

ADVANCED TECHNOLOGY GROUP (ATG)



Accelerate with ATG Webinar: Storage Virtualize 8.7.2 Technical Update

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- IBM Cloud Object Storage Test Drive - (Appliance based)
- IBM Cloud Object Storage Test Drive - (VMware based)
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Direct link <https://www.menti.com/alhsf3bgvxu6>

Or

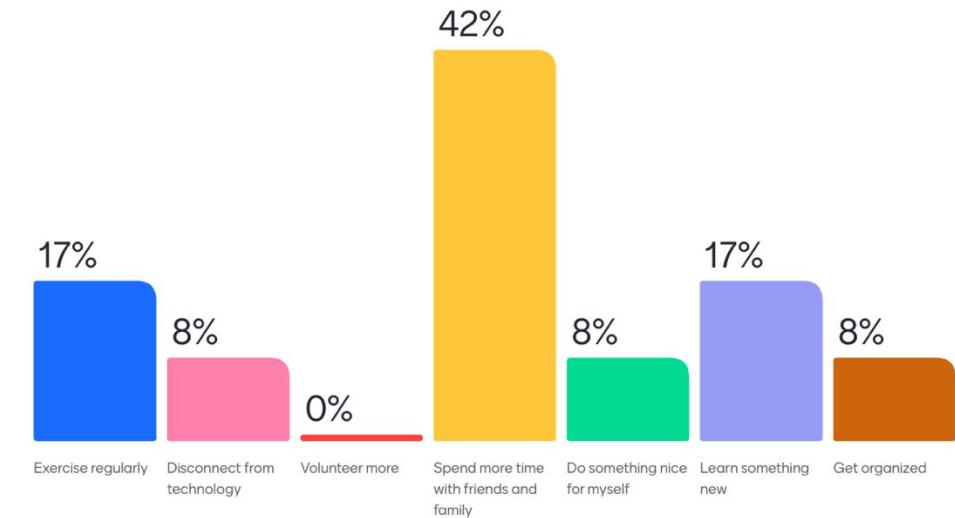
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What will your New Year's resolution be?



ADVANCED TECHNOLOGY GROUP (ATG)



Accelerate with ATG Webinar: Storage Virtualize 8.7.2 Technical Update

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Meet the Speakers



Byron Grossnickle is an IBM Storage Technical Specialist concentrating on Storage Virtualize software. This includes FlashSystem, SVC, and Storage Virtualize for Public Cloud. Byron has been with IBM 19 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.

IBM Storage Virtualize 8.7.2 Agenda



- Release Schedule
- Security Updates
 - Internal Key Management
- Host Attach Enhancements
 - Using Fabric (FDMI) Info for Host Management
 - Jumbo Frames
 - CHAP Secret Enhancements
 - Scaling NVMe/FC
- Replication and HA Updates
 - iSCSI HA with Portset Linking
 - CHAP Secret Changes
 - Interop Update for PBHA
 - Restoring/Refreshing Snapshots PBR/PBHA
- Flash Grid Updates
 - GUI
 - Storage Partition Migration Automation
- Misc Updates
- Plugin Updates
 - VMware
 - CSI

Release Schedule

- RFA Announce – 8.7.2 – November 12, 2024
- eGA – 8.7.2 – November 29, 2024
- pGA – There is no hardware associated with this release

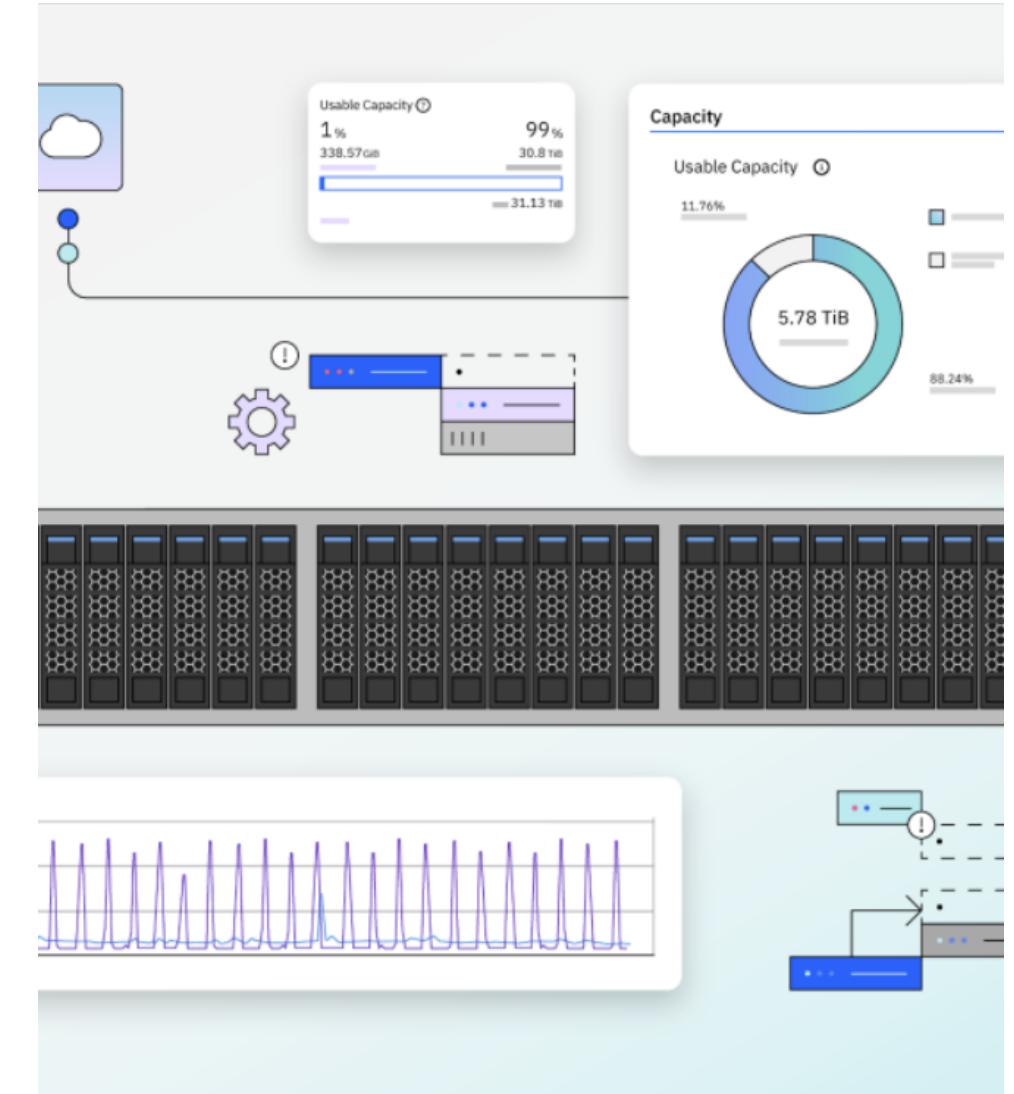
8.7.2 is a Non-LTS Release. Non-LTS releases are tested identically to LTS releases. Non-LTS releases will not get any patches and will not be maintained long term. Those patches will be available in the next Non-LTS or LTS release.



– [Release FAQ](#)

IBM Storage Virtualize

Encryption Internal Key Management

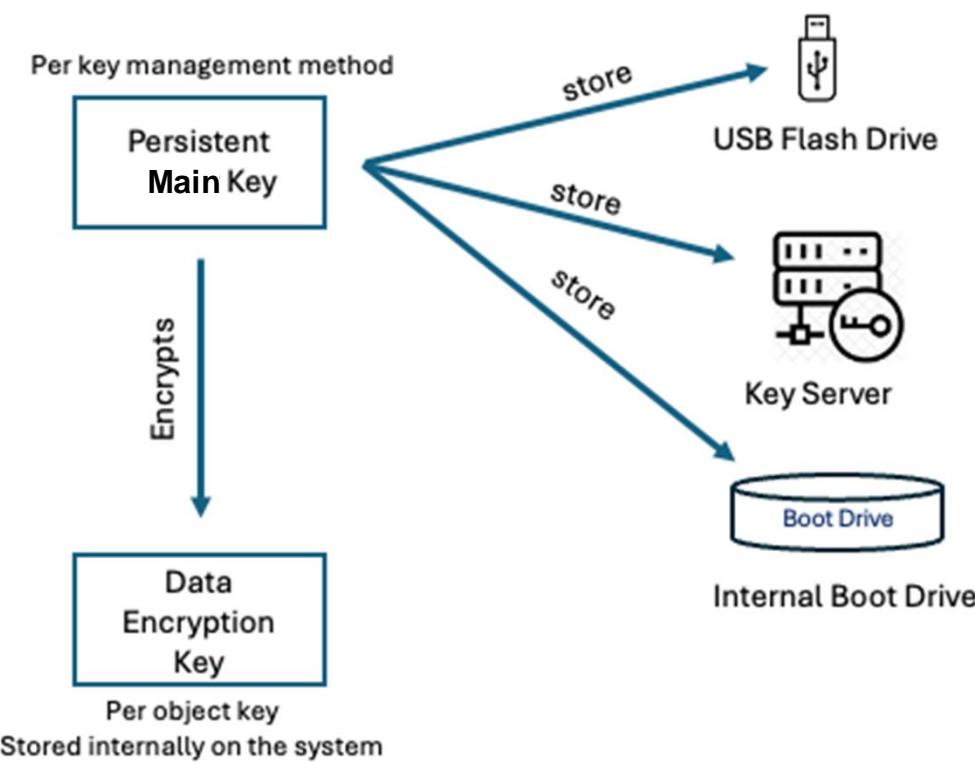


Internal Key Management (IKM) Overview

- Existing External Key Management
 - External Key Challenges
 - Storing the main keys
 - Redundant server infrastructure for key manager - complexity
 - Managing the main key for encryption enabled system
 - How many copies of keys and where to store them
 - Can lose keys, security risk if lost, access to encrypted data lost forever if all keys destroyed
 - Other Drivers
 - USB constraints, Security Issues
 - Key server software cost and maintenance overhead
- Internal Key Management
 - Stores a copy on the internal boot drive(s) of every node
 - AES-256 bit key, sealed by the node's unique TPM chip
 - Automatic system, unlocks, no user intervention
 - Designed for secure site environments

Internal Key Management (IKM)

- **How it works**



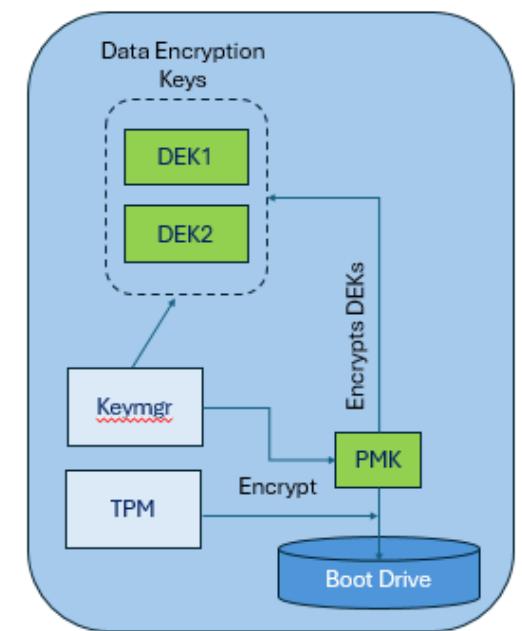
- IKM stores keys secured internally
- Keys are secured using TPM Hardware
- TPM Sealed Keys are stored on all the nodes for redundancy
- System automatically attempts to unlock on power up
- IKM Keys are rekeyed automatically every 24 hours
- Encryption Recovery Key is recommended to be enabled

- **Security**

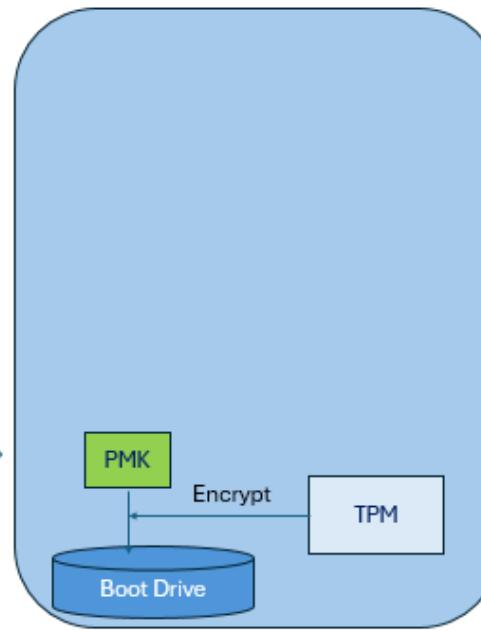
- User shall not have access to IKM Keys
- Keys are stored on internal drives within systems and so it is more secured
- Each node stores encrypted IKM Keys with its own unique TPM hardware

Internal Key Management (IKM)

Node 1



Node 2



• Recovering Data

- **IKM Keys are stored on all the nodes in the cluster for redundancy**
- **With any node surviving in the cluster, system is unlocked automatically**
- **During T1, T2, T3 recovery, system can automatically unlock using TPM hardware, internally stored key and recover data**
- **In case of multiple hardware failures (TPM, Drive, Node..), Encryption Recovery Key allows us to recover data**

CLI Changes

- A new CLI option “-internal” in existing “chencryption”
- A modification in “lsencryption” CLI to display the internal key management status and last rekey time

```
#chencryption -internal -enable  
-disable
```

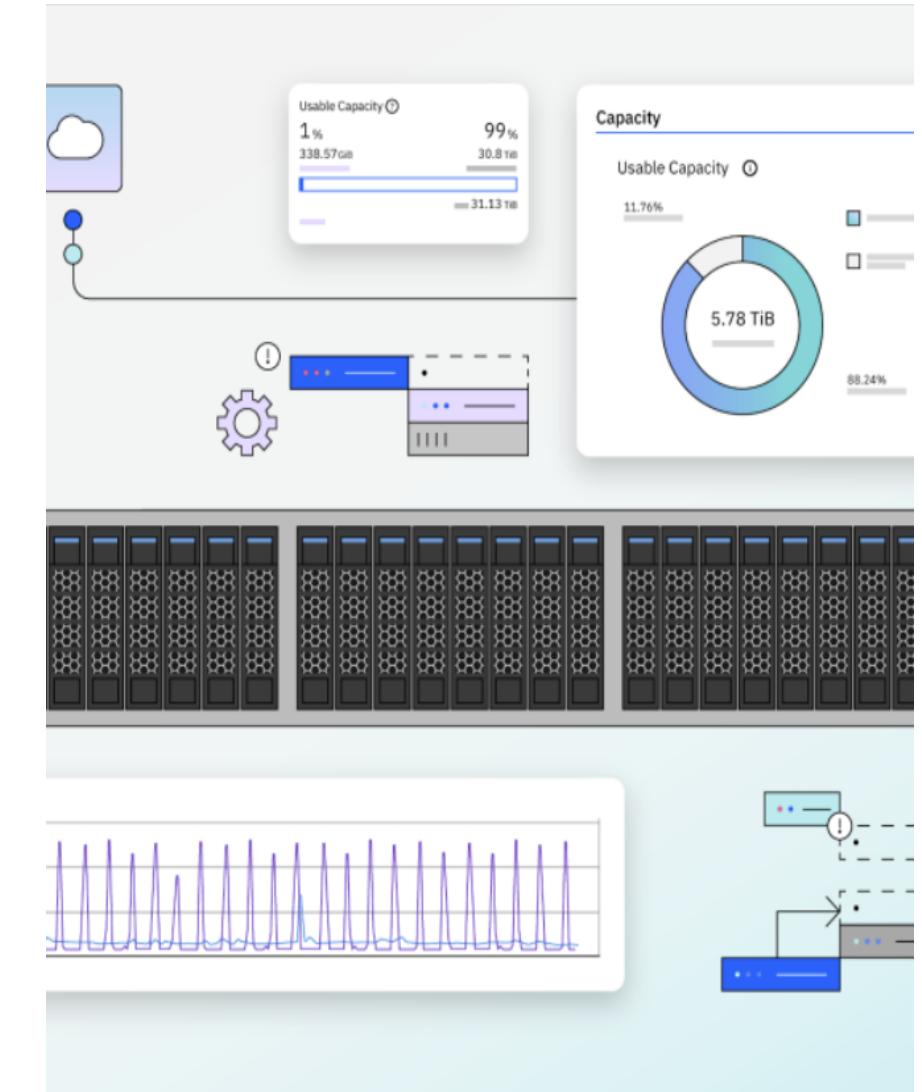
```
#lsencryption  
  
status licensed  
error_sequence_number  
usb_rekey_no_key  
usb_key_copies 0  
usb_key_filename  
usb_rekey_filename  
keyserver_status licensed  
keyserver_rekey_no_key  
keyserver_pmkey_id  
keyserver_pmkey_rekey_id  
recovery_key_status enabled  
recovery_key_rekey_no  
recovery_key_name recoverykey_000002043CA0D058_3CA0D05800000001_Fab3Plus  
recovery_key_rekey_name  
internal_key_status enabled  
usb_last_rekey_time  
keyserver_last_rekey_time  
recovery_key_last_rekey_time 240808111327  
internal_key_last_rekey_time 240808111247
```

Things to Think About

- Reasons to Use IKM
- Easy to configure
- Prevents “losing” the key
- Automatic rekey
- No intervention upon coming up from a power down
- Reasons to Think About the Deployment of IKM
 - If your location is not secured and the physical array is stolen your data is compromised
 - This can be prevented with external key management
 - When decommissioning a FlashSystem, you need to remember to do a secure erase on the unit before it goes out the door
 - If not, again, your data is compromised
 - While external key management does not replace the best practice of a secure erase, if the external keys are not with the storage array when decommissioned, the data is not compromised
 - Internal and external key management can be used simultaneously, but other forms will need to be configured from the command line

IBM Storage Virtualize

Non-HA Host Attach Updates

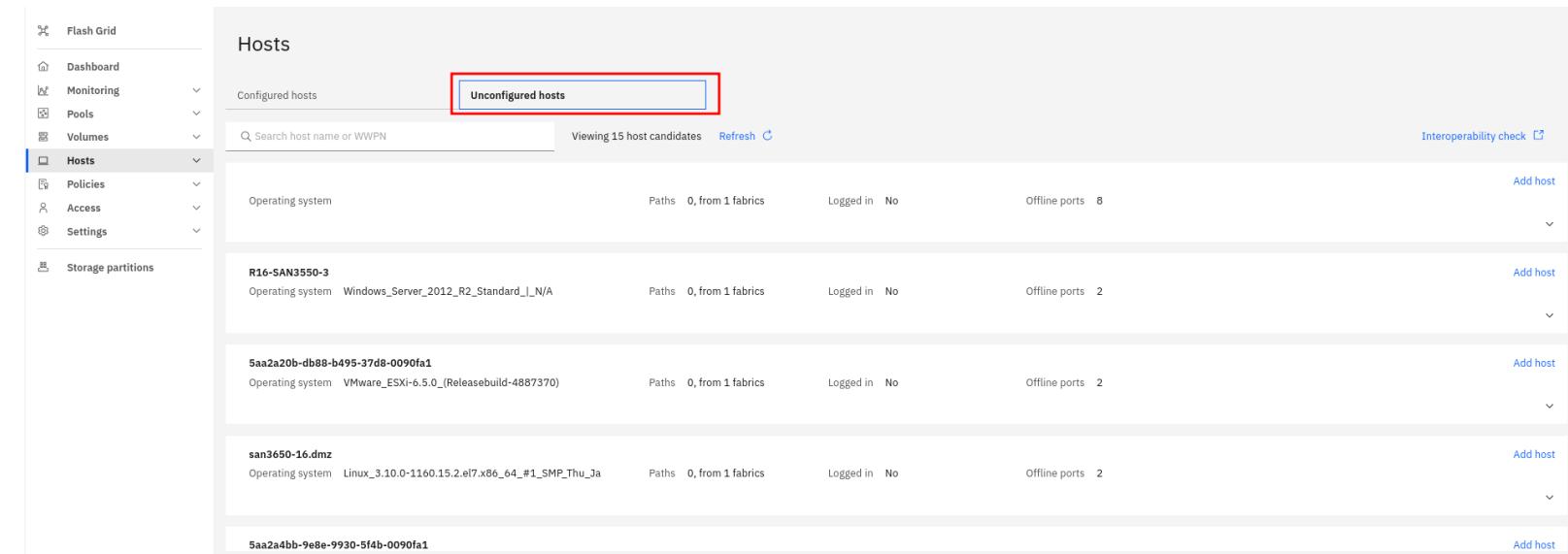


Improved FC Host Management with Fabric Device Management Interface (FDMI)

- Current Challenges
 - Only zoned WWPNs are listed in the GUI
 - No grouping of WWPNs based on the host server
 - Hard to correlate listed WWPNs with the real host server
 - Hard to configure unzoned WWPNs
 - Addition or replacement of host port requires burdensome management steps
- Benefits
 - Understand fabric better
 - Simplified host configurations
 - Know host connectivity
 - Easier Interop Checking

Fabric Insights Help with Host Management

- FC Fabric Insights
- All hosts connected in the fabric (zoned / unzoned)
- Host name configured on the server
- Host OS
- Host Port details
- Host Paths to FlashSystem
- 1 click fabric view refresh is available



The screenshot shows the 'Hosts' section of the Fabric Insights interface. The left sidebar includes 'Flash Grid', 'Dashboard', 'Monitoring', 'Pools', 'Volumes', 'Hosts' (which is selected and highlighted in blue), 'Policies', 'Access', and 'Settings'. The main area is titled 'Hosts' and shows a table of host candidates. The table includes columns for 'Operating system', 'Paths', 'Logged in', and 'Offline ports'. The 'Hosts' section is divided into 'Configured hosts' and 'Unconfigured hosts', with the latter being highlighted by a red box. The 'Unconfigured hosts' section contains five entries: 'R16-SAN3550-3', '5aa2a20b-db88-b495-37d8-0090fa1', '5aa2a4bb-9e8e-9930-5f4b-0090fa1', 'san3650-16.dmz', and '5aa2a4bb-9e8e-9930-5f4b-0090fa1'. Each entry provides details such as 'Paths 0, from 1 fabrics', 'Logged in No', and 'Offline ports 8' (for the first entry). There are 'Add host' buttons next to each entry.

One Click Host Configuration

- The discovered host can be added with names configured on the server
- Host Server name
- Host OS
- WWPNs from the server (zoned / unzone)
- Host connectivity details to FlashSystem
- Simplified CLI to configure a host with the server's name
- System automatically discovers all WWPNs on the server

Add Host

All the inputs are prefilled based on the selected server.

Server name
R49B_U30_ESXi8_host

Paths
2, from 1 fabrics

Operating system
VMware_ESXi-8.0.0_(Releasebuild-20513097)

Logged in
Yes

Host name
R49B_U30_ESXi8_host

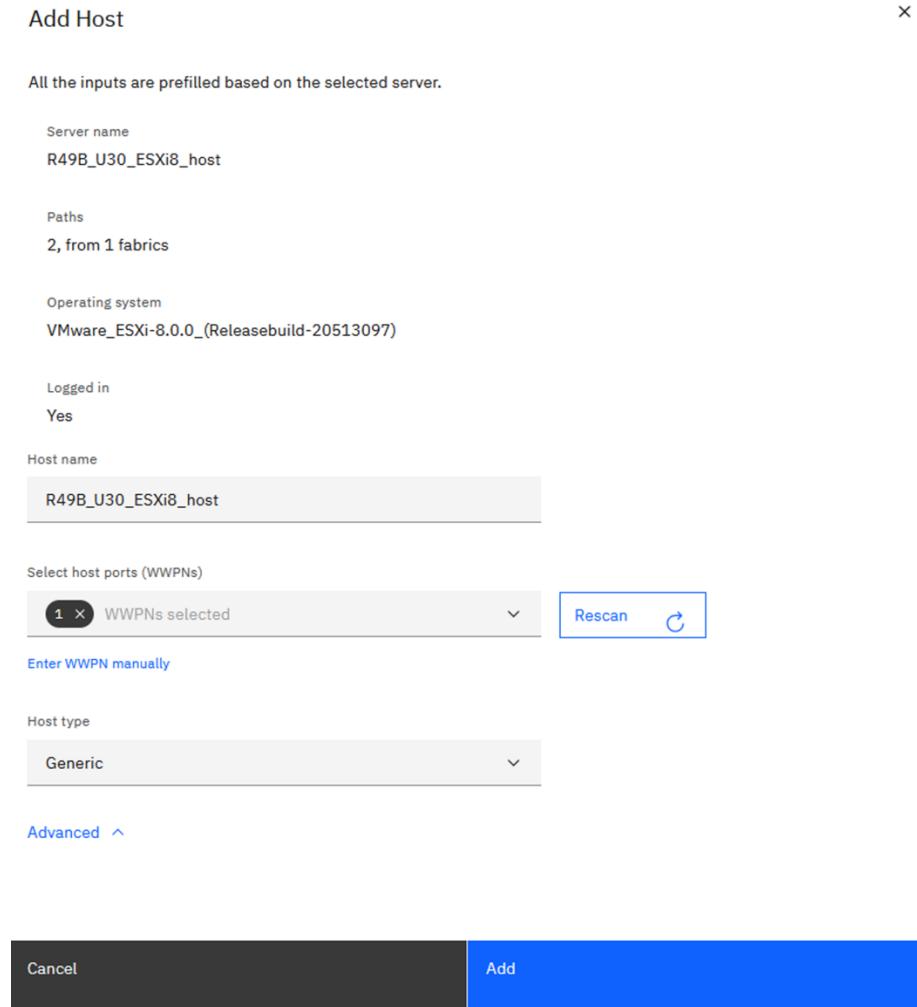
Select host ports (WWPNs)
1 x WWPNs selected Rescan

Enter WWPN manually

Host type
Generic

Advanced ^

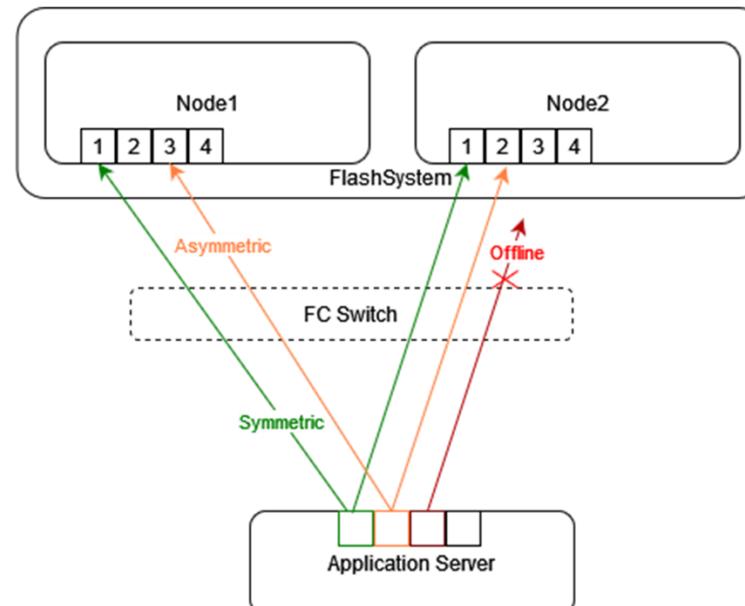
Cancel Add



Host Connectivity Insights

- Login Status
- Symmetric/ Asymmetric /Offline
- Login Counts
- Total logins to the FlashSystem
- Valid Login Count
- Logins serving valid SCSI paths
- Speed
- Host port speed for troubleshooting

rhel9.4-pune									Add host
Operating system	Paths 30, from 5 fabrics				Logged in	Yes	Offline ports	1	
WWPNs	Login status	Speed	Login count	Valid login count	Fabric WWN	I/O group count	Serial number		
10000090FAD16058	⚠ Asymmetric	16Gb	1	1	500507680B53AC4A	1	11S01CV842Y650HY67L070		
10000090FA941EDF	✓ Symmetric	16Gb	4	4	200100DEFBDA4C21	1	11S01AC345Y450HY58L00B		
10000090FA9421CC	✓ Symmetric	16Gb	4	4	100050EB1AD959B9	1	11S01AC346Y450HY58L03G		
21000024FF16C47D	⚠ Asymmetric	32Gb	1	1	500507680B5A5D2E	1	RFD1707R30419		

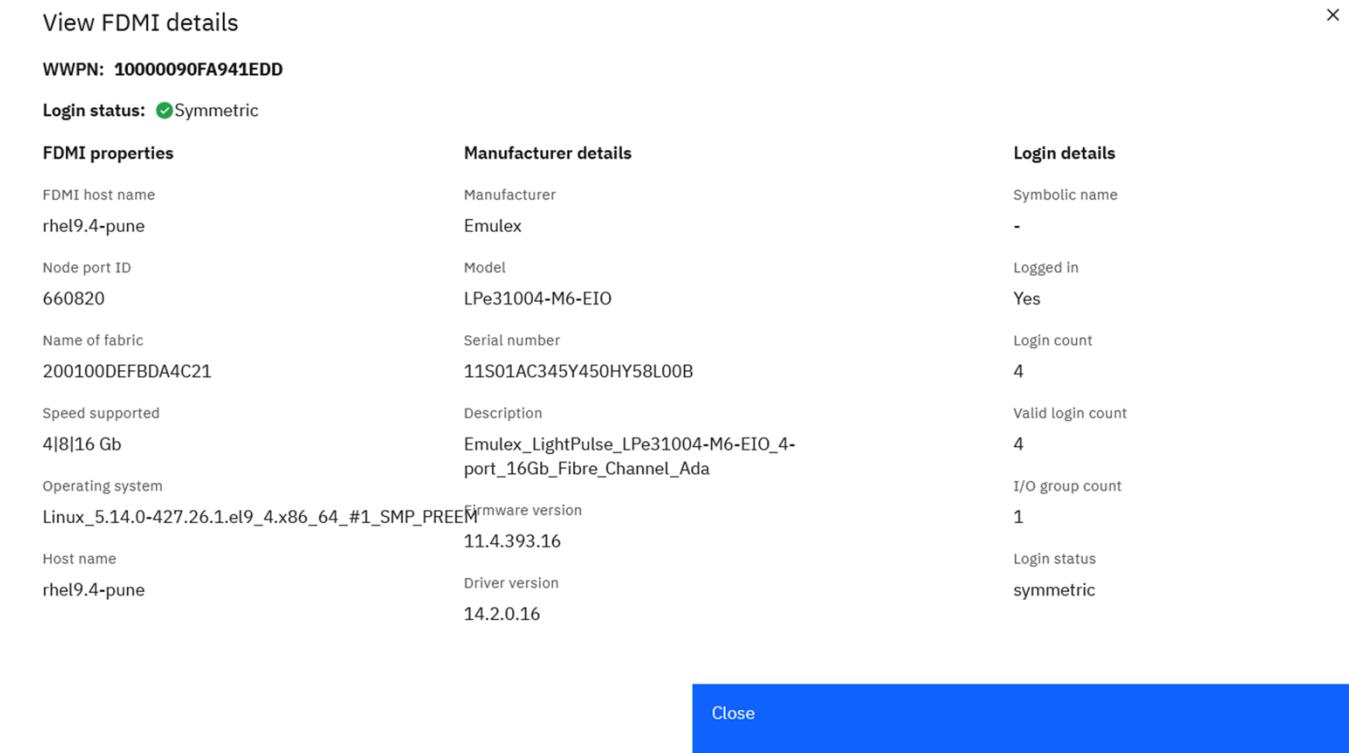


Symmetric vs Asymmetric Host Access

- Symmetric
- Nodes have same number of valid logins and are to the same set of ports
- Asymmetric
- Nodes have different login counts from the host port OR logins are not on the same ports
- If a host shows as asymmetric, it generally means there is a connectivity or zoning issue

Easier Interop Checking

- Operating System
- OS version
- HBA Details
- FW version
- Driver version
- Vendor Name
- These details can be used to verify interop support using SSIC [<https://www-03.ibm.com/systems/support/storage/ssic>]



The dialog box displays FDMI details for a storage adapter. It includes sections for FDMI properties, Manufacturer details, and Login details. Key information includes WWPN, Node port ID, Name of fabric, Speed supported, Operating system, Host name, and various model and serial numbers. A 'Close' button is at the bottom right.

View FDMI details		
WWPN: 10000090FA941EDD		
Login status: Symmetric		
FDMI properties	Manufacturer details	Login details
FDMI host name	Manufacturer	Symbolic name
rhel9.4-pune	Emulex	-
Node port ID	Model	Logged in
660820	LPe31004-M6-EIO	Yes
Name of fabric	Serial number	Login count
200100DEFBDA4C21	11S01AC345Y450HY58L00B	4
Speed supported	Description	Valid login count
4 8 16 Gb	Emulex_LightPulse_LPe31004-M6-EIO_4-port_16Gb_Fibre_Channel_Ada	4
Operating system	Firmware version	I/O group count
Linux_5.14.0-427.26.1.el9_4.x86_64_#1 SMP PREEM	11.4.393.16	1
Host name	Driver version	Login status
rhel9.4-pune	14.2.0.16	symmetric

- Note: FDMI detail will vary based on how well host OS communicates with FDMI

Jumbo Frames – MTU9000

- Prior to 8.7.2, MTU 9000 was supported only for iSCSI host attachment.
- Starting from 8.7.2, MTU 9000 can now be used for NVMe/TCP host attachment as well.
- There are no changes to the CLI/GUI

Scaling NVMe/FC

- Why -

There can be a benefit to NVMe/FC, particularly with VMware where their NVMe stack is more scalable/performant than their SCSI stack. Our current limits were insufficient for most of VMware environments

- What -

- We have increased FC-NVMe/FC host limit to 256 (previously 32) and number of per FS-node port logins to 64

- How -

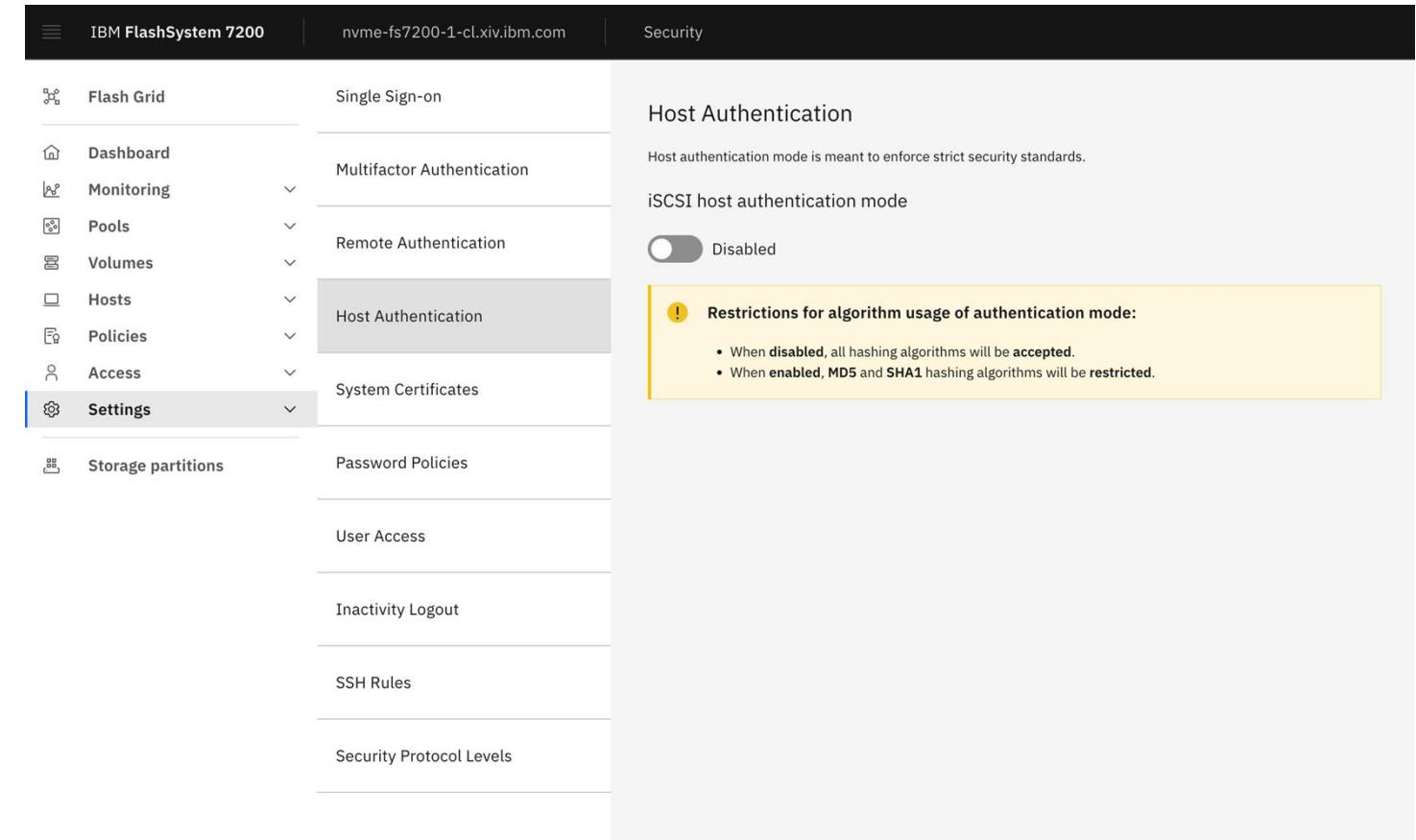
- User will have to make use of non-default FC port-set while creating NVMe/FC host using GUI/CLI

iSCSI Authentication Updates

- 8.7.2 Onward
- Deprecates system-wide Bidirectional CHAP, previously configured through the chsystem CLI
- Introduces Host-wide Bidirectional CHAP, configurable through the chhost CLI
- Adds an option to enforce FIPS-compliant hashing algorithms for CHAP in the chsecurity CLI
- Eliminates the display of cleartext CHAP secrets in both the CLI and GUI
- Benefits
 - This request was primarily driven by a customer (RFE SCSI-I-1247)
 - Provides better control over hashing algorithms used in CHAP authentication
 - Offers granular control of Bidirectional CHAP, making it more suitable for multi-tenancy
 - Eliminates system-wide disruptions. Previously, changing or removing system-wide CHAP was a disruptive process, potentially causing LUN outages if not properly coordinated with host configurations.
 - The new model aligns well with PBHA, facilitating smoother volume mobility

Hashing Algorithm Control

- Introduces a new security setting called iSCSI Host Authentication Mode
- When **disabled**:
No restrictions on hashing algorithms; all currently supported algorithms MD5, SHA1, SHA2, and SHA3-256 are allowed.
- When **enabled**:
Only FIPS-compliant hashing algorithms are permitted, specifically SHA2 and SHA3-256 from the currently supported options.

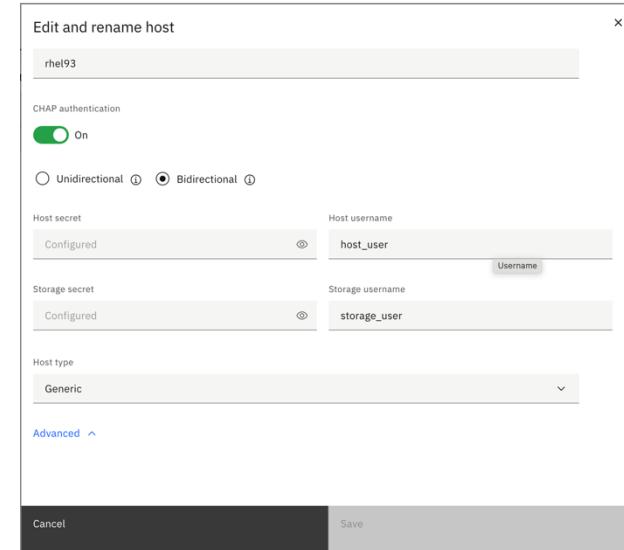
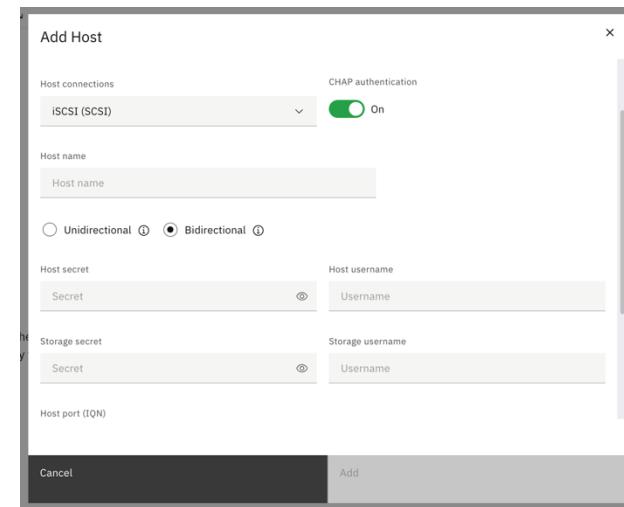


The screenshot shows the IBM FlashSystem 7200 web interface. The top navigation bar includes the system name 'IBM FlashSystem 7200', the IP address 'nvme-fs7200-1-cl.xiv.ibm.com', and the 'Security' tab. The left sidebar menu lists: Flash Grid, Dashboard, Monitoring, Pools, Volumes, Hosts, Policies, Access, Settings (which is currently selected), Storage partitions, and Password Policies. The main content area is titled 'Host Authentication' and contains the following information:

- Host authentication mode is meant to enforce strict security standards.
- iSCSI host authentication mode is currently **Disabled** (indicated by a greyed-out toggle switch).
- A yellow callout box titled 'Restrictions for algorithm usage of authentication mode:' lists:
 - When **disabled**, all hashing algorithms will be **accepted**.
 - When **enabled**, **MD5** and **SHA1** hashing algorithms will be **restricted**.

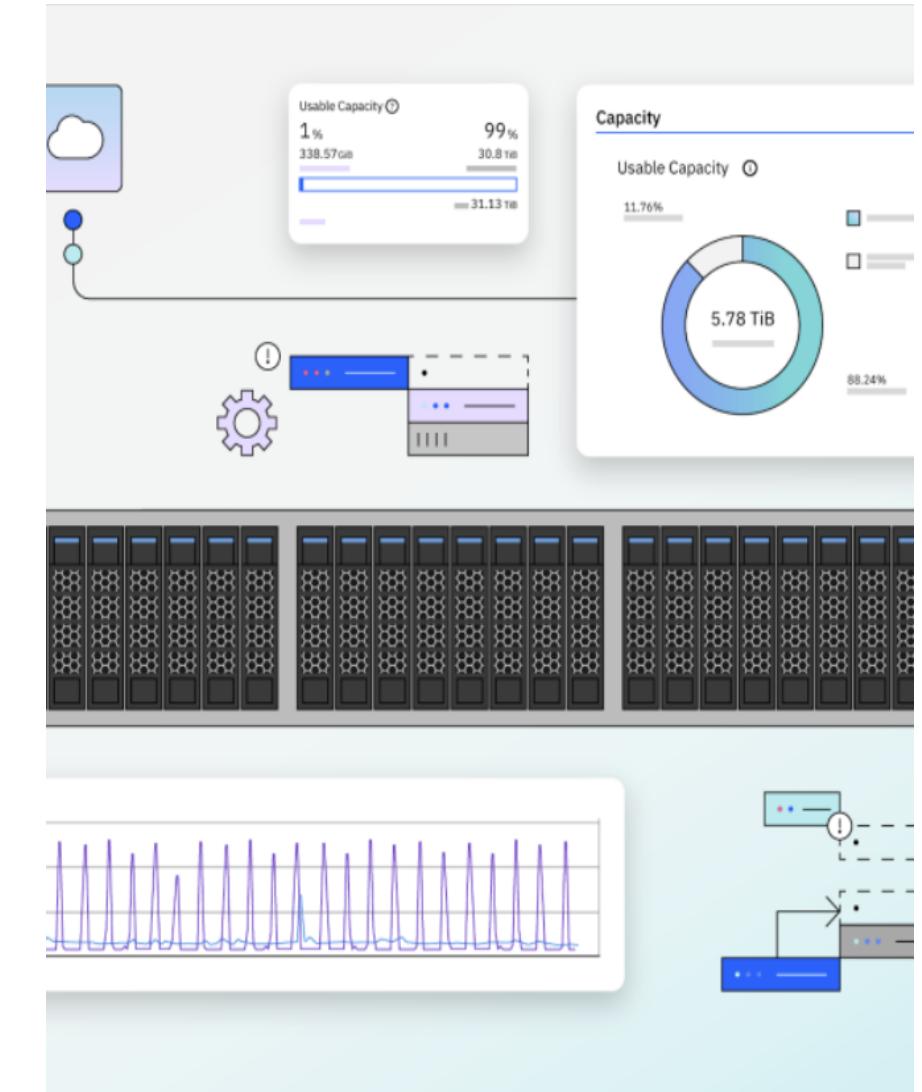
Per Host Bi-directional CHAP

- From 8.7.2 onwards at host level we will also have bidirectional CHAP configuration option along side unidirectional
- Secrets are no longer displayed
- When upgrading, the system wide CHAP will automatically be moved to the host definitions so there will be no disruption when migrating from one CHAP model to the other



IBM Storage Virtualize

Replication and HA Changes

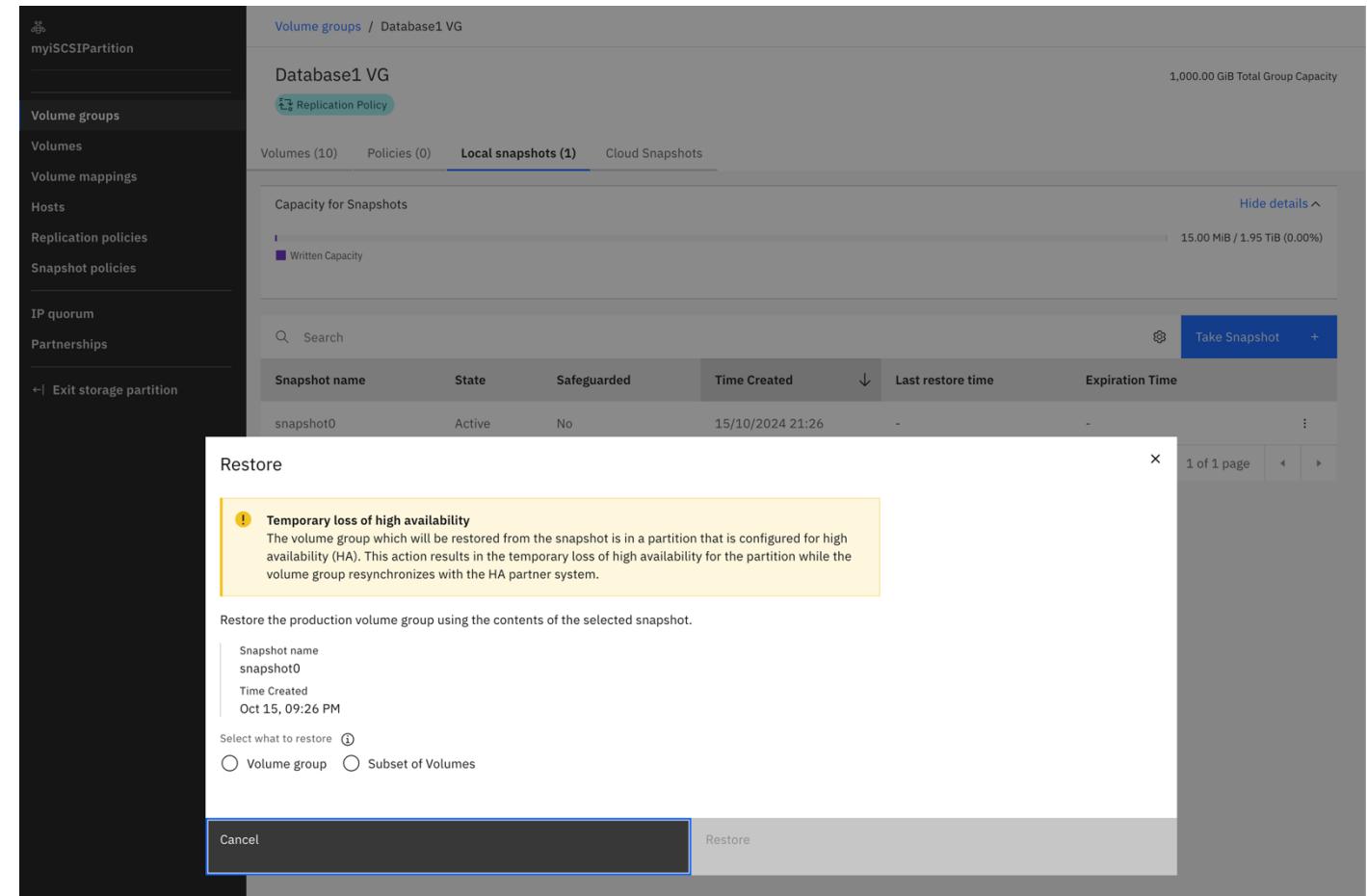


Restore/Refresh Replicated Volumes

- Support for restoring or refreshing from snapshots for volume groups/volumes using in policy-based replication, policy-based HA or HA+DR.
- Allows instant restore from regular snapshots and safeguarded snapshots.
- With asynchronous replication, restoring and refreshing can only be run against production or independent volume groups/volumes.
- HA volume groups/volumes can only be restored or refreshed using snapshots at the active management location – remember that the management location can be changed!
- Restoring or refreshing HA volume groups/volumes will cause HA to be **temporarily** lost while the contents of the snapshot is synchronized to the partner. This is automatic and requires no intervention.

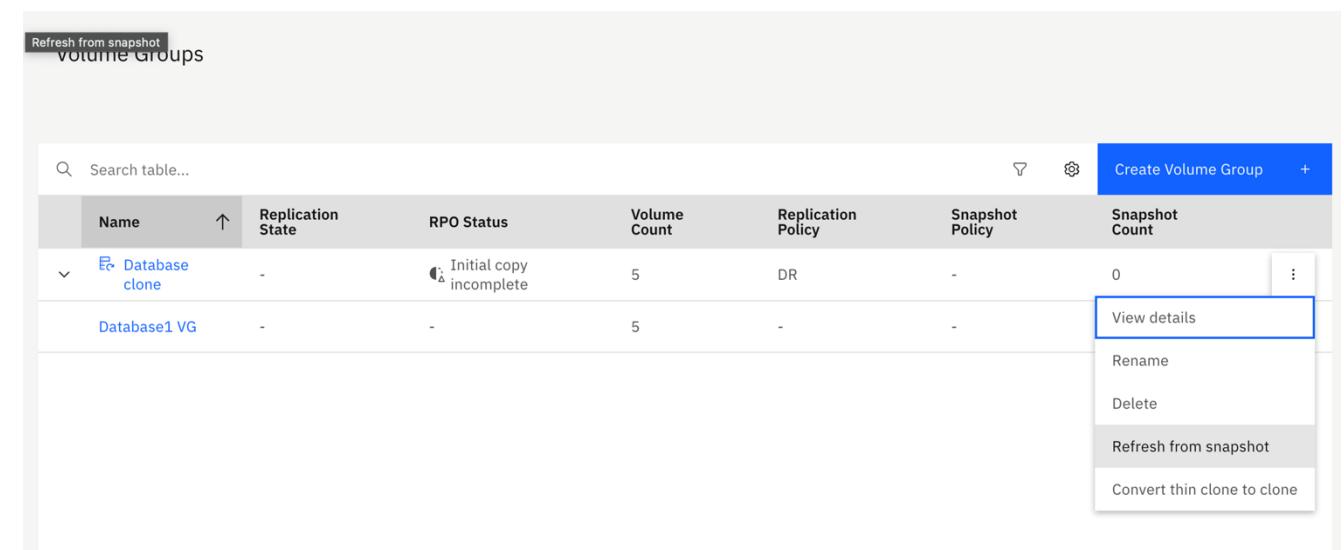
Policy-based High Availability

- A warning is displayed indicating that restoring will temporarily cause HA to be suspended until the resynchronization completes
- While the partition is resynchronizing, a snapshot is automatically taken at the other site to maintain a point in time should a failure occur



Policy-based High Availability

- Refreshing replicated volume groups or volumes works the same as non-replicated volume groups
- To refresh a volume or volume group, it must be a thin-clone
- Replication or HA will incrementally resynchronize the changes from the snapshot



Refresh from snapshot

volume Groups

Search table...

Name	↑	Replication State	RPO Status	Volume Count	Replication Policy	Snapshot Policy	Snapshot Count
Database clone	-	-	Initial copy incomplete	5	DR	-	0
Database1 VG	-	-	-	5	-	-	

Create Volume Group +

View details

Rename

Delete

Refresh from snapshot

Convert thin clone to clone

iSCSI Support for Policy-based High Availability

<ul style="list-style-type: none">• All-Ethernet HA deployment	<ul style="list-style-type: none">• Linked portsets	<ul style="list-style-type: none">• Interoperability support
<ul style="list-style-type: none">• RDMA-based Ethernet partnerships can be used for HA, with optionally either RDMA or TCP/IP partnerships for async replication to create a HA+DR solution.• Combined with iSCSI host support, allows for an Ethernet-only deployment.• The user-experience is <i>very</i> similar to configuring a Fibre Channel setup, with the only difference being linked portsets.• CHAP secrets are supported for HA hosts, but only the new 8.7.2 per-host username/secret implementation as it is more secure.	<ul style="list-style-type: none">• When configuring HA with iSCSI hosts, portsets must be linked between the systems. Portsets are optional for Fibre Channel, but this applies to Fibre Channel too.• Reminder: Portsets are a group of IP addresses or WWPNs assigned to ports on the system.• Using the same model as pool linking, portsets are linked between the two systems which defines which portset will be used on the partner when hosts are created.• Default host portsets are auto-linked after the partnership is created.• Hosts cannot be associated with an empty portset! This applies to non-HA hosts as well, to avoid unintentional access issues.	<ul style="list-style-type: none">• All supported versions of:<ul style="list-style-type: none">• Red Hat Enterprise Linux• SUSE Linux Enterprise• VMware ESXi• Other operating systems will be added as testing completes.• PBHA Host Interop

Portset Linking in PBHA

- Portsets can be linked from the GUI network settings menu after creating portsets...

Management IP Addresses

Service IP Addresses

▼ Ethernet Ports

▼ Priority Flow Control

▼ iSCSI

▼ Fibre Channel Connectivity

Fibre Channel Ports

NVMe Connectivity

DNS

Internal Proxy Server

Portsets

Portsets

Portsets are groupings of logical addresses that are associated with a port for specific traffic types. The system supports host, replication, and storage traffic for portsets.

Find Portset
↑↓

Portset	Port Type	Port Count	Member Count	⋮
portset0 (Default) Host Attachment	Ethernet	0	0	⋮
portset64 (Default) Host Attachment	Fibre Channel	4	0	⋮
SystemManagement (Default) Management	Ethernet	1	0	⋮
myHaPortset Host Attachment	Ethernet	0	0	Rename
portset1 Replication	Ethernet	0	0	Delete Add portset link Edit portset link Remove portset link
portset2	Port Type	Port Count	Member Count	⋮

Portset Linking

- Or, using the partition HA setup wizard...

Configure replication for myiSCSIPartition

Complete the steps to configure replication for the storage partition

Configure replication

Complete the actions below to configure high availability for this partition.

myiSCSIPartition

glitzy-c Logged in here

High availability

haddock-c

Partnership configured

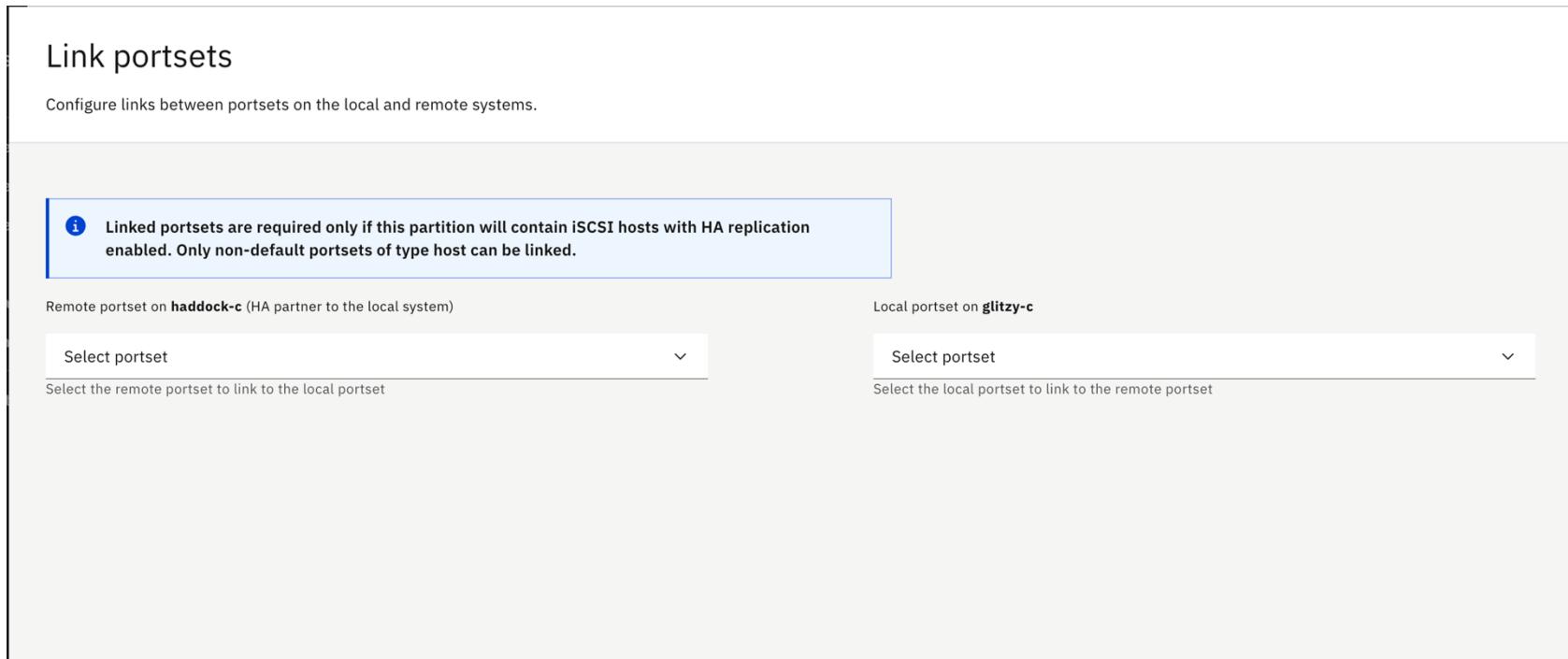
[Link portsets](#)

Pool links configured

[Configure IP quorum](#)

Portset Linking

- Or, using the partition HA setup wizard...



Import from external storage while maintaining existing DR

- 1. Create image-mode volumes with cache-disabled from the external storage controller
- The external storage can maintain its existing replication. If a disaster occurs before the new replica is established, the storage admin can access the DR copy maintained by their old array
- 2. Add the image mode volumes to a volume group and assign a replication policy
- While the sync progresses, add a copy of the volume to the internal arrays
- 3. When the synchronization completes, remove the replication from the external array, and convert the volumes to be cache-enabled on the production system
- Delete the image mode volume copy once its copied to the internal array
- Notes:
 - Cache must be changed to read/write mode once the synchronization completes as the replication direction cannot be reversed while cache-disabled volumes exist in the volume group.
 - Only image mode volumes may be added with cache disabled, and cache cannot be disabled on replicated volumes.
 - DR recovery volumes should not be exported using image mode as write cache is always enabled.

Misc. Replication Items

- Automatic Pool Linking
- The first pool created in the system will automatically be linked to partnered systems if both systems are running 8.7.2+.
- On upgrade, if there is only a single pool in the system and it's not currently linked, it will configure itself to be auto-linked.
- Interoperability for HA (and HA + DR)
- The following page will be updated as new operating systems are qualified:

[PBHA/PBHA+DR Interop](#)

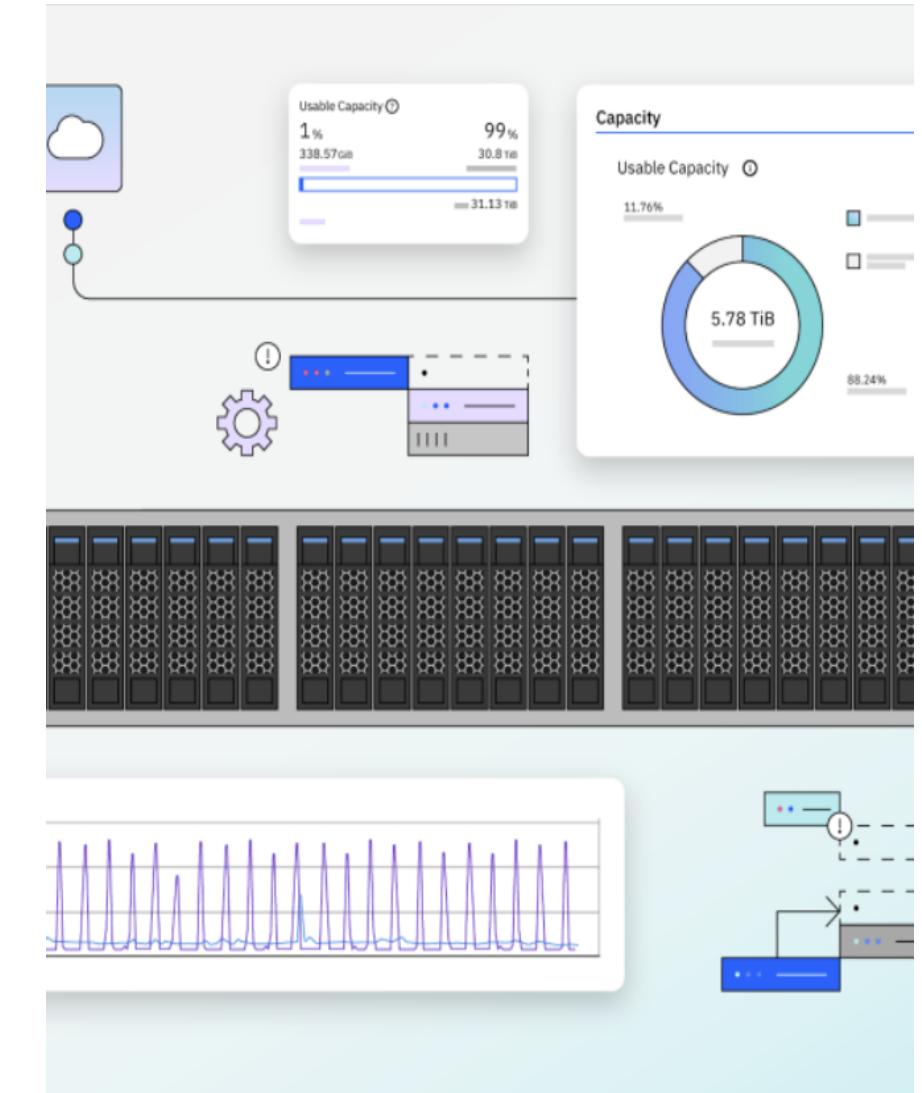
Supported OS's

- FC SCSI
- Red Hat Enterprise Linux, including with KVM (all supported versions)
- SUSE Linux Enterprise (all supported versions).
- IBM AIX (version 7.2 and later)
- Linux on IBM Z (all supported versions and distributions)
- VMware ESXi (all supported versions)
- Microsoft Windows Server, including Hyper-V (all supported versions). This requires both systems to be running IBM Storage Virtualize 8.7.2 or later
- Hoping to have IBM-I support soon (expected this month)
- iSCSI
- Red Hat Enterprise Linux, including with KVM (all supported versions).
- SUSE Linux Enterprise (all supported versions).
- VMware ESXi (all supported versions).

IBM Storage Virtualize

Flash Grid GUI

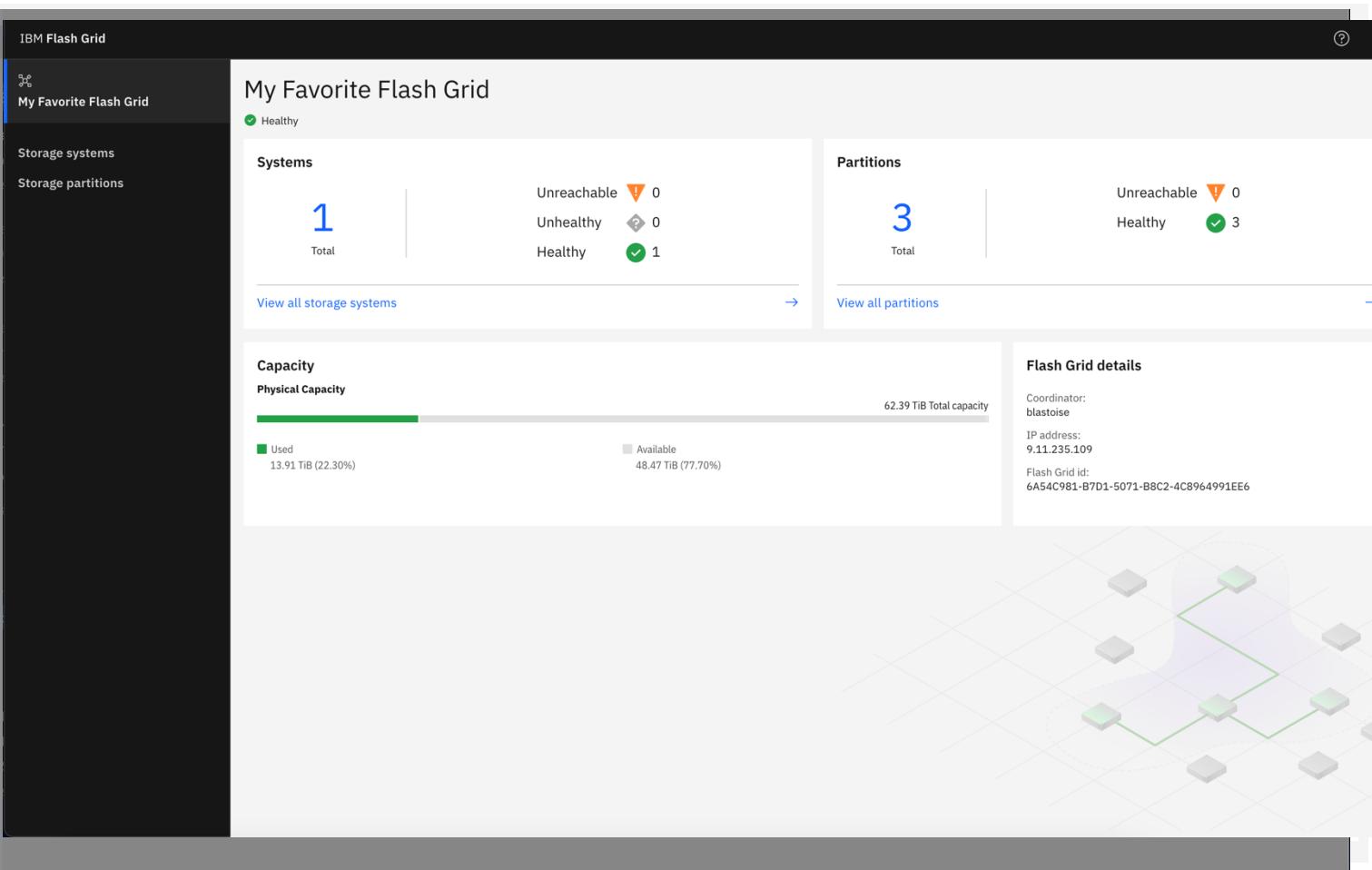
Partition Migration Automation



Flash Grid Configuration, Monitoring and Partition Migration

Before 8.7.2	In 8.7.2
Configuration (Create Flash Grid, Add Member) CLI Only	Configuration (Create Flash Grid, Add Member) CLI and GUI
Monitoring Storage Insights Only	Monitoring Storage Insights and GUI
Partition Migration CLI/Storage Insights	Partition Migration CLI/Storage Insights

Create a New Flash Grid



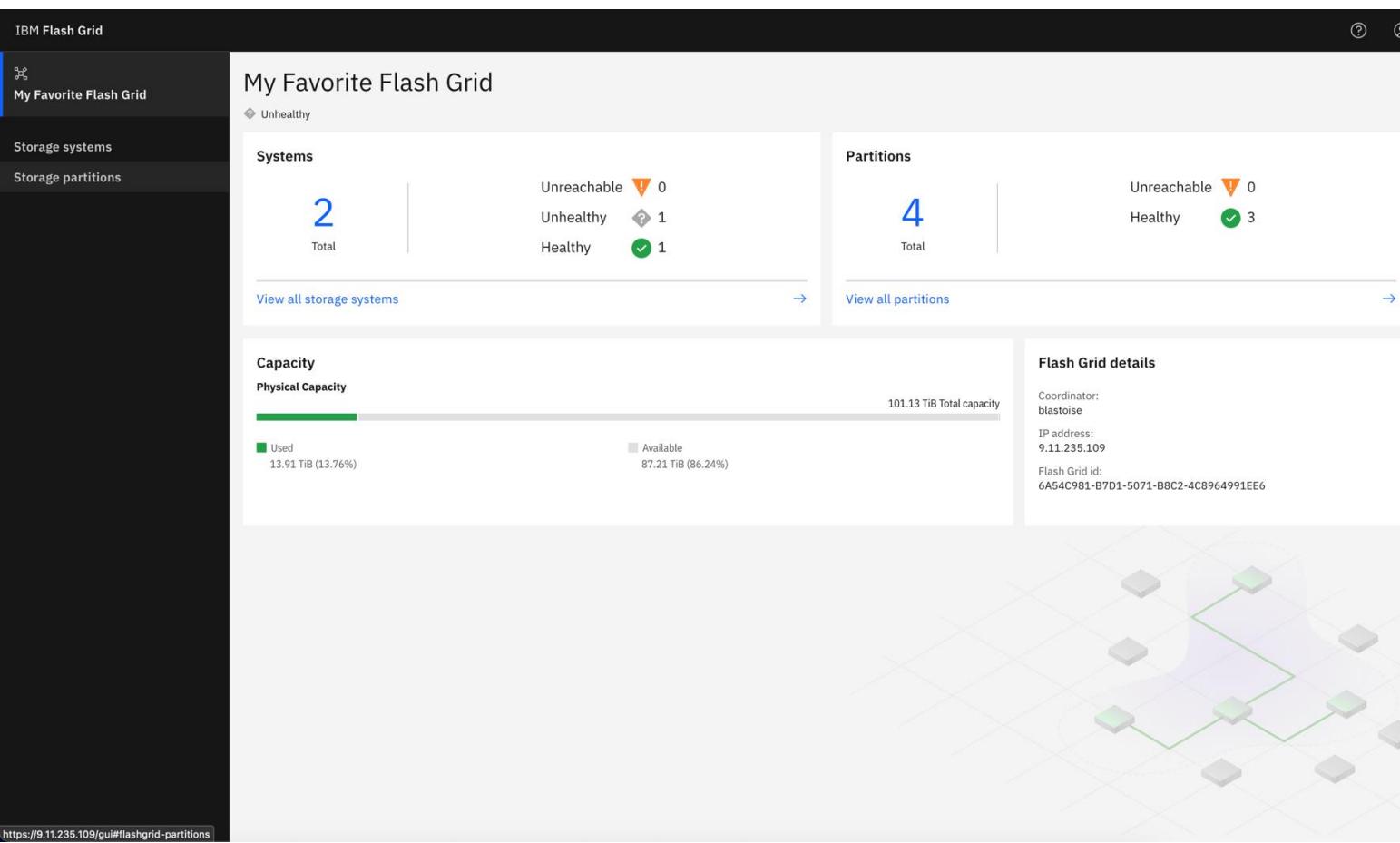
The screenshot shows the IBM Flash Grid interface. On the left, a sidebar lists 'Storage systems' and 'Storage partitions'. The main dashboard is titled 'My Favorite Flash Grid' and is marked as 'Healthy'. It displays two sections: 'Systems' (1 total, 0 unreachable, 0 unhealthy, 1 healthy) and 'Partitions' (3 total, 0 unreachable, 3 healthy). Below these are sections for 'Capacity' (Physical Capacity: Used 13.91 TiB (22.30%), Available 48.47 TiB (77.70%), Total capacity 62.39 TiB) and 'Flash Grid details' (Coordinator: blastoise, IP address: 9.11.235.109, Flash Grid id: 6A54C981-B7D1-5071-B8C2-4C8964991EE6). At the bottom is a 3D visualization of the Flash Grid structure.

- 8.7.2 systems that support Flash Grid will have a new notification
 - Notification can be disabled

Steps

1. Click on Create a new Flash Grid
2. Name your Flash Grid
3. Successful creation will take you to the Flash Grid dashboard
 - Single system added
 - Flash Grid Coordinator

Flash Grid Dashboard



Number of systems and partitions

System / Partition Health

- Healthy, Unhealthy, Unreachable

Aggregated Capacity

- Physical capacity only in this release

Flash Grid details

Side menus for Storage systems and Storage partitions

Flash Grid Login Screen

IBM

IBM Flash Grid
My Favorite Flash Grid (blastoise)

Username

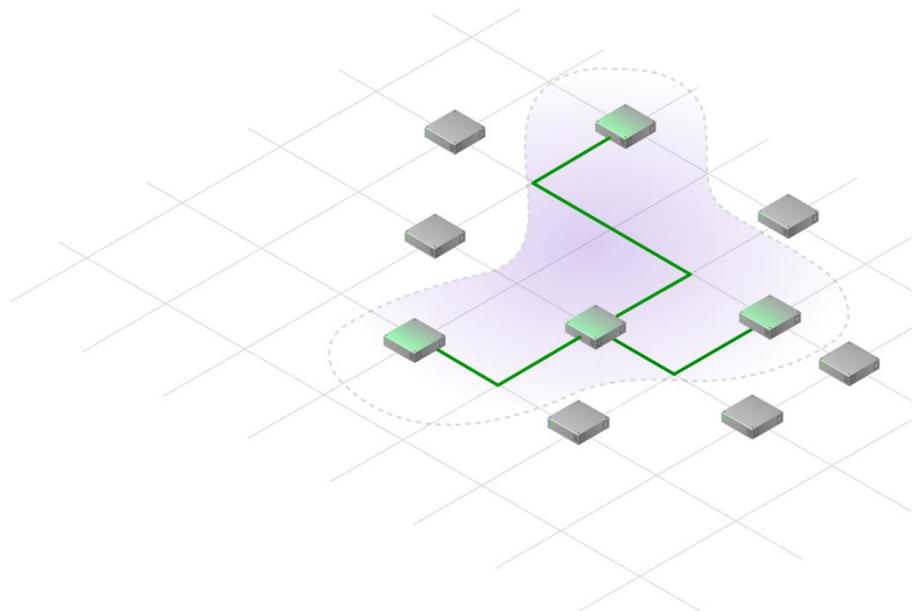
Password

Sign in →

Or

Sign in with SSO →

ⓘ Use credentials for the Flash Grid coordinator (blastoise) to log into the Flash Grid.



The Flash Grid Coordinator will have a new Flash Grid login screen

User credentials to log in are those of the system you connect to

- Supports LDAP, SSO

Flash Grid Login Screen

IBM

IBM FlashSystem 7300
Storage Management (FS7300-TestDrive)

Username

Password

Sign in

Managed by IBM Flash Grid
[Login to IBM Flash Grid](#)This system is used for the Storage Virtualize Test Drive from
TechZone. Please contact Byron Grossnickle
(byrongo@us.ibm.com) with any questions

A member of the Flash Grid will have a normal login screen with the option to connect to the Flash Grid Coordinator that is running the Flash Grid GUI front end

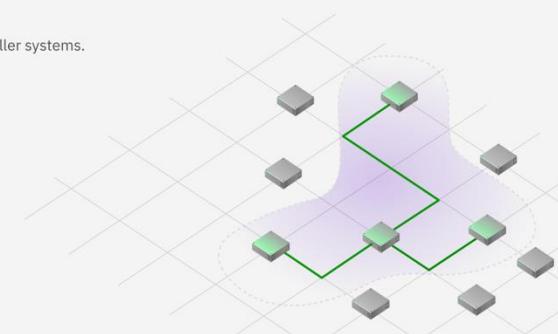
Add a member to the Flash Grid

What is a Flash Grid?

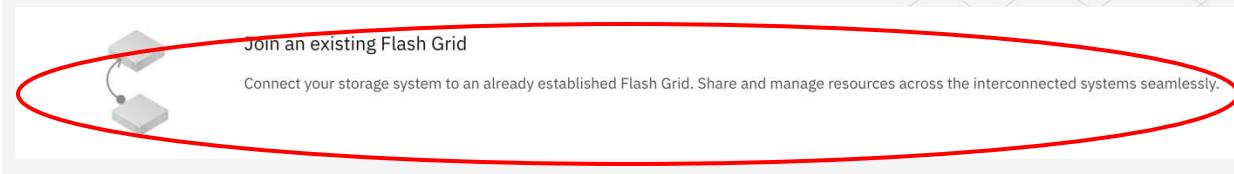
A Flash Grid is a scalable storage platform spanning multiple FlashSystem or SAN Volume Controller systems.

Key benefits

- Increase the capacity of your storage infrastructure by adding up to eight member systems in the Flash Grid
- Manage and monitor all connected systems as a single system from a single interface
- Stay updated about partition health and migrate partitions seamlessly between member systems



Get started



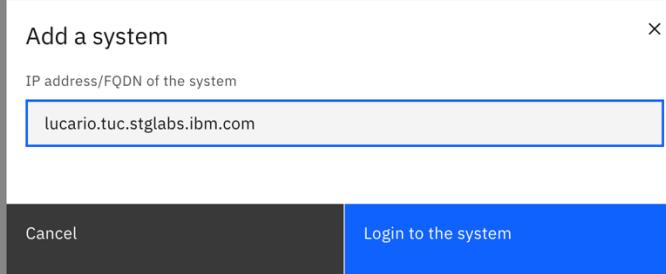
Storage system

Healthy

Search table...

Storage system	Product name	Code level	Last contacted	Connectivity health	Hardware health	Physical capacity
blastoise coordinator	IBM FlashSystem 5200	8.7.2.0	now	Healthy	Healthy	13.88 TiB (22%)

Items per page: 10 1-1 of 1 item



Add a system

IP address/FQDN of the system

lucario.tuc.stglabs.ibm.com

Cancel Login to the system

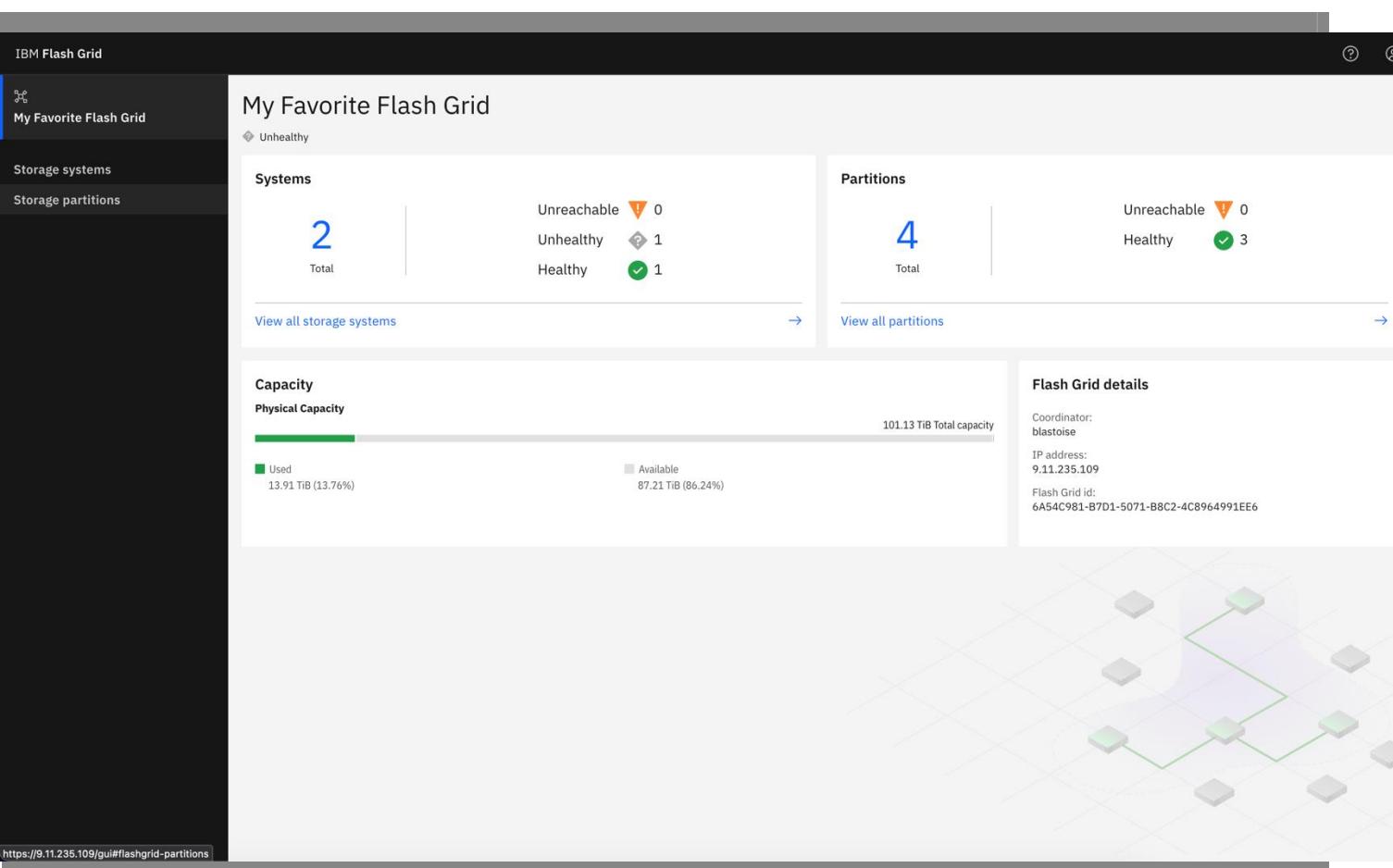
Add a member from the Storage systems page

OR

From the new member system's Flash Grid configuration screen

- Select Join an existing Flash Grid

Add a member to the Flash Grid – Cont'd



GUI automatically navigates you to the member system

- May require logging in

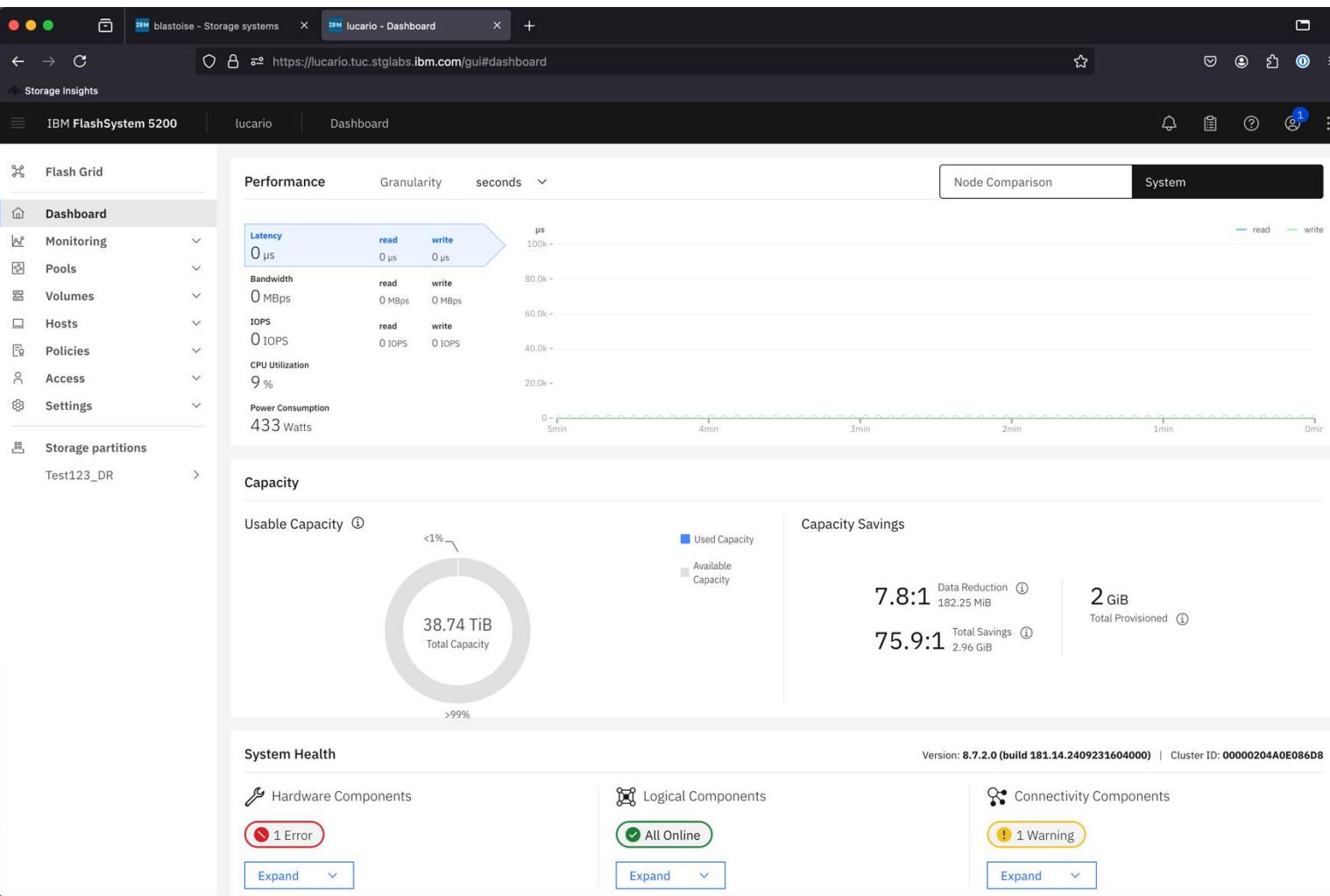
Verify and exchange certificates

GUI automatically navigates back to the Flash Grid coordinator to complete join process

Approve Flash Grid join request and new member is added

Dashboard now shows additional systems and new aggregate capacity

Flash Grid – Storage systems



The screenshot shows the IBM FlashSystem 5200 Dashboard. The left sidebar includes options for Flash Grid, Dashboard, Monitoring, Pools, Volumes, Hosts, Policies, Access, Settings, and Storage partitions. The main area displays performance metrics (Latency, Bandwidth, IOPS, CPU Utilization, Power Consumption) and capacity usage (Usable Capacity: 38.74 TiB Total Capacity, Capacity Savings: 7.8:1 Data Reduction, 75.9:1 Total Savings, 2 GiB Total Provisioned). The System Health section shows 1 Error for Hardware Components, All Online for Logical Components, and 1 Warning for Connectivity Components. The bottom of the screen shows the version (8.7.2.0) and Cluster ID (00000204A0E086D8).

All storage systems in the Flash Grid are managed here

Product name, Code level details, Physical capacity

Last contacted shows last time the system was queried from the Flash Grid

Connectivity, Hardware health provides similar attributes to system health boxes

Clicking on storage system name will pop up system dashboard in a separate tab

Flash Grid – Storage partitions

IBM Flash Grid | blastoise | Storage partition: Test VMs

Test VMs

Replication overview

Test VMs

blastoise
Logged in here

DR running

Test VMs_DR

lucario

Storage components

Hosts (1) Online

Volumes (1)

Volume groups (1) 1 within RPO

Connectivity

DR partnership (lucario) Configured

Aggregated list of all storage partitions in the Flash Grid

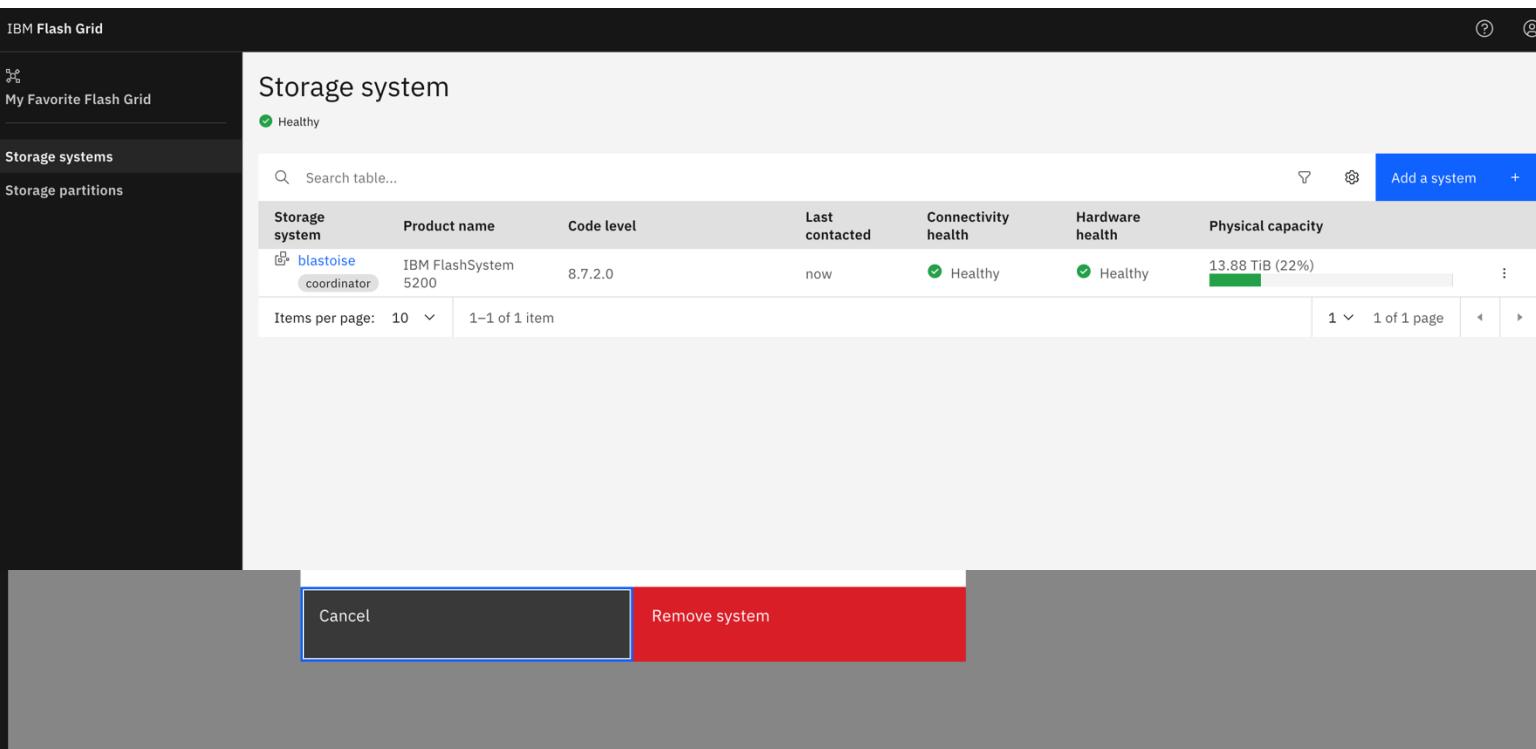
Provides replication and migration status and number of volume groups

Partition and Volume Group links

- Clicking on links will launch to the partition or volume group
 - Launches within the window
 - No additional tab
 - May require login
 - SSO configured systems will auto log in

Exiting storage partition brings you back to the Storage partitions list

Removing a member from a Flash Grid



The screenshot shows the IBM Flash Grid interface. On the left, a sidebar has 'My Favorite Flash Grid' selected. The main area is titled 'Storage system' and shows a single entry: 'blastoise coordinator' (IBM FlashSystem 5200, 8.7.2.0, last contacted 'now', healthy, healthy, 13.88 TiB (22%)). Below the table are buttons for 'Cancel' and 'Remove system'. A modal dialog is open at the bottom, with 'Cancel' in a grey box and 'Remove system' in a red box.

Storage system	Product name	Code level	Last contacted	Connectivity health	Hardware health	Physical capacity
blastoise coordinator	IBM FlashSystem 5200	8.7.2.0	now	Healthy	Healthy	13.88 TiB (22%)

Accessible from Storage systems page

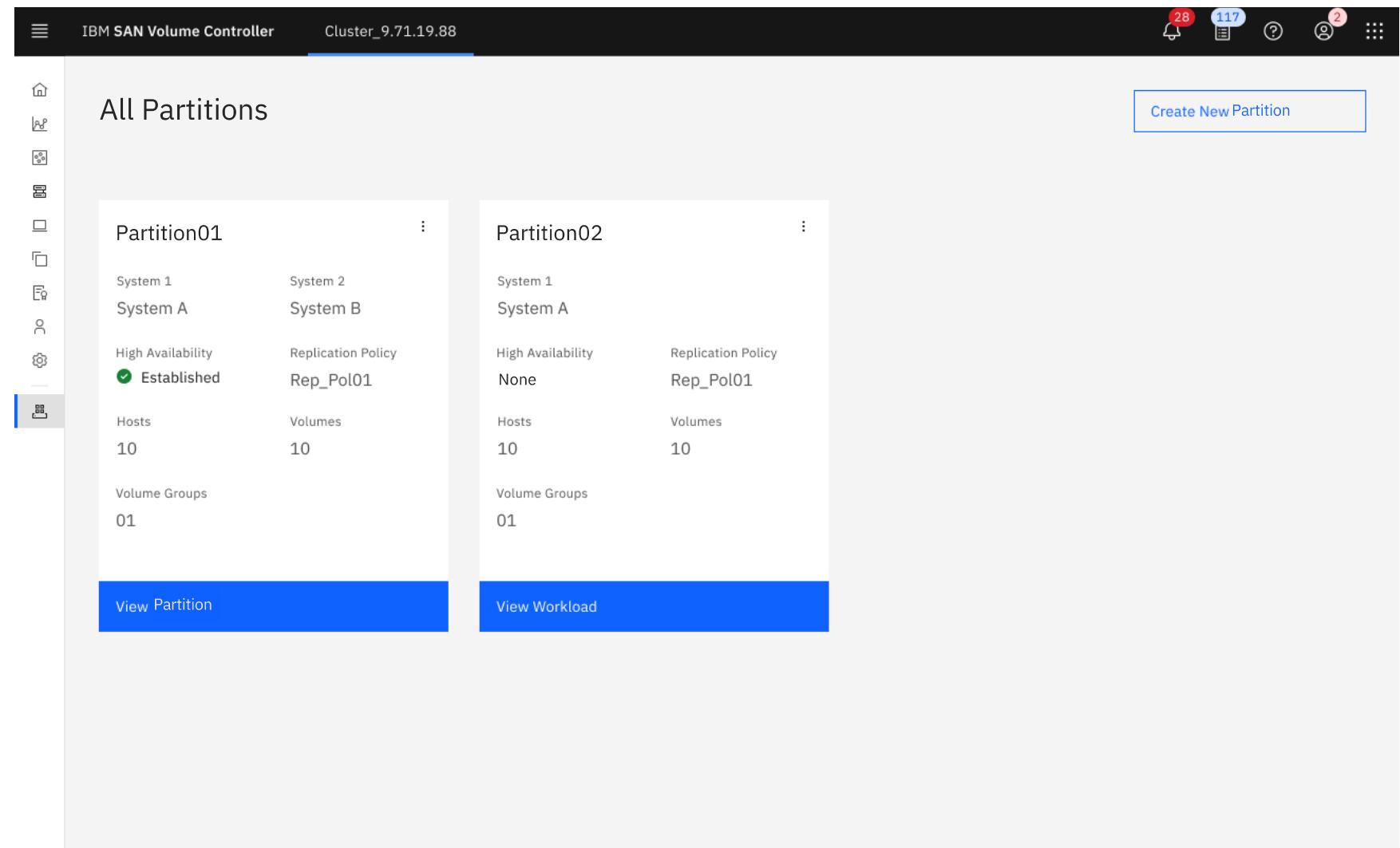
Select Remove system from the action menu of the system you want to remove

Confirm and system is removed

Removing the LAST system (coordinator) from the Flash Grid will dissolve the Flash Grid entirely

Storage Partition : New Unit for Managing Workload Storage

- New unit of management
- Consists of multiple volume groups, hosts
- Typically, assigned to one workload
- Currently limited to four partitions per system



IBM SAN Volume Controller Cluster_9.71.19.88

All Partitions

Create New Partition

Partition	System 1	System 2	Hosts	Volumes	Volume Groups
Partition01	System A	System B	10	10	01
Partition02	System A	None	10	10	01

View Partition

View Workload

Storage Partition Migration:

Mobility Drivers

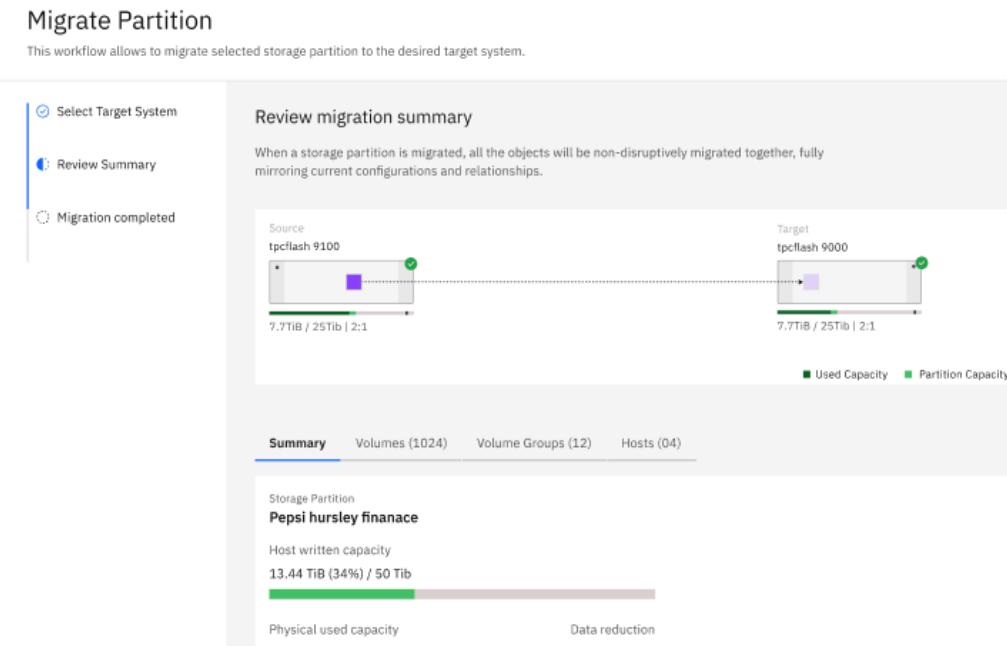
1. Migration Use case:

Storage Partition Movement

2. Flash Grid Optimization:

Load-Balancing across Fleet of Storage

3. Hardware Refresh: Non-disruptive System Retirals



Solution and Roadmap

1. Single-click Automation for Migration (24Q1)
2. Zero downtime (Non-disruptive) (24Q1)
3. AI driven automated migration through Storage Insights (24Q2)
4. Integration with VMWare Host environments (24Q4)
5. Automated Network, Host actions (8.7.2/Future)

User Interaction during Storage Partition Migration

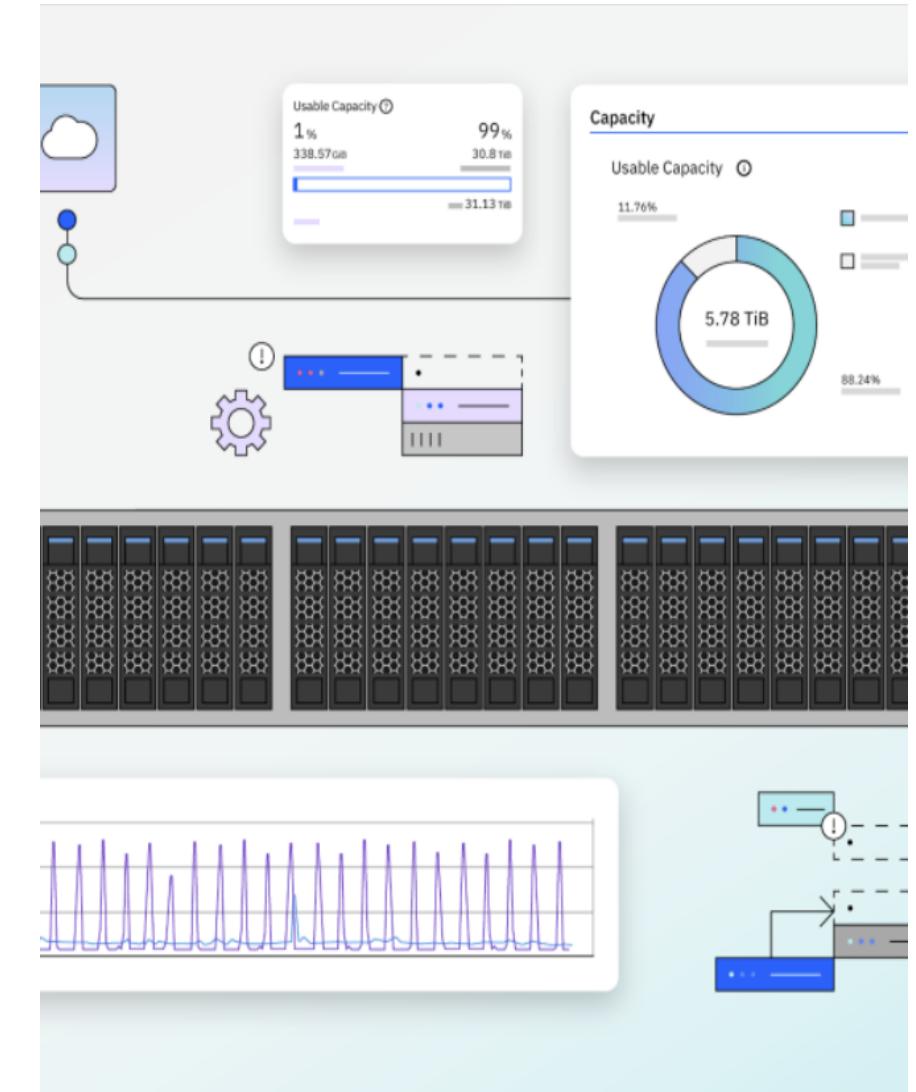
Before 8.7.2	In 8.7.2
User initiates storage partition migration	User initiates storage partition migration
User Action#1 Request Host Rescan - Scan paths at host level and continue	User Action#1 Request Host Rescan - Scan paths at host level and continue (not required for VMWare environments)
User Action#2 Copy Delete Consent - Delete source copy and complete the migration	User Action#2 Copy Delete Consent - Delete source copy and complete the migration

- Ease of use / Minimum intervention
 - Providing a way to detect environment that has automated rescan support
 - Providing a way for user to configure if given host has periodic automated rescan capability
 - CLI Only: chhost –autostoragediscovery yes

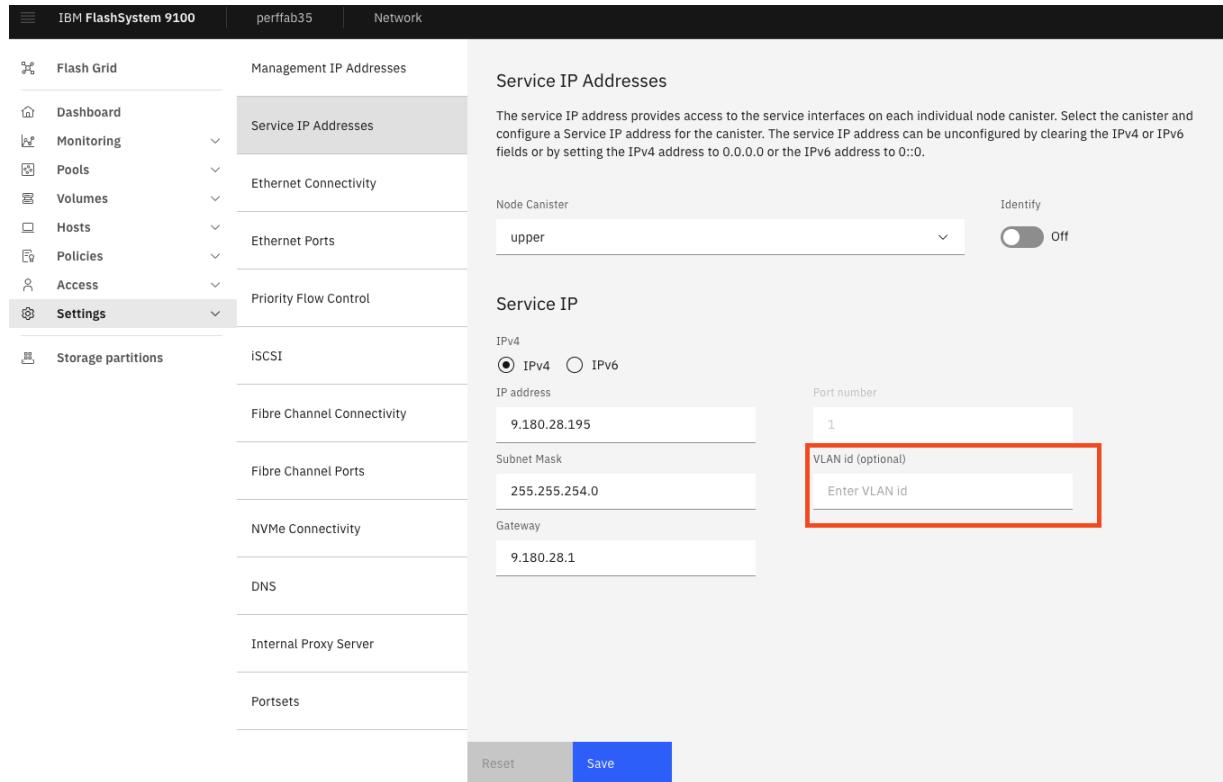
– Note: FDMI data is used to set this value for hosts known to auto-rescan

IBM Storage Virtualize

Misc. Topics



Service IP Updates



The screenshot shows the 'Service IP Addresses' configuration page for an IBM FlashSystem 9100. The left sidebar shows navigation options like Flash Grid, Dashboard, Monitoring, Pools, Volumes, Hosts, Policies, Access, Settings, and Storage partitions. The 'Service IP Addresses' option under 'Settings' is selected. The main panel displays the 'Service IP Addresses' configuration. It includes a 'Node Canister' dropdown set to 'upper' and an 'Identify' toggle switch set to 'Off'. The 'Service IP' section contains fields for 'IPv4' (selected), 'IP address' (9.180.28.195), 'Subnet Mask' (255.255.254.0), and 'Gateway' (9.180.28.1). To the right, a 'Port number' field is set to '1'. Below it, a 'VLAN id (optional)' field has the placeholder 'Enter VLAN id' and is highlighted with a red box. At the bottom are 'Reset' and 'Save' buttons.

- To align with the overall improvements of IP Addresses, we have added VLAN tagging support to Service IPs that are managed from the service GUI/CLI or the System GUI/CLI
- Note – we will only support either an IPv4 OR an IPv6 address for the service IP, not both

Additional IP Replication Statistics

Stats	Explanation	SI Metric Counter	SI Metric Name
ipbz	Indicates the average size (in bytes) of data that is being submitted to the IP partnership driver since the last statistics collection period.	1264	IP Replication Transfer Size (Receive)
iprc	Indicates the total bytes that are received before any decompression takes place.	1280	IP Replication Compressed Data Rate (Receive)
ipre	Indicates the bytes retransmitted to other nodes in other clusters by the IP partnership driver.	1278	IP Replication-to-Remote Node Data Rate (Resend)
iptt	Indicates the average round-trip time in microseconds for the IP partnership link since the last statistics collection period.	1265	IP Replication Latency
iprx	Indicates the bytes received from other nodes in other clusters by the IP partnership driver.	1277	IP Replication-to-Remote Node Data Rate (Receive)
ipsz	Indicates the average size (in bytes) of data that is being transmitted by the IP partnership driver since the last statistics collection period.	1263	IP Replication Transfer Size (Send)
iptc	Indicates the total bytes that are transmitted after any compression (if active) takes place.	1279	IP Replication Compressed Data Rate (Send)
iptx	Indicates the bytes transmitted to other nodes in other clusters by the IP partnership driver.	1276	IP Replication-to-Remote Node Data Rate (Send)

- Provide XML IO Statistics for individual IP Partnerships for multi-site configurations

- These are not in SI right now, but available in the XML statistics

```
<partnership_ipperf index="1" cluster="auxnear" remote_cluster_id="0x0000020439602218" port_id="4"
iptx="680288517951" iprx="12495722729" ipre="10366232" ipsz="1210"
ipbz="1147" iptt="46" iptc="673275635991" iprc="6473577404"/>
```

Quotaless Child pools

Create Child Pool x

Create a child pool or a Safeguarded child pool for a parent storage pool. Use safeguarded child pools to store backups for a volume that is protected by the Safeguarded Copy function.

Parent Pool

Group0

Available pool capacity : 29.96 TiB

Child pool name and capacity

Child Pool (optional)

Example: Group0_Child 0

Share capacity with parent pool

Show more ⓘ

Cancel Create

- Provide a new mechanism for creating a Standard Child Pools without a capacity quota for easier maintenance, Object Based Access Controls and IO throttling
- `mkmdiskgrp -noquota -parentmdiskgrp {id} -datareduction no`
- VMware vVols still require a quota-controlled standard pool(s)

Host Offline Alert Changes

8.6.1 introduced a new alert when a host changes status to offline

Feedback from customers was that sometimes hosts going offline was expected.

- New option to ignore certain hosts when they go offline:
- CLI/API option on chhost
- DMP-driven approach when resolving the host-offline event to select certain hosts to ignore status changes.

Updates to Config Backup

- Modernized tools in order to:
 - use less memory
 - use JSON instead of XML
 - Significantly improves the performance of config backup, T3 and T4 prepare steps – down to **20s** from 3 hours
 - T4 No longer restores
 - Cloud accounts,
 - Host iSCSI Auth,
 - Cloud Backup
 - **No longer in /tmp**

/dumps/svcconfig/svc.config.backup.json

Capacity reporting CLIs

Terminology changes for capacity

- Physical Capacity (Usable)
- Logical Capacity (Effective)

Note: Logical capacity metrics are only available for systems and pools which are backed by FCM-only arrays

- Provides consistency across GUI, SI and external APIs
 - Prevents each piece of software doing complex math separately for capacity metrics

lssystemcapacity

```
total_physical 38.74TB
used 12.45GB
warning_exceeded no
total_logical 178.62TB
allocated 602.00GB
written 482.44GB
written_snapshots 0.75MB
provisioned_host 600.00GB
reserved_host_volume 117.56GB
reserved_contingency 2.00GB
reserved_childpools 0.00MB
```

lspoolcapacity

```
id 0
name swimming_pool
total_physical 38.74TB
used 12.45GB
warning 8000
warning_set no
total_logical 178.62TB
allocated 602.00GB
written 482.44GB
written_snapshots 0.75MB
provisioned_host 600.00GB
reserved_host_volume 117.56GB
reserved_contingency 2.00GB
reserved_childpools 0.00MB
```

New Login Panel

IBM

IBM FlashSystem
5200

Storage Management (perfcab3)

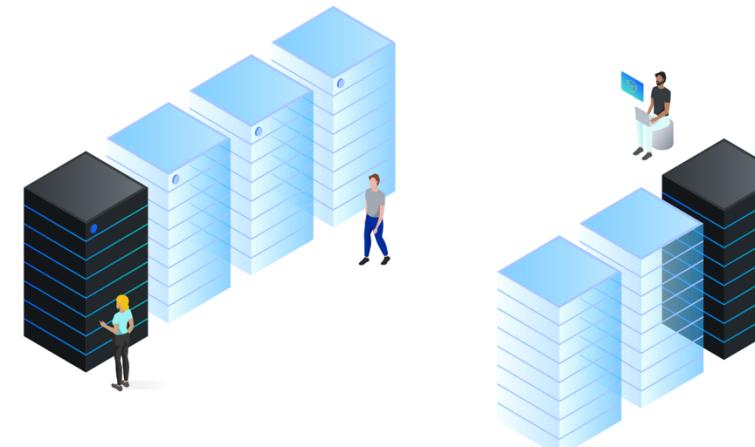
Username

Password 

Sign in 

IBM



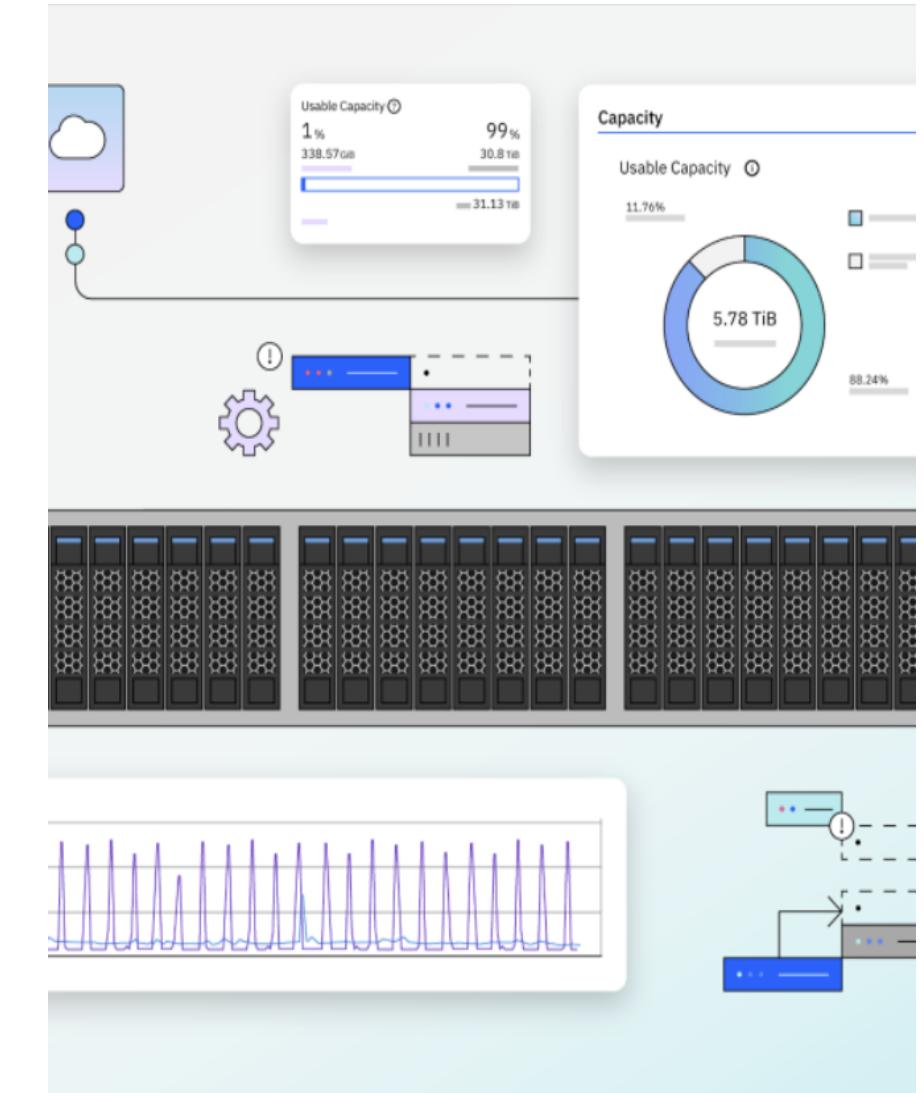


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IBM Storage Virtualize

Plugin Updates

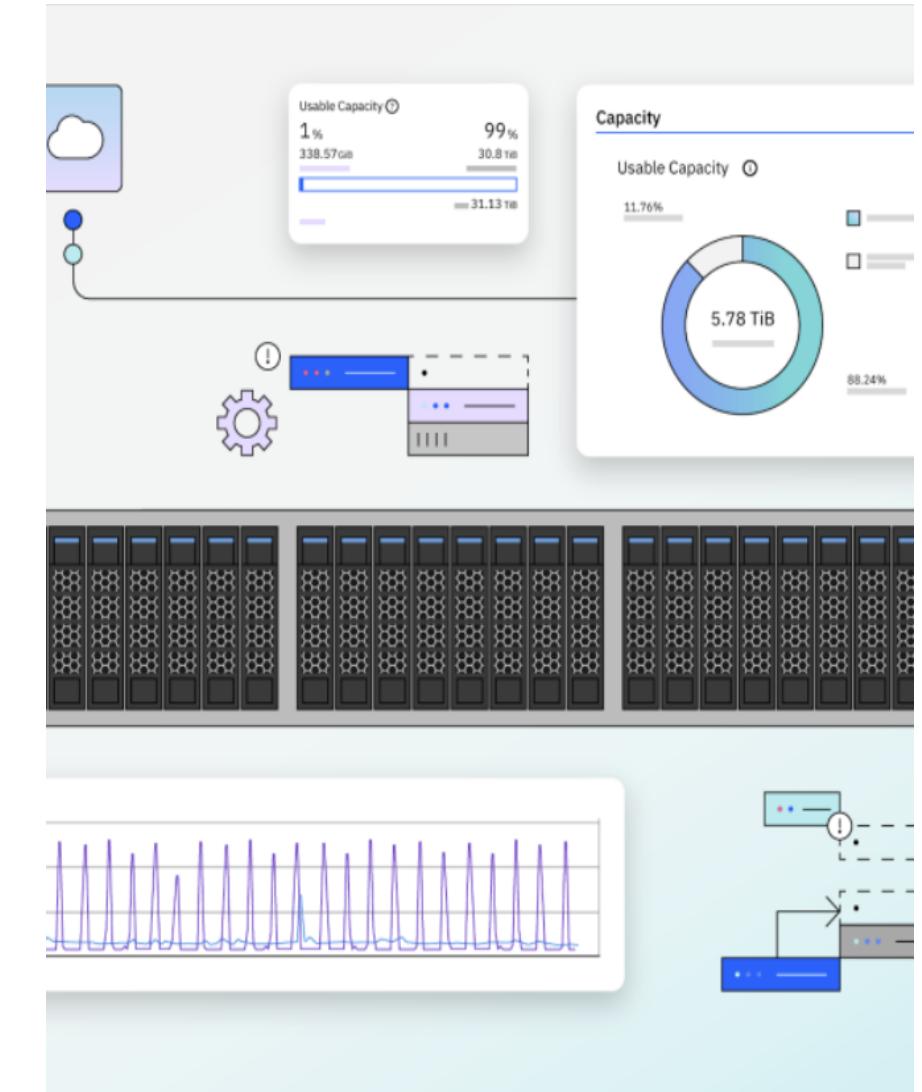
vSphere Plugin CSI Driver



IBM Storage Virtualize

Plugin Updates

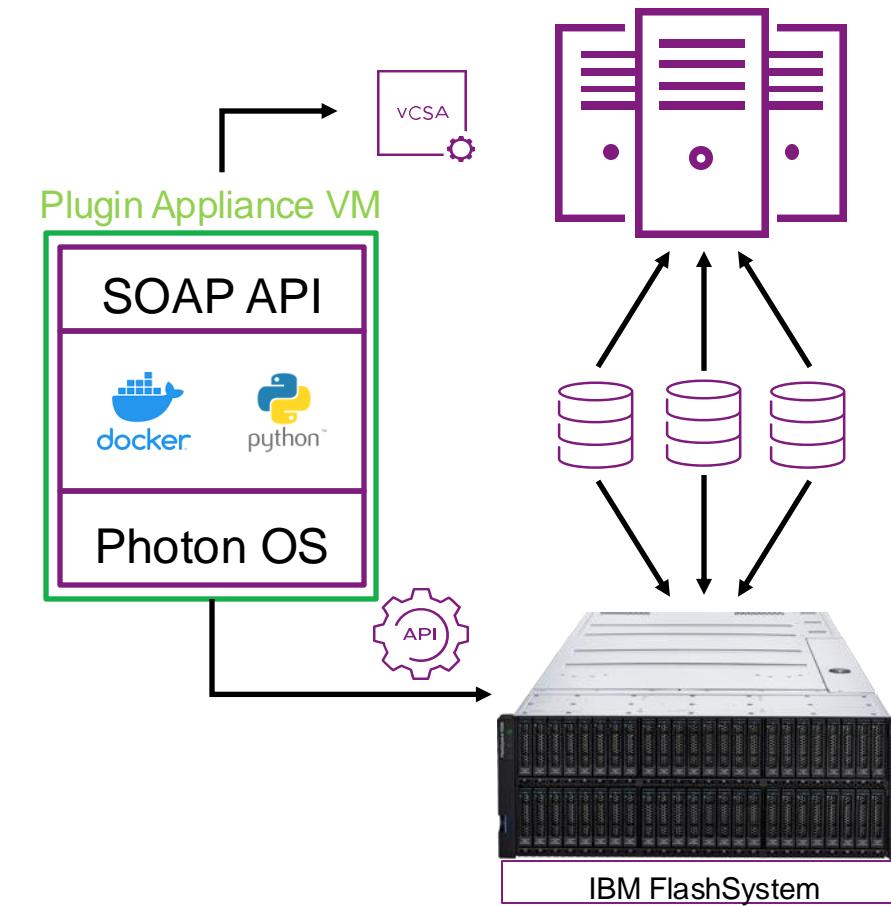
vSphere 2.0.0
December



IBM Storage Virtualize plugin for vSphere

Automates vSphere and storage tasks together All from the vCenter UI

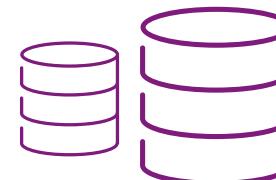
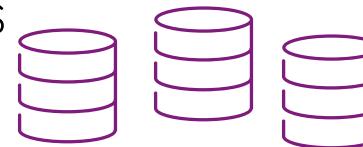
- Supports all Storage Virtualize platforms: FlashSystem (8.5.0+), SAN Volume Controller and Storwize products)
- Manage multiple storage systems from a single plugin instance
- Simplifies Storage Provisioning & Management
- Provides storage context for vSphere objects
- OVA can be Download from IBM Fix Central
- Backed by crisp documentation <https://www.ibm.com/docs/en/svpfv>



Current vSphere Plugin Capabilities

- Manage FC host
- Manage FC host cluster
- vSphere privileges check
- Storage system details
- Manual reconciliation

- Manage VMFS datastores
 - Create datastores
 - Expand datastore
 - Delete datastore



- Manage datastores volume group
 - View volume group details
 - Move datastore to a volume group
 - Remove datastore from a volume group



- Manage datastores snapshot
 - Take snapshot
 - View snapshots
 - Copy to new datastore
 - Delete snapshot



What's New in vSphere Plugin 2.0 Overview

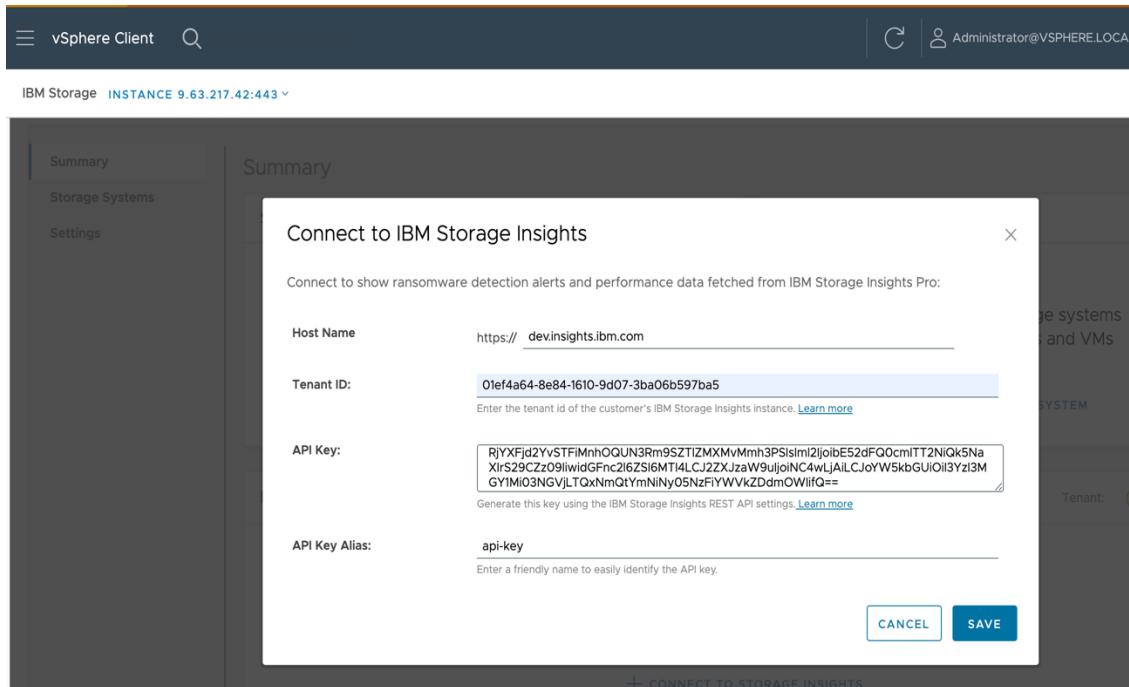
Performance Monitoring Dashboard

- Integration with Storage Insights
- Provision to connect SI through proxy server(For dark site users)
- List top 5 storage systems by IOPS, Bandwidth or latency
- List top 5 datastores by IOPS, Bandwidth or latency
- View recent CPU utilization of each registered storage system
- Doughnut chart to categorize storage systems based on version, platform, call-home enabled, and status
- Aggregate view of number of datastores and VMs with focus on publishing status with error if any
- View system(storage system) level statistics with respect to IOPs, bandwidth and latency
- View volume(datastore) level statistics with respect to IOPs, bandwidth and latency

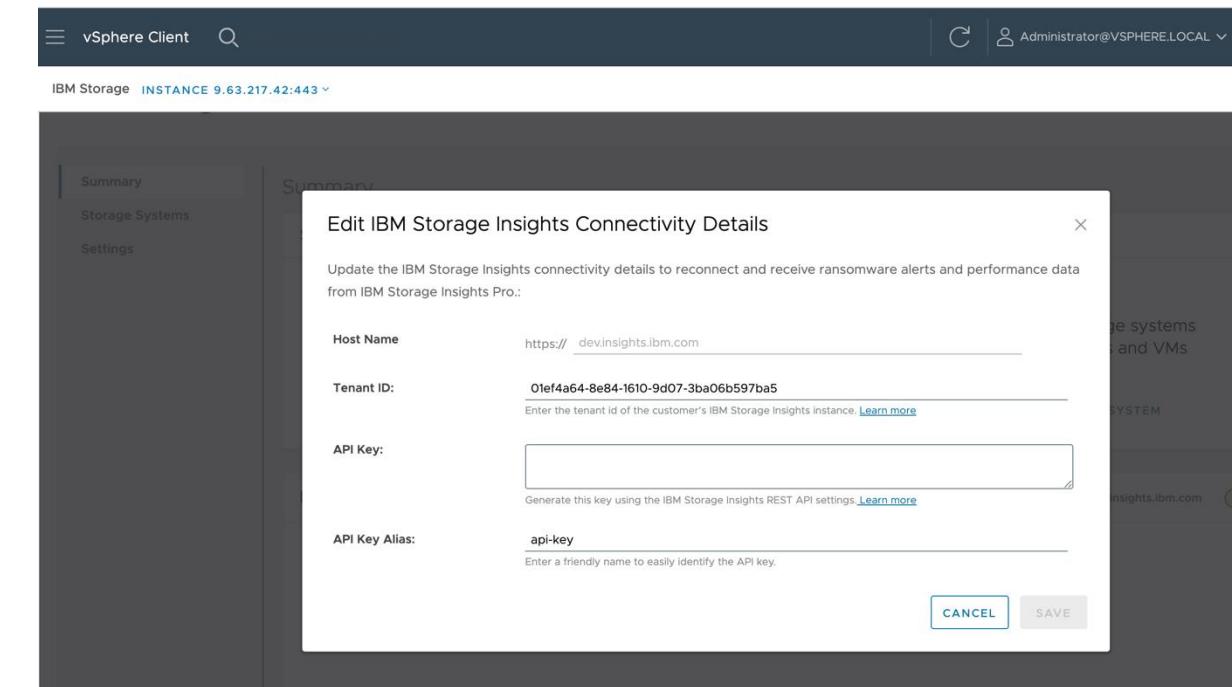
Plugin settings view

Storage Insights Integration

- From vSphere Plugin dashboard summary, add SI instance by providing SI tenant ID, API Key and API Key alias.
- This result into availability of performance statistics automatically at system and datastore level for those storage system which are part of this SI inventory.
- This also enables the ransomware threat detection alert feature right in the vSphere UI



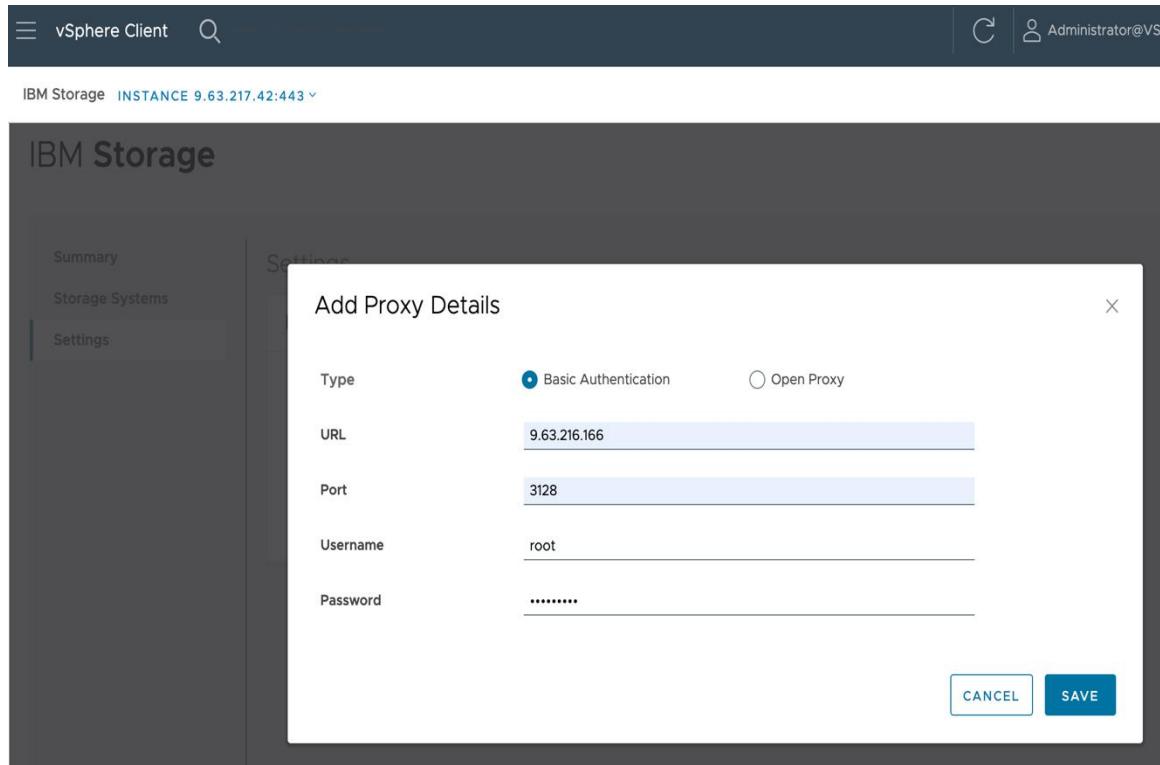
Add Storage Insights



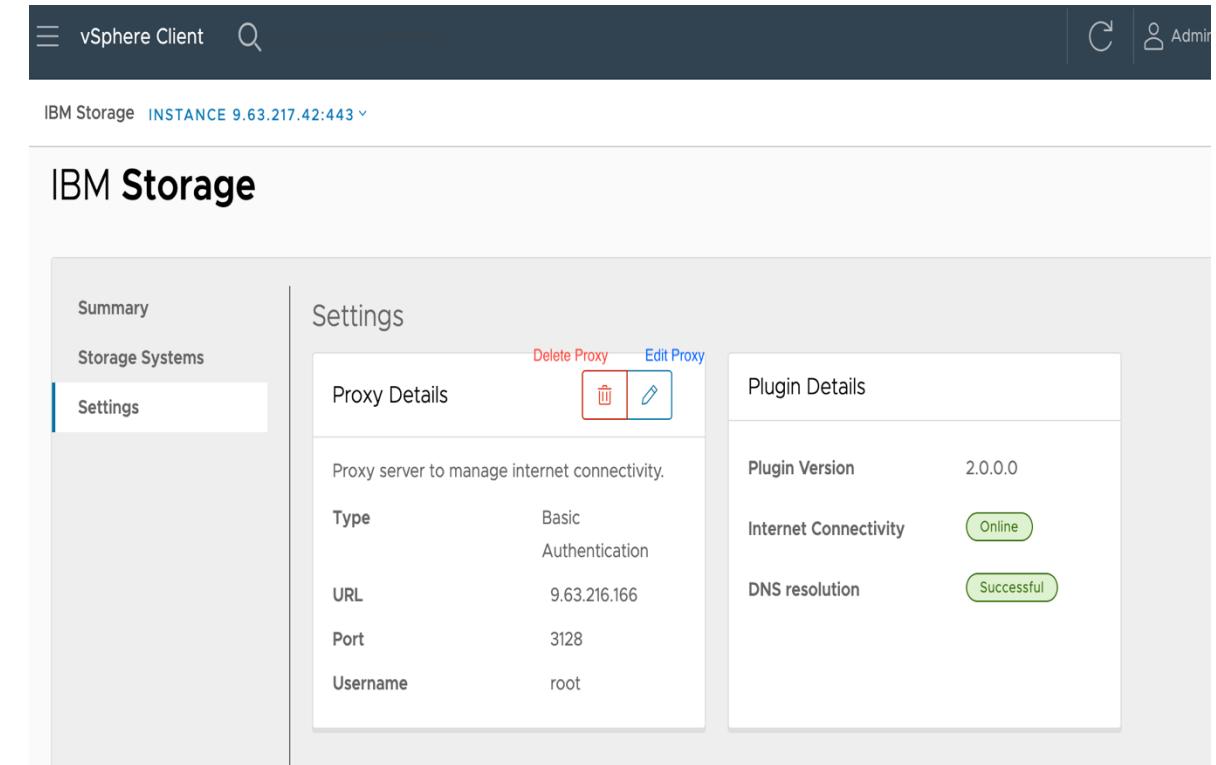
Edit Storage Insights

Proxy Server and plugin settings

- For internet connectivity purpose if required, from settings page, proxy server can be added by providing URL, port, username and password based on proxy type selection



Add Proxy server



Edit/Delete Proxy server

Sample performance monitoring dashboard

vSphere Client Search in all environments Administrator@VSPHERE.LOCAL ?

IBM Storage INSTANCE 9.193.231.219:443

IBM Storage

IBM

Summary

Storage Systems

Settings

Systems

View By Status

Status

Version

Call Home Status

Platform

Online 60 Systems

Offline 40 Systems

Datastore & VMs

Datastores 18 2 offline

VMs 8 2 offline

Performance (24 of total 30 systems) i

Top Systems IOPS

storage_system_001	2.3 M	2.3 M
srt_system_1	2.2 M	2.2 M
prod_system_new	2.1 M	2.1 M
prod_system1	2.0 M	2.0 M

Top Datastores IOPS

ds_1_001	2.3 M	2.3 M
ds_1_023	2.2 M	2.2 M
ds_001_new	2.1 M	2.1 M
ds_121_new	2.0 M	2.0 M

CPU Usage

Utilisation %

T2. Insights.IBM.com Connected

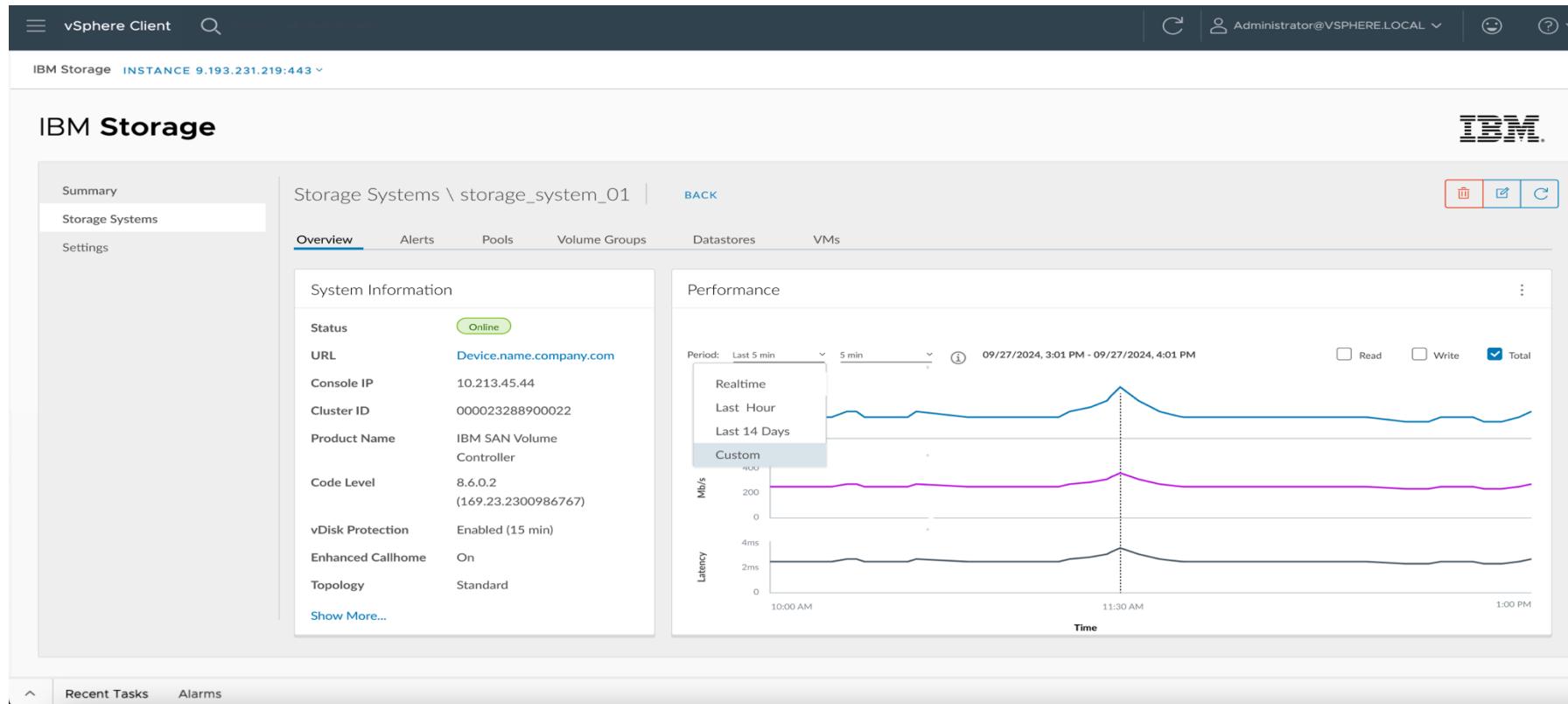
System1 System2 System3 System4 System5 System6 System7 System8 System9 System10

Recent Tasks Alarms

Performance Monitoring Dashboard

System Level Statistics

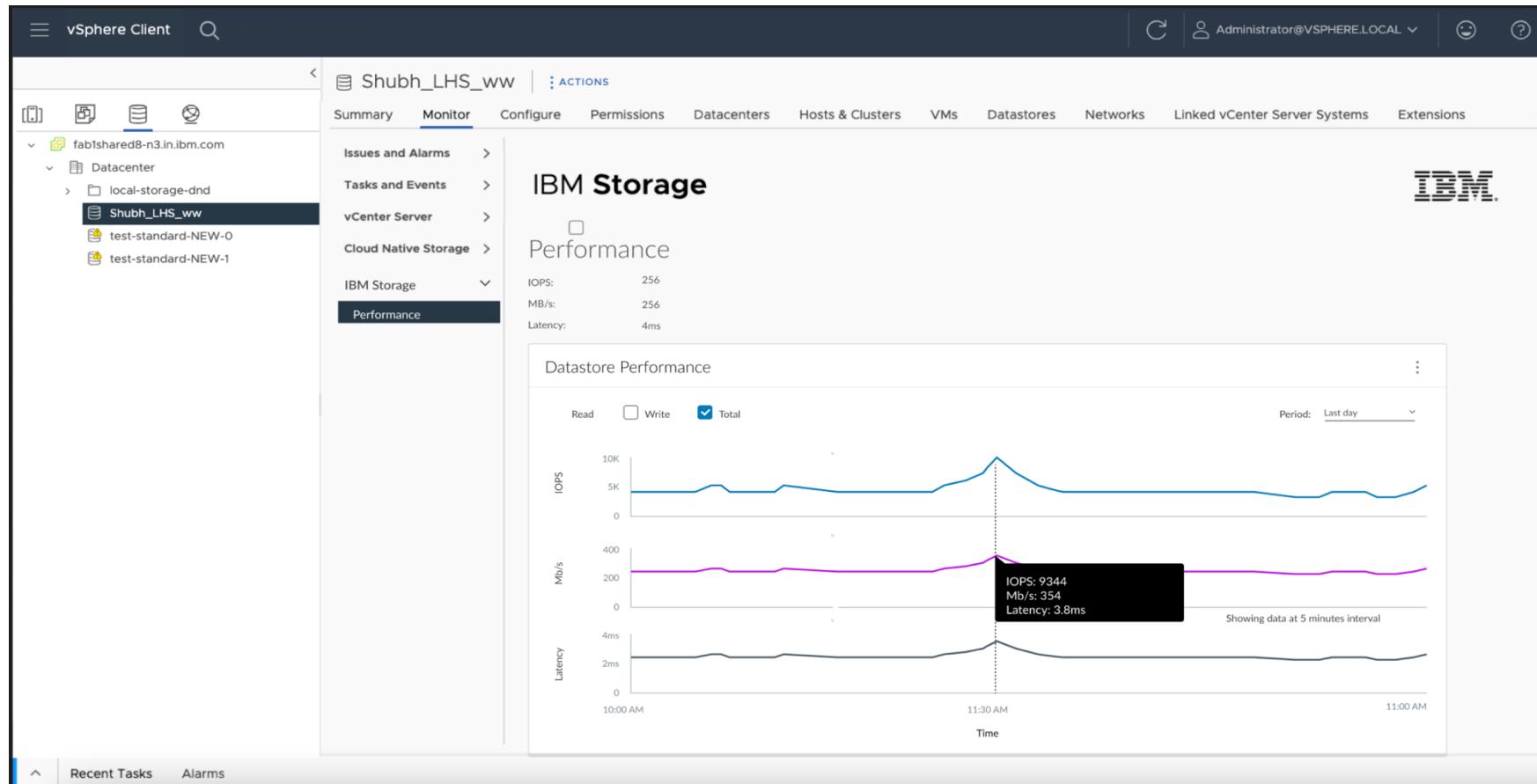
- View system level performance statistics in Storage System's Overview tab
- View current and historical performance data having both read and write flavor (Latency, IOPS, Bandwidth) in chart/table form.



System Level Statistics

Volume Level Statistics

- View volume level performance statistics in Monitor tab of datastore
- View current and historical performance data having both read and write flavor (Latency, IOPS, Bandwidth) in chart/table form.



Volume Level Statistics

What's New in vSphere Plugin 2.0(continued...)

iSCSI host support

- Provision to add and edit iSCSI host through vSphere plugin
- Provision to create/reconcile iSCSI sessions
- Host Cluster Management support now comes with both FC and iSCSI type of hosts

Ransomware alerts integration through SI

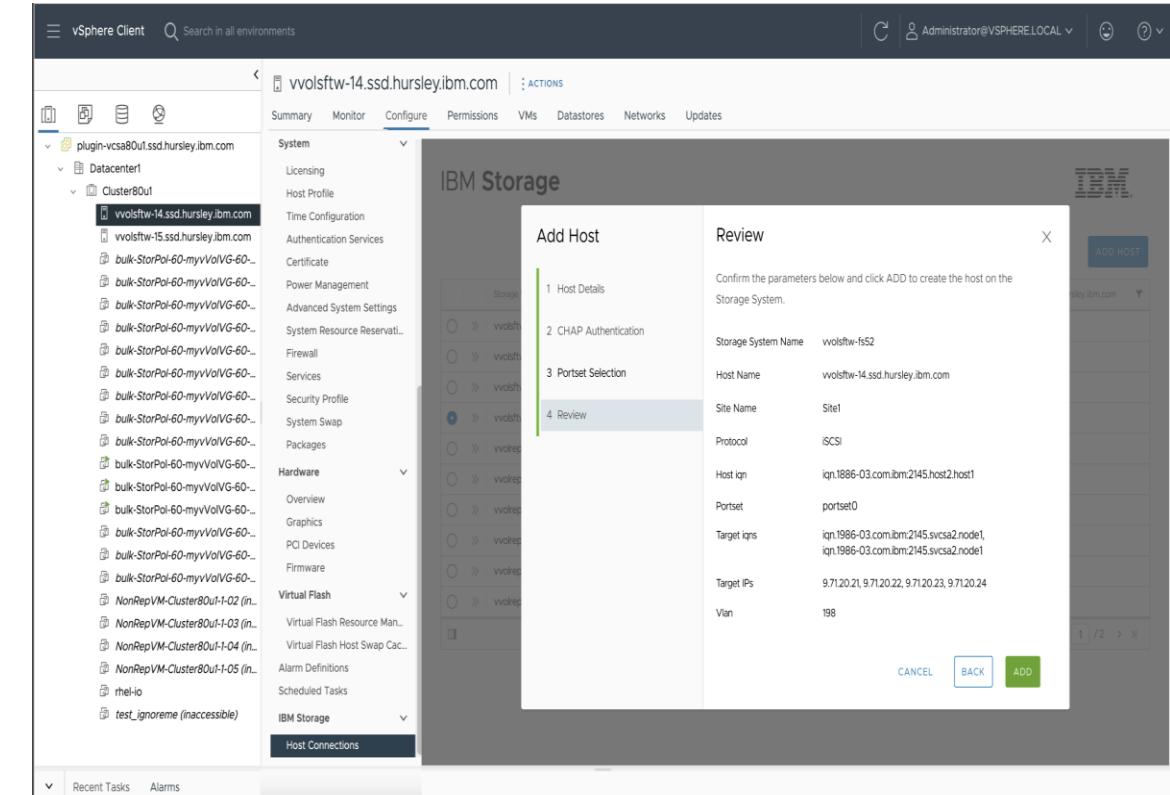
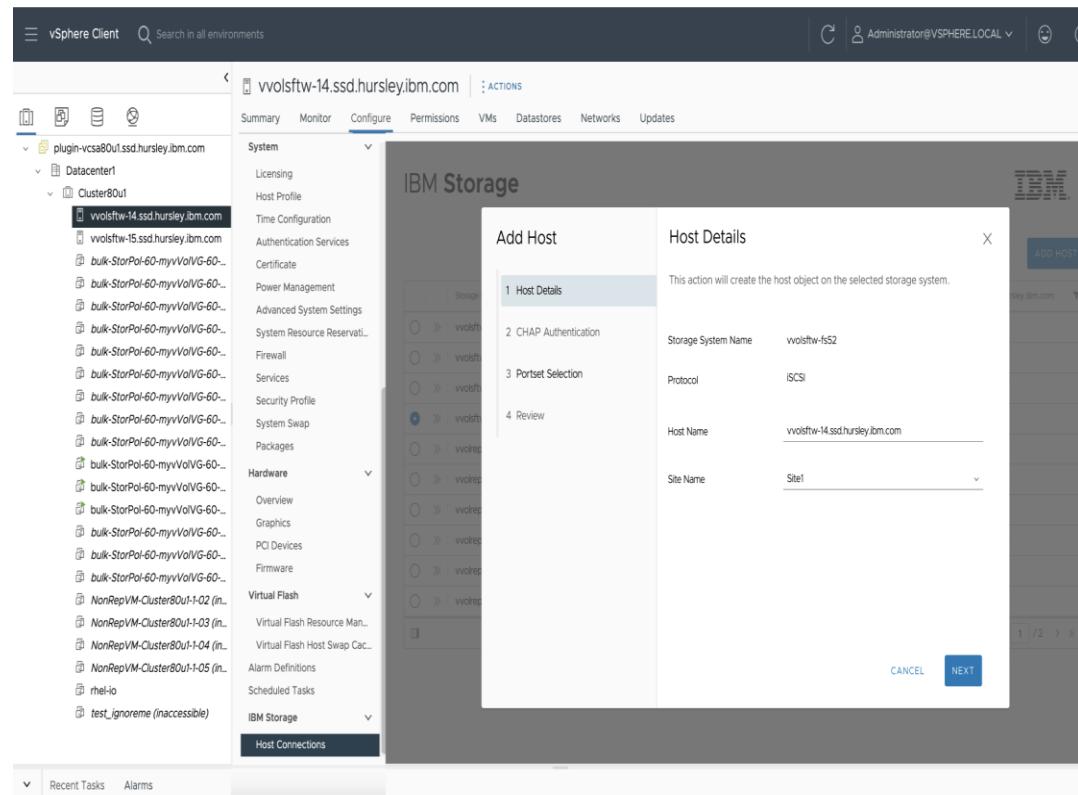
Ransomware alert will be highlighted in following locations in vSphere plugin, if detected:

- Overall summary on dashboard
- Storage systems
- Datastore summary

List of alerts (apart from ransomware) from FlashSystem

Add iSCSI Host Through vSphere Plugin

- Add host configured with iSCSI protocol on storage system from plugin
IBM Storage → host connections which is part of host configure tab in vSphere
- Provide required input like name, CHAP details, portset etc.
- Automatic discovery of target and session creation



Add iSCSI host

Edit Host Through vSphere Plugin

- Edit host details like name, site, CHAP details, portset etc.

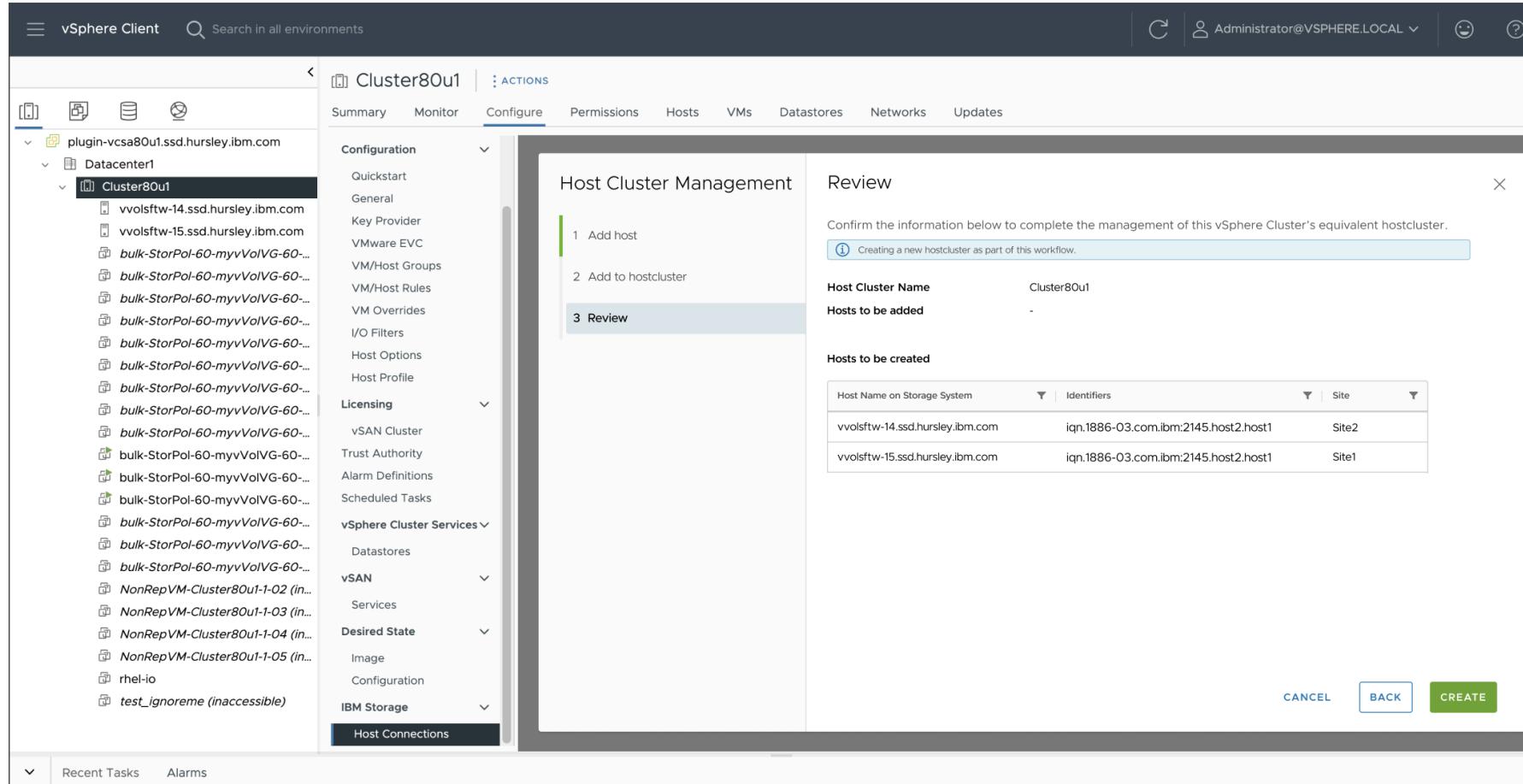
The screenshot shows the vSphere Client interface with the following details:

- Header:** vSphere Client, Search in all environments, Actions, Administrator@VSPHERE.LOCAL, Help.
- Left Sidebar:** Datacenter1, Cluster80u1, vvolsftw-14.ssd.hursley.ibm.com, vvolsftw-15.ssd.hursley.ibm.com, bulk-StorPol-60-myvvVolVG-60..., NonRepVM-Cluster80u1-02 (in...), NonRepVM-Cluster80u1-03 (in...), NonRepVM-Cluster80u1-04 (in...), NonRepVM-Cluster80u1-05 (in...), rhel-io, test_ignoreme (inaccessible).
- Selected Host:** vvolsftw-14.ssd.hursley.ibm.com
- Actions Bar:** Summary, Monitor, **Configure** (selected), Permissions, VMs, Datastores, Networks, Updates.
- Central Panel:** IBM Storage, Edit Host dialog. The dialog is divided into four steps:
 - 1 Host Details:** Storage System Name: vvolsftw-fs52, Host Name: vvolsftw-14.ssd.hursley.ibm.com, Site Name: site2.
 - 2 CHAP Authentication:** (Not visible in the screenshot)
 - 3 Portset selection:** (Not visible in the screenshot)
 - 4 Review:** (Not visible in the screenshot)
- Bottom Buttons:** CANCEL, NEXT.

Edit host

Host Cluster Management for iSCSI Hosts

- Add multiple iSCSI hosts to the existing or a new cluster on storage system using vSphere plugin host cluster management in a single workflow



The screenshot shows the vSphere Client interface with the title bar "vSphere Client" and a search bar "Search in all environments". The top navigation bar includes "Cluster80u1" (selected), "Actions", "Summary", "Monitor", "Configure" (selected), "Permissions", "Hosts", "VMs", "Datastores", "Networks", and "Updates". The left sidebar shows a tree structure with "plugin-vcsa80u1.ssd.hursley.ibm.com", "Datacenter1", and "Cluster80u1" selected. Under "Cluster80u1", there are several host entries: "vvolstw-14.ssd.hursley.ibm.com", "vvolstw-15.ssd.hursley.ibm.com", and several entries starting with "bulk-StorPol-60-myvVolVG-60...". The "Configure" tab is open, showing sections for "Configuration" (Quickstart, General, Key Provider, VMware EVC, VM/Host Groups, VM/Host Rules, VM Overrides, I/O Filters, Host Options, Host Profile) and "Licensing" (vSAN Cluster, Trust Authority, Alarm Definitions, Scheduled Tasks). The "vSphere Cluster Services" section includes "Datastores", "vSAN" (selected), "Services", and "Desired State" (Image, Configuration). The "IBM Storage" section includes "Host Connections". A modal dialog titled "Host Cluster Management" is open, showing a "Review" step. The dialog content includes: "Host Cluster Management" (1. Add host, 2. Add to hostcluster, 3. Review), "Review" (Confirm the information below to complete the management of this vSphere Cluster's equivalent hostcluster. Creating a new hostcluster as part of this workflow.), "Host Cluster Name" (Cluster80u1), "Hosts to be added" (empty), "Hosts to be created" (table):

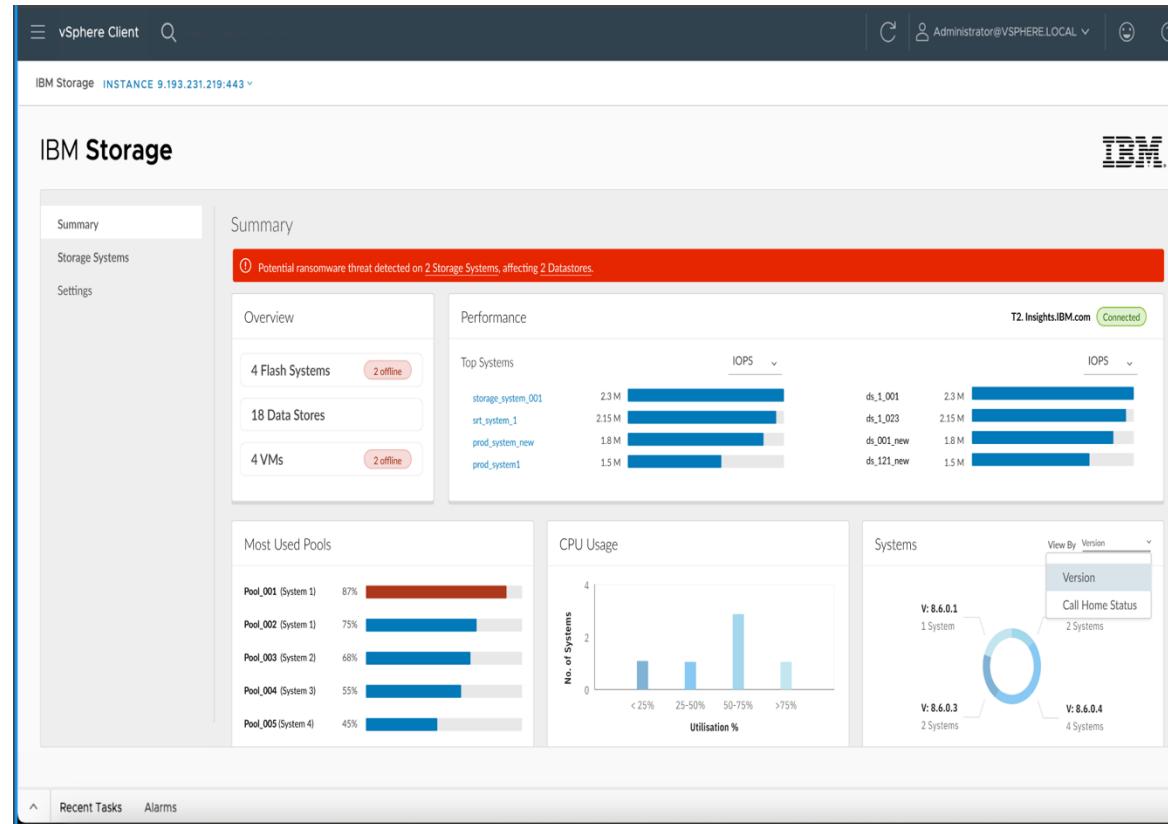
Host Name on Storage System	Identifiers	Site
vvolstw-14.ssd.hursley.ibm.com	iqn.1886-03.com.ibm:2145.host2.host1	Site2
vvolstw-15.ssd.hursley.ibm.com	iqn.1886-03.com.ibm:2145.host2.host1	Site1

Buttons at the bottom of the dialog are "CANCEL", "BACK", and "CREATE".

Host cluster management for iSCSI hosts

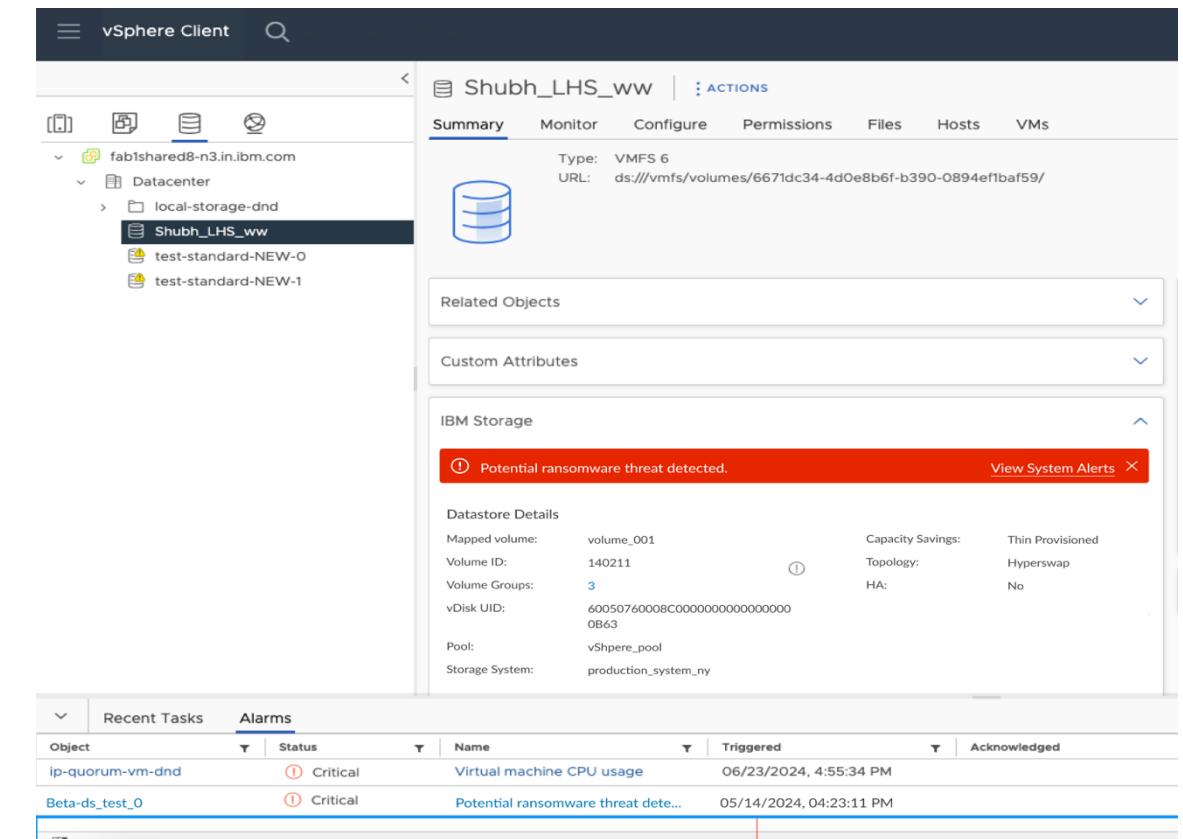
Ransomware Alerts Through SI

- Ransomware alert will be highlighted in important locations in vSphere plugin, if detected:



The screenshot shows the vSphere Client interface for the IBM Storage plugin. The main title bar says "vSphere Client" and "IBM Storage". The top navigation bar includes "Administrator@VSPHERE.LOCAL", a search icon, and a help icon. The main content area is titled "Summary" and contains several sections: "Storage Systems" (4 Flash Systems, 18 Data Stores, 4 VMs), "Performance" (Top Systems: storage_system_001, srt_system_1, prod_system_new, prod_system1; Datastores: ds_1_001, ds_1_023, ds_001_new, ds_121_new), "Most Used Pools" (Pool_001 to Pool_005), "CPU Usage" (Utilisation %: <25%, 25-50%, 50-75%, >75%), and "Systems" (Version: V:8.6.0.1, V:8.6.0.3, V:8.6.0.4). A prominent red banner at the top states: "① Potential ransomware threat detected on 2 Storage Systems, affecting 2 Datastores." The bottom navigation bar includes "Recent Tasks" and "Alarms".

Ransomware alert on
Overall Summary



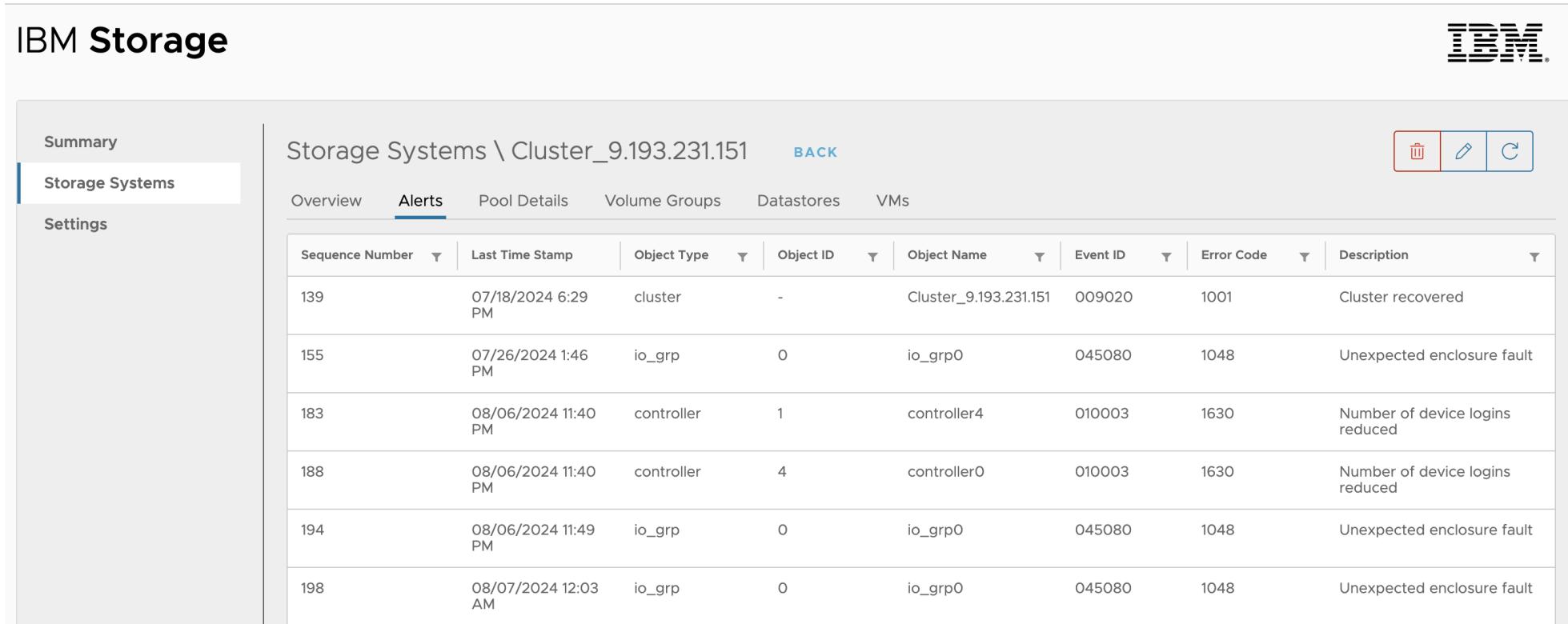
The screenshot shows the vSphere Client interface for the IBM Storage plugin, focusing on a specific volume. The title bar says "vSphere Client" and "Shubh_LHS_ww". The left sidebar shows a tree structure: fab1shared8-n3.in.ibm.com > Datacenter > local-storage-dnd > Shubh_LHS_ww. The main content area shows "Datastore Details" for "volume_001" (Volume ID: 140211, Volume Groups: 3, vDisk UID: 60050760008C0000000000000000000008463, Pool: vSphere_pool, Storage System: production_system_ny). A red banner at the bottom left states: "① Potential ransomware threat detected." Below this is a table of "Alarms" with two entries: "ip-quorum-vm-dnd" (Status: Critical, Name: Virtual machine CPU usage, Triggered: 06/23/2024, 4:55:34 PM) and "Beta-ds_test_0" (Status: Critical, Name: Potential ransomware threat dete..., Triggered: 05/14/2024, 04:23:11 PM).

Ransomware alert on
Datastore Summary

Alerts From Storage System

- View critical alerts from Storage System apart from ransomware

IBM Storage INSTANCE 9.63.217.42:443 ▾



The screenshot shows the IBM Storage Management interface. The left sidebar has tabs for 'Summary', 'Storage Systems' (which is selected and highlighted in blue), and 'Settings'. The main content area is titled 'Storage Systems \ Cluster_9.193.231.151' with a 'BACK' button. Below the title is a toolbar with three icons: a red trash can, a blue pencil, and a blue circular arrow. The main area is a table with the following data:

Sequence Number	Last Time Stamp	Object Type	Object ID	Object Name	Event ID	Error Code	Description
139	07/18/2024 6:29 PM	cluster	-	Cluster_9.193.231.151	009020	1001	Cluster recovered
155	07/26/2024 1:46 PM	io_grp	0	io_grp0	045080	1048	Unexpected enclosure fault
183	08/06/2024 11:40 PM	controller	1	controller4	010003	1630	Number of device logins reduced
188	08/06/2024 11:40 PM	controller	4	controller0	010003	1630	Number of device logins reduced
194	08/06/2024 11:49 PM	io_grp	0	io_grp0	045080	1048	Unexpected enclosure fault
198	08/07/2024 12:03 AM	io_grp	0	io_grp0	045080	1048	Unexpected enclosure fault

Alerts from Storage System

Plugin Upgrade

- Supporting upgrade from vSphere Plugin 1.1.x/1.2.0/1.3.0 to v2.0.0
- Seamless upgrade –
- Upgrade ensures continuous management of old datastores by new plugin instance.
- All registered storage systems and pools remains intact in vSphere plugin inventory

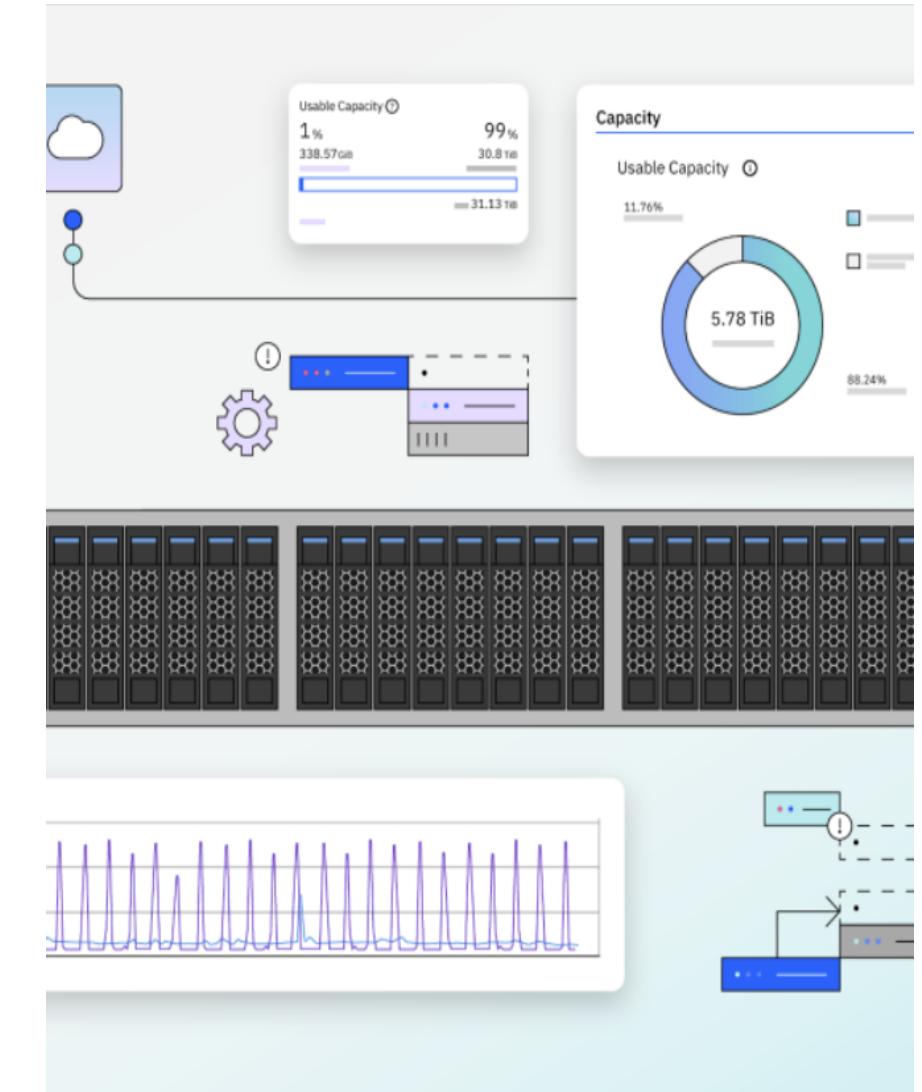
Restrictions And Limitations

- Only fiber channel (SCSI) and iSCSI connectivity between the ESXi hosts and the storage systems would be supported through plugin 2.0.0.
- Standard, Stretched and HyperSwap topologies are supported by the plugin.
- Plugin does not support multiple vCenters unless they are configured in linked mode
- Recommended to have user, hosts and pools either to be part of same ownership group or not part of any ownership group
- Partition based features like PBHA, 3site PBR + PBHA etc. are not yet supported

IBM Storage Virtualize

Plugin Updates

CSI v1.12
December



PVC Shared Access mode - RWX

```
kind: PersistentVolumeClaim
apiVersion: v1
metadata:
  name: demo-pvc-file-system
spec:
  volumeMode: Filesystem  # Optional. The default is Filesystem.
  accessModes:
  - ReadWriteMany
  resources:
    requests:
      storage: 1Gi
  storageClassName: demo-storageclass
```

- IBM added RWX support to PVC, which allows the creation of VMs with OCPv that are "live-migration" capable.
- Existing PVC can also be converted to RWX manually by changing the accessModes to ReadWriteMany or by using the [example script](#).

Portset for HostDefiner

Field	Description
prefix	<p>Adds a prefix to the hosts defined by the host definer.</p> <p>Note: The prefix length is bound by the limitation of the storage system. When defined, the length is a combination of both the prefix and node (server) hostname.</p>
connectivityType	<p>Selects the connectivity type for the host ports.</p> <p>Possible input values are:</p> <ul style="list-style-type: none"> - nvmeofc for use with NVMe over Fibre Channel connectivity - fc for use with Fibre Channel over SCSI connectivity - iscsi for use with iSCSI connectivity <p>By default, this field is blank and the host definer selects the first of available connectivity types on the node, according to the following hierarchy: NVMe, FC, iSCSI.</p> <p>Note: When left blank, the connectivity type will update along with any changes within the host ports, according to the set hierarchy. If the value is set and there are host port changes, connectivity needs to be manually updated. For more information, see Changing node connectivity.</p>
allowDelete	<p>Defines whether the host definer is allowed to delete host definitions on the storage system.</p> <p>Input values are true or false.</p> <p>The default value is true.</p>
dynamicNodeLabeling	<p>Defines whether the nodes that run the CSI node pod are dynamically labeled or if the user must create the hostdefiner.block.csi.ibm.com/manage-node=true label on each relevant node. This label tells the host definer which nodes to manage their host definition on the storage side.</p> <p>Input values are true or false.</p> <p>The default value is false, where the user must manually create this label on every node to be managed by the host definer for dynamic host definition on the storage.</p>
portSet	Specifies port set for new port definitions (ports already defined on SVC are not modified).

- With this feature enabled, all hosts dynamically created by HostDefiner will be set to the provided portset.
- There is no need to change the portset for existing hosts.
- See official [docs](#) for more information on host definer.

CSI Support Information

- General documentation:
- <https://www.ibm.com/docs/en/stg-block-csi-driver/1.11.4>

- Log collection instructions:
- <https://www.ibm.com/docs/en/stg-block-csi-driver/1.11.4?topic=troubleshooting-log-status-collection>

Thank you!

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 with code 5151 0447 or

Direct link <https://www.menti.com/alhsf3bgvxu6>

Or

QR Code

