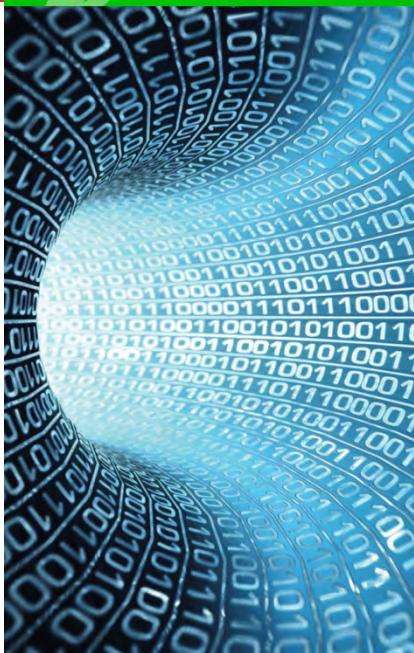


Delivering Innovative I/O Virtualization
Solutions for the Data Center



WHITEPAPER

Using Virtensys to Reduce the Cost and Complexity of VMware[®] Server Deployments



Contents

Executive Summary	3
Problem Statement	4
The Scenario: A “VMware Engine” / Server Consolidation rack	5
The Virtensys Implementation	7
The Virtensys Solution	8
Solution Comparison	10
The Virtensys VMware Engine in action:	12
Local diskless booting:	12
Improved operational agility and simplified network: – <i>Wire once, provision at will</i>	12
The Dedicated “VMotion Network”	13
Configuring the virtualized I/O:	14
Configuring the virtual Direct-Attach Storage (vDAS):	16
Operating VMware in the Virtensys virtualized I/O environment:	18
Further considerations	21
Virtensys I/O Virtualization in the Enterprise – Flexibility and efficiency	22
Summary	23

Executive Summary

A traditional rack-mount server configuration designed for hosting multiple VMware Virtual Machines (VMs) is compared and contrasted with a the configuration modified to leverage the capabilities of Virtensys I/O virtualization.

The advantages to the Virtensys solution are noted in three areas:

■ Reduced management complexity

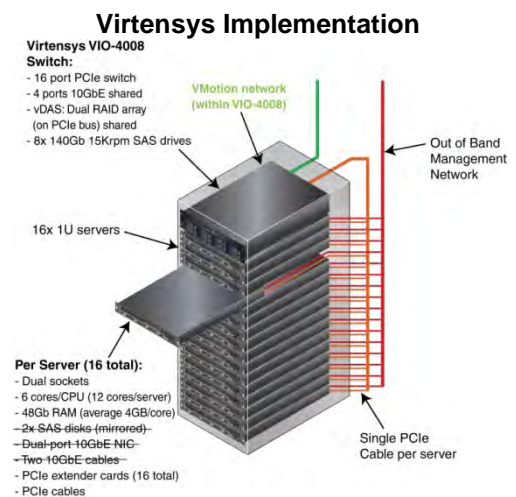
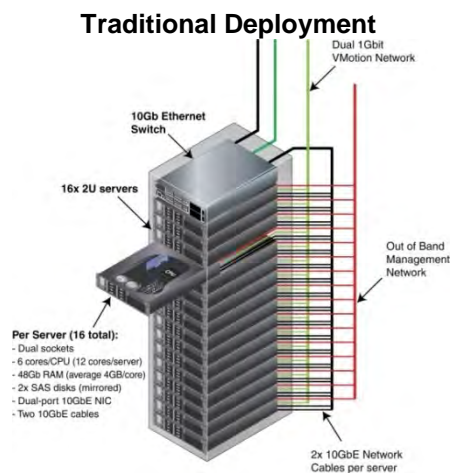
The Virtensys VIO-400x I/O virtualization switches consolidate & simplify I/O management into a single console and enable you to automate and remotely manage the connectivity to the servers as a single entity. A single system administrator instead of multiple teams can setup and reconfigure racks of servers in minutes rather than hours or days. The VIO-400x provides integrated and seamless support for VMotion. As a result, you can reduce your server management complexity & operational expenses by over 60%.

■ Wire once, Reconfigure at will

Rather than reconfiguring your servers by opening them again and again to add I/O cards or to modify their I/O configuration, the Virtensys I/O virtualization solution enables you to connect the servers once, and reconfigure the I/O of the servers dynamically.

■ Cost and power savings

The VIO-400x I/O virtualization switches enable you to lower the costs of server I/O deployments by 45% and decrease the I/O power consumption by 72%.



NOTE: These two alternatives afford exactly the same CPU and memory capacity.

Problem Statement

When you leverage a multi-core server to host a large number of virtual machines on a single server box, you quickly discover that although you can have remarkable CPU and memory capacity, this compute capacity has outpaced the available I/O. Most servers today still come with only the same pair of Gbit NICs that servers have had for several years. Simply adding multiple cards to the servers also adds expense and management complexity. The bottlenecks – including management/TCO – have moved. Virtensys I/O Virtualization switches provide the most efficient solution address your virtualization challenges.

Because of this need for more I/O, VMware has recommended adding quad-port Gbit NICs (sometimes several) to your VM-host systems. As the available compute capacity (total available CPU cores and memory) in a single server continues to climb, more peak network – and storage – capacity and bandwidth are required.

There are real and practical limits to the number of 1Gbit ports that can be added to a server. Consider, for example, the cabling and Ethernet switch costs and complexity of connecting two quad-port Gbit NICs (if your servers are capable) to your infrastructure: 8 ports, 8 cables, and the associated power and cooling complexities, as well as the management & administration complexities.

This has accelerated the adoption of 10-gigabit Ethernet (10GbE) for VMware deployments.

However, the cost and complexity of deploying 10GbE for VMware servers is not limited to the server alone: There is the associated complexity and expense of the 10GbE networking: cabling, switching, etc...

This is further complicated by the nature of network traffic: Multiple guest virtual servers on a single hardware host require considerable *aggregate* bandwidth, but the bandwidth requirements are intermittent.

The Scenario: A “VMware Engine” / Server Consolidation rack

Per current typical virtualization best practices, consider an environment consisting of sixteen (16) dual-socket servers, each with:

- Dual Intel Xeon 6-core X5650 CPUs¹ and associated chipset – 12 cores total per server;
- 48 GB of ECC RAM total per server (an average of 4GB RAM per core);
- Redundant, hot-swap power supplies, fans, etc.

This “Engine” – in a single rack – provides a total aggregate of 192 high-performance, virtualization-optimized cores, and 768GB of RAM. Using VMware ESX Server 4, the administrator will be able to create and deploy multiple virtual machines per server – single-CPU and multiple-CPU, 32-bit and 64-bit VMs. Using VMware’s VMotion, these VMs can be moved from server to server while running, and to facilitate maximum flexibility, the servers will be configured into a single VMotion cluster.

To build out the “Engine” using traditional I/O, we will use 2U rack-mount servers – similar to HP’s DL380 G7² – We will add to each server:

- **Boot/System disks**
Dual 146GB mirrored 15K rpm enterprise SAS disks (a total of 32 disks);
- **Networking**
A dual-port 10GbE NIC – to provide adequate bandwidth for the 12 cores of CPU horsepower in each server (a total of 16 dual-port 10GbE NICs);
- **Internal Storage**
Included in each server is a native SAS/SATA RAID controller.

These servers will be connected to 10GbE top-of-rack switches via dual 10GbE SFP+ copper cables, which will be connected to the central datacenter switching infrastructure via fiber (owing to the limited distance for 10GbE copper cabling).

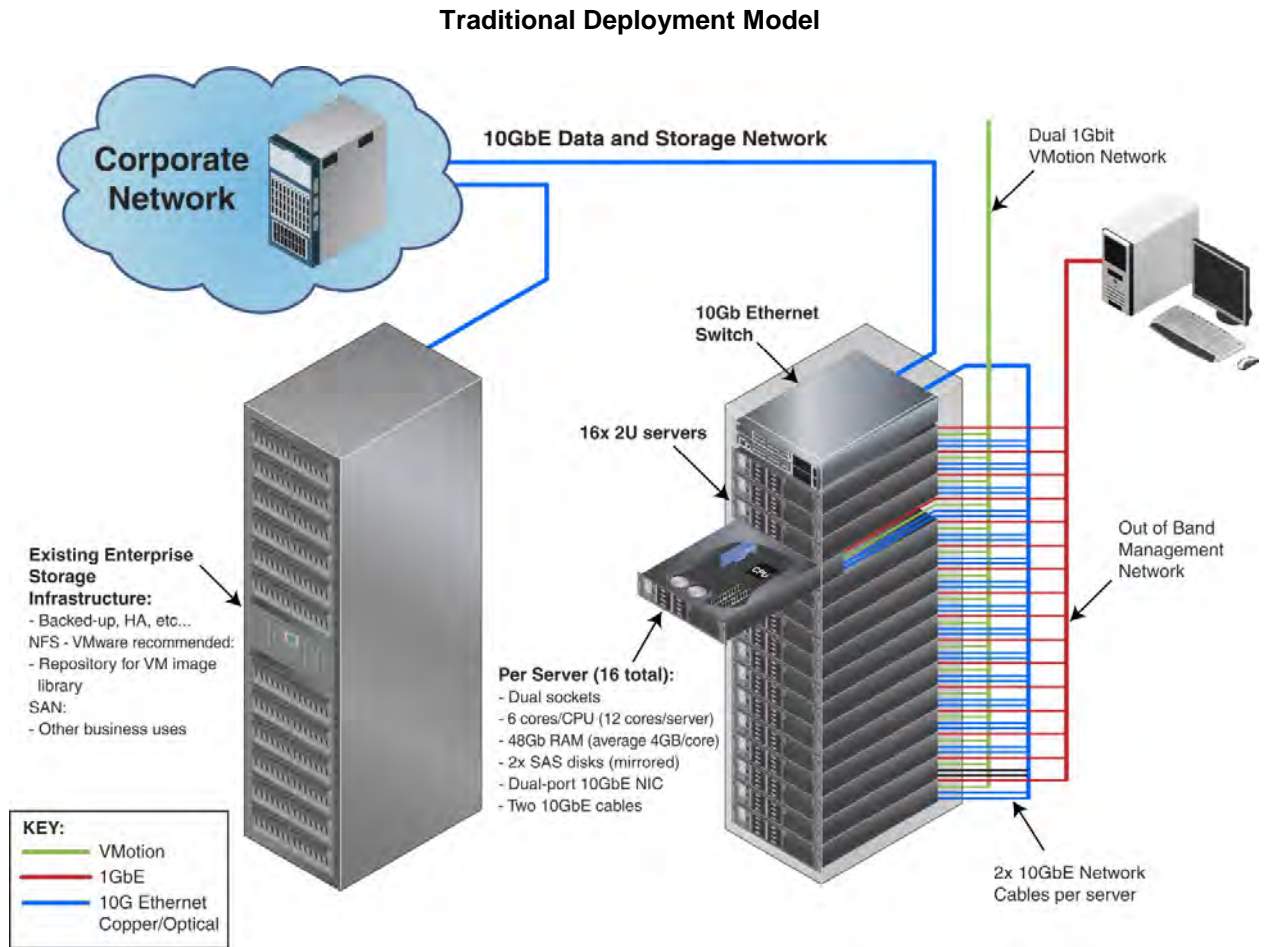
For this deployment, the on-board dual 1Gbit NICs in each server can be used for the VMware-recommended dedicated VMotion network and the out-of-band management NIC/port will be used for administration of the base server.

VMware suggests using NFS as a repository for images for virtual machines.

¹ See: <http://ark.intel.com/Product.aspx?id=47922>

² Or an IBM System x3650 M3 or Dell PowerEdge C2100, for example

Configuring this using (for illustration purposes) HP DL servers and Cisco 10GbE (Nexus 5000 series) networking switches, and connecting this to the rest of your network via 10GbE optical uplinks, the comparative environments would look similar to:



Observations:

While the Traditional deployment is impressive and functional, you will note several issues:

- The total cost of deploying 10GbE to the servers is significant – adding over 30% to the cost of the base servers (as is illustrated in the comparison table further in the document).
- While it is certainly possible that each server may occasionally require 10 gigabits of network bandwidth – or more (for peak demands) – it is likely that the average, “steady-state” network I/O requirements for each server will be much less than this (10-20%). Given the significant total expense of deploying 10GbE to each server, there is considerable under-utilized aggregate bandwidth expense in the configuration.

- Under extreme conditions, there may be occasions where an individual server might be able to consume even more network bandwidth than an individual 10GbE NIC could provide – It would be very appealing to be able to share the available bandwidth back to the central datacenter switching infrastructure more effectively among all the servers in the rack.
- Finally, to facilitate efficient utilization of the servers as a comprehensive virtualization platform, each of the systems should boot into an identical ESX hypervisor environment. The IT pro would welcome a more efficient manner to manage the booting environment for the servers than administering 16 separate mirrored disk pairs.

The Virtensys Implementation

There are several distinguishing characteristics of the requirements for the “VMware Virtualization Engine” that the Virtensys implementation can uniquely leverage, for example:

- **All of the servers in the Engine should boot from identical ESX Hypervisor images.**
This facilitates leveraging VMotion to migrate running VMs among different servers in a VMotion cluster with confidence.
- **This Hypervisor boot image changes relatively infrequently.**
- **The VMware-recommended “VMotion Network” should be separated from other network traffic.**
This provides deterministic network performance for moving the VMotion data among the servers.
- **While the servers can have very high I/O requirements, this need is intermittent.**
The cost, power, and administrative tradeoffs should reflect this dynamic.

The Virtensys Solution



Virtensys VIO-4008 I/O Virtualization Switch

The Virtensys VIO-4008 I/O Virtualization Switch consolidates and virtualizes 10GbE NICs and RAID storage Host Bus Adapters. The VIO-4008 connects to up to 16 servers and shares the physical NICs as virtual NICs (vNICs) between the servers without requiring any changes to the servers, OS, applications or I/O device drivers. The switch provides up to four 10GbE uplinks to the attached servers and connects directly to your network without an additional layer of switching.

In a similar way, the VIO-4008 also virtualizes up to two RAID controllers and internal arrays – up to 8 disks – as virtualized Direct Attached Storage (“vDAS”) which is shared between the servers, thus eliminating the internal drives from the servers. The switch supports traditional and SSD drives with different levels of RAID.

The VIO-4008 attaches to each server using a single PCIe® (PCI-Express) cable that connects to the server-native PCIe bus and provides 20Gbps bandwidth. The PCIe cable replaces the multiple Ethernet cables per server and carries both Ethernet and DAS traffic.

The VIO-4008 enables servers to be wired once and dynamically reconfigured with different Ethernet and DAS profiles without making any physical changes, via an intuitive web-based GUI. It is a lossless and non-blocking switch that delivers the full connectivity bandwidth to each server. The networking bandwidth and storage capacity can be dynamically allocated and shared between servers.

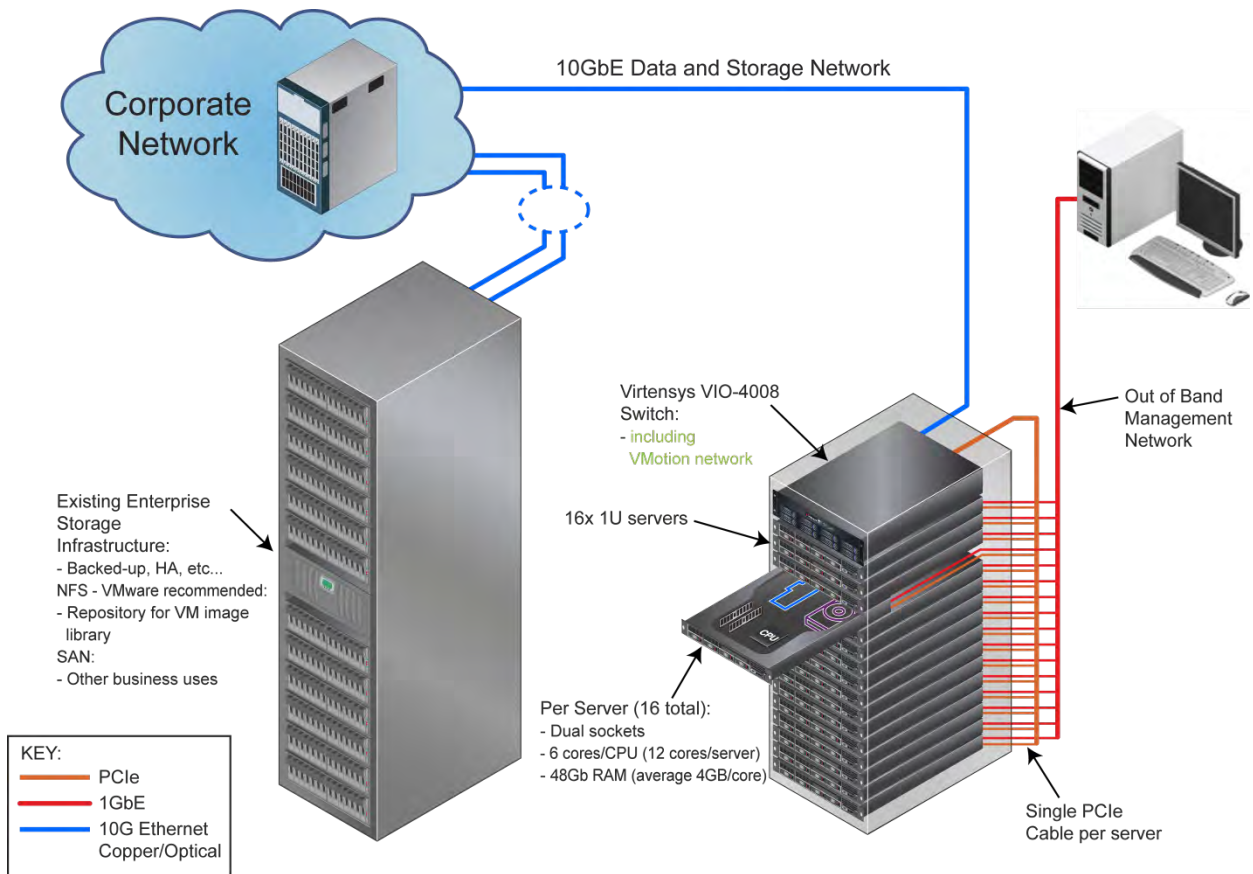
The Key Benefit to you is that you configure your servers as compute/memory devices, and externalize the I/O (network, boot disks, and storage). This reduces the complexity and management overhead of administering the environment, provides the opportunity to gain better aggregate performance, for less cost and lower power.

You truly CAN finally “Wire Once, Provision at Will”.

The Virtensys I/O Virtualization solution applied to the VMware “Engine” consists of the following:

- The Servers in the Engine are configured diskless, and all boot from the vDAS (Virtual Direct Attached Storage) RAID array in the Virtensys VIO-4008 I/O Virtualization Switch.
- The Servers will not have added networking beyond their native (“motherboard-based”) 1GbE and Out-of-Band (OoB) management ports.
- Instead, each Server will have a Virtensys PCIe extender card which is connected to the VIO-4008 via an industry-standard PCIe cable – a total of 16 PCIe cables
- A single VIO-4008 configured with:
 - 2 (two) dual-port 10GbE NICs (40Gbits of total aggregate bandwidth) which can be dynamically shared among all the servers.
 - 2 6G SAS/SATA RAID controllers, with...
 - 8 (eight) 1TB SAS Enterprise disk drives.

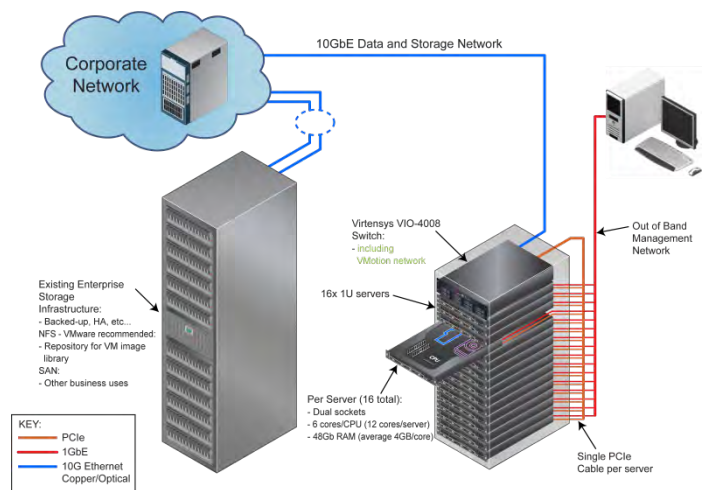
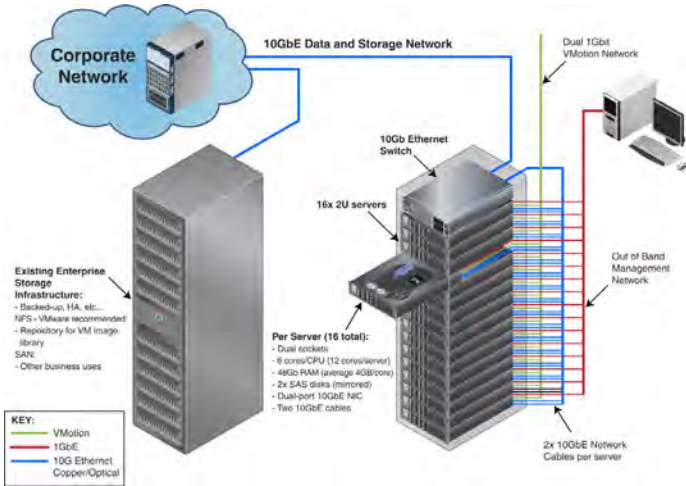
Virtensys Deployment Model



Solution Comparison

Traditional Deployment (based on US prices):

Virtensys Deployment (based on US prices):



16 Servers total:		% of total Cost	Power (watts)	% of total power
Servers				
<i>Each Server:</i>				
Chassis w/CPUs: 2 sockets, 12 cores	HP DL380 G7 2U w/Intel X5650s	51.1%	308.41	67.5%
48 GB RAM	(avg 4GB/core)	19.6%	44.53	9.8%
Server Subtotal:		70.7%	352.94	77.8%
I/O				
<i>Each server's local I/O:</i>				
Local disks	2x15K SAS	7.4%	32.02	7.0%
10GbE dual-port NIC	HP NC522SFP+	5.2%	25.03	5.5%
Subtotal:		12.6%	57.05	12.5%
External cabling & switch-ports:				
Cisco Nexus 5020, config'd, cables	2 ports per server	16.7%	750	10.3%
I/O Subtotal:		29.3%	1662.8	22.7%
Relative cost and power of complete solution (Traditional = 1)		1		1

16 Servers total:		% of total Cost	Power (watts)	% of total power
Servers				
<i>Each Server:</i>				
Chassis w/CPUs: 2 sockets, 12 cores	HP DL360 G7 1U w/Intel X5650s	58.5%	278.11	79.2%
48 GB RAM	(avg 4GB/core)	22.8%	44.53	12.7%
Server Subtotal:		81.3%	322.64	91.8%
I/O				
<i>Each server's local I/O:</i>				
No local disk		0%	0	0%
No local 10GbE NIC		0%	0	0%
Subtotal:		0%	0	0%
Configured Virtensys Solution:				
VIO-4008 I/O Virtualization switch, cards, disks, cables	(total)	18.7%	459.4	8.2%
I/O Subtotal		18.7%	459.4	8.2%
Relative cost and power of complete solution (Traditional = 1)		0.85		0.77

Some first-order highlights of the Virtensys deployment model include:

- The cost of I/O alone when deploying the VIO-4008 is reduced by 45%: *The overall cost of the Virtensys solution is over 14% lower than the Traditional approach.*

When considering the total system cost, I/O cost is reduced from 29.3% to 18.7% of the total system cost.

- The I/O power alone is reduced by over 72%: *The overall **power** of the Virtensys solution is over 23% lower than the Traditional approach.*

When considering the power requirements to deploy the entire system, the portion of total power consumed by I/O is reduced from 22.7% to just 8.2% of the total system power.

- The system is using 24 fewer hard disks and 32 fewer 10GbE cables/ports, reducing the complexity and management costs, and improving reliability.
- *The engine “rack space” is reduced by nearly 50% (a total reduction of 16U).*
Leveraging 1U servers essentially identical the 2U servers of the traditional approach (same CPUs, same RAM, same chipset, etc...). Also, by moving the disk and I/O out of the servers, we are able to reduce the size, cost, and power requirements for the redundant power supplies in each server. Taken in combination, this could also reduce the footprint (and power) required in your data center.
- The utilization of the network bandwidth is increased to more than 80%.
- Finally, all of these changes work cleanly with the rest of the infrastructure already in place in the datacenter and the rest of your environment. The Virtensys I/O virtualization switch replaces the top-of-rack access switches in your infrastructure, and works seamlessly with the rest of the environment you have in place and continue to build – transparently, but for less cost to buy and much less cost to operate, with more flexibility and agility.

These capital and operating expense improvements are impressive, but it is the flexibility and power of the Virtensys Virtual I/O approach that provides the real ROI. Let's explore how:

The Virtensys VMware Engine in action:

Local diskless booting:

The first place where we simplify life for the IT pro and reduce both capital and operating costs (as well as reduce power, heat, and improve reliability/manageability) is by deploying diskless servers³. Diskless booting from a SAN has been a possibility that has been eschewed by many IT pros owing to the performance and complexities involved. But with the VIO-4008, the VMware ESX hypervisor boot volumes for these servers are only one PCIe 'hop' away – in the same rack as the servers. Inside the VIO-4008 is a SAS/SATA RAID controller that sits on the switched/shared PCIe bus – unlike the complexity of booting off a SAN, the servers can easily be configured to boot from a vDAS volume that appears directly on the native PCIe bus in each server.

Further, managing these boot volumes is simplified in that all of them reside within a single array, managed by the GUI of the VIO-4008 (*see screen shot*). The backups of the hypervisor boot image(s) can reside on the enterprise storage you are already using, and can be loaded down to the VIO (or pushed up to the enterprise storage system from the VIO) as needed. Since these images should all be identical, this becomes a trivial effort, and the VIO's array can be optimized for booting the servers into the hypervisor.

Once booted, the servers (per Virtualization best practices) should seldom need to go back to their boot disks – this is an ideal application for the “shared local” array in the VIO-4008.

Improved operational agility and simplified network: – *Wire once, provision at will*

One of the biggest challenges facing the IT pro working with heavily virtualized environments is how to deal with the network bandwidth requirements. When all applications were running on dedicated servers, it was easy to characterize the network I/O requirements for the apps, and adding CPU horsepower meant that you were also adding network capacity.

Today, however, the aggregate CPU horsepower in a server can easily outstrip the available native network capacity of the hardware. In the past, a common solution was to add quad-port Gbit NICs or even 10GbE NICs to each server to increase network throughput.

We have shown how this is both expensive and/or impractical. The VIO-4008 allows the bandwidth of up to four 10GbE ports to be available and be reconfigured virtually, without having to open the servers later to add cards and/or re-wire cables. The dynamic bandwidth allocation capability of the VIO-4008 allows you to allocate minimum bandwidth to be made available to each server, and yet allow the servers to dynamically grab even more bandwidth as the requirements dictate.

³ See: <http://www.infoworld.com/print/111179> and <http://www.infoworld.com/print/111179>

The VIO-4008 makes available the full peak bandwidth of a dual-port 10GbE NIC – 20Gbs – to any server in the “Engine”, directly to their native PCIe bus. Further, the full bandwidth of all the I/O devices in the VIO-4008 can be dynamically allocated among the servers in the “Engine.” All of this power and flexibility is managed from a single point – virtually.

The Virtensys I/O Virtualization approach allows you to connect all of the servers in the “Engine” to the Virtualization switch *once* – via an industry-standard PCIe cable – and dynamically reconfigure how the I/O devices in the switch are presented to the connected servers via the intuitive web-based UI of the VIO-400x. There is no need to open up the servers to add cards, etc. The VIO-400x allows you to modify the server I/O configuration on the fly. For instance, configuring which 10GbE ports and how much bandwidth is available to each server.

Similarly, if only one of the virtual machines has an application requiring Fibre Channel connectivity to a SAN, and the VIO-400x is configured with an FC HBA, from the Management console of the VIO-400x, you can add FC connectivity to any of the other attached servers and subsequently VMotion-migrate the application to the new server – *without having to open up the second server, and without having to buy another FC HBA!*

To the servers, the I/O devices (NICs, RAID controllers, HBAs) appear local, and use the same drivers as if the same devices were installed inside the server. No changes are required for the applications, the operating systems, the hypervisor, the servers, or the rest of the infrastructure.

When configuring VMware on the servers, the NICs in the I/O Virtualization switch appear as local devices, and configuring them is done in exactly the same manner as you are already familiar (see below).

In this way, all the I/O for the entire “Engine” can be managed and reconfigured from a single place: The Virtensys I/O Virtualization switch.

The Dedicated “VMotion Network”

It is suggested by VMware with ESX/vCenter version 4 to dedicate a network for VMotion – the ‘VMotion Network’ – to provide deterministic network performance to move the VMotion data structures from one server to another.

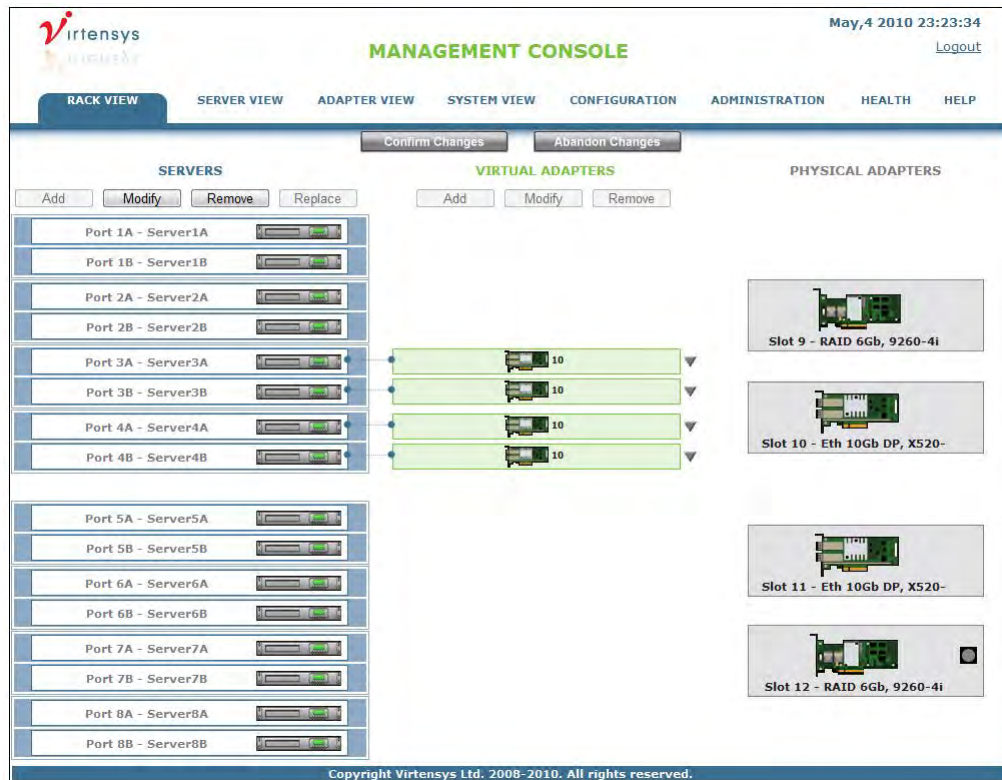
Here is one of the most profound benefits of the Virtensys solution: The VMotion traffic stays within the VIO-4008. Rather than hit a NIC and an Ethernet switch, the VMotion traffic flies along the PCIe bus. By recognizing that the traffic is bound for a destination within the VIO-4008, it routes the packets directly. Automatically.

Configuring the virtualized I/O:

The first step in setting up the “Engine” from the VIO-4008 is to configure how we would like each connected server to “see” the I/O devices in the Virtualization switch.

Here is the Management Console environment being used to virtually “connect” the NICs in the VIO-4008. We are virtually connecting the dual-port 10GbE NICs (on the right) to the servers (on the left).

The Virtensys Management Console configuring NIC-Server connections



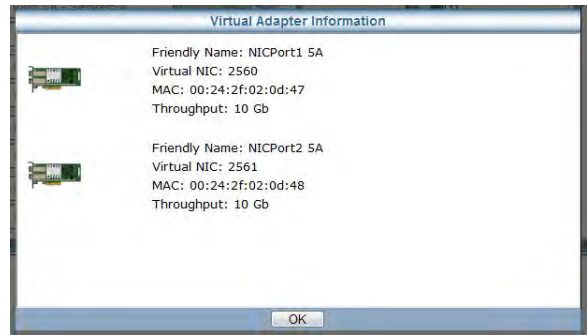
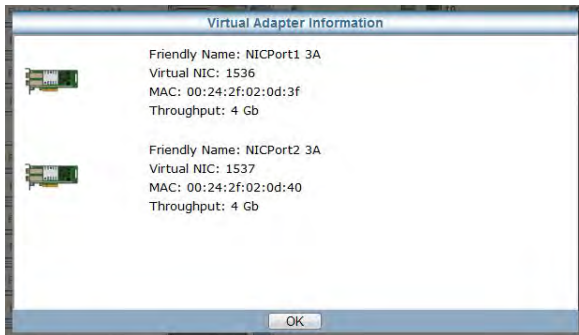
How you connect the devices is up to you – These changes can be made from the Management Console of the VIO-4008 without needing to open up the servers or to run more cables.

When configuring the 10GbE NICs, you might wish to specify how much of the I/O bandwidth of the NICs should be guaranteed to be available to each server.

Below, the administrator is configuring the NICs attaches to two different servers, on the left, they are granting a server to have as much of the NIC’s bandwidth as possible to be available – the full 10 Gbits. On the right – based on knowledge of the applications on that specific server – the administrator has set a limit of 4Gbits.

Configuring a Server for full 10GbE Bandwidth

Configuring a Server for 40% Bandwidth

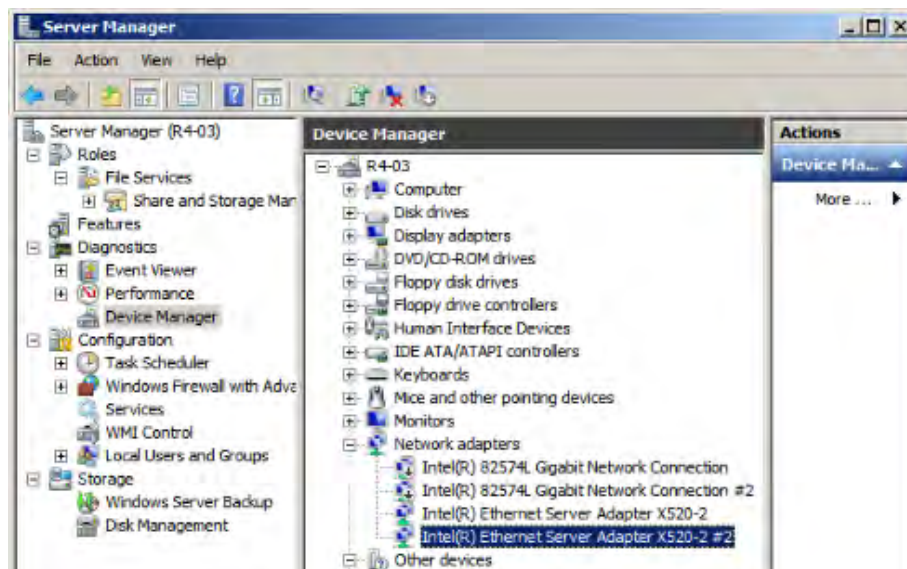


In this way, the VIO-4008 provides the administrator the flexibility and capability to more efficiently manage the available resources (in this case, the valuable uplink bandwidth to the datacenter switch).

Once the admin has configured the I/O virtually in this manner to meet their needs, the servers “see” the I/O devices as if they were installed inside the server, right on their PCIe bus.

Below is the familiar Windows Server 2003 Device Manager view of these 10GbE NICs. As you can see, as far as the server is concerned, the devices are local.

Windows Device Manager sees the virtualized NIC as if it were installed locally



The VIO-4008 consolidates & simplifies I/O management into a single console and enables you to automate and remotely manage the connectivity to the servers as a single entity. You wire the servers once and reconfigure them dynamically without any physical changes. Server virtualization combined with the VIO-4008 enable you more effectively utilize your storage, network, and computing resources to control costs and respond faster to changing business requirements. Networking connectivity and storage capacity can be treated as a pool of resources to be reallocated on the fly – reducing your server management complexity and operational expenses by more than 60%.

Configuring the virtual Direct-Attach Storage (vDAS):

As mentioned above, the VIO-4008 has an integrated RAID controller and capacity for up to 8 standard SAS or SATA drives in various RAID configurations. The most compelling use for this capability in the “VMware Engine” is as the local, in-rack, diskless boot resource for the servers in the “Engine”.

From the Management Console, the RAID environment is managed and configured for all the attached servers – from one place.

Below, we are setting up a RAID controller for use in the “Engine.”

Configuring a RAID Controller

The screenshot displays the Virtensys Management Console interface. At the top, the logo and 'MANAGEMENT CONSOLE' are visible, along with the date and time 'May, 4 2010 23:29:14' and a 'Logout' link. A navigation bar contains tabs for RACK VIEW, SERVER VIEW, ADAPTER VIEW (selected), SYSTEM VIEW, CONFIGURATION, ADMINISTRATION, HEALTH, and HELP.

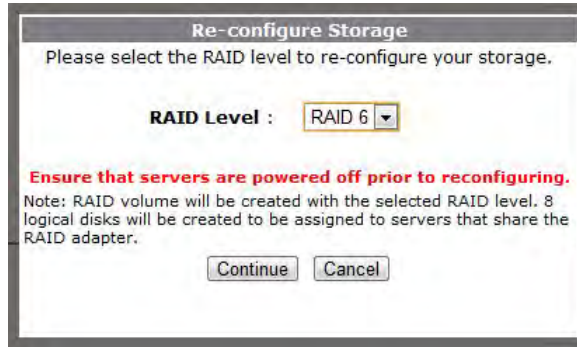
The main content area is divided into two sections: 'PHYSICAL ADAPTERS' and 'ADAPTER VIEW'. Under 'PHYSICAL ADAPTERS', four slots are listed: Slot 9 (RAID 6Gb, 9260-4i), Slot 10 (Eth 10Gb DP, X520-SR2), Slot 11 (Eth 10Gb DP, X520-SR2), and Slot 12 (RAID 6Gb, 9260-4i). The 'ADAPTER VIEW' section provides details for the selected device (ID 787200), including buttons for 'Show All Logical Disks', 'Re-configure Storage', and 'Turn Off Alarm'. A table on the right shows the following configuration details:

Adapter Name: RAID 6Gb, 9260-4i
Sharable: Yes
Total LDs: 8
Available LDs: 8
State: Normal

At the bottom of the console, a copyright notice reads: 'Copyright Virtensys Ltd. 2008-2010. All rights reserved.'

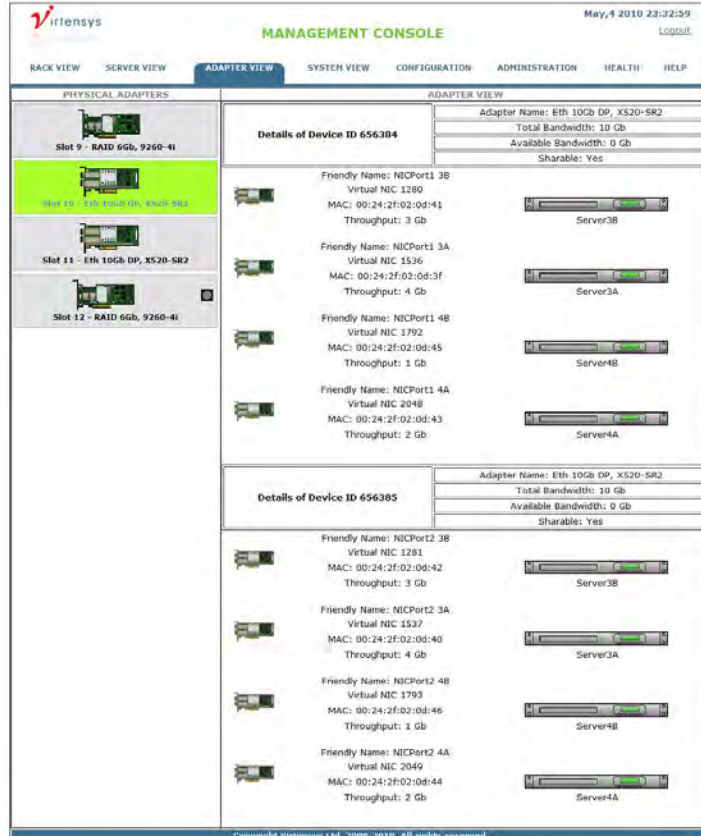
Once the controller is set up, we can attach the disks and configure the RAID array. To the left we are selecting RAID level 6 for the array to use for the boot volumes for the servers.

Setting up the RAID Configuration



After the array has been initialized and boot volumes assigned to the servers, we are ready to boot the servers from the vDAS into their ESX hypervisors.

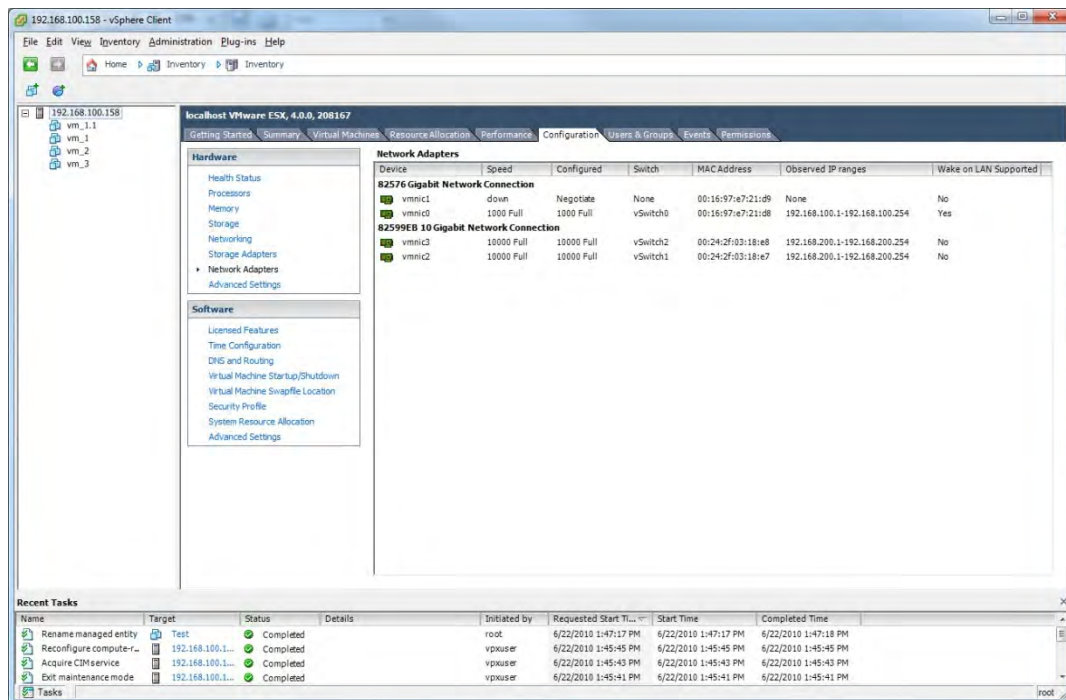
Below is the adapter view of the VIO-4008’s configuration. This dashboard provides you a summary and overview of the Virtualized I/O environment for the entire “Engine” – a single view of the entire I/O subsystem for the rack.



Operating VMware in the Virtensys virtualized I/O environment:

Once we are satisfied with how we have configured the storage and I/O from within the VIO-4008, we can log into vSphere and configure the VMware virtual switches. Since the servers “see” the I/O devices as if they were physically installed inside each configured server, VMware also sees the I/O devices as local, and configuring and administrating the environment is familiar to the VMware administrator.

The I/O virtualized NICs appearing to ESX transparently

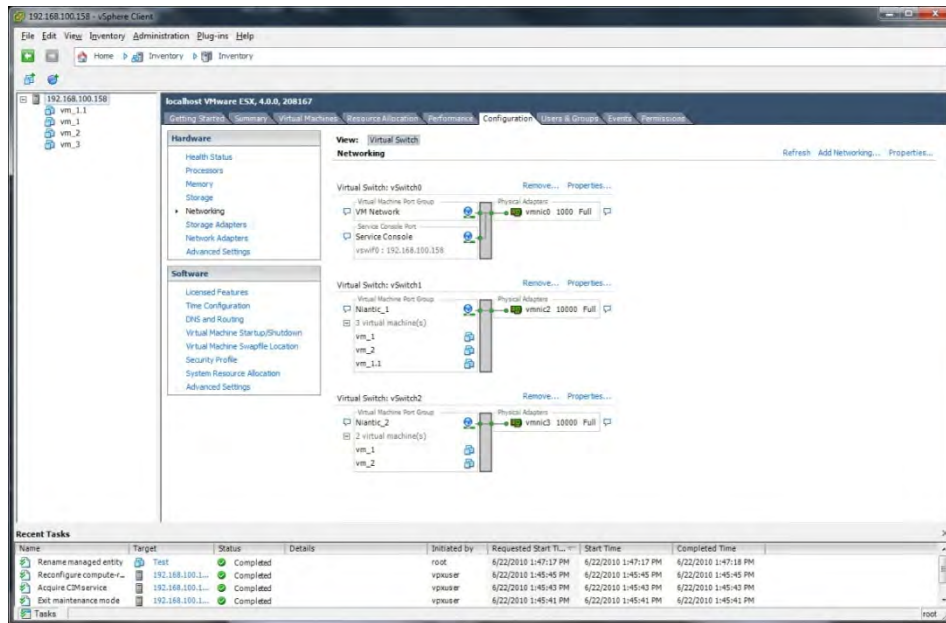


Here we see the 10GbE NICs appearing to the ESX 4.0 hypervisor management environment as local NICs, and being set up in VMware virtual switches, below.

Configuring the VMs running on the hypervisor, and providing access to the network infrastructure is done in exactly the same manner as if the NICs were local. The VMware administrator has nothing new to learn.

Once the I/O has been configured in the VIO-4008 as we showed above, the VMware environment sees the devices as if they were locally installed inside the server(s).

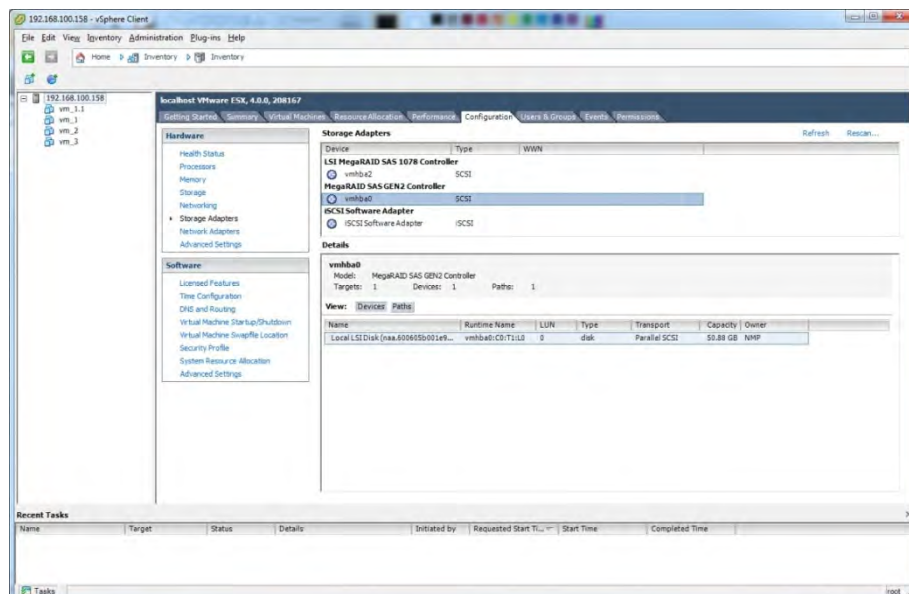
...setting up the VMware virtual switches



The VMware administrator can configure and manage the vSphere environment just as they would normally.

For instance: Below you can see the RAID controller in the VIO-4008 that we were configuring earlier appearing to the vSphere client transparently – as if it were inside the server.

...and the RAID controller visible transparently to vSphere



The power and flexibility to reconfigure your I/O on the fly virtually – without having to open servers and add new hardware – is transparently presented to the VMware environment. Nothing looks any different to the VMware management environment, and the VMware administration remains unchanged.

This is the elegance of the Virtensys solution applied to VMware deployments – you can extend the concept of virtualization beyond just the CPU, and virtualize the entire I/O environment, with similar benefits (agility, reduced TCO, much greater return on your hardware investment, etc.), all transparently to the VMware infrastructure.

Further considerations

This has been a high-level overview to illustrate the power of Virtensys I/O virtualization applied to a typical VMware deployment. There are some variations that you may consider, based on your requirements, and here are but a few:

- **Fibre Channel connectivity**

The example illustrated above relies only of NFS for storage connectivity. For environments that also require Fibre Channel connectivity to a SAN, Virtensys also supports virtualizing FC HBAs in the same way that 10 GbE NICs can be virtualized and shared. The VIO-4001 includes both Fibre Channel and 10GbE connectivity, and the Management Console allows the ability to configure, re-configure, and manage the FC connectivity in the same manner as was shown for the 10GbE devices above.

Virtensys VIO-4001 Ethernet and FC I/O Virtualization Switch



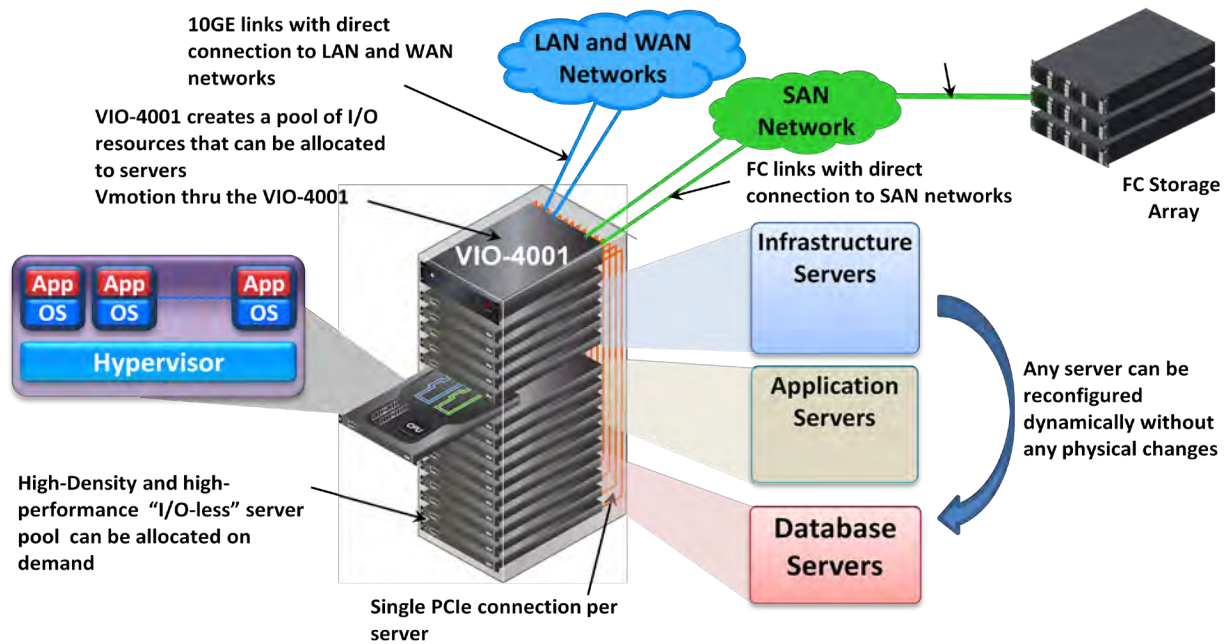
What makes this particularly powerful in the VMware scenario is that the FC connectivity in the Virtensys I/O Virtualization Switch can present the FC connectivity to *any* (or all...) of the servers in the “Engine”, allowing for VMs that require Fibre Channel to be migrated to any of the servers – again: without having to add more hardware, without having to pull another cable, and without having to open the servers – all done virtually!

- **High Availability (HA) considerations**

One factor critical to many environments is designing the infrastructure for maximum uptime. The Virtensys Virtualization switches are available with redundant hot-swap power supplies. But for high-level HA deployments, Virtensys recommends configuring a second, parallel VIO-400x switch, with a second set of PCIe cables connecting it to the servers. In addition to providing full failover capability, this configuration provides *double* the I/O (up to 40Gbits) *per server* when both switches are operating(!).

Virtensys I/O Virtualization in the Enterprise – Flexibility and efficiency

Organizations turning to server virtualization and cloud computing require server and I/O resources that not only scale, but also are flexible and agile. The VIO-4001 virtualizes I/O – including Ethernet and FC connectivity – so that these can be allocated on demand to servers. The VIO-4001 provides a mechanism to dynamically “right-size” the Ethernet and FC bandwidth for any server workload. Similarly, server I/O profiles can be modified on demand, allowing server reconfiguring, re-purposing and seamless VMotion application migration between servers.



Please contact Virtensys for more information, and to discuss your unique requirements, such that we can advise how best to configure and deploy our solution to address your needs.

Summary

Two factors are converging that Virtensys feels are defining the landscape for the next generation of server deployments:

- Increasing-performance multi-core CPUs, combined with very large memory capacities in common servers are providing ideal compute platforms to leverage server virtualization to drive unprecedented levels of consolidation – But I/O isn't keeping pace, and the economies (OpEx and CapEx) are suffering.
- CPU, chipset, and server architecture are evolving: PCIe is now optimized as THE first-class native expansion port for all I/O – everything else (except memory) has been put on the PCIe bus.

Virtensys' approach: I/O virtualization based on connecting directly to and switching across the native PCIe bus of the server/chipset, provides the highest-performance, lowest latency I/O virtualization solution.

Because of the ubiquity of the PCIe bus – native in every industry-standard server made – only Virtensys' can offer you a I/O virtualization solution that lowers your costs by more than 45% and lowers the I/O power consumption by more than 70% and that works with the equipment you already have and are buying – without requiring you replace what you have built and are building. Virtensys I/O virtualization switches enable you to reduce the server management complexity and operational expenses by more than 60%.

Perhaps nowhere can these advantages be more clearly demonstrated than in the example above: Solving real-world challenges associated with deploying a world-class VMware virtualization infrastructure.

Getting the maximum benefit from VMware deployments requires a new level of agility, and we have shown how the Virtensys VIO-4008 provides the most flexible and agile approach to I/O virtualization that fully compliments the capabilities of the VMware ESX and vCenter/vSphere 4.0 environment and enable you to deploy end-to-end virtualization in your data center.

Delivering Innovative I/O Virtualization Solutions for the Data Center

About Virtensys

Virtensys develops industry-leading, patented PCI Express®-based I/O virtualization technologies for servers and storage platforms, revolutionizing the way I/O infrastructures are deployed and used in data centers, and delivering significant improvements in I/O utilization, cost, performance, power consumption, and management. The deployment of the IOV switches is totally non-disruptive and dramatically reduces IT complexity and expenses. The company was founded in December 2005 by leading technologists in the fields of high-performance switching, networking, and systems design, and is backed by several premier technology venture capital firms.

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