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About Volume Shredder

The Hitachi Volume Shredder software provides secure erasure of existing data on disk drives. Using Volume Shredder, you can overwrite existing data with dummy data to prevent restoration of the erased data.

Data security practices and Volume Shredder

The Volume Shredder software enables you to securely erase data on volumes by overwriting existing data to prevent restoration of the erased data. For example, when the user of a volume changes, you may want to purge the data stored by the previous user before giving access to the new user. This method of erasing data by overwriting it with dummy data is referred to as shredding.

Because of the way data is written on the drives, overwriting data once or twice might not be enough to ensure that the data cannot be restored. The best practice is to overwrite data at least three times with dummy data. Volume Shredder allows you to specify the number of times the data is overwritten, enabling you to ensure compliance with applicable requirements (for example, DoD5220.22-M).
NoteComplete data erasure can be guaranteed only for hard disk drives (HDDs). For flash drives (SSDs, SCMs, and FMDs), complete data erasure (overwriting all cells including overprovisioned cells) cannot be guaranteed. For information about data erasure for flash drives (for example, cryptographic erasure, data eradication services), contact customer support.

Supported volume types

You can use Volume Shredder to shred volumes on both open-systems and mainframe systems, including logical devices (LDEVs) and custom volumes (CVs) of all emulation types. External volumes and Dynamic Provisioning virtual volumes can also be shredded. When a shredding operation is performed on an unused virtual volume for Dynamic Provisioning, no dummy data is written to the volume.

You cannot use Volume Shredder to shred the following types of volumes:

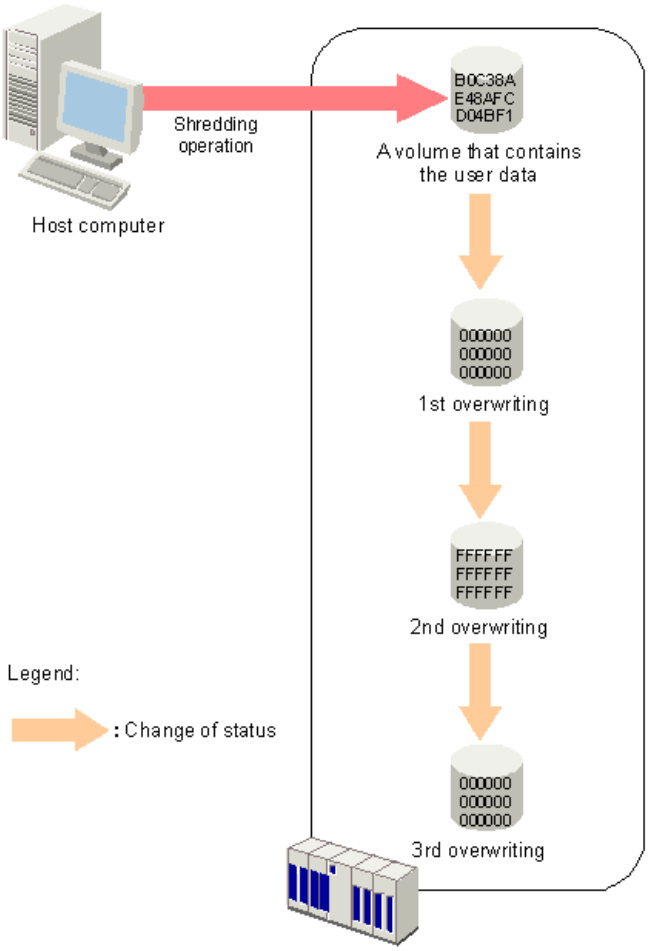
- Pool volumes
- Virtual volumes for Thin Image
- Journal volumes
- Volumes that are not write-enabled (access attribute is not read/write)
- FlashCopy® TSE-VOL
- Virtual volume with ALU attribute
- Volumes for which accelerated compression is enabled
- Virtual volumes for which the capacity saving function is enabled

- Deduplication system data volumes

Volume Shredder functions

The following figure shows user data that is being overwritten three times (default value for number of overwrites). Volume Shredder overwrites data using the following dummy data values:

- The first overwrite is 00.
- The second overwrite is FF.
- The third overwrite is 00.



You can configure Volume Shredder to overwrite data from three to eight times, and each time the system overwrites the data you can configure the dummy data to be any hexadecimal number from 0 to FFFF.

After the system finishes overwriting data, you can view the results in the user interface or, if configured, you can open the compressed results files.

We recommend that you execute the shredding function at times of day when the host I/O load is lowest. If the number

of LDEVs to be shredded is large, shredding operations might affect host I/O operations.

Shredding times

The standard required time for shredding (without host I/Os) differs depending on the drive type. For details, see the following sections.

- Standard required time for hard disk drives
- Standard required time for SSDs (with SAS interface)
- Standard required time for SSDs (with NVMe interface)
- Standard required time for SCMs
- Standard required time for FMDs

In these sections, the tables assume the use of OPEN-V volumes with drive type DKxxx-JxxxSS/KxxxSS/HxxxSS. The same standard times also apply to shredding encrypted drives.

Since each volume is overwritten three times with dummy data by default, Volume Shredder requires three times the time listed in the tables. If the number of overwrites has been changed, use the following formula to calculate the time required for shredding:

> (time required for shredding) = [time for one overwrite (standard required time)] x (number of overwrites (n))

When host I/Os are performed, the required shredding time is at least six times that of when no host I/Os are performed. If a DKxxx-HxxxSS data drive is used for creating a parity group on an encrypted data drive, the time required for shredding that parity group is the maximum time listed.
Notes on shredding times

- In these sections, the tables also assume the following conditions:
  - For VSP 5000 series, 8 DKBs/DKBNs are mounted per system. For VSP G/F700 and VSP G/F900, 2 DKBs are mounted per cluster.
  - Shredding is performed on one ECC group.
  - The assumed number of LDEVs is the maximum number of LDEVs that is allowed per ECC group when each LDEV has 100 GB of capacity. If each LDEV does not have 100 GB of capacity, the required time might be longer than the time in the tables.
- If the volumes to be shredded belong to drives of mixed types or mixed configurations, the longest required times associated with the drive type or drive configuration apply to all volumes. Thus, mixed types and configurations take more time for the volumes to become available for use than when the drive type and drive configuration are the same. When you add drives or change drive configurations, you should arrange the drives into those with the same standard required times, and then add drives starting with those volume types requiring the least shredding time.
- When the emulation type for mainframe is selected for the LDEV, Fibre Channel connectivity for mainframe is required. When the emulation type for open systems is selected, a channel for open systems is required.
- Complete data erasure can be guaranteed only for disk drives. For information about complete data erasure for flash drives and SCMs, contact customer support.

Standard required time for hard disk drives

The following tables show the standard required times for shredding for HDDs (DKxxx-JxxxSS/KxxxSS/HxxxSS disk drives).

For VSP 5000 series:

Rotation per minute	RAID level		Standard required time*
10K rpm	RAID 1	2D+2D	140 minutes
	RAID 5	3D+1P	90 minutes
		7D+1P	40 minutes
	RAID 6	6D+2P	45 minutes
		14D+2P	20 minutes
7.2K rpm	RAID 1	2D+2D	175 minutes
	RAID 5	3D+1P	115 minutes
		7D+1P	55 minutes
	RAID 6	6D+2P	65 minutes
		14D+2P	30 minutes
*Data drive capacity is assumed to be 1 TB.			

For VSP G130, G/F350, G/F370, G/F700, G/F900:

Rotation per minute	Drive capacity	RAID level		Standard required time (minute)				
				VSP G130	VSP G350/ VSP F350	VSP G370/ VSP F370	VSP G700/ VSP F700	VSP G900/ VSP F900
10K rpm	600 GB	RAID 1	2D+2D	160	130	125	125	120
		RAID 5	3D+1P	110	85	80	85	85
			4D+1P	85	65	60	65	65
			6D+1P	60	45	45	45	45
			7D+1P	50	40	40	40	40

Rotation per minute	Drive capacity	RAID level		Standard required time (minute)				
				VSP G130	VSP G350/ VSP F350	VSP G370/ VSP F370	VSP G700/ VSP F700	VSP G900/ VSP F900
		RAID 6	6D+2P	60	50	45	45	45
			12D+2P	35	25	25	25	25
			14D+2P	30	25	20	20	20
	1.2 TB	RAID 1	2D+2D	155	135	130	130	130
		RAID 5	3D+1P	110	85	85	85	85
			4D+1P	85	65	65	65	65
			6D+1P	60	45	45	45	45
			7D+1P	50	40	40	40	40
		RAID 6	6D+2P	60	45	45	45	45
			12D+2P	35	25	25	25	25
			14D+2P	30	20	20	20	20
	1.8 TB	RAID 1	2D+2D	155	125	105	105	105
		RAID 5	3D+1P	105	80	65	65	60
			4D+1P	80	60	50	45	45
			6D+1P	55	40	30	30	30
			7D+1P	50	35	35	30	30
		RAID 6	6D+2P	50	35	30	30	30
			12D+2P	35	20	15	20	20
			14D+2P	30	20	15	15	15
	2.4 TB	RAID 1	2D+2D	145	120	115	115	115
		RAID 5	3D+1P	100	80	75	75	75
			4D+1P	75	60	60	60	55

Rotation per minute	Drive capacity	RAID level		Standard required time (minute)				
				VSP G130	VSP G350/ VSP F350	VSP G370/ VSP F370	VSP G700/ VSP F700	VSP G900/ VSP F900
			6D+1P	55	40	40	40	35
			7D+1P	50	35	35	35	30
		RAID 6	6D+2P	50	40	40	40	35
			12D+2P	35	20	20	20	20
			14D+2P	30	20	20	20	15
7.2K rpm	6.0 TB	RAID 1	2D+2D	215	160	160	160	160
		RAID 5	3D+1P	140	100	90	90	90
			4D+1P	110	75	70	70	65
			6D+1P	75	50	45	45	45
			7D+1P	65	45	40	40	40
		RAID 6	6D+2P	75	50	45	45	45
			12D+2P	40	30	25	25	25
			14D+2P	35	25	25	25	20
	10.0 TB	RAID 1	2D+2D	210	160	160	155	155
		RAID 5	3D+1P	140	90	85	80	80
			4D+1P	105	75	65	60	60
			6D+1P	70	50	45	40	40
			7D+1P	65	45	40	35	35
		RAID 6	6D+2P	75	50	45	40	40
			12D+2P	40	30	25	20	20
			14D+2P	35	30	25	20	20

Standard required time for SSDs (with SAS interface)

The following tables show the standard required times for shredding for SSDs (with SAS interface).

For VSP 5000 series:

Number of parity groups	RAID level		Standard required time*
From 1 to 4	RAID 1	2D+2D	20 minutes
	RAID 5	3D+1P	15 minutes
		7D+1P	10 minutes
	RAID 6	6D+2P	10 minutes
		14D+2P	5 minutes
*Flash drive capacity is assumed to be 1 TB.			

For VSP G130, G/F350, G/F370, G/F700, G/F900:

Drive capacity	RAID level		Standard required time (minute)				
			VSP G130	VSP G350/ VSP F350	VSP G370/ VSP F370	VSP G700/ VSP F700	VSP G900/ VSP F900
480 GB	RAID 1	2D+2D	15	15	15	15	15
	RAID 5	3D+1P	20	10	10	10	10
		4D+1P	20	10	10	10	10
		6D+1P	15	5	5	5	5
		7D+1P	15	5	5	5	5
	RAID 6	6D+2P	20	5	5	10	5
		12D+2P	15	5	5	5	5
		14D+2P	15	5	5	5	5
960 GB	RAID 1	2D+2D	15	15	15	15	15
	RAID 5	3D+1P	20	10	10	10	10
		4D+1P	20	10	10	10	10
		6D+1P	15	5	5	5	5
		7D+1P	15	5	5	5	5

Drive capacity	RAID level		Standard required time (minute)				
			VSP G130	VSP G350/ VSP F350	VSP G370/ VSP F370	VSP G700/ VSP F700	VSP G900/ VSP F900
	RAID 6	6D+2P	20	5	5	5	5
		12D+2P	15	5	5	5	5
		14D+2P	15	5	5	5	5
1.9 TB	RAID 1	2D+2D	15	15	15	15	15
	RAID 5	3D+1P	20	10	10	10	10
		4D+1P	20	10	10	10	10
		6D+1P	15	5	5	5	5
		7D+1P	15	5	5	5	5
	RAID 6	6D+2P	20	5	5	5	5
		12D+2P	15	5	5	5	5
		14D+2P	15	5	5	5	5
3.8 TB	RAID 1	2D+2D	15	15	15	15	15
	RAID 5	3D+1P	20	10	10	10	10
		4D+1P	20	10	10	10	10
		6D+1P	15	10	10	10	10
		7D+1P	15	5	5	5	5
	RAID 6	6D+2P	20	10	10	10	10
		12D+2P	20	5	5	5	5
		14D+2P	20	5	5	5	5
7.6 TB	RAID 1	2D+2D	15	15	15	15	15
	RAID 5	3D+1P	20	10	10	10	10
		4D+1P	20	10	10	10	10
		6D+1P	15	5	5	5	5

Drive capacity	RAID level		Standard required time (minute)				
			VSP G130	VSP G350/ VSP F350	VSP G370/ VSP F370	VSP G700/ VSP F700	VSP G900/ VSP F900
		7D+1P	15	5	5	5	5
	RAID 6	6D+2P	20	10	5	5	5
		12D+2P	20	5	5	5	5
		14D+2P	20	5	5	5	5
15.0 TB	RAID 1	2D+2D	20	20	20	20	20
	RAID 5	3D+1P	25	15	15	15	15
		4D+1P	25	15	15	15	15
		6D+1P	20	10	10	10	10
		7D+1P	20	10	10	10	10
	RAID 6	6D+2P	30	10	10	10	10
		12D+2P	20	10	10	10	10
		14D+2P	20	10	10	10	10

Standard required time for SSDs (with NVMe interface)

The following table shows the standard required times for shredding for SSDs (with NVMe interface).

Drive capacity	RAID level		Standard required time (minute)
			VSP E series
1.9 TB	RAID 1	2D+2D	10
	RAID 5	3D+1P	10
		4D+1P	10
		6D+1P	10
		7D+1P	10
	RAID 6	6D+2P	10

Drive capacity	RAID level		Standard required time (minute)
			VSP E series
		12D+2P	10
		14D+2P	10
3.8 TB	RAID 1	2D+2D	10
	RAID 5	3D+1P	10
		4D+1P	10
		6D+1P	10
		7D+1P	10
	RAID 6	6D+2P	10
		12D+2P	10
		14D+2P	10
7.6 TB	RAID 1	2D+2D	10
	RAID 5	3D+1P	10
		4D+1P	10
		6D+1P	10
		7D+1P	10
	RAID 6	6D+2P	10
		12D+2P	10
		14D+2P	10
15 TB	RAID 1	2D+2D	10
	RAID 5	3D+1P	10
		4D+1P	10
		6D+1P	10
		7D+1P	10

Drive capacity	RAID level		Standard required time (minute)
			VSP E series
	RAID 6	6D+2P	10
		12D+2P	10
		14D+2P	10

Standard required time for SCMs

The following table shows the standard required times for shredding for SCMs.

Number of parity groups	RAID level		Standard required time*
			VSP 5000 series
From 1 to 4	RAID 1	2D+2D	5 minutes
	RAID 5	3D+1P	5 minutes
		7D+1P	5 minutes
	RAID 6	6D+2P	5 minutes
		14D+2P	5 minutes
*SCM capacity is assumed to be 1 TB.			

Standard required time for FMDs

The following tables show the standard required times for shredding for FMDs.

For VSP 5000 series:

Number of parity groups	RAID level		Standard required time*
From 1 to 4	RAID 1	2D+2D	20 minutes
	RAID 5	3D+1P	10 minutes
		7D+1P	10 minutes
	RAID 6	6D+2P	10 minutes

Number of parity groups	RAID level		Standard required time*
		14D+2P	10 minutes
*FMD capacity is assumed to be 1 TB.			

For VSP G130, G/F350, G/F370, G/F700, G/F900:

Drive capacity	RAID level		Standard required time (minute)			
			VSP G350/ VSP F350	VSP G370/ VSP F370	VSP G700/ VSP F700	VSP G900/ VSP F900
3.2 TB	RAID 1	2D+2D	5	5	5	5
	RAID 5	3D+1P	5	5	5	5
		4D+1P	5	5	5	5
		6D+1P	5	5	5	5
		7D+1P	5	5	5	5
	RAID 6	6D+2P	5	5	5	5
		12D+2P	5	5	5	5
		14D+2P	5	5	5	5
6.4 TB, 13.0 TB	RAID 1	2D+2D	10	10	10	10
	RAID 5	3D+1P	5	5	5	5
		4D+1P	5	5	5	5
		6D+1P	5	5	5	5
		7D+1P	5	5	5	5
	RAID 6	6D+2P	5	5	5	5
		12D+2P	5	5	5	5
		14D+2P	5	5	5	5