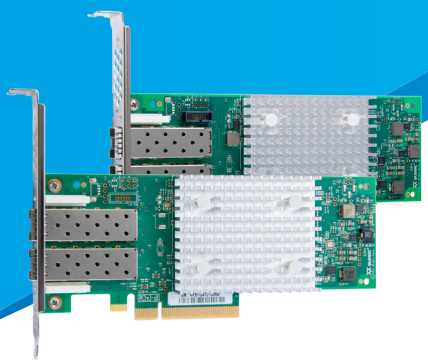
VM Aware Fibre Channel

In-depth Virtual Machine Traffic Visibility for SANs



QLogic Gen 6 (32Gb) and Enhanced Gen 5 (16Gb) Fibre Channel Adapters from Cavium and Brocade Gen 6 switches provide VM-ID technology, which strengthens data center capabilities by enabling the ability to monitor, manage, and control individual virtual machine workloads in the SAN.

KEY BENEFITS

- **Increases Visibility of VM Traffic:** The hypervisor and FC switches can use VM-ID tags to help SAN administrators understand the data flowing across the SAN environment. This enables them to more effectively monitor outages or determine heavier traffic at different points along the path to help mitigate these situations.
- **Allows End-to-End Quality of Service (QoS):** Enables SAN administrators to apply specific levels of QoS on a per application basis to direct Fibre Channel (FC) traffic from a specific VM through the fabric and onto the end storage device as a potential use case.
- **Improves Usage of Storage Devices:** Target systems utilizing VM-ID can optimize the proper performance level of the storage device (flash-based or HDD-based) to match the need of the VM as a future use case.

EXECUTIVE SUMMARY

Mysteries of the world occur in nature, such as how the Monarch butterflies can find their way using migration paths all the way back to their species' origination point even though they had never been there before. With VM clusters generating an increasing amount of FC traffic that crisscrosses across SANs within enterprise/data center ecosystem, these paths and accesses should not remain a mystery any longer.

With VM-ID technology, an industry standard capability, the unknown can now become the known and thereby help improve customers' experience by providing a more fully informed understanding of how each storage device's usage levels are accessed by every VM in the network. Increased visibility to better monitor the health aspects of each VM connection from end-to-end can assist service providers with better ways to fix problem areas and prevent degradations within their environments.

The implementation of VM-ID within the QLogic® Gen 6 and Enhanced Gen 5 adapters from Cavium™ integrates with the VM Insight feature, available through the Brocade® Fabric Vision technology. Working in collaboration with switch vendors like Brocade, with Cavium's QLogic adapters, we supply our mutual customers with functionalities that strengthen and boost their bottom line, improving their ROI when using the VM aware FC SAN to their utmost capabilities.

SERVER VIRTUALZATION AND THE EXISTING SAN

Server virtualization has allowed for greater use of a common link, such as sharing a Fibre Channel link between a larger number of virtual machines (VMs). This helps to fully utilize the maximum available bandwidth along with CPU cores, memory, and other system resources. However, the data sent from multiple VMs from a server are blended together and eventually merged onto a single physical port where the VM flows becomes indistinguishable—as the traffic that travels across the Storage Area Network (SAN) appear the same—and cannot be seen individually (see Figure 1).

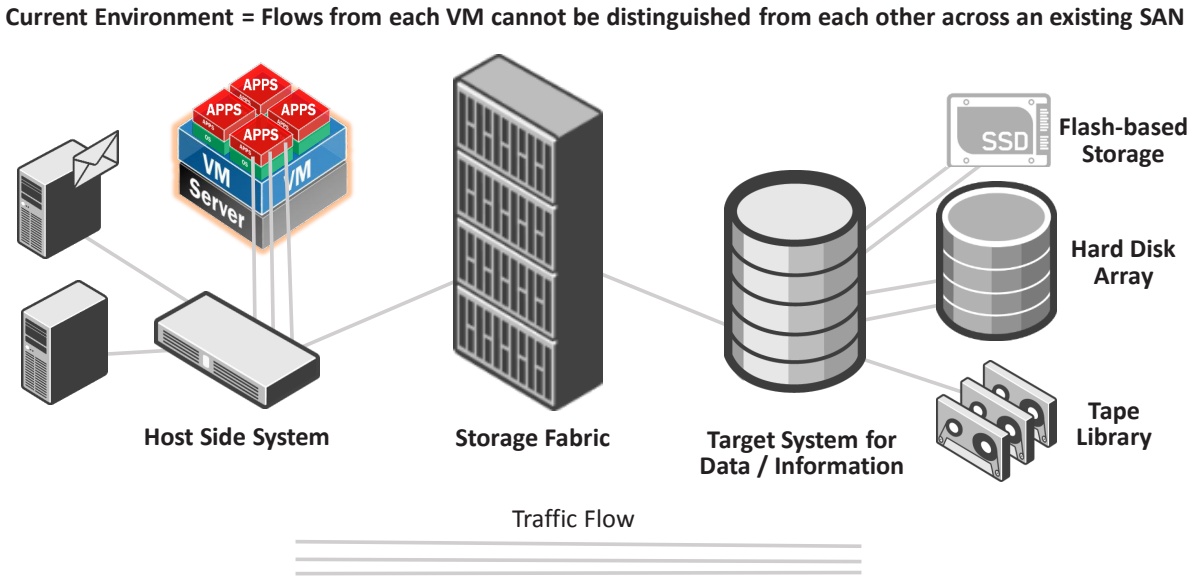


Figure 1. SAN Traffic Flow without VM-ID Capabilities

VIRTUAL MACHINE IDENTIFICATION FOR SANS

QLogic VM-ID technology from Cavium provides an end-to-end solution that uses frame tagging to associate the different VMs and their I/O flows across the SAN. Cavium has enabled this industry standard capability on our latest 2700 Series (Gen 6) and 2690 Series (Enhanced Gen 5) FC Host Bus Adapters (HBAs). When used with Brocade's VM Insight feature (available through its Fabric Vision feature set), this technology has a built-in Application Services monitoring that detects the globally unique ID from the hypervisor level, such as from VMware® ESX. It can then interpret the different IDs from every VM to perform intelligent monitoring, with the future potential of enabling the SAN administrator to apply QoS policies to each VM traffic from one end to the other.

The VM-ID with VM Insight technologies working together brings a deep level of visibility on how and where the I/O flows are originating at which VM then through the fabric. This enables SAN managers to control and direct application level services to each virtual workload within a Cavium and Brocade Fibre Channel environment.

APPLICATIONS AND USES CASES

VM-ID can be applied to a variety of applications and use cases. As the technology becomes more fully ingrained into more products, systems and environments can realize the potential benefits to their greatest extent. The following topics discuss a few of the top use cases.

Increased Visibility Across the Environment

When used with the Brocade Fabric Vision feature called "VM Insight," the VM-ID capability increases visibility across the environment. This enables the SAN administrator to see how traffic flows from even a single VM to the associated tiered storage for proper handling. This can also improve troubleshooting by identifying when and where an issue has occurred (see Figure 2).

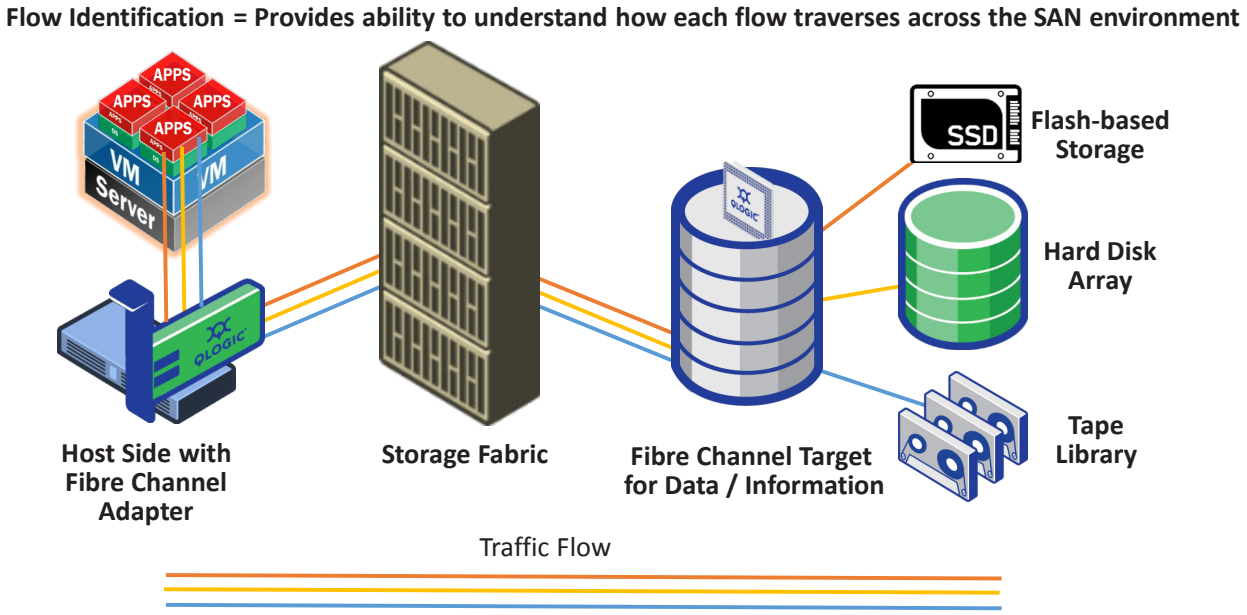


Figure 2. SAN Traffic Flow with VM Insight Monitoring and VM-ID Capabilities

Quality of Service for Any Application

Another targeted future benefit for VM-ID is to enable the ability for the end application that requires more storage performance to access the end device that can support its needs and applications that require less performance to be directed to their required storage type. This helps to ensure how each storage device can be utilized to the best of its capabilities (see Figure 3).

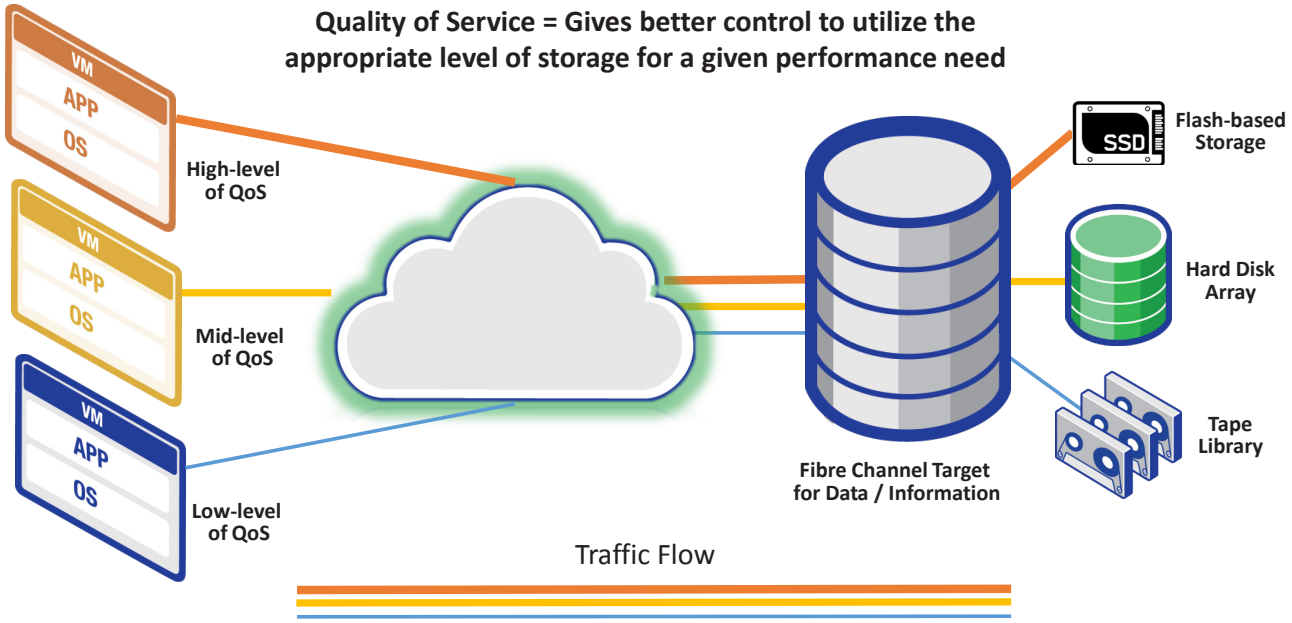


Figure 3. VM-ID Enables Improved Bandwidth Allocation Based on Required Storage Performance

Improved Storage Usage and Performance

Managing the different needs of end users or related applications to the respective storage was not possible before VM-ID. The overall health of the storage target could be less effectively utilized by not using the right storage required for an application's actual performance. With VM-ID, the SAN administrator can in the future solve this problem by granting the needs for higher IOPs or bandwidth to the highest performing devices and sending the slower or higher capacity backups to tape storage (see Figure 4).

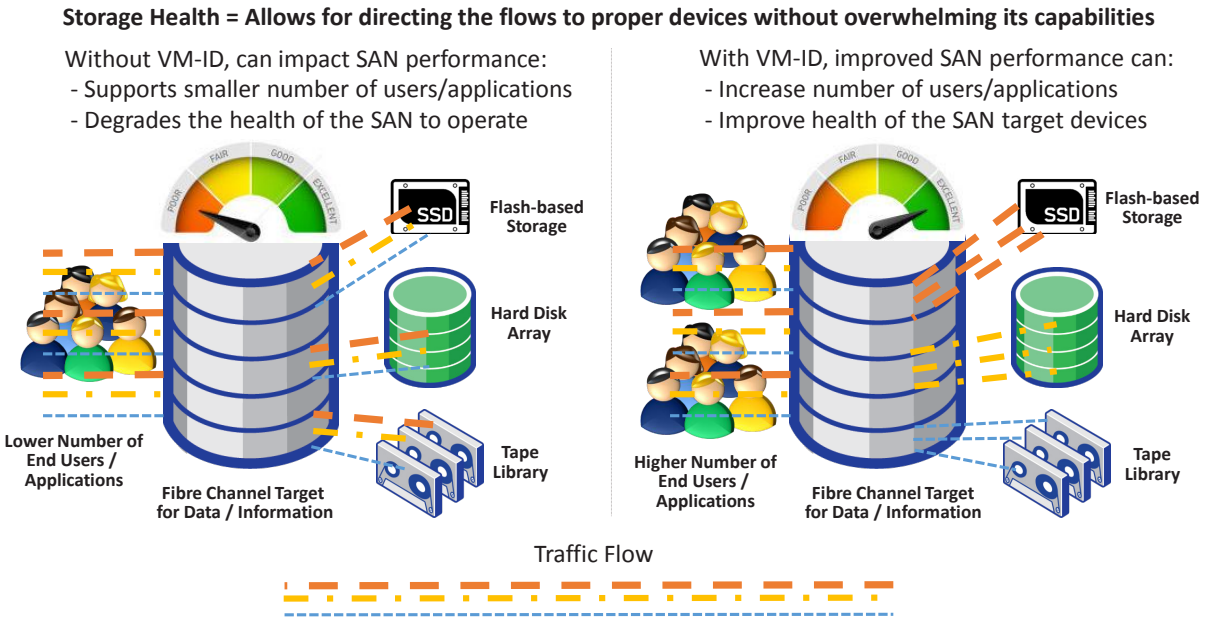


Figure 4. Improving Storage Health by Directing Data Flow to Appropriate Storage Device

SUMMARY

QLogic VM-ID technology strengthens the data center capabilities for assisting virtualized infrastructures to monitor, manage, and control the separate flows from end-to-end. Business applications that require extremely fast IOPs can be augmented by ensuring they are only accessing flash-based storage, while other processes that do not require the speed but still perform critical operations are met with the lower tier storage devices. The overall health of the storage end is maintained at more optimal levels by having this ability to use the correct storage for the right performance level. Quality of Service can further help data center operators by giving them the capability to service end customers with a better path to utilize a mix of storage that meets their exact needs.

ABOUT CAVIUM

Cavium, Inc. (NASDAQ: CAVM), offers a broad portfolio of infrastructure solutions for compute, security, storage, switching, connectivity and baseband processing. Cavium's highly integrated multi-core SoC products deliver software compatible solutions across low to high performance points enabling secure and intelligent functionality in Enterprise, Data Center and Service Provider Equipment. Cavium processors and solutions are supported by an extensive ecosystem of operating systems, tools, application stacks, hardware reference designs and other products. Cavium is headquartered in San Jose, CA with design centers in California, Massachusetts, India, Israel, China and Taiwan.

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