Remote Management with

Virtual Media in the DRAC 4

Using the virtual media feature in the recently released Dell™ Remote Access Controller 4 (DRAC 4), administrators can extend the remote management capabilities of Dell PowerEdge™ servers with a virtual CD or virtual floppy disk boot process. In addition, administrators can use DRAC 4 virtual media functionality to remotely install applications, update drivers, and install new operating systems. This article describes the virtual media feature and its usage model.

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To manage systems remotely, administrators often require a way to remotely copy files to and from a system, install applications such as Dell OpenManage™ systems management software, and install new operating systems. Such tasks can be performed easily using the virtual media feature in the Dell Remote Access Controller 4 (DRAC 4).

The DRAC 4 is an independent, out-of-band management card. It has its own microprocessor with embedded operating system (OS), network interface card (NIC), Web server, Telnet interface, and serial interface. It runs on auxiliary power so that it can be available even when the managed server is powered down. Major features in the DRAC 4 include virtual media, console redirection, power management, alerts, system event log, and Microsoft® Active Directory® directory service.[1,2]

Overview of the virtual media feature

The virtual media feature provides the server with a virtual CD drive and a virtual floppy disk drive that can use standard media connected anywhere on the network. The virtual CD drive and virtual floppy disk drive are two electronic devices embedded in the DRAC 4 and controlled by its firmware. To the OS and BIOS on a managed server, they look like a physical CD and a physical floppy disk drive.

Figure 1 shows the overall architecture and operation of the virtual media feature. The management station provides the physical media or image file across the network. For the virtual media feature to work, a virtual media plug-in must be installed in the management station. When a remote administrator connects to a DRAC 4 card through a Web browser and opens the virtual media

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[1] For an overview of DRAC 4 features and functionality, see "Exploring the Next-Generation DRAC 4 Dell Remote Access Controller" by Jon McGary and Donnie Bell in *Dell Power Solutions*, October 2004.

[2] For an overview of Active Directory directory service implementations using the DRAC 4, see "Using Microsoft Active Directory Authentication with the DRAC 4" by Jon McGary and Bradley Bransom in *Dell Power Solutions*, October 2004.
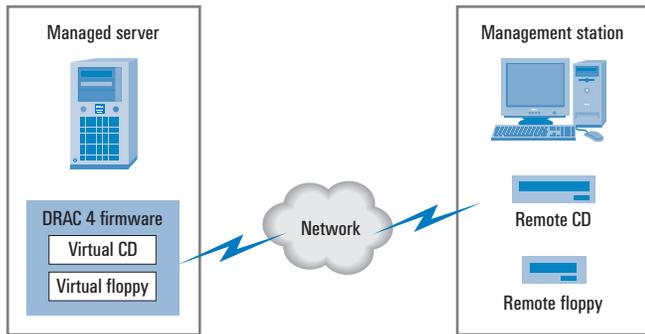

Figure 1. Virtual media architecture

page for the first time, or when a new version of the plug-in is available in the firmware, the virtual media plug-in is downloaded and installed on the management station.

The DRAC 4 uses a client/server model to perform virtual media functions. A virtual media server runs in the DRAC 4 firmware on the managed server and a virtual media client in the plug-in runs on the management station (see Figure 2). Once logged in to the DRAC 4 Web server, administrators can open the Virtual Media page to launch a connection to the virtual media server. When a virtual media session is established, all virtual CD and virtual floppy disk drive access requests from a managed server are directed to the virtual media plug-in on the management station through the network. The plug-in processes the requests, accesses the local device that is used as virtual CD media and virtual floppy disk media, and sends a response back to the virtual media server. The virtual media server then sends the response to the virtual CD and virtual floppy disk devices embedded in the DRAC 4.

If the virtual media is not connected by a remote administrator, then the DRAC 4 firmware automatically responds to any media access command with a "media not present" error message to the virtual CD or virtual floppy disk device. In such a scenario, the virtual devices behave the same way as physical drives that do not have any media present. The virtual media devices are always
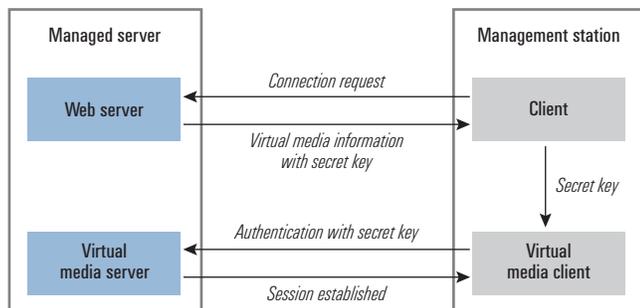
present to the managed server OS and BIOS regardless of whether the virtual media is connected.

Because virtual CD and virtual floppy disk devices look exactly like physical CD and physical floppy disk devices in either connected or unconnected mode, the OS on a managed server can use a standard native device driver to access the virtual devices. Before the OS loads its device driver, IDE option ROM BIOS embedded on a DRAC 4 card takes control of the virtual devices. It detects the virtual CD and floppy disk devices during the power-on self-test (POST) and reports them as boot entry vector (BEV) devices. System BIOS adds these BEV devices in its boot order list. Administrators can change the BIOS boot order list in the BIOS setup screen to boot from virtual CD and virtual floppy disk devices. Administrators can also easily use the virtual media feature to install a new OS or driver, or to diagnose a system in a pre-OS environment. When used with console redirection—another useful DRAC 4 feature, discussed in the "Use of virtual media with console redirection" section of this article—the virtual media feature can enable administrators to achieve excellent remote-access capability.

Virtual media security
To prevent unauthorized access to the virtual media server, a security exchange protocol is used in the virtual media connection. When an administrator logs in to the DRAC 4 Web server and selects the Virtual Media sub-tab, a "connection request" command is sent to the DRAC 4 firmware. The DRAC 4 firmware responds by sending a secret key along with a set of virtual media configuration settings—virtual media server IP address, port number, and so on—through a Secure Sockets Layer (SSL) channel. Virtual media client software starts a connection and sends the secret key to the virtual media server for authentication (see Figure 2). If it passes the virtual media server authentication, a virtual media session is established. Otherwise, a "failed authentication" error message is sent back to the client, and the connection is terminated. The secret key is a long, random number. Generated by DRAC 4 firmware every time a "connection request" command is received, the secret key helps prevent replay attacks.

To use the virtual media feature, administrators must have RAC Virtual Media User permission. An administrator who does not have RAC Virtual Media User permission will not see the Virtual Media sub-tab when logging in to the Web server.

The DRAC 4 virtual media server port number is configurable to help organizations meet their firewall criteria. The Racadm utility, located on the Dell OpenManage CD, can be used to easily configure the port number. The command syntax is as follows:

```
racadm config –g cfgRacVirtual –o
    cfgVirAtapiSvrPort port-number
```


Figure 2. Virtual media client/server model

How to launch virtual media

To launch the virtual media, the remote administrator should open a Web browser and enter the IP address of the DRAC 4. The administrator will be prompted to log in with a user ID and password.

The major functions of the DRAC 4 fall into three categories: power, console, and media. After the administrator logs in, links to these categories appear on the left pane of the DRAC 4 Web graphical user interface (GUI), as shown in Figure 3. Clicking "Media" causes a new page to open, and then the virtual media plug-in loads. All available drives are listed in the Floppy Drive or CD-ROM Drive sections of the GUI. *Note:* A Universal Serial Bus (USB) memory key or a floppy disk image file is also listed in the Floppy Drive section because it may be virtualized as a virtual floppy disk. Administrators can select one virtual CD and one virtual floppy disk media at the same time.

The virtual media feature provides the server with a virtual CD drive and a virtual floppy disk drive that can use standard media connected anywhere on the network.

Currently the virtual floppy disk drive can be connected to a legacy 1.44 MB floppy disk drive with a 1.44 MB floppy disk, a USB floppy disk drive with a 1.44 MB floppy disk, a 1.44 MB floppy disk image, and USB keys. The virtual CD drive can be connected to a CD-ROM, DVD, or CD-RW drive with CD media. *Note:* The drive letters of virtual devices on the managed server have no correlation with the drive letters of physical drives on the management station.

Once the administrator has made a selection and the connection is authenticated, the connected media is displayed. Pressing the Disconnect button will disconnect all the virtual drives.

Use of virtual media with an active OS

On a managed server node, virtual media works with any of the following operating systems:

- Microsoft Windows® 2000 Server with Service Pack 4 (SP4)
- Microsoft Windows Server™ 2003
- Red Hat® Enterprise Linux® 2.1 (ES, AS, and WS)
- Red Hat Enterprise Linux 3 (ES, AS, and WS)

On Windows servers, the virtual media drives are mounted and given a drive letter, which is controlled by Windows. The virtual floppy disk drive may be assigned the A:\ drive if a clean installation is performed with the DRAC 4 present, causing the local floppy disk drive to be moved to the next available drive letter. Using the virtual drives from within Windows is similar to using physical drives. Once virtual media is connected, the media becomes available by simply clicking on the drive and browsing its contents.

On a Linux server, the virtual drives must be mounted before they can be accessed. Before mounting the drive, an administrator must create a connection to the media at the management station. Linux automatically creates mount points in the /etc/fstab file for the virtual floppy disk and virtual CD drives.

Using Linux, administrators can quickly identify the assigned virtual media devices by typing the following statement at the command line:

```
cat  /var/log/messages  |  grep VIRTUAL
```

The virtual CD will have an entry for a device named /dev/cdrom*X* where *X* is an optional index that is assigned by Linux. Normally the virtual CD is named /dev/cdrom1 and the local CD is named /dev/cdrom.

The virtual floppy disk drive has an entry for a device named /dev/floppy*X* where *X* is an optional index that is assigned by Linux. If there is a local floppy disk drive, the virtual floppy disk drive will be named either /dev/floppy or /dev/floppy1.

A virtual CD or virtual floppy disk drive can be used to do anything that a physical CD or a physical floppy disk drive can do. Some typical administrative tasks performed after an OS boot that uses virtual media include installing applications, updating drivers, and running diagnostics.

How to boot from virtual media

One interesting aspect of virtual media is its use in a pre-OS environment. In many cases, virtual media provides a way to perform
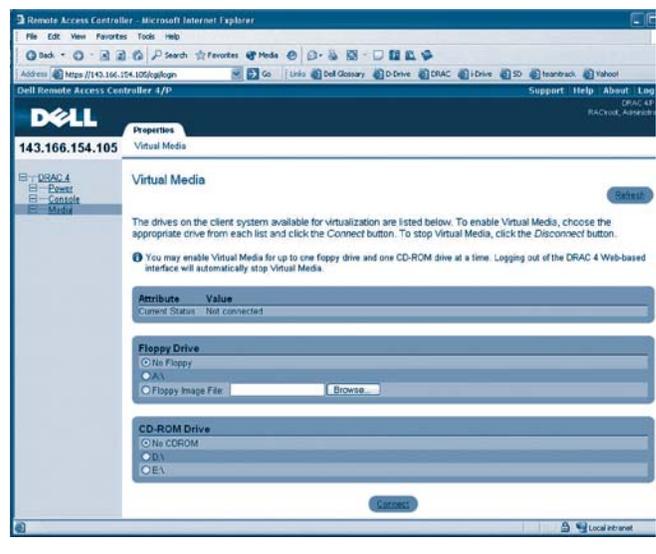

Figure 3. Virtual Media page in DRAC 4 GUI

administrative tasks remotely before the server OS is functioning. As mentioned in the section "Overview of the virtual media feature," IDE option ROM BIOS is operational before the OS boots, so administrators can use virtual media to boot the server or even install a new OS.

On supported systems, the system BIOS allows administrators to boot from the virtual CD and virtual floppy disk drive as follows:

1. Reboot the server, and press F2 to enter the BIOS setup window.
2. Scroll to the boot sequence and press Enter.
3. In the popup window shown in Figure 4, virtual CD and virtual floppy disk drives appear along with other, physical boot devices. Administrators can change the boot order by following the on-screen instructions. The system will boot from a bootable device based on the boot order.

If the system tries to boot from a virtual device that is connected, and bootable media is present, the system will boot to this virtual device. Otherwise, the system skips the virtual device—just as it would skip a physical device that lacks bootable media. *Note:* To boot the server from virtual media, administrators must connect virtual media before the IDE option ROM BIOS runs.

How to install operating systems using virtual media

To boot the managed server from the virtual CD drive, administrators can insert the OS installation CD into the CD drive on the management station and follow the instruction in the "How to boot from virtual media" section in this article. This procedure allows administrators to install a new OS on the server remotely. Using the Dell OpenManage Server Assistant CD, which is shipped with

Dell servers, is strongly recommended when installing an OS on a Dell server because the drivers and installation processes are optimized for Dell PowerEdge servers. *Note:* The virtual floppy disk drive is not available during OS installation using the virtual CD drive. The two virtual drives work simultaneously only when the OS is up and running.

Use of virtual media with console redirection

The combination of virtual media and console redirection enables administrators to perform administrative tasks on the server without being physically present. When an administrator is logged in to the DRAC 4 Web GUI, three links appear in the left pane: Power, Console, and Media. Clicking "Console" brings up the Console Redirection page, which shows the maximum console redirection sessions allowed and how many sessions are currently in use. If sessions are available, the administrator may select the Open Console tab, and a console redirection window will display.

Regardless of whether the managed server is in text mode or graphics mode, its console can be directed to the management station. The mouse and keyboard are also fully functional through the redirected console. Some special key macros such as Ctrl+Alt+Delete are available through the control panel at the bottom of the console redirection window. The console redirection feature enables administrators to control a geographically distant server while at a remote management station. From this vantage point, administrators can operate a remote server while the server is using the virtual CD and virtual floppy disk in the management station.

Powerful remote-access capabilities

Virtual media is a powerful, easy-to-use remote-access feature that can help administrators perform various administrative tasks, including booting a system, until the OS is functioning. All remote operations over the server, including virtual media access, can be performed using a redirected console. By leveraging the virtual media feature in the DRAC 4, administrators can help enhance the productivity, security, availability, and convenience of systems management capabilities.

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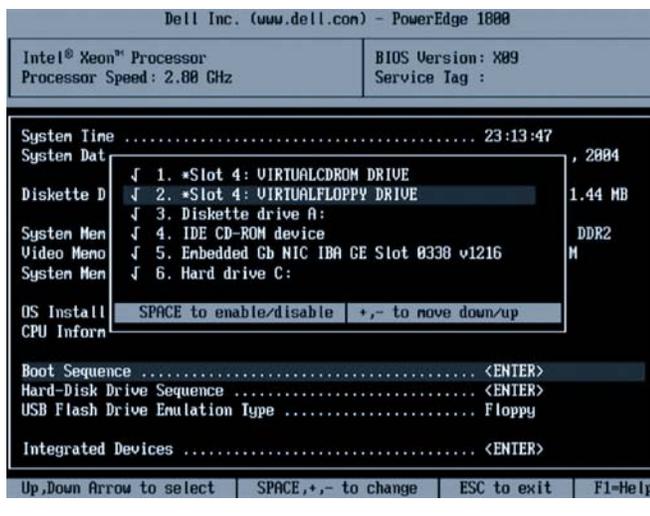

Figure 4. Boot sequence for virtual media