Post Power On Step

Type:

- Command on VLSR Server
- Prompt (requires a user to acknowledge the prompt before the plan continues)
- Command on Recovered VM

Name: Reconfigure AG VIP  
62 characters remaining

Content: `Powershell.exe C:\Install-Files\Change-Cluster-AG-VIP-Reversed.ps1`  
4030 characters remaining

Timeout: 5 minutes 0 seconds

17. Click **OK** to commit the changes.

### VM Recovery Properties - Papilolo-01

Changes to these properties will apply to this VM in all recovery plans.

Recovery Properties | IP Customization

Priority Group: 1 (Highest)  
All virtual machines within a priority group will be started before proceeding to the next priority group. The startup order of virtual machines within a priority group may be specified by adding VM dependencies. The virtual machines within a priority group will start in

> Pre Power On Steps: None

▼ Post Power On Steps

These steps run after the VM is powered on.

+ NEW | EDIT | DELETE | MOVE UP | MOVE DOWN

Name	Type	Timeout
Reconfigure AG VIP	Run on Recovered VM	5 min 0 sec

1 step(s)

Here's the script we used for this exercise. It also appears in the appendix.

```
Change-Cluster-AG-VIP-Reversed.ps1 X
1 # Change-Cluster-AG-VIP.ps1 (For reconfiguring recovered MS SQL Server cluster properties)
2 Import-Module FailoverClusters
3
4 # Let's Force-Start our Cluster first
5
6 # Immediately post-recovery, the whole Cluster is down
7
8 Start-ClusterNode -FQ
9
10 # Let's define our new IP address and subnet mask for the Cluster IP Address
11 $newClusIP = "10.156.138.87" # Replace with your new IP address
12 $newClusMask = "255.255.240.0" # Replace with your subnet mask
13
14 # Get the IP Address of the Cluster resource
15 $setNewClusIP = Get-ClusterResource -Name "SRM-AG01_Clus_IP"
16
17 # Set the new IP address and subnet mask for the Cluster resource
18 $setNewClusIP | Set-ClusterParameter -Name Address -Value $newClusIP
19 $setNewClusIP | Set-ClusterParameter -Name SubnetMask -Value $newClusMask
20
21 ##### Next, we modify the AG VIP
22 # Let's define our new IP address and subnet mask for the AG VIP Address
23 $newAGIP = "10.156.138.88" # Replace with your new IP address
24 $newAGMask = "255.255.240.0" # Replace with your subnet mask
25
26 # Get the IP Address of the AG resource
27 $setNewAGIP = Get-ClusterResource -Name "SRM-AG01-IP"
28
29 # Set the new IP address and subnet mask for the AG resource
30 $setNewAGIP | Set-ClusterParameter -Name Address -Value $newAGIP
31 $setNewAGIP | Set-ClusterParameter -Name SubnetMask -Value $newAGMask
32
33 # Bring the resources offline
34 Stop-ClusterResource "SRM-AG01_Clus_IP"
35 Stop-ClusterResource "SRM-AG01_SRM-AG-List"
36 Stop-ClusterResource "Cluster Name"
37 Stop-ClusterResource "SRM-AG01"
38 Stop-ClusterResource "SRM-AG01-IP"
39
40 # We now start up everything
41 Start-ClusterResource "SRM-AG01"
42 Start-ClusterResource "SRM-AG01-IP"
43 Start-ClusterResource "SRM-AG01_SRM-AG-List"
44 Start-ClusterResource "SRM-AG01_Clus_IP"
45 Start-ClusterResource "Cluster Name"
```

## Conclusion

We've reached the end of our demonstration on how to prepare and configure a set of virtualized business-critical application VMs in a vSphere-based infrastructure to be protected against a disaster event and recovered with VMware Live Site Recovery to restore business continuity.

We showcased a multi-tiered application stack that required special considerations. We covered using in-guest scripting to complement VMware Live Site Recovery's automated workflow and capabilities.

We demonstrated how to use VMware Live Site Recovery to conduct:

- Test recovery operations for compliance purposes and verify our recovery plans' reliability on demand.
- A real disaster recovery operation and reconfigure the recovered workloads to be protected again after we achieved stability.

We also provided the in-guest scripts used in these exercises in the appendix.

We hope you've found this comprehensive documentation useful for your own purposes. Thank you.

## Appendix A: Sample scripts

We (Broadcom) provide the following sample scripts for illustration purposes only. We don't assure, warranty, or guarantee their suitability for your purposes and usage. We don't provide support for these scripts. We disclaim any responsibility for any adverse effect that might result from your use of these sample scripts.

### Run-Post-Script.ps1

This reboots the first Domain Controller that VMware Live Site Recovery recovers.

```
Write-Output "Rebooting VM to complete recovery..." $(Get-Date) > c:\install-files\recovery.txt  
shutdown -r -t 60
```

### Change-Cluster-AG-VIP.ps1

This reconfigures the recovered SQL Server cluster properties.

```
Import-Module FailoverClusters  
  
# Let's Force-Start our Cluster first  
  
# Immediately post-recovery, the whole Cluster is down  
  
Start-ClusterNode -FQ  
  
# Let's define our new IP address and subnet mask for the Cluster IP Address  
$newClusIP = "10.156.139.87" # Replace with your new IP address  
$newClusMask = "255.255.240.0" # Replace with your subnet mask  
  
# Get the IP Address of the Cluster resource  
$setNewClusIP = Get-ClusterResource -Name "SRM-AG01_Clus_IP"  
  
# Set the new IP address and subnet mask for the Cluster resource  
$setNewClusIP | Set-ClusterParameter -Name Address -Value $newClusIP  
$setNewClusIP | Set-ClusterParameter -Name SubnetMask -Value $newClusMask  
  
##### Next, we modify the AG VIP  
# Let's define our new IP address and subnet mask for the AG VIP Address  
$newAGIP = "10.156.139.88" # Replace with your new IP address  
$newAGMask = "255.255.240.0" # Replace with your subnet mask  
  
# Get the IP Address of the AG resource  
$setNewAGIP = Get-ClusterResource -Name "SRM-AG01-IP"  
  
# Set the new IP address and subnet mask for the AG resource  
$setNewAGIP | Set-ClusterParameter -Name Address -Value $newAGIP  
$setNewAGIP | Set-ClusterParameter -Name SubnetMask -Value $newAGMask
```

```
# Bring the resources offline
Stop-ClusterResource "SRM-AG01_Clus_IP"
Stop-ClusterResource "SRM-AG01_SRM-AG-List"
Stop-ClusterResource "Cluster Name"
Stop-ClusterResource "SRM-AG01"
Stop-ClusterResource "SRM-AG01-IP"

# We now start up everything
Start-ClusterResource "SRM-AG01"
Start-ClusterResource "SRM-AG01-IP"
Start-ClusterResource "SRM-AG01_SRM-AG-List"
Start-ClusterResource "SRM-AG01_Clus_IP"
Start-ClusterResource "Cluster Name"
```

## Change-Cluster-AG-VIP-Reversed.ps1

You'd use this when the recovered SQL Server VM is reprotected.

```
Import-Module FailoverClusters

# Let's Force-Start our Cluster first

# Immediately post-recovery, the whole Cluster is down

Start-ClusterNode -FQ

# Let's define our new IP address and subnet mask for the Cluster IP Address
$newClusIP = "10.156.138.87" # Replace with your new IP address
$newClusMask = "255.255.240.0" # Replace with your subnet mask

# Get the IP Address of the Cluster resource
$setNewClusIP = Get-ClusterResource -Name "SRM-AG01_Clus_IP"

# Set the new IP address and subnet mask for the Cluster resource
$setNewClusIP | Set-ClusterParameter -Name Address -Value $newClusIP
$setNewClusIP | Set-ClusterParameter -Name SubnetMask -Value $newClusMask

##### Next, we modify the AG VIP
# Let's define our new IP address and subnet mask for the AG VIP Address
$newAGIP = "10.156.138.88" # Replace with your new IP address
$newAGMask = "255.255.240.0" # Replace with your subnet mask

# Get the IP Address of the AG resource
$setNewAGIP = Get-ClusterResource -Name "SRM-AG01-IP"

# Set the new IP address and subnet mask for the AG resource
$setNewAGIP | Set-ClusterParameter -Name Address -Value $newAGIP
$setNewAGIP | Set-ClusterParameter -Name SubnetMask -Value $newAGMask

# Bring the resources offline
Stop-ClusterResource "SRM-AG01_Clus_IP"
Stop-ClusterResource "SRM-AG01_SRM-AG-List"
Stop-ClusterResource "Cluster Name"
```

```
Stop-ClusterResource "SRM-AG01"  
Stop-ClusterResource "SRM-AG01-IP"  
  
# We now start up everything  
Start-ClusterResource "SRM-AG01"  
Start-ClusterResource "SRM-AG01-IP"  
Start-ClusterResource "SRM-AG01_SRM-AG-List"  
Start-ClusterResource "SRM-AG01_Clus_IP"  
Start-ClusterResource "Cluster Name"
```

## References

- [Installation, setup, configuration and/or administration of VMware vSphere infrastructure](#)
- [Installation, setup, configuration and/or administration of specific VMware vSphere-based cloud infrastructure](#)
- [Installation, setup, configuration and/or administration of VMware Live Site Recovery](#)
- [Virtualizing Active Directory Domain Services on VMware vSphere](#)
- [Architecting Microsoft SQL Server on VMware vSphere](#)
- [Installation, setup, configuration and/or administration of Microsoft Active Directory Domain Services or Domain Controllers](#)
- [Installation, setup, configuration and/or administration of Microsoft SQL Server, Windows Failover Cluster or Always On](#)
- [VMware vSphere Client](#)

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