

Capstone Project Use Case 2

Azure Site Recovery

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Chapter 1: Introduction

Problem Statement:

In an Azure-based infrastructure, there is a need to ensure business continuity and disaster recovery (DR) for Azure virtual machines (VMs). The goal is to set up DR for Azure VMs, run a DR drill, perform a production failover, and fail back to the primary site with minimal downtime and data loss. The challenge is to properly configure and test the disaster recovery solution using Azure Site Recovery, while ensuring that the production environment remains unaffected and that the failback process is efficient and seamless.

Introduction:

The project addresses the need for a comprehensive Azure Site Recovery (ASR) framework to establish an effective Disaster Recovery plan for Azure VMs. The goal is to seamlessly transition workloads between primary and secondary Azure regions, ensuring business continuity in the face of disasters or disruptions. This involves setting up initial replication, running periodic DR drills, orchestrating production failovers, and managing the subsequent failback processes.

Framework of the Proposed Work:

1. Setting up DR for Azure VMs:

This involves configuring Azure Site Recovery, creating a recovery plan, and setting up replication for the desired Azure VMs.

2. Running a DR drill:

A DR drill, also known as a test failover, allows you to validate the replication and DR strategy without affecting the production environment or causing any data loss.

3. Performing a production failover:

In the event of a disaster, a planned or unplanned failover can be initiated to shift operations to the secondary site.

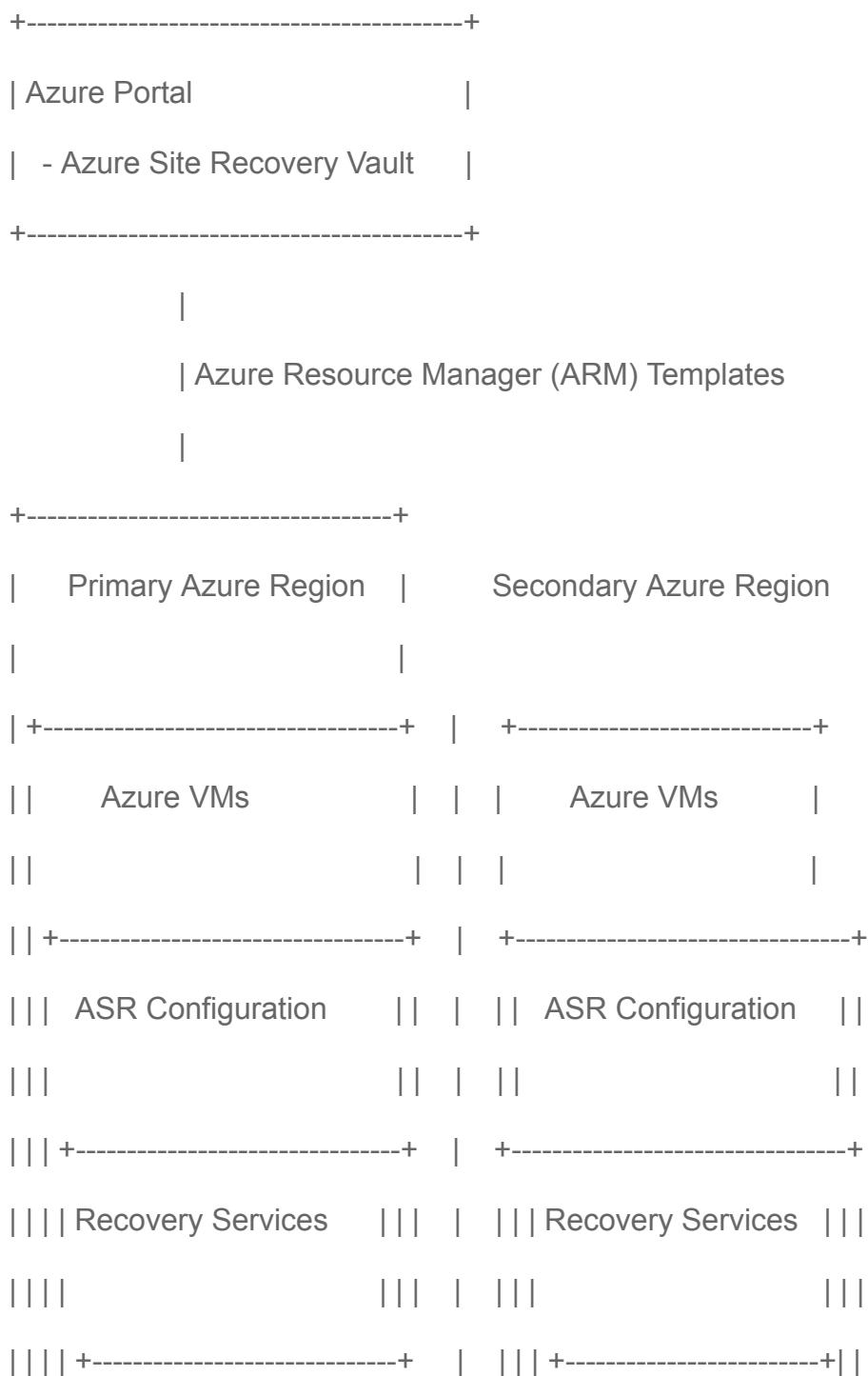
4. Failing back to the primary site:

After the disaster has been mitigated, a failback process can be executed to return operations to the primary site.

The proposed framework ensures a systematic approach to Azure Site Recovery, addressing each phase with meticulous planning and execution. This project aims to provide organizations with a reliable and tested solution for safeguarding their Azure VMs against unexpected disruptions while minimizing downtime and data loss.

Chapter 2: Architectural Diagram

Azure Site Recovery Architecture:

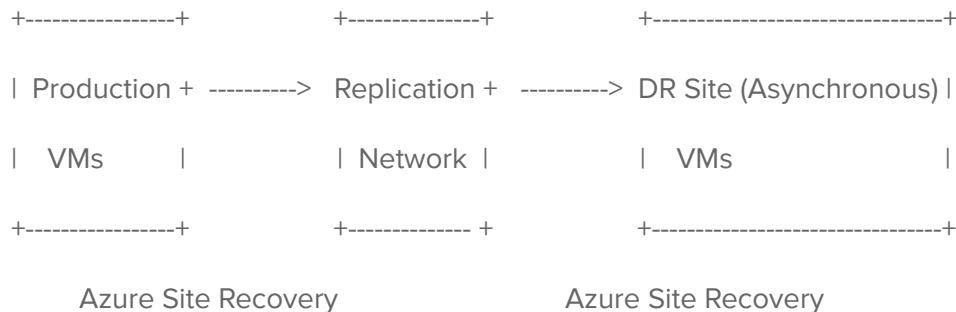


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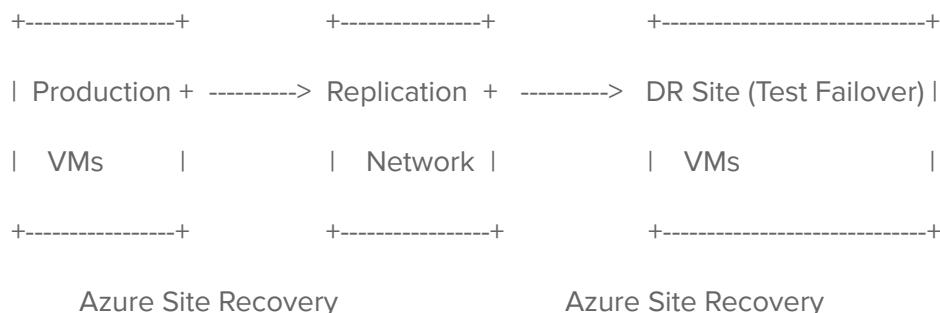
Step-wise Architectural Diagram:

Here's an architectural diagram that includes the steps for Azure Site Recovery, covering Setup DR for Azure VMs, Running a DR Drill, Production Failover, and Failing Back:

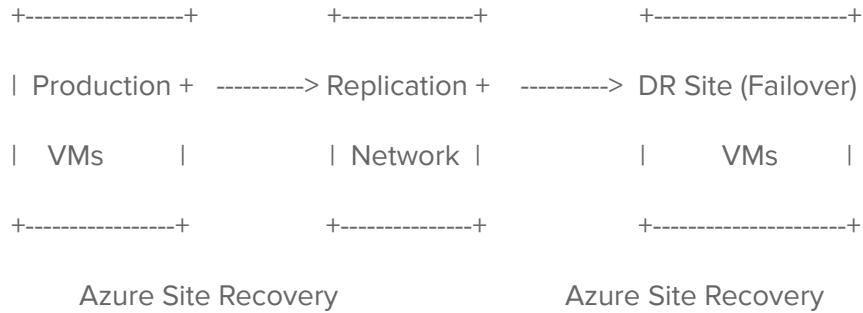
Step 1: Setup DR for Azure VMs:



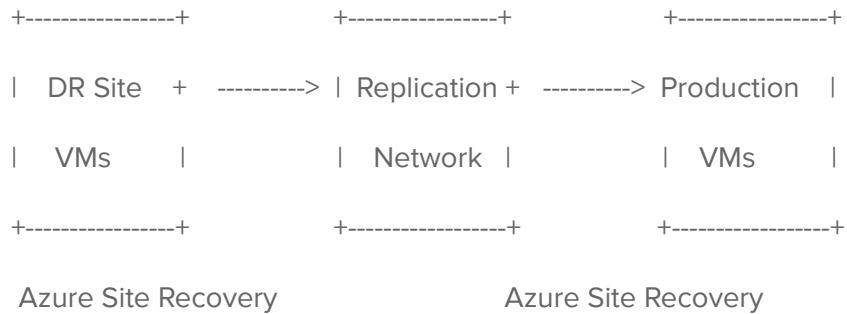
Step 2: Run a DR Drill (Test Failover):



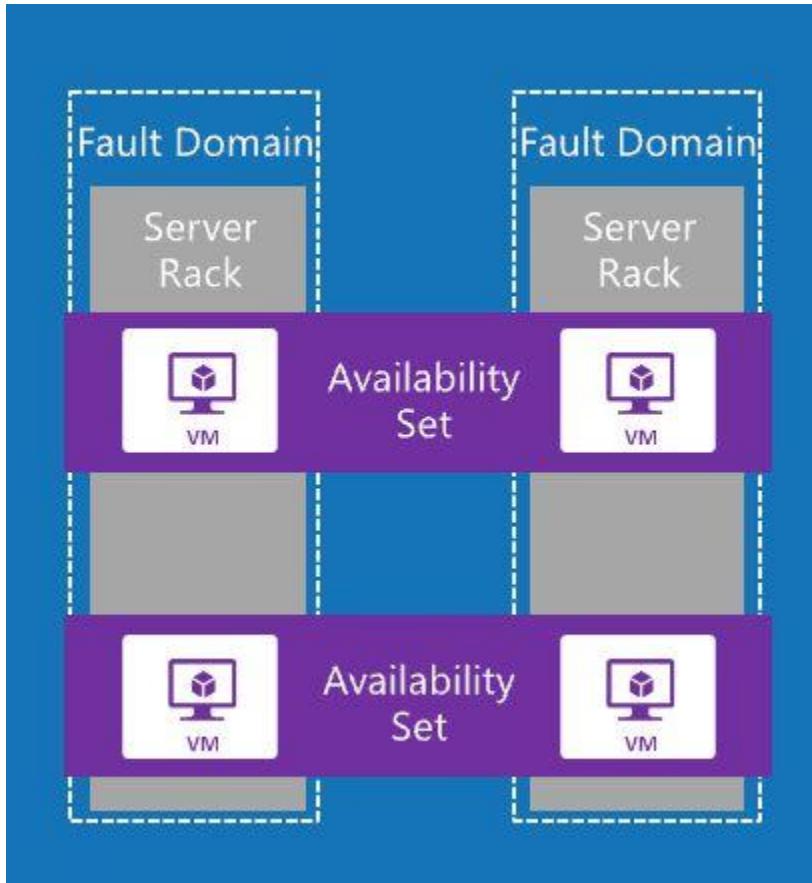
Step 3: Run a DR Drill (Test Failover):



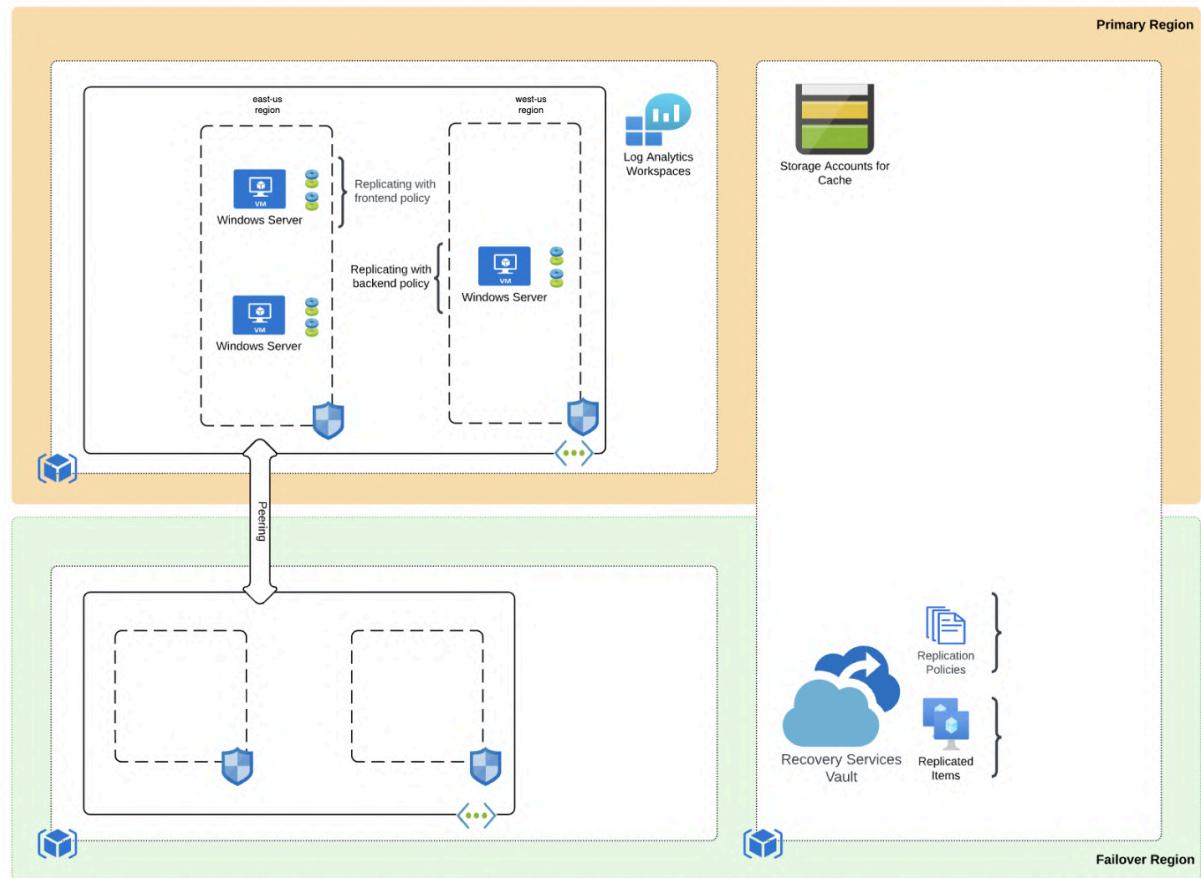
Step 4: Fail Back to the Primary Site:



How Availability sets work:

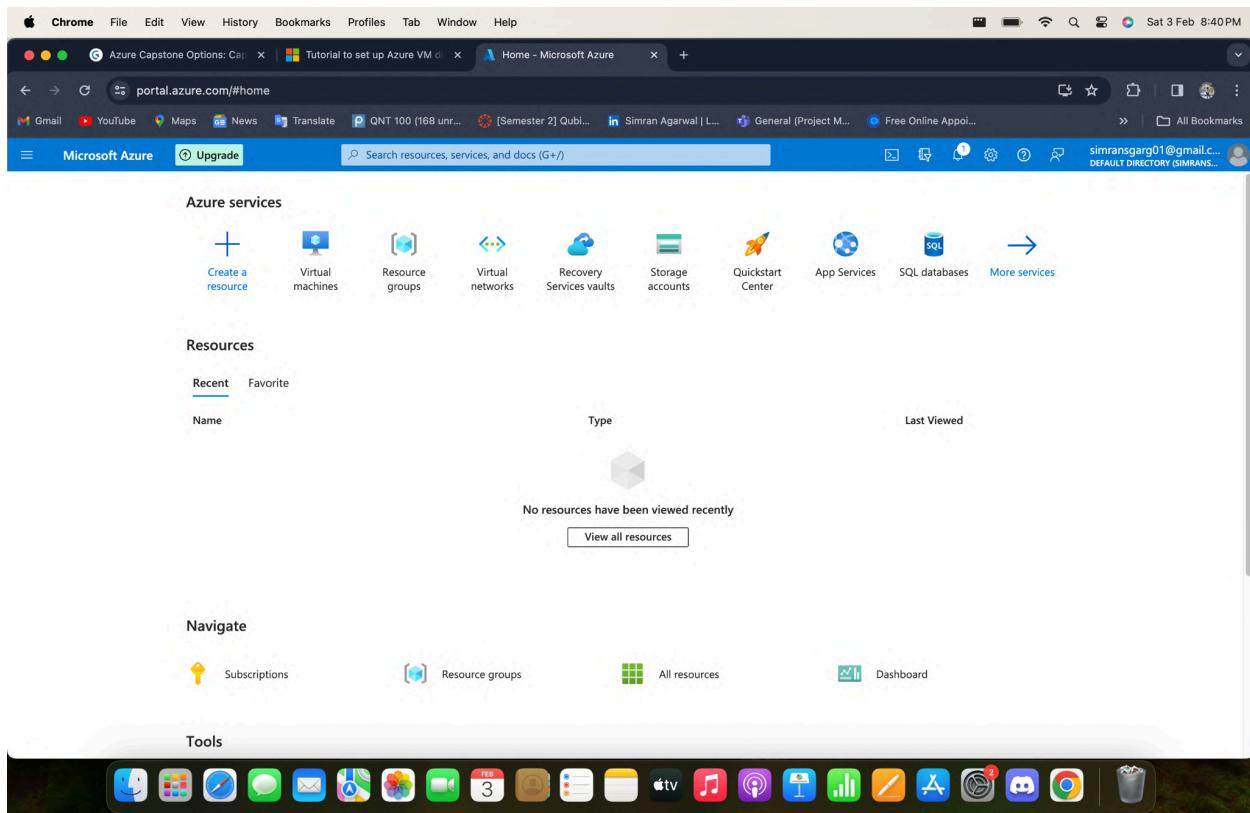


Final Architectural Diagram:



Chapter 3: Pre-Requisites

Step 1: Create a AZURE account:



Step 2: Create a Virtual Machine:

The screenshot shows the Microsoft Azure portal interface. The main content area displays the properties of a virtual machine named "vm".

Essentials

Resource group (move)	: vm	Operating system	: Windows (Windows Server 2019 Datacenter)
Status	: Running	Size	: Standard DS2 v2 (2 vcpus, 7 GiB memory)
Location	: East US	Public IP address	: 20.163.156.80
Subscription (move)	: Free_Trial	Virtual network/subnet	: vm-vnet/default
Subscription ID	: 3754456c-ce38-4c4c-86d2-b3606bdebe1b	DNS name	: Not configured
		Health state	: -

Tags (edit) : Add tags

Properties **Monitoring** **Capabilities (8)** **Recommendations** **Tutorials**

Virtual machine

Computer name	vm
Operating system	Windows (Windows Server 2019 Datacenter)
Image publisher	MicrosoftWindowsServer
Image offer	WindowsServer
Image plan	2019-datacenter-gensecond
VM generation	V2
VM architecture	x64
Agent status	Ready

Networking

Public IP address	20.163.156.80 (Network interface vm545)
Public IP address (IPv6)	-
Private IP address	10.0.0.4
Private IP address (IPv6)	-
Virtual network/subnet	vm-vnet/default
DNS name	Configure

Size

Size	Standard DS2 v2
------	-----------------

Bottom navigation bar: Home, VM, Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Connect, Connect, Bastion, Windows Admin Center, Networking, Network settings, Load balancing, Application security groups, Network manager, Settings, Disks, Extensions + applications.

Step 3: Create a Resource Group in DR region:

The screenshot shows a Microsoft Azure portal page in a web browser. The URL is portal.azure.com/#view/HubsExtension/BrowseResourceGroups. The top navigation bar includes links for Gmail, YouTube, Maps, News, Translate, QNT 100 (168 unr...), [Semester 2] Qubi..., Simran Agarwal | L..., General [Project M...], Free Online Appoi..., Microsoft Azure, Upgrade, and a search bar. The user's email, simransarg01@gmail.com, is visible in the top right.

The main content area is titled "Resource groups" and shows a list of existing resource groups: NetworkWatcherRG, vm, and vm-asr. A modal window on the right side of the screen displays a green checkmark icon and the message "Resource group created". Below the message, it says "Creating resource group 'vm-asr' in subscription 'Free Trial' succeeded." There are two buttons at the bottom of the modal: "Go to resource gr..." and "Pin to dashboard".

Below the list of resource groups, there are filters: "Subscription equals all", "Location equals all", and "Add filter". On the right, there are grouping and view options: "No grouping" and "List view".

At the bottom of the page, there are navigation links for "Page 1 of 1" and "Next >". A "Give feedback" link is also present. The bottom of the screen shows the Mac OS X dock with various application icons.

Step 4: Recover Service Vault inside Resource Group Created for DR region:

The screenshot shows a Microsoft Azure portal page titled "Microsoft.RecoveryServicesV2-1706973771684 | Overview". The deployment status is marked as "Your deployment is complete". Key details listed include:

- Deployment name : Microsoft.RecoveryServicesV2-1706973771684
- Subscription : Free Trial
- Resource group : vm-asr
- Start time : 03/02/2024, 20:53:08
- Correlation ID : ae7e5811-1f2a-4e1d-9eff-2ca62903e2b1

The left sidebar shows navigation options: Overview, Inputs, Outputs, and Template. Below the main content, there are links for "Give feedback" and "Tell us about your experience with deployment". To the right, there are promotional cards for "Cost management", "Microsoft Defender for Cloud", "Free Microsoft tutorials", and "Work with an expert". The bottom of the screen shows the Mac OS Dock with various application icons.

Step 5: VNET in DR Region:

The screenshot shows a Microsoft Azure deployment overview page titled "vnet-asr-1706974088629 | Overview". The main content area displays a green checkmark icon and the message "Your deployment is complete". Below this, it lists deployment details: Deployment name : vnet-asr-1706974088629, Subscription : Free Trial, and Resource group : vnm-asr. To the right, there are sections for "Cost management", "Microsoft Defender for Cloud", "Free Microsoft tutorials", and "Work with an expert". At the bottom, there's a "Give feedback" section and a "Tell us about your experience with deployment" link. The top of the screen shows the Azure navigation bar and several open tabs in the browser.

Step 6: Cache Storage Account in Primary Region:

The screenshot shows a Chrome browser window with multiple tabs open. The active tab is titled "asrstorage_1706974440296 | Overview". The page displays a deployment summary with the following details:

- Deployment name:** asrstorage_1706974440296
- Subscription:** Free Trial
- Resource group:** vms
- Start time:** 03/02/2024, 21:04:13
- Correlation ID:** 39688074-69bf-448f-9e91-9fa6751c3c12

The main content area shows a message: "Your deployment is complete". Below this, there are sections for "Deployment details" and "Next steps". A "Go to resource" button is present. On the right side of the page, there are promotional links for "Cost Management", "Microsoft Defender for Cloud", "Free Microsoft tutorials", and "Work with an expert". The browser's toolbar and menu bar are visible at the top, along with the system status bar at the bottom.

Step 7: Key Vault is required if Virtual Machine is not added in Availability set:

In our case, Availability set is already set, so no need for Key Vault.

You can see the Availability set - TRYSET here.

The screenshot shows the Microsoft Azure portal interface for configuring disaster recovery. The URL in the address bar is <https://portal.azure.com/#/resourcegroups/3754456c-ce38-4c4c-86d2-b3606bdebe1b/providers/Microsoft.Compute/virtualmachines/vm/providers/Microsoft.RecoveryServices/disasterrecoverysteps/1>. The page title is "vm | Disaster recovery". The "Availability" section shows "TRYSET" selected as the Availability set. The "Target settings" table is currently loading. The "Capacity Reservation Settings" section indicates that capacity is being reserved at the destination location. At the bottom, there are buttons for "Review + Start replication", "Previous", and "Next : Review + Start replication".

Step 8: Replication Policy inside Resource Service Vault:

The screenshot shows a Chrome browser window on a Mac OS X desktop. The address bar displays the URL: portal.azure.com/#view/Microsoft_Azure_RecoveryServices/SettingsMenuBlade/~/vmwareReplicationPolicies/id%2Fsubscriptions%2F3754456c-ce38-4c4c-86d2-b.... The title bar says "Site Recovery Infrastructure".

The main content area is titled "Site Recovery infrastructure | Replication policies". On the left, there's a sidebar with navigation links for "For Azure virtual machines" (Network mapping, Replication policies, Extension update settings), "For VMware & Physical machines" (ASR replication appliances, Replication policies, Mobility agent update settings), "For System Center VMM" (VMM Servers, Network mapping, Replication policies), and "For Hyper-V Sites" (Hyper-V Sites, Hyper-V Hosts, Replication policies). The "Replication policies" link under "For VMware & Physical machines" is highlighted.

In the center, there's a table titled "Filter items..." showing a single replication policy:

Name	Source type	Target type	Status
replication	VMware	Azure	Not in use

Step 9: Following URLs should be white-listed if using firewall in the system:

As I am not using Firewall in my system, I can skip this step.

Name	Commercial	Government	Description
Storage	*.blob.core.windows.net	*.blob.core.usgovcloudapi.net	Allows data to be written from the VM to the cache storage account in the source region.
Microsoft Entra ID	login.microsoftonline.com	login.microsoftonline.us	Provides authorization and authentication to Site Recovery service URLs.
Replication	*.hypervrecoverymanager.windowsazure.com	*.hypervrecoverymanager.windowsazure.com	Allows the VM to communicate with the Site Recovery service.
Service Bus	*.servicebus.windows.net	*.servicebus.usgovcloudapi.net	Allows the VM to write Site Recovery monitoring and diagnostics data.

Step 10: Outbound connectivity for IP address ranges:

If you're using network security groups (NSGs) to control connectivity, create a service-tag based NSG rules that allow HTTPS outbound to port 443 for these service tags(groups of IP addresses):

I can skip this step too.

Tag	Allow
Storage tag	Allows data to be written from the VM to the cache storage account.
Microsoft Entra ID tag	Allows access to all IP addresses that correspond to Microsoft Entra ID.
EventsHub tag	Allows access to Site Recovery monitoring.
AzureSiteRecovery tag	Allows access to the Site Recovery service in any region.
GuestAndHybridManagement tag	Use if you want to automatically upgrade the Site Recovery Mobility agent that's running on VMs enabled for replication.

Chapter 4: Steps + Implementation Screenshots:

Step 1: Setup DR for Azure VM's:

The screenshot shows the Azure portal interface for managing a virtual machine named "vm". The "Disaster recovery" section is currently selected. The main pane displays the following details:

Essentials	
Resource group (move)	: vm
Status	: Running
Location	: East US
Subscription (move)	: Free_Trial
Subscription ID	: 3754456c-ce38-4c4c-86d2-b3606bdebe1b

Below this, there is a "Tags (edit)" section with the entry "Add tags".

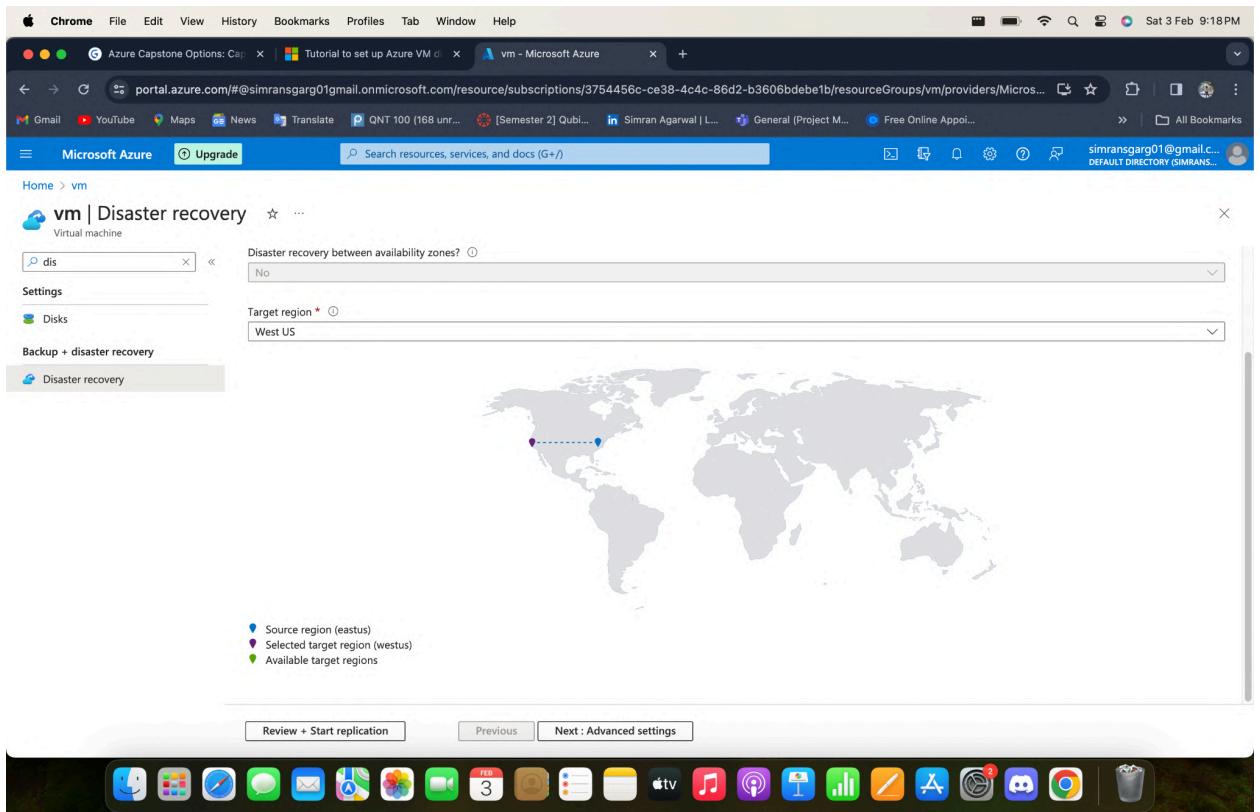
At the bottom of the main pane, there are tabs for "Properties", "Monitoring", "Capabilities (8)", "Recommendations", and "Tutorials".

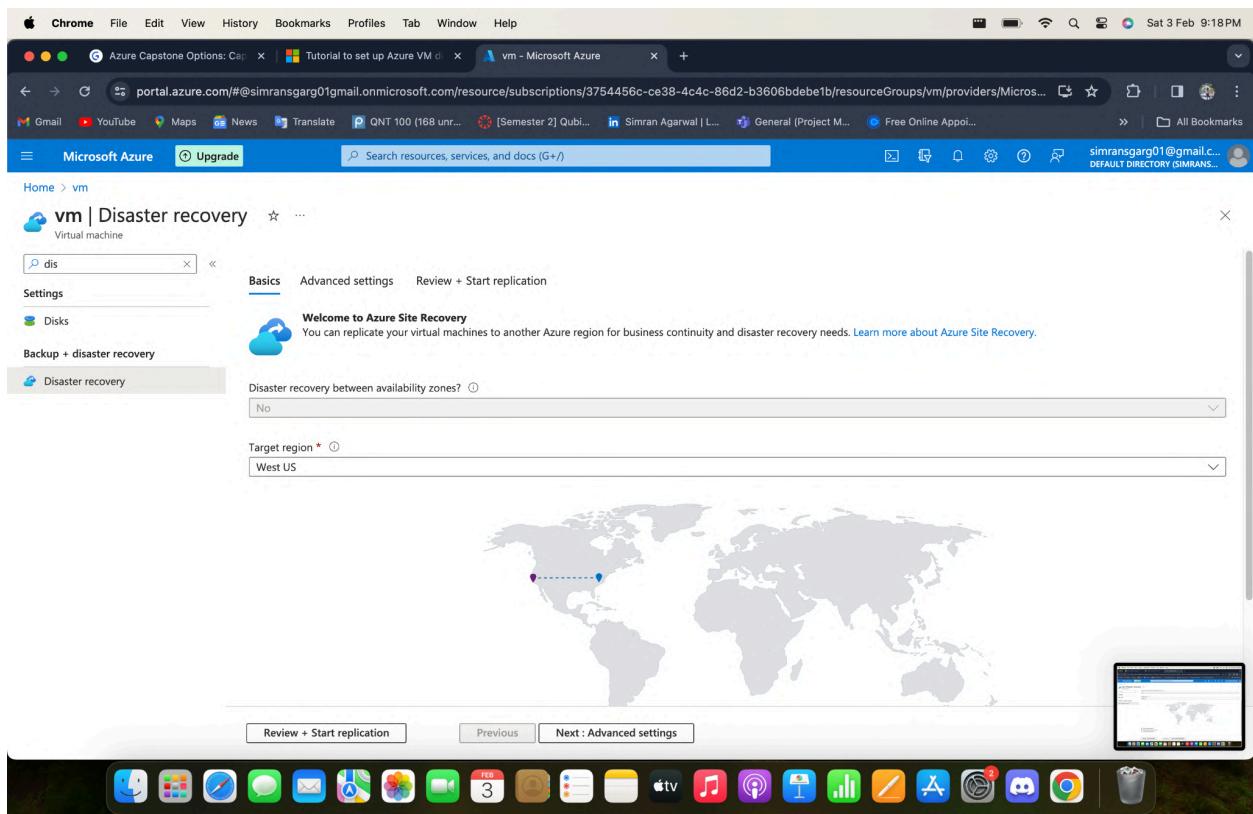
On the right side, there is a "Networking" section with the following details:

Networking	
Public IP address	: 20.163.156.80 (Network interface vm545)
Public IP address (IPv6)	: -
Private IP address	: 10.0.0.4
Private IP address (IPv6)	: -
Virtual network/subnet	: vm-vnet/default
DNS name	: Not configured

Below the networking section, there is a "Size" section.

The URL in the browser bar is: <https://portal.azure.com/#@simransgarg01@gmail.onmicrosoft.com/resource/subscriptions/3754456c-ce38-4c4c-86d2-b3606bdebe1b/resourceGroups/vm/providers/Microsoft.Compute/virtualMachines/vm/siteRecoverySetting>





Chrome File Edit View History Bookmarks Profiles Tab Window Help

portal.azure.com/#/simransgarg0@gmail.onmicrosoft.com/resource/subscriptions/3754456c-ce38-4c4c-86d2-b3606bdebe1b/resourceGroups/vm/providers/Microsoft...

Home > vm | Disaster recovery

Basics Advanced settings Review + Start replication

Target settings

General settings	Source	Target	Info
VM resource group	Loading...	vm-asr	
Virtual network	Loading...	Loading	
Availability	Availability set	Single instance Availability set	
Proximity placement g...	Loading...	Loading	

Capacity Reservation Settings

Reserve a capacity at the destination location - for this Virtual machine size - Standard_DS2_v2
Why to reserve capacity at the destination location?

Capacity Reservation Groups

Review + Start replication Previous Next : Review + Start replication

The screenshot shows a Chrome browser window with the following details:

- Title Bar:** Chrome, File, Edit, View, History, Bookmarks, Profiles, Tab, Window, Help.
- Address Bar:** portal.azure.com/#/simransgarg0@gmail.onmicrosoft.com/resource/subscriptions/3754456c-ce38-4c4c-86d2-b3606bdebe1b/resourceGroups/vm/providers/Microsoft...
- User Information:** simransgarg0@gmail.c... (Default Directory SIMRANS...)

The main content area displays the "vm | Disaster recovery" page under "Virtual machine". The "Advanced settings" tab is selected. The "Target settings" section includes the following configuration:

General settings	Source	Target	Info
Subscription	Free Trial	Free Trial	(i)
VM resource group	vm	vm-asr	(i)
Virtual network	vm-vnet	vnet-asr	(i)
Availability	Availability set TRYSET	Single instance Availability set (new) TRYSET-asr	(i)
Proximity placement g...	Not Applicable	Select	(i)

Below this, there is a "Capacity Reservation Settings" section with a note about reserving capacity at the destination location. At the bottom, there are "Review + Start replication" and "Next : Review + Start replication" buttons.

The screenshot shows the Microsoft Azure portal interface. The URL in the address bar is <https://portal.azure.com/#/resource/subscriptions/3754456c-ce38-4c4c-86d2-b3606bdebe1b/resourceGroups/vm/providers/Microsoft.Compute/virtualMachines/vm/disasterRecovery>. The page title is "vm | Disaster recovery".

The main content area displays the "Disaster recovery" configuration for a virtual machine named "dis". The "Source managed disk" is selected, and the "Disk to replicate" dropdown shows "[Premium SSD] vm_OsDisk_1... (new) vm_OsDisk_1_8e38568... Premium SSD". The "Replica managed disk type" dropdown is set to "include".

Below this, the "Replication settings" section is expanded, showing the following configuration:

- Vault subscription: Free Trial
- Recovery services vault: asr
- Vault resource group: VM-BSR
- Replication policy: (new) 24-hour-retention-policy

Under "Extension settings", the "Automation account" dropdown is set to (new) asr-z42-asr-automationaccount.

At the bottom of the configuration pane, there are two buttons: "Review + Start replication" and "Next : Review + Start replication".

The browser's toolbar at the top includes icons for Gmail, YouTube, Maps, News, Translate, and several pinned tabs. The status bar at the bottom right shows "Sat 3 Feb 9:23 PM".

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes links for Gmail, YouTube, Maps, News, Translate, QNT 100 (168 unr...), [Semester 2] Qubi..., Simran Agarwal | L..., General [Project M...], Free Online Appoi..., and All Bookmarks. The user is signed in as simransgarg0@gmail.c... with a DEFAULT DIRECTORY (SIMRANS...).

The main content area displays the "vm | Disaster recovery" page under "Virtual machine". The "Disaster recovery" tab is selected. A search bar at the top right contains the text "Search resources, services, and docs (G+)".

The configuration section for "Churn for the VM" is set to "Normal Churn". The "Cache storage account" is set to "asrstorage [StandardLRS]". Under "Source managed disk", the disk "vm_OsDisk_1..." is selected, and the "Replica managed disk type" is "Standard SSD". There is a checkbox labeled "include".

The "Replication settings" section includes fields for "Vault subscription" (Free Trial), "Recovery services vault" (asr), "Vault resource group" (VM-BSF), and "Replication policy" (new) 24-hour-retention-policy.

The "Extension settings" section includes "Update settings" (Allow ASR to manage) and "Automation account" (new) asr-z42-asr-automationaccount.

At the bottom, there are buttons for "Review + Start replication", "Previous", and "Next : Review + Start replication".

The screenshot shows a Chrome browser window with three tabs open:

- Azure Capstone Options: C...
- Tutorial to set up Azure VM d...
- vm - Microsoft Azure

The main content area displays the Azure portal for a virtual machine named "vm". The URL is <https://portal.azure.com/#/resource/subscriptions/3754456c-ce38-4c4c-86d2-b3606bdebe1b/resourceGroups/vm/providers/Microsoft.Compute/virtualMachines/vm/disasterRecovery>.

The page title is "vm | Disaster recovery" and the sub-page title is "Virtual machine".

The "Review + Start replication" tab is selected. On the left, there's a sidebar with "Settings" and "Backup + disaster recovery" sections, with "Disaster recovery" currently selected.

The main configuration area shows "Target settings" for a replicated disk:

Source	Target
Free Trial	Free Trial
vm	vm-asr
vm-vnet	vnet-asr
TRYSET (Availability set)	(new) TRYSET-asr (Availability set)
Not Applicable	Select

Below this, under "Storage settings", there's a warning message: "⚠ If you are choosing General Purpose v2 storage accounts, ensure that operations and data transfer prices are understood clearly before you proceed. [Learn more](#)".

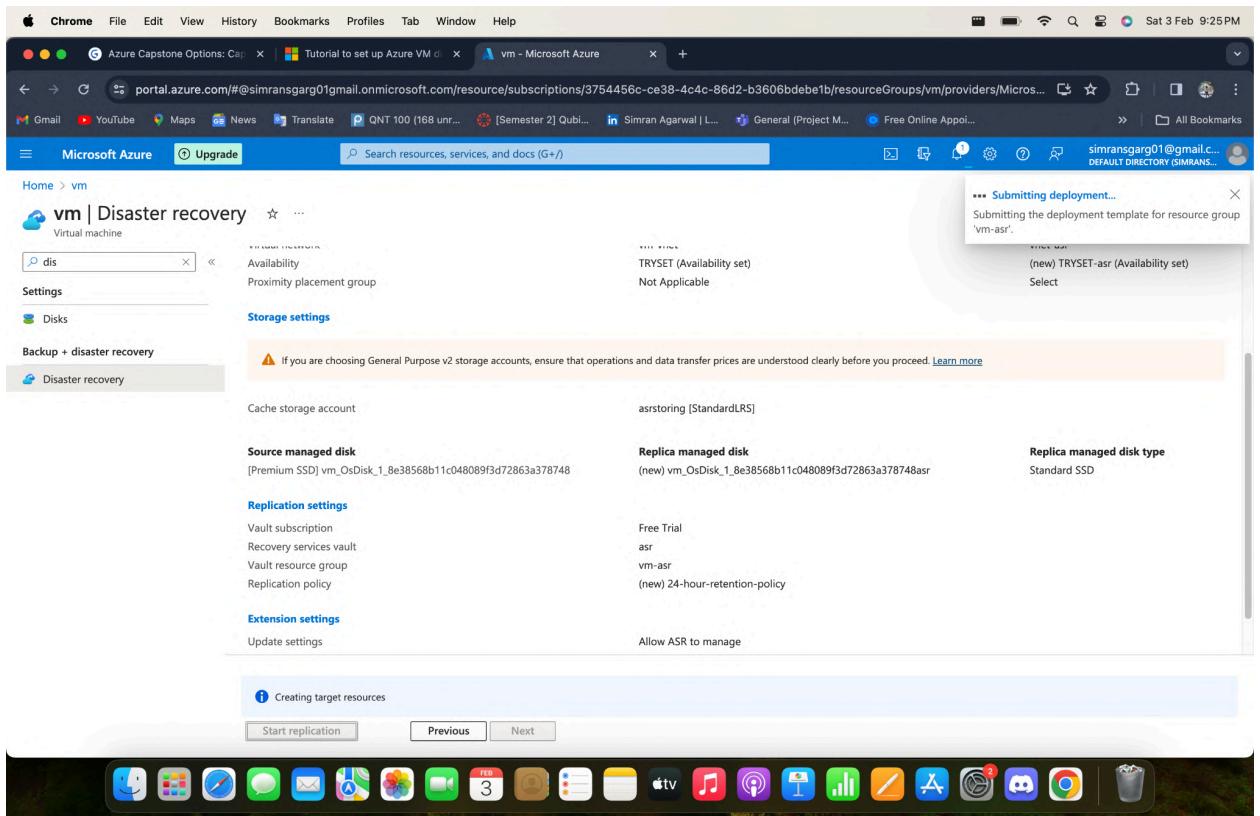
Further down, "Replication settings" are shown:

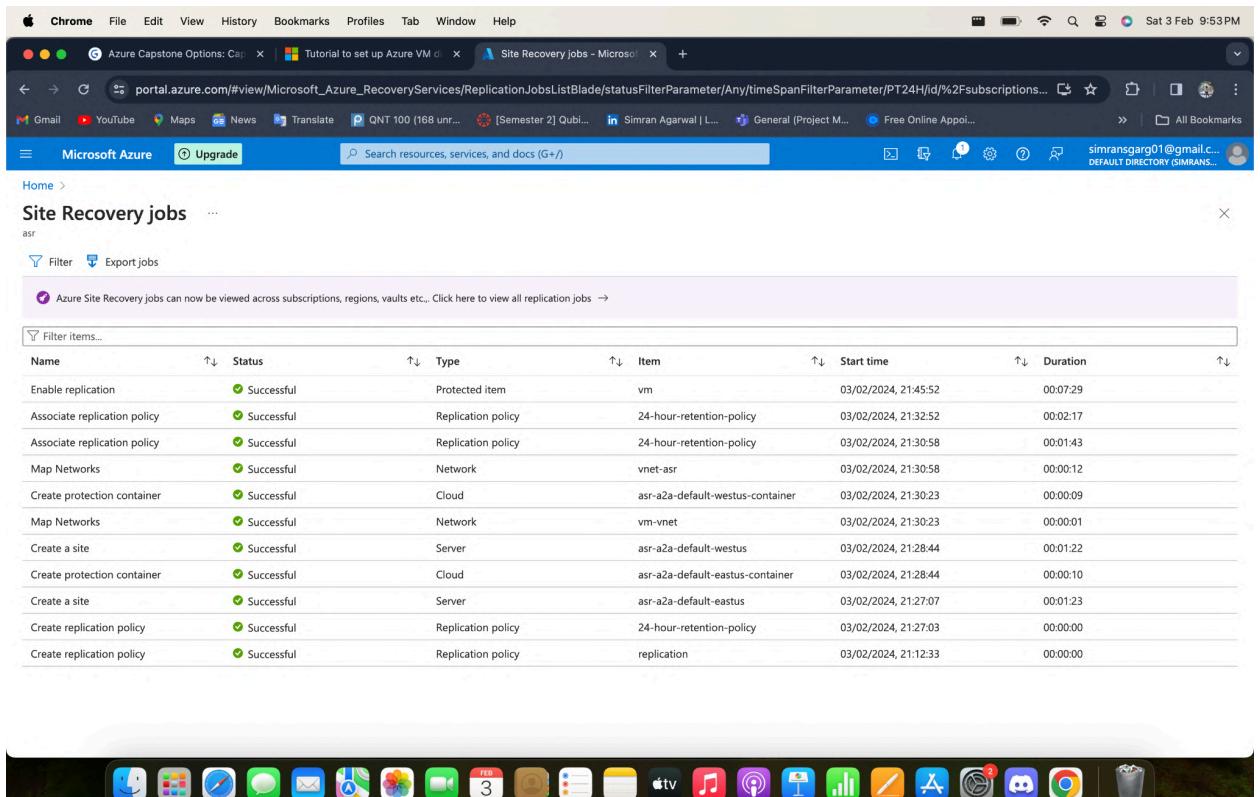
Source managed disk	Replica managed disk	Replica managed disk type
[Premium SSD] vm_OsDisk_1_8e38568b11c048089f3d72863a378748	(new) vm_OsDisk_1_8e38568b11c048089f3d72863a378748asr	Standard SSD
Vault subscription	Free Trial	

At the bottom, there are "Start replication", "Previous", and "Next" buttons.

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes links for Gmail, YouTube, Maps, News, Translate, QNT 100 (168 unr...), [Semester 2] Qubi..., Simran Agarwal | L..., General [Project M...], Free Online Appoi..., and All Bookmarks. The user's email, simransgarg0@gmail.com, is visible in the top right corner.

The main content area displays the 'vm | Disaster recovery' page for a virtual machine named 'dis'. The left sidebar lists 'Settings' and 'Disks'. The right side shows 'Storage settings' with a warning about choosing General Purpose v2 storage accounts. It details 'Source managed disk' (Premium SSD) and 'Replica managed disk' (new). 'Replication settings' include vault subscription, recovery services vault, vault resource group, and replication policy. 'Extension settings' show an automation account. At the bottom, there are 'Start replication', 'Previous', and 'Next' buttons, followed by a dark taskbar with various application icons.





Azure Capstone Options: C... X Tutorial to set up Azure VM d... X Site Recovery jobs - Microsoft X

portal.azure.com/#view/Microsoft_Azure_RecoveryServices/ReplicationJobsListBlade/statusFilterParameter/Any/timeSpanFilterParameter/PT24H/jd/%2Fsubscriptions... G...

Gmail YouTube Maps News Translate QNT 100 (168 unr... [Semester 2] Qubi... Simran Agarwal | L... General [Project M... Free Online Appoi...

Microsoft Azure Upgrade Search resources, services, and docs (G+)

Home > Site Recovery jobs asr

Filter Export jobs

Azure Site Recovery jobs can now be viewed across subscriptions, regions, vaults etc.. Click here to view all replication jobs →

Filter items...

Name	Status	Type	Item	Start time	Duration
Enable replication	Successful	Protected item	vm	03/02/2024, 21:45:52	0:07:29
Associate replication policy	Successful	Replication policy	24-hour-retention-policy	03/02/2024, 21:32:52	0:02:17
Associate replication policy	Successful	Replication policy	24-hour-retention-policy	03/02/2024, 21:30:58	0:01:43
Map Networks	Successful	Network	vnet-asr	03/02/2024, 21:30:58	0:00:12
Create protection container	Successful	Cloud	asr-a2a-default-westus-container	03/02/2024, 21:30:23	0:00:09
Map Networks	Successful	Network	vm-vnet	03/02/2024, 21:30:23	0:00:01
Create a site	Successful	Server	asr-a2a-default-westus	03/02/2024, 21:28:44	0:01:22
Create protection container	Successful	Cloud	asr-a2a-default-eastus-container	03/02/2024, 21:28:44	0:00:10
Create a site	Successful	Server	asr-a2a-default-eastus	03/02/2024, 21:27:07	0:01:23
Create replication policy	Successful	Replication policy	24-hour-retention-policy	03/02/2024, 21:27:03	0:00:00
Create replication policy	Successful	Replication policy	replication	03/02/2024, 21:12:33	0:00:00

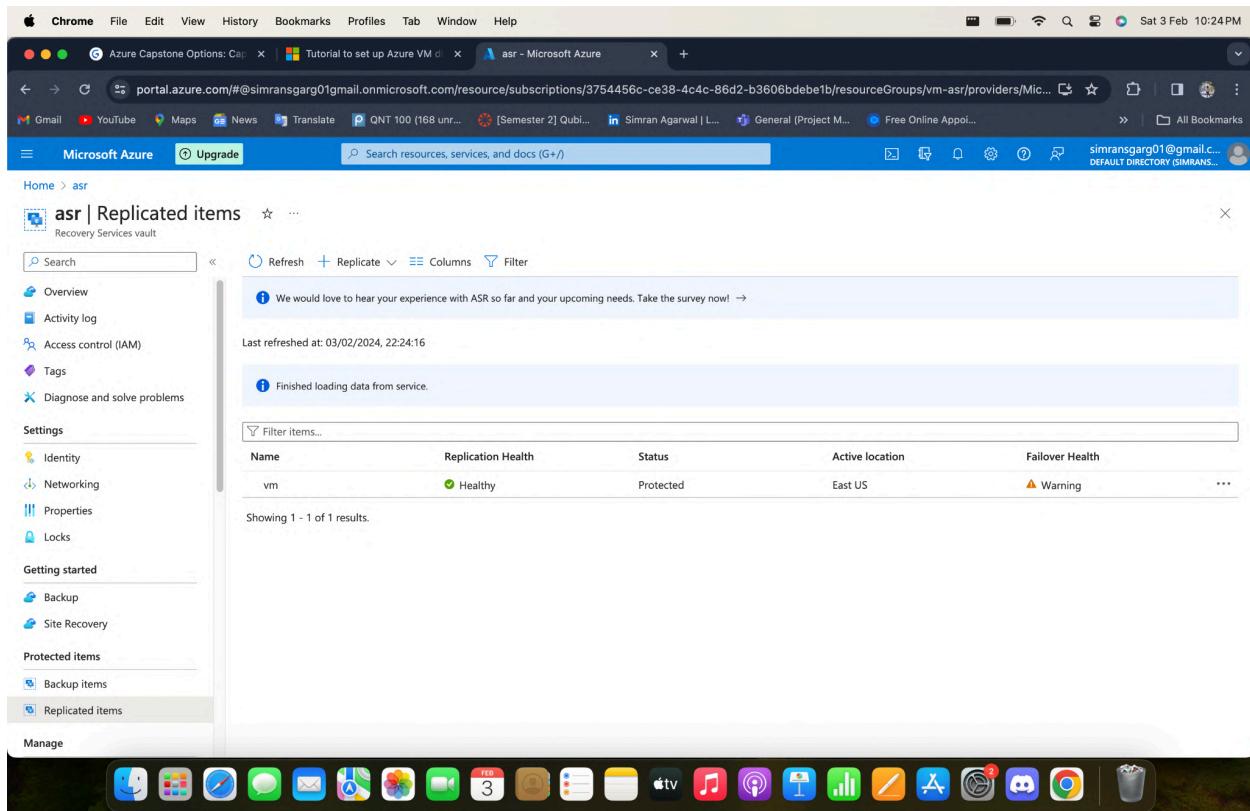
A screenshot of a Microsoft Azure Site Recovery job titled "Enable replication". The job is for a "Site Recovery Job" named "vm". The "Job id" is listed as "fda82bec-7e25-41ca-aa21-7908aed15125 ActivityId: fd530387-bde3-48a7-9036-990a2b83b313". The "Properties" section shows the vault as "asr". The "Job" section displays a table of tasks:

Name	Status	Start time	Duration
Prerequisites check for enabling protection	Successful	03/02/2024, 21:45:53	00:00:08
Installing Mobility Service and preparing target	Successful	03/02/2024, 21:46:01	00:03:47
Enable replication	Successful	03/02/2024, 21:49:48	00:00:00
Starting initial replication	Successful	03/02/2024, 21:49:49	00:03:33
Updating the provider states	Successful	03/02/2024, 21:53:22	00:00:00



Step 2 - Run a DR Drill

1. Verify VM settings
 1. In the vault > Replicated items, select the VM.

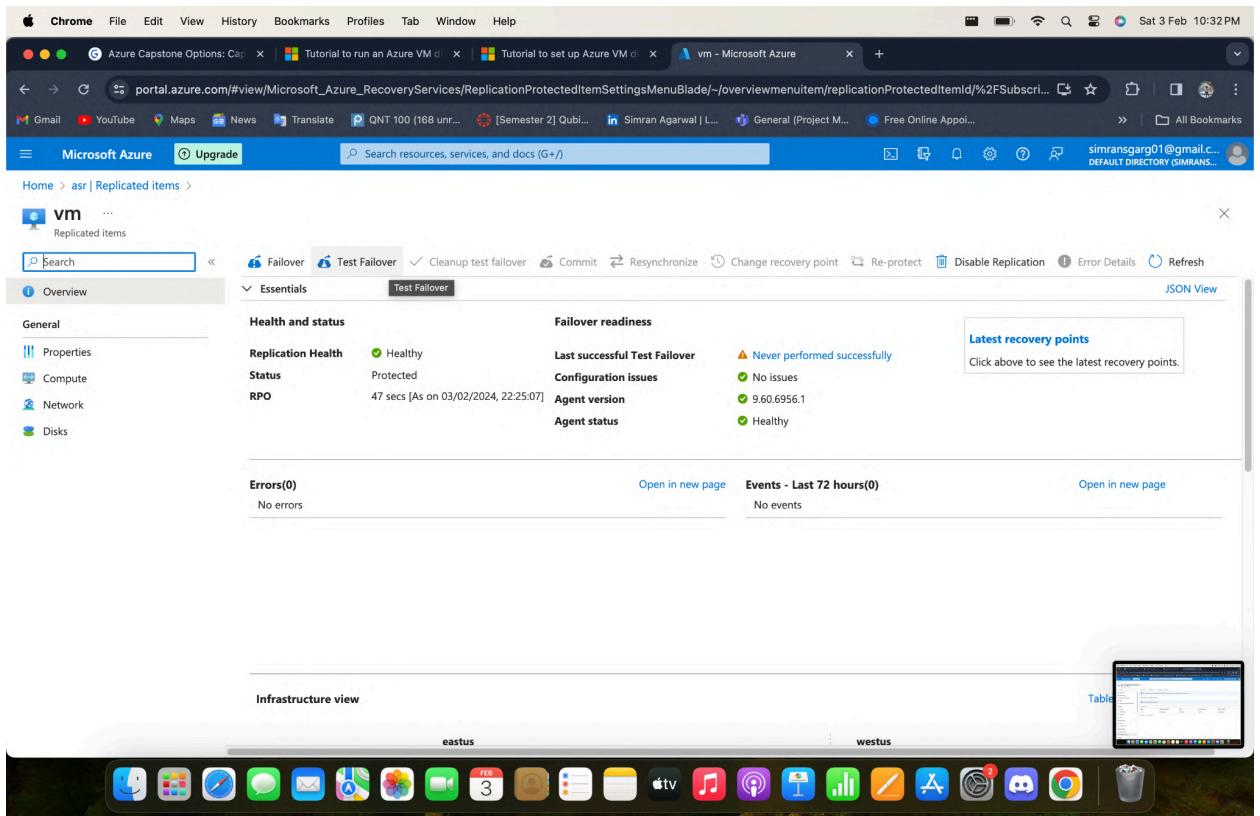


Name	Replication Health	Status	Active location	Failover Health
vm	Healthy	Protected	East US	Warning

2. On the Overview page, check that the VM is protected and healthy.
3. When you run a test failover, you select an Azure virtual network in the target region. The Azure VM created after failover is placed in this network.

2. Run a test failover

1. On the Overview page, select Test Failover.



2. In Test Failover, choose a recovery point. The Azure VM in the target region is created using data from this recovery point.

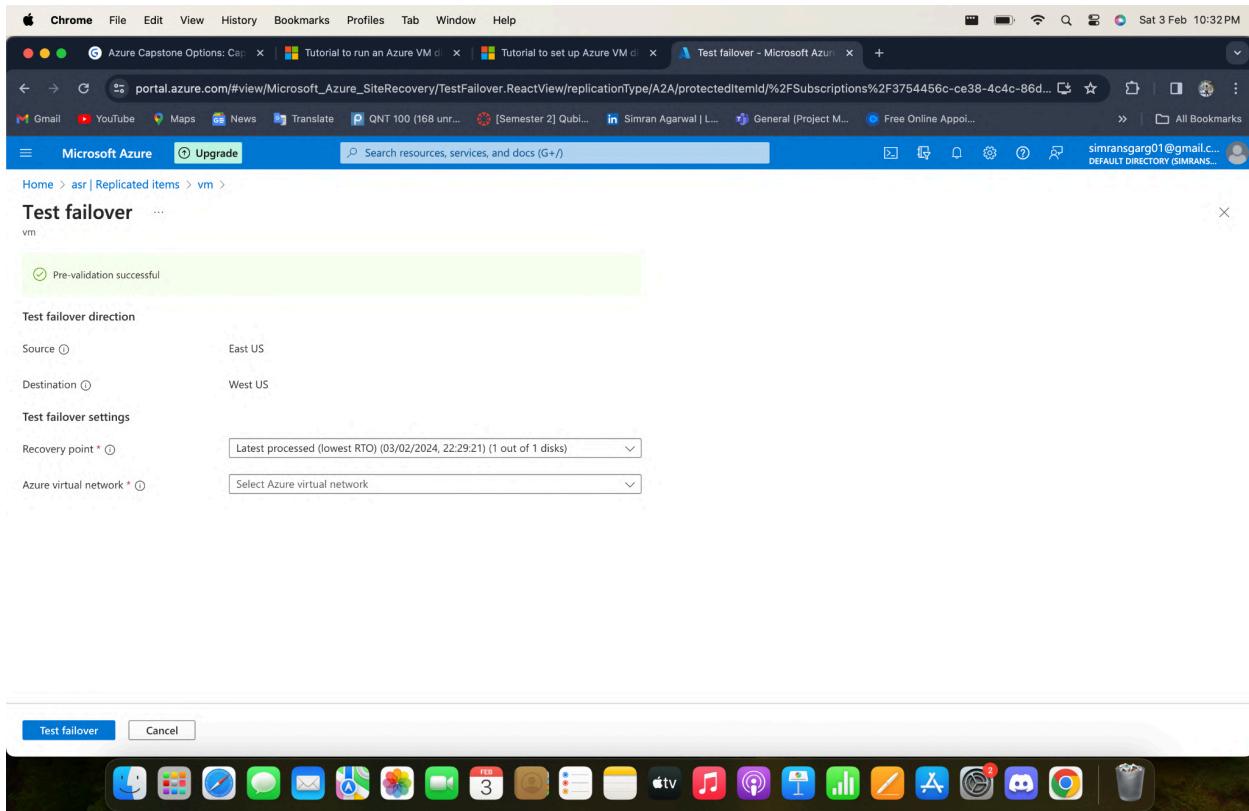
Latest processed: Uses the latest recovery point processed by Site Recovery. The time stamp is shown. No time is spent processing data, so it provides a low recovery time objective (RTO).

Latest: Processes all the data sent to Site Recovery, to create a recovery point for each VM before failing over to it. Provides the lowest recovery point objective (RPO), because all data is replicated to Site Recovery when the failover is triggered.

Latest app-consistent: This option fails over VMs to the latest app-consistent recovery point. The time stamp is shown.

Custom: Fail over to a particular recovery point. Custom is only available when you fail over a single VM, and don't use a recovery plan.

3. In Azure virtual network, select the target network in which to place Azure VMs created after failover. Select a non-production network if possible, and not the network that was created when you enabled replication.



4. To start the failover, select OK.
5. Monitor the test failover in notifications.

The screenshot shows the Microsoft Azure portal on a Mac OS X desktop. The browser window is titled "vm - Microsoft Azure". The URL in the address bar is https://portal.azure.com/#view/Microsoft_Azure_RecoveryServices/ReplicationProtectedItemSettingsMenuBlade/~/overviewmenuitem/replicationProtectedItemId%2FSubscriptionId%2FResourceGroup%2FVMName%2Fvm. The page displays the "Replicated items" blade for a virtual machine named "vm".

Health and status:

- Replication Health: Healthy
- Status: Protected
- RPO: 47 secs [As on 03/02/2024, 22:25:07]

Failover readiness:

- Last successful Test Failover: Never performed successfully
- Configuration issues: No issues
- Agent version: 9.60.6956.1
- Agent status: Healthy

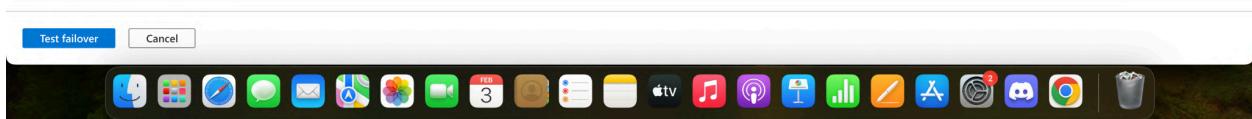
Errors(0): No errors. [Open in new page](#)

Events - Last 72 hours(0): No events. [Open in new page](#)

Latest recovery points: Click above to see the latest recovery points.

Infrastructure view: Shows a dock with various Mac OS X application icons.

The screenshot shows the Azure portal interface with the URL https://portal.azure.com/#view/Microsoft_Azure_SiteRecovery/TestFailover.ReactView/replicationType/A2A/protectedItemId/%2FSubscriptions%2F3754456c-ce38-4c4c-86d.... The page title is "Test failover - Microsoft Azure". The navigation bar includes "Home", "Recovery Services vaults", "asr | Replicated items", and "vm". The main content area is titled "Test failover" and shows "vm". A green success message box contains the text "Pre-validation successful". Below it, under "Test failover direction", "Source" is set to "East US" and "Destination" is set to "West US". Under "Test failover settings", "Recovery point" is set to "Latest processed (lowest RTO) (03/02/2024, 22:34:21) (1 out of 1 disks)". The "Azure virtual network" dropdown is set to "vnet-asr (mapped)". A warning message at the bottom states: "⚠ It is recommended that the networks selected for test failover and failover operations are different. Learn more about DR Drills".



The screenshot shows the Azure portal interface for managing replicated items. The main view displays the 'VM' blade for a specific item. Key details include:

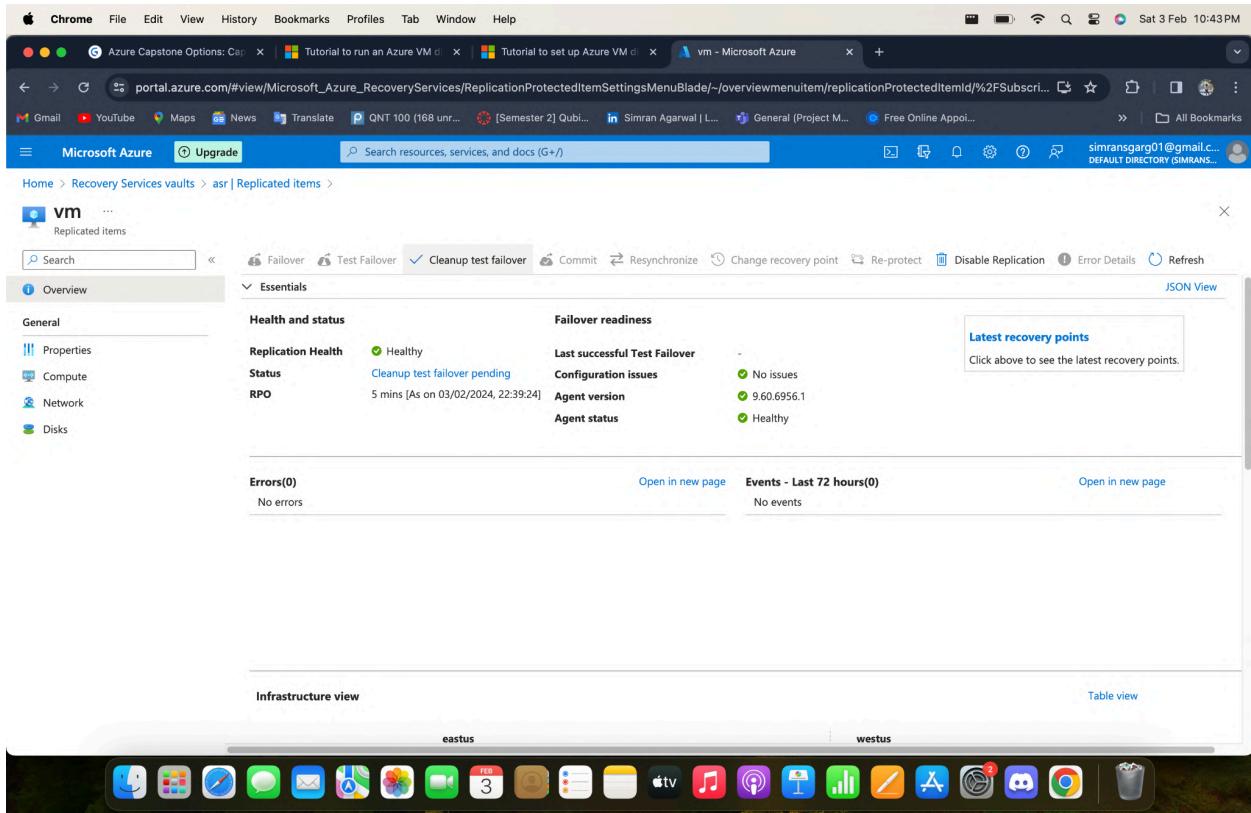
- Health and status:** Replication Health is healthy, Status is 'Cleanup test failover pending', and RPO is 5 mins (As on 03/02/2024, 22:39:24).
- Failover readiness:** Last successful Test Failover was recent, and Configuration issues show no issues.
- Notifications:** A message indicates the task to perform test failover for the virtual machine has started successfully.

The Mac OS Dock at the bottom of the screen shows various application icons.

- After the failover finishes, the Azure VM created in the target region appears in the Azure portal Virtual Machines. Make sure that the VM is running, sized appropriately, and connected to the network you selected.

3. Clean up resources

1. In the Essentials page, select Cleanup test failover.



The screenshot shows the Microsoft Azure portal interface. The user is on the 'Essentials' page for a VM named 'Replicated items'. The top navigation bar includes links for Home, Recovery Services vaults, and Replicated items. The main content area has tabs for Overview, General, and Infrastructure view. Under the Overview tab, there are sections for Health and status and Failover readiness. The 'Health and status' section shows Replication Health as Healthy, Status as 'Cleanup test failover pending', and RPO as '5 mins [As on 03/02/2024, 22:39:24]'. The 'Failover readiness' section shows Last successful Test Failover as '-' and Configuration issues as 'No issues'. The 'Events - Last 72 hours(0)' section shows 'No events'. At the bottom, there are tabs for eastus and westus, and a toolbar with various application icons.

2. In Test failover cleanup > Notes, record and save any observations associated with the test failover.

Test failover cleanup

Notes

Test Failover Succeeded. No Issues Encountered.

Testing is complete. Delete test failover virtual machine(s). *

OK

3. Monitor cleanup progress in notifications.

The screenshot shows the Azure portal interface for managing replicated items. The main content area displays the 'Overview' tab for a specific VM. Key details shown include:

- Health and status:** Replication Health is Healthy, Status is Cleanup test failover pending, and RPO is 5 mins [As on 03/02/2024, 22:39:24].
- Failover readiness:** Last successful Test Failover was at 5 mins ago, Configuration issues are No issues, Agent version is 9.60.6956.1, and Agent status is Healthy.
- Logs and Events:** Errors(0) - No errors, Events - Last 72 hours(0) - No events.

A message box at the top right indicates that a task to delete the test failover environment is starting, with a note that the operation is in progress.

4. We have successfully run a disaster recovery drill to check that failover works as expected. Now we can try out a full failover.

Step 3 - Prod Failover:

1. In the vault > Replicated items, select the VM.
2. On the VM Overview page, check that the VM is protected and healthy, before you run a failover.

The screenshot shows the Microsoft Azure portal interface. The user is navigating through the Azure Capstone Options and has opened the 'Recovery Services vaults' section. Within this section, they have selected the 'asr' vault. The main content area is titled 'asr | Replicated items' and shows a table of replicated items. The table has columns for Name, Replication Health, Status, Active location, and Failover Health. There is one entry: 'vm' with a green 'Healthy' status under both Replication Health and Failover Health, and it is listed as 'Protected' with an 'Active location' of 'East US'. The portal's navigation bar at the top includes links for Home, Recovery Services vaults, and asr - Microsoft Azure. The bottom of the screen shows the Mac OS X dock with various application icons.

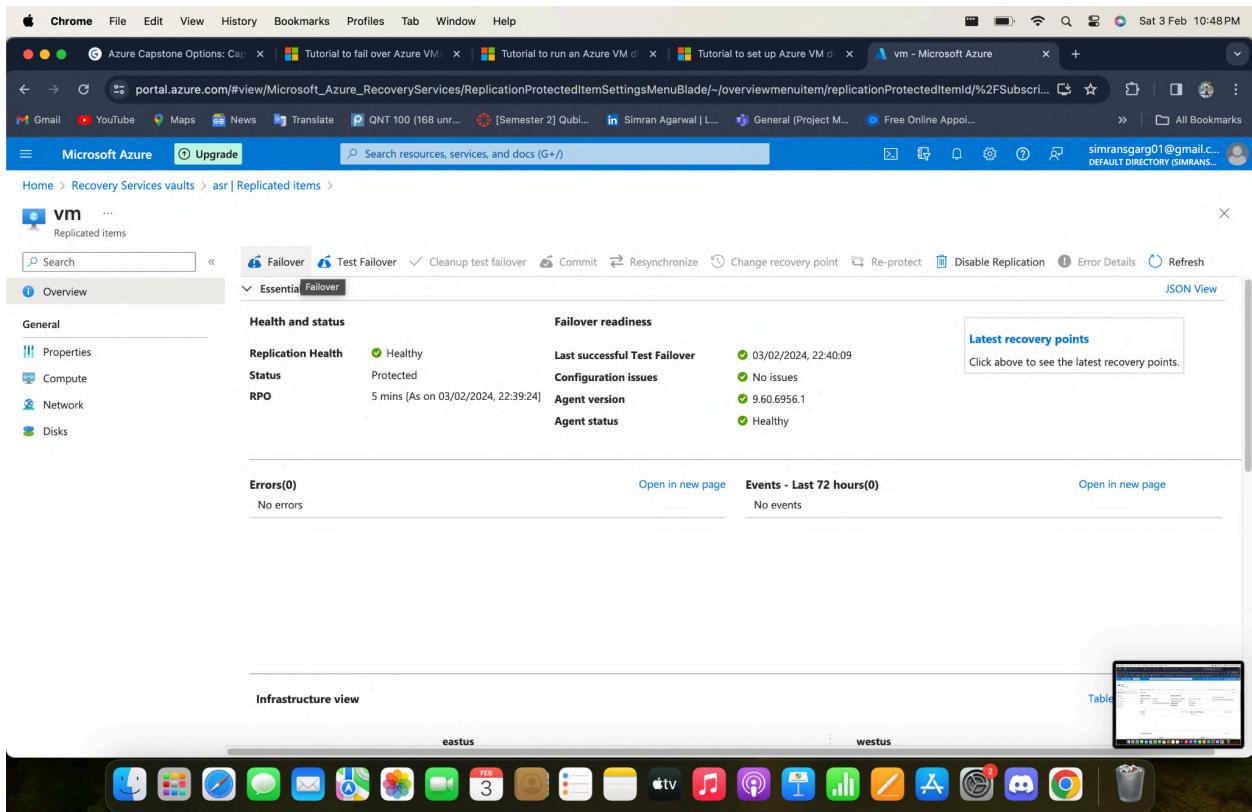
Name	Replication Health	Status	Active location	Failover Health
vm	Healthy	Protected	East US	Healthy

Showing 1 - 1 of 1 results.

The screenshot shows the Microsoft Azure portal interface. The user is on the 'VM' Overview page for a replicated item. The top navigation bar includes links for Home, Recovery Services vaults, and asr | Replicated items. The main content area displays the 'Essentials' section with tabs for Health and status, Failover readiness, Errors(0), and Events - Last 72 hours(0). The Failover readiness section shows a successful test failover on 03/02/2024 at 22:40:09 with no issues. The Errors(0) section indicates 'No errors'. The Events section shows 'No events'. Below this, there's an Infrastructure view showing two regions: eastus and westus, each with a row of application icons. A 'Table view' link is also present.

Run a failover

3. On the VM Overview page, select Failover.



4. In Failover, choose a recovery point. The Azure VM in the target region is created using data from this recovery point.

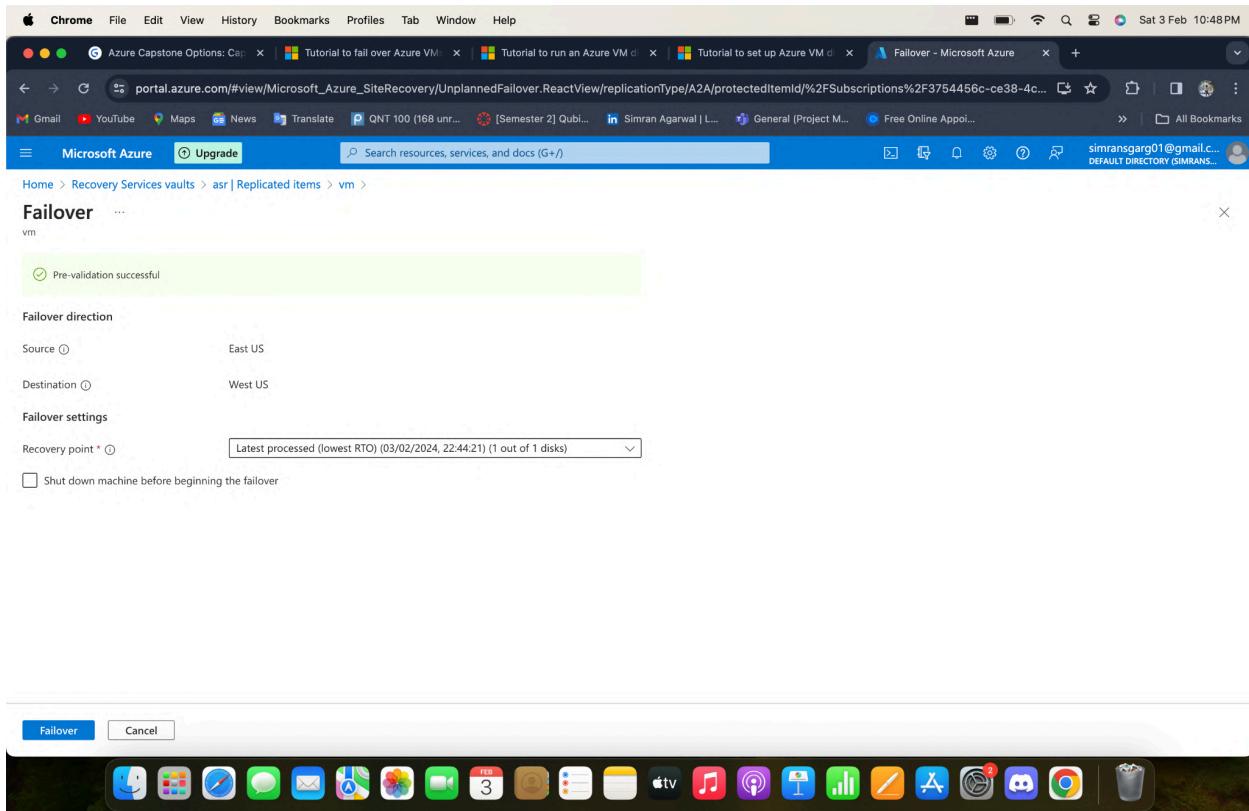
Latest processed: Uses the latest recovery point processed by Site Recovery. The time stamp is shown. No time is spent processing data, so it provides a low recovery time objective (RTO).

Latest: Processes all the data sent to Site Recovery, to create a recovery point for each VM before failing over to it. Provides the lowest recovery point objective (RPO), because all data is replicated to Site Recovery when the failover is triggered.

Latest app-consistent: This option fails over VMs to the latest app-consistent recovery point. The time stamp is shown.

Custom: Fail over to a particular recovery point. Custom is only available when you fail over a single VM, and don't use a recovery plan.

5. Select Shut down machine before beginning failover if you want Site Recovery to try to shut down the source VMs before starting failover. Shutdown helps to ensure no data loss. Failover continues even if shutdown fails.



6. To start the failover, select OK.
7. Monitor the failover in notifications.

A screenshot of a Microsoft Azure VM failover test interface. The main content area shows the 'Overview' tab for a replicated item named 'VM'. It displays health status (Healthy), failover history (Last successful Test: 03/02/2024, 22:40:09), and configuration issues (No issues). A 'Latest recovery points' section is present. Below this are links for 'Errors(0)', 'Events - Last 72 hours(0)', and 'Open in new page'. To the right, a 'Notifications' sidebar lists three recent events: 'Starting the task to perform unplanned failover of virtual machine 'vm'' (Running, a few seconds ago), 'Starting the task to delete the test failover environment of 'vm'' (Successfully completed, 4 minutes ago), and 'Starting the task to perform test failover of virtual machine 'vm'' (Successfully completed, 7 minutes ago).

8. After the failover, the Azure VM created in the target region appears in Virtual Machines. Make sure that the VM is running, and sized appropriately. If you want to use a different recovery point for the VM, select Change recovery point, on the Essentials page.
9. When you're satisfied with the failed VM, select Commit on the overview page, to finish the failover.

The screenshot shows the Microsoft Azure portal with the URL https://portal.azure.com/#view/Microsoft_Azure_RecoveryServices/ReplicationProtectedItemSettingsMenuBlade/~/overviewmenuitem/replicationProtectedItemId%2FSubscriptionId%2FResourceGroup%2FVMName%2FReplicaVmId. The page title is "Azure Capstone Options: Cet...". The user is signed in as "simransgarg01@gmail.c...". The main content area shows the "VM" replication item under "Recovery Services vaults > asr | Replicated items > VM". The "Overview" tab is selected. The "Essentials" section displays the following status information:

Health and status		Failover readiness	
Replication Health	-	Last successful Test Failover	-
Status	Failover completed	Configuration issues	No issues
RPO	-	Agent version	9.60.6956.1
		Agent status	Healthy

Below this, there are sections for "Errors(0)" (No errors), "Events - Last 72 hours(0)" (No events), and "Latest recovery points" (Click above to see the latest recovery points). At the bottom, there are links for "Infrastructure view" and "Table view". The bottom of the screen shows the Mac OS X dock with various application icons.

10. In Commit, select OK to confirm. Commit deletes all the available recovery points for the VM in Site Recovery, and you won't be able to change the recovery point.

The screenshot shows a Microsoft Azure portal page titled "Azure Capstone Options: C:\\". The main content area displays the "Recovery Services vaults > asr | Replicated items > VM" blade. A notification at the top right says "*** Committing failover" and "The operation is in progress.". On the left, there's a navigation menu under "General" with options like Properties, Compute, Network, and Disks. The central "Overview" section has tabs for Failover, Test Failover, Cleanup test failover, Commit, Resynchronize, Change recovery point, Re-protect, Disable Replication, Error Details, Refresh, and JSON View. Below these tabs, there are sections for Health and status, Failover readiness, and Latest recovery points. The "Health and status" section shows "Status: Failover completed" and "RPO: -". The "Failover readiness" section shows "Last successful Test Failover: -", "Configuration issues: No issues", "Agent version: 9.60.6956.1", and "Agent status: Healthy". The "Latest recovery points" section has a link "Click above to see the latest recovery points.". At the bottom, there are sections for Errors (0) and Events - Last 72 hours (0). The bottom of the screen shows a Mac OS X dock with various application icons.

11. Monitor the commit progress in notifications.

The screenshot shows the Microsoft Azure portal interface. The main content area is titled 'VM' under 'Replicated items'. It displays the 'Overview' blade with sections for 'Health and status' and 'Failover readiness'. The 'Health and status' section includes tabs for 'Replication Health', 'Status', and 'RPO'. The 'Failover readiness' section includes tabs for 'Last successful Test' and 'Failover'. Under 'Configuration issues', it shows 'No issues'. The 'Agent version' is listed as 9.60.6956.1 and 'Agent status' as 'Healthy'. Below this, there's a 'Latest recovery points' section with a note to click above to see the latest recovery points. At the bottom, there are three tabs: 'Errors(0)', 'Events - Last 72 hours(0)', and 'Open in new page'. The 'Events' tab shows 'No events'. To the right, a 'Notifications' sidebar lists several recent operations with green checkmarks: 'Committing failover' (status: 'Successfully completed the operation.'), 'Starting the task to perform unplanned failover of virtual machine 'vm'' (status: 'Successfully completed the operation.'), 'Starting the task to delete the test failover environment of 'vm'' (status: 'Successfully completed the operation.'), and 'Starting the task to perform test failover of virtual machine 'vm'' (status: 'Successfully completed the operation.'). The browser toolbar at the top has tabs for 'Tutorial to fail over Azure VM', 'Tutorial to run an Azure VM', 'Tutorial to set up Azure VM', and 'vm - Microsoft Azure'. The address bar shows the URL 'portal.azure.com/#view/Microsoft_Azure_RecoveryServices/ReplicationProtectedItemSettingsMenuBlade/~/overviewmenuitem/replicationProtectedItemId/%2FSubscri...'. The user's name 'simransgarg01@gmail.c...' and email 'simransgarg01@gmail.c...' are visible in the top right corner.

Reprotect the VM

12. Make sure that VM Status is Failover committed before you start.
13. Check that you can access the primary region is available, and that you have permissions to create VMs in it.
14. On the VM Overview page, select Re-Protect.

The screenshot shows the Microsoft Azure portal interface. The user is navigating through the 'Recovery Services vaults' section for a specific VM. The 'Essentials' tab is currently active, providing an overview of the replication status. Key information displayed includes:

- Health and status:** Replication Health (Status: Failover committed), RPO (Failover committed).
- Failover readiness:** Last successful Test Failover (None), Configuration issues (No issues), Agent version (9.60.6956.1), Agent status (Healthy).
- Errors:** 0 errors.
- Events:** 0 events over the last 72 hours.

Additional features shown include 'Re-protect' (button), 'Disable Replication' (link), and 'Error Details' (link). The portal also offers 'JSON View' and 'Table view' options. The bottom of the screen shows the Mac OS X dock with various application icons.

15. In Re-protect, verify the replication direction (secondary to primary region), and review the target settings for the primary region. Resources marked as new are created by Site Recovery as part of the reprotect operation.

16. Select OK to start the reprotect process. The process sends initial data to the target location, and then replicates delta information for the VMs to the target.
17. Monitor reprotect progress in the notifications.

Re-protect

westus to eastus

Target resource group (vm)

Cache storage accounts (new) icb8nrasrasrache

Target availability sets (TRYSET)

Target proximity placement group (Not Applicable)

Target virtual network (vm-vnet)

Replica managed disks (0 premium disks(s), 1 standard disk(s))

Notifications

More events in the activity log → Dismiss all

- *** Deployment in progress... Running (Deployment to resource group 'vm-asr' is in progress. a few seconds ago)
- ✓ Committing failover Successfully completed the operation. (2 minutes ago)
- ✓ Starting the task to perform unplanned failover of virtual machine 'vm'... Successfully completed the operation. (5 minutes ago)
- ✓ Starting the task to delete the test failover environment of 'vm'... Successfully completed the operation. (12 minutes ago)
- ✓ Starting the task to perform test failover of virtual machine 'vm'... Successfully completed the operation. (15 minutes ago)

The screenshot shows the Azure portal interface with the URL https://portal.azure.com/#view/Microsoft_Azure_RecoveryServices/ReplicationProtectedItemSettingsMenuBlade/~/overviewmenuitem/replicationProtectedItemid/%2FSubscri.... The main content area displays the 'VM' replicated item under the 'Recovery Services vaults' section. The 'Overview' tab is selected, showing the 'Essentials' section with 'Health and status' and 'Failover readiness' details. The 'Health and status' table includes rows for Replication Health (green), Status (Failover committed), and RPO (green). The 'Failover readiness' table includes rows for Last successful Test (Failover) and Configuration issues (No issues). Below this, there's a 'Latest recovery points' section with a note to click above to see the latest recovery points. At the bottom, there are sections for 'Errors(0)' (No errors), 'Events - Last 72 hours(0)' (No events), and 'Open in new page' links. To the right, a 'Notifications' sidebar lists several successful operations: 'Reprotecting virtual machine' (a few seconds ago), 'Deployment succeeded' (Deployment 'Microsoft.RecoveryServices.EnDRAFT-202413225751' to resource group 'vm-asr' was successful), 'Committing failover' (8 minutes ago), 'Starting the task to perform unplanned failover of virtual machine 'vm'...' (11 minutes ago), 'Starting the task to delete the test failover environment' (14 minutes ago), and 'Starting the task to perform test failover of virtual' (21 minutes ago). The bottom of the screen shows the Mac OS X dock with various application icons.

Step 4 - Fail Back:

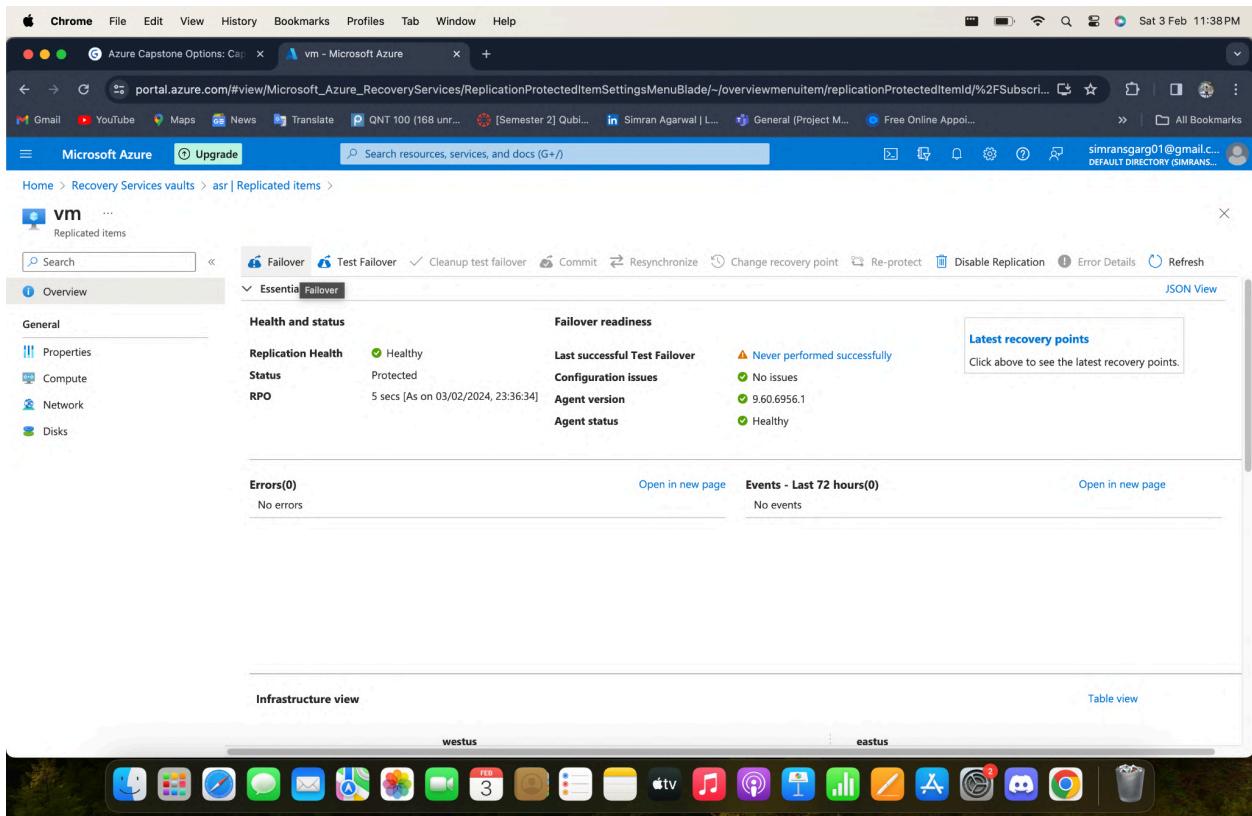
After VMs are reprotected, you can fail back to the primary region as needed.

1. In the vault > Replicated items, select the VM.
2. On the VM overview page, check that the VM is healthy, and that synchronization is complete, before you run a failover. The VM should be in a Protected state.

Name	Replication Health	Status	Active location	Failover Health
vm	Healthy	Protected	West US	Warning

The screenshot shows the Azure portal's Recovery Services vaults overview page for a VM named 'vm'. The main content area is titled 'Overview' and includes sections for 'Health and status', 'Failover readiness', and 'Errors(0)'. The 'Health and status' section shows 'Replication Health' as 'Healthy', 'Status' as 'Protected', and 'RPO' as '5 secs [As on 03/02/2024, 23:36:34]'. The 'Failover readiness' section indicates 'Last successful Test Failover' was never performed successfully, with 'Configuration issues' listed as 'No issues'. The 'Errors(0)' section shows 'No errors'. On the right side, there is a 'Latest recovery points' panel with a note to click above to see the latest recovery points. The bottom of the screen shows the Mac OS X dock with various application icons.

3. On the overview page, select Failover. Since we're not doing a test failover this time, we're prompted to verify.



4. In Failover, note the direction from secondary to primary, and select a recovery point. The Azure VM in the target (primary) region is created using data from this point.

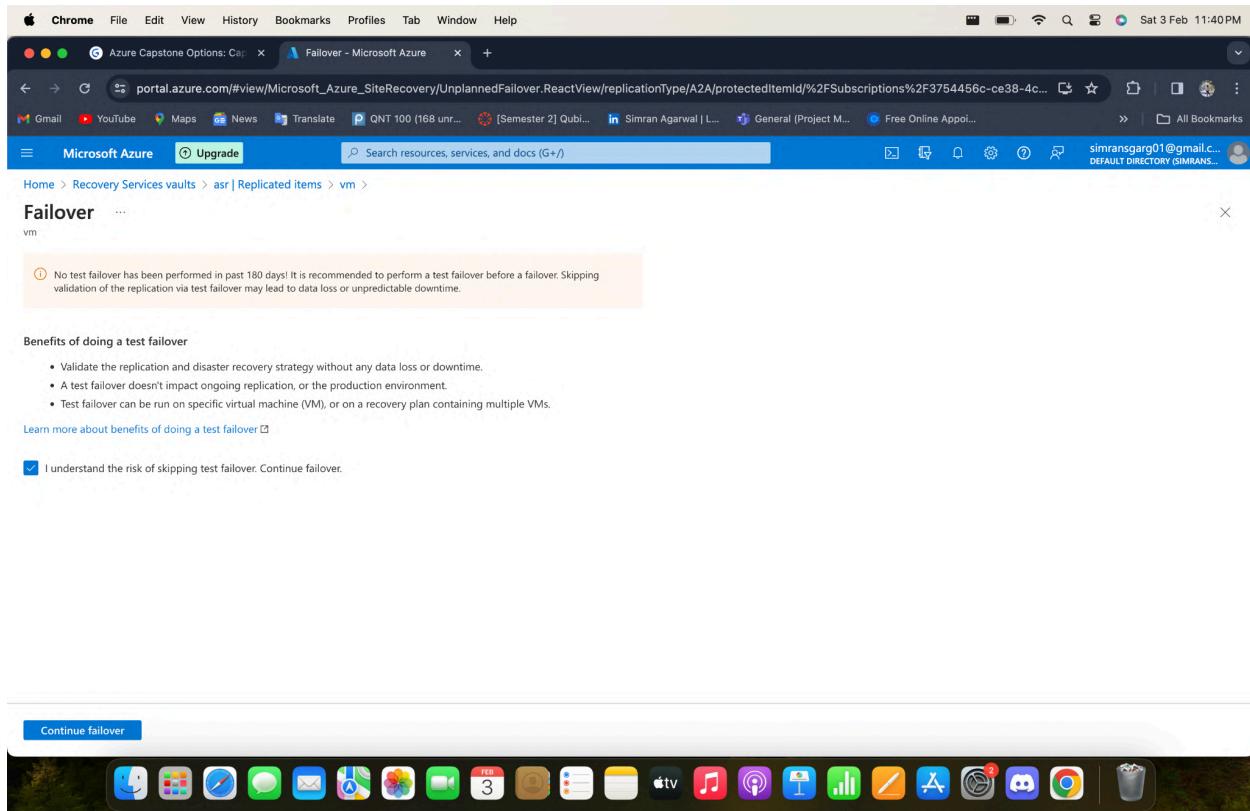
Latest processed: Uses the latest recovery point processed by Site Recovery. The time stamp is shown. No time is spent processing data, so it provides a low recovery time objective (RTO).

Latest: Processes all the data sent to Site Recovery, to create a recovery point for each VM before failing over to it. Provides the lowest recovery point objective (RPO), because all data is replicated to Site Recovery when the failover is triggered.

Latest app-consistent: This option fails over VMs to the latest app-consistent recovery point. The time stamp is shown.

Custom: Fail over to particular recovery point. Custom is only available when you fail over a single VM, and don't use a recovery plan.

5. Select Shut down machine before beginning failover if you want Site Recovery to attempt to shut down the source VMs before starting failover. Shutdown helps to ensure no data loss. Failover continues even if shutdown fails.



6. To start the failover, select OK.

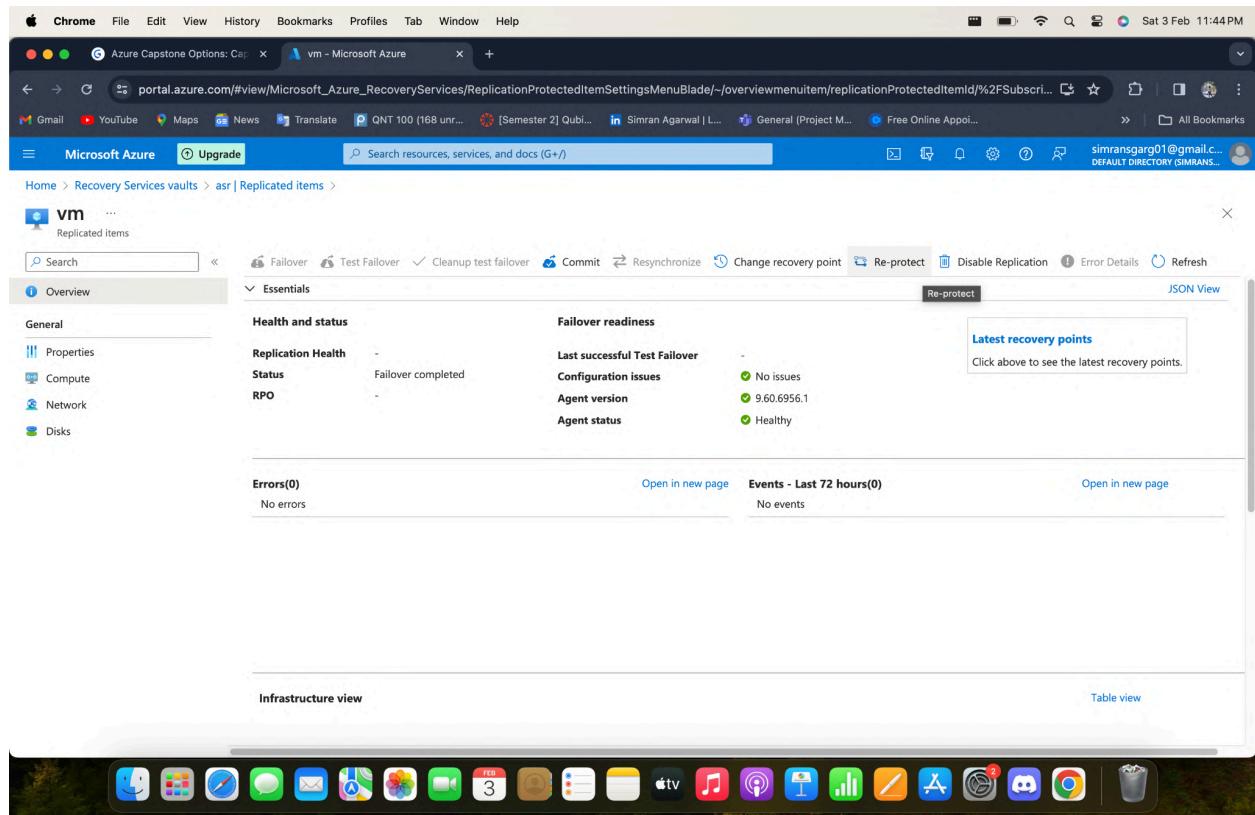
The screenshot shows the Microsoft Azure portal interface. The user is performing a failover for a virtual machine (vm) from a source location (West US) to a destination location (East US). A green success message indicates that pre-validation was successful. The recovery point selected is the latest processed one (03/02/2024, 23:36:30). The 'Shut down machine before beginning the failover' option is checked. The top navigation bar shows various browser tabs and the date and time (Sat 3 Feb 11:40PM).

7. Monitor the failover in notifications.

The screenshot shows a Microsoft Azure portal page for a virtual machine named 'vm'. The main content area displays the 'Health and status' and 'Failover readiness' sections. The 'Health and status' section includes fields for Replication Health (Healthy), Status (Protected), and RPO (5 secs [As on 03/02/2024, 23:36:34]). The 'Failover readiness' section shows the 'Last successful Test Failover' as 'Never performed successfully' and 'Configuration issues' as 'No issues'. Below these sections is a 'Latest recovery points' box with a note to click above to see the latest recovery points. At the bottom, there are links for 'Errors(0)' (No errors), 'Events - Last 72 hours(0)' (No events), and 'Open in new page'. To the right, the 'Notifications' pane is open, showing a log entry: 'Starting the task to perform unplanned failover of virtual machine 'vm''. This entry is marked as completed and occurred 'a few seconds ago'. The browser's address bar shows the URL as https://portal.azure.com/#.

Reprotect VMs

8. After failing back VMs to the primary region, you need to reprotect them, so that they start replicating to the secondary region again.



The screenshot shows the Azure portal interface for managing replicated items. The URL in the address bar is https://portal.azure.com/#view/Microsoft_Azure_RecoveryServices/ReplicationProtectedItemSettingsMenuBlade/~/overviewmenuitem/replicationProtectedItemId%2FSubscri.... The main content area displays a 'VM' item under 'Replicated items'. On the right side, there is a toolbar with various actions: Failover, Test Failover, Cleanup test failover, Commit, Resynchronize, Change recovery point, Re-protect, Disable Replication, Error Details, and Refresh. The 'Re-protect' button is highlighted with a red box. Below the toolbar, there's a section titled 'Health and status' which includes 'Replication Health' (Status: Failover completed, RPO: -), 'Failover readiness' (Last successful Test Failover: -, Configuration issues: No issues, Agent version: 9.6.0.6956.1, Agent status: Healthy), and a 'Latest recovery points' panel. At the bottom, there are sections for 'Errors(0)' (No errors) and 'Events - Last 72 hours(0)' (No events). A navigation bar at the bottom includes links for Infrastructure view and Table view, along with a standard Mac OS X dock at the very bottom.

9. In the Overview page for the VM, select Re-protect.
10. Review the target settings for the primary region. Resources marked as new are created by Site Recovery as part of the reprotect operation.

The screenshot shows the Azure portal's 'Re-protect' configuration page for a VM named 'eastus to westus'. The page includes the following sections:

- Target resource group:** vm-asr
- Cache storage accounts:** (new) asqhorasrasrache
- Target availability sets:** TRYSET-ASR
- Target proximity placement group:** Not Applicable
- Target virtual network:** vnet-asr
- Replica managed disks:** (new) 0 premium disk(s), 1 standard disk(s)

A warning message at the top states: "⚠ If you are choosing General Purpose v2 storage accounts, ensure that operations and data transfer prices are understood clearly before you proceed. [Learn more](#)".

The bottom of the screen shows a Mac OS X dock with various application icons, including Finder, Mail, Safari, and others.

11. Select OK to start the reprotect process. The process sends initial data to the target location, and then replicates delta information for the VMs to the target.
12. Monitor reprotect progress in notifications.

The screenshot shows a Chrome browser window on a Mac OS X desktop. The title bar says "Chrome" and the address bar shows "portal.azure.com/#view/Microsoft_Azure_RecoveryServices/ReplicationProtectedItemSettingsMenuBlade/~/overviewmenuitem/replicationProtectedItemId%2FSubscri...". The main content area is the Azure Recovery Services vaults blade for a resource group named 'vm-asr'. The left sidebar has sections for General, Properties, Compute, Network, and Disks. The main pane displays the 'Essentials' section with tabs for Health and status, Failover readiness, Replication Health, Status, and RPO. It also includes a 'Latest recovery points' section and error logs. On the right, the 'Notifications' pane lists three recent events:

- Reprotecting virtual machine**: Successfully completed the operation. (a few seconds ago)
- Deployment succeeded**: Deployment 'Microsoft.RecoveryServices.EnDRAFT-202413234518' to resource group 'vm-asr' was successful. (9 minutes ago)
- Starting the task to perform unplanned failover of virtual machine 'vm'**: Successfully completed the operation. (11 minutes ago)

The bottom of the screen shows the Mac OS X dock with various application icons.

The screenshot shows a Chrome browser window with the following details:

- Title Bar:** Chrome, File, Edit, View, History, Bookmarks, Profiles, Tab, Window, Help.
- Address Bar:** portal.azure.com/#@simransgarg0@gmail.onmicrosoft.com/resource/subscriptions/3754456c-ce38-4c4c-86d2-b3606bdebe1b/resourceGroups/vm-asr/providers/Mic...
- User Information:** simransgarg0@gmail.c... (Default Directory SIMRANS...)
- Content Area:**
 - Page Title:** asr | Replicated items
 - Section:** Recovery Services vault
 - Search Bar:** Search
 - Buttons:** Refresh, + Replicate, Columns, Filter
 - Message:** We would love to hear your experience with ASR so far and your upcoming needs. Take the survey now! →
 - Information:** Last refreshed at: 03/02/2024, 23:56:52
 - Message:** Finished loading data from service.
 - Filter:** Filter items...
 - Table:** Displays a single item: Name (vm), Replication Health (Healthy), Status (0% Synchronized), Active location (East US), Failover Health (-).
 - Text:** Showing 1 - 1 of 1 results.
- Sidebar:** Includes sections for Settings (Identity, Networking, Properties, Locks), Getting started (Backup, Site Recovery), Protected items (Backup items, Replicated items), and Manage (Backup policies, Backup Infrastructure, Site Recovery infrastructure, Recovery Plans (Site Recovery)).
- Bottom:** A Mac OS Dock with various application icons.

As you can see we have completed every step from this.

Chapter 6: Cost Analysis:

To provide a cost analysis for the Azure Site Recovery solution implemented across the four steps, we need to consider various Azure services and their associated pricing. Here's a breakdown of potential costs for each step:

1. Setup DR for Azure VMs:

- Pricing varies based on the number of protected instances and the selected replication type (standard or premium).
- Assume 10 Azure VMs are protected using the standard replication type.
- Estimated cost: \$10 per protected instance per month * 10 instances = \$100 per month.

2. Run a DR Drill:

- The cost for running a DR drill is typically included in the overall ASR pricing.
- No additional cost for running a DR drill.

3. Prod Failover:

- Similar to setup costs, the monthly cost depends on the number of protected instances and the replication type.
- Assume the same 10 Azure VMs are failed over to the secondary region in a production scenario.
- Estimated cost: \$10 per protected instance per month * 10 instances = \$100 per month.

4. Fail Back:

- Azure Site Recovery (ASR) Pricing:
- Failback costs may involve data transfer and storage costs in addition to ASR fees.
- Data transfer costs: Depend on the amount of data transferred back to the primary region.

- Storage costs: Incurred if temporary storage is used during failback.
- Estimate: Varies based on the amount of data and storage utilized during failback.

Total Monthly Cost Estimate:

- Setup DR for Azure VMs: \$100
- Run a DR Drill: \$0
- Prod Failover: \$100
- Fail Back: Varies (additional data transfer and storage costs)

Therefore, the estimated monthly billing for the implemented solution, considering 1000 users, would be approximately \$200 for the setup and failover phases. Additional costs may apply for failback depending on data transfer and storage usage. It's essential to monitor usage and adjust the estimate based on actual consumption.

Chapter 7: Lessons and Observations:

1. Understanding Business Requirements:

The project highlighted the importance of thoroughly understanding the organization's business requirements and objectives before implementing a disaster recovery solution. This ensures that the solution aligns with the organization's goals and priorities.

2. Planning and Preparation:

Proper planning and preparation are crucial for the successful implementation of a disaster recovery solution. Each step, from setting up disaster recovery for Azure VMs to performing failback, requires careful planning, including resource allocation, testing, and documentation.

3. Importance of DR Drills:

Running disaster recovery drills (DR drills) is essential to validate the effectiveness of the solution and ensure readiness in case of a real disaster. The project emphasized the significance of conducting regular DR drills to identify any weaknesses or gaps in the recovery process and address them proactively.

4. Testing and Validation:

Thorough testing and validation of the disaster recovery solution are vital to verify its functionality and reliability. It's crucial to validate each step of the recovery process, including failover and failback, to ensure seamless operation during a real disaster scenario.

5. Monitoring and Maintenance:

Continuous monitoring and maintenance of the disaster recovery environment are essential to detect and address any issues or performance bottlenecks promptly. Implementing robust monitoring tools and establishing regular maintenance routines help ensure the ongoing effectiveness of the solution.

6. Documentation and Knowledge Sharing:

Comprehensive documentation of the disaster recovery solution, including setup procedures, recovery plans, and troubleshooting guides, facilitates knowledge sharing among team members and enables efficient response during emergencies.

7. Cost Considerations:

The project highlighted the importance of considering the cost implications of the disaster recovery solution, including setup, ongoing maintenance, and failover/failback operations. Balancing cost-effectiveness with performance and reliability is essential when designing the solution.

8. Continuous Improvement:

Disaster recovery is an ongoing process that requires continuous improvement and optimization. Regular reviews and updates to the disaster recovery plan based on lessons learned from DR drills and real-world incidents help ensure the solution remains effective and resilient over time.

Chapter 8: Conclusion:

The implementation of Azure Site Recovery for disaster recovery (DR) purposes is a critical aspect of ensuring business continuity and minimizing downtime in the event of a disaster. Throughout the project, we successfully completed each step of the DR process, including setting up DR for Azure VMs, conducting DR drills, performing production failovers, and executing failback operations.

By establishing a robust disaster recovery solution, we have significantly enhanced the resilience of our IT infrastructure, mitigating the risk of data loss and service interruptions. Through thorough planning, testing, and validation, we have validated the effectiveness of our DR strategy and preparedness for real-world disaster scenarios.

Moving forward, it is imperative to maintain regular monitoring and maintenance of the DR environment, conduct periodic DR drills to ensure readiness, and continuously update and refine the disaster recovery plan based on lessons learned and evolving business requirements.

In conclusion, the successful implementation of Azure Site Recovery for disaster recovery has positioned our organization to better withstand unforeseen disruptions and uphold our commitment to delivering uninterrupted services to our customers and stakeholders.

Chapter 9: Summary:

The Azure Site Recovery project aimed to establish a comprehensive disaster recovery (DR) solution for Azure virtual machines (VMs) to ensure business continuity and minimize downtime in the event of a disaster. The project consisted of four main steps:

1. Setup DR for Azure VMs:

This involved configuring Azure Site Recovery to replicate Azure VMs to a secondary region, ensuring data redundancy and availability.

2. Run a DR Drill:

A simulated disaster recovery drill was conducted to test the effectiveness of the DR setup, validate recovery procedures, and identify any gaps or issues.

3. Prod Failover:

In the event of an actual disaster or service interruption, a production failover would be initiated to seamlessly transition operations to the secondary region and minimize downtime.

4. Fail Back:

Once the primary region is restored and operational, a failback operation would be executed to return operations to the primary environment while ensuring data integrity and minimal disruption.

Throughout the project, meticulous planning, testing, and validation were conducted to ensure the reliability and effectiveness of the Azure Site Recovery solution. Regular monitoring and maintenance will be essential to uphold the readiness and resilience of the DR environment moving forward. Overall, the successful implementation of Azure Site Recovery enhances the

organization's ability to withstand disasters and maintain uninterrupted service delivery to customers and stakeholders.