kaleidescape

Hot Spare Disk Cartridges

Technical Note

The Kaleidescape hot spare disk cartridge is an additional disk cartridge installed in the 3U Server to add another level of data protection.

If a drive fails, data stored on the failed drive is automatically restored to the hot spare. The hot spare prevents content loss in case of a second drive failure and reduces the urgency of a service call which can be especially important for marine and other remote installations.

How the Hot Spare Works

Every 3U Server has an unused disk cartridge that serves as a hot spare. The hot spare has no content or file system information. The server periodically checks the hot spare to verify that the disk is operating normally and is ready in case of a drive failure. The hot spare disk cartridge in a 3U Server is easily identified by the blinking status light. Blinking indicates standby or ready status.

Note: If a new disk cartridge is added to a 3U Server, the new disk cartridge usually becomes the hot spare and the original hot spare is added to the disk array.

One failed drive

When the server detects a failed drive, the server enters degraded mode (state where data has not yet been rebuilt from a missing or failed disk). The server begins an immediate rebuild using RAID-K data to restore the data from the failed drive to the hot spare. The status light on the hot spare stops blinking to indicate that the disk is now part of the rebuild and is no longer available as a hot spare.

No content is lost if one drive fails. When the server enters degraded mode, current imports are completed but new imports are not allowed until the rebuild is complete; other server functions, especially playback, are still available.

During rebuild, the disk is incorporated into the RAID-K disk array. After rebuild is complete, the server returns to normal operation but no longer has a hot spare. See Figure 1.

To restore the 3U Server to the original level of fault protection, a new disk cartridge must be installed as soon as possible. The new disk cartridge becomes the new hot spare and must at least match the capacity of the largest disk cartridge in the server.

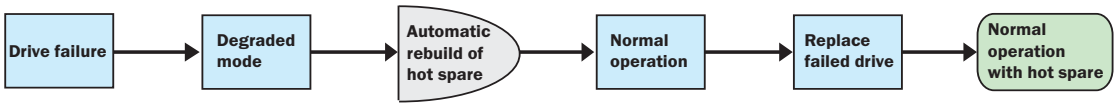

Figure 1 Hot Spare Process with One Failed Drive

Two failed drives

After the rebuild of the first drive is complete, the server is once again protected by RAID-K. If a second drive then fails, the server enters degraded mode again. Movies and music are still available. See Figure 2.

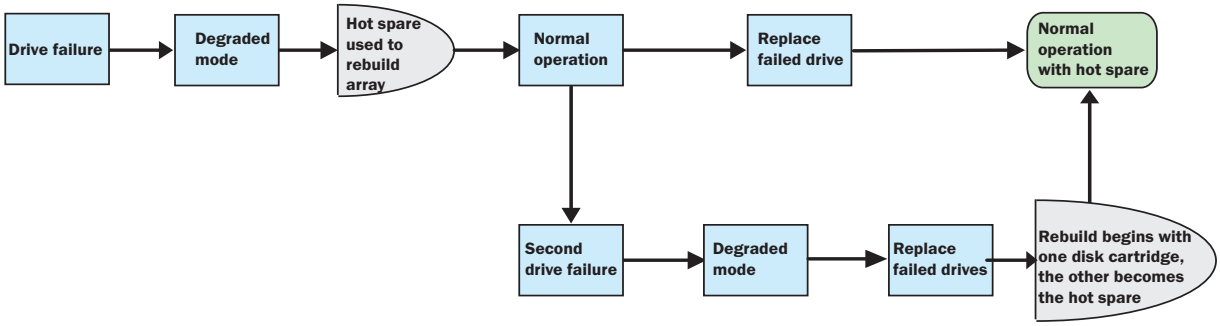

Figure 2 Hot Spare Process with Two Failed Drives

If a drive fails while a rebuild is in progress, or if a third drive fails before any drives have been replaced, the server will stop operating and have to be returned to Kaleidescape. In this case, some or all of the content on the server may be lost. Therefore, it is extremely important to replace failed drives as quickly as possible.

Remote Installations

In some installations it is not possible, or practical, to replace a disk cartridge immediately after a drive failure. For example, a Kaleidescape System installed on a yacht might not be available for maintenance for weeks at a time, or the system might be installed in a vacation home where timely service calls are not possible.

In these remote installations, two drives can fail without loss of content.

Note: If a drive fails while another drive is rebuilding, data can be lost.

Examples

The following examples discuss server and disk cartridge behavior during normal operation, and after one or two hard drive failures.

Normal Operation with Hot Spare

When a 3U Server functions normally, the front panel glows blue. Disk cartridge status lights are a steady blue except for the hot spare, which blinks blue. The hot spare can be in any slot.

Single Drive Failure

When a drive fails in a 3U Server, the server enters degraded mode but the server front panel continues to glow blue. An immediate rebuild to the hot spare begins. The status light on the hot spare stops blinking because the drive has joined the file system. Any imports already in progress will be completed but new imports are not permitted until the rebuild is complete. When the rebuild is complete, the server exits degraded mode and resumes normal operation.

After the rebuild is complete, all the disk cartridge status lights are a steady blue except one. The failed disk cartridge has an amber status light.

The former hot spare disk cartridge is now part of the RAID-K disk array. Without a hot spare, the server continues to function normally. To restore the hot spare feature, replace the failed drive with a new disk cartridge as soon as possible.

Second Drive Failure

If a second drive fails after the first failed drive is rebuilt, but before the first failed drive is replaced, the server front panel glows amber. Any imports already in progress will be completed but new imports are not permitted. The server is in degraded mode until the second failed drive finishes rebuilding to the first replacement drive. No content is lost and movies and music can still be enjoyed.

The server might lose content if a third drive fails. All the disk cartridge status lights are a steady blue except for the two failed drives with amber lights.

The server requires two disk cartridges immediately to rebuild the second failed disk and replace the hot spare.

Note: If a drive fails while another is rebuilding, or if a third drive fails before any drives have been replaced, the server stops operating and must be returned to Kaleidescape.

Status Lights

Table 1 summarizes how status lights behave and lists corrective action when required.

Table 1 Status Light Summary

Server Front Panel	Disk Cartridge Status Lights	Server Condition	Action Required
Blue glow	• One disk cartridge has blinking blue light.	Normal operation, Hot spare available	None
	• One disk cartridge has a blinking amber light.	Hot spare too small	Replace hot spare with disk cartridge with larger capacity.
	• One disk cartridge has an amber light or is unlit.	Either degraded mode with hot spare rebuilding or normal operation with no hot spare	Replace failed drive as soon as possible to restore hot spare.
Amber glow	• Two disk cartridges have amber lights or are unlit.	Hot spare NOT available Content is at risk if another drive fails	Replace at least one failed drive immediately. Replace second drive as soon as possible.
	• One disk cartridge is amber or unlit. • One disk cartridge has a blinking amber light.	Degraded mode but hot spare too small	Replace failed drive and hot spare with disk cartridges with larger capacity

Conclusion

The hot spare disk cartridge provides additional data protection for the 3U Server. The hot spare allows the rebuild process to begin sooner and significantly reduces the risk of content loss from a double-drive failure. Failed drives must be replaced as quickly as practical.

For additional information, contact Kaleidescape Support.

- Send email message to support@kaleidescape.com.
- Call the support line at **+1 (650) 625-6160**.

Be prepared to provide the serial number of the Kaleidescape server. Serial numbers are printed on labels located on the backs and behind the front panels of 3U Servers.

The Kaleidescape website always has the latest support updates.

http://www.kaleidescape.com