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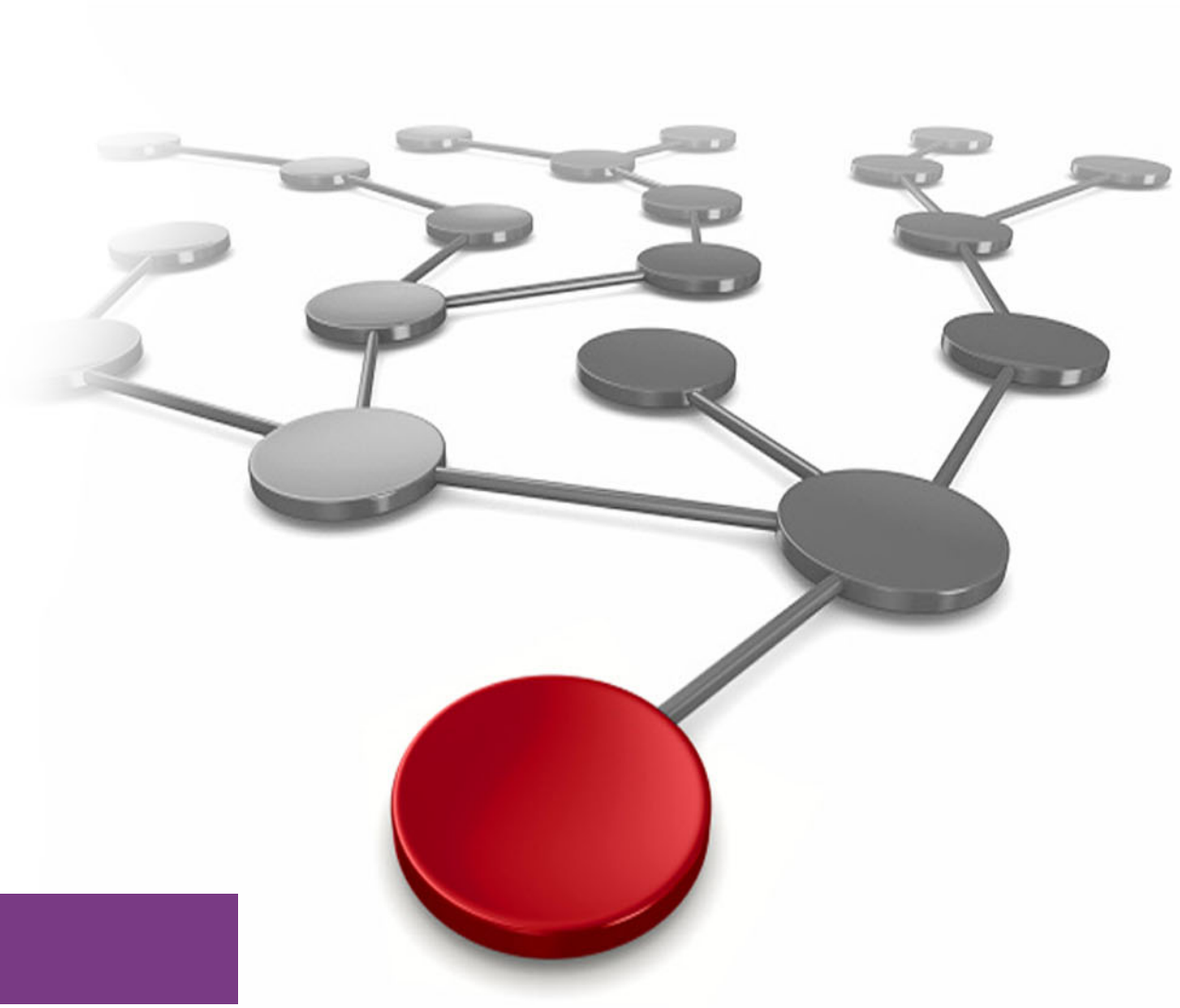
IBM FlashCore Module Cryptographic Erase

For use with the IBM FlashSystem 9100, IBM Storwize V7000, and IBM Storwize V5100

Matt Smith



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Statement on Cryptographic Erasure

IBM® FlashCore Modules (FCMs) are storage devices that are available in 4.8 TB, 9.6 TB, and 19.2 TB capacities. They are a 2.5-inch drive form factor device and use second-generation 3D triple-level cell (TLC) flash memory on which to store data.

This paper describes the cryptographic erasure of data that is stored on these devices when used in an IBM FlashSystem® 9100 (9846-AF7, 9846-AF8, 9848-AF7, 9848-AF8, 9848-UF7, and 9848-UF8), or IBM Storwize® V5100 (2077-424, 2077-A4F, 2078-424, and 2078-A4F).

The cryptographic erasure process that is described in this paper is designed to meet the requirements that are set in Appendix D of NIST SP 800-88.

Each FCM is a Self-Encrypting Drive (SED), where a unique media encryption key (MEK) exists on the device and is used to encrypt any data that is written to the drive. To read data back from device, the same unique key is required to decrypt the data.

In the IBM FlashSystem 9100, IBM Storwize V7000, and IBM Storwize V5100 products where FCMs are used, a unique MEK is created when the FCM device is added to a RAID array. Data that is written to and read from the device use only this key to encrypt and decrypt data.

Generating the MEK is done by using an SP 800-90A dynamic random bit generator (DRBG). Encryption is performed by using XTS-AES-256. IBM obtained FIPS 140-2 certification for the IBM FlashCore® Modules that are listed at this website.

The FCM uses two partitions when it is used in the IBM FlashSystem 9100, IBM Storwize V7000, and IBM Storwize V510. The first partition is used to store encrypted client data. A smaller, second 1 GB partition is used to store unencrypted system configuration data for recovery. No client data is stored on the second partition.

To achieve a cryptographic erase, the MEK and the wrapped key structure where the MEK is stored must be overwritten to ensure that the encrypted data on the drive cannot be decrypted. This process is described in “Process for Cryptographic Erasure” on page 2.

One of the steps in the cryptographic erasure process is to add the FCM device into the new array. As part of adding the FCM device into a new array, a new MEK is generated by using a DRBG that is placed in the same location as the old keys. If the generation of a new key fails, the device is not added into the array and is not considered as cryptographically erased.

To ensure the integrity of an MEK, the FCM device does not support escrow or injection of the MEK at or below the level of the sanitization operation. An MEK is generated internally to the FCM device and never leaves it.

FCMs do not support export of a MEK for key escrow. FCMs do not support importing a random number from outside the FCM to be used as a MEK (that is, key inject).

The FCM devices should be cryptographically erased only within a supported IBM FlashSystem 9100, IBM Storwize V7000, or IBM Storwize V5100 by using the process described next. No direct support is available for cryptographic erase by way of the FCM device NVMe interface.

This paper covers FCMs only. Other drives that are found within an IBM FlashSystem 9100, IBM Storwize V7000, or IBM Storwize V5100 do not have FIPS 140-2 certification. If the IBM Easy Tier® function is used between FCMs and other drives, consider that the other drives are not certified to the same level, but might still contain client data.

Process for Cryptographic Erasure

The process that is described in this section is for mass cryptographic erasure of multiple FCMs that are in use in a Storage Pool. Before starting, ensure that all FCMs are shown as online; otherwise, the MEKs cannot be deleted.

By using the GUI, ensure that encryption is enabled, as shown in Figure 1.

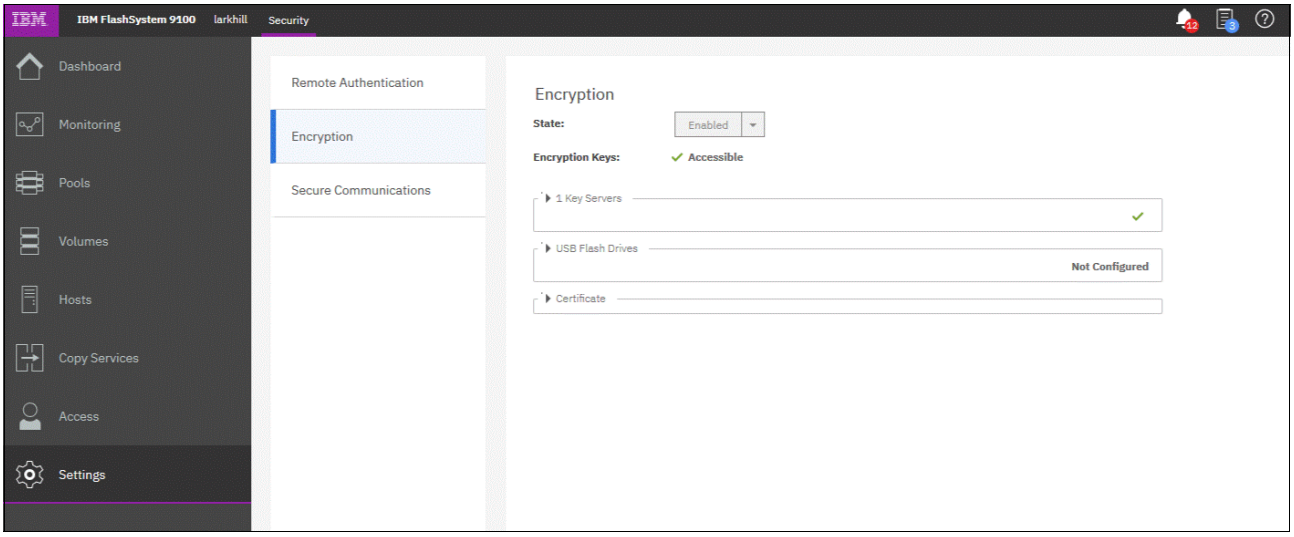

Figure 1 Ensuring encryption is enabled

Navigate to the Pools window and locate the Storage Pool (or Pools) that contain the FCMs. Select the **Delete Pool** option to remove the FCMs from the Pool, as shown in Figure 2.

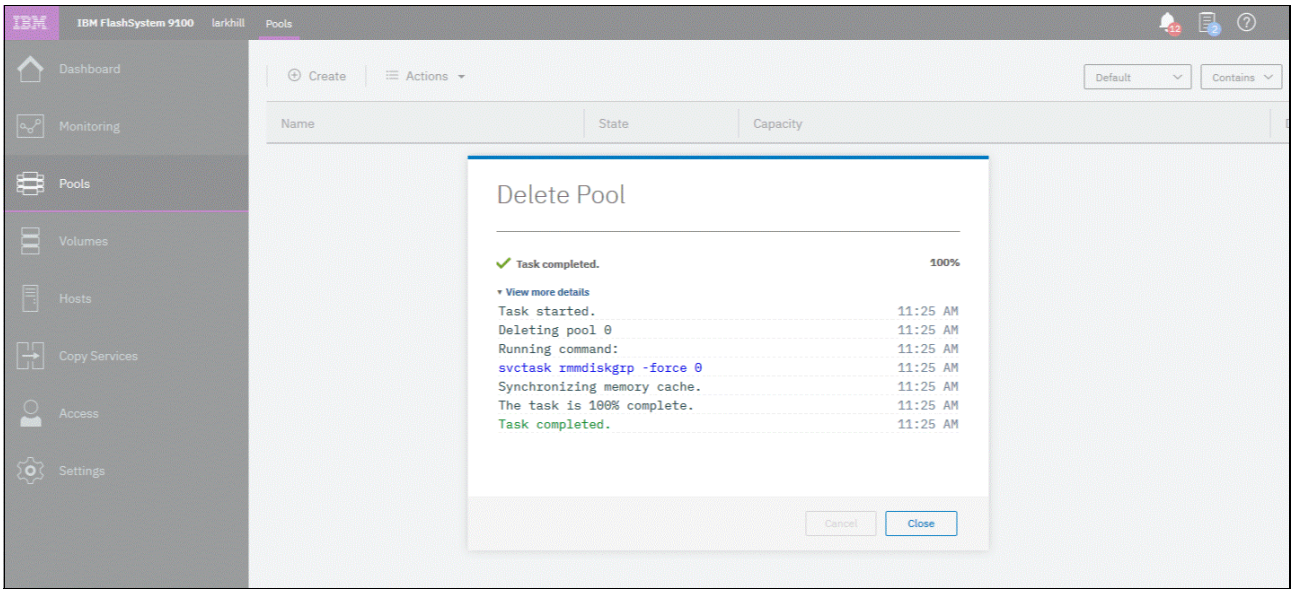

Figure 2 Selecting the Delete option

By using the same window, select the **Create Pool** option and ensure that encryption is enabled. This process creates a Storage Pool into which you can add the FCM devices, as shown in Figure 3.

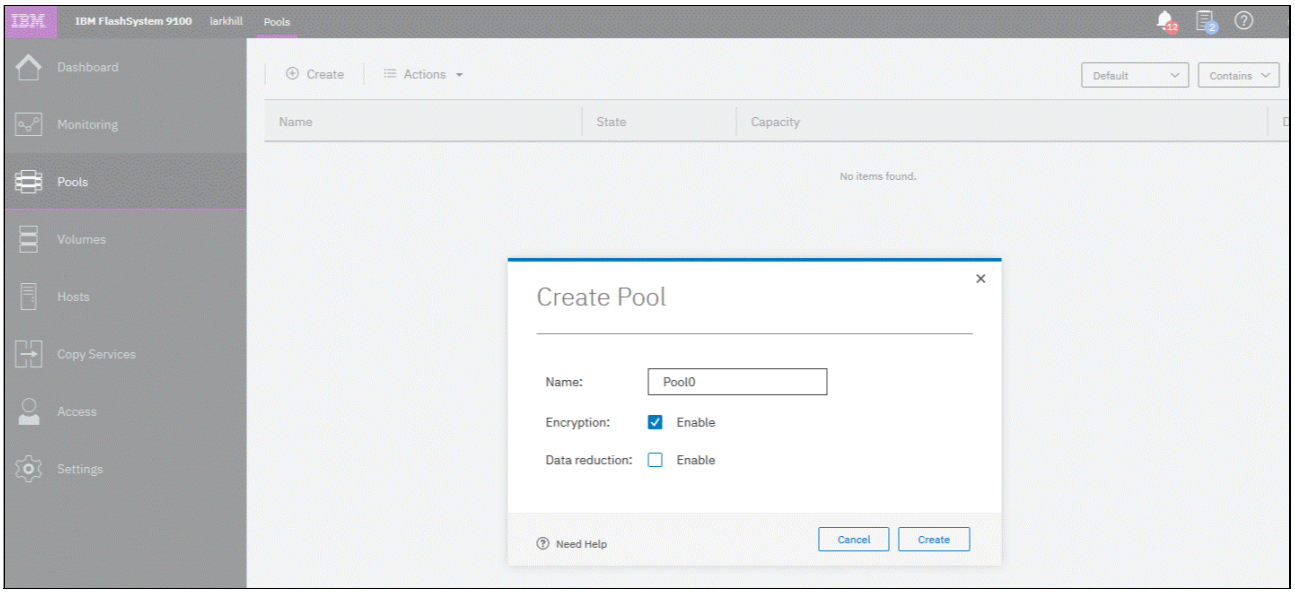

Figure 3 Select the Create Pool option ensuring encryption is enabled

Then, select the Storage Pool that you just created and click **Add Storage**. Because FCM devices are classified as internal storage, select **Internal** and add the same set of FCM devices that you removed from the previous Storage Pool into this new Storage Pool, as shown in Figure 4 on page 4.

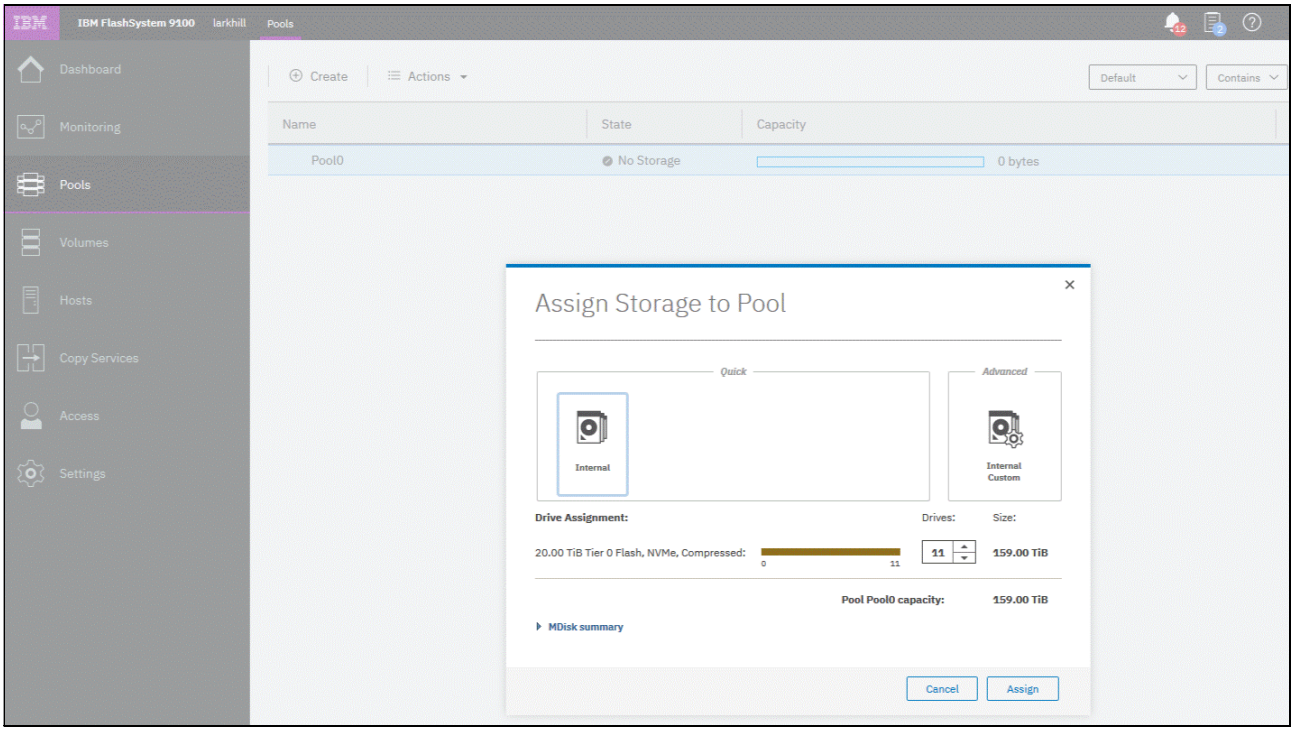

Figure 4 Assigning the storage to a pool

A dialogue appears that shows the FCM devices being added to the pool. Assuming that the task completes successfully, this process writes new MEKs to the FCMs over the location of the old keys and the cryptographic erase is complete, as shown in Figure 5.

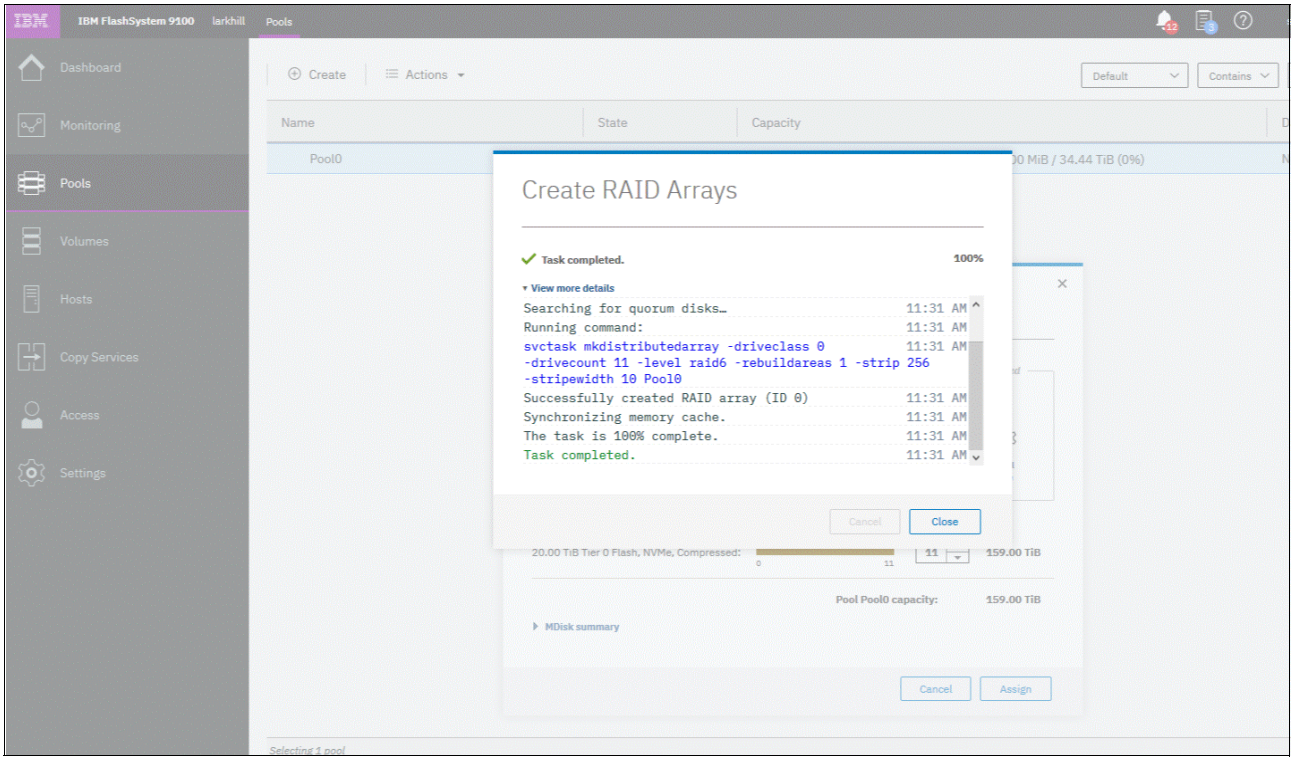

Figure 5 Cryptographic erase is complete

You can validate these steps by using the Audit Log. You see an entry for remove pool (**rmmdiskgrp**), followed by an entry for create pool (**mkmdiskgrp**) and then, an entry for adding the FCMs to the pool (**mkdistributedarray**), as shown in Figure 6.

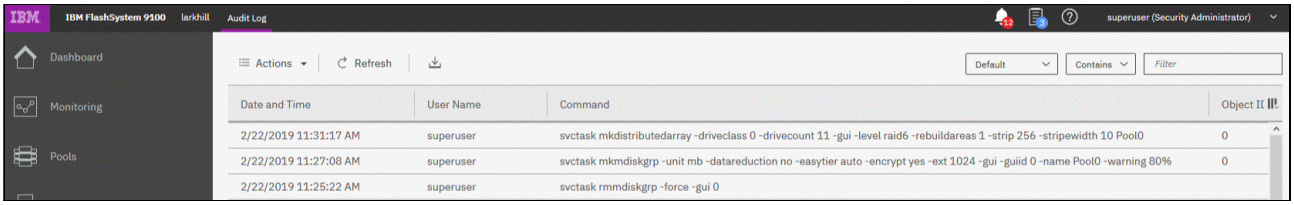

Figure 6 Validating the steps by using the Audit Log

It is not possible to confirm by using the GUI that the set of FCM devices that were removed were the set of FCMs that were added back into the pool. However, if you are performing a mass cryptographic erase of all FCMs in the system, you can add them back into the new pool and confirm that the **-drivecount** parameter on the command **mkdistributedarray** matches the number of drives in the system.

Authors

This paper was produced at IBM Hursley, UK.

Matt Smith is a FlashSystem Offering Manager with responsibility for the FlashSystem V9000 and FlashSystem 9100.

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