

Feature Comparison Between the Dell PowerEdge M910 and HP ProLiant BL685c G7 Blade Servers

A Dell Technical White Paper

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Executive Summary

Introduction

The Dell PowerEdge M1000e blade enclosure and Dell blade servers such as PowerEdge M910 have unique features unavailable from competitors.

- Dual Internal SD cards, which allow for redundancy for the embedded hypervisor
- FlexMem Bridge technology, which doubles available DIMM slots on 2-socket configurations
- Up to 50% higher Ethernet port count

To show why these features are important and quantify their benefits to administrators, Dell Inc. (Dell) commissioned its Systems Performance Analysis team to compare the greater uptime provided by redundant embedded hypervisors and the greater virtualization capacity provided by FlexMem Bridge technology to a competing blade from HP; and to detail the PowerEdge M1000e's higher Ethernet port count versus a comparable blade chassis from HP, the BladeSystem c7000 Enclosure.

Key Findings

Key findings from the study for power and performance are summarized below.

Comparison 1: Dell Internal Dual SD Card for Redundant Embedded Hypervisor

- The Dell PowerEdge M910 experienced no unplanned downtime when a single SD card failed, and the remote management capabilities of the blade and M1000e enclosure send alerts through multiple interfaces. The HP ProLiant BL685c G7 experienced almost 30 minutes of unplanned downtime when the USB media hosting its non-redundant hypervisor failed.
- After its failed media was replaced, the Dell PowerEdge M910 rebuilt its mirror in less than 2 minutes with minimal user interaction and no need to reconfigure the hypervisor. The HP ProLiant BL685c G7 required a complete reinstallation of the hypervisor after the failed media was replaced, causing at least 10 minutes additional downtime. After hypervisor reinstallation, a complete reconfiguration of the hypervisor was required.

Comparison 2: FlexMem Bridge Technology for Greater VM Scalability

- The Dell PowerEdge M910 and the HP ProLiant BL685c G7 were tested in 2-socket configuration with their respective highest performing processors and the maximum number of 4GB DIMMs they could access. In this configuration, the Dell PowerEdge M910 was able to sustain almost twice as many VMs as the HP ProLiant BL685c G7 while running VMmark, an industry-standard virtualization benchmark. This advantage was due to [Dell FlexMem Bridge technology](#), which allows access to all of the blade's memory slots with no [performance penalty](#)*.

* Based on VMmark benchmark testing performed by Dell's System Performance Analysis lab in March 2011.

Comparison 3: Blade Enclosure Ethernet Port Count Advantage

- The **Dell PowerEdge M1000e** Modular Blade Enclosure provides up to **160 Ethernet ports** with full-height blades, versus a maximum of 128 using ProLiant BL685c G7 full-height blades in a HP BladeSystem c7000 Enclosure, giving the **PowerEdge M1000e a 25% port count advantage**.
- The **Dell PowerEdge M1000e** blade enclosure provides up to **192 Ethernet ports** with half-height blades (such as the Dell PowerEdge M610), versus a maximum of 128 with HP ProLiant half-height blades (such as the HP ProLiant BL465c G7), giving the **PowerEdge M1000e a 50% port count advantage**.

Test methodology and detailed results are documented in this paper.

Comparison 1: Dell Internal Dual SD Card for Embedded Hypervisor

Introduction

On the latest PowerEdge blade servers such as the M910 and M710HD, Dell introduced the redundant SD-card module for embedded hypervisors. When an embedded hypervisor such as VMware ESXi 4.0 is installed on redundant SD cards, administrators enjoy added security and a zero hard drive footprint installation while still maintaining enterprise-class redundancy that HP's ProLiant blades cannot provide. In Test 1, we quantify the effects of failure of the USB storage device hosting the VMware ESXi 4.0 embedded hypervisor on both platforms.

Methodology

We installed VMware ESXi 4.0 on both blade systems using each vendor's customized ESXi installation ISO, which had the relevant drivers included.

- The HP ProLiant BL685c G7 hypervisor was installed to an internal 2GB HP-branded USB key, part number 608447-B21. At the time of this writing, HP did not offer media to install in the blade's internal Micro SD slot (which also provides no redundancy).
- The Dell PowerEdge M910 was configured with dual internal 1GB SD cards, Dell part number RX790. As detailed in the Dell whitepaper found [here](#), enabling SD card mirroring is as simple as entering the M910 System Setup program and setting SD card Redundancy to Mirror Mode. The two SD cards are seen as a single USB mass storage device by the operating system, and all subsequent writes to SD card 1 will be automatically mirrored to SD card 2.

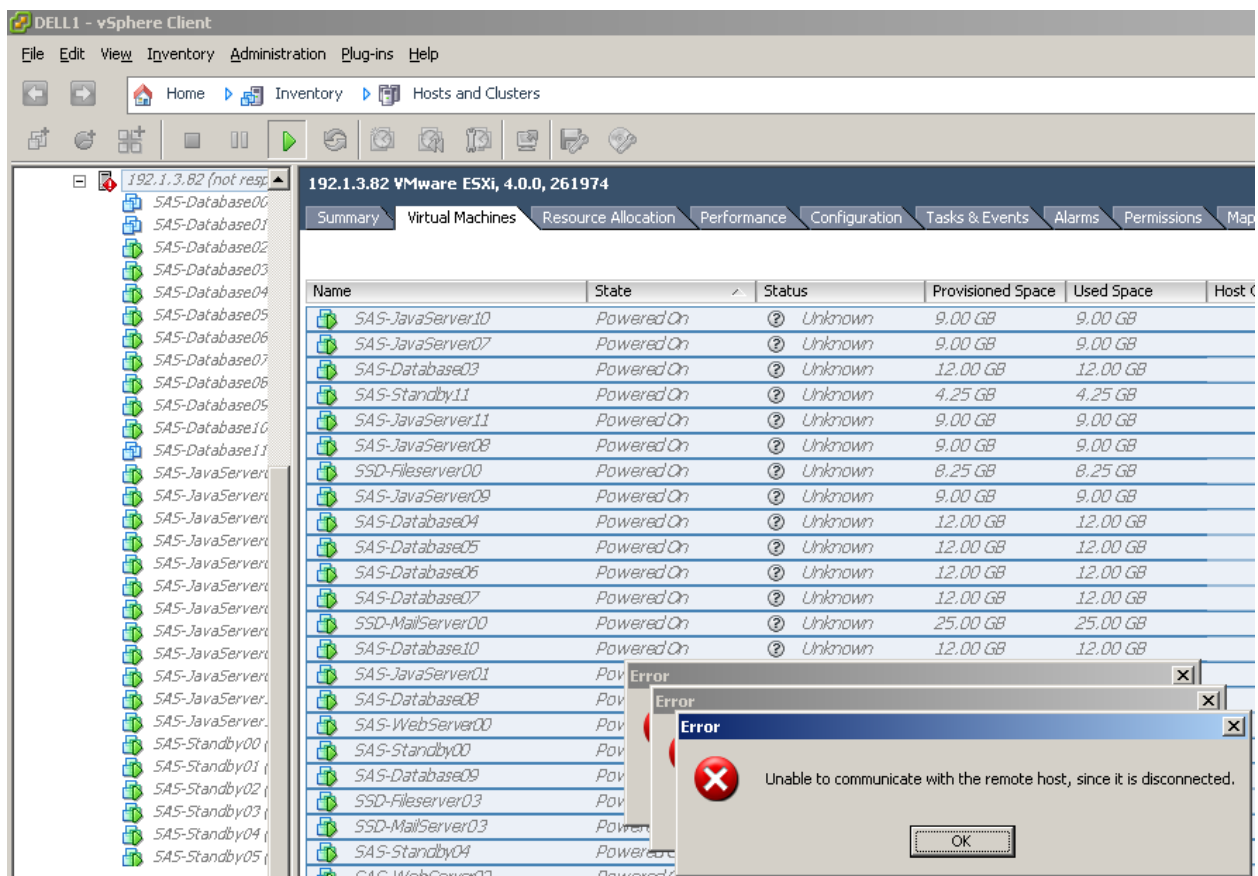
In each scenario, an EqualLogic PS6010 10GbE iSCSI array was used for shared storage for VMs. VM and management network traffic used each blade's first embedded network adapter, and vMotion traffic to the EqualLogic array was isolated to each blade's second embedded network adapter connected to a dedicated test network.

Once VMware ESXi 4.0 was installed on both blades, 25 virtual machines, running a mixture of Windows and Linux guest operating systems, were placed on each host and powered on. We then simulated the failure of USB media on the ProLiant BL685c G7 by removing its USB key, and the failure of USB media on the M910 by removing one of its SD cards.

Results — HP ProLiant BL685c G7

Within 5 minutes of removing the non-redundant USB key hosting the hypervisor on ProLiant BL685c G7, the host stopped responding and all contact with its virtual machines was lost (see Figure 1). At this point, the ProLiant BL685c G7 blade did not show any errors in the BladeSystem c7000 chassis management interfaces; in a non-clustered environment, an administrator would not be alerted to this failure.

Figure 1. Lost Contact With the HP ProLiant BL685c G7 VMware Host



To quantify the amount of unscheduled downtime in a sample clustered environment, we paired the BL685c G7 with a BL465c G7, both with 64GB of memory, and both running ESXi 4.0. Both blades were configured for VM HA clustering and set to use a dedicated 1Gb link for VMKernel traffic. The BL465c G7, serving as the “hot-spare” blade in the test setup, was not hosting any VMs prior to starting the test.

When the USB media hosting VMware ESXi was removed from the ProLiant BL685c G7 and connectivity to it was lost, VMs were automatically migrated to the ProLiant BL465c G7 as expected; however, using our 1Gb test network, it took **29 minutes, 53 seconds** for all 25 VMs to complete auto-migration. VMware HA clustering mitigated the failure as expected, but in this scenario, an IT organization would still be subject to an unacceptable amount of unscheduled downtime.

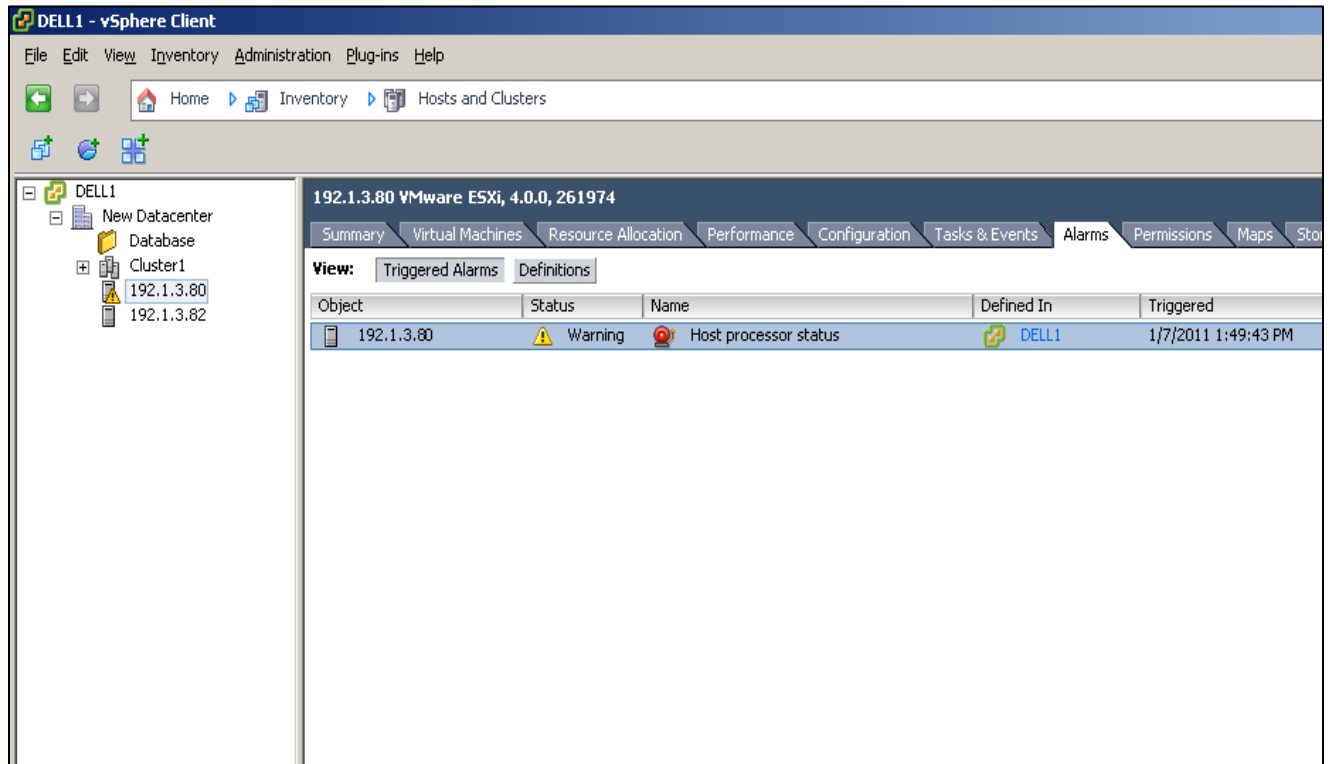
Administrators in a non-clustered environment would be faced with indefinite unscheduled downtime until they could replace the USB media on the failed blade and reinstall the operating system.

At this point, an administrator, realizing that contact with the host is lost, would replace the USB media in the blade and reinstall the hypervisor. Testing showed that installation of VMware ESXi 4.0 U2 through HP’s downloadable customized [ISO image](#) took 10 minutes, 44 seconds, not counting reboots.

Results – Dell PowerEdge M910

On the Dell PowerEdge M910, the results were much different. When one of the SD cards failed, the VMware hypervisor and all of its virtual machines kept running; the alert light on the M910 blade blinked amber to indicate that there was a problem, and vSphere marked the M910 with a yellow warning triangle (Figure 2).

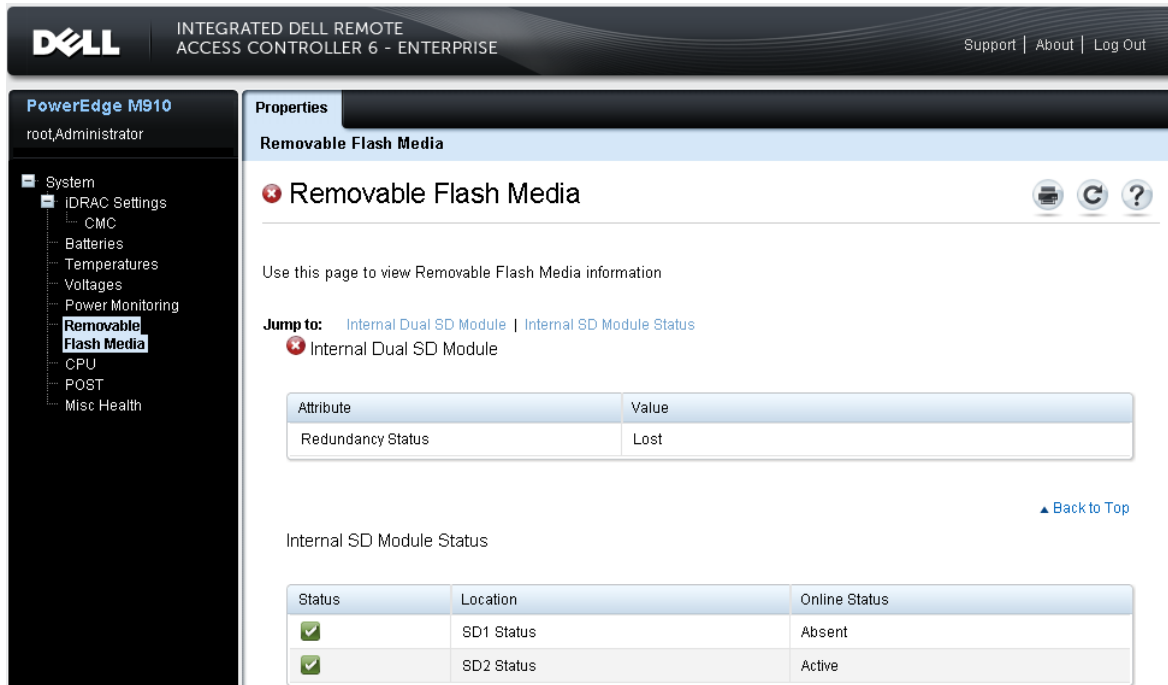
Figure 2. vSphere Detects the Problem on the Dell PowerEdge M910 Blade



Feature Comparison of Recent PowerEdge and ProLiant Blade Servers

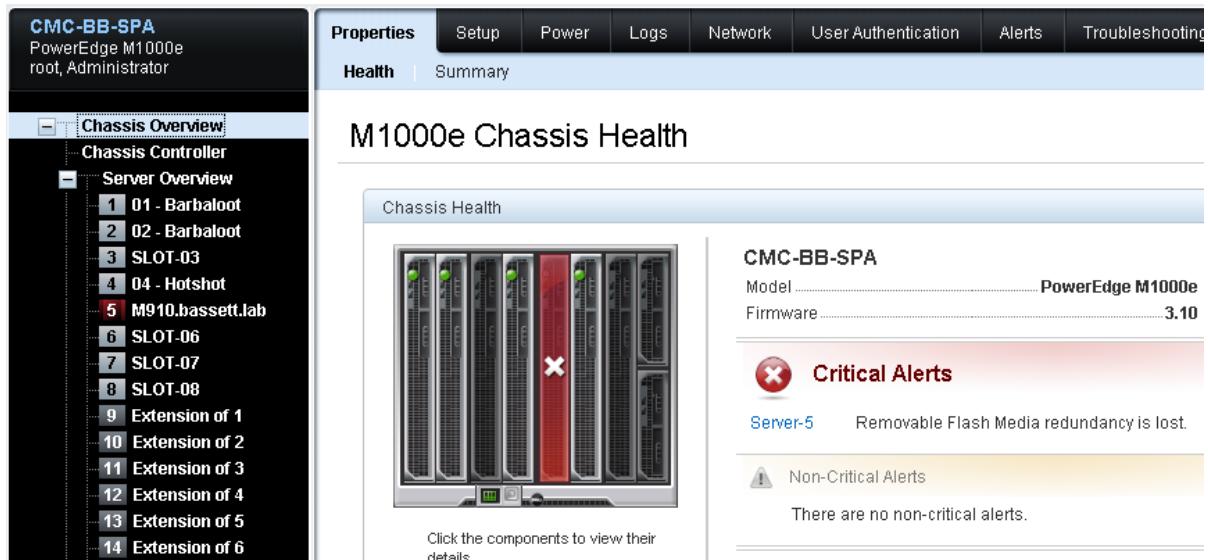
At this point, the administrator can check for details on the problem in the blade's Integrated Dell Remote Access Controller (iDRAC).

Figure 3. iDRAC GUI with Details on the Missing USB Media



Details are also available from the PowerEdge M1000e enclosure's Chassis Management Controller (CMC) GUI.

Figure 4. Error on PowerEdge M910 Displayed in M1000e Enclosure GUI



At this point, the administrator has been alerted about the issue with the blade, but contact with the hosts and VMs is never lost, since ESXi is still running on the remaining embedded USB media. VMs can be gracefully moved to a standby host through vMotion with zero unscheduled downtime.

Once VMs have been moved off the M910 host, it can be gracefully shut down, and the faulty SD card media replaced. When restarted, the PowerEdge M910 detects the presence of a new, unformatted SD card, and offers to recreate the mirror.

Figure 5. Rebuilding a Mirror with Redundant SD Cards Requires One Keystroke

```
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iDRAC6 Firmware Revision version: 3.21 (Build 032)
Primary Backplane Firmware Revision 1.06

-----
          IPv6 Settings
-----
IPv6 Stack      : Disabled
Address 1      : ::
Default Gateway : ::
-----
          IPv4 Settings
-----
IPv4 Stack      : Enabled
IP Address     : 10.35.152.58
Subnet mask    : 255.255.255.128
Default Gateway : 10.35.152.1
Press <Ctrl-E> for Remote Access Setup within 5 sec.....

SD Card 1 has been replaced and needs to be rebuilt.
This action will overwrite SD Card 1 with the contents of SD Card 2.
Press <Y> to rebuild or <N> to continue without rebuilding.

-
```

The rebuild gives updates of its progress.

Figure 6. Rebuild on M910 Gives Regular Updates of its Progress

```
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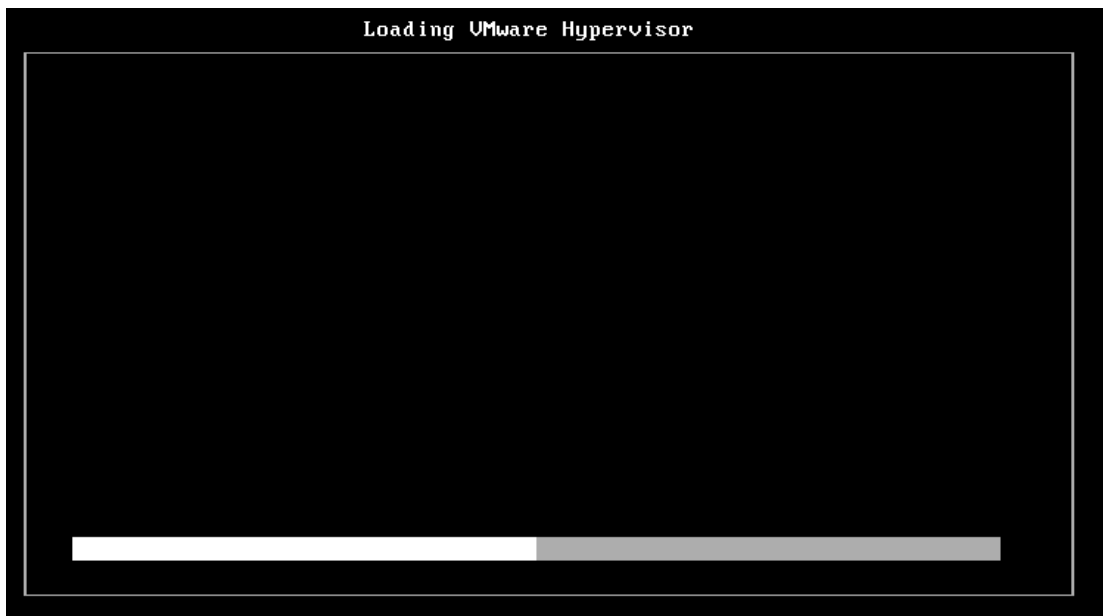
iDRAC6 Firmware Revision version: 3.21 (Build 032)
Primary Backplane Firmware Revision 1.06

-----
      IPv6 Settings
-----
IPv6 Stack      : Disabled
Address 1      : ::
Default Gateway : ::
-----
      IPv4 Settings
-----
IPv4 Stack      : Enabled
IP Address     : 10.35.152.58
Subnet mask    : 255.255.255.128
Default Gateway : 10.35.152.1
Press <Ctrl-E> for Remote Access Setup within 5 sec.....

SD Card 1 has been replaced and needs to be rebuilt.
This action will overwrite SD Card 1 with the contents of SD Card 2.
Press <Y> to rebuild or <N> to continue without rebuilding.
The rebuild is in progress...05%_
```

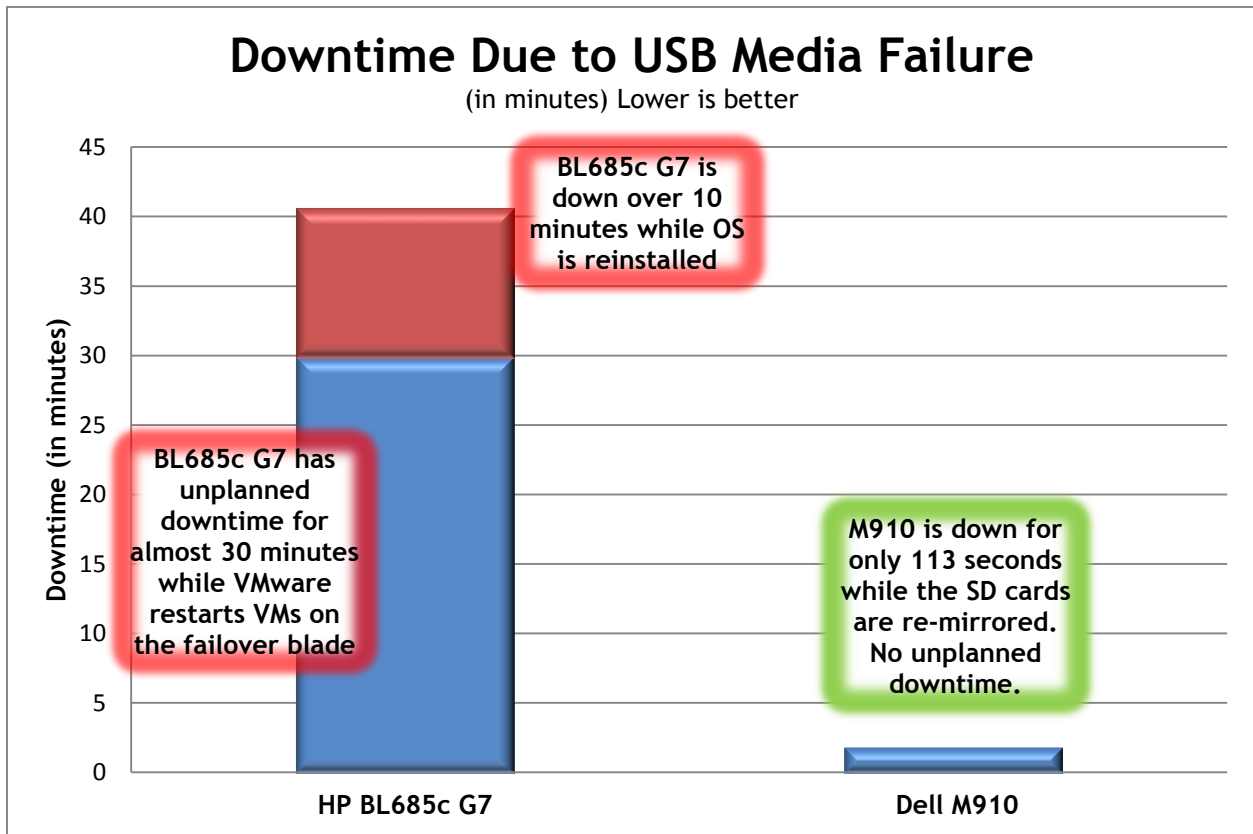
In 1 minute 53 seconds, the rebuild is complete and the ESXi 4.0 hypervisor boots.

Figure 7. Rebuild Complete in Less Than Two Minutes



At this point the Dell host is redundant again, and full functionality has been restored with no further configuration necessary.

Figure 8. Total Downtime Due to USB Media Failure



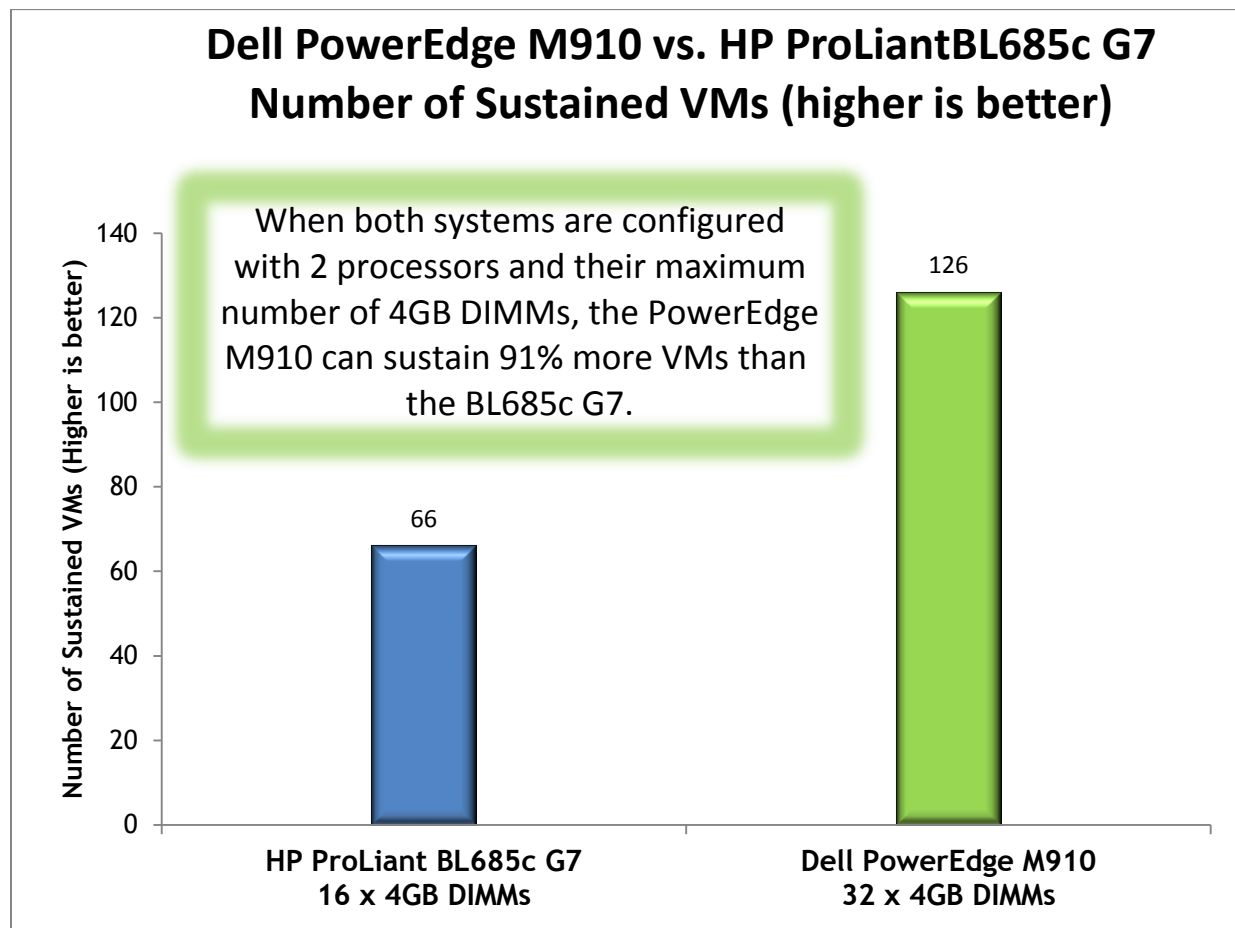
Comparison 2: Dell versus HP Virtualization 2-Processor Performance

Dell FlexMem Bridge Technology allows customers who only need 2 processors to still access all 32 memory slots in a PowerEdge M910 blade. Competitive offerings from HP, such as the ProLiant BL685c G7, are limited to 16 memory slots in 2-processor configurations, cutting available memory in half.

Since virtualization workloads are often memory bound rather than processor bound, and each processor has multiple cores and threads, many customers utilize 2-socket blade configurations. To demonstrate the additional scalability provided by the Dell PowerEdge M910's double memory capacity versus competitors without FlexMem Bridge technology, we ran VMmark, an industry-standard virtualization benchmark, on both platforms. The benchmark system is comprised of VMs, grouped into "tiles", running sub-tests that are derived from commonly used load-generation tools, as well as from benchmarks developed by the Standard Performance Evaluation Corporation (SPEC®).

The benchmark was run multiple times on both platforms, with increasingly greater numbers of virtual machines, until the benchmark filled available memory. The results quoted are for the runs with the largest number of VMs that each platform could sustain.

Figure 9. Number of Sustained VMs



Feature Comparison of Recent PowerEdge and ProLiant Blade Servers

The results clearly show that for blades populated with two processors and the same DIMM capacity, the PowerEdge M910's ability to support twice as many populated DIMM slots provides almost double the virtualization capacity when compared to the HP ProLiant BL685c G7.

Comparison 3: Ethernet Port Count

Customers not yet ready to make the transition to 10Gb Ethernet need to provide as many 1Gb Ethernet ports to each server as possible. As the following tables show, the PowerEdge M910 blade server with quad-port mezzanine cards can provide 160 Gigabit Ethernet ports per M1000e enclosure, a 25% advantage over the maximum provided by the HP ProLiant BL685c blade server.

Table 1. Total Ethernet Port Count With Full-Height Blade Servers

Full-Height Blades	Onboard Ports	Ports from Mezzanine Cards	Maximum Ports Per Blade	Maximum Ports Per Blade Enclosure (8 Full-Height Blades)	Dell PowerEdge Advantage
PowerEdge M910	4	16	20	160	25%
ProLiant BL685c	4	12	16	128	

The PowerEdge M710HD blade server with quad-port mezzanine cards can provide 192 Gigabit Ethernet ports per M1000e enclosure, a 50% advantage over the HP C7000 enclosure.

Table 2. Total Ethernet Port Count With Half-Height Blade Servers

Half-Height Blades	Onboard Ports	Ports from Mezzanine Cards	Maximum Ports Per Blade	Maximum Ports Per Blade Enclosure (16 Half-Height Blades)	Dell PowerEdge Advantage
PowerEdge M710HD	4	8	12	192	50%
ProLiant BL465c	2	6	8	128	

Both blade enclosures provide a feature for persistent MAC addressing to minimize the reconfiguration needed in the event of a blade server failure, but at significantly different pricing. Customers wishing to upgrade their Dell PowerEdge M1000e with the FlexAddress feature can order an SD card with the feature from dell.com for \$499; once the SD card is inserted in the M1000e CMC module, the feature is automatically activated, and it can be enabled on any or all blades.

Customers wishing to upgrade their ProLiant C7000 blade enclosure with similar functionality are required to replace one of their enclosure IO modules with a proprietary HP Virtual Connect Flex-10 Expansion Module costing \$12,199.00¹.

¹ Source: Quote from HP authorized reseller, February 11, 2011.

Appendix A – Test Methodology

For Comparison 1, unexpected downtime on the HP ProLiant BL685c G7 blade was measured by removing USB media while VMs were running in HA mode and recording the time for all 20 VMs to be restarted on the failover blade, as reported in vSphere.

For Comparison 2, both blades were connected through Gigabit Ethernet pass-through modules to a Dell PowerConnect 6248 Gigabit Ethernet switch. An EqualLogic PS6010 array, connected via 10Gb uplink to the PowerConnect 6248, provided shared storage for the virtual machines.

Appendix B – Enclosure Configuration Information

Table 3. Enclosure Configuration Information

	Dell PowerEdge M1000e	HP BladeSystem c7000
Dimensions and Specifications		
Height (inches)	17.3	17.5
Width (inches)	17.6	17.5
Depth (inches)	29.7	32
U size in server rack	10	10
Chassis Management Firmware	CMC 3.1	3.21
Power Supplies		
Total number	6	6
Wattage of each	2700	2450
Power Supply Part Number	G803N	499243-B21
Cooling Fans		
Total number	9	10
I/O Modules in Chassis		
Gigabit Pass Through Modules	2 x Dell 16-port Gigabit Pass-Through	2 x HP 16-port Gigabit Pass-Through

Appendix C – Blade System Configuration Information

Table 4. Blade System Configuration Information

Servers	Dell PowerEdge M910	HP ProLiant BL685c G7
Processor		
Installed processors	2 x Intel Xeon X7560	2 x AMD Opteron 6176
Total Accessible DIMM slots	32	16
Memory Modules		
Total RAM in system (GB)	128	64
Number of RAM modules	32 x 4 GB (Maximum allowed in 2-CPU configuration)	16 x 4 GB (Maximum allowed in 2-CPU configuration)
Vendor and model number	Hynix HMT151R7AFP8C-G7	Micron MT18JSF51272PZ-1G4D1BB
Type	PC3-8500R	PC3-10600R
Speed (MHz)	1066	1333
Speed in system as tested	1066	1333
Timing/latency	CAS 7	CAS 9
Rank organization	Quad Rank	Single Rank
Hard Disk		
Number of hard disks in system	0	0
USB media	Dual Dell-branded 1GB SD cards (Part Number RX790)	Single HP-branded 2GB USB key (Part Number 608447-B21)
Operating System		
Name	ESXi 4.0 Update 2 (Dell customized)	ESXi 4.0 Update 2 (HP customized)
Build number	261974	583772_006
Language	English	English
Network Adapter		
Vendor and model number	Broadcom [®] BCM5709S NetXtreme [®] II	Two embedded NC551i dual-port 10 Gb
Type	Integrated	Integrated

Appendix D – Blade System Firmware

Table 5. Detailed Configuration Information for Blade Server Solutions

Servers	Dell PowerEdge M910	HP ProLiant BL685c G7
System BIOS	1.2.0	2010.09.30
Management Firmware	iDRAC 3.1	iLO3 1.15

References

FlexMem Bridge Technology-The Keyword is Flex-ibility

<http://en.community.dell.com/dell-blogs/enterprise/b/inside-enterprise-it/archive/2010/04/19/flexmem-bridge-technology-the-keyword-is-flex-ibility.aspx>

Impact of Dell FlexMem Bridge on Microsoft® SQL Server® Database Performance

<http://i.dell.com/sites/content/business/solutions/whitepapers/en/Documents/flexmem-bridge-sql-database.pdf>

Impact of Dell FlexMem Bridge on Microsoft® SQL Server® Database Performance

<http://i.dell.com/sites/content/business/solutions/whitepapers/en/Documents/flexmem-bridge-sql-database.pdf>

Dell™ Internal Dual SD Module (IDSMD)

<http://www.dell.com/downloads/global/products/pedge/en/poweredge-idsdm-whitepaper-en.pdf>