



Advisory

Why You Need to Pay Attention to How Your Blade Vendor Handles I/O Address Virtualization

Executive Summary

All server blade environments are pretty much the same — aren't they? After all, they all use some form of switch or backplane for internal networking; most use standard, commodity, Intel-based microprocessors; they all have power supplies; and they all have fans for cooling. The only things that seem to differ are blade form factors and blade chassis designs — right?

As I've stated in previous advisories, there are many technological, ecological, environmental, manageability, and pricing/packaging differences between blade servers — especially between the blade designs offered by IBM and Hewlett-Packard (HP). In this *Advisory*, *Clabby Analytics* examines yet another major difference between IBM blade offerings and those of HP — how each company handles I/O (input/output) address virtualization. What I find is that:

HP and IBM use different architectural approaches to provide I/O address virtualization. HP's architecture relies on a hardware module to mask blade server addresses from external LAN and SAN networks — IBM uses a more traditional software management approach that integrates blades with external networks. Each approach has merits. But HP's approach has some very distinct disadvantages (particularly related to hardware costs, breadth/depth of virtual I/O product offerings, network vendor support, and 3rd party management compatibility). These differences will be explored in-depth in this Clabby Analytics Advisory.

What Is Address Virtualization— and How Do Blades Exploit It?

First: what is "virtualization"? Simply stated, virtualization is the pooling of computing resources. There are many types of resources that can be pooled including systems, storage, network, applications, and more.

The virtualization of resources delivers many benefits to enterprise information technology (IT) users. For instance, the virtualization of systems increases overall system utilization, simplifies management, and enables the easy creation of test beds on existing production servers. The virtualization of storage also increases utilization by finding and making available unused storage — as well as simplifies storage management. And the same holds true for virtualized networking — unused bandwidth can be found and exploited. So what is *I/O address virtualization* — and what benefits does it deliver?

One of the big challenges for distributed systems managers and administrators — and especially blade administrators — is the constant provisioning/reconfiguring of systems to adjust for changing workloads. To provision and configure blades, blade administrators need to constantly assign and manage a myriad of MAC (Media Access Control — or Ethernet Hardware Access) addresses and World Wide Name (WWN) identifiers — a monumental task in large blade server environments. After basic hardware set-up, systems administrators are called upon to assign LAN connection addresses and then SAN connection addresses. AND THEN REPEAT THIS PROCEDURE FOR EVERY SERVER THAT IS BEING INSTALLED!

Why You Need to Pay Attention to How Your Blade Vendor Handles Virtual I/O

I/O address virtualization makes it possible to create a pool of I/O addresses that can be automatically configured and assigned to new blades — or to blades that are being reconfigured. The creation of this address pool makes it possible for blade administrators to easily configure, reconfigure, fail-over, boot, workload balance, monitor, control, and otherwise manage blades in a fluid blade environment — thus helping to lower management costs.

*Both HP and IBM provide tools and utilities for virtualizing I/O addresses. But there are major differences in each company's approach to handling virtualized I/O addresses — which is why it is **EXTREMELY IMPORTANT** to understand each approach before making your vendor selection.*

How HP Handles Virtual I/O Address Management

HP provides access to virtual I/O by using an architecture it calls "HP Virtual Connect" (an HP-architected communications module that can be inserted into its BladeSystem enclosures to link to external networks). This Virtual Connect module looks just like a standards-based Ethernet or Fibre Channel switch.

Technically speaking, HP's Virtual Connect is physical hardware, created by HP, that incorporates an Ethernet bridge and a host bus adapter (HBA) aggregator. This hardware module holds the MAC addresses and WWN (Ethernet addresses as described earlier) constant in firmware. By doing this, changes made amongst HP blade servers are mapped (remembered) locally between the local network interface card (NIC) and the host bus adapter. But the outward looking Ethernet address (the address that the external network and the SAN environment see) remains constant.

HP's Virtual Connect approach keeps systems and network/storage management separate, so managers in each discipline can tune, monitor, and otherwise manage their respective environments independently. Systems administrators can worry about moving/relocating/failing-over resources — while network managers can focus on network management, and storage managers can focus on volume management...

How Does HP Manage This Environment

Complimenting HP's Virtual Connect module is "HP Proliant Virtual Machine Management Software, a suite of management program for systems, networks, and storage — as well as HP's graphically-driven Virtual Connect Manager (VCM). VCM is used to provide configuration, availability, and monitor/control functions designed to simplify the deployment and management of HP BladeSystems.

HP's Systems Insight Manager is the master management program that provides systems, storage and network management. Two plug-ins — the Proliant Essentials Virtual Machine Management Pack and the Proliant Essentials Server Migration Pack — provide extensions for managing HP BladeSystem virtual machines. The first plug-in, Proliant Essentials for Virtual Machine Management, serves to provide central management and control of VMware and Microsoft virtual machines (these are popular host-based virtualization packages). The Server Migration Pack helps automate the migration of servers between physical or virtual platforms.

How IBM Handles Virtual I/O Address Management

IBM's approach to virtual I/O is *significantly different* when compared to HP's approach in two distinct ways:

Why You Need to Pay Attention to How Your Blade Vendor Handles Virtual I/O

1. First, IBM leverages an ecosystem of networking partners for switching hardware. Vendors including Cisco, Brocade, QLogic and Nortel (Blade Network Technologies) provide IBM BladeCenter switches.

Because IBM utilizes its ecosystem of switch partners, IBM BladeCenter buyers reap two extra benefits: 1) they have a wider range of switch vendors from which to choose; and, 2) the vendor supplied switches work better than HP's Virtual Connect with a given vendor's management schema (for instance: switches in IBM's BladeCenter switches can be easily managed by Cisco's CiscoWorks and BNT's Smart Connect).

2. Second, IBM uses a traditional management software-based approach toward blade configuration and management (as opposed to placing logic in switch firmware, as with HP's Virtual Connect approach).

This management software approach enables IBM's virtual I/O addressing to better integrate with external networks. Think of it this way: HP is masking its I/O addressing from the external network behind its switch hardware; IBM is integrating its addressing with external networks using software designed to run in conjunction with network vendor's switches.

How Does IBM Manage This Environment?

"IBM Director" is IBM's master management program for blade environments (the program under which you find tools and utilities for monitor, control, security, performance tuning, etc.). IBM's BladeCenter Open Fabric Manager is a program that works with IBM Director that focuses specifically on managing virtual I/O addressing (it also works with 3rd party software from BNT Smart Connect and Cisco VFrame).

IBM tools and utilities for automatically dispersing MAC and WWN addresses are located within IBM's BladeCenter Open Fabric Manager. Using the "advanced management module" within this product, BladeCenter systems managers/administrators can pre-configure a pool of addresses that can easily and automatically be assigned to new blades or re-provisioned blades.

One key difference between IBM's approach and HP's approach is that IBM blade addresses are visible to the external environment. This is important because network and storage managers can see what's going on with bladed systems using their own management environments — and blade managers can see what's going on in external SAN and LAN environments. Using the IBM approach there is no "artificial wall" between the systems, storage and network management environments.

Another important difference is that IBM's Advanced BladeCenter Open Fabric Manager can provide automated failover capability.

IBM's Tivoli Provisioning Manager and Intelligent Orchestrator products can also be used to manage blade environments, providing automated, policy-based management services.

A Closer Look at How IBM Handles I/O Addressing: BladeCenter Open Fabric Manager

IBM's BladeCenter Open Fabric Manager mixes data and storage in a common pool of resources that can be shared virtually across a set of blade servers. Instead of physically mapping each blade server to external networks every time a new or replacement server is needed, IBM's BladeCenter Open Fabric Manager automatically

Why You Need to Pay Attention to How Your Blade Vendor Handles Virtual I/O

maps new or reconfigured servers. Systems administrators also have the ability to pre-assign all LAN and SAN connections and failover scenarios across the entire enterprise portfolio of switches and pass-thru modules. Using a product such as this, blade managers can cut configuration time down from days to minutes, saving their enterprise substantial budget by eliminating significant manual labor.

Clabby Analytics is already on record as preferring this type of integrated, cross systems/storage approach because I believe that systems and storage management will ultimately merge, and will be under the control of the same administrators (not under the control of siloed administrators). IBM's approach, therefore, is more in keeping with the way I think that blades will be managed in the future.

Which Approach Toward Virtualized I/O Is Better?

HP Advantages/Disadvantages

In the HP overview section ("How HP Handles Virtual I/O") *Clabby Analytics* explained how HP's Virtual Connect hardware handles virtual addressing by masking their blades from the external network — thus separating blade servers from external LANs and SANs. I believe that the reason HP took this approach was to simplify the configuration and management of its blades by making it easier for systems administrators to manage changes without having to deal with "ripple effect" changes to LAN and SAN environments.

For HP, then, the primary advantage is that Virtual Connect requires that systems administrators only know how to monitor and control a blade systems environment. This means that lesser-skilled (and therefore less costly) systems administrators may be able to be used to operate HP Virtual Connect environments. On the other hand, an enterprise may still have to pay for specialized network and storage administrators — so these potential cost savings may be a wash.

IBM Advantages/Disadvantages

As I stated at the outset of this Advisory, IBM's blade environment has numerous distinct advantages when compared to HP's environment. These advantages are articulated in Figures 1 and 2.

In short:

- By embracing 3rd party network vendor switches rather than engineering its own, IBM has been able to get switches to market, more quickly with native network management support from the switch vendor. And because IBM has so many 3rd party vendors in its portfolio — and because HP does not — the level of HP's Virtual Connect integration with other vendor's management environments is not as feature/function rich as the IBM offerings (example: no layer 3 routing on HP's Virtual Connect).
- From a cost perspective, HP bundles its I/O address management capability with its hardware — so its Ethernet hardware costs \$5600, while its Fibre Channel hardware costs \$8000. IBM's Ethernet switch is \$999, while its Fibre Channel is \$5000 (but add \$1500 to \$3500 to each chassis if you want the virtualized address management/fail-over software). Still, IBM's combined hardware/management solution costs less than HP's combined Virtual Connect solution. (See Figure 1).

Why You Need to Pay Attention to How Your Blade Vendor Handles Virtual I/O

Figure 1 – HP vs. IBM Blade Switch/Management Software Comparison

HP Hardware/Software Costs	HP	IBM	Delta (HP Additional Cost)
HP 4Gb Virtual Connect Fibre Channel Module for c-Class BladeSystem - expansion module - 4 ports Manufacturer: HP Part number: 409513-B21	\$9499	\$4999	\$4500 per module
Hewlett Packard HP 1/10Gb Virtual Connect Ethernet Module - expansion module - 8 ports Manufacturer: HP 399593B22	\$5699	\$ 999	\$4700 per module
HP Virtual Connect Enterprise Manager for c7000 enclosure	\$9000	\$1000	\$8000 per chassis
HP Virtual Connect Enterprise Manager for c3000 enclosure	\$4500	\$1000	\$3500 per chassis

IBM Hardware/Software Costs

Fibre Channel Switch Module – Cisco Systems Fiber Intelligent Gigabit Ethernet Switch Module 32R1888	\$4999
Ethernet Switch Module range (several vendors to chose from)	
– Nortel 10 Gb Model name 39Y9267	\$9799
– Cisco Systems Intelligent Gigabit Ethernet Switch Module 32R1892	\$4999
– Nortel 10Gb Uplink Ethernet Switch Module 32R1783	\$4999
– Nortel Layer 2/3 Copper GbE Switch Module 32R1860	\$2399
– Nortel Networks Layer 2/3 Fiber GbE Switch Module 26K6531	\$3659
– Nortel Layer 2-7 GbE Switch 32R1859	\$8999
– Server Connectivity Module for IBM BladeCenter 39Y9324	\$ 999*
IBM BladeCenter Open Fabric Manager 44W3981	\$1000
IBM BladeCenter Advanced Open Fabric Manager (w/fail-over) 46C3551	\$3500**
IBM Bladecenter Advanced Open Fabric Manager for IBM Director 46C3552	\$3500

Notice How Many Ethernet Choices IBM Offers

* Functionally equivalent external Ethernet access to HP's Virtual Connect Ethernet Module (hence, used this for comparison)

** HP has no functionally equivalent fail-over (hence, this was not used for comparison)

*** Note: other blade switches are available, but not listed because HP does not offer a functional equivalent (Infiniband)

Source: Clabby Analytics, November 2007

- Automated failover (available in December) will be a distinct advantage for IBM.
- Rich switch feature support is also an advantage for IBM, as is the ability of BladeCenter switches to be managed by native 3rd party management programs.

Figure 2 (next page) provides a graphical view of these preceding comparison points.

Why You Need to Pay Attention to How Your Blade Vendor Handles Virtual I/O

Figure 2—HP Virtual Connect vs. IBM BladeCenter Open Fabric Manager

	<i>HP</i>	<i>IBM</i>
Automated Failover	—	✓ Q4 — 2007
# of Network Vendors Supported	1 (HP)	✓ 5 Distinct Vendors
Price		✓ See Figure 1
Compatibility	Managed by HP management schema.	✓ Broader compatibility w/industry leading switch makers & 3 rd party management software
Functionality	No support for 10Gb Ethernet, Full Fabric Fibre Channel; Layer 3 Routing	✓ All vendor's switch features suppt'd

Source: Clabby Analytics — November, 2007

The only disadvantage I could find for IBM is that it has taken them this long to get their solution to market.

Summary Observations

The way your blade vendor handles virtual I/O is extremely important. It has major ramifications on hardware pricing, integration and compatibility with your existing network, and on human-related management costs.

HP, with its Virtual Connect offering, has taken a hardware-based approach to simplifying blade management by isolating its blade servers from the corporate LAN. IBM, on the other hand, has taken a software approach toward I/O address virtualization. And IBM uses 3rd party vendor switches — another major differentiator.

Ultimately, both HP's and IBM's approaches to virtual I/O make system management easier. Both can cut the time it takes to configure blades from days to minutes. But it's hard to ignore how many more benefits IBM's traditional software approach

Why You Need to Pay Attention to How Your Blade Vendor Handles Virtual I/O

delivers when compared to the HP hardware-based Virtual Connect approach. IBM advantages in hardware costs, manageability, breadth of product line, compatibility with other management schema, automated failover, and switch functionality are really hard to ignore.

The Bottom Line:

There are huge differences in how HP and IBM handle I/O virtualization, configuration, provisioning (the build-up or tear-down of blade environments), and workload virtualization. You need to understand these differences as they affect how your company will manage and integrate its blade environments with the rest of the network.

When evaluating blade environments, you need to pay particularly close attention to the applications, tools, and utilities offered by your blade vendor. These implements must make it possible to simplify and automate blade provisioning, workload-balancing, and fail-over across virtualized I/O. Choosing the wrong approach can have a major effect on the amount of manual configuration your systems/storage administrators need to perform. Choosing the proper approach to virtual I/O management can reduce server deployment times from days to minutes. And, with the right Virtual I/O management approach, enterprises can save big money when it comes to systems administration labor costs while also greatly improving the time it takes to provision new workloads.

Clabby Analytics
<http://www.clabbyanalytics.com>
Telephone: 001 (207) 846-0498

© 2007 Clabby Analytics
All rights reserved
November, 2007

Clabby Analytics is an independent technology research and analysis organization that specializes in information infrastructure and business process integration/management. Other research and analysis conducted by Clabby Analytics can be found at: www.valleyviewventures.com.