

Why QLogic FastLinQ 10GbE Intelligent Adapters are the Right Choice for VMware vSphere

Outlast the Competition with Advanced Features for Virtualized Servers and Networks



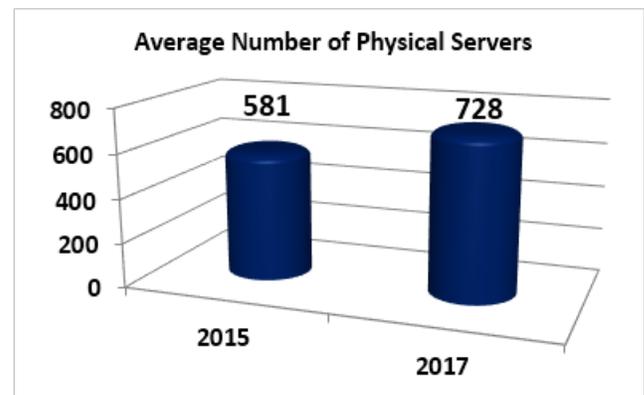
Data centers can fully optimize 10GbE network capacity for virtualized servers. Large enterprise and cloud deployments achieve optimum network scalability and performance. Converged network adapters reduce server and switch costs with full hardware offloads for iSCSI and FCoE.

QLOGIC ADVANTAGES

- Switch-independent NPAR with concurrent SR-IOV – partition 10GbE links and allocate network bandwidth to deliver QoS for virtual machines and applications
- Network virtualization with stateless offloads – enable enterprise tunneling with maximum bandwidth and optimum efficiency
- Remote multi-adapter management – lower OPEX by managing adapters throughout the data center using the QLogic® ConvergeConsole® (QCC) plug-in module for VMware® vCenter™
- Hardware-based storage offloads – reduce I/O processing and power consumption in servers for iSCSI and FCoE networked storage

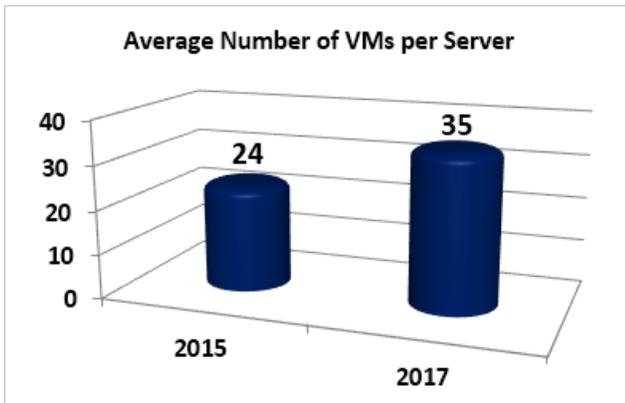
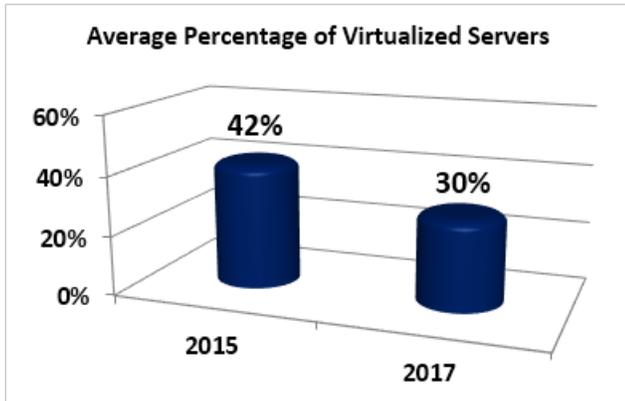
INTRODUCTION

The demand for data center resources continues to grow at a rapid rate. This demand is being met with the deployment of a growing number of new and more powerful servers. As shown below, the average number of servers per data center is forecast to increase by 25% over the current two-year period.¹



¹ Data Center Strategies North American Enterprise Survey, May 2015

Server virtualization has also become a critical technology to fully utilize the capability of new servers. As shown below, the percentage of virtualized servers and the number of VMs per server is also forecast to grow significantly.¹



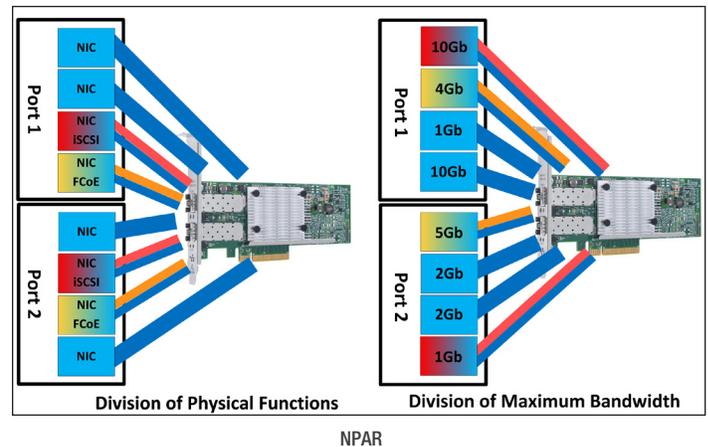
QLogic® FastLinQ® 3400 Series 10 Gigabit Ethernet (10GbE) Intelligent Ethernet Adapters and QLogic FastLinQ 8400 Series 10GbE CNAs are the optimum choice for network connectivity to fully leverage the capabilities of virtualized servers. This solution sheet provides information on key benefits for large data centers, private and public clouds, and managed server providers (MSPs) that are using VMware® vSphere® for server virtualization. These benefits are critical to outsmart, outperform, and outlast the competition.

OUTSMART

In addition to increased bandwidth, QLogic FastLinQ Intelligent 10GbE adapters provide important features that fully optimize VMware deployments. In other words, it's not just the speed of the pipe, but also the capability to reduce network impact on servers, optimize CPU resources, and reduce operating expense (OPEX) with cost-effective management.

Adapter Virtualization

Switch-independent NIC partitioning (NPAR) is a hardware-based method for partitioning a 10GbE port into multiple PCIe® physical functions (PFs). As shown in the following figure, each PF looks like a unique physical port to the host and bandwidth can be allocated individually to each PF. This capability has specific application for VMware deployments where PFs can be assigned to VMs to meet QoS requirements and to allocate bandwidth for live VM migration using VMware vMotion®.



Using NPAR, data centers can fully utilize the capacity that 10GbE networks provide. This means fewer network and switch ports are required which can reduce CAPEX.

Many tier-1 server OEMs have also adopted QLogic's NPAR technology and added their own differentiation to create OEM-specific versions of NPAR that are tightly integrated with server management applications. This is a powerful endorsement of the value-added benefit that QLogic NPAR provides.

NPAR is configured for QLogic FastLinQ 3400/8400 adapters during power-on initialization with dynamic controls for minimum and maximum bandwidth settings per PF. Minimum settings ensure that a PF will always get at least a baseline amount of bandwidth while maximum settings can be as high as 100% to ensure full bandwidth utilization.

The QLogic implementation of NIC partitioning can also be used concurrently with single root I/O virtualization (SR-IOV). This unique capability can reduce the number of adapter ports needed to support failover and load balancing on a virtualized host that is using SR-IOV.

Key Benefits of NPAR with Concurrent SR-IOV

- Simplified and seamless transition from 1GbE to 10GbE
- Higher performance in virtualized environments
- Reduced CAPEX and OPEX
- Freedom of choice in selecting an Ethernet switch
- Ensured QoS
- Improved scalability

Network Virtualization

The scale of large enterprise and cloud-based, multitenant deployments has pushed the limitations of traditional vLANs which are restricted to 4096 network IDs. The solution has been the development of network virtualization/tunneling that can support up to 16 million IDs. For VMware deployments, network tunneling is typically done using VXLAN technology.

The benefits of virtual overlay networks are:

- Shared infrastructure – traffic isolation for multitenancy
- Ease of VM provisioning as attributes of the physical network remain intact
- Data center scalability – support for up to 16 million separate IDs compared with only 4096 for vLANs
- Physical network independence with the freedom to migrate to lower-cost data center switches

QLogic FastLinQ 3400/8400 adapters fully support VXLAN with stateless offloads when tunneling is enabled. As detailed later in this solution sheet, tunneling offload provides a 19% increase in bandwidth and 6% increase in CPU efficiency, which is a key benefit for public/private cloud and MSP deployments.

Networked Storage

The 10X increase in bandwidth provided by 10GbE networks can also be used to support protocols for SANs. FCoE and iSCSI are the predominant storage protocols for Ethernet and both hardware and software-based initiator solutions are available in the market.

QLogic is the industry leader for Fibre Channel connectivity and QLogic FastLinQ 8400 CNAs optimize server utilization with full hardware offload for iSCSI and FCoE protocols. This enables simultaneous, fully offloaded, high-performance, multi-protocol support for network and storage data traffic from each independent port of the adapter. By comparison, most other 10GbE adapters require iSCSI and FCoE software initiators that squander critical CPU resources for storage I/O.

In addition to improved CPU efficiency, QLogic storage offload enables:

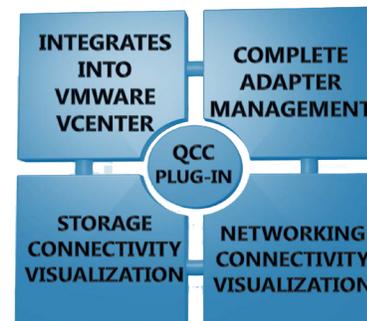
- Ability to support more users and larger applications
- Scalability to support more storage protocols as network infrastructures evolve
- Cost savings by converging Fibre Channel onto Ethernet, reducing the number of storage adapters and switches most often used in blade servers

Powerful Management for Adapters

Ongoing OPEX for network management can be a much greater cost factor than the original CAPEX for deployment. With that in mind, data center and network managers want the option to remotely manage adapters from a centralized management console. This helps reduce cost and is also critical to ensure network consistency.

As a starting point, QLogic FastLinQ 3400/8400 adapters are fully supported with baseline VMware management utilities. For VMware vSphere deployments, the ideal management solution is the fully integrated QLogic QCC plug-in for VMware vCenter Server and vSphere Web Client. The QCC plug-in module is a set of software components delivered through industry-standard CIM providers that enables management of QLogic adapters using VMware vCenter. This capability allows administrators to centrally manage QLogic adapters from a single-pane-of-glass view that is provided by the VMware vCenter console.

As shown below, the vCenter plug-in (VCPI) module provides a detailed topology model that provides a wide range of management capabilities. These include remote deployment of firmware updates, full integration into VMware Update Manager (VUM), and diagnostics to troubleshoot network issues.



Key Features of the QConvergeConsole Plug-in and Web Client for VMware vCenter

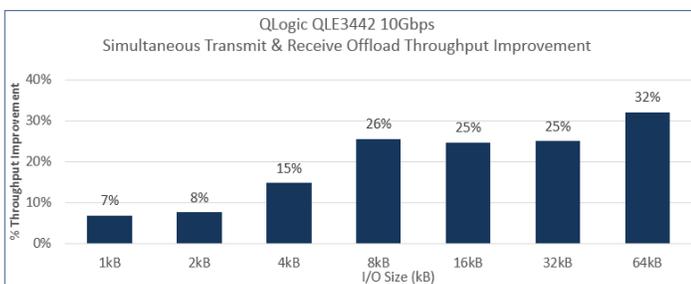
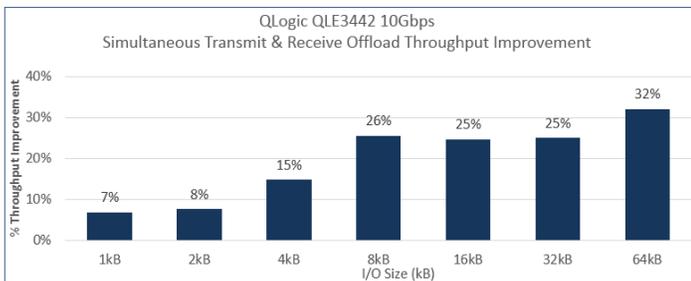
Managing VMware vSphere servers using the QCC Plug-in and vSphere Web Client enables multi-protocol and multi-fabric management of QLogic adapters, resulting in lower deployment times, faster troubleshooting, and reduced total cost of ownership.

OUTPERFORM

With the growing adoption of high-performance, virtualized networks, data center administrators are looking for ways to maximize network throughput and minimize the impact on server CPU resources. QLogic FastLinQ 3400/8400 adapters provide the optimum solution by offloading tunneling encapsulation from the host processor to the adapter.

QLogic worked with ESG Lab to test performance benefits with tunneling offload for network virtualization overlays using VXLAN. The first evaluation was bidirectional bandwidth using one port of a QLogic QLE3442-SR Dual-port 10GbE Adapter. Each VMware server was configured with four VMs and each VM ran two test threads, giving a total of eight threads for sending and eight threads for receiving. Bidirectional bandwidth was measured using message sizes ranging from 1Kb to 64Kb, with and without offloading enabled. Test results are shown in the following chart.

As ESG summarized in its report, “The smallest gains were realized with 1Kb data blocks (7%), while the largest gains were realized with 64Kb data blocks (32%). This is to be expected, as more work is required to segment a large block into packets. On average, offloading tunneling resulted in a 19% improvement in the amount of data transferred. Legacy Ethernet adapters, which cannot offload modern tunneling protocols, are limited in their ability to deliver maximum throughput or improve the efficiency of the data center.”



OUTLAST

The final consideration is how to outlast the competition by infusing long-term value into the network.

QLogic FastLinQ 3400/8400 adapters can be reconfigured using powerful management tools that support adapters throughout the data center from a single management console. This allows new functionality to be added with optional firmware updates that are posted on the QLogic web site. These capabilities provide protection for investments in initial CAPEX and ongoing management expertise by leveraging new standards, software, and optimization.

QLogic is also delivering on its comprehensive roadmap with new 25GbE, 40GbE and 100GbE adapters. These new adapters are supported with the same management tools that are used for 10GbE adapters and fully integrated into the VMware vCenter console. This roadmap ensures unlimited bandwidth for future growth with 10GbE, 25GbE, 40Gb, 50GbE, and 100GbE. It provides confidence that investments made today will be compatible and consistent with new generations of network infrastructure.

CONCLUSION

Data center are focusing investments on new servers that use VMware vSphere as the platform for virtualization. QLogic FastLinQ 3400 Series 10GbE Intelligent Ethernet Adapters and QLogic FastLinQ 8400 Series CNAs provide key benefits that make them ideally suited for VMware vSphere deployments, and provide the capability to outsmart, outperform, and outlast the competition.

The following documents provide additional information on key benefits of deploying QLogic FastLinQ 3400/8400 adapters in VMware virtual environments:

- [SR-IOV Improves Server Virtualization Performance](#)
- [Accelerating Network Virtualization Overlays](#)
- [NIC Partitioning and Data Center Bridging](#)
- [Concurrent NIC Partitioning and SR-IOV](#)
- [Visualize I/O Connectivity for VMware vSphere](#)

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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