SOLUTION BRIEF

Increasing Microsoft Hyper-V Efficiency

Mellanox RDMA Technology Increases Operational Efficiency in Virtualized Data Centers

EXECUTIVE SUMMARY

Companies striving to increase IT flexibility, drive down costs, and accelerate time to market, may implement server virtualization platforms to contribute to their success in these areas. With an increasing number of server CPUs sharing virtualization loads and network links, coupled with an extraordinary demand that is being placed on server CPUs and data center networks, even with all the potential benefits of virtualization, there is an increasing need to further improve efficiencies. Mellanox high-performance Ethernet connectivity products remove CPU overhead and provide faster and more efficient movement of data for hypervisors like Microsoft's Hyper-V, enabling performance gains and reducing virtualization and networking overhead on CPUs.

OVERCOMING BARRIERS

Virtualized environments must support a variety of workloads, including teir-1 applications, while processing all the network data transmissions for these applications. This can places a tremendous burden on server processors and has the potential of wasting precious CPU cycles, choking virtualized servers and the network. This ultimately effects the efficiency of the virtualized servers, with the end result affecting application performance, limiting resource utilization and overall scalability. To overcome these issues, Mellanox offers high-performance networking components capable of assisting by offloading network data transmision tasks freeing CPU resources. This enable a virtual environment that can run more efficiently, achieve better utilization of system resources and increase scalability.

SOLUTION HIGHLIGHTS

- Improved I/O rates
- Lower latencies & CPU utilization
- Dynamic on-demand scaling
- Increase virtual machine densities
- Scale virtual machine workloads
- Boost CPU power efficiency
- Accelerate network performance
- Increase sever efficiency by 3X through stateless offloads
- Reduce live migration times by 10X through the use of RDMA
- Lower Total Cost of Ownership

MICROSOFT HYPER-V

Microsoft Hyper-V makes it easier than ever to take advantage of the cost savings of virtualization. Allowing optimization of server hardware by consolidating multiple servers onto separate virtual machines. This permits running multiple different operating systems and applications in parallel on a single physical server. By complimenting Microsoft hypervisor services with high-performance Ethernet solutions from Mellanox, administrators will benefit from remarkable new levels of efficiency and scalability – all designed to help lower costs and increase ROI. Mellanox Ethernet connectivity assists server processors by offering offloads and overlay networks so that more CPU power is available to increase Hyper-V's ability to run applications rather than being consumed to move data. This creates increased efficiencies that results in a virtualized infrastructure that returns better data center ROI.

INCREASING EFFICIENCIES

To deliver a truly efficient and scalable virtual environment requires overcoming three main challenges; minimizing the use of inefficient network protocols and removing network virtualization and compute virtualization penalties. To explain what is meant by inefficient network protocols, take TCP for example. The CPU must process the entire protocol stack including address translation and error handling, when sending and receiving data. This can consume as much as 30% or more of available CPU resources. Offloading IO transmission to dedicated Mellanox hardware frees CPU cycles from processing networking protocols. This drastically reduces the CPU's involvement in IO requests and has the ability to reduce memory bandwidth bottlenecks. In addition, Mellanox offers RDMA capabilities which are used to accelerate VM migration, VM replication and hypervisor access to storage. In fact, live migrations efforts using Microsoft SMB and Mellanox RDMA can complete this process in one tenth the time. The use of RDMA transfers the task of moving data from node-to-node from the CPU to the Mellanox hardware, yielding as much as a 10 times performance boost, lowering latency, access-times, and CPU overhead

VIRTUALIZATION PENALTIES

Network virtualization penalties can degrade IO performance due to the overhead of traffic traversing the software hypervisor. In order to accommodate increasingly larger numbers of virtual machines (VMs), traffic is segregated over virtual networks. This assists with workload mobility and migration across physical servers and geographic locations.

To do so efficiently, virtual networks must be able to handle increasingly large numbers of MAC addresses, VLANs and provide isolation of physical L2 networks without burdening the CPU. To assist in this process, Mellanox employs stateless offloads such as VXLAN, NVGRE, or GENEVE to assist in provisioning, routing encapsulation and decapsulation. This is done over hardware-based switches within the adapter to eliminate the CPU from being involved in the process and helps to address key network scalability challenges. In tests with Microsoft, offloading the processing of NVGRE encapsulated frames to the Mellanox adapters resulted in over three times higher application efficiency.

Additionally, Ethernet switches have tens of thousands of entries in their MAC forwarding table. A few hundred servers can host tens of thousands of VMs and place significant strain on switches which require access to forwarding tables. This can cause severe network performance degradation when operating under load. Mellanox Spectrum® switches offer full L2/L3 switching, routing, and data center bridging capabilities that remove network virtualization penalties. Spectrum also has the ability to process virtualized and containerized data packets at full line rate without dropping packets to ensure network and application performance does not suffer.

CONCLUSION

In today's virtualized data center, IO is the key bottleneck leading to degraded virtual server and application performance. Mellanox products enable a high-performance virtual infrastructure by offloading protocols to dedicated hardware, completely bypassing the host OS and allowing more CPU cycles for applications and overall better utilization of system resources. With Mellanox, users do not need to compromise their performance, application service levels, and efficiency in virtualized environments. After all, the one main goal and advantage of virtualization, is to increase the efficiency of server resources to help lower costs and increase ROI.

For more related information visit:
http://www.mellanox.com/page/microsoft_based_solutions

Download the Microsoft whitepaper:
Achieving Over 1-Million IOPS from Hyper-V VMs in a Scale-Out File Server Cluster Using Windows Server 2012 R2

About Mellanox

Mellanox Technologies is a leading supplier of end-to-end InfiniBand and Ethernet interconnect solutions and services for servers and storage. Mellanox interconnect solutions increase data center efficiency by providing the highest throughput and lowest latency, delivering data faster to applications and unlocking system performance capability. Mellanox offers a choice of fast interconnect products: adapters, switches, software, cables and silicon that accelerate application runtime and maximize business results for a wide range of markets including high-performance computing, enterprise data centers, Web 2.0, cloud, storage and financial services.

To find out more, visit our website: www.mellanox.com

350 Oakmead Parkway, Suite 100
Sunnyvale, CA 94085
Tel: 408-970-3400 • Fax: 408-970-3403
www.mellanox.com