Transparent Routing is a standard feature of Qlogic® series switches. Qlogic’s Transparent Routing (Tr) solution continues the industry-standard NPIV revolution by making truly heterogeneous SANs a practical reality. Building on advantages already proven in the context of Qlogic’s high volume OEM blade server switch sales, Tr removes the vendor-to-vendor interoperability concerns traditionally associated with multi-platform storage networks.

With Tr, Qlogic 5800 and 3800 Series Switches provide seamless, cost-effective expansion of SANs from QLogic or any other vendor. Existing services and management practices are preserved while new storage resources are attached via a state-of-the-art 8Gb infrastructure. New and existing resources can be immediately shared across platforms without disruption. E_port complexity is eliminated as the QLogic series switches become “transparent” to the original switch infrastructure. From the perspective of the existing SAN, only the new hosts and storage devices are visible.

This paper will examine Tr and explain the benefits that help QLogic series switches with TR provide best-in-class flexibility and value.
Customer Challenge: Create Competitive Advantage by Rapidly Implementing New Technologies with Little or No Disruption

Enterprise investments in IT infrastructure typically span a wide range of products and providers—and storage network infrastructure investments are no exception. The constant availability of new technologies makes change enticing, but it can also introduce new management burdens, cause interoperability problems, and place an increasing strain on limited budgets.

Nevertheless, ongoing IT enhancement remains a competitive necessity and cost-effective growth solutions must be found. The corporate SAN environment must evolve, and during all evolutionary phases it must meet these minimum requirements:

- **Non-disruptive Expansion**: Service levels to end users must remain constant
- **Investment Protection**: Value of existing infrastructure must be preserved
- **Operational Efficiency**: Administration and management must become less, not more labor intensive

Solution: Flexible Strategies Based on NPIV

N-Port Virtualization (NPIV) is a widely deployed ANSI T11 Fibre Channel standard that allows multiple N_Port IDs to share a single physical N_Port. This standard, protocol-based, multi-layered addressing scheme is the underlying building block for several highly beneficial developments traditionally used in virtualized host environments. Qlogic has extended this benefit to the SAN fabric to allow customers to exploit open, multi-vendor fabrics. First, we examine the foundation of NPIV based on virtual server environments.

NPIV for Server Virtualization

Server virtualization is the abstraction of the physical computing resources, including the operating system (OS) from server applications in an environment that presents itself as a dedicated set of computing resources upon which an OS can run. Adopting server virtualization technologies allows data centers to optimize and streamline deployment of their enterprise applications. Server virtualization is made possible by the Fibre Channel industry-standard NPIV functionality.

NPIV lets multiple virtual OS instances on the same physical machine have their own World Wide Port Name (WWPN), therefore allowing them to be treated as discrete entities by network devices. In other words, virtual machines (VMs) can now share a single Host Bus Adapter and switch port while receiving individualized network services such as zoning (see Figure 1). This capability has been a key element driving the popularity of server virtualization, arguably the greatest efficiency enhancement to occur in SANs for the past several years.

Since their market introduction, QLogic Fibre Channel Host Bus Adapters have used NPIV to allow end users to effectively virtualize Fibre Channel Host Bus Adapter functionality such that each VM running on a server can share a pool of Host Bus Adapters, yet have independent access to its own protected storage. The QLogic Fibre Channel Adapter NPIV implementation virtualizes the physical adapter port, allowing a single physical Fibre Channel Adapter-port to function as multiple logical ports. NPIV allows each physical port to support up to 256 virtual ports.

Figure 2 illustrates the advantage of NPIV in a virtual SAN environment. NPIV I/O virtualization allows storage administrators to deploy virtual servers with QLogic Fibre Channel Adapter technology, creating VMs that are more secure and easier to manage. Without NPIV, a storage administrator would have to reconfigure fabric zone and LUN masking parameters during server migration.
Extending NPIV into the SAN Fabric with Transparent Routing

QLogic’s use of NPIV technology does not stop at the host. By using NPIV within the fabric as well, QLogic Fibre Channel Switch fabric ports can be made to appear to any externally-connected Fibre Channel Switch as a host Host Bus Adapter or N-port. Switch-to-switch E_port compatibility, domain ID, and management issues are eliminated.

Fabric-side NPIV enables full interoperability of the QLogic 5800 and 3800 Series Switches with any vendor’s switch. Changes to existing management approaches are not required. TR provides selective, secure sharing of devices in both directions without merging fabrics (see Figure 3).

Figure 3: NPIV Facilitates Transparent Router Interoperability

TR technology is the next natural progression of NPIV, incorporating and managing NPIV at the switch-port level to provide full heterogeneous switch interoperability. TR technology eliminates the support and management challenges of switch E-port interoperability and merged SAN fabrics of the past to allow sharing of server and storage resources over multiple paths between heterogeneous SANs.

Multi-vendor SAN Interoperability Without the Complexity

QLogic 5800 and 3800 Series Fibre Channel Switches with TR provide the performance and port consolidation of an additional switch without actually exposing the switch to the existing core SAN. TR is a standard feature of QLogic 5800 and 3800 Series Switches, and it is enabled on a per-port basis. There is no need to dedicate a domain ID to interconnect an existing fabric. The QLogic solution provides a high level of security and access control, whereby only the customer-specified devices are visible and shareable between fabrics.

Transparent Routing in Three Easy Steps

TR is extremely easy to deploy, thanks to the included wizard-based management tools. A simple, three-step process provides this unprecedented interoperability between heterogeneous SAN switches.

Step 1: Place one or more selected QLogic SB5800 or SB3800 Switch port(s) into TR mode and connect Fibre Channel cables between the QLogic and existing third-party switches. (For purposes of this brief, the third-party switch will be termed the “remote” switch.)

Fabric Interaction

The remote switch accepts the QLogic TR port login as if it was a host or storage device, not a switch. The QLogic switch displays as an N_port device in the remote switch’s name server.

Figure 4: Step 1 – Set the QLogic Port Type to “TR” using QuickTools or CLI

Step 2: Map devices between fabrics (i.e., identify which QLogic-attached devices will communicate with which remote fabric devices). This process is very simple, as an easy-to-use menu of QLogic- and remote-attached devices is presented along with a list of available TR ports to use.

Fabric Interaction

Zones called Inter-Fabric Zones (IFCs) are automatically created on the QLogic series switch to facilitate mapping of devices between the fabrics. This ensures that only specified devices on each fabric can communicate to devices on the other fabric. However, these zones will not be active until the corresponding zoning is performed in the remote fabric (see the next step).
**Step 3:** Generate zoning commands for the existing Fibre Channel Switches

The QLogic wizard automatically generates zoning commands for this purpose (following the standard conventions of the vendor brand selected), which may be pasted directly into the remote fabric’s management application for maximum convenience and deployment speed.

![Image](image-url)

Figure 6: Step 3 – Zone Both Fabrics with Easy Zoning Wizard

**Fabric Interaction**

Once the inter-fabric zones are enabled on the remote fabric, communication is immediately possible between the mapped devices according to the mappings established in Step 2.

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**Conclusion**

It is imperative that organizations continue to evolve their IT environments to address new and emerging challenges. The pace of change is increasing, driving the need for performance with flexibility. Creating a unified SAN environment is a critical component in making IT a competitive advantage.

QLogic’s TR technology enables non-disruptive connection to an existing SAN infrastructure, and eliminates the support and management challenges of switch interoperability and merged SAN fabrics of the past. This innovative feature facilitates the sharing of server and storage resources over multiple paths between heterogeneous SANs. Future-proof your storage assets with the QLogic 5800 and 3800 Series Fibre Channel Switches.

Not only does TR allow new technologies to be seamlessly implemented within deployed infrastructure, it also provides another critical benefit. By ensuring greater choice and eliminating the necessity of lock-in to a single proprietary vendor, TR boosts competitiveness, encourages innovation, and motivates the market to keep system prices in check.

Customers can now exploit the unique benefits of QLogic SANs through the use of TR by adding QLogic switches to any existing SAN. You can create inter-switch stacking links without losing data ports, deploy the most cost-effective departmental switch, and enjoy truly simple management with drag-and-drop zoning, wizards, and an intuitive user management interface.

With TR, QLogic allows customers to exploit open, multi-vendor fabrics. Now, you have the freedom of choice to eliminate vendor lock-in and take advantage of the most proven Fibre Channel stack in the industry.