XCubeSAN Series White Paper

SED (Self-Encrypting Drive) and ISE (Instant Secure Erase) Support

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www.QSAN.com

March 2018

This edition applies to QSAN XCubeSAN series. QSAN believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

Notices

This XCubeSAN series white paper is applicable to the following XCubeSAN models:

XCubeSAN Storage System 4U 19” Rack Mount Models

Model Name	Controller Type	Form Factor, Bay Count, and Rack Unit
XS5224D	Dual Controller	LFF 24-disk 4U Chassis
XS3224D	Dual Controller	LFF 24-disk 4U Chassis
XS3224S	Single Controller	LFF 24-disk 4U Chassis
XS1224D	Dual Controller	LFF 24-disk 4U Chassis
XS1224S	Single Controller	LFF 24-disk 4U Chassis

XCubeSAN Storage System 3U 19” Rack Mount Models

Model Name	Controller Type	Form Factor, Bay Count, and Rack Unit
XS5216D	Dual Controller	LFF 16-disk 3U Chassis
XS3216D	Dual Controller	LFF 16-disk 3U Chassis
XS3216S	Single Controller	LFF 16-disk 3U Chassis
XS1216D	Dual Controller	LFF 16-disk 3U Chassis
XS1216S	Single Controller	LFF 16-disk 3U Chassis

XCubeSAN Storage System 2U 19” Rack Mount Models

Model Name	Controller Type	Form Factor, Bay Count, and Rack Unit
XS5212D	Dual Controller	LFF 12-disk 2U Chassis
XS5212S	Single Controller	LFF 12-disk 2U Chassis
XS3212D	Dual Controller	LFF 12-disk 2U Chassis
XS3212S	Single Controller	LFF 12-disk 2U Chassis
XS1212D	Dual Controller	LFF 12-disk 2U Chassis
XS1212S	Single Controller	LFF 12-disk 2U Chassis
XS5226D	Dual Controller	SFF 26-disk 2U Chassis
XS5226S	Single Controller	SFF 26-disk 2U Chassis
XS3226D	Dual Controller	SFF 26-disk 2U Chassis
XS3226S	Single Controller	SFF 26-disk 2U Chassis
XS1226D	Dual Controller	SFF 26-disk 2U Chassis

XS1226S	Single Controller	SFF 26-disk 2U Chassis

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This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products.

All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

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SED and ISE Support

Executive Summary

With data security issues at the time, the company places a high priority on ensuring that sensitive data is protected from unauthorized access. Whether it is due to internal policies or external compliance, access to data remains a matter of high importance for all organizations. These organizations will seek out storage manufacturers that provide a stored data protection method, SED (Self-Encrypting Drive), that has both authentication and encryption features.

In addition, ISE (Instant Secure Erase) drive is designed to protect data on hard disk drives by instantly resetting the drive back to factory settings and changing the encryption key so that any data remaining on the drive is cryptographically erased. This means all data on the drive is permanently and instantly unreadable, as needed.

INFORMATION:
SED (Self-Encryption Drive) and ISE (Instant Secure Erase) drive support is available in SANOS firmware 1.3.0.

Audience

This document is applicable for QSAN customers and partners who are interested in learning about SED and ISE drive for securing data on the storage systems. It assumes the reader is familiar with QSAN products and has general IT experience, including knowledge as a system or network administrator. If there is any question, please refer to the user manuals of products, or contact QSAN support for further assistance.

Overview

When disk drives are retired and moved outside from the data center into someone else's hands, the data on those drives is put at significant risk. IT administrators routinely retire drives for a variety of reasons, including:

- Returning drives for warranty, repair, maintenance, or expired lease agreements
- Removal and disposal of disk drives
- Repurposing drives to another storage

Through the study found that almost all drives eventually leave the enterprise or data center, but the corporate data resides on such drives, and when most leave the data center, the data they contain is still readable. Even data that has been striped across many drives in a RAID protection is vulnerable to data theft, because just a typical single stripe in today's high-capacity arrays is large enough to expose the sensitive and secured data.

Drive Control Challenges and Disposal Costs

In an effort to avoid data breaches, corporations have tried many ways to erase the data on retired drives before they leave the houses and potentially fall into the bad guy. Current retirement practices are all expensive and time-consuming, such as:

- Overwriting drive data
- Degaussing or physically shredding
- Hire professional disposal services

These designed to make data unreadable rely on significant human involvement in the process, and are thus subject to both technical and human failure.

The Solution

Every day, thousands of disk drives leave data centers as old systems are retired. But what if all those disk drives had been automatically and transparently encrypting that data, enabling it to be instantly and securely erased? SED comprehensively resolve these issues, making encryption for drive retirement both easy and affordable.

SED has build-in an encryption controller and an encryption key on the disk drive itself. It can provide instant secure erase (cryptographic erase or making the data no longer readable), and to enable auto-locking to secure active data if a drive is misplaced or stolen from a system while in use.

While ISE provides instant secure erase only. When it's time to retire or repurpose the drive, the owner sends a command to the drive to perform a cryptographic erase. Cryptographic erase simply replaces the encryption key inside the encrypted drive, making it impossible to ever decrypt the data encrypted with the deleted key.

Benefits

SED & ISE reduce IT operating expenses by freeing IT from both drive control headaches and disposal costs. By using SED & ISE, they are without hindering IT efficiency. Furthermore, SED & ISE simplify decommissioning and preserve hardware value for returns and repurposing by:

- Securing warranty and expired lease returns
- Eliminating the need to overwrite or destroy the drive
- Enabling drives to be repurposed securely

In addition, the drive owner may choose to employ the SED in the auto-lock mode to help secure active data against theft. Utilizing the SED in auto-lock mode simply requires securing the drive during its normal use with an authentication key. When secured in this manner, the drive's data encryption key is locked whenever the drive is powered down. In other words, the moment the SED is switched off or unplugged, it automatically locks down the drive's data.

When the SED is then powered back on, the SED requires authentication before being able to unlock its encryption key and read any data on the drive, thus protecting against misplacement and insider or external theft.

Theory of Operation

SED has two functions. There are authentication which is operated by AK (Authentication Key) and encryption data which is operated by DEK (Data Encryption Key). ISE drive has encryption data only by DEK but no authentication.

SED Operation Process

An AK is generated by a user entered password. After enabling authentication key successfully, recommend to export the key file to an external media (e.g.: external disk drive, USB drive, etc.) and store it in a safe location. You must be able to use the authentication key file to recover in case of an unforeseen event.

TIP:
Recommend backup the key, or you risk losing all data on the SEDs.

A new clean SED is not locked; it has to be written an AK into the SED first. It's called initiate SED. The following describes the steps that occur during the authentication process of a secured drive.

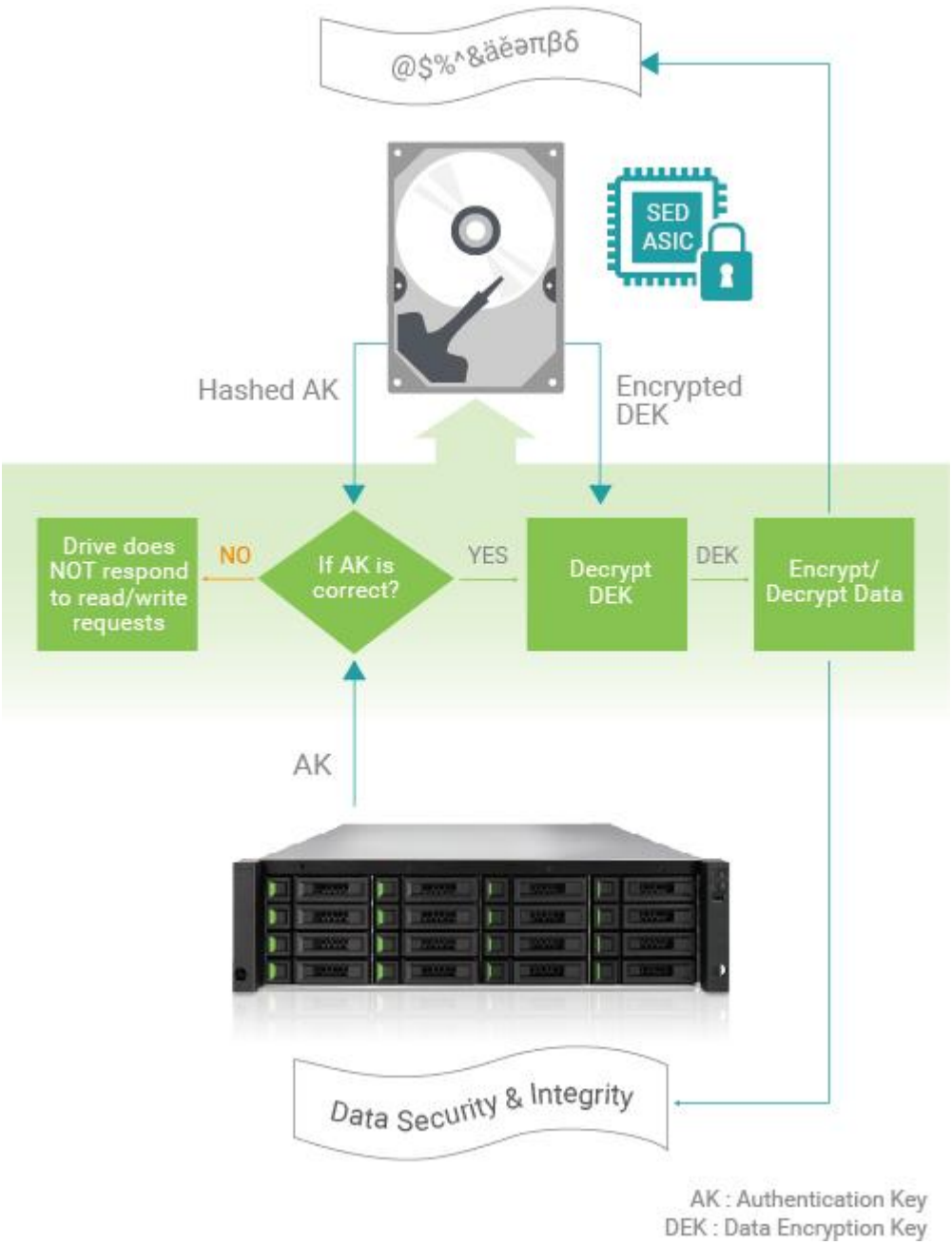


Figure 1 SED Operation Process

Authentication

The storage system gets the AK from user entered and sends it to the correct locked drive. The drive hashes the AK and compares the result with the hash of the AK that's stored in a secure area of the disk. If the two hashed AK values do not match, the authentication process ends, and the drive will not permit reading data from the disk. The drive remains locked.

Decrypt the DEK

If the two hashes match, the drive is then unlocked, and the drive uses the AK it received from the storage system to decrypt the DEK (which was previously encrypted with the AK) that's stored in a secure area of the disk. Once the authentication process is successfully completed, the drive is unlocked until the next time it is powered down. Note that this authentication process only occurs when the drive is first powered on. It does not repeat with each I/O.

The DEK Encrypts and Decrypts the Data

The DEK is then used to encrypt data to be written to the disk and to decrypt data that's being read from the disk. The drive now works in standard fashion during data transfers, with encryption and decryption transparently occurring in the background.

ISE Technology

Each ISE drive (SED as well) randomly generates an encryption key in the factory that is embedded on the drive. The ISE automatically performs full disk encryption; when a write is performed; clear text enters the drive and is first encrypted (using the DEK embedded within the drive) before being written to the disk. When a read is performed, the encrypted data on the disk is decrypted before leaving the drive. During normal operation an ISE is completely transparent to the system, appearing to be the same as a non-encrypting drive. The self-encrypting is constantly encrypting, encryption cannot be accidentally turned off.

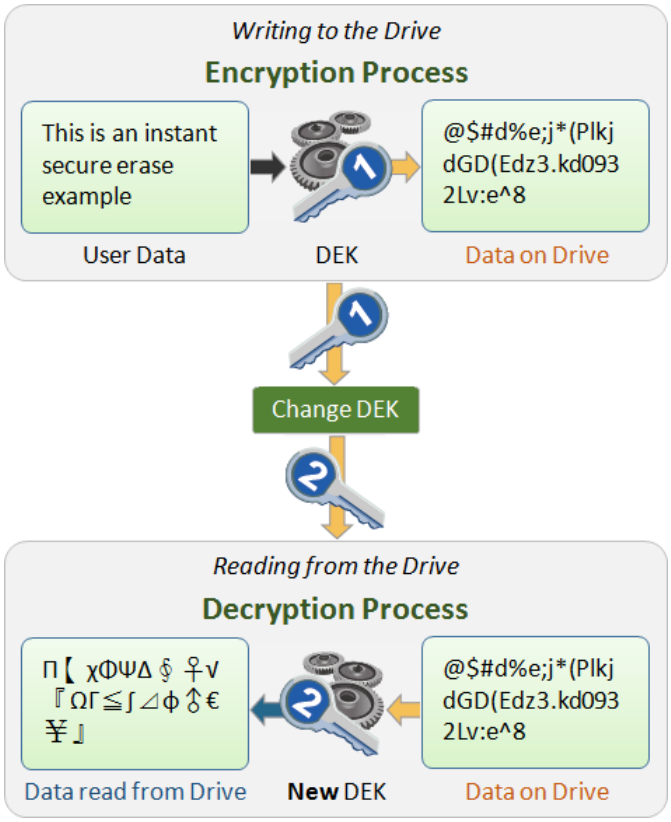


Figure 2 ISE Technology

ISE technology greatly simplifies repurposing of the drive and disposal. An owner wishing to repurpose a drive simply performs a key erase to replace the encryption key. The drive deletes the encryption key and replaces it with a new encryption key generated randomly within the drive. After key erase, any data that had been written to the disk is unreadable; data that was encrypted with the previous key is unintelligible when decrypted with the new encryption key. The drive is left as it was delivered from the factory.

Instant Erase Limitation

If ISEs are free and not be used as any pool member, they can be performed instant erase. The same limitation as SEDs, however SEDs can be erased by the AK is enabled. Another case is that the unknown SED is put in lock mode, the way to erase it is to perform erase SED by PSID which is a unique number in each drive, printed on the disk label, and visible to anyone with physical access to the SED. The owner would simply perform a secure erase to replace the encryption key.

TIP:
SEDs or ISE drives can be erased only if their usage status is free.

Configure Authentication Key

This section will describe the operations of configuring AK.

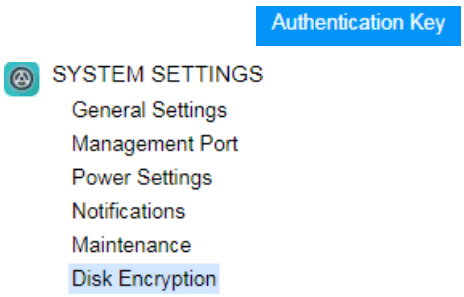


Figure 3 Disk Encryption Function Submenu

Operations on Authentication Key

The options available in this tab:

Enable Authentication Key

Before using SED, you have to enable AK. Note that all SEDs in the system use this AK. Here is an example of enabling an AK.

1. Select the **Authentication Key** function tab in the **Disk Encryption** function submenu.

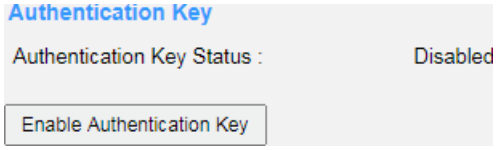


Figure 4 Authentication Key is Disabled

2. Click the **Enable Authentication Key** button to enable.

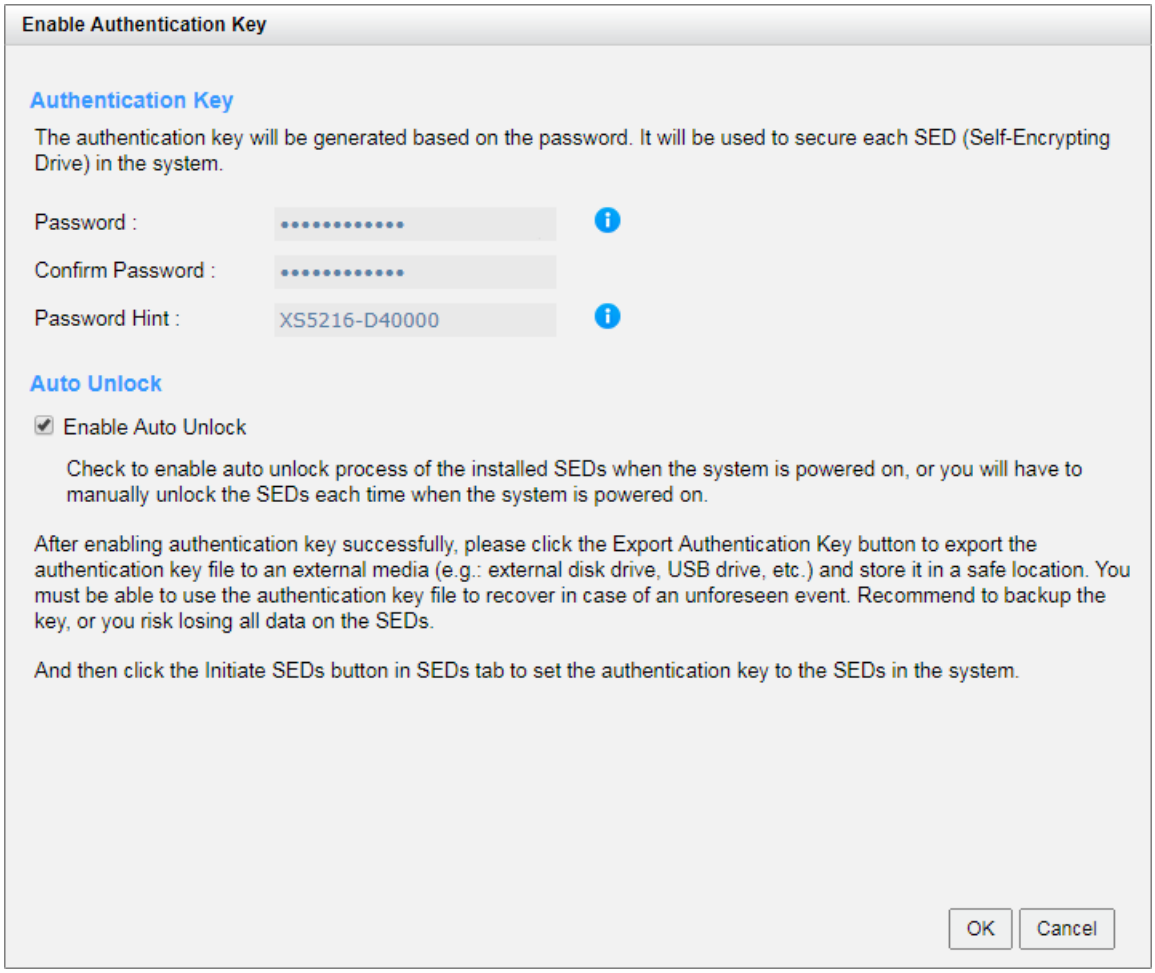


Figure 5 Enable Authentication Key

3. Enter a **Password** for generating the AK. The length of the password is between 4 to 12 characters. Valid characters are [A~Z | a~z | 0~9 | ~!@#$%^&*_-+=`|\(){}[]:;"'<>,.?/]. And enter it again at **Confirm Password**.
4. Enter a **Password Hint**. It is the AK hint for recognizing the system. The default value is system name and can be changed. The maximum length of the password hint is 32 characters. Valid characters are [A~Z | a~z | 0~9 | _-].
5. Check the **Enable Auto Unlock** option will enable auto unlock process of the installed SEDs when the system is powered on, or you will have to manually unlock the SEDs each time when the system is powered on. The default value is enabled.
6. Click the **OK** button to enable.

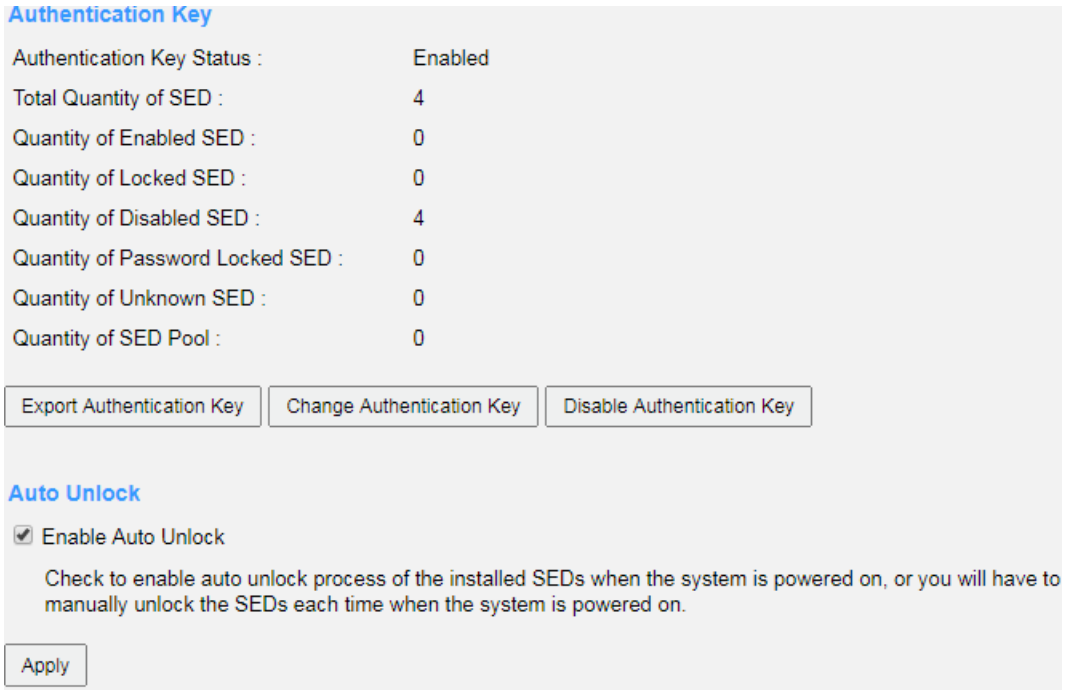


Figure 6 Authentication Key is Enabled

After the AK is enabled fully, there are SED summary displayed in the page. In addition, **Auto Unlock** option can also be changed here. You can uncheck the **Enable Auto Unlock** option and then click the **Apply** button to take effect.

Export Authentication Key

After enabling the AK successfully, please click the **Export Authentication Key** button to export the AK file to an external media (e.g.: external disk drive, USB drive, etc.) and store it in a safe location. You must be able to use the AK file to recover in case of an unforeseen event.

TIP:
Recommend backup the key, or you risk losing all data on the SEDs.

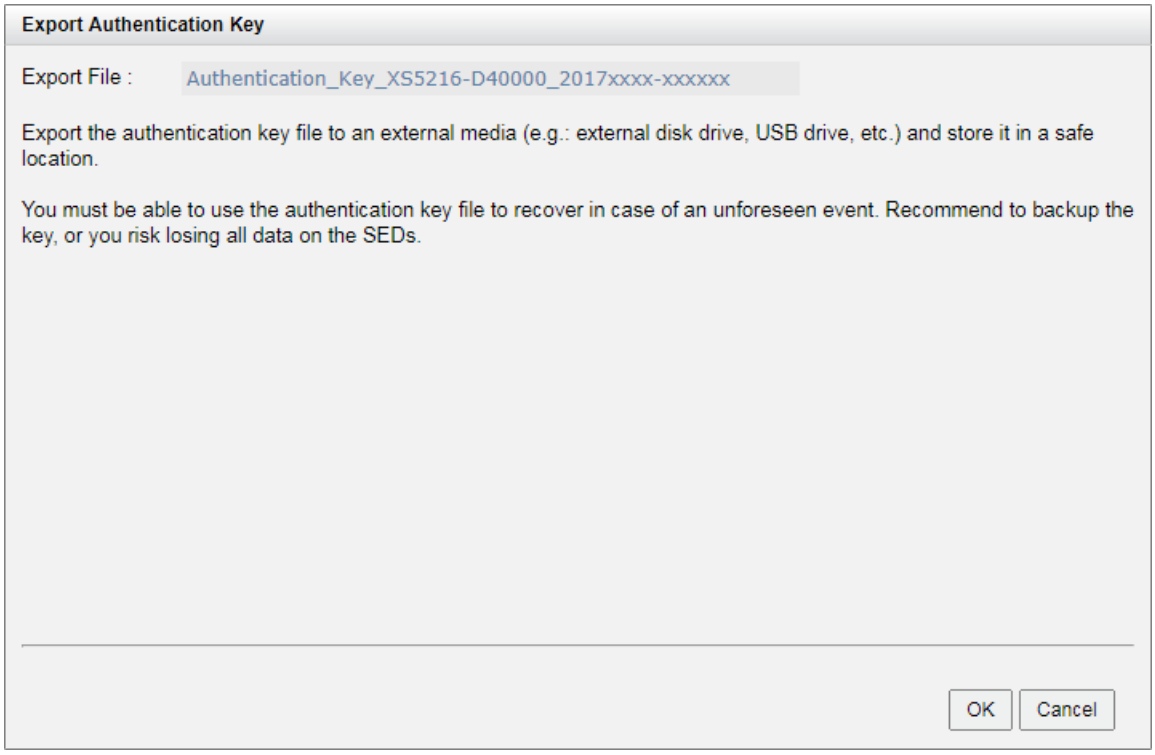


Figure 7 Export Authentication Key

1. Enter an **Export File** name to export the AK file. The default vale is the password hint plus date and time.
2. Click the **OK** button to export.

Change Authentication Key

Click the **Change Authentication Key** button to change the AK. Before changing the AK, please stop all I/O of the encryption pools within the SEDs. The new AK will be regenerated based on the new password and set the new authentication key to all enabled SEDs in the system. If the I/O are still running, it may risk losing data during changing the AK. Here is an example of changing the AK.

1. Click the **Change Authentication Key** button to change.

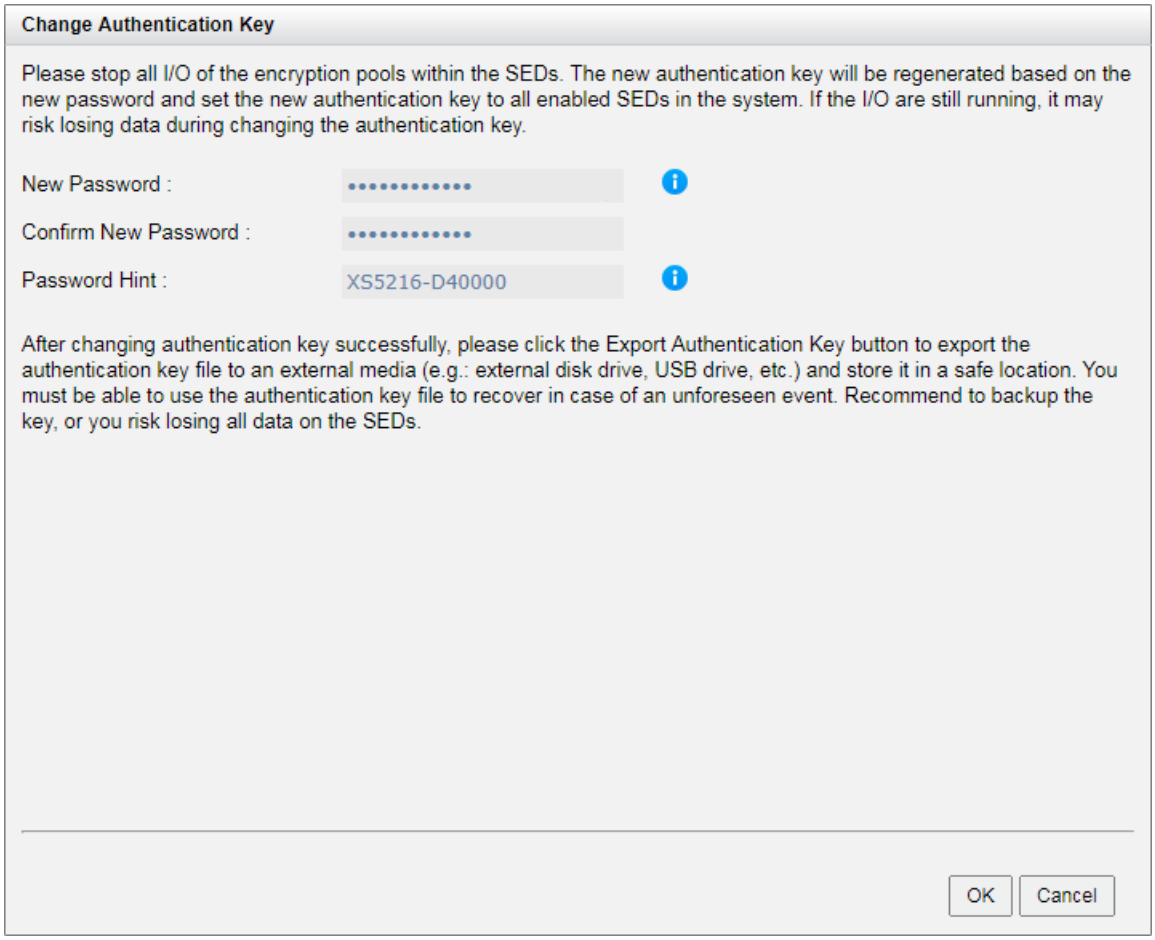


Figure 8 Change Authentication Key

2. Change the **Password** for generating the AK. The length of the password is between 4 to 12 characters. Valid characters are [A~Z | a~z | 0~9 | ~!@#$%^&*_-+=`|\(){}[]:;'"<>,.?/]. And enter it again at **Confirm Password**.
3. Change the **Password Hint** if necessary. The maximum length of the password hint is 32 characters. Valid characters are [A~Z | a~z | 0~9 | _-].
4. Click the **OK** button to change. If there are enabled SEDs in the system, the system will change them one by one and display the results.

Disable Authentication Key

If you no longer use disk encryption and there are no encryption pools within the SEDs. The AK can be disabled. Click the **Disable Authentication Key** button to disable it.

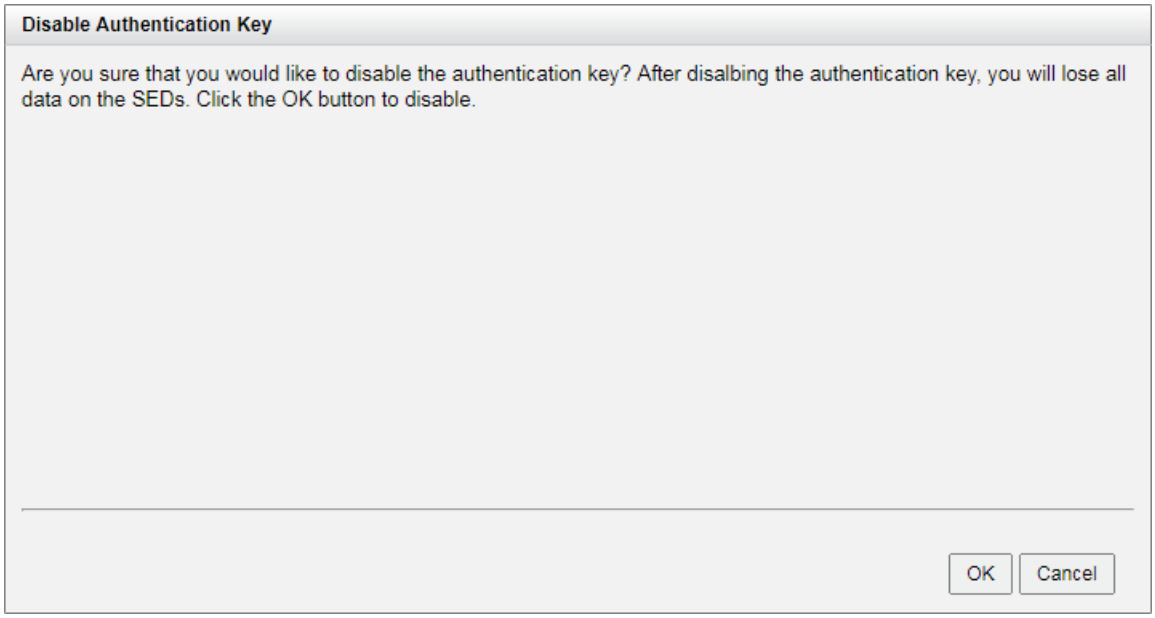


Figure 9 Disable Authentication Key

Click the **OK** button to confirm.

TIP:
The **Disable Authentication Key** function can be operated when there is no encryption pools within the SEDs and the SED status of all SEDs is disabled or unknown.

Configure SEDs

The **SEDs** function tab in the **Disk Encryption** function submenu is only visible when the AK is enabled. Select the **SEDs** function tab to display the status of SEDs, initiate SEDs, unlock SEDs, or erase SEDs.

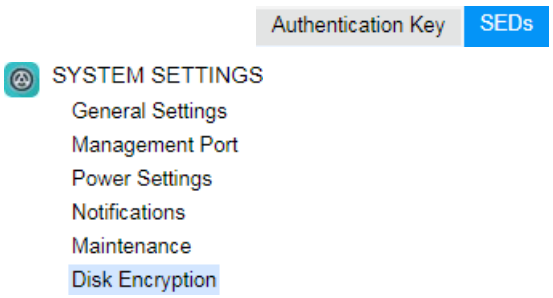


Figure 10 Disk Encryption Function Submenu

List SEDs

The drop-down lists at the top enable you to select the enclosure from head unit (SAN system) or expansion units (expansion enclosures). The disk properties can be configured by clicking the functions button ▼ to the left side of the specific disk drive.

TIP:
Enclosure format: Enclosure ID ([Head Unit | Expansion Unit]: Model Name). For example: 0 (Head Unit: XS5216), 1 (Expansion Unit: XD5316)

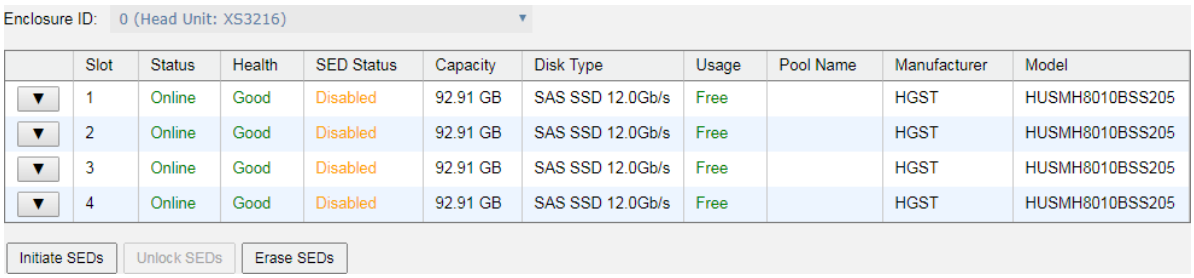


Figure 11 List SEDs

This table shows the column descriptions.

Table 1 Disk Column Descriptions

Column Name	Description
Slot	The position of the disk drive.
Status	The status of the disk drive: • Online: The disk drive is online. • Rebuilding: The disk drive is being rebuilt.

	• Transitioning: The disk drive is being migrated or is replaced by another disk when rebuilding occurs. • Scrubbing: The disk drive is being scrubbed. • Check Done: The disk drive has been checked the disk health. • Copying Back: The disk drive is being copied back.
Health	The health of the disk drive: • Good: The disk drive is good. • Failed: The disk drive is failed. • Error Alert: S.M.A.R.T. error alerts. • Read Errors: The disk drive has unrecoverable read errors.
SED Status	The status of the SED: • Enabled: The SED is enabled. • Locked: The SED is locked. It must be unlocked by the correct AK before it can be used. • Disabled: The SED is disabled. It must be initiated before it can be used. • Password Locked: The SED is locked by entering the incorrect password too many times. • Unknown: The SED is unknown. • Initiating: The SED is being initiated. • Unlocking: The SED is being unlocked. • Erasing: The SED is being erased. • Changing Key: The SED is being changed the key.
Capacity	The capacity of the disk drive.
Disk Type	The type of the disk drive: • [SAS HDD | NL-SAS HDD | SAS SSD | SATA SSD] • [12.0Gb/s | 6.0Gb/s | 3.0Gb/s | 1.5Gb/s]
Usage	The usage of the disk drive: • Free: This disk drive is free for use. • RAID: This disk drive has been set to a pool. • SSD Cache: This SSD has been set to an SSD cache pool. • Dedicated Spare: This disk drive has been set as dedicated spare of a pool. • Local Spare: This disk drive has been set as local spare of the enclosure. • Global Spare: This disk drive has been set as global spare of whole system. • SSD Spare: This SSD has been set as dedicated SSD spare of an

	SSD cache pool.
Pool Name	Which pool the disk drive belongs to.
Manufacturer	The manufacturer of the disk drive.
Model	The model name of disk drive.

Operations on SEDs

The options available in this tab:

Initiate SEDs

Click the **Initiate SEDs** button to initiate the selected SEDs. And then click the **OK** button to proceed.

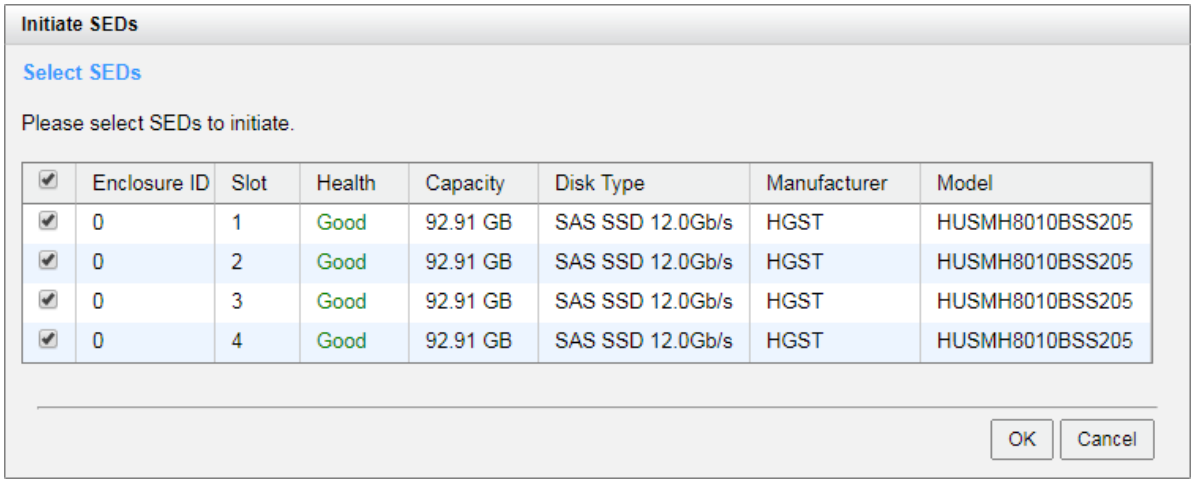


Figure 12 Initiate SEDs

After proceeding, it will pop up a dialog to display the results.

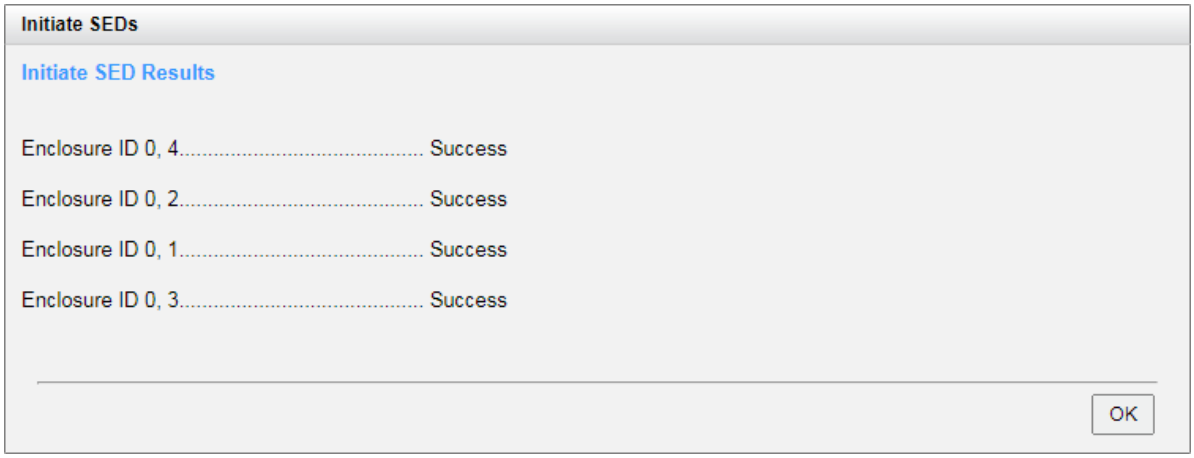


Figure 13 Initiate SED Results

If the results are successful, the SED status will become Enabled.

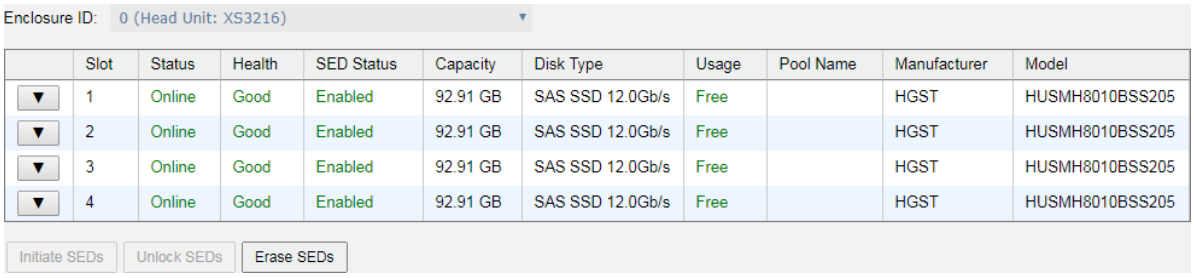


Figure 14 List SEDs

TIP:
The **Initiate SEDs** function can be operated when the usage status of SEDs is free and the SED status is Disabled.

Unlock SEDs

Click the **Unlock SEDs** button to unlock the selected SEDs. Please select a method to unlock the SEDs. And then click the **OK** button to proceed.

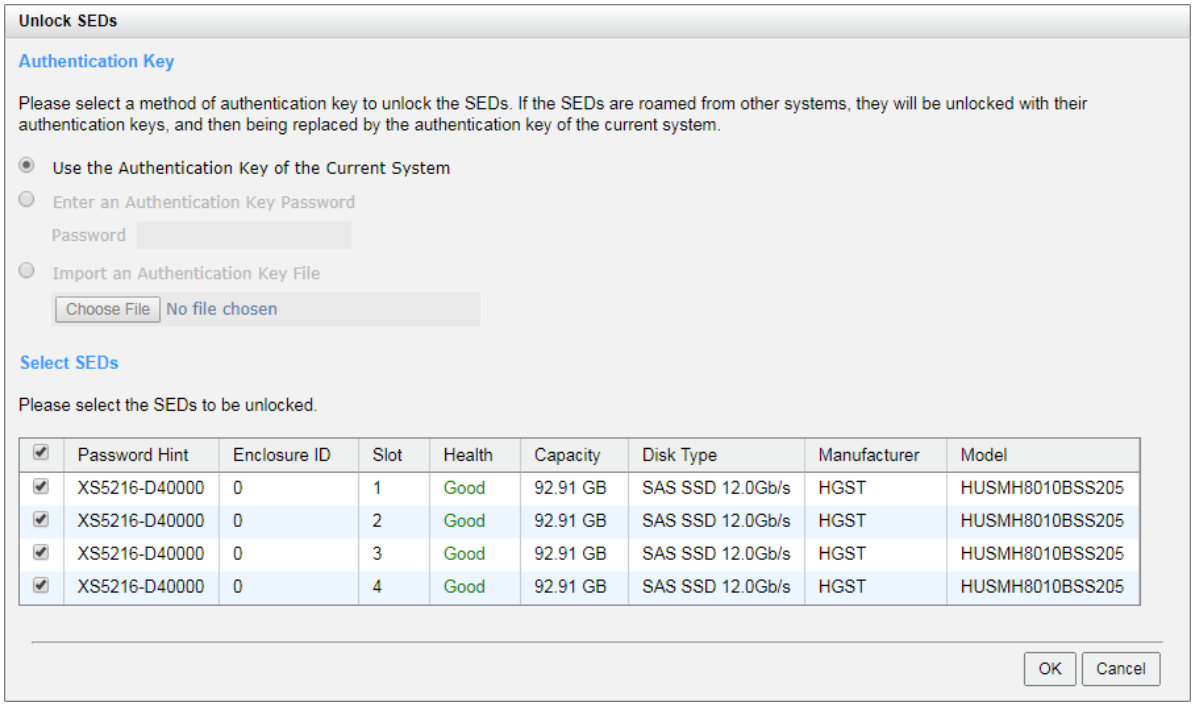


Figure 15 Unlock SEDs

You can select the **Use the Authentication Key of the Current System** to unlock the SEDs. Or if the SEDs are roamed from other systems, they will be unlocked with their AKs, and then being replaced by the AK of the current system. In this case, please select the **Enter an Authentication Key Password** or **Import and Authentication Key File** to unlock the SED.

TIP:
The **Unlock SEDs** function can be operated when the SED status of SEDs is Locked.

Erase SEDs

If there are no encryption pools within the SEDs, these SEDs can be erased. Click the **Erase SEDs** button to erase the selected SEDs. And then click the **OK** button to proceed

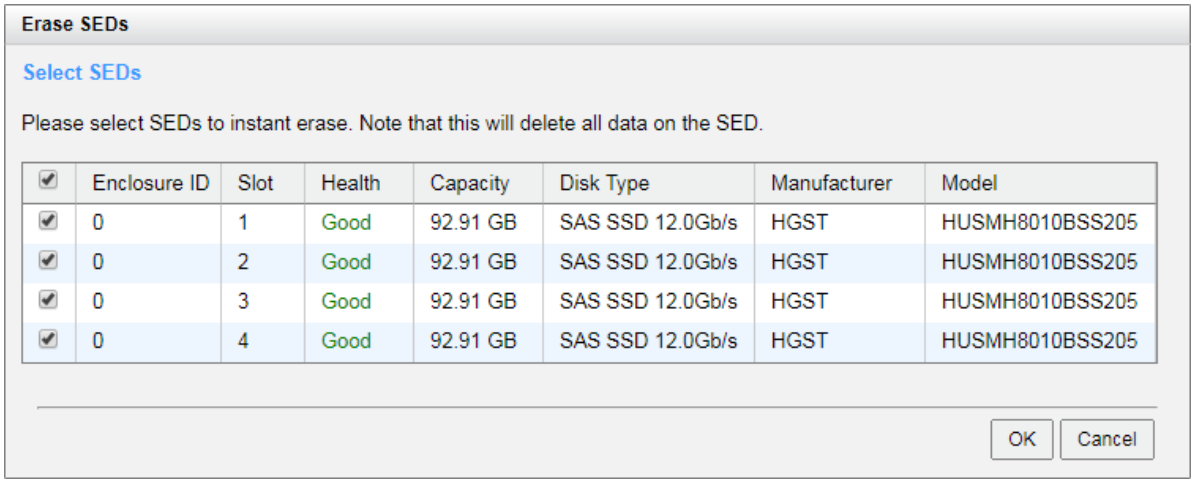


Figure 16 Erase SEDs

After proceeding, it will pop up a dialog to display the results. If the results are successful, the SED status will become Disabled.

TIP:
The **Erase SEDs** function can be operated when the usage status of SEDs is free.

CAUTION:
Erasing the SEDs will change the DEK and delete all data on the SED. The data on SED can never be restored, please exercise caution.

Erase SED by PSID

If you don' know where the SED comes from, or the status of the SED is unknown and you don't know its password. The last method is to erase the SED by PSID (Physical Secure ID) which is on the label of the disk drive. Click ▼ **-> Erase SED by PSID** to erase the SED by PSID.

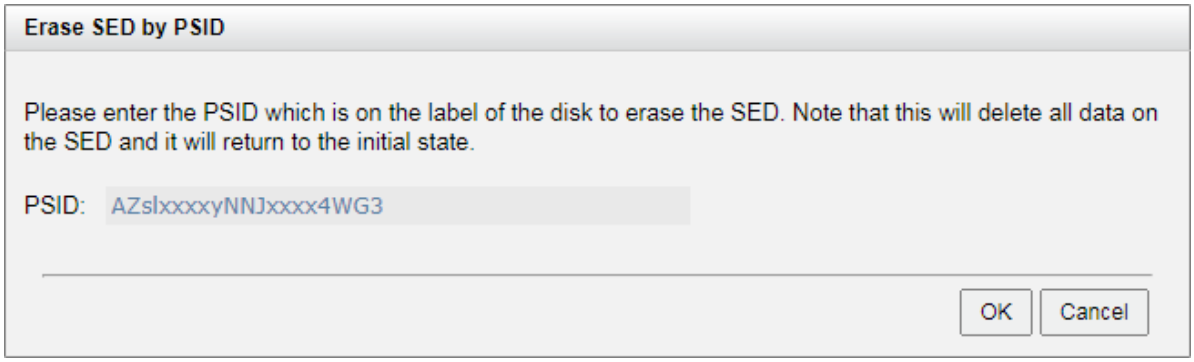


Figure 17 Erase SED by PSID

TIP:
The **Erase SED by PSID** function can be operated when the usage status of the SED is free.

CAUTION:
Erasing the SED by PSID will delete all data on the SED and it will return to the initial state. The data on SED can never be restored, please exercise caution.

Configure SED Pools

This section will describe the operations of configuring an SED pool.

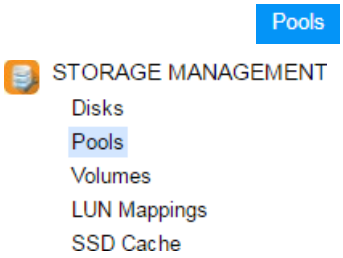


Figure 18 Pools Function Submenu

Create an SED Pool

Here is an example of creating an SED pool with 3 SEDs configured in RAID 5. At the first time of creating a pool, it contains a disk group and the maximum quantity of disk in a disk group is 64.

1. Select the **Pools** function submenu, click the **Create Pool** button. It will scan available disks first.

TIP:
It may take 20 ~ 30 seconds to scan disks if your system has more than 200 disk drives. Please wait patiently.

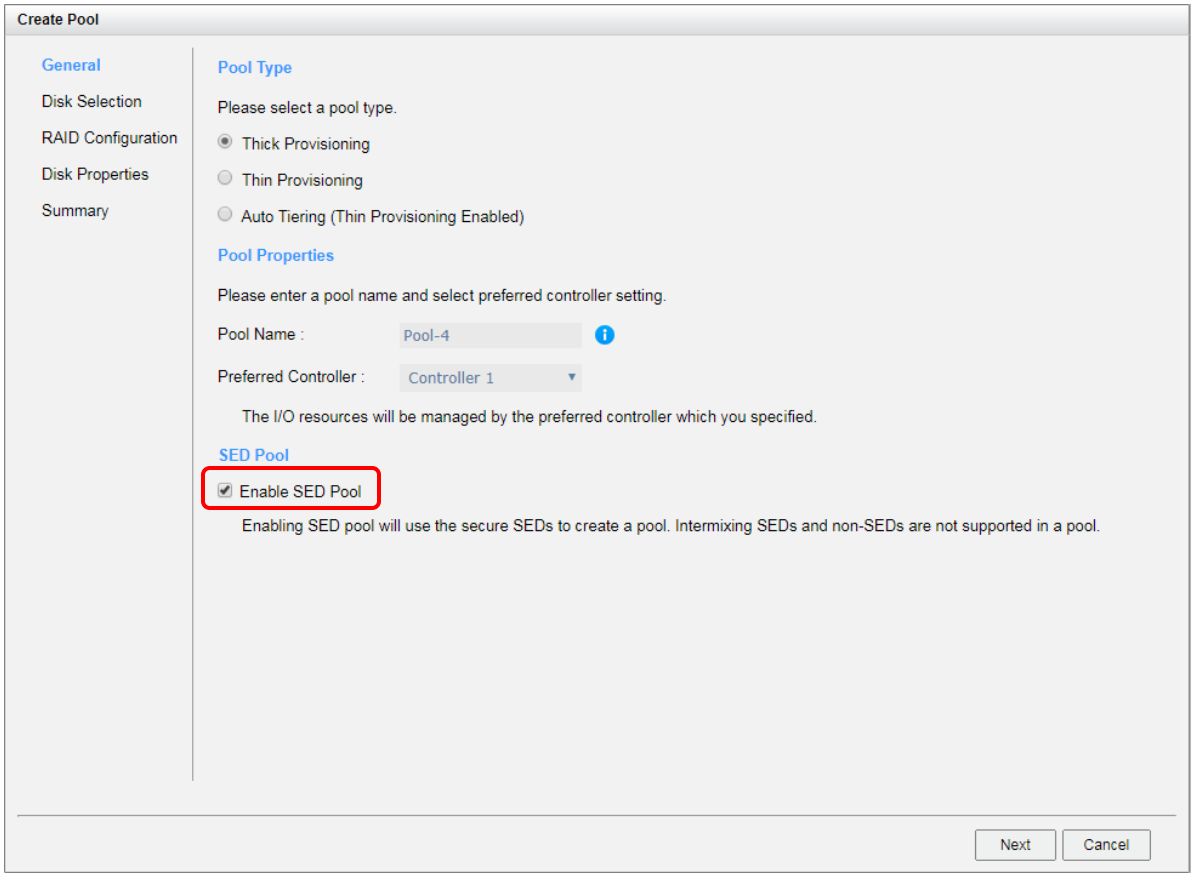


Figure 19 Create an SED Pool Step 1

2. Select a **Pool Type**.
3. Enter a **Pool Name** for the pool. The maximum length of the pool name is 16 characters. Valid characters are [A~Z | a~z | 0~9 | -_<>].

4. Select a **Preferred Controller** from the drop-down list. The backend I/O resources in this pool will be processed by the preferred controller which you specified. This option is available when dual controllers are installed.
5. Check the **Enable SED Pool** checkbox. Enabling SED pool will use the secure SEDs to create a pool. Intermixing SEDs and non-SEDs are not supported in a pool.
6. Click the **Next** button to continue.

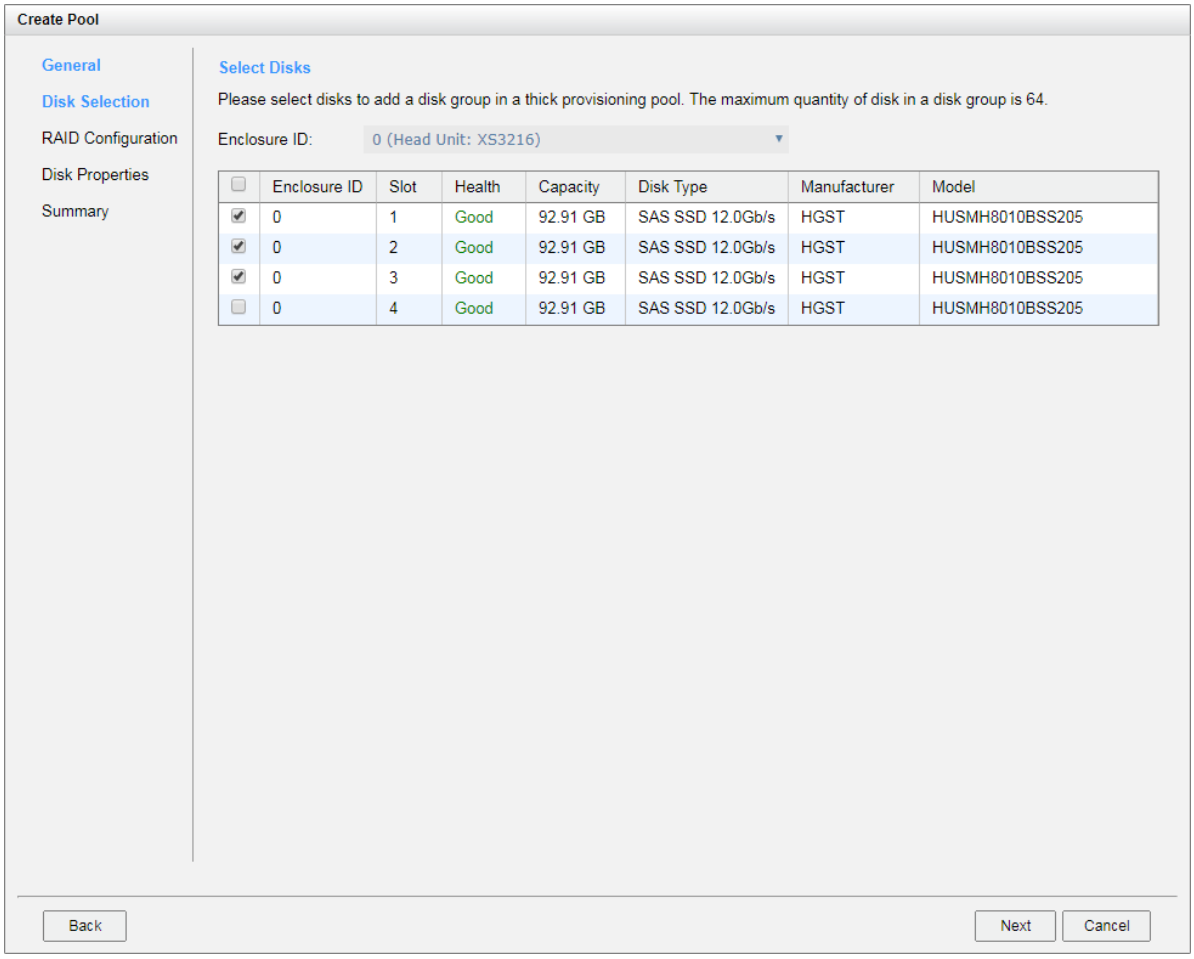


Figure 20 Create an SED Pool Step 2

7. Please select disks for pool. The maximum quantity of disk in a disk group is 64. Select an **Enclosure ID** from the drop-down list to select disks from expansion enclosures.
8. Click the **Next** button to continue.

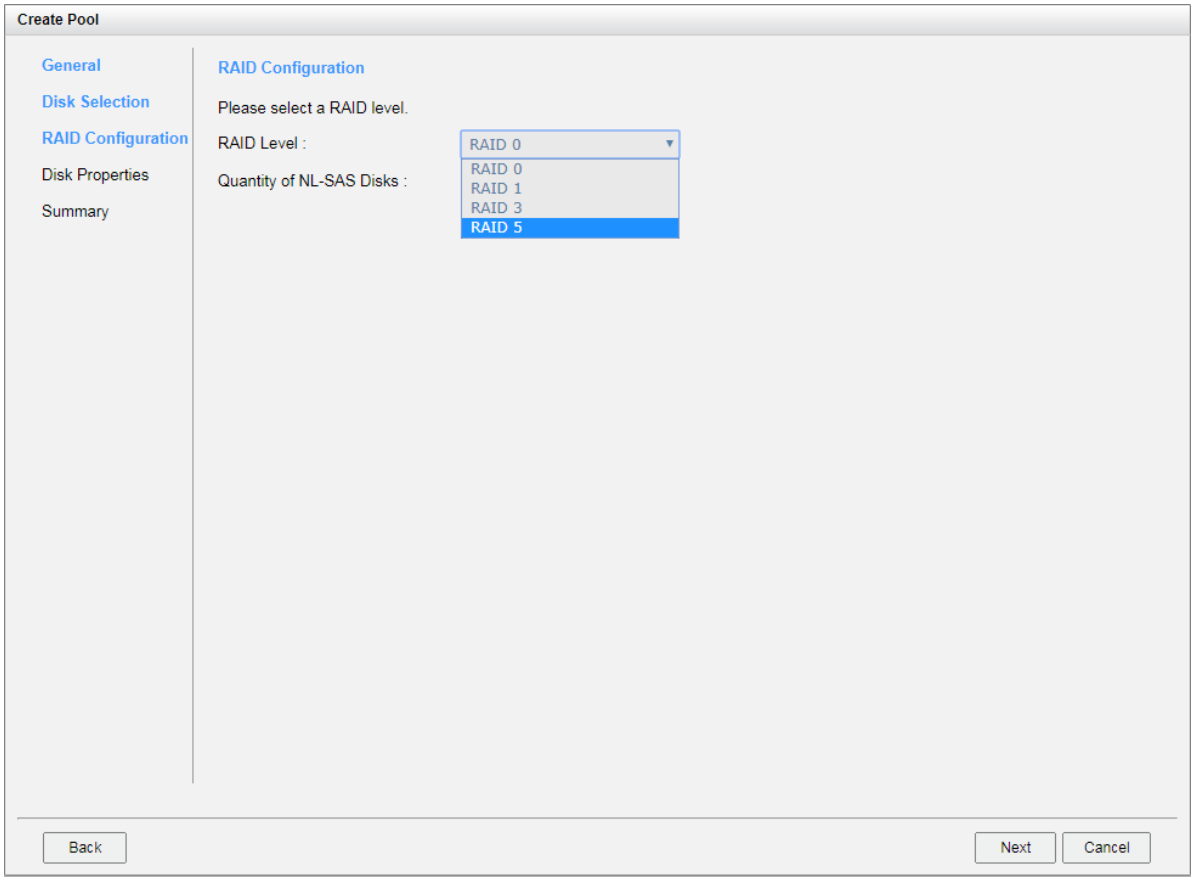


Figure 21 Create an SED Pool Step 3

9. Select a **RAID Level** from the drop-down list which lists available RAID level only according to the disk selection. And also select a **Quantity of Subgroups** if the combination RAID level is selected.
10. Click the **Next** button to continue.

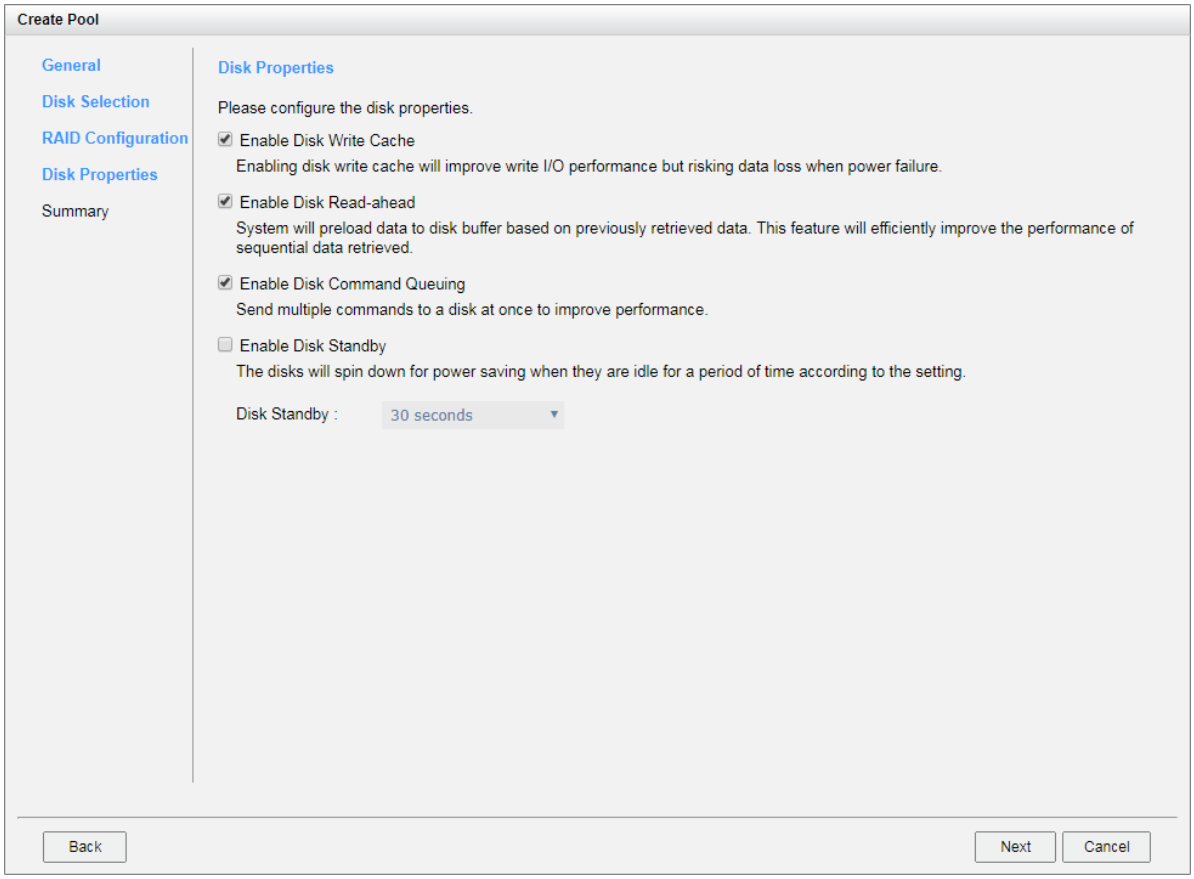


Figure 22 Create an SED Pool Step 4

11. Disk properties can also be configured optionally in this step:
    - **Enable Disk Write Cache**: Check to enable the write cache option of disks. Enabling disk write cache will improve write I/O performance but have a risk of losing data when power failure.
    - **Enable Disk Read-ahead**: Check to enable the read-ahead function of disks. System will preload data to disk buffer based on previously retrieved data. This feature will efficiently improve the performance of sequential data retrieved.
    - **Enable Disk Command Queuing**: Check to enable the command queue function of disks. Send multiple commands to a disk at once to improve performance.
    - **Enable Disk Standby**: Check to enable the auto spin down function of disks. The disks will be spun down for power saving when they are idle for the period of time specified.
12. Click the **Next** button to continue.

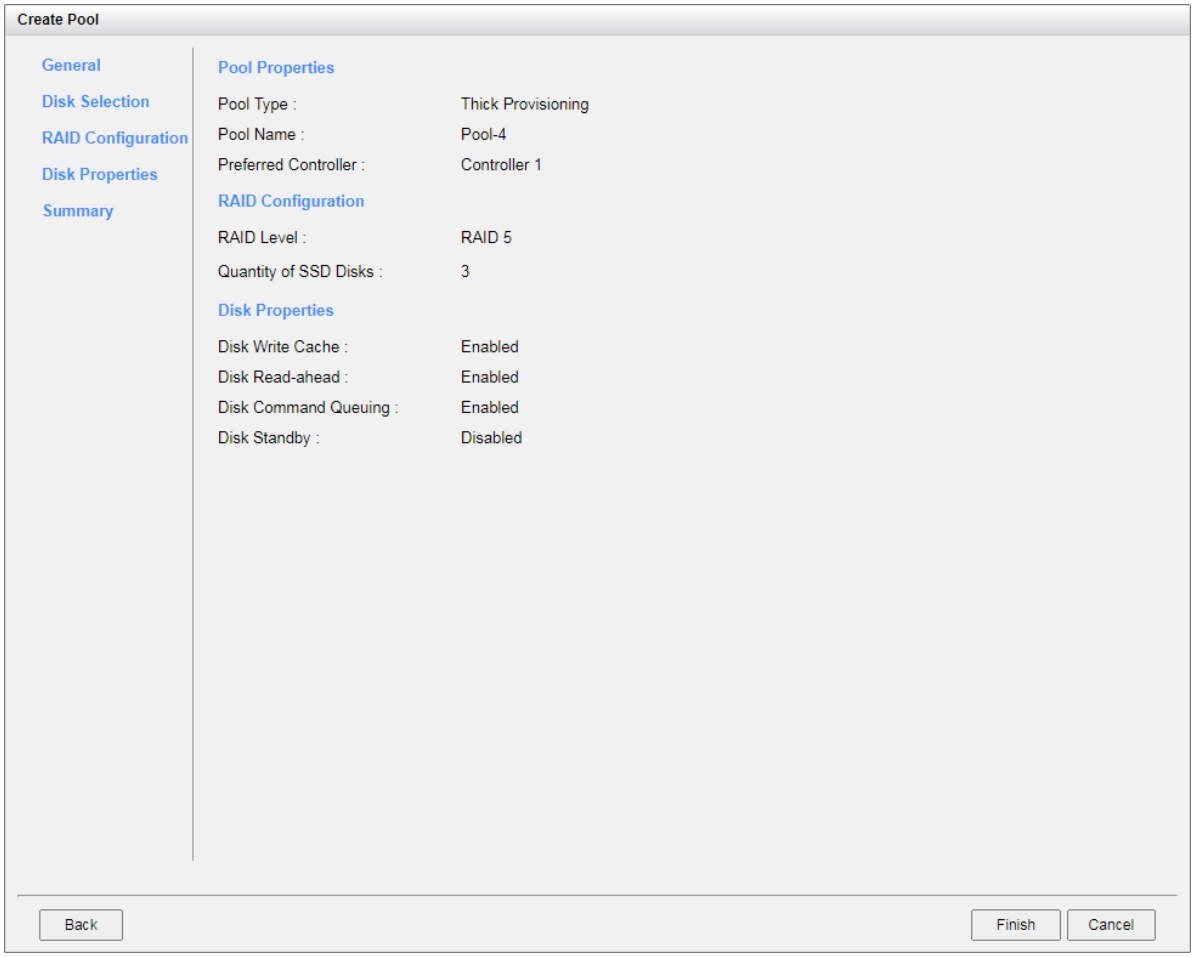


Figure 23 Create an SED Pool Step 5

13. After confirmation of info on the summary page, click the **Finish** button to create a pool.

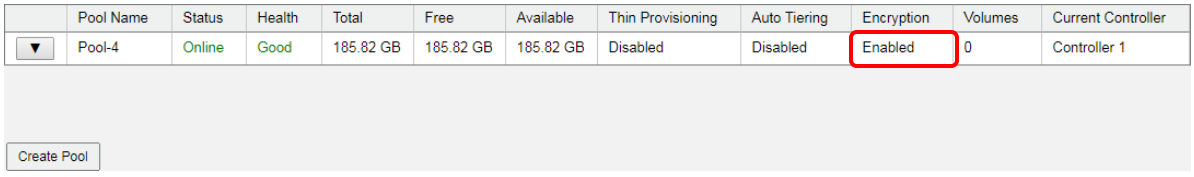


Figure 24 An SED Pool is Created

14. An SED pool has been created. If necessary, click the **Create Pool** button again to create others.

List SED Pools

Click a pool; it will display the related disk groups. Similarly, click a disk group; it will display the related disk drives. The pool properties can be configured by clicking the functions button ▼ to the left side of the specific pool.

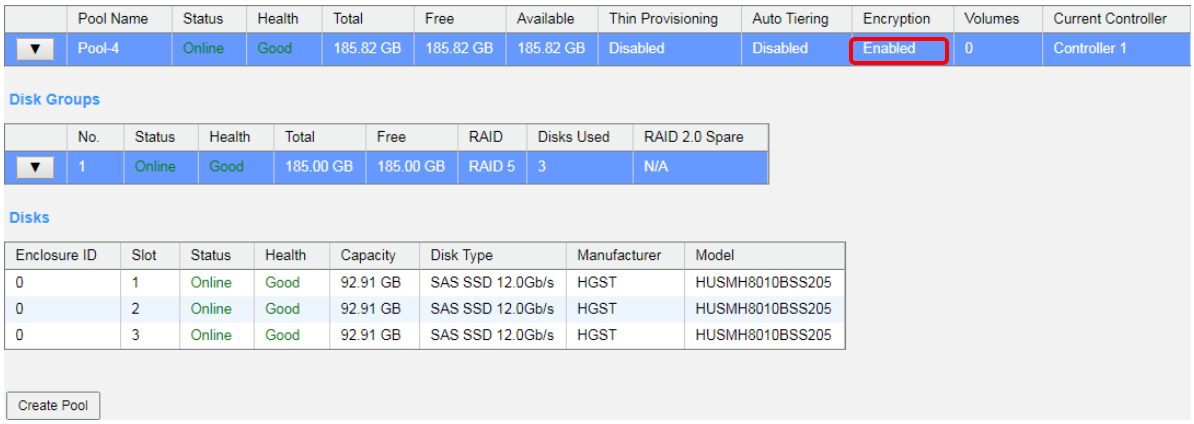


Figure 25 List SED Pools

This table shows the column descriptions.

Table 2 Pool Column Descriptions

Column Name	Description
Pool Name	The pool name.
Status	The status of the pool: • Online: The pool is online. • Offline: The pool is offline. • Rebuilding: The pool is being rebuilt. • Migrating: The pool is being migrated. • Relocating: The pool is being relocated. • EE Rebuilding: The pool is being RAID EE rebuilt.
Health	The health of the pool: • Good: The pool is good. • Failed: The pool is failed. • Degraded: The pool is not healthy and not complete. The reason could be missing or failed disks.
Total	Total capacity of the pool.
Free	Free capacity of the pool.

Available	Available capacity of the pool.
Thin Provisioning	The status of Thin provisioning: • Disabled: The pool is thick provisioned. • Enabled: The pool is thin provisioned.
Auto Tiering	The status of Auto Tiering: • Disabled: The pool is auto tiering disabled. • Enabled: The pool is auto tiering enabled. • Not Supported: The pool contains the disk groups with mixed disk type.
Encryption	The Data Secure Mode: • Disabled: The pool is not encrypted. • Enabled: The pool is encrypted.
Volumes	The quantity of volumes in the pool.
Current Controller (*This option is only visible when dual controllers are installed.*)	The current running controller of the pool.

Table 3 Disk Group Column Descriptions

Column Name	Description
No	The number of disk group.
Status	The status of the disk group: • Online: The disk group is online. • Offline: The disk group is offline. • Rebuilding: The disk group is being rebuilt. • Migrating: The disk group is being migrated. • Relocating: The disk group is being relocated. • EE Rebuilding: The disk group is being RAID EE rebuilt.
Health	The health of the disk group: • Good: The disk group is good. • Failed: The disk group fails. • Degraded: The disk group is not healthy and not completed. The reason could be lack of disk(s) or have failed disk.
Total	Total capacity of the disk group.
Free	Free capacity of the disk group.

RAID	The RAID level of the disk group.
Disks Used	The quantity of disk drives in the disk group.
RAID 2.0 Spare	The quantity of RAID 2.0 spare disk drives in the disk group. Display N/A is the RAID level is traditional.

Table 4 Disk Column Descriptions

Column Name	Description
Enclosure ID	The enclosure ID.
Slot	The position of the disk drive.
Status	The status of the disk drive: • Online: The disk drive is online. • Missing: The disk drive is missing in the pool. • Rebuilding: The disk drive is being rebuilt. • Transitioning: The disk drive is being migrated or is replaced by another disk when rebuilding occurs. • Scrubbing: The disk drive is being scrubbed. • Check Done: The disk drive has been checked the disk health. • Copying Back: The disk drive is being copied back.
Health	The health of the disk drive: • Good: The disk drive is good. • Failed: The disk drive is failed. • Error Alert: S.M.A.R.T. error alerts. • Read Errors: The disk drive has unrecoverable read errors.
Capacity	The capacity of the disk drive.
Disk Type	The type of the disk drive: • [SAS HDD | NL-SAS HDD | SAS SSD | SATA SSD] • [12.0Gb/s | 6.0Gb/s | 3.0Gb/s | 1.5Gb/s]
Manufacturer	The manufacturer of the disk drive.
Model	The model name of disk drive.

Operations on SED Pools

Most operations are described in the Configuring Storage Pools section in the XCubeSAN SANOS 4.0 User's Manual. We describe the restrictions about SED pool in the following.

Add a Disk Group into the Pool

Click ▼ **-> Add Disk Group** to add a disk group. Disks can only choose SEDs. Select SEDs and then click the **OK** button.

Move Disk Group Member Disks

Click ▼ **-> Move Disk Group** in disk group to move the member SEDs of the disk group to other SEDs. They cannot move to non SED. Select SEDs and then click the **OK** button.

Rebuild on SED Pools

Rebuilding an SED pool will use SED as spare disk, whether it is from global, local, or dedicated spare.

Create an SSD Cache Pool on SED Pools

Most operations are described in the SSD Cache chapter in the XCubeSAN SANOS 4.0 User's Manual. We describe the restrictions about creating an SSD cache pool on an SED pool in the following.

Create an SSD Cache Pool

Select the **SSD Cache** function submenu; click the **Create SSD Cache Pool** button. It will scan available SSDs with SED only.

Data Backup on Encrypted Volumes

Most operations are described in the Data Backup chapter in the XCubeSAN SANOS 4.0 User's Manual. We describe the tips about data backup on encrypted volumes in he following.

Local Clone on Encrypted Volume

If executing local clone from an encrypted volume to a non-encrypted volume, it will pop up a warning message.

Remote Replication on Encrypted Volume

If executing remote replication from an encrypted volume, It will pop up a warning message.

Configure ISE Drives

Select the **Disks** function submenu to display the status of the SED and ISE drives.

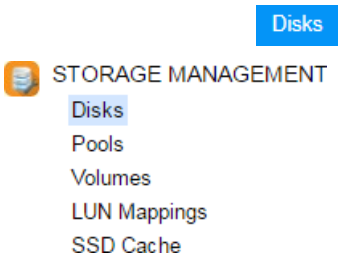


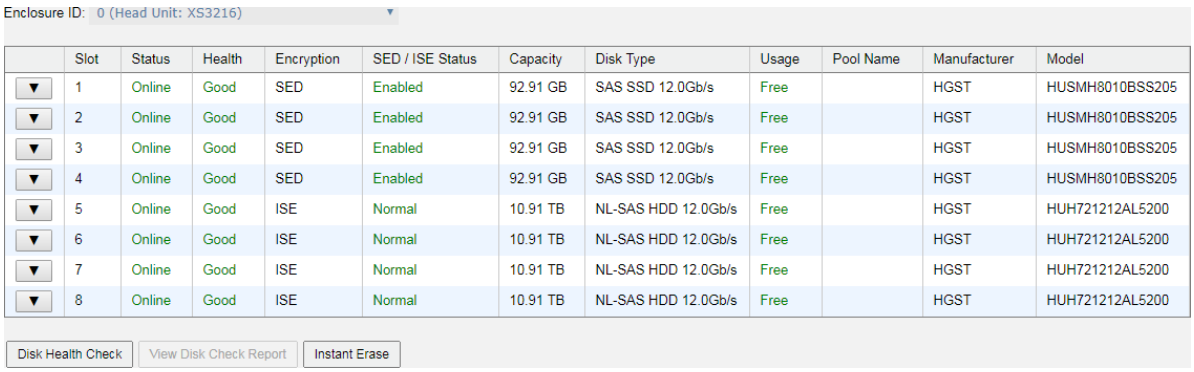
Figure 26 Disks Function Submenu

This section will describe the operations of configuring ISE drives. They can only be operated by instant erased.

List ISE Drives

The drop-down lists at the top enable you to select the enclosure from head unit (SAN system) or expansion units (expansion enclosures). The disk properties can be configured by clicking the functions button ▼ to the left side of the specific disk drive.

TIP:
Enclosure format: Enclosure ID ([Head Unit | Expansion Unit]: Model Name). For example: 0 (Head Unit: XS5216), 1 (Expansion Unit: XD5316)



	Slot	Status	Health	Encryption	SED / ISE Status	Capacity	Disk Type	Usage	Pool Name	Manufacturer	Model
▼	1	Online	Good	SED	Enabled	92.91 GB	SAS SSD 12.0Gb/s	Free		HGST	HUSMH8010BSS205
▼	2	Online	Good	SED	Enabled	92.91 GB	SAS SSD 12.0Gb/s	Free		HGST	HUSMH8010BSS205
▼	3	Online	Good	SED	Enabled	92.91 GB	SAS SSD 12.0Gb/s	Free		HGST	HUSMH8010BSS205
▼	4	Online	Good	SED	Enabled	92.91 GB	SAS SSD 12.0Gb/s	Free		HGST	HUSMH8010BSS205
▼	5	Online	Good	ISE	Normal	10.91 TB	NL-SAS HDD 12.0Gb/s	Free		HGST	HUH721212AL5200
▼	6	Online	Good	ISE	Normal	10.91 TB	NL-SAS HDD 12.0Gb/s	Free		HGST	HUH721212AL5200
▼	7	Online	Good	ISE	Normal	10.91 TB	NL-SAS HDD 12.0Gb/s	Free		HGST	HUH721212AL5200
▼	8	Online	Good	ISE	Normal	10.91 TB	NL-SAS HDD 12.0Gb/s	Free		HGST	HUH721212AL5200

Figure 27 List SEDs and ISE Drives

This table shows the column descriptions.

Table 5 Disk Column Descriptions

Column Name	Description
Slot	The position of the disk drive.
Status	The status of the disk drive: • Online: The disk drive is online. • Rebuilding: The disk drive is being rebuilt. • Transitioning: The disk drive is being migrated or is replaced by another disk when rebuilding occurs. • Scrubbing: The disk drive is being scrubbed. • Check Done: The disk drive has been checked the disk health. • Copying Back: The disk drive is being copied back.
Health	The health of the disk drive: • Good: The disk drive is good. • Failed: The disk drive is failed. • Error Alert: S.M.A.R.T. error alerts. • Read Errors: The disk drive has unrecoverable read errors.
Encryption	The data security mode of the disk drive: • SED: The disk drive is a Self-Encryping Drive. • ISE: The disk drive is an Instant Secure Erase drive. • None: The disk drive does not have encryption function.
SED / ISE Status	The status of the SED: • Enabled: The SED is enabled. • Locked: The SED is locked. It must be unlocked by the correct AK before it can be used. • Disabled: The SED is disabled. It must be initiated before it can be used. • Password Locked: The SED is locked by entering the incorrect password too many times. • Unknown: The SED is unknown. • Initiating: The SED is being initiated. • Unlocking: The SED is being unlocked. • Erasing: The SED is being erased. • Changing Key: The SED is being changed the key. The status of the ISE: • Normal: The ISE is normal. • Erasing: The ISE is being erased. • Unknown: The ISE is unknown.

	The status of the Non SED/ISE: • N/A: The field is not applicable.
Capacity	The capacity of the disk drive.
Disk Type	The type of the disk drive: • [SAS HDD | NL-SAS HDD | SAS SSD | SATA SSD] • [12.0Gb/s | 6.0Gb/s | 3.0Gb/s | 1.5Gb/s]
Usage	The usage of the disk drive: • Free: This disk drive is free for use. • RAID: This disk drive has been set to a pool. • SSD Cache: This SSD has been set to an SSD cache pool. • Dedicated Spare: This disk drive has been set as dedicated spare of a pool. • Local Spare: This disk drive has been set as local spare of the enclosure. • Global Spare: This disk drive has been set as global spare of whole system. • SSD Spare: This SSD has been set as dedicated SSD spare of an SSD cache pool.
Pool Name	Which pool the disk drive belongs to.
Manufacturer	The manufacturer of the disk drive.
Model	The model name of disk drive.

Operations on ISE Drives

Most operations are described in the Working with Disk Drives section in the XCubeSAN SANOS 4.0 User's Manual. We describe the operations about an ISE drive in the following.

Instant Erase

If there are no pools within the ISE drives, these ISE drives can be erased. Click the **Instant Erase** button to erase the selected ISEs. And then click **OK** button to proceed

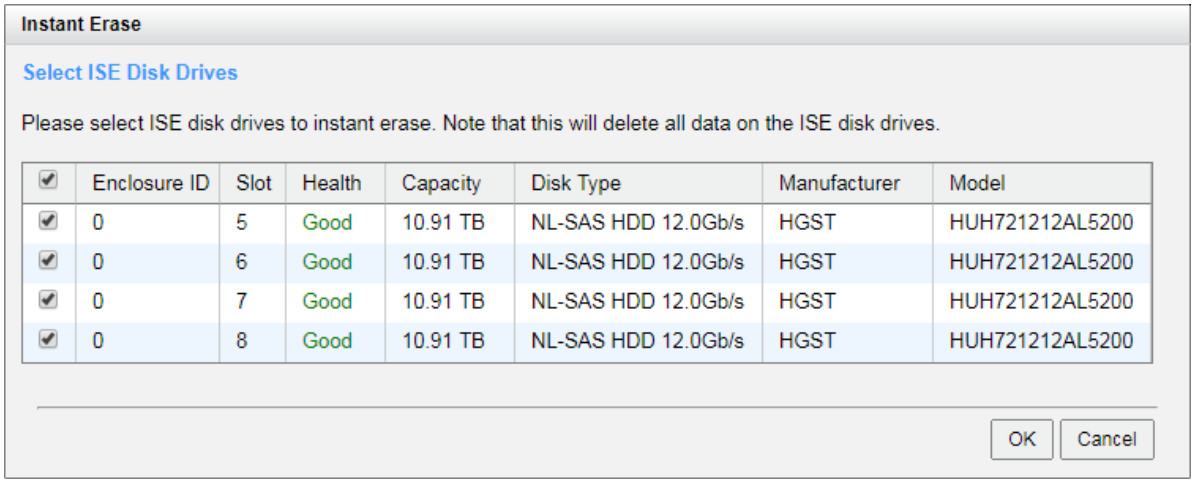


Figure 28 Instant Erase ISE drives

After proceeding, it will pop up a dialog to display the results.

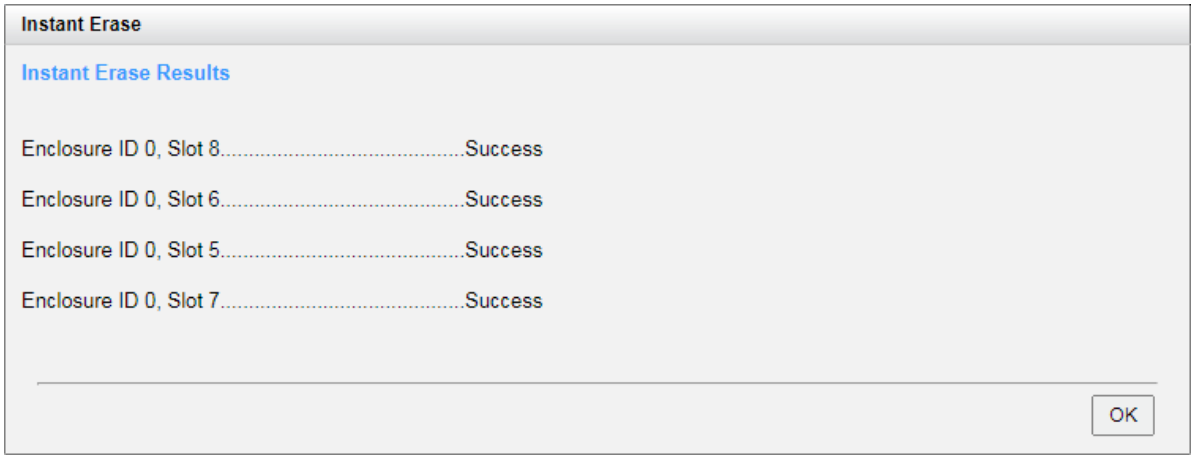


Figure 29 Instant Erase Results

TIP:
The **Instant Erase** function can be operated when the usage status of ISE drives is free.

CAUTION:
Erasing the ISE drives will change the DEK and delete all data on the ISE drive. The data on ISE drive can never be restored, please exercise caution.

Conclusion

As data security becomes more popular, storage systems need to provide secure data to ensure the peace of mind, compliance, and general security use cases that cared by companies. Regardless of disk drives are lost, stolen, or failed, unauthorized persons cannot compromise the security of the organization by accessing any sensitive data.

Data encryption ensures that all sensitive user data stored on the array is encrypted as it is written to disk, so that private data does not fall into the bad guys. With SED & ISE technology support, it is a simple and useful function for protecting your data. Therefore, organizations can be assured that their data is always safe and secure when stored on the QSAN storage systems.

Apply To

- XCubeSAN XS5200 / XS3200 / XS1200 FW 1.3.0 and later

Reference

XCubeSAN SANOS 4.0 User's Manual

- XCubeSAN SANOS 4.0 User's Manual

Appendix

Related Documents

There are related documents which can be downloaded from the website.

- All XCubeSAN Documents
- XCubeSAN QIG (Quick Installation Guide)
- XCubeSAN Hardware Owner's Manual
- XCubeSAN Configuration Worksheet
- XCubeSAN SANOS 4.0 User's Manual
- Compatibility Matrix
- White Papers
- Application Notes

Technical Support

Do you have any questions or need help trouble-shooting a problem? Please contact QSAN Support, we will reply to you as soon as possible.

- Via the Web: https://qsan.com/support
- Via Telephone: +886-2-7720-2118 extension 136
  (Service hours: 09:30 - 18:00, Monday - Friday, UTC+8)
- Via Skype Chat, Skype ID: qsan.support
  (Service hours: 09:30 - 02:00, Monday - Friday, UTC+8, Summer time: 09:30 - 01:00)
- Via Email: support@qsan.com

