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STORAGE AREA NETWORK

NPIV: Emulex Virtual HBA and Brocade, Proven Interoperability and Proven Solution

This paper outlines the benefits of N_Port ID Virtualization (NPIV) technology, specifically, how the combination of Emulex NPIV-enabled Fibre Channel HBAs and Brocade switches and directors extend virtualization into your Storage Area Networks.

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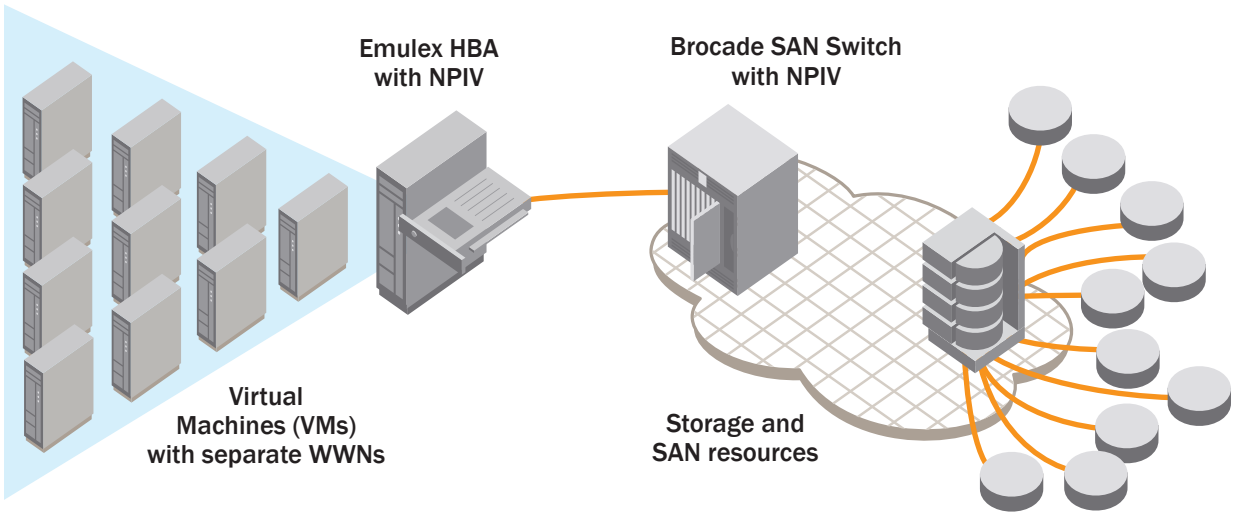
INTRODUCTION TO NPIV

N_Port ID Virtualization (NPIV) is an extension to the Fibre Channel industry standard, which is available across the Emulex® Host Bus Adapter (HBA) product line and the Brocade® Storage Area Network (SAN) switches and directors. NPIV delivers significant advantages for running multiple Virtual Machines (VMs) and managing the workload across multiple physical servers.

The technology was developed by IBM and Emulex and has been in production on IBM z-Series Fibre Channel (FC) switches and directors from Brocade for over two years. Emulex released the first NPIV-enabled HBAs in 2007, and Brocade was among the first SAN vendors to be NPIV certified. Industry analysts, such as the Gartner Group, have rated server virtualization, blade servers, and Linux as the three "disruptive technologies" that will change the face of IT.

What are the benefits of NPIV?

In a server virtualization environment, NPIV allows each virtual machine to have a unique Fibre Channel World Wide Name (WWN), enabling multiple virtual machines to share a single physical HBA and switch port, the virtual HBA port, as shown below. By providing a unique virtual HBA port, storage administrators can implement SAN best practices, such as zoning for individual virtual machines. Administrators can also take advantage of SAN management tools. Migration of Virtual Machines and their storage resources is significantly simplified.



The benefits of deploying NPIV in your storage environment are real and available today:

- Maintaining fewer physical components reduces the number of points of failure, resulting in improved availability and network uptime.
- Less hardware, portable connections, and VM-level zoning all contribute to simplified SAN and server management.
- NPIV allows the SAN Best Practices that are available with physical servers to be used with virtual server environments.

What does a server virtualization product add to this solution?

A number of enhancements are being introduced into server virtualization products in the market, such as VMware® ESX Server, Microsoft Virtual Server and Xen, to augment existing support for Fibre Channel SANs, including NPIV and load balancing across FC ports.

Addressing and Access Control. Each FC port in a fabric has a World Wide Name (WWN) assigned to it by the equipment manufacturer, which uniquely identifies each node. WWNs play a critical role in determining the visibility and accessibly of storage LUNs by servers connected to the fabric. Zoning is the mechanism by which FC ports are grouped together to restrict interference, add security, and simplify management. Zoning utilizes WWNs to allow access to storage. A server can see and access only storage LUNs that share a common zone with that server.

NPIV in a Virtualized Environment. The hypervisor leverages NPIV to assign individual WWNs to each Virtual Machine, so that each VM can be recognized as a specific end point in the fabric. The benefits of this approach are listed below:

- **Granular security.** Access to specific storage LUNs can be restricted to specific VMs using the VM WWN for zoning, in the same way that they can be restricted to specific physical servers.
- **Easier monitoring and troubleshooting.** The same monitoring and troubleshooting tools used with physical servers can now be used with VMs, since the WWN and the fabric address that these tools rely on to track frames are now uniquely associated to a VM.
- **Flexible provisioning and upgrade.** Since zoning and other services are no longer tied to the physical WWN hard-wired to the HBA, it is easier to replace an HBA. You do not have to reconfigure the SAN storage, because the new server can be pre-provisioned independently of the physical HBA WWN.
- **Workload mobility.** The virtual WWN associated with each VM follow the VM when it is migrated across physical servers, No SAN reconfiguration is necessary when the workload is relocated to a new server.
- **Applications identified in the SAN.** Since virtualized applications tend to be run on a dedicated VM, the WWN of the VM now identifies the application to the SAN.

What are the combined benefits of an Emulex-Brocade solution?

The following hardware and software components are required to deploy NPIV in the fabric:

- **Switches.** NPIV needs to be supported on the switch connected to the HBA. All Brocade FC switches and enterprise-level platforms currently support NPIV—specifically starting in FOS 5.0.1, M-EOSc 8.1, and M-EOSn 9.6.0.
- **HBAs.** HBAs must support NPIV as well. All Emulex 4Gbit/sec HBAs support NPIV with firmware level 2.70a5 or later. All Emulex 8Gbit/sec HBAs support NPIV with firmware 1.00a9 or later.
- **Storage.** NPIV is completely transparent to storage arrays, so no specific support is required on the storage side.

You can implement increased server consolidation, while maintaining storage best practices for zoning, application-level chargeback, and so on. You can reduce physical server costs, and also increase availability. In addition, the Brocade Access Gateway N_Port failover, a feature of Fabric OS running on the Brocade switch or director, provides greater fault tolerance in a bladed server environment. And portable connection reduces disruptive fabric reconfigurations. You can achieve greater connectivity into more fabrics without interoperability concerns. And scale upward without switch or domain count constraints.

WHAT ARE EMULEX AND BROCADE DELIVERING TO THE MARKET?

As long-time partners, Brocade and Emulex have worked together to ensure the highest level of interoperability and seamless operation between HBAs and switches. Customers who implement this NPIV solution for their data centers can be confident that Emulex and Brocade are standing behind their products.

NPIV is supported in the following Emulex and Brocade products.

Emulex HBAs:

- LPe12000/12002 LightPulse 8Gbit/sec HBAs
- LPe11000/11002 LightPulse 4Gbit/sec HBAs
- LPe1150 LightPulse 4Gbit/sec HBAs
- LP11000/11002 LightPulse 4Gbit/sec HBAs
- LP1150 LightPulse 4Gbit/sec HBAs
- And OEM equivalents, including blade mezzanine cards

Operating Systems:

- Microsoft Virtual Server 2005 R2 for Windows Server 2003
- VMware ESX Server 3.5
- Linux (2.6.23 kernel and above)

Brocade switches and directors running Fabric OS 5.1.0c and later:

- Brocade 48000, Mi10K, and M6140 Directors
- Brocade 5000, 4900, 4100, M4700, 200E, and M4400 Switches