vFlash: An Overview

This Dell Technical White Paper provides information about the vFlash features of iDRAC with Lifecycle Controller on Dell PowerEdge servers.

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Executive summary

This paper provides an overview of vFlash, an iDRAC with Lifecycle Controller feature that helps automate deployment and management of the server. It is one of the three-part vFlash-related white papers.

vFLash is an SD card on the server's front panel and it is connected to and controlled by the iDRAC. It emulates USB flash storage to the operating system (OS), but its content can be updated remotely through the iDRAC network. Some of the applications of vFlash include:

- Back up and restore the platform in case you need to replace the motherboard.
- Download a custom image, and instruct the BIOS to boot to it.
- Store data for the local OS user.

The vFlash SD card can be up to 16 GB and can be divided into multiple partitions. You can use Dell-provided SD cards or your own as long as you have the iDRAC Enterprise license.

This document is intended for remote system administrators. It illustrates some of the use cases of vFlash to better manage your servers.

Introduction

vFlash is a function of Dell Life-Cycle controller of Dell PowerEdge 11th- and 12th-generation servers that provides a shared storage space between the server system and its iDRAC. The storage resides on an external vFlash SD card inserted into the system. The SD card can be up to 16GB. This shared space adds much flexibility to the systems management functions.

On one hand, vFlash provides a convenient in-band storage space for the system. Systems management processes, like operating system deployment or application installation, may use storage spaces to hold deployment images that may not be readily available on an unconfigured bare-metal system.

On the other hand, vFlash can also serve as an out-of-band storage space for the systems management functions running on the iDRAC. It is frequently used by systems management as the storage space to back up and restore system configurations.

Because the same vFlash space can be shared by both the in-band and out-of-band applications, the out-of-band systems management can place contents on the vFlash to be shared with the system applications.

All these vFlash operations can be performed remotely without physical access to the system. This is a great convenience for a data center system administrator when physical access to a system is difficult.

In this document, we will describe the hardware capability of the vFlash device and the vFlash partition management software provided by the iDRAC Lifecycle Controller.

vFlash systems can be managed through several front-ends: iDRAC GUI, Unified System Console, remote WS-MAN service, and RACADM Command Line Interface (CLI).

For specific operational examples, you can refer to two other vFlash *how-to* whitepapers:

- *How to use vFlash via GUI/USC* – explains how to manage vFlash devices from iDRAC GUI and Unified System Configurator
- *Scripting vFlash partition management* – explains how to manage vFlash devices through web service and command-line interfaces

The vFlash features are offered on tower, blade and rack servers. Some servers have a built-in vFlash connector, the 12th generation series 600 and above, while others require the iDRAC Enterprise adapter, the 11th generation servers or 12th generation series 500 and below; server licensing is required to fully access vFlash features.

vFlash technology through USB device emulation

The vFlash device is a removable SD card that provides a per-system local storage space. The system operator accesses the physical SD card slot on the front panel of the server on the Dell 12th generation rack and tower servers, or from the back of the Dell 11th generation rack and tower servers. Blade servers have an internal vFlash card that cannot be removed or inserted without removing the blade from the system chassis. The vFlash device supports most of the generic SD cards. You can use Dell-branded or most off-the-shelf SD cards. The Dell SD card provides better performance.

One of the key enabling technologies of vFlash is the emulation of the out-of-band storage space as in-band USB storage device(s). This allows the content of the emulated USB device to be accessed and prepared remotely. The emulated storage type can be Floppy, CD, or Hard drive. This is critical to a system operator where the physical access to a server system is not possible.

Together with the Autorun capability for some operating systems, like Windows, the system operator can perform automated program execution on the server system by remotely preparing a CD image on the vFlash, and then emulating the image into a USB CD device attached to the server system. The operator can operate on the vFlash partitions regardless of whether the operating system is running or not.

vFlash partition management

vFlash allows full management of its storage space. The vFlash partition is the basic management unit. vFlash service can then emulate the vFlash partition as a separate USB storage device.

iDRAC Lifecycle Controller provides direct storage management functionality to the system operators through several user interface channels: Unified Server Configurator (USC), iDRAC Graphic User Interface (GUI), WS-MAN remote web service API, and RACADM Command Line Interface. An operator can fully operate on the vFlash storage remotely through these interfaces.

For a new SD card, the operator must initialize the card before its space can be managed by the vFlash system. The initialization procedure reformats the card, erases all existing content, and creates proprietary system files on the card. Though the system files are not hidden, an operator must not alter the files in any manner. As a vFlash security measure, any alteration to the system files will render the card uninitialized. If this occurs, the operator needs to go through another vFlash initialization procedure to erase all existing content on the card.

After initialization, the vFlash storage space can be managed in partitions. An operator can create up to 16 vFlash partitions. Each partition can have a size up to 4GB. When the vFlash SD card is inserted into a Windows workstation, the operator can observe that the partitions are in fact proprietary image files on the SD card and not physical disk partitions.

An operator creates partitions in several different ways. One can create an empty vFlash partition and then format it into FAT, EXT2, or EXT3 file systems. An operator can also upload a partition to vFlash from a remote disk image, for example, CD/DVD ISO images. Conversely, the operator can save the partition data to a remote partition image file.

The USB mass-storage device emulation is a critical vFlash function. It allows the out-of-band iDRAC to share the partition data with the server operating system through the iDRAC built-in USB hub as an external hard disk drive (HDD), an optical drive (CD or DVD), or a flash memory device (FD). The emulated iDRAC USB device goes online when the operator *attaches* a vFlash partition.

The out-of-band nature of vFlash management becomes very important for system management. It allows an operator to prepare data, for example, application installation scripts or CD images, totally out-of-band without interrupting the operating application on the server system. Only after the image is ready, the applications on the server system can see the device and use the prepared content.

Where to Find More Information

Web Services for Management (WS-MAN):
http://dmtf.org/standards/wsman

Learn more about firmware inventory as defined by the Dell CIM profile specification:
http://www.delltechcenter.com/page/DCIM.Library.Profiles.DCIM+Software+Inventory+Profile+1.0

Learn more about firmware updates as defined by the Dell CIM profile specification:
http://www.delltechcenter.com/page/DCIM.Library.Profile.DCIM+Software+Update+Profile+1.0

Learn more about job control as defined by the Dell CIM profile specification:
http://www.delltechcenter.com/page/DCIM+Job+Control+Profile+1.1

WSMAN Interface Guide for Linux:
http://attachments.wetpaintserv.us/BMJk79WsVP3F0jwl50xR_w2088275

WSMAN Interface Guide for Windows:
http://attachments.wetpaintserv.us/utYVFQFaHmnfG_LHEnx1YQ2026735

WSMAN command line open source for Linux (Openwsman):
http://sourceforge.net/projects/openwsman/

WSMAN command line for Windows (Winrm):
http://msdn.microsoft.com/en-us/library/windows/desktop/aa384291(v=VS.85).aspx

All about Lifecycle Controller in iDRAC:
http://support.dell.com/support/edocs/software/smusc/smlc/lc_1_5/index.htm

Summary

Out-of-band style systems management is particularly attractive because the out-of-band systems management tasks can be performed without any interruption to the execution of the server-based in-band applications. Dell Lifecycle Controller provides an out-of-band systems management environment. To bridge the Lifecycle Controller execution environment with its server system environment, the vFlash system provides a shared and flexible local storage space.

The vFlash system supports both graphical user interface and the scriptable command line interfaces. Through these interfaces, a system operator can manage and use the vFlash system remotely. The full scripting ability allows a system operator to tailor and automate the vFlash usage to any systems management applications.

While this paper gave some possible usage examples of vFlash, the vFlash feature is very flexible and can support many other use cases depending on the customer's environment. The ability to remotely download an image through a management network to a local storage device and control how it is used is very powerful.

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