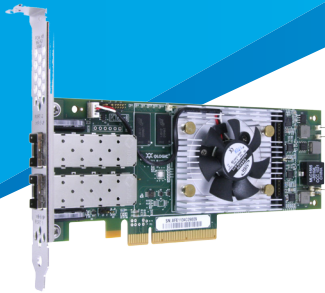


The Benefits of I/O Virtualization in Windows Server 2012

Virtualize Tier-1 Applications and Increase VM Density in Hyper-V with Single Root I/O Virtualization



Offloading CPU processing for network I/O traffic using SR-IOV capabilities in Microsoft Windows 2012 Hyper-V and the QLogic 8300 Series Converged Network Adapter significantly reduces system overhead, ensuring that such critical CPU utilization levels are never reached.

EXECUTIVE SUMMARY

The advent of server virtualization has had a number of positive impacts on server resource utilization. Fewer servers with more memory and CPU cores can now do the work of many servers more efficiently and provide simplified management. When virtualizing Tier-1 heavy-duty applications like Microsoft® SQL Server®, there are times when CPU utilization exceeds critical levels because CPUs are simply asked to do too much. This situation can be exacerbated during times of high application traffic or when applications are moved to other nodes in a cluster due to hardware issues or maintenance.

However, offloading CPU processing for network I/O traffic using Single Root I/O Virtualization (SR-IOV) capabilities in Microsoft Windows® 2012 Hyper-V® and the QLogic® 8300 Series Converged Network Adapter significantly reduces system overhead, ensuring that such critical CPU utilization levels are never reached. Reduced overall system CPU utilization allows Tier-1 workload performance to scale. In addition, streaming and financial applications can benefit with reduced network I/O latency by enabling SR-IOV.

BENEFITS OF SR-IOV OFFLOAD CAPABILITIES

- Reduce system CPU utilization
- Reduce network latency
- Increase network I/O throughput

CHALLENGE

Traditionally, a packet being transferred to a virtual machine (VM) is received by the physical network port (Physical Function) in the host server. In these virtual environments, the hypervisor manages network I/O traffic, which requires high CPU processing to sort packets. The packets are then routed to the appropriate guest operating systems, as shown in Figure 1.

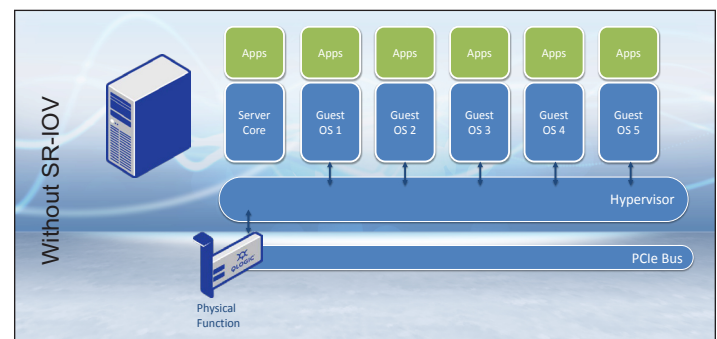


Figure 1. Packet Routing without SR-IOV

SOLUTION

SR-IOV enables the VM to use a Virtual Function to send and receive packets directly to the physical network port, bypassing the traditional path (through the hypervisor) completely, as shown in Figure 2. This method boosts the network I/O, reduces network latency, and decreases the overhead on the host machine’s processor.

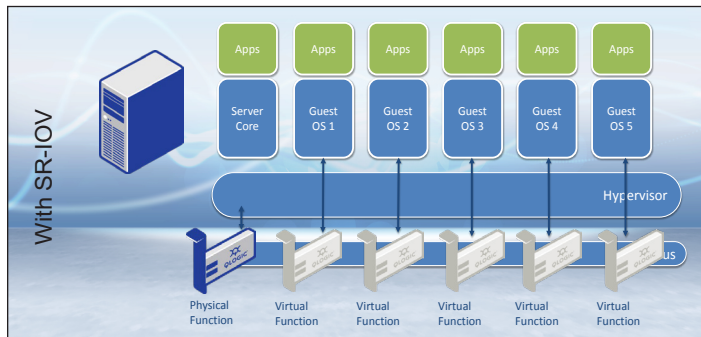


Figure 2. Packet Routing with SR-IOV

PROVEN REDUCTION IN CPU UTILIZATION

In larger virtualized environments (20 or more VMs per host), or when virtualizing several Tier-1 application workloads, high CPU utilization can be an issue. Typically, the only way to reduce CPU utilization is to move VMs off the host server.

However, with the implementation of SR-IOV on the QLogic 8300 Series Converged Network Adapter, host CPU utilization can be significantly reduced. This reduction can be significant enough that additional VMs can be added to the host server without negatively affecting host system performance.

As illustrated in Figure 3, CPU utilization trends upward as VMs are added to the host server when SR-IOV is not enabled. When SR-IOV is enabled, CPU utilization tends to level off at a much lower percentage as VMs are added. Extensive QLogic testing has shown up to 58 percent lower CPU utilization with SR-IOV enabled.

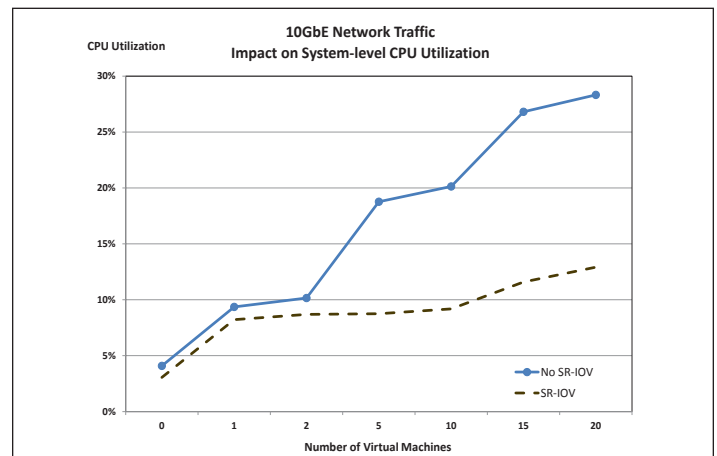


Figure 3. CPU Utilization is Lowered by Using SR-IOV

SUMMARY

Microsoft Windows Server® 2012 with Hyper-V configured with SR-IOV and the QLogic Series 8300 Converged Network Adapter together work to decrease host CPU utilization, reduce network latency, and increase network I/O throughput. This technology allows virtual systems to do more and be more efficient at the same time, increasing the overall value of the virtual environment.

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