



# ADVANCED TECHNOLOGY GROUP (ATG)

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## Accelerate with ATG Webinar: Storage Virtualize 8.6.2 Update

Byron Grossnickle

IBM Advanced Technology Group - Storage Virtualize SME

[byrongro@us.ibm.com](mailto:byrongro@us.ibm.com)



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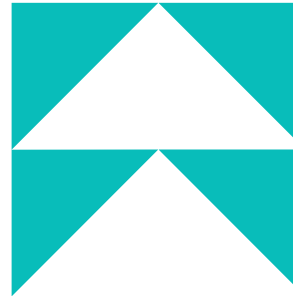
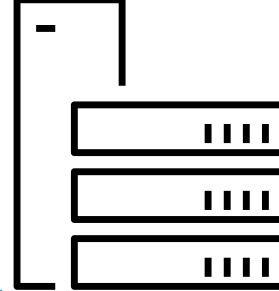
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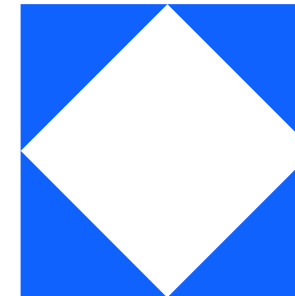
Meet the Expert

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Game On!



## Accelerate with ATG Survey

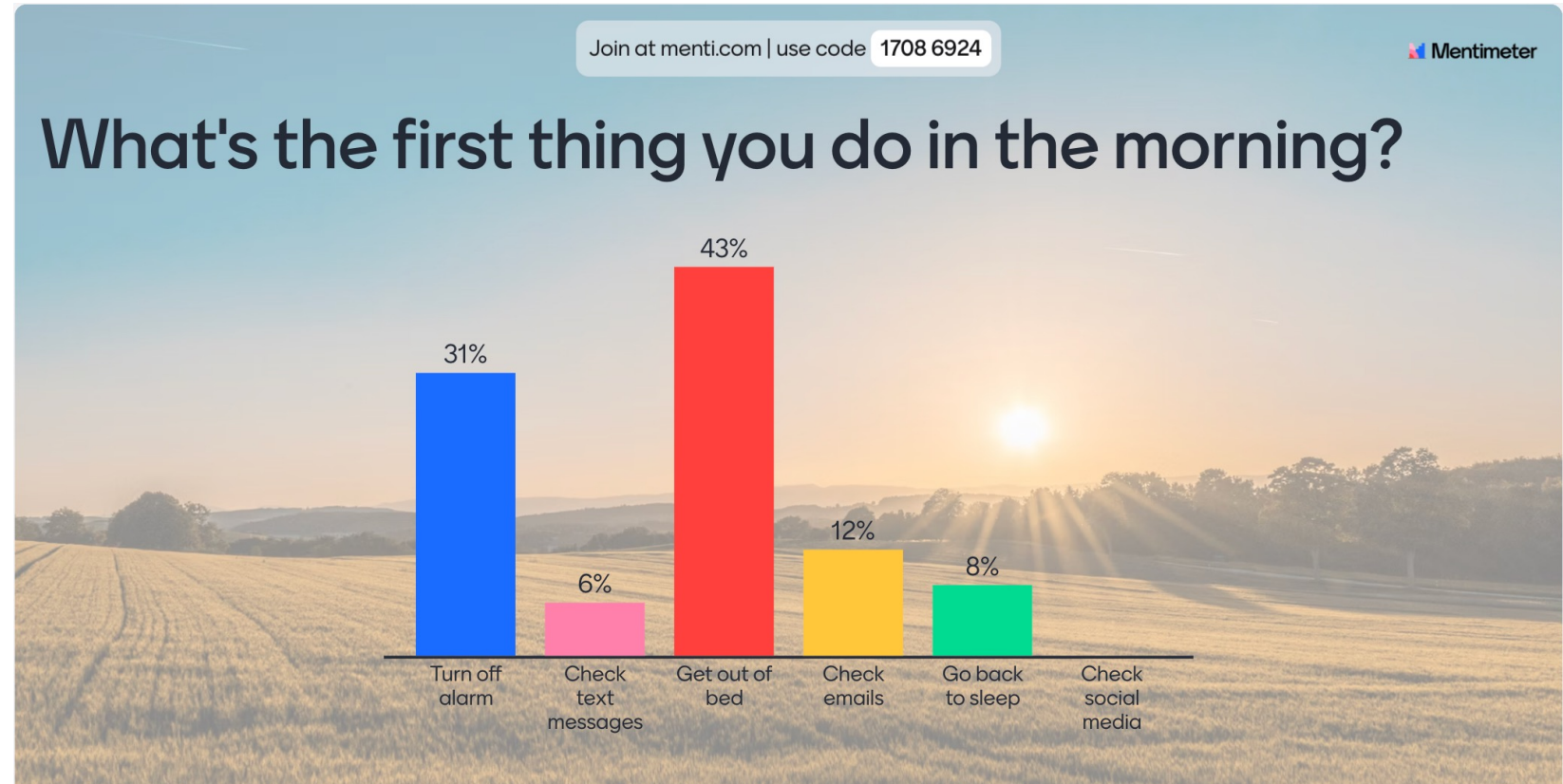
Please take a moment to share your feedback with our team!

You can access this 6-question survey via [Menti.com](https://www.menti.com) with code 1708 6924 or

Direct link <https://www.menti.com/alwhyze7z1gz>

Or

QR Code





# ADVANCED TECHNOLOGY GROUP (ATG)

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## Accelerate with ATG Webinar: Storage Virtualize 8.6.2 Update

Byron Grossnickle

IBM Advanced Technology Group - Storage Virtualize SME

[byrongro@us.ibm.com](mailto:byrongro@us.ibm.com)



## Meet the Speakers

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Byron Grossnickle is an IBM Storage Technical Specialist concentrating on Storage Virtualize software. This include FlashSystem, SVC, and Storage Virtualize for Public Cloud. Byron has been with IBM 18 years exclusively in storage. Prior to working for IBM, Byron spent 6 years engineering storage in the Telcom Industry. Prior to that he worked 8 years in healthcare IT. Byron lives in the Kansas City area and is available to travel to customer engagements.

## Agenda

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- Release Schedule
- NVMe/TCP Performance Enhancements
- High Speed Ethernet (iSER) Replication
- Performance – Lee and Yijie
- VMware Messaging
- vVol 2.0 Replication
- VMware Plugin 1.2
- Restore In Place/Single Volume Clone
- Misc
  - Dual Voltage PS for FS5200
  - Encryption Recovery Key
  - SNMP Security Improvements
  - 4 I/O Group Support for PBR
  - 4 PB Replication Capacity for SV3
  - DRAID Smart Rebuild with Extent Awareness
  - FIPS-140
  - Scalability Increases
  - GUI Enhancements
  - Statistics Enhancements/Environmental Stats



# Release Schedule

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- RFA Announce – 8.6.2 – December 5, 2023
- eGA – 8.6.2 – December 21, 2023

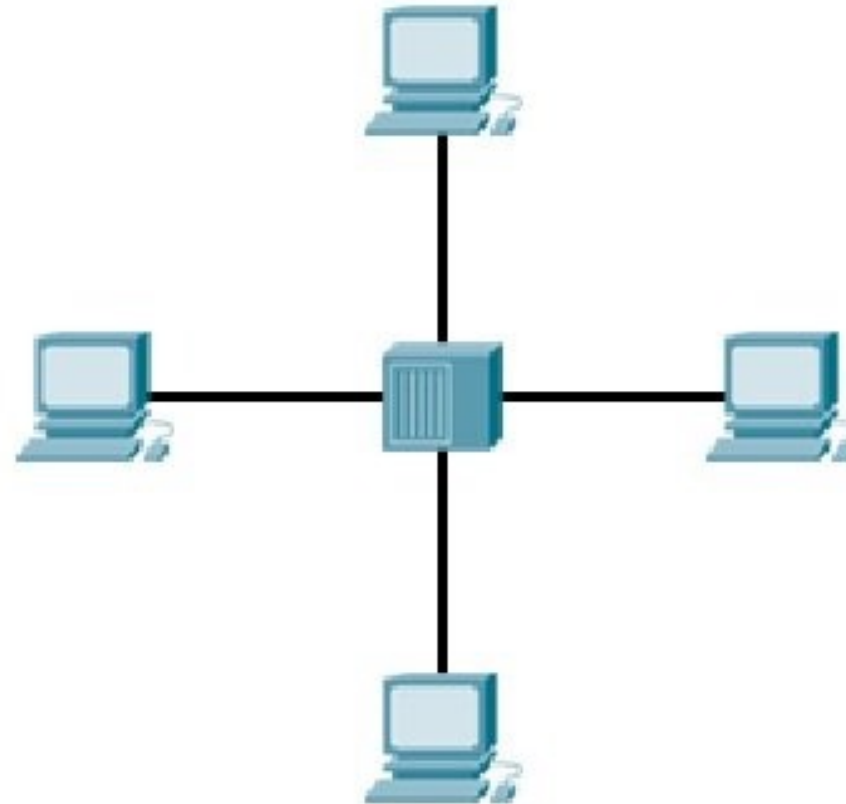
8.6.2.1 is a Non-LTS Release. This means that it will get no patches or updates until the next Non-LTS or LTS release

Storage Virtualize was previously known as Spectrum Virtualize



# Ethernet and NVMe/TCP Enhancements

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# Jumbo Frames on RoCE Adapters

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- In 8.6.0.0 jumbo frames were disabled on RoCE (Mellanox) adapters due to the driver crashing
  - In 8.6.2 jumbo frames have been re-enabled giving significant performance advantages to iSCSI/iSER
  - This fix is backported to 8.6.0.2+
- NVMe/TCP and NVMe/RDMA are still limited to a 1500 MTU. Hopefully this limitation will be lifted in the future.

# NVMe/TCP Enhancements

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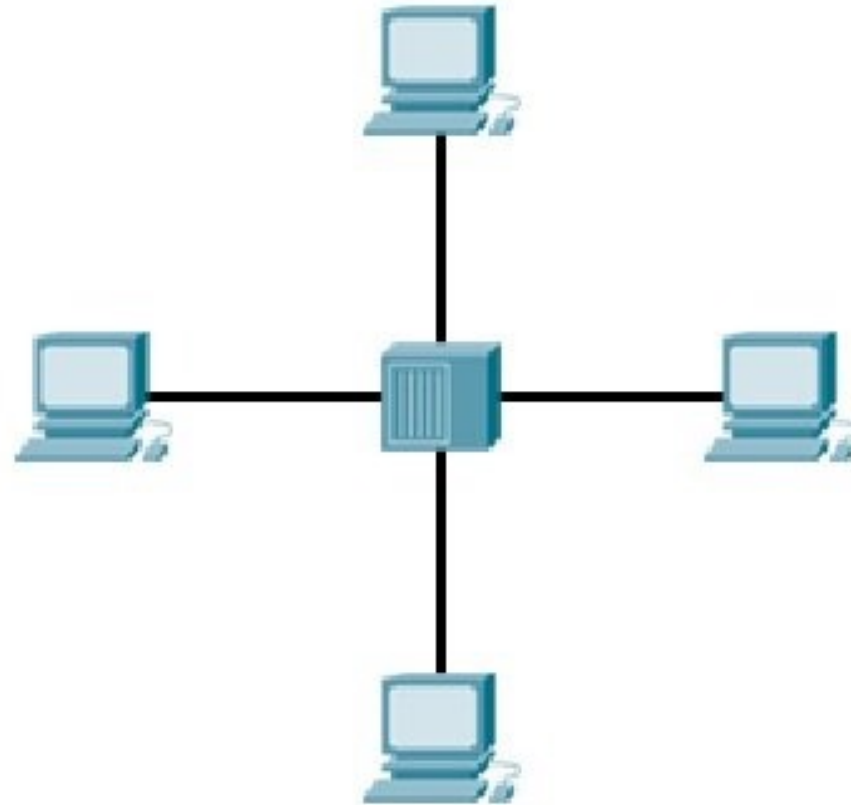
- `lsystemstats` and `lsnodecanisterstats` will show NVMe/TCP and NVMe/RDMA IO statistics, in MB/s and IOPs, for all nodes as well as per node canister for later
- The above statistics are available in GUI as well

## Host Attach Changes

- `mkhost/chhost/mkip` CLIs will now throw error message when NVMe/TCP and NVMe/RDMA host attach is getting used with portset having Ethernet ports with MTU other than 1500

# High Speed Ethernet Replication (iSER)

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# Short Distance/High Speed Ethernet Link

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- This was designed for synchronous replication
  - 1ms rtt or less
  - Zero packet drop is preferred on the network
  - iSER protocol used
- Short distance partnership using RDMA allows to connect two systems and establish an IP partnership. This partnership uses RDMA capable Ethernet ports to accelerate the traffic between Storage Virtualize systems
- iWarp cards only
- Use Cases
  - MetroMirror
  - Volume Mobility
  - Potentially PB-HA in the future

## Admin Model

1. Create highspeedreplication portsets
2. Associate IP addresses with highspeedreplication portsets
3. Create partnership using mkippartnership command in same way as you would for native IP partnership except use highspeed replication portsets for link1 and link2
4. There is no change in lspartnership view. Users may look at link1, link2 field and match them into lsportset view to find out if the partnership uses TCP or RDMA. GUI already displays this information in partnership list.
5. Each node displays its connectivity under “sainfo lsnodeipconnectivity” view.

```

IBM_FlashSystem:FS9500_Cluster:superuser> sainfo lsnodeipconnectivity
status      local_port_id local_vlan local_rdma_type local_ip_addr remote_port_id remote_vlan remote_rdma_type remote_ip_addr remote_wvnn remote_panel_name cluster_id error_data
Connected:  iWARP 4      30      iWARP      17.17.17.41 6      30      iWARP      17.17.17.21 500507681000110C 01-1 000020420002218
Connected:  iWARP 4      30      iWARP      17.17.17.41 6      30      iWARP      17.17.17.22 5005076810001143 01-2 000020420002218
Connected:  iWARP 4      30      iWARP      17.17.17.41 6      30      iWARP      17.17.17.23 500507681000AA02 02-1 000020420002218
Connected:  iWARP 4      30      iWARP      17.17.17.41 6      30      iWARP      17.17.17.24 50050768100032CA 02-2 000020420002218
Connected:  iWARP 6      30      iWARP      17.17.17.61 6      30      iWARP      17.17.17.21 500507681000110C 01-1 000020420002218
Connected:  iWARP 6      30      iWARP      17.17.17.61 6      30      iWARP      17.17.17.22 5005076810001143 01-2 000020420002218
Connected:  iWARP 6      30      iWARP      17.17.17.61 6      30      iWARP      17.17.17.23 500507681000AA02 02-1 000020420002218
Connected:  iWARP 6      30      iWARP      17.17.17.61 6      30      iWARP      17.17.17.24 50050768100032CA 02-2 000020420002218
    
```

# Notes and Limitations

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1. Ethernet HyperSwap and Short distance partnership using RDMA are mutually exclusive on system
2. Short distance partnership using RDMA does not support Encryption of data in flight and Compression
3. Short distance partnership using RDMA is only supported using iWARP
4. This feature requires users to open network TCP ports 3260 and 21456 in their network firewall for management and data connection between systems
5. Most of native IP rep DMPs (2021/2022/2023) are used by short distance partnership as well. DMP 2020 is only for native IP replication (uses TCP).



# Performance Summary

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- HSE replication demonstrates equivalent or better performance when compared to FC replication. It offers user an alternative mirroring connectivity (other than IP replication) when high replication performance is in demand and short distance is allowed.
- Note: PBHA will be supported for HSE replication in the near future, but not yet available in v8.6.2 release
- MTU9000 enablement improves iscsi performance by up to 2x, and the performance improvement is more obvious in FS9500 than in FS7300.

# vVol Replication

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# vVol Replication Agenda

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## Overview

Planning

Implementing

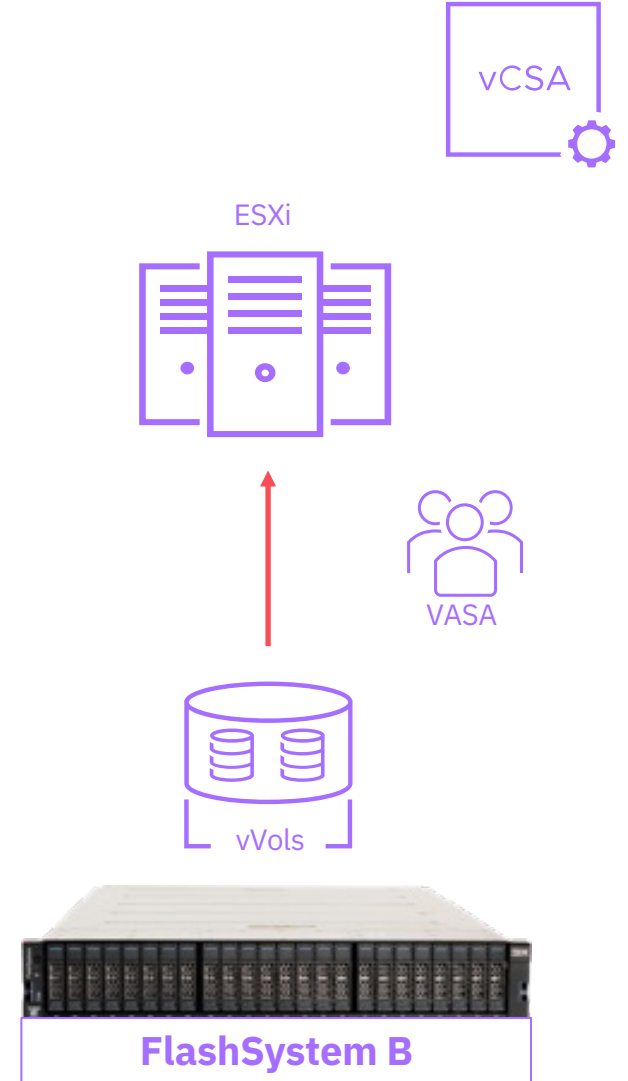
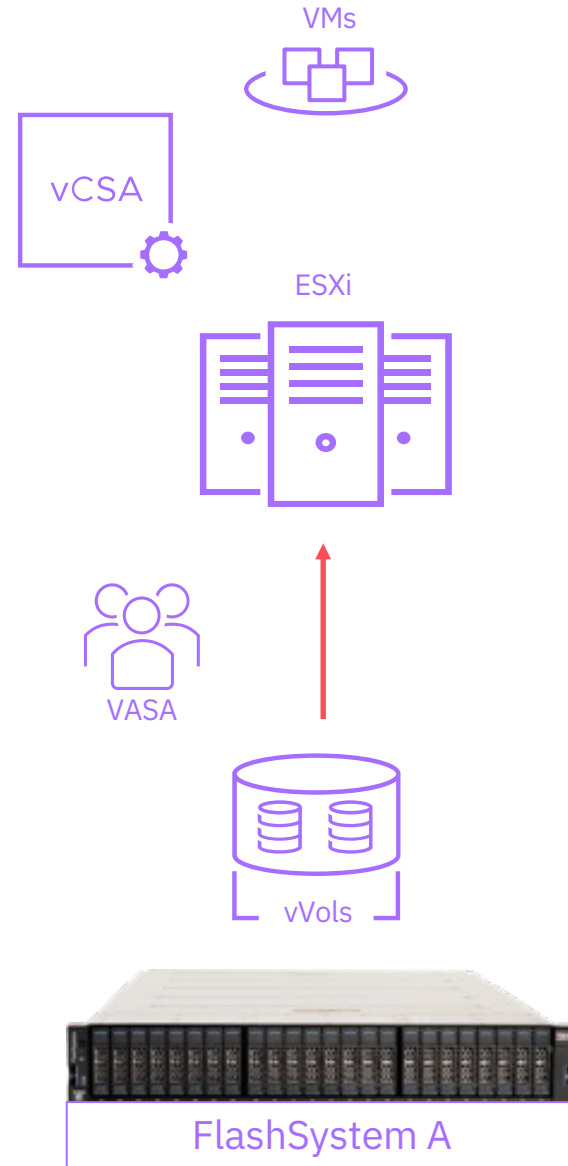
Monitoring

Managing

## Overview

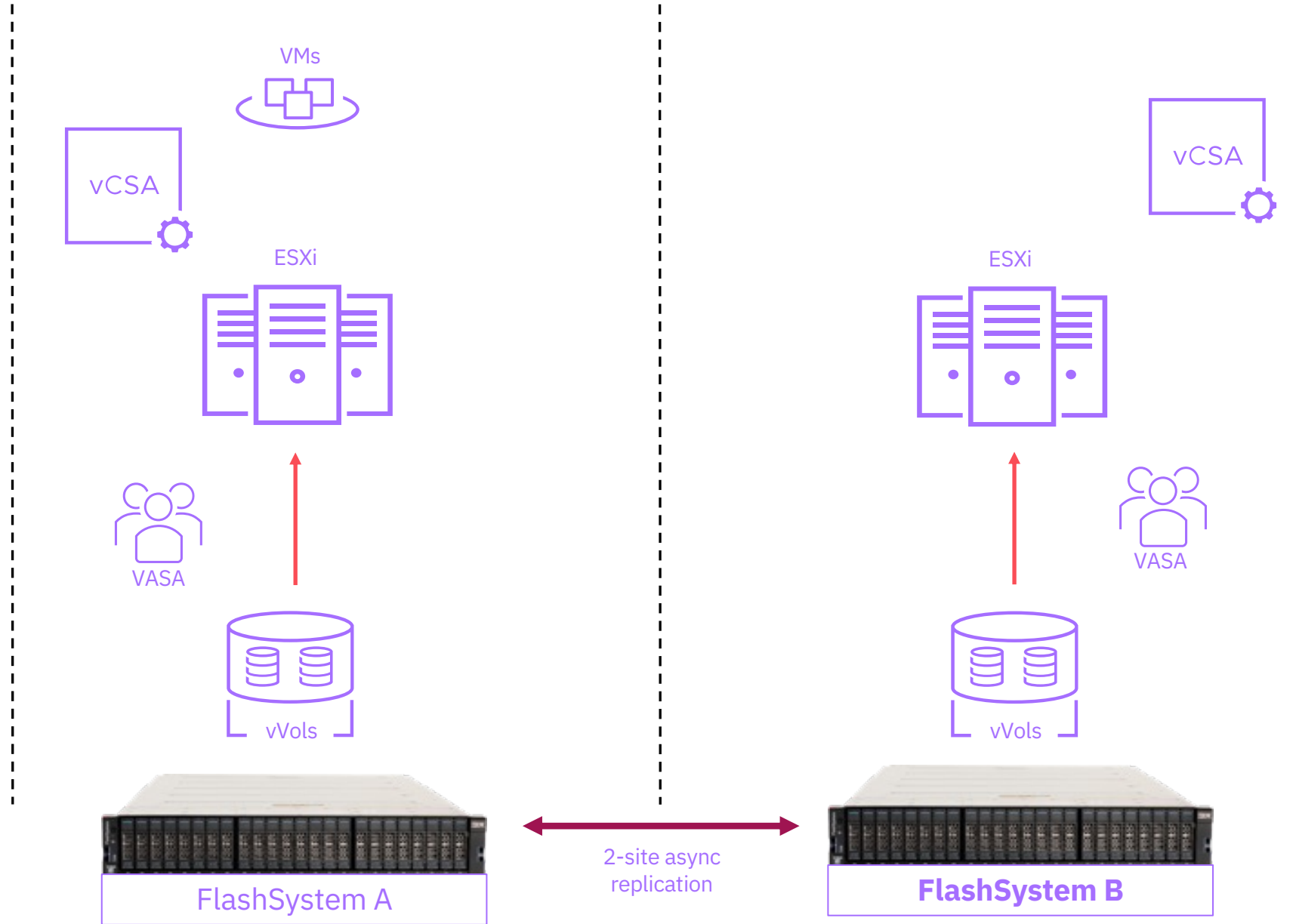
Each site requires:

- A storage system
- A vCenter Server
- One or more ESXi hosts



Overview

Configure a 2-site partnership between systems using async policy-based replication

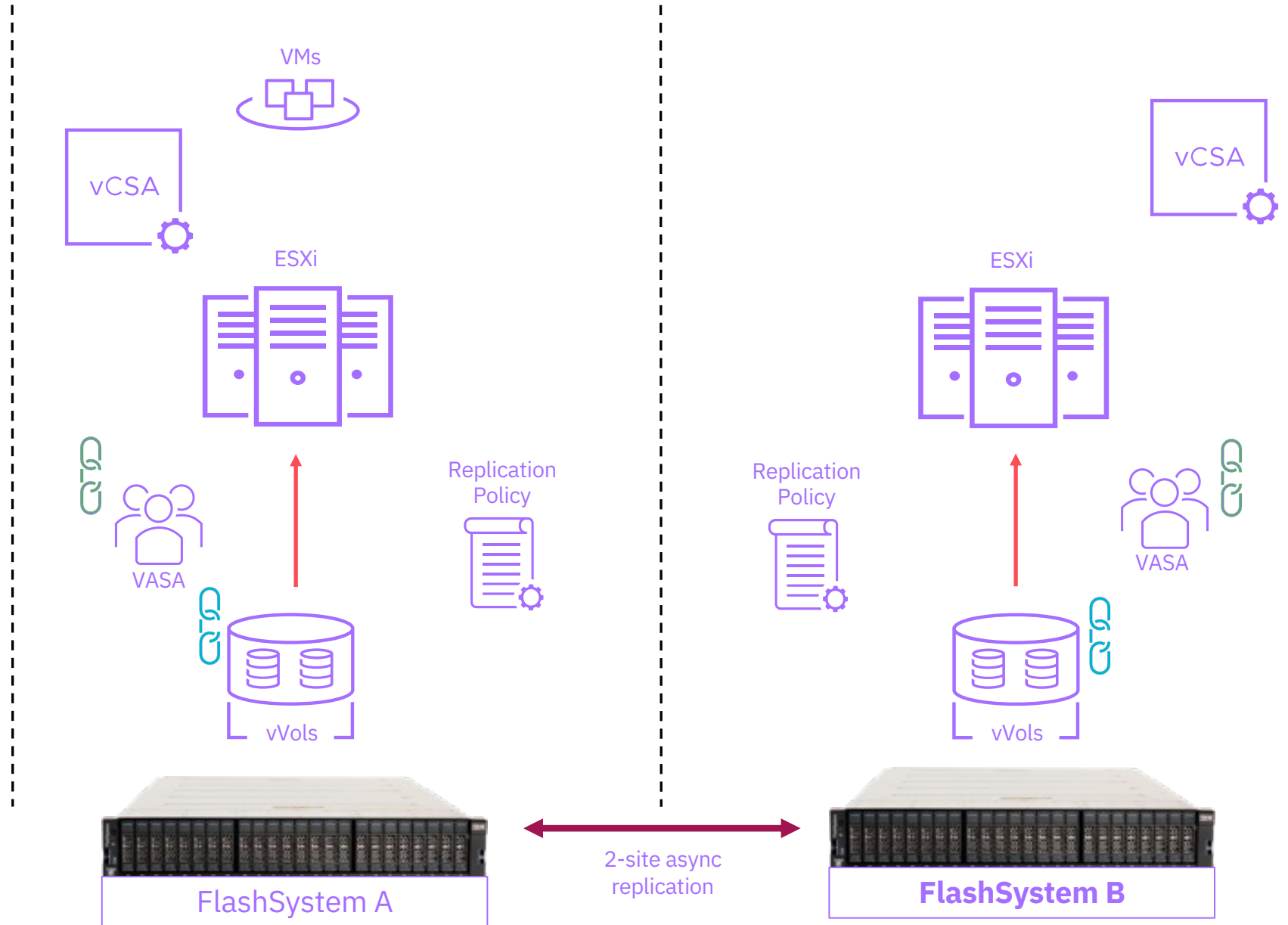


## Overview

Enable vVol replication to:

- Link ownership groups
- Link child pools
- Create a volume group with a replication policy

Additional volume groups and child pools can be configured later

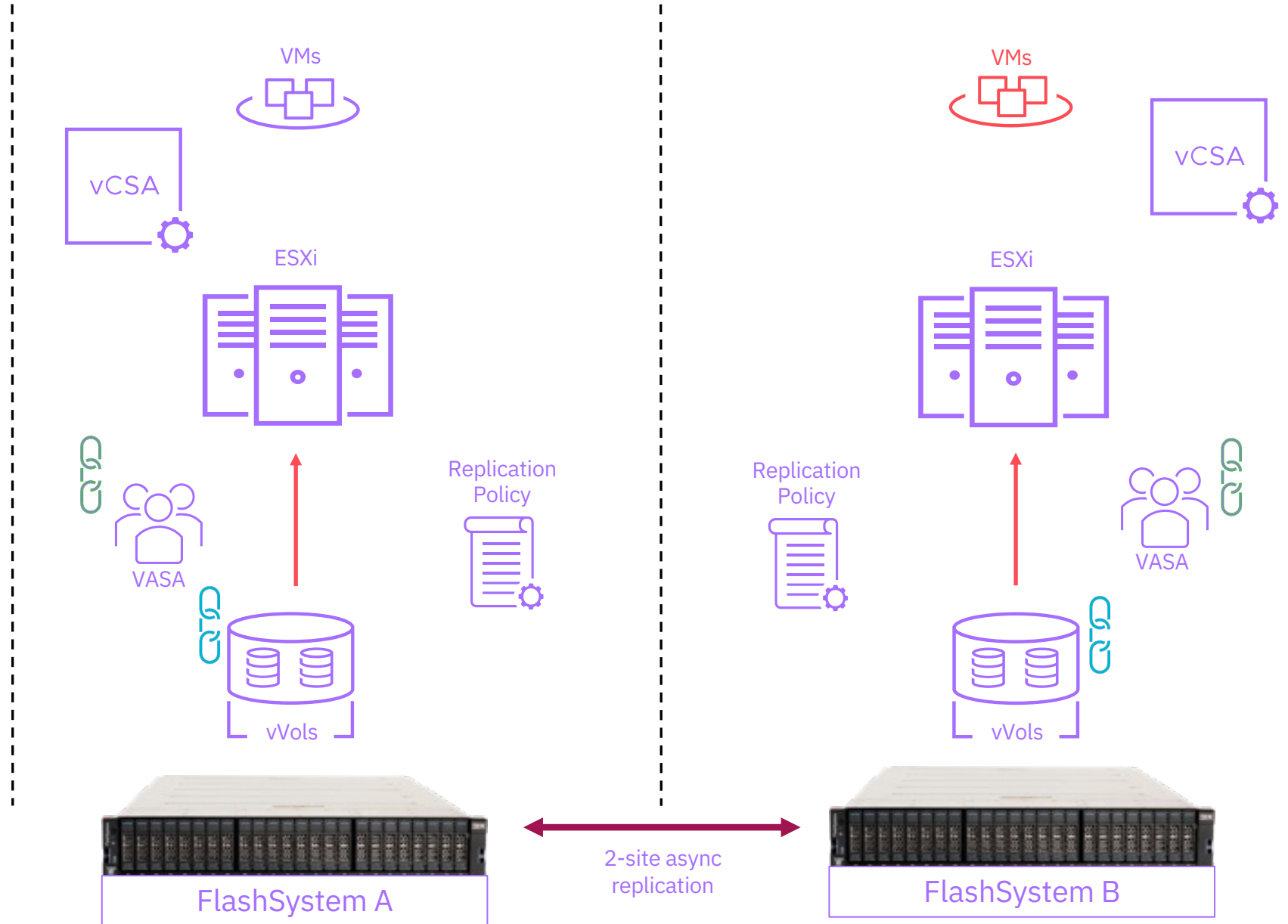


## Overview

Each vVol volume group with a replication policy is a Replication Group for VMware

A VM Storage Policy can be created in vSphere that specifies the replication settings:

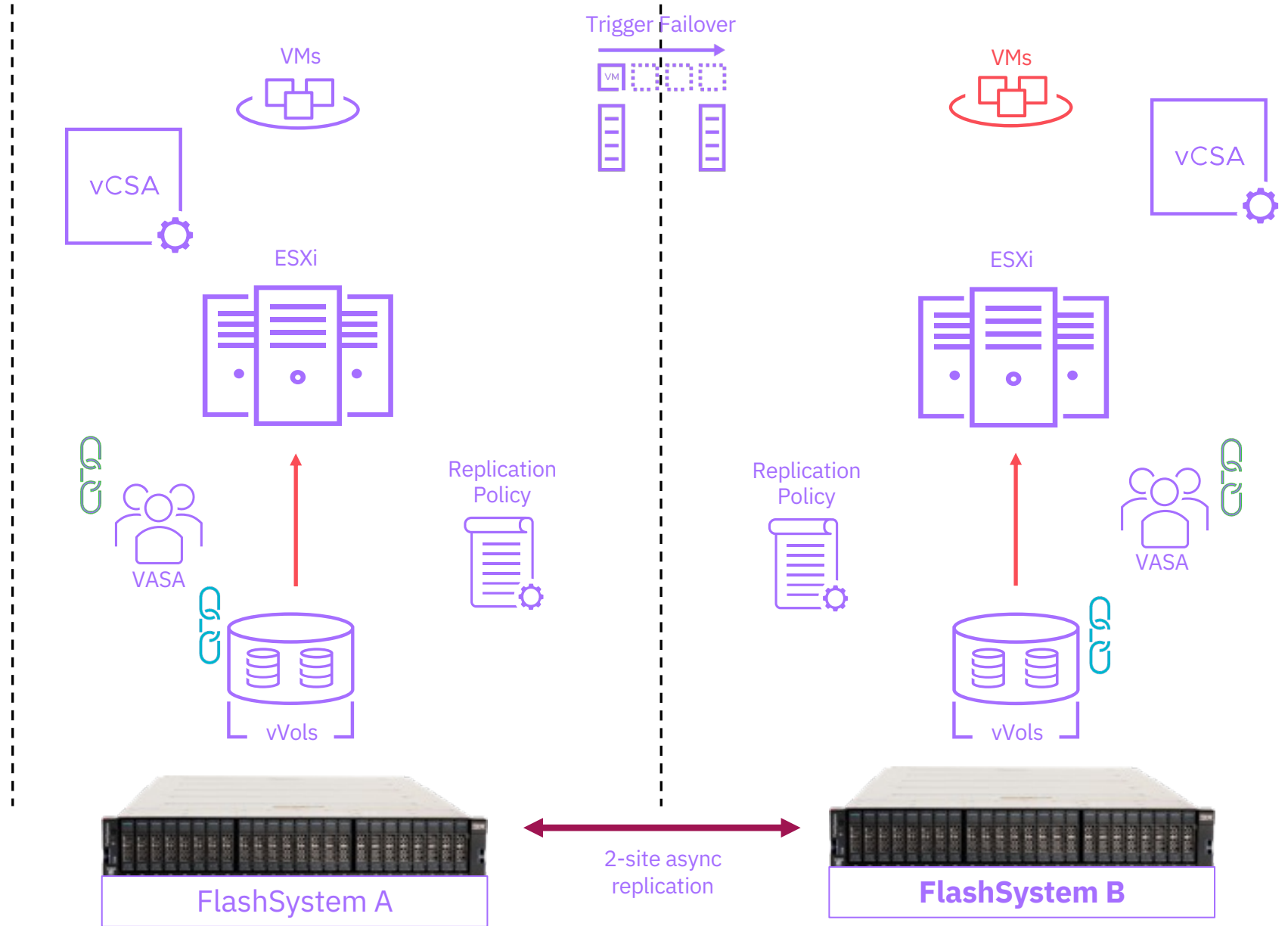
- Remote system
- RPO



# Overview

Replication is managed in the VMware environment using Site Recovery Manager or PowerCLI

Virtual Machines can be failed-over to the recovery site

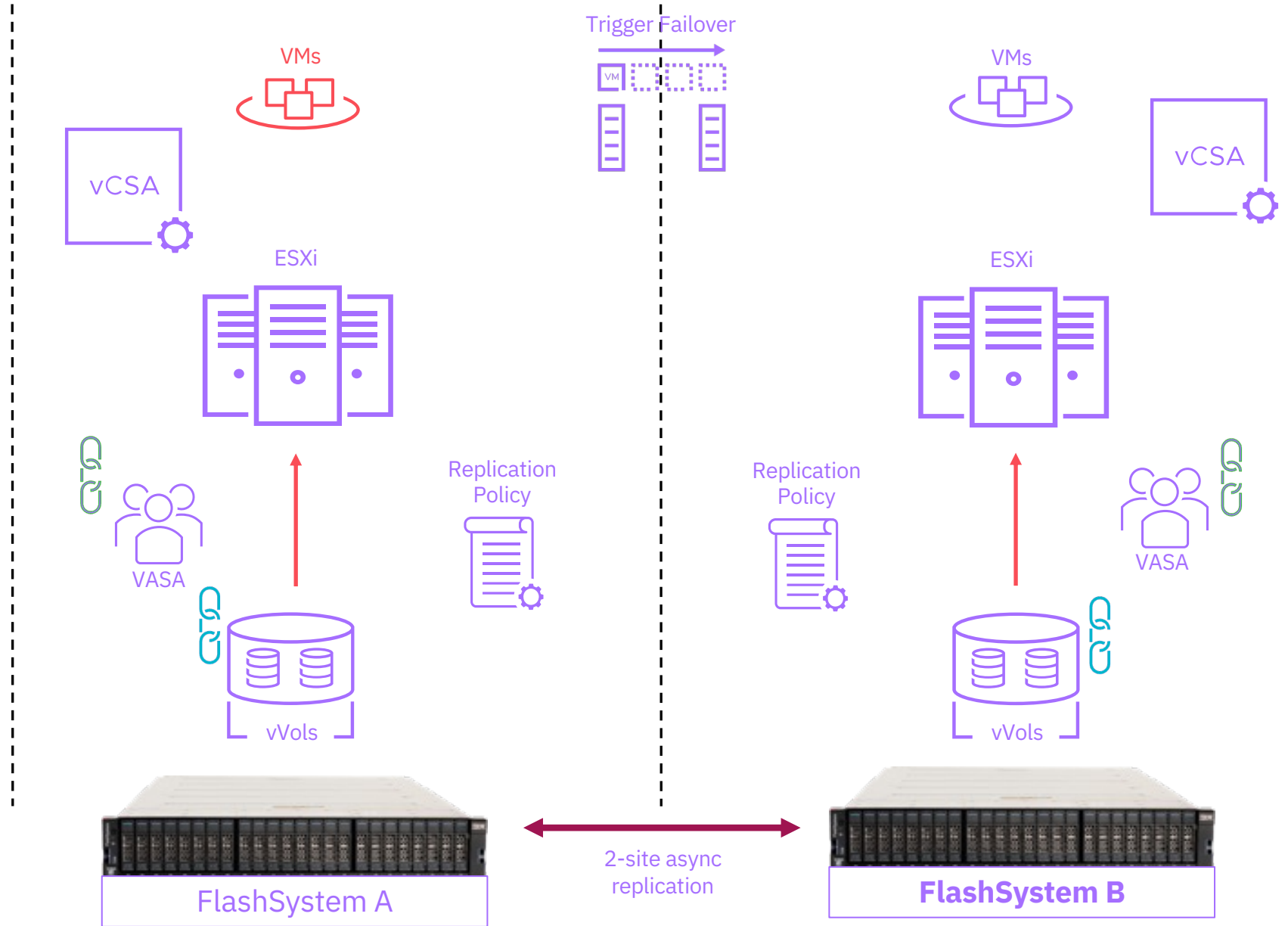




# Overview

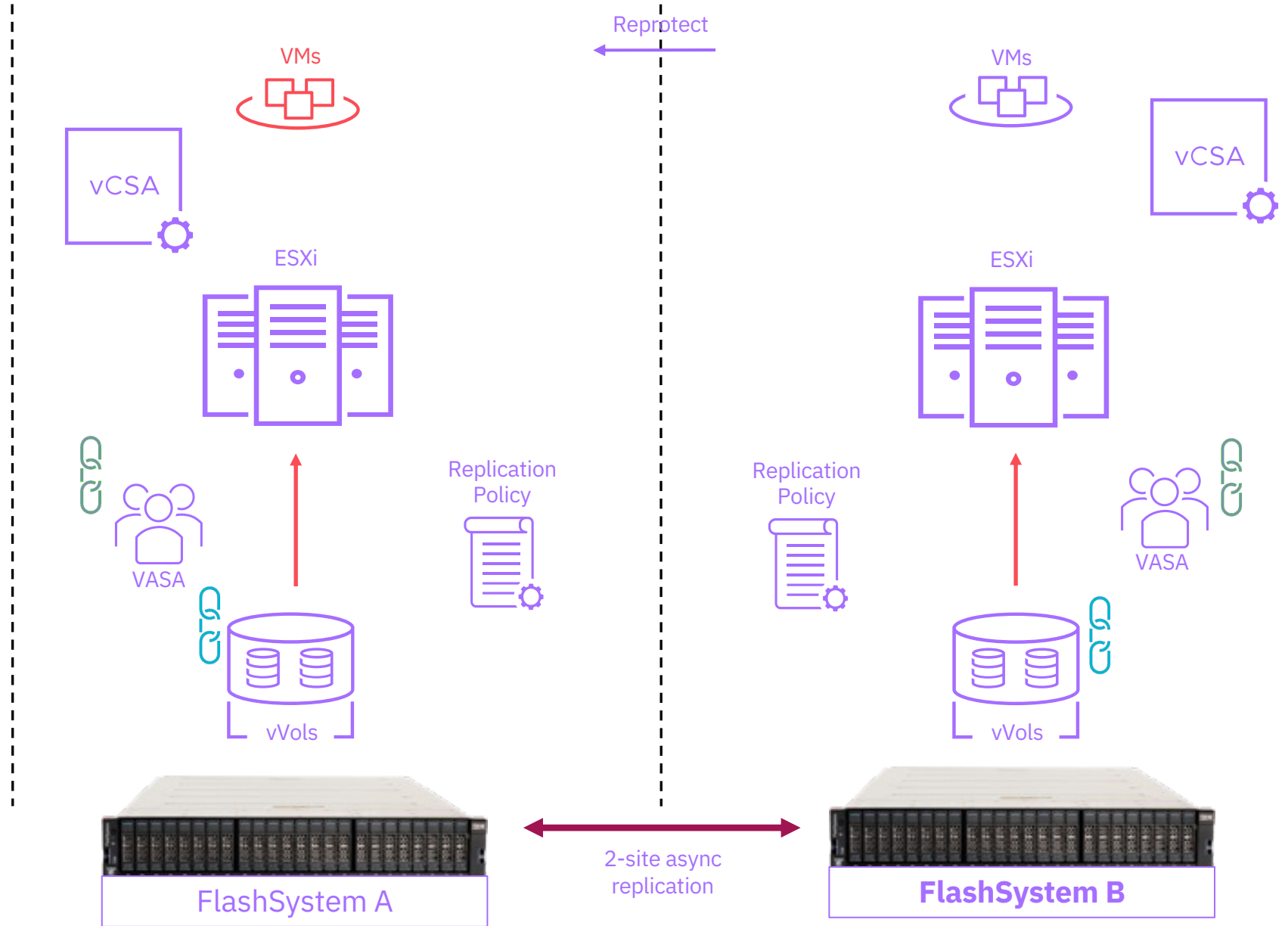
Replication is managed in the VMware environment using Site Recovery Manager or PowerCLI

Virtual Machines can be failed-over to the recovery site



Overview

Replication can be reversed to reprotect VMs after a failover



# vVol Replication Agenda

Overview

**Planning**

Implementing

Monitoring

Managing

# Planning for vVols replication

## System limits:

- 1 partnership per system using vVol replication.
  - Additional partnerships can be configured, but only one can be used for vVol replication.
- Single I/O group systems
- Standard topology systems
- At least one standard storage pool is required. Data reduction pools are not supported.
- Each system must support vVols and asynchronous policy-based replication.
- The standard configuration guidelines for policy-based replication apply.
- A vCenter Server is required in each location.
- Use vCenter Server and ESXi versions that support vVols replication.
- Failover and disaster recovery operations are managed through vCenter Server integrations such as:
  - VMware Site Recovery Manager (SRM)
  - PowerCLI

# Supported platforms for vVol Replication

Model	vVol replication
SAN Volume Controller	Supported
FlashSystem 9500	Supported
FlashSystem 9200	Supported
FlashSystem 91x0	Supported
FlashSystem 7300	Supported
FlashSystem 7200	Supported
FlashSystem 5200	Supported*
FlashSystem 50x5	Not supported
Storage Virtualize for Public Cloud	Not supported**

\* Requires minimum of 128 GB of memory per canister

\*\* Needs 8.7 update to be supported

# vVol Replication Agenda

Overview

Planning

**Implementing**

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# Implementing

Enable vVol replication using the GUI

The screenshot shows the IBM FlashSystem 5200 GUI. The top navigation bar includes the system name 'IBM FlashSystem 5200', the identifier 'wolrep-fs52-3', and the page title 'System'. On the left, a sidebar menu lists various system settings, with 'VMware Virtual Volumes (vVols)' selected. The main content area is titled 'VMware Virtual Volumes (vVols)' and contains the following information:

- A description: 'The vVols feature designates a pool to a VASA provider to create and change volumes. [More Information](#)'
- An 'Enable vVols' toggle switch, which is currently turned 'On'.
- 'Local system steps:'
  1. Go to the Hosts page and change the accessing hosts to have a host type of vVol.
- 'VMware vVols configuration' table:

Username	Parent Pool	Child Pool Name	Child Pool Capacity
vmware	Pool0	vvolCP1	1.00 TiB
- 'vVols replication' section with the text 'Enable VMware vVol replication for disaster recovery' and a blue 'Begin set up' button.
- 'Reset' and 'Save' buttons at the bottom of the configuration area.

The bottom status bar displays performance metrics: Latency 0 ms, Read 0 ms, Write 0 ms, Bandwidth 0 MBps, Read 0 MBps, Write 0 MBps, and IOPS 0, Read 0, Write 0.

# Implementing

Enable vVol replication  
using the GUI

IBM FlashSystem 5200 | vvolrep-fs52-3 | System

Date and Time

## Setup vVol replication

Complete the steps to set up vVol replication

- Select Partnership
- Review Ownership Group and Pool Links
- Create Volume Group
- Create or Select Replication Policy
- Summary Review

### Select Partnership

Select the partnership and review the ownership group you would like to set up vVol replication for. Only partnerships configured for policy-based replication can be used for vVol replication.

Partnership

vvolrep-fs52-4

Will vvolrep-fs52-3 be used for production virtual machines?

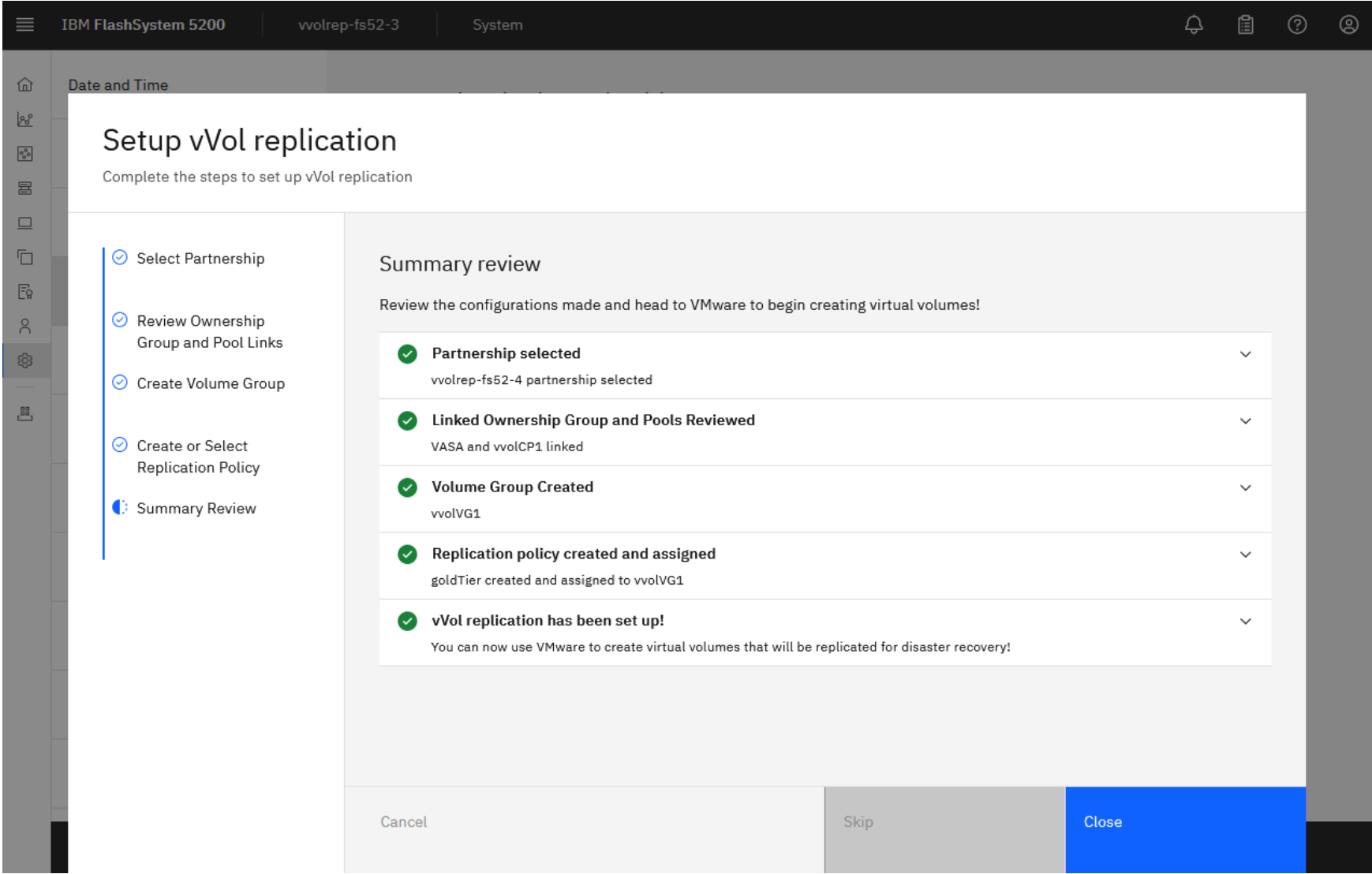
Yes  No

Cancel Skip Continue



# Implementing

Enable vVol replication using the GUI



# Implementing

Enable vVol replication  
using the GUI

The screenshot displays the IBM FlashSystem GUI for system 'vvolrep-fs52-3'. The left sidebar contains navigation options: Date and Time, Licensed Functions, Update System, VMware Virtual Volumes (vVols), Volume Protection, Resources, IP quorum, I/O Groups, Transparent Cloud Tiering, Automatic Configuration, and Remote-copy Bandwidth Limit. The main content area is titled 'VMware Virtual Volumes (vVols)' and includes the following sections:

- Enable vVols:** A toggle switch is set to 'On'.
- Local system steps:** A list containing one step: '1. Go to the Hosts page and change the accessing hosts to have a host type of vVol.'
- VMware vVols configuration:** A table with the following data:

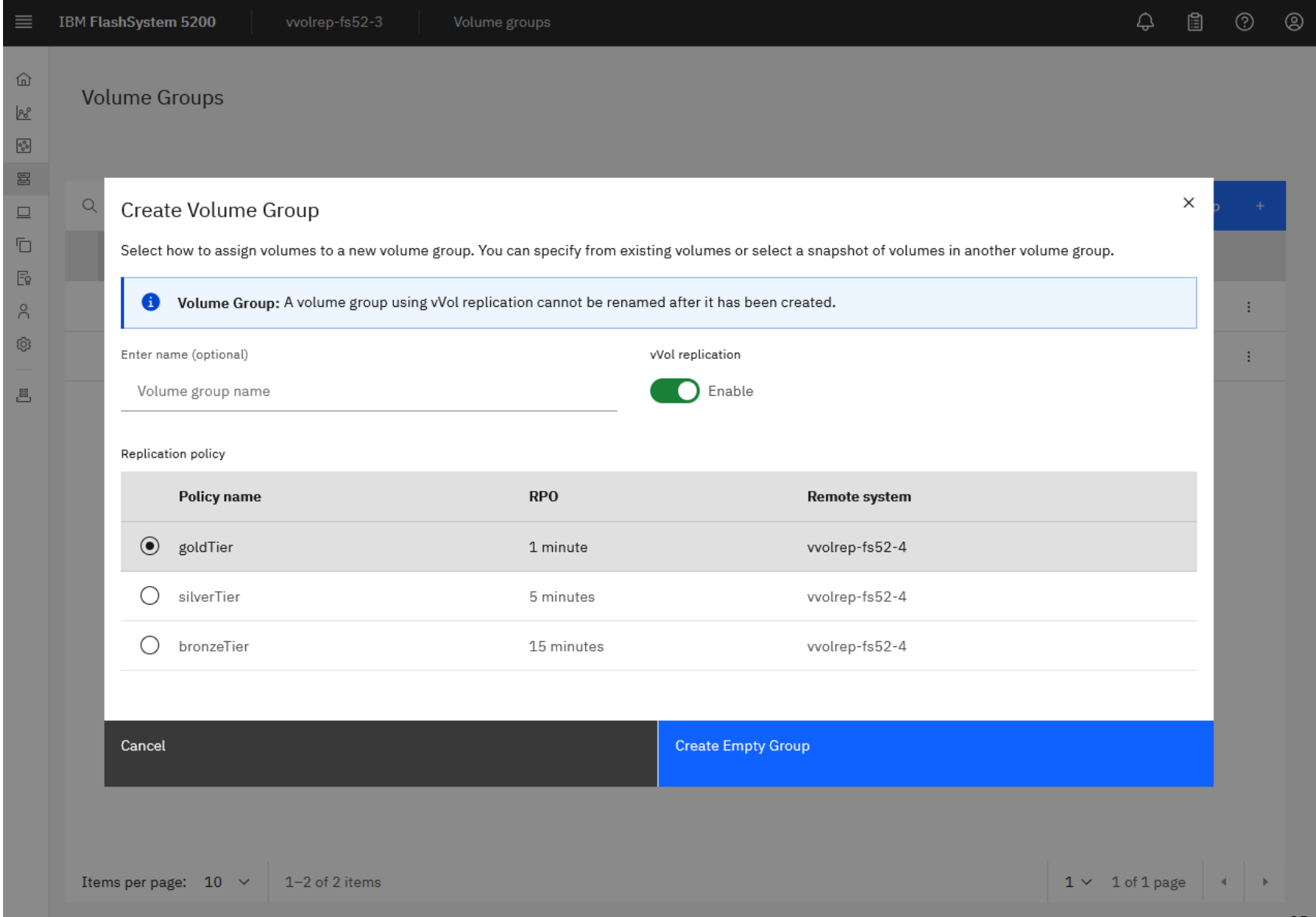
Username	Parent Pool	Child Pool Name	Child Pool Capacity
vmware	Pool0	vvolCP1	1.00 TiB
- vVols replication:** A section stating 'vVol replication is configured on this system and additional configuration can be performed using vCenter. Log into the vCenter to manage vVol replication. [More Information](#)'.
- Enable vVol replication:** A toggle switch is set to 'On'.
- Configuration summary table:**

Total vVol volume groups	Remote system	Ownership Group
1 volume group	vvolrep-fs52-4	VASA

At the bottom of the configuration area are 'Reset' and 'Save' buttons. The footer of the GUI shows performance metrics: Latency 0 ms, Read 0 ms, Write 0 ms, Bandwidth 0 MBps, Read 0 MBps, Write 0 MBps, IOPS 0, Read 0, Write 0.

# Implementing

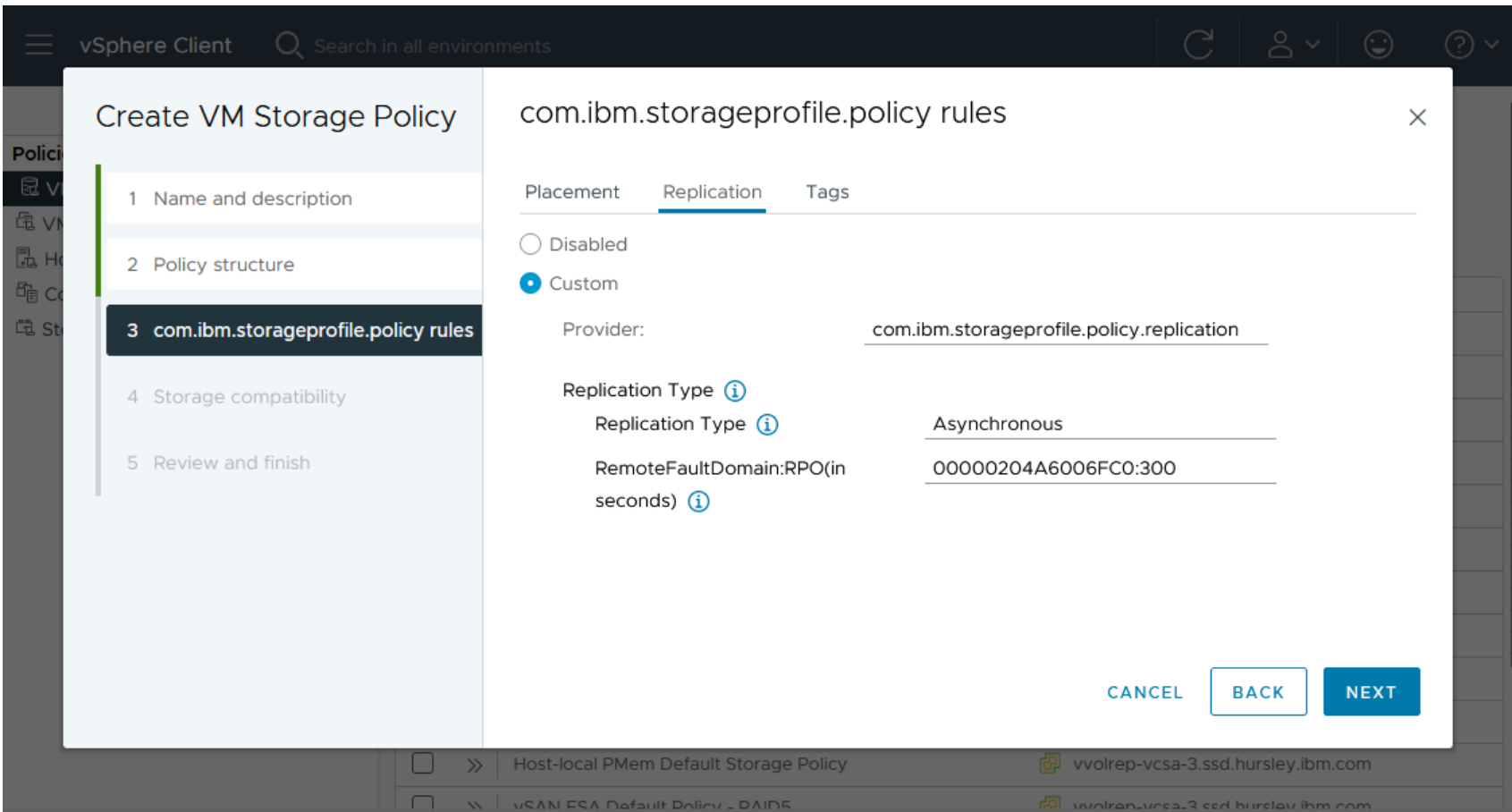
Additional **Replication Groups** can be configured for use by VMware by creating volume groups with a replication policy



# Implementing

Create VM **Storage Policies** in vSphere that specify the replication requirements

The remote system (fault domain) and RPO choices here reflect the capabilities of the vVol volume groups configured on the storage system



# Implementing

Create new Virtual Machines in vSphere, selecting a Storage Policy that includes replication and a compatible vVol data store

The **Replication Group** choices here reflect the choice of compatible volume groups configured on the storage system

The screenshot shows the vSphere Client interface during the 'New Virtual Machine' wizard. The 'Select storage' step is active, displaying a table of storage options and a 'Replication Group' dropdown menu. Two purple ovals highlight the 'VM Storage Policy' dropdown and the 'Replication Group' dropdown.

**New Virtual Machine**

- Select a creation type
- Select a name and folder
- Select a compute resource
- Select storage**
- Select compatibility
- Select a guest OS
- Customize hardware
- Ready to complete

**Select storage**

Select the storage for the configuration and disk files

Encrypt this virtual machine (Requires Key Management Server)

**VM Storage Policy** vVol replication from site1 to site2 - 5min RPO

Disable Storage DRS for this virtual machine

	Name	Storage Compatibility	Capacity	Provisioned	Free	Type
<input checked="" type="radio"/>	DS vvolrep-fs52-3 vvolC...	Compatible	1 TB	25.55 GB	1,003 GB	vVol
<input type="radio"/>	Argent-ISOs	Incompatible	6.89 TB	3.9 TB	2.99 TB	NFS v3
<input type="radio"/>	Replicants-NFS	Incompatible	503.84 GB	338.68 GB	220.08 GB	NFS v3
<input type="radio"/>	vvolrep-03-localds	Incompatible	319 GB	21.96 GB	316.74 GB	VMFS 6

Items per page 10 4 items

**Replication Group** vVol volumegroup 1 - 5min RPO

**Compatibility**

✓ Compatibility checks succeeded.

CANCEL BACK NEXT

# vVol Replication Agenda

Overview  
Planning  
Implementing  
**Monitoring**  
Managing

# Monitoring

Replication status can be seen under

## Volumes > Volume Groups

High-level summary of all volume groups

The screenshot shows the 'Volume Groups' page in the IBM FlashSystem 5200 management interface. The page title is 'Volume Groups' and the breadcrumb is 'Volumes > Volume Groups'. The table lists the following volume groups:

Name	Replication State	RPO Status	Volume Count	Replication Policy	vVols
appGroup1	✓ Running	✓ Recovery point within policy	5	goldTier	No
appGroup2	-	-	2	-	No
vvolReplicationGroup1	✓ Running	✓ Recovery point within policy	4	goldTier	Yes
vvolReplicationGroup2	✓ Running	✓ Recovery point within policy	0	silverTier	Yes

# Monitoring

Replication status can be seen under

## Volumes > Volume Groups

Table can be searched, sorted and filtered to easily identify groups of interest

The screenshot displays the IBM FlashSystem 5200 management console for 'vvolrep-fs52-3' under 'Volume groups'. The 'Volume Groups' section includes a search bar and a 'Create Volume Group' button. Below are filter dropdowns for Name, Replication State, RPO Status, Replication Policy, Safeguarded Backup Policy, Snapshot Policy, Snapshot Count, Safeguarded, Ownership group, and vVols. The vVols filter is currently open, showing 'Yes' selected. The table below lists the volume groups:

Name	Replication State	RPO Status	Volume Count	Replication Policy	vVols
vvolReplicationGroup1	Running	Recovery point within policy	4	goldTier	Yes
vvolReplicationGroup2	Running	Recovery point within policy	0	silverTier	Yes

At the bottom, the interface shows 'Items per page: 10' and '1-2 of 2 items'.



# Monitoring

Replication status can be seen under

## Volumes > Volume Groups

Selecting a volume group and selecting the **Policies** tab:

- displays detailed replication status for the group

- provides links for the actions for replication that can be performed on the group

The screenshot displays the IBM FlashSystem 5200 management interface. The breadcrumb navigation shows 'Volume groups / vvolReplicationGroup1'. The main content area is titled 'vvolReplicationGroup1' and shows a 'Policies (1)' tab. A 'vVol replication' button is highlighted with a purple oval. Below this, a 'Replication Policy' card is shown with details: Policy name 'goldTier', Topology '2 Site, Asynchronous', and RPO Alert '1 minute'. The 'Replication status' section shows two volume groups: 'vvolrep-fs52-3' (Production copy) and 'vvolrep-fs52-4'. A purple oval highlights the 'vvolrep-fs52-4' card, which includes a tooltip stating 'Replication for this volume group is managed by VMware' and an 'Enable access' button. A message on the right states 'Snapshot policies are not currently supported by vVols.' The bottom right corner has a link: 'To use External Safeguarded Backup Policy, [Learn More](#)'.

# Monitoring

Storage Policy compliance can be seen in vSphere

The screenshot shows the vSphere Client interface for a virtual machine named VM1. The top navigation bar includes a search field and a menu icon. Below the navigation bar, there are tabs for Summary, Monitor, Configure, Permissions, Datastores, Networks, Snapshots, and Updates. The Summary tab is active, displaying an 'Issues and Alarms' section with a warning: 'There is no network assigned to this virtual machine.' Below this, there are three main panels: 'Guest OS' with a console launch button, 'Virtual Machine Details' showing power status (Powered On), guest OS (VMware Photon OS), and VMware Tools (Running), and 'Storage Policies' which is circled in purple. The Storage Policies panel shows 'VM Storage Policies' (vVol replication from site1 to site2 - 5min RPO) and 'VM Storage Policy Compliance' (Compliant). It also shows the last checked date as 10/24/2023, 12:46:47 PM and a 'CHECK COMPLIANCE' button.

vSphere Client Search in all environments

VM1 ACTIONS

Summary Monitor Configure Permissions Datastores Networks Snapshots Updates

Issues and Alarms

⚠ There is no network assigned to this virtual machine.

Guest OS

LAUNCH REMOTE CONSOLE

LAUNCH WEB CONSOLE

Virtual Machine Details ACTIONS

Power Status Powered On

Guest OS VMware Photon OS (64-bit)

VMware Tools Running, version:11365 (Guest Managed)

DNS Name

IP Addresses

Encryption Not encrypted

Storage Policies

VM Storage Policies

vVol replication from site1 to site2 - 5min RPO

VM Storage Policy Compliance

✓ Compliant

Last Checked Date

10/24/2023, 12:46:47 PM

VM Replication Groups

CHECK COMPLIANCE

# vVol Replication Agenda

Overview  
Planning  
Implementing  
Monitoring  
**Managing**

VMware can perform three types of failovers:

- **Planned failover**
- Unplanned Failover
- Test Failover

Movement of a VM from one site to another for a planned migration.

The systems at both sites are required to be accessible throughout the failover process.

Failover of a VM without data loss (RPO=0).

Once a planned failover is complete, replication can optionally be reversed so that the failed-over VM can be reprotected.

VMware can perform three types of failovers:

- Planned failover
- Unplanned Failover
- Test Failover

Movement of a VM in response to a failure in the production site.

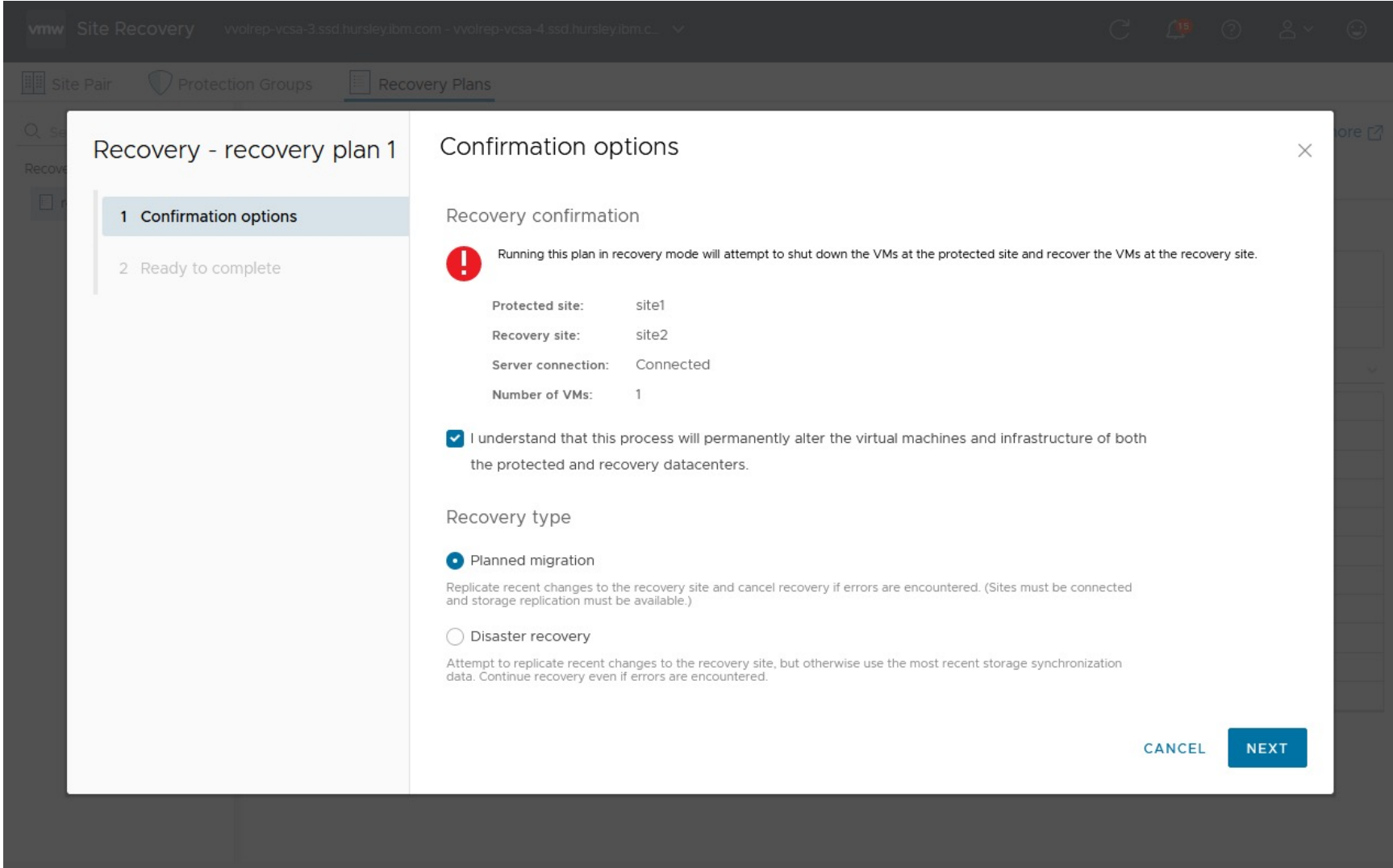
Only the recovery system is required to be accessible. If the original production site recovers after the failover, replication can optionally be reversed so that the failed-over VM can be reprotected. Alternatively, a new storage policy with alternative replications settings can be configured.

VMware can perform three types of failovers:

- Planned failover
- Unplanned Failover
- Test Failover

Allows the recovery copy of a VM to be brought up for testing, without taking down the production VM. Test failover enables temporary access to the recovery environment to allow a failover plan to be verified before an actual disaster or planned migration. When the test failover is stopped, any changes made to the recovery copy during the test are discarded.

# Example planned failover using VMware Site Recovery Manager



# Example planned failover using VMware Site Recovery Manager

The screenshot displays the VMware Site Recovery Manager interface. The top navigation bar includes 'Site Pair', 'Protection Groups', and 'Recovery Plans'. The main content area shows 'recovery plan 1' with a progress bar at 51% completion. Below the progress bar, a table lists 14 recovery steps with their respective statuses and completion times.

Recovery Step	Status	Step Started	Step Completed
1. Restore hosts from standby for live migration	Skipped		
2. Suspend non-critical VMs at recovery site for liv...			
3. Prepare stretched storage consistency groups f...	Skipped		
4. Live migration of VMs			
5. Pre-synchronize storage	Success	Tuesday, October ...	Tuesday, October 24, ...
6. Shut down VMs at protected site	Success	Tuesday, October ...	Tuesday, October 24, ...
7. Resume VMs suspended by previous recovery			
8. Restore recovery site hosts from standby	Success	Tuesday, October ...	Tuesday, October 24, ...
9. Restore protected site hosts from standby			
10. Prepare protected site VMs for migration	Success	Tuesday, October ...	Tuesday, October 24, ...
11. Synchronize storage	Running	Tuesday, October ...	4%
12. Suspend non-critical VMs at recovery site			
13. Change recovery site storage to writable			
14. Power on priority 1 VMs			



# Example using PowerCLI

## Preparing for a Planned Failover

```
PS /Users/warren> Get-Cluster Cluster1 | Get-VM -server vvolrep-vcsa-1 | Format-Table -AutoSize
```

Name	PowerState	Num CPUs	MemoryGB
bulk-TestSPBMPolicy-myvVolVG-60-1-1-02	PoweredOn	1	2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-05	PoweredOn	1	2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-01	PoweredOn	1	2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-03	PoweredOn	1	2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-04	PoweredOn	1	2.000
vvolrep-11-1	PoweredOn	2	8.000
vvolrep-12-1	PoweredOff	2	8.000

“bulk” VMs exist in vCSA-1

```
PS /Users/warren> Get-Cluster Cluster2 | Get-VM -server vvolrep-vcsa-2 | Format-Table -AutoSize
```

Name	PowerState	Num CPUs	MemoryGB
vvolrep-21-1	PoweredOff	2	6.000
vvolrep-22-2	PoweredOff	2	8.000

No “bulk” VMs exist in vCSA-2

```
PS /Users/warren> $ReplicationGroups = Get-SpbmReplicationGroup
```

```
PS /Users/warren> $ReplicationGroups | Format-Table -AutoSize
```

Name	ReplicationState
myvVolVG-60-1	Source
rfc4122.d150a8dc-fb02-44e7-a6cb-acbf9c4620f3	Target

```
PS /Users/warren> $ReplicationGroupSource = Get-SpbmReplicationGroup | Where-Object {$_.State -eq "Source"}
```

```
PS /Users/warren> $ReplicationGroupPair = Get-SpbmReplicationPair -Source $ReplicationGroupSource
```

```
PS /Users/warren> $ReplicationGroupTarget = $ReplicationGroupPair.Target
```

```
PS /Users/warren> Sync-SpbmReplicationGroup -PointInTimeReplicaName "Checkpoint 1" -ReplicationGroup $ReplicationGroupTarget
```

Name	CreationTime	ReplicationGroup
rfc4122.d150a8dc-fb02-44...	25/10/2023 12:42:06	rfc4122.d150a8dc-fb02-44...

Synchronize IO checkpoint

```
PS /Users/warren> Start-SpbmReplicationPrepareFailover $ReplicationGroupSource
```

Prepare Failover

# Example using PowerCLI

## Triggering Planned Failover

```
PS /Users/warren> $VMs = Start-SpbmReplicationFailover -ReplicationGroup $ReplicationGroupTarget
Confirm
Are you sure you want to perform this action?
Performing the operation "Starting failover on" on target "Replication group 'rfc4122.d150a8dc-fb02-44e7-a6cb-acbf9c4620f3'".
[Y] Yes [A] Yes to All [N] No [L] No to All [S] Suspend [?] Help (default is "Y"): a

PS /Users/warren> $VMs
[vVolCP1-vvolrep-fs52-2] rfc4122.07e8f9be-4fe5-4083-80ad-ca29abe87eed/bulk-TestSPBMPolicy-myvVolVG-60-1-1-01.vmx
[vVolCP1-vvolrep-fs52-2] rfc4122.46dae322-a2b4-4ab5-a4c1-3789df3487c2/bulk-TestSPBMPolicy-myvVolVG-60-1-1-04.vmx
[vVolCP1-vvolrep-fs52-2] rfc4122.63d85174-9aa0-4c20-baef-50289c5404a2/bulk-TestSPBMPolicy-myvVolVG-60-1-1-02.vmx
[vVolCP1-vvolrep-fs52-2] rfc4122.bda8fe2e-26ee-4c09-b738-3f4e4e790a87/bulk-TestSPBMPolicy-myvVolVG-60-1-1-03.vmx
[vVolCP1-vvolrep-fs52-2] rfc4122.cf984cb7-9b01-4038-8252-4f476a006c55/bulk-TestSPBMPolicy-myvVolVG-60-1-1-05.vmx

PS /Users/warren> $VMsToRegister = @()
PS /Users/warren> foreach ($VM in $VMs){
>>     $VMsToRegister += New-VM -VMFilePath $VM -ResourcePool Cluster2
>> }

PS /Users/warren> Get-Cluster Cluster2 | Get-VM | Format-Table -AutoSize

Name                                     PowerState Num CPUs MemoryGB
----
bulk-TestSPBMPolicy-myvVolVG-60-1-1-05  PoweredOff 1         2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-03  PoweredOff 1         2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-02  PoweredOff 1         2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-04  PoweredOff 1         2.000
bulk-TestSPBMPolicy-myvVolVG-60-1-1-01  PoweredOff 1         2.000
vvolrep-21                               PoweredOff 2         6.000
vvolrep-22                               PoweredOff 2         8.000

PS /Users/warren> Start-SpbmReplicationReverse -ReplicationGroup $ReplicationGroupTarget

Name             ReplicationState
----
myvVolVG-60-1   Source
```

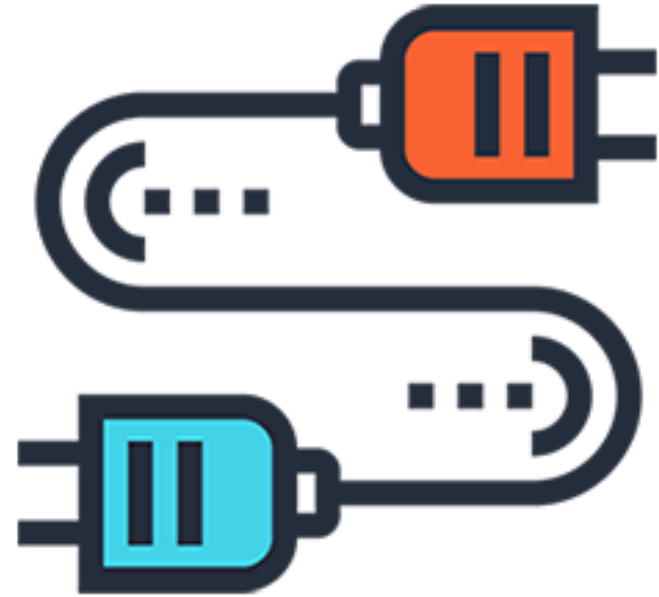
Initiate Planned Failover

Register VMs into vCSA-2

"bulk" VMs now in vCSA-2

Initiate re-protection / reverse replication

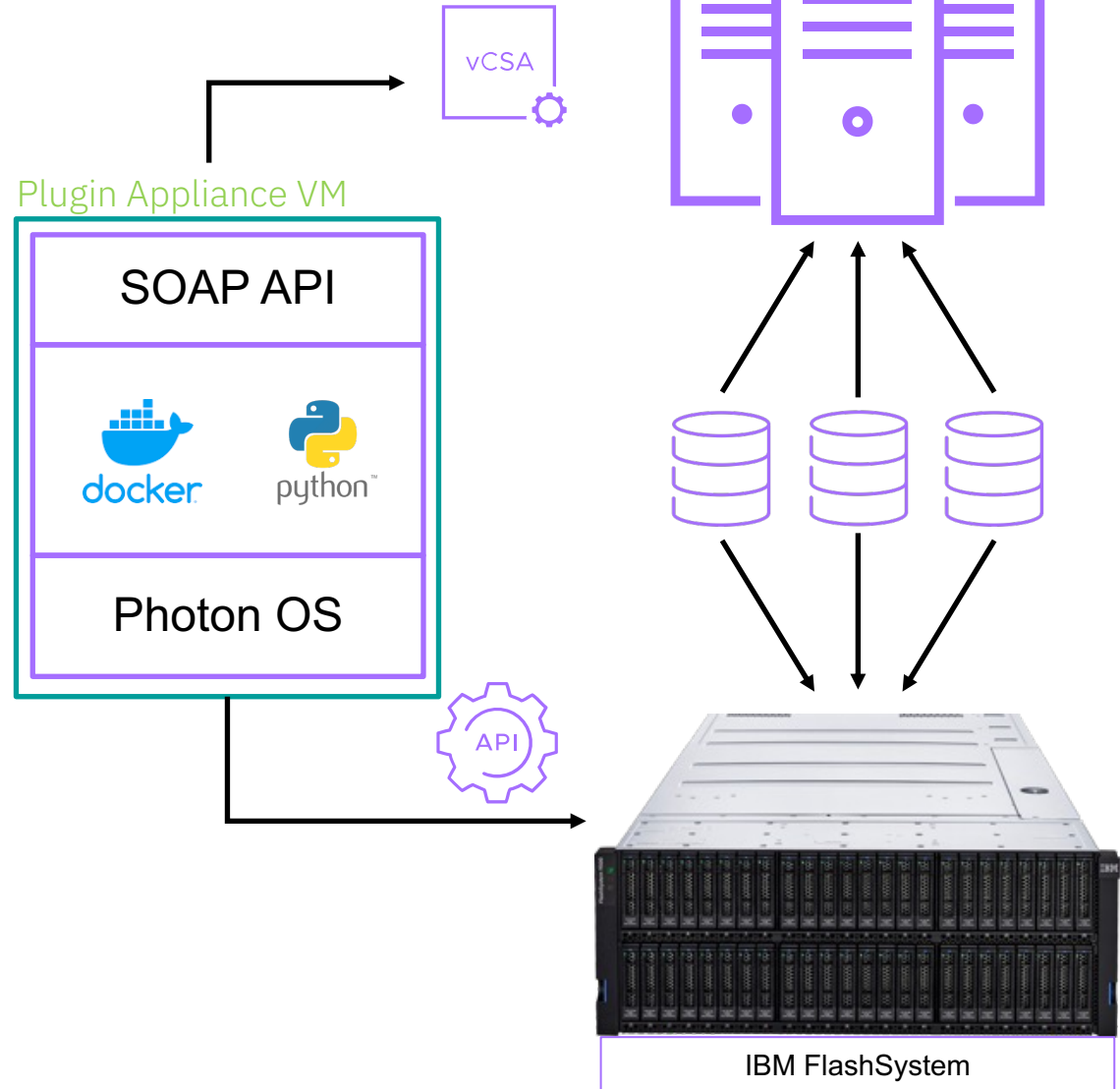
# VMware Plugin 1.2



# IBM Storage Virtualize plugin for vSphere

*Automates vSphere and storage tasks together All from the vCenter UI*

- Based on VMware remote plugin architecture
- Supports all Storage Virtualize platforms: FlashSystem (8.4.2+), SAN Volume Controller and Storwize products)
- Manage multiple storage systems from within vSphere
- Simplifies Storage Provisioning & Management
- Provides storage context for vSphere objects
- OVA Download from IBM Fix Central



# Current vSphere Plugin Capabilities

- **Create Multiple Datastores**

- Automates creation of volumes, mapping to hosts and creation of VMFS datastores



- **Expand Datastore**

- Combines volume expansion and increase datastore capacity



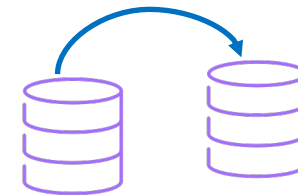
- **Delete Datastore**

- Combines unmount datastore, delete volume and delete datastore
- Checks for existing VMs registered and Snapshots



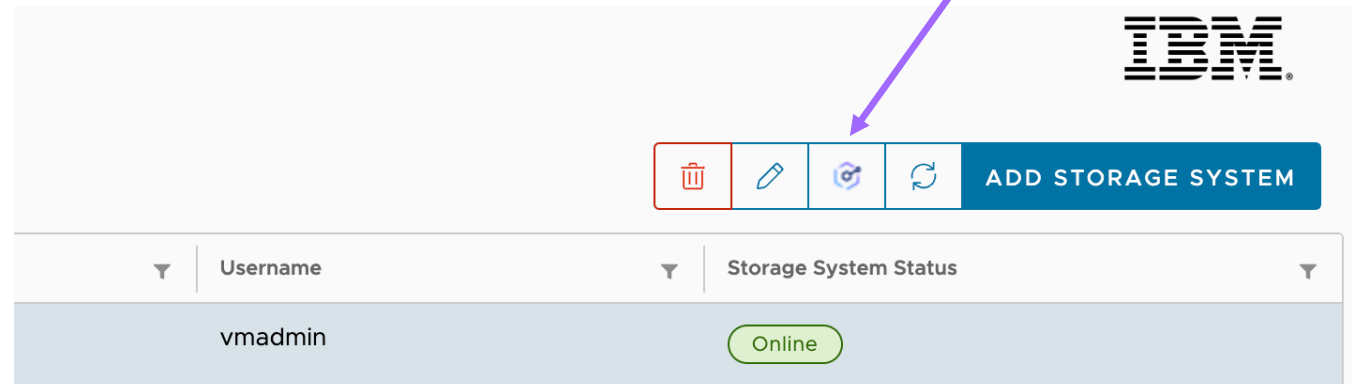
- **Snapshot**

- Volume Group Snapshot support
- Creates volume group, adds volume to VG and initiates a snapshot



# 1.1.1 Updates

- Hyperlink to Storage Insights (if enabled)
- RBAC on the VMWare Cluster
- Manually Rescan all objects managed by the plugin



# IBM Storage Virtualize plugin for vSphere v1.2

## Volume Groups

- Snapshot Policies
- Replication Policies

## Snapshot Management

## Multiple-Pools

Manage Volume Group

Select a volume group to add **Datastore1** underlying volume to.

**Snapshot Policy:** Taken every Wednesday at 10:00 AM and retained for 30 days. Safeguarded

**Replication Policy:** 5 minute RPO Alert 2 Site, Asynchronous  
Zooty Production | Snazzy Recovery

Search for a volume group:

Volume Group Name	Replication Policy	Snapshot Policy
<input type="radio"/> volumegroup1	-	predefinedsspolicy0
<input type="radio"/> volumegroup2	replicationpolicy1	-
<input type="radio"/> volumegroup3	-	-
<input type="radio"/> volumegroup4	-	predefinedsspolicy1
<input checked="" type="radio"/> volumegroup5	replicationpolicy0	predefinedsspolicy2
<input type="radio"/> volumegroup6	-	-
<input type="radio"/> volumegroup7	-	-

1-10 / 100 < 1 >

# Plugin Dashboard Updates

- The dashboard presents all the registered IBM storage systems and specific information for each of them.

The screenshot shows the vSphere Client interface with the IBM Storage plugin. The top navigation bar includes 'vm vSphere Client', a search bar, and the user 'Administrator@VSPHERE.LOCAL'. The main header displays 'IBM Storage' and the instance 'INSTANCE 9.71.20.18:443'. Below the header is a table listing storage systems, with an 'ADD STORAGE SYSTEM' button. The table has columns for Storage System Name, Alias Name, Product Name, URL, Username, and Storage System Status. Two systems are listed: 'vvolsftw-sv1' and 'vvolsftw-dh8', both with 'Online' status.

	Storage System Name	Alias Name	Product Name	URL	Username	Storage System Status
○ >>	vvolsftw-sv1	FS-SV1	IBM SAN Volume Controller	9.71.20.20	superuser	Online
○ >>	vvolsftw-dh8	FS-DH8	IBM SAN Volume Controller	9.71.20.130	superuser	Online

The screenshot shows the detailed view of the 'vvolsftw-sv1' storage system. The top right has an 'ADD STORAGE SYSTEM' button. The left sidebar shows a list of storage systems with 'vvolsftw-sv1' selected. The main area is split into 'Pool Details' and 'More Details' tabs. The 'More Details' tab is active, showing various system parameters and their values.

Parameter	Value
URL	9.71.20.20
Storage System Status	Online
Username	superuser
Product Name	IBM SAN Volume Controller
Code Level	8.6.0.2 (169.23.2310161109000)
Cluster ID	0000020325200037
Time Zone	522 UTC
Console IP	9.71.20.20
NTP Server	9.71.44.170
vDisk Protection Enabled	No
vDisk Protection Time	15
Enhanced Callhome	On
Host Unmap	Off
Snapshot Policy Suspended	No



# Support for Multiple Pools

- When adding a new storage system, you can now select multiple pools for management under the plugin

**Add Storage System**

- 1 Connect to Storage
- 2 Storage System Details
- 3 Pool Selection**
- 4 Review

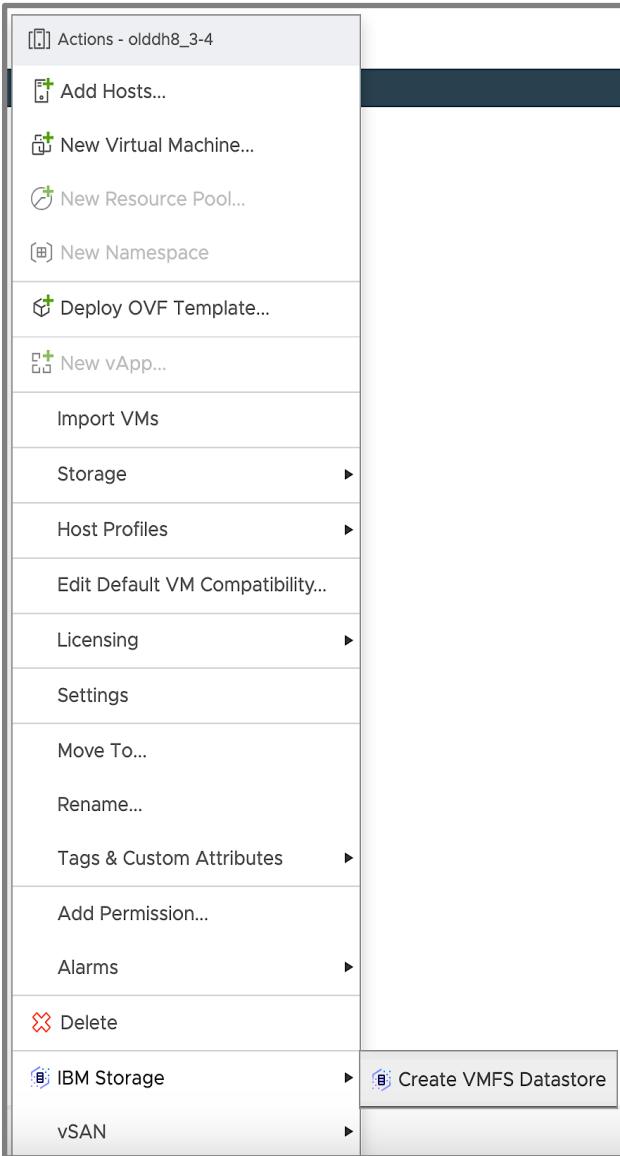
**Pool Selection** ✕

Select a pool from the list below. This pool will be used when creating volumes during datastore creation.

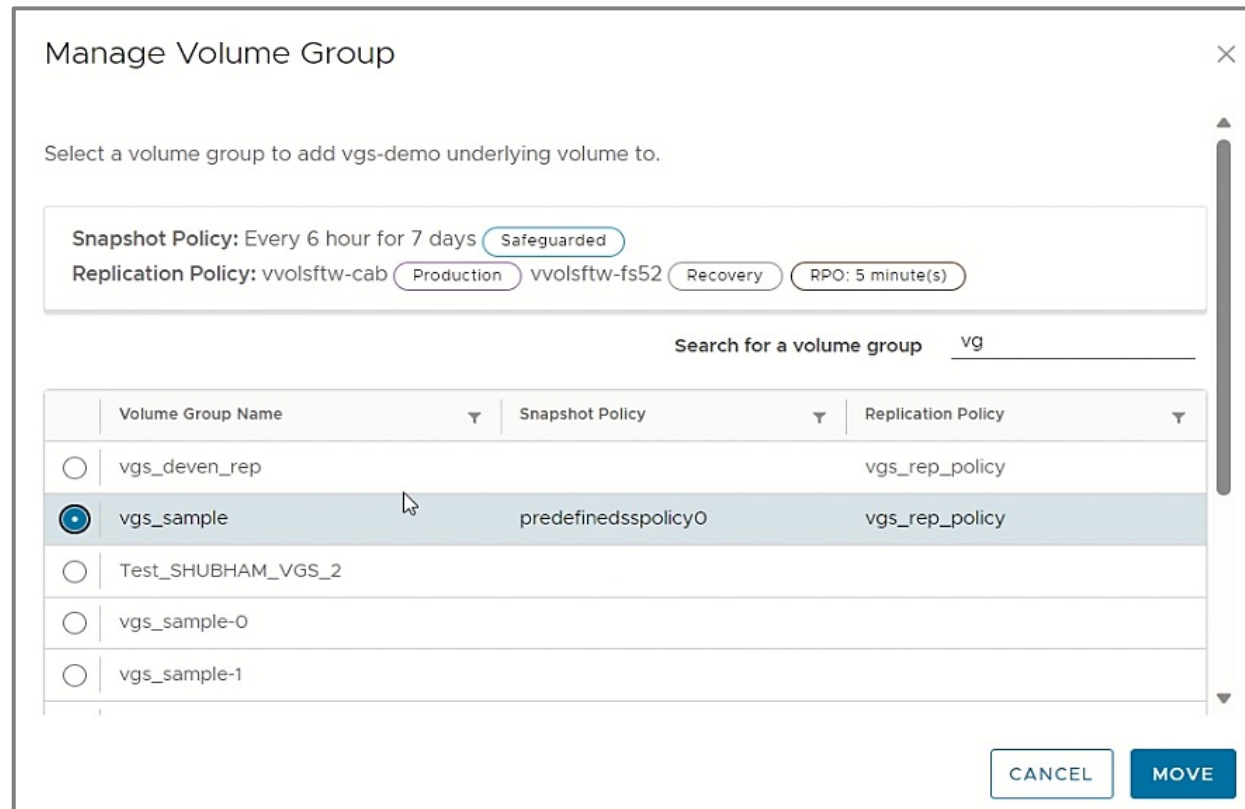
<input type="checkbox"/>	Pool Name ▾	Parent Pool ▾	Provisioning Policy ▾	Capacity	Status ▾
<input type="checkbox"/>	mdiskgrp0	-	None	<div style="width: 20%; background-color: #0070C0;"></div>	Online
<input type="checkbox"/>	hagrid	mdiskgrp0	None	<div style="width: 10%; background-color: #A9A9A9;"></div>	Online
<input type="checkbox"/>	plugin	mdiskgrp0	Capacity Optimized	<div style="width: 10%; background-color: #A9A9A9;"></div>	Online

CANCEL BACK NEXT

# Create VMFS Datastore with Volume Groups

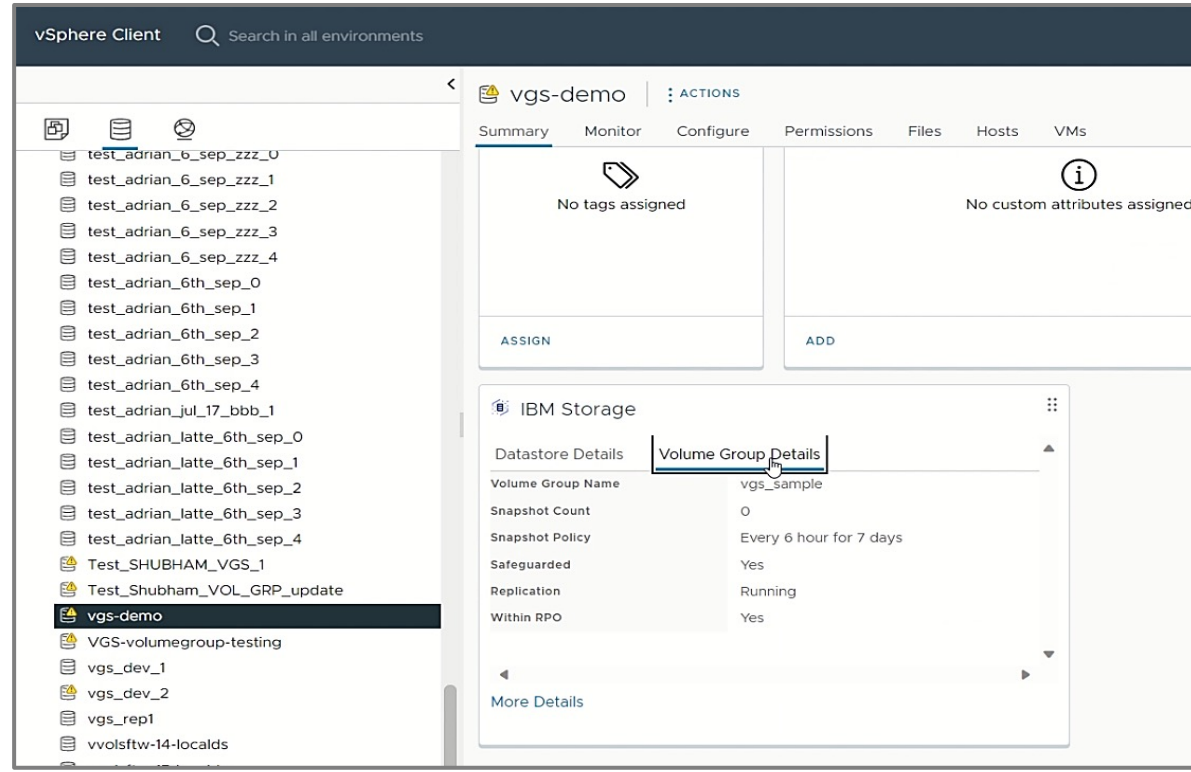
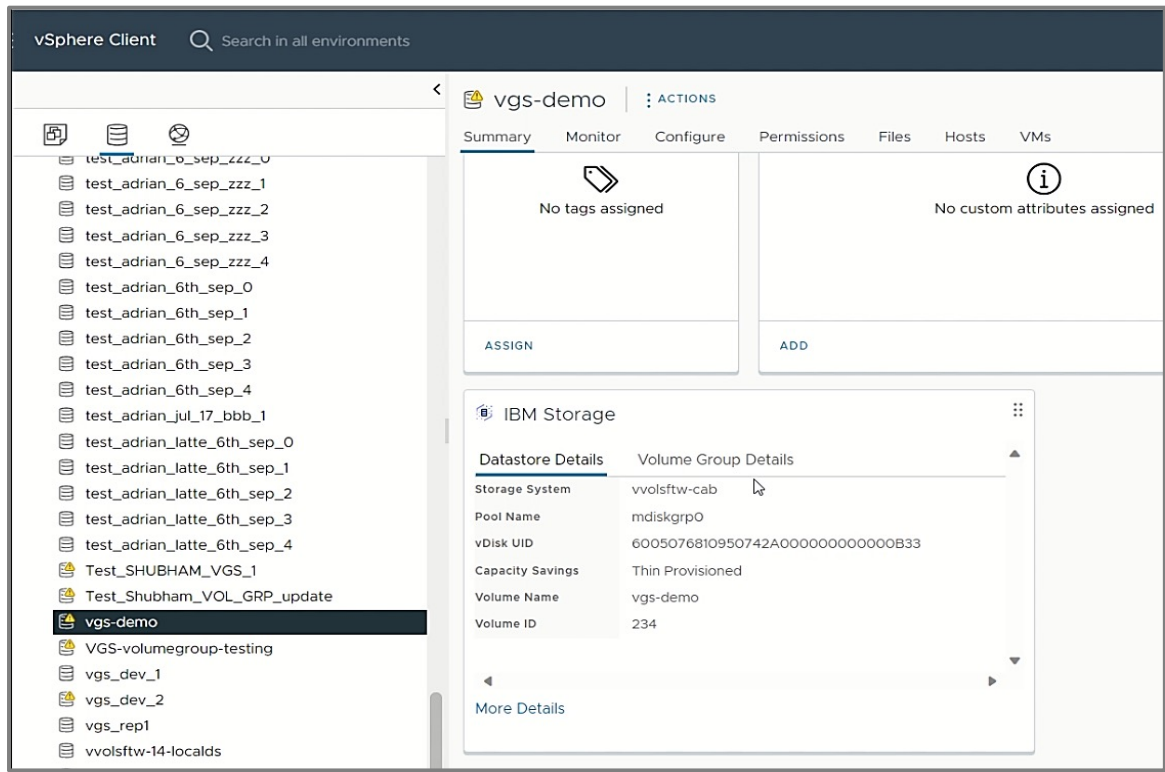


- During VMFS datastore creation, the user can now select a volume group for the datastore to reside in
- Support for showing snapshot and replication policies of the volume group
  - Snapshot policy will show schedule details
  - Replication policy will show locations and RPO



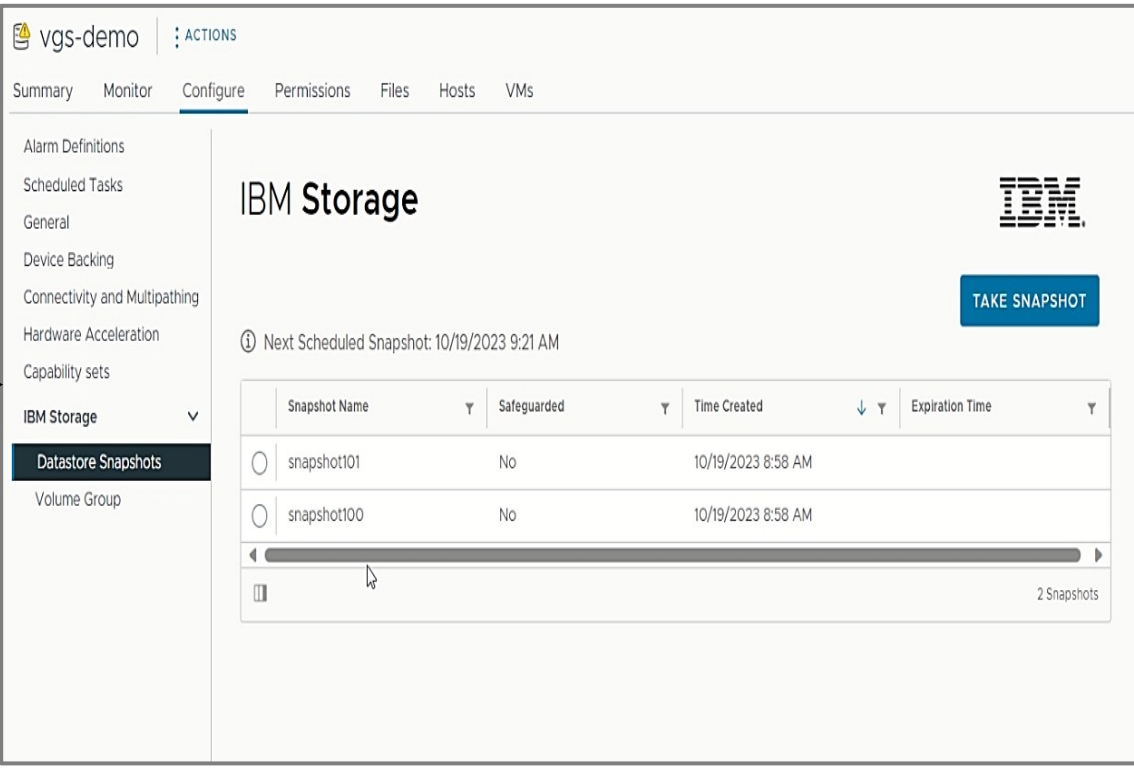
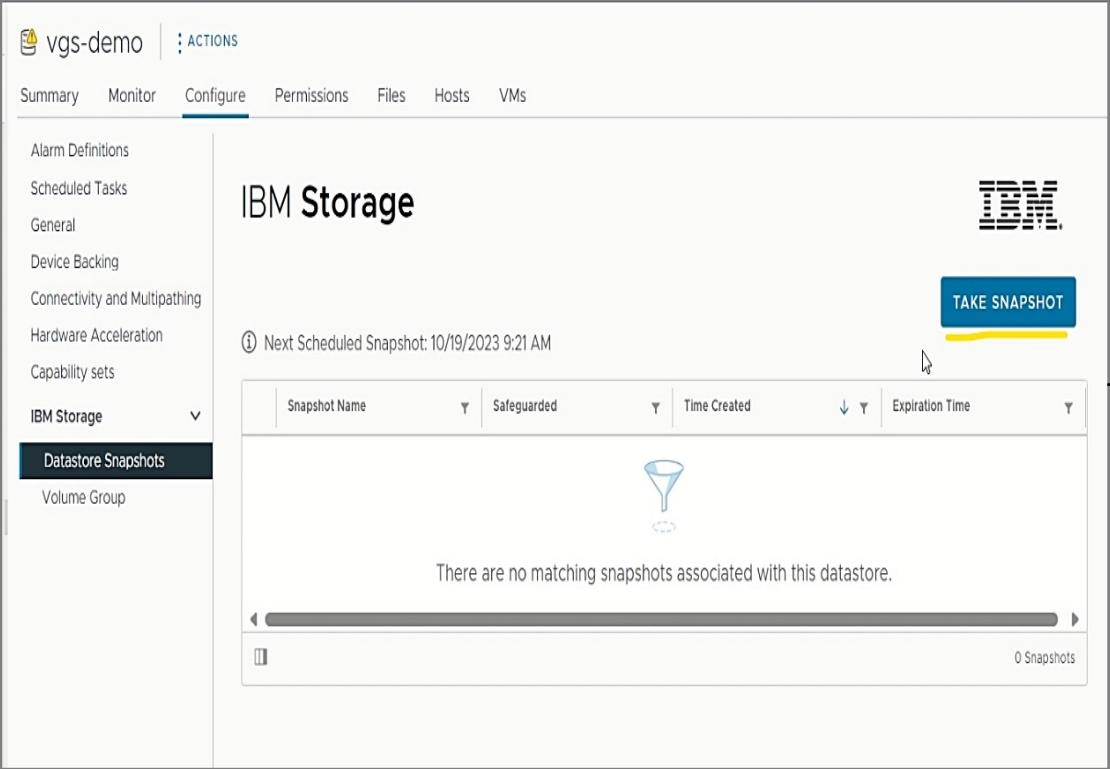
# Datastore Summary

- VMware Admin can see **“Datastore Details”** in summary section
- VMware Admin can also see **“Volume Group Details”** in summary section



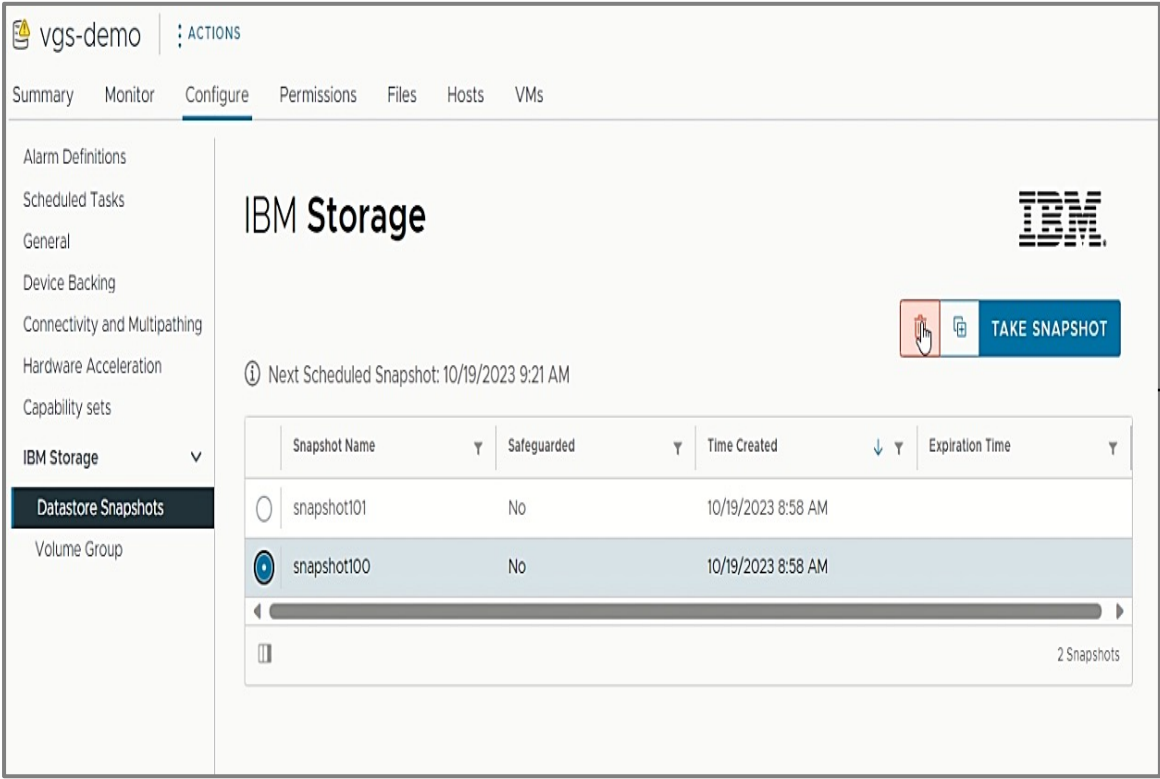
# Datastore Snapshots

- Provision to **take a snapshot** of volume group associated to datastore.
- List of snapshots taken on a volume group are visible in this section with its attributes like safeguarded, creation and expiry time.



# Delete a Snapshot

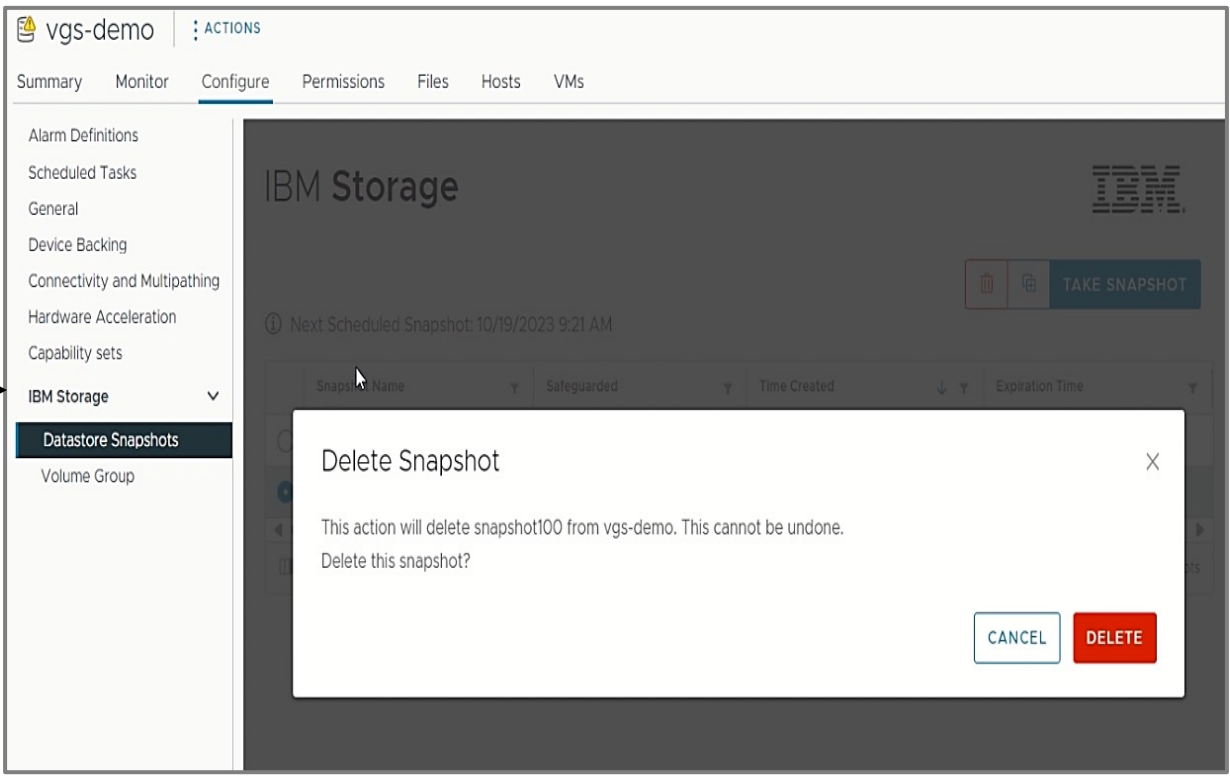
- Provision to delete a snapshot of volume group associated to datastore.



The screenshot shows the 'Configure' tab for 'IBM Storage' in a 'vgs-demo' environment. A table lists two snapshots:

Snapshot Name	Safeguarded	Time Created	Expiration Time
snapshot101	No	10/19/2023 8:58 AM	
snapshot100	No	10/19/2023 8:58 AM	

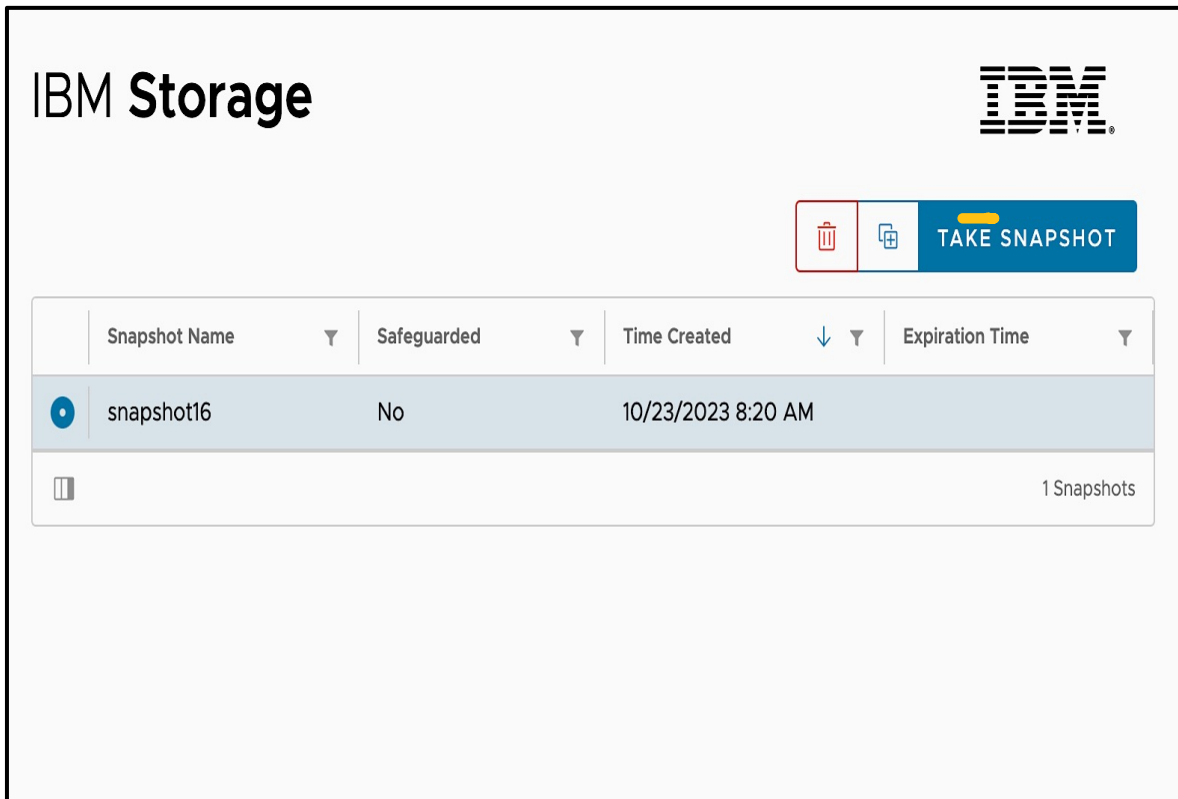
The 'snapshot100' row is selected. A 'TAKE SNAPSHOT' button is visible in the top right of the configuration area.



The screenshot shows the 'Delete Snapshot' dialog box. The message reads: 'This action will delete snapshot100 from vgs-demo. This cannot be undone. Delete this snapshot?'. There are 'CANCEL' and 'DELETE' buttons at the bottom right.

# Copy Snapshot to a New Datastore

- Provision to perform copy of snapshot which creates a new datastore using thin clone or clone.



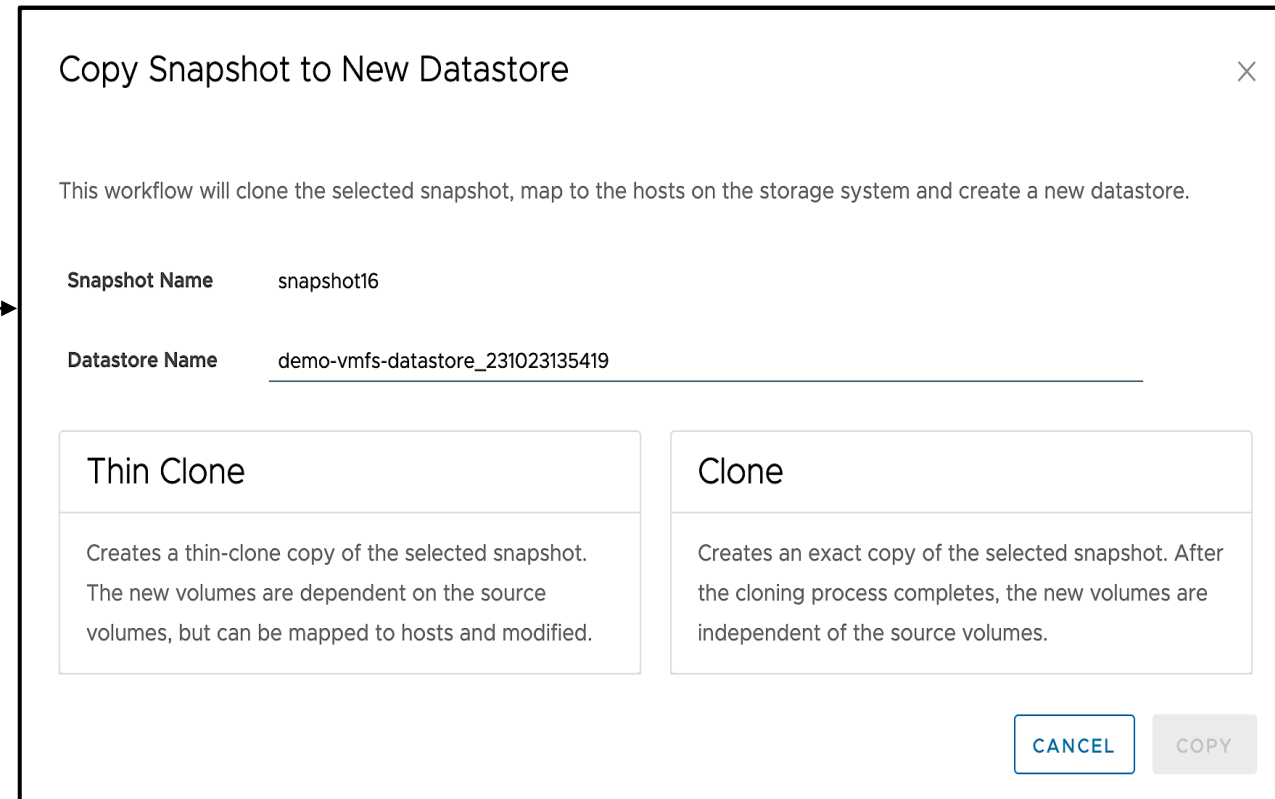
IBM Storage

IBM

TAKE SNAPSHOT

Snapshot Name	Safeguarded	Time Created	Expiration Time
snapshot16	No	10/23/2023 8:20 AM	

1 Snapshots



Copy Snapshot to New Datastore

This workflow will clone the selected snapshot, map to the hosts on the storage system and create a new datastore.

Snapshot Name: snapshot16

Datastore Name: demo-vmfs-datastore\_231023135419

**Thin Clone**  
Creates a thin-clone copy of the selected snapshot. The new volumes are dependent on the source volumes, but can be mapped to hosts and modified.

**Clone**  
Creates an exact copy of the selected snapshot. After the cloning process completes, the new volumes are independent of the source volumes.

CANCEL COPY

# Volume Group Details of a Datastore

- VMware Admin can see “**Snapshot Policy**” details of Volume Group, if assigned
- VMware Admin can see “**Replication Policy**” details of Volume Group, if assigned

The screenshot displays the vSphere Client interface for an IBM Storage environment. The left sidebar shows a list of storage objects, with 'vgs-demo' selected. The main content area shows the 'Configure' tab for the 'vgs-sample' volume group. The volume group is in a 'Replicating' and 'Safeguarded' state. Two policy details are shown:

Snapshot Policy	
Policy Name	predefinedsspolicy0
Policy	Every 6 hour for 7 days
Safeguarded	yes
Next Scheduled Snapshot	10/19/2023 9:21 AM

Replication Policy	
Policy Name	vgs_rep_policy
Topology	2-site-async-dr
RPO Alert	RPO: 5 minute(s)
Systems	vvolsftw-cab (production) vvolsftw-fs52 (recovery)

# Manage Volume Group for a Datastore

- Provision to move datastore from one Volume Group to other on a given storage system, based on policy requirements

The screenshot shows the IBM Storage configuration interface for a datastore named 'adrian\_mocha\_13\_june\_0'. The left sidebar contains navigation options like 'Summary', 'Monitor', 'Configure', 'Permissions', 'Files', 'Hosts', and 'VMs'. The main area is divided into two policy sections: 'Snapshot Policy' and 'Replication Policy'. The 'Snapshot Policy' section shows details for 'predefinedsspolicy0', including a frequency of 'Every 6 hour for 7 days', 'Safeguarded' status, and a 'Next Scheduled Snapshot' of '10/19/2023 11:04 AM'. The 'Replication Policy' section indicates 'No Replication Policy Assigned.' A blue button labeled 'MANAGE VOLUME GROUP' is positioned between the two sections and is highlighted with a yellow underline.

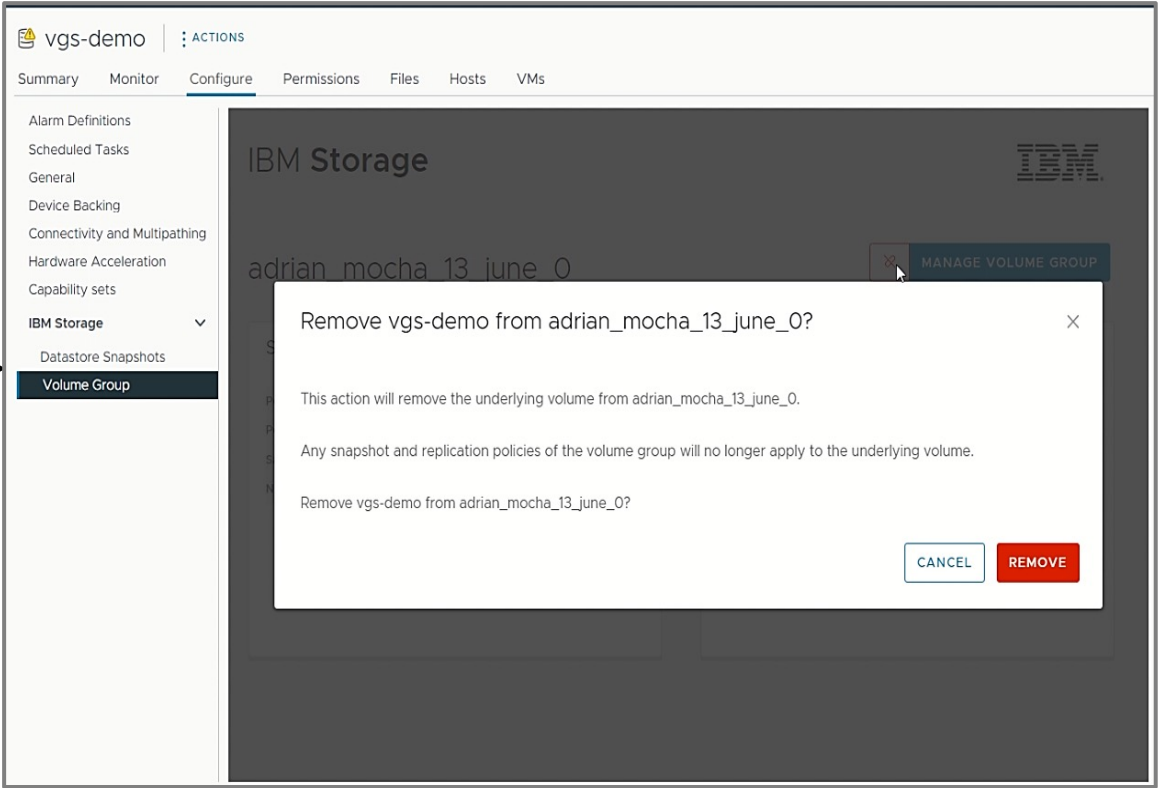
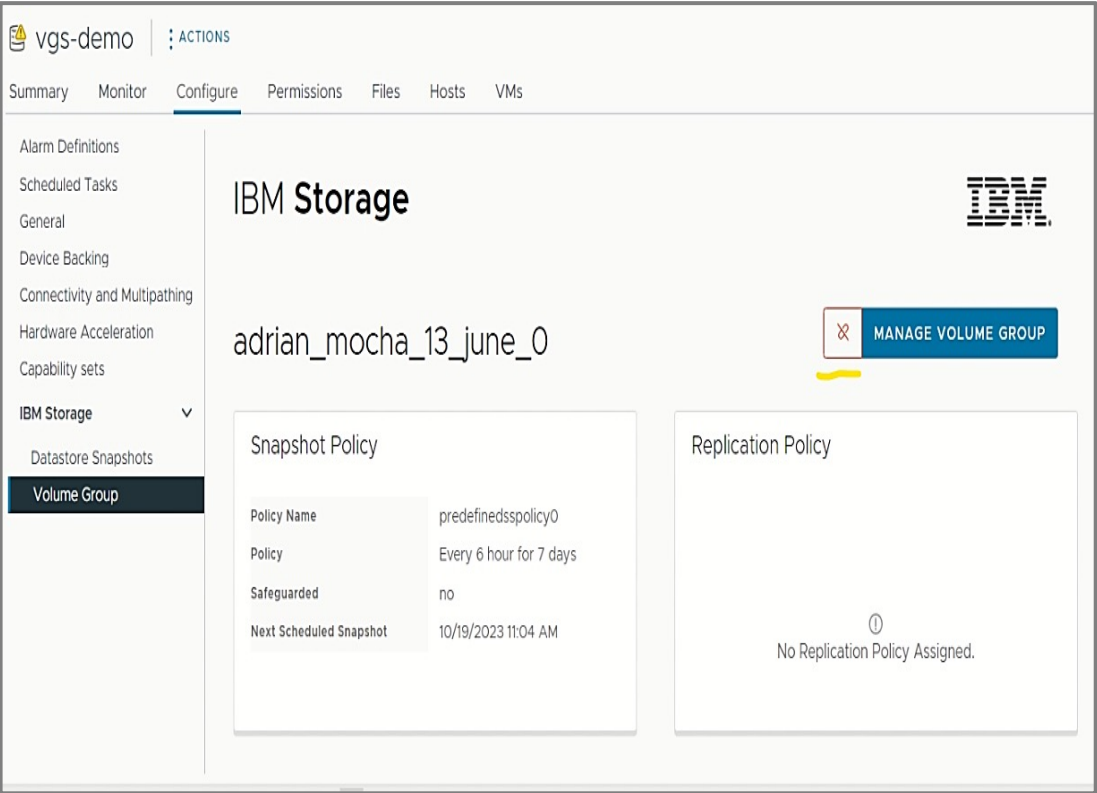
The 'Manage Volume Group' dialog box prompts the user to 'Select a volume group to add vgs-demo underlying volume to.' It displays the current configuration: 'Snapshot Policy: Every 6 hour for 7 days Safeguarded' and 'Replication Policy: vvolsftw-cab Production vvolsftw-fs52 Recovery RPO: 5 minute(s)'. Below this is a search bar with the text 'Search for a volume group vgs'. A table lists available volume groups with columns for 'Volume Group Name', 'Snapshot Policy', and 'Replication Policy'. The 'vgs\_sample' group is selected, showing a 'predefinedsspolicy0' snapshot policy and a 'vgs\_rep\_policy' replication policy. Other groups listed include 'vgs\_deven\_rep', 'Test\_SHUBHAM\_VGS\_2', 'vgs\_sample-0', and 'vgs\_sample-1'. 'CANCEL' and 'MOVE' buttons are at the bottom right.

Volume Group Name	Snapshot Policy	Replication Policy
<input type="radio"/> vgs_deven_rep		vgs_rep_policy
<input checked="" type="radio"/> vgs_sample	predefinedsspolicy0	vgs_rep_policy
<input type="radio"/> Test_SHUBHAM_VGS_2		
<input type="radio"/> vgs_sample-0		
<input type="radio"/> vgs_sample-1		



# Remove Volume Group for a Datastore

- Provision to remove a datastore from a Volume Group



# Upgrade Plugin From v1.1

## **Database upgrade**

- We will support database migration so that existing data is not lost when upgrading from from v1.1/1.1.1 to v1.2.0.
- Seamless upgrade - It would ensure continuous management of old datastores by new plugin instance.

# Restore In Place/Single Volume Clone



# Snapshot Restore

- In 8.5.1 we added the ability for a user to take a snapshot of a volume group. If they wanted to access the data from one of those snapshots they had to create a volume group from the snapshot and set up the required host mappings.
- 8.6.2 adds full support for the restoration of a volume group from one of its snapshots thereby removing the need to create volume groups and set up host mappings.
- This functionality is provided by the addition of a new command:
  - `restorefromsnapshot`
- The management GUI supports snapshot restores from the Volume Group panel.

Currently Snapshot Restore **not** supported for:

- TCT enabled volumes
- Volumes involved with policy-based replication and policy-based HA
- Metro Mirror, Global Mirror and HyperSwap
- 3 site configurations

# Prerequisites

- A volume group can only be restored from a snapshot taken from that volume group
- The composition of the volume group at the time of the restore from snapshot must be the same as when the snapshot was taken (no extra volumes in the volume group)
- If a volume has been deleted from the volume group after a snapshot was taken, restoring from that snapshot will result in the volume being changed back to the active state and being re-added to the volume group

# Restore From Snapshot

Volume groups / vg24

vg24 1 128.00 GiB Total Group Capacity

Volumes (4) Policies (0) **Snapshots (4)**

Capacity for Snapshots 2 Hide details ^

Written Capacity 9.00 MiB / 384.00 GiB (0.00%)

Take Snapshot +

Snapshot name	State	Safeguarded	Time Created	Expiration Time
snapshot3	Active	No	10/2/2023 10:47 AM	-
snapshot2	Active	No	10/2/2023 10:47 AM	-
snapshot1	Active	No	10/2/2023 10:46 AM	-
snapshot0	Active	No	10/2/2023 10:46 AM	-

Restore 3

Restore

Restore the production volume group using the contents of the selected snapshot.

Snapshot name: snapshot3  
Time Created: Oct 02, 10:47 AM

Select what to restore

Volume group  Subset of Volumes

Cancel

Restore

Restore the production volume group using the contents of the selected snapshot.

Snapshot name: snapshot3  
Time Created: Oct 02, 10:47 AM

Select what to restore

Volume group  Subset of Volumes

Confirm the name of the volume group

Volume group name

snapshot3 Snapshot

vg24 volume group

Overwrite

The restore operation overwrites the data of volume group **vg24** with the snapshot **snapshot3**.

This action cannot be reversed.

Cancel Restore

Restore

Restore the production volume group using the contents of the selected snapshot.

Snapshot name: snapshot3  
Time Created: Oct 02, 10:47 AM

Select what to restore

Volume group  Subset of Volumes

Select volumes to restore

Volume Name	State	Capacity	Pool	Host Mappings	Protocol Type
<input type="checkbox"/> volume0	Online	32.00 GiB	mdiskgrp0	No	
<input type="checkbox"/> volume1	Online	32.00 GiB	mdiskgrp0	No	
<input type="checkbox"/> volume2	Online	32.00 GiB	mdiskgrp0	No	
<input type="checkbox"/> volume3	Online	32.00 GiB	mdiskgrp0	No	

Items per page: 10 1-4 of 4 items

Cancel Restore

# Monitoring Restores

- **lsvolumegrouppopulation** – shows progress at a volume group level. Some additional fields have been added:
  - **data\_to\_move** - the amount of data yet to be restored. As the restore progresses the value in this field will decrease. An empty field indicates no more data to restore.
  - **restore\_start\_time** - The time that the latest restore operation was started. Blank if no restore operation is ongoing
  - **restore\_snapshot\_name** - The name of the snapshot used to populate the volume group. Blank if no restore operation is ongoing.
  - **restore\_estimated\_completion\_time** - An estimate for when the background restore of the volumes in the volume group will complete. This estimate will be calculated using the used\_capacity (used\_capacity\_before\_reduction for DRP) of the volumes and the actual background copy rate being achieved to estimate how long each volume is going to take and then choosing the longest time remaining.
- **lsvolumeepopulation** – shows progress at a volume level.
  - A new field, **data\_to\_move**, has been added. The amount of data yet to be restored. As the restore progresses the value in this field will decrease. An empty field indicates no more data to restore.
- **lsvolumegroup** – a new field, **restore\_in\_progress**, has been added. This is a yes / no field.
- **lsvdisk** – a new field, **restore\_in\_progress**, has been added. This is a yes / no field.

We have added a **volume\_size\_mismatch** field to **lsvolumesnapshot**. If this field is 'yes' it indicates that the volume has been expanded since the snapshot was taken and so a restore using that snapshot will not proceed until the size has been restored to what it was when the snapshot was taken.

# Thin Clone Refresh

- The user creates a thin-clone volume group and populates it from a snapshot of the source volume group. These volumes can be mapped to a host and accessed. The user wants to examine a different snapshot without having to map a new set of volumes to the host. They also want to be able to discard changes made to the volumes by host IO activity without having to map a new set of volumes to the host.
- In addition, there is the same use-case as the volume group refresh discussed above but for a vector of volumes instead of a whole volume group. This is primarily aimed at automation software rather than a manual operation because of the difficulties in managing arbitrary lists of volumes.
- A new command, `refreshfromsnapshot`, is available to refresh a thin-clone volume group or a subset of thin-clone volumes from a snapshot.
- The thin-clone volumes being refreshed can't have any snapshots.
- The functionality to refresh a subset of thin-clone volumes is only available via the CLI



# Thin Clone Refresh

The screenshot shows the IBM FlashSystem 9100 management interface. At the top, the breadcrumb navigation reads "IBM FlashSystem 9100" > "sq1-fab3-cluster-d" > "Volume groups". The main area displays a table of Volume Groups:

Name	Volume Count
volumegroup0	161
volumegroup0-0	161

Below the table, the details for "volumegroup0-0" are shown, including "Source volume group name: volumegroup0", "Source Snapshot: snapshot0", and "Time created/refreshed: Oct 04, 11:28 AM". A context menu is open over the "volumegroup0-0" row, with the "Refresh from snapshot" option highlighted in a green circle. A green arrow points from this menu to a modal dialog box.

The modal dialog is titled "Refresh a thin clone volume group with the source volume group snapshot". It contains the following information:

- Source volume group name: volumegroup0
- Current snapshot: snapshot0, Time Created: Oct 04, 11:28 AM
- Select a snapshot to refresh with:

Source snapshot	State	Safeguarded	Time Created	Expiration Time
<input type="radio"/> snapshot0	Active	No	10/4/2023 11:27 AM	-
<input checked="" type="radio"/> snapshot1	Active	No	10/4/2023 11:28 AM	-

A green arrow points from the "snapshot1" row in this table to the "Refresh" button at the bottom of the dialog.

A second modal dialog is shown in the foreground, titled "Are you sure you want to refresh this thin-cloned volume group?". It contains a text input field with "volumegroup0-0" and a diagram showing a red "Overwrite" arrow from "snapshot1" to "volumegroup0-0 Thin-clone". The text "This action cannot be reversed." is displayed below the diagram. The dialog has "Cancel" and "Refresh" buttons at the bottom.

# New Volume Creation Options

- **mkvolume** has been extended to allow a clone or thin-clone of a volume to be created from a volume snapshot of the required source volume.
- This would create a new volume that is based on the specified source volume and pre-populated with the contents of the specified snapshot.
- The pool attribute must be specified.
- It is possible to create a mirrored volume by specifying a colon separated list of pools. (SVC only)

# Misc Snapshot Changes

- When calling out individual volumes in the **addsnapshot** command, the command can now accept up to 512 individual volumes instead of the previous 128
- The **rmvolumegroup** command now has an **-evictvolumes** flag to remove the volumes when the volume group is deleted
  - Prior a **chvdisk -removevolumegroup** needed to be issued for each volume prior to deleting the volume group
  - The volume group cannot have:
    - Replication policy
    - Snapshot policy
    - Storage Partition
    - Snapshots

# Misc Snapshot Changes - Continued

## Maintain Source Volume ID

- If a volume is created from a snapshot, the source volume ID and source volume name will be listed on the `lsvdisk` command

## Clean up Snapshots

When using automation there is a potential that certain snapshots could be orphaned on the system

- The `addsnapshot` command has been given new parameters:
  - `-retentiondays`
  - `-retention minutes`

Using these parameter will make sure snapshots are cleaned up after a certain length of time

Misc. Updates



# Auto-Ranging Power Supply for FS5200

Starting on October 10, 2023, all new FS5200s will ship with an auto-ranging (100-240 volt) power supply

- [FS5200 Auto-sensing Power Supply](#)
- Feature Code **AHPG**
- This fulfills a long time ask from small customers and BPs

# Storage Virtualize encryption methods

## Primary encryption methods (existing)



Encryption with USB  
flash drives



IBM Security Guardium  
Key Lifecycle Manager



CipherTrust Manager

## Backup encryption method (NEW)



Encryption Recovery Key

- The Encryption Recovery Key is a secondary method and not intended to be used as a primary key method

# Motivation for encryption recovery key

Some clients want a backup encryption key method to compliment key server encryption, but don't want or can't use encryption with USB flash drives.

## Journalist opens USB letter bomb in newsroom

21 March



TWITTER/POLICIA ECUADOR





# Encryption Recovery Key Features

## No Additional Hardware

The encryption recovery key is presented to the user as an ASCII text string

## Rapid Data Access

The encryption recovery key will unlock encrypted storage as quickly as the key can be entered

No need to have an admin on site to fetch USB drives from the safe, the encryption recovery key can be entered remotely

## Peace of Mind from Hardware Failure

Worried about a USB drive batch failure or key server outage?

The encryption recovery key offers an additional layer of protection

## Use Your Existing License

An encryption recovery key can be enabled on systems with existing encryption without any additional cost or license requirements

Simply upgrade, enable and go

# Encryption Admin Security

- Current key must be supplied when rekeying
- Keys for existing types must be supplied when enabling new type
- Disabling encryption must be carried out using the technician port

# SNMP Security Improvements

- Strengthen security for SNMP by delivering the following improvements:
  - More secure algorithms for authentication and privacy
  - Encrypt authentication and privacy passphrases at rest and ensure that they are redacted in all logs
  - Automatically encrypt existing passphrases on upgrade to 8.6.2+
  - Support SNMP over TLS and server certificates
- Improve usability by providing a command to test that SNMP servers are correctly configured

# New SNMP Configuration Options

- Two security models for SNMPv3 servers:
  - User-based Security Model (USM) provides application layer security using authentication and privacy passphrases
  - Transport Security Model (TSM) provides transport layer security using TLS and certificates
- Both USM and TSM can be enabled for the same SNMP server
- New test command **testsnmpserver** can be used to verify that the configuration works
- Supported algorithms (new in bold):
  - Authentication: MD5, SHA-1, **SHA-224, SHA-256, SHA-384, SHA-512**
  - Privacy: DES, AES-128, **AES-196, AES-256**
  - MD5, SHA-1 and DES are insecure and not recommended, but supported for backwards compatibility
  - Algorithms used for TLS are determined by the system-wide security setting (sslprotocol)
  - Certificates are configured using trust stores, which now have an option to enable use for SNMP

## Limitations

- Max passphrase length reduced from 255 characters to 64 characters
- TLS not supported over IPv6

# PBR Enhancements

- Four I/O groups for async policy-based replication
  - Each I/O group can replicate to a maximum of six I/O groups in partnered systems (see illustration)
  - High availability permits, and will continue to permit, only one I/O group to exist in each system
  - Remember that the partnership bandwidth applies to each I/O group connection

## DR Recovery Test Function

- Starting a recovery test makes the DR volumes accessible while replication continues
- Can promote the test image to independent if a real disaster occurs
  - Recommended to take a snapshot when starting the test so a 'true' recovery point is preserved
- Reduced resynchronization once the test stops
- CLI and REST API only
  - The GUI will show that a DR test is active, but doesn't allow starting/stopping of a test
  - Initiated from the target side

# Increased volumes and capacity

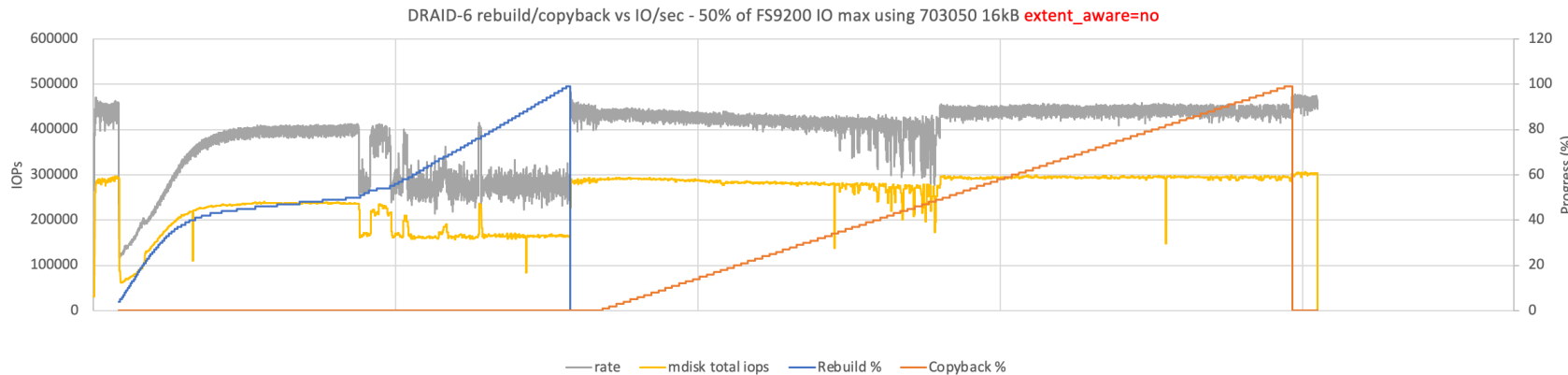
Model	HA/replicated volume count	HA/replicated capacity (per I/O group)
FlashSystem 50x5	Not supported	Not supported
FlashSystem 5200*	7932	1024 TiB
FlashSystem 7200	7932	2048 TiB
FlashSystem 7300	15864 → 16050	2048 TiB
FlashSystem 91x0/9200	7932	2048 TiB
FlashSystem 9500	15864 → 32500	4096 TiB
SAN Volume Controller (SA2/SV2)	7932	2048 TiB
SAN Volume Controller (SV3)	7932	2048 TiB → 4096 TiB
SV Public Cloud*/**	7932	1024 TiB

\* Requires minimum of 64GiB of memory per node. \*\* Async only, only on certain clouds

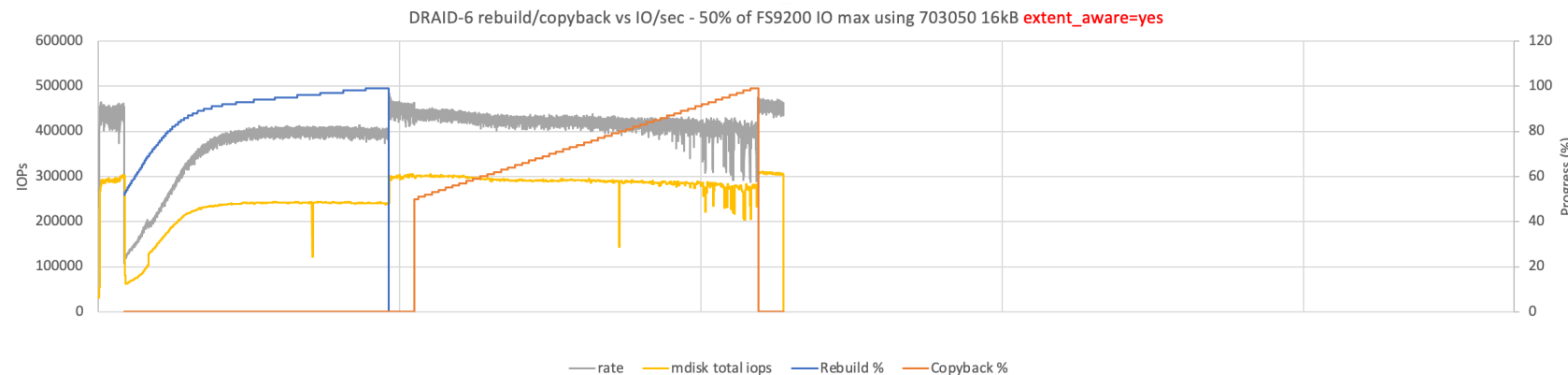
# DRAID Smart Rebuild

- Rebuild, Rebuild-In-Place, Copyback and Scrub will only perform on parts of an array that have extents allocated (extents are allocated for things like vdisks/cdisks, FC snapshots, etc).
- For example, this would mean a 3PB array with 10% extents allocated that would normally take 30-40 hours to rebuild would now only take 3-4 hours.
- FCM drives only (All Generations)
- DRAID6, DRAID5 and DRAID1 arrays only.
- Progress will be calculated according to the allocated capacity of the array when the rebuild, RIP, copyback or scrub was triggered, not the full capacity.
- Upgrade from a release that does not support extent awareness tasks shall not affect any already running tasks and they shall either complete regularly or be restarted.
- Any DRAID array that has supporting member drives shall become extent aware after the CCU. New tasks will then use the extent awareness feature.

# Rebuild Performance Comparison with Extent Awareness On vs. Off



**extent\_awareness = no**  
Rebuild time: 9hr  
45min  
Copyback time: 14hr  
59min



**extent\_awareness = yes**  
Rebuild time: 5hr  
57min  
Copyback time: 7hr  
24min

- Test condition: FS9200 w/24x 4.8TB FCMs, 50% physical capacity used
- Note: Extent awareness also lowers host IO impact and the IO impact duration. Host IO is recovered to expected performance sooner.



# FIPS - Federal Information Processing Standards

- FCM 1 drives have been certified to FIPS 140-2 level 1
  - [FCM1 - NIST Certification Statement](#)
- FCM 2 drives have been certified to FIPS 140-2 level 2
  - [FCM2 - NIST Certification Statement](#)
- FCM 3 undergoing FIPS 140-3 certification
- FCM 4 certification is planned
- Due to the time taken (12+ months), only one FIPS firmware per FCM generation is likely to undergo compliance testing
  - Bugs found in FIPS certified versions will likely be fixed with a FIPS non-certified (but compliant) version
- Customers can choose between:
  - FIPS certified
  - FIPS non-certified (compliant)
  - Non-FIPS (validated)
- By default, drives from the factory ship with non-FIPS (validated) firmware
- The firmware on Fix Central is non-FIPs

– Requests for FIPS certified code can be directed to: [jorgeesc@mx1.ibm.com](mailto:jorgeesc@mx1.ibm.com)

# FIPS

## Pre 8.6.2

- Data at rest was AES-256 encrypted
- Security PINs were sent to the drive in cleartext over the PCI bus
- A bad actor with physical access could listen to that traffic for the PIN and use that to unlock the drive outside of the Flashsystem enclosure

## 8.6.2+

- Data at rest is AES-256 encrypted (just like FCM 1 & 2 before)
- Security PINs are sent to the drive in encrypted form over the PCI bus with SKP (Secure Key Passing)
- FCM3: RSA public key cryptography
- FCM4: RSA and CRYSTALS Kyber cryptograph
  - SKP data is encrypted twice, once by each cypher
- CRYSTALS Kyber is a Quantum Safe Cryptography (QSC) algorithm
  - AKA Post-Quantum Cryptography (PQC)

## 8.6.2+ and SKP (Secure Key Passing)

- SKP is used on all FCM 4 drives, whether in FIPS mode or not
- FCM 4 is a FRU for FCM 3 drives
- From 8.6.2 onwards, if SKP is available it will be enabled
  - Brings additional security benefits, including PQC, to all customers
  - Ensures the SKP code is well tested and reliable for FIPS customers
  - Non FIPS arrays can have mixed SKP support

# FIPS Mode

- FIPS mode ensures that everything in the unit is FIPS certified/compliant
- Moving into or out of FIPS mode is data destructive!
  - **Do it BEFORE putting data on the box**
  - FIPS firmware levels will not be available on fix central – only via support
  - FIPS spec requires that the key used on a FIPS drive is NOT shared with any other drive
  - An existing array cannot be upgraded into FIPS mode
  - Data would need to be copied off, FIPS upgraded, then copied back
  - Could be accomplished with swing storage, but painful

## CLI Changes

- **lsdrive and lsarray**
  - fips\_enabled [yes|no] field in the detailed view
  - For lsdrive – the drive is running a FIPS firmware
  - For lsarray – all members are running FIPS firmware
- **lsdriveclass**
  - fips [yes|no] in the normal and detailed view

# FIPS Feature Matrix

Drive	AES-256 Encrypted Data	FIPS Tested	SKP with FIPS	SKP without FIPS	SKP with RSA	SKP with Crystals Kyber
FCM 1	✓	✓	✗	✗	✗	✗
FCM 2	✓	✓	✗	✗	✗	✗
FCM 3	✓	In Progress	✓	3.2 PTF onwards	✓	✗
FCM 4	✓	Planned	✓	✓	✓	✓

# Scalability Increases

Limit	5200	7300	9500	SV3
Host Mappable Volumes	8,192	16,050	32,500	15,864
Snapshots	15,863	32,099	64,999*	15,863
Snapshot Capacity	4PiB	20PiB	40PiB	40PiB**
Policy Based Rep Async volumes	7,932	16,050	32,500	7,932

\* Assuming 1 volume on the system

\*\*\* 40PB assuming no volume mirroring. Bitmap space is shared between snapshots and volume mirroring.

# GUI Enhancements

- Duration field added to the audit log
  - Tracks how long a process takes
- GUI support for security patch installation
- Wattage consumption added to dashboard
- New statistics intervals added to performance screens

## Proof Keycode Exchange (PKE) Support

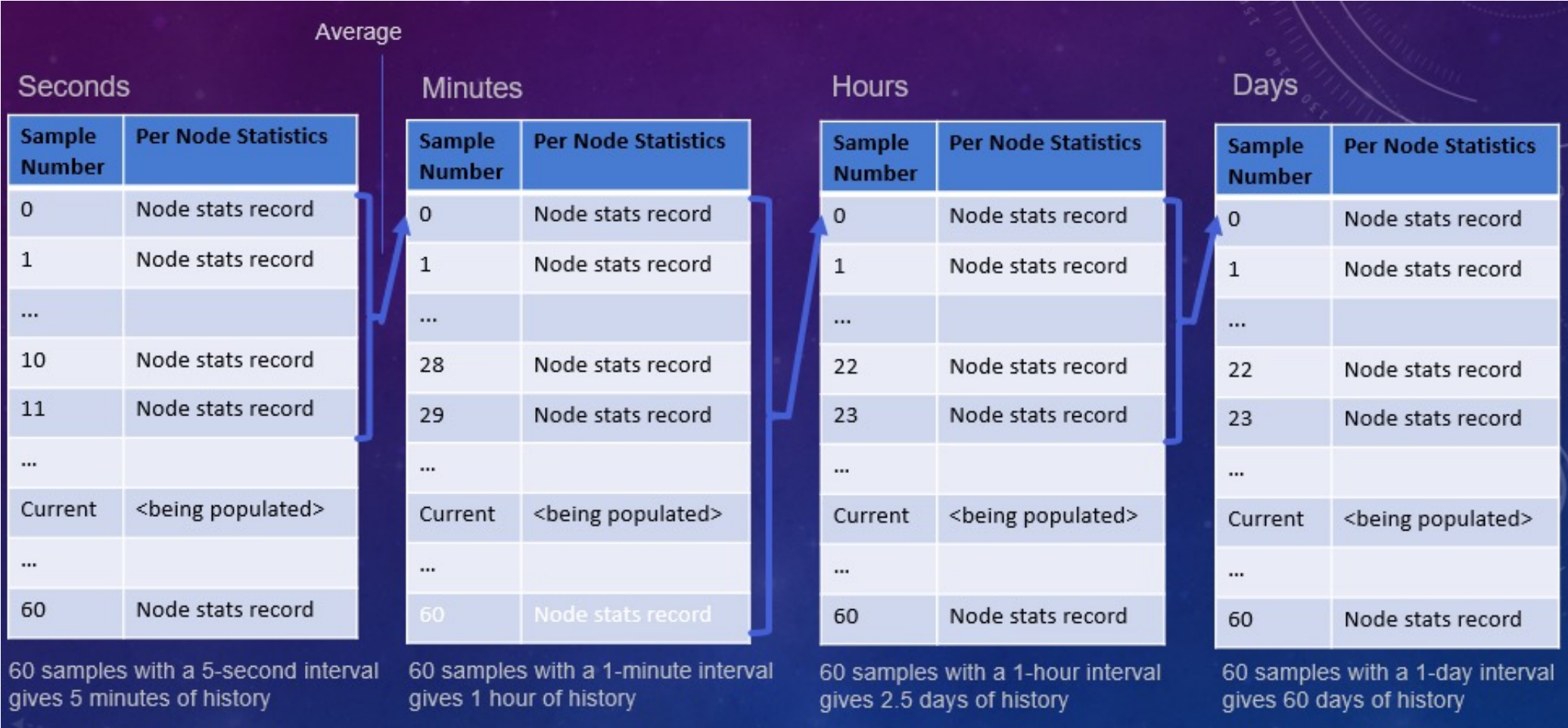
- Improves security between FlashSystem and supported SSO/MFA providers
- The security admin must enable PKCE support in their SSO or MFA application definition
  - FlashSystem storage admin configures connection to SSO / MFA provider, but no setup needed for PKCE
- Allows the SSO or MFA provider to verify that the FlashSystem that initiated the authorization flow is the same FlashSystem that completes the flow.
- Based on a unique token called a code\_challenge that is compared to a code\_verifier token to ensure integrity of the authorization flow

# Statistics Improvements

- Add power usage and temperature for SVC nodes (lsnodestats)
- Increase available history with minute, hour and daily averages
- Save history to file to avoid loss on node failover or T2
- Add power and temperature to the XML performance stats (Nn\_stats)
- Include lssystemstats -days in the daily inventory



# Cascading Statistics



# Stats CLI Changes

- New parameters: `-minutes` / `-hours` / `-days` for existing CLI `lsnode(canister)stats`, `lsenclosurestats` and `lssystemstats`
- Can be used with or without `-history`
- Inventory includes `lssystemstats -days`:

<i>stat_name</i>	<i>stat_current</i>	<i>stat_peak</i>	<i>stat</i>	<i>peak_time</i>
<i>compression_cpu_pc</i>	<i>0</i>	<i>0</i>		<i>231023124821</i>
<i>cpu_pc</i>	<i>1</i>	<i>1</i>		<i>231023124821</i>
<i>...</i>				
<i>power_w</i>	<i>1162</i>	<i>1162</i>		<i>231023124821</i>
<i>temp_c</i>	<i>23</i>	<i>23</i>		<i>231023124821</i>
<i>temp_f</i>	<i>73</i>	<i>73</i>		<i>231023124821</i>

# Integration Updates

- IBM Sentinel now supports multifactor authentication
- PowerHA SystemMirror 7.2.8 that now integrates SGC2 into PowerHA
  - Announced Oct10 and GA's Dec 15

**Thank you!**

## Accelerate with ATG Survey

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Please take a moment to share your feedback with our team!

You can access this 6-question survey via [Menti.com](https://www.menti.com/join/17086924) with code 1708 6924 or

Direct link <https://www.menti.com/alwhyze7z1gz>

Or

QR Code

