Application Note: HyperIP WAN Optimization and Veeam Backup & Replication

Introduction

HyperIP WAN optimization virtual appliance is a software-based WAN accelerator that operates on a VMware ESX or ESXi server to boost the performance of replication applications from vendors such as Veeam Software. HyperIP for VMware mitigates TCP performance issues that are common when moving storage data over wide area network connections because of bandwidth restrictions, latency due to distance and/or router hop counts, packet loss, and network errors.

Veeam Backup & Replication is a disaster recovery solution for a VMware Infrastructure that combines backup and replication, as well as the fastest file-level restore, in a single product. Enabling these options from one interface solves the most critical problems of the VMware Infrastructure management by protecting mission-critical virtual machines from both hardware and software failure.

TCP link bandwidth issues and limitations

Several characteristics of TCP/IP cause applications to perform poorly over lossy bandwidth and long distances:

- ***Window Size***

Window size is the amount of data allowed to be outstanding (in-the-air) at any given point-in-time. The available window size on a given bandwidth pipe is the rate of the bandwidth times the round-trip delay or latency. Using a cross-country OC-3 link (approximately 60 ms based on a total 6000-mile roundtrip) creates an available data window of 155Mbps x 60ms = 1,163Kbytes. A DS3 satellite connection (540 ms roundtrip) creates an available data window of 45Mbps X 540ms = 3,038Kbytes.

When this is contrasted with standard and even enhanced versions of TCP, there is a very large gap between the available window and the window utilized. Most standard TCP implementations are limited to 64Kbytes windows. There are a few enhanced TCP versions capable of using up to 512Kbytes or larger windows. Either case means an incredibly large amount of "dead air" and very inefficient bandwidth utilization.

- ***Acknowledgement Scheme***

TCP causes the entire stream from any lost portion to be retransmitted in its entirety. In high bit-error-rate (BER) scenarios this will cause large amounts of bandwidth to be wasted in resending data that has already been successfully received, all with the long latency time of the path. Retransmissions may be subjected to the performance penalty issues of “Slow Start”.

- ***Slow Start***

TCP data transfers start slowly to avoid congestion due to possible large numbers of sessions competing for the bandwidth, and ramp-up to their maximum transfer rate, resulting in poor performance for short sessions.

- ***Session free-for-all***

Each TCP session is throttled and contends for network resources independently, which can cause over-subscription of resources relative to each individual session.

The net result of these TCP limitations is very poor bandwidth utilization. The typical bandwidth utilization for large data transfers over long-haul networks is usually less than 30% and more often less than 10%.

Implications for VEEAM Backup & Replication on TCP/IP networks

TCP/IP is included in most operating systems and has become the preferred transport for moving data over the WAN. Like many other replication applications Veeam Backup & Replication uses TCP/IP for moving data over the WAN.

Latency and packet loss will affect Veeam's throughput and overall performance.

It should not be a surprise to see the Veeam application performance degrade when TCP is used for many of the reasons mentioned above. It should be noted, it is not a fault of the Veeam Backup & Replication application but more a symptom of using the TCP transport technology.

The cost effective high performance solution: Veeam Backup & Replication and HyperIP

HyperIP was designed specifically for large amounts of data over big bandwidth and long distance, and to be highly efficient regardless of the BER congestion, or jitter. HyperIP is a standard TCP/IP network node requiring no modifications to LAN / WAN infrastructures and no proprietary hardware. It provides transparent "acceleration" across WANs.

HyperIP provides the following benefits:

- ***Window size***

The HyperIP transport protocol keeps the available network bandwidth pipe full. The results are over 90% efficient link utilization. It eliminates the discrepancy between maximum available bandwidth and the results provided by native TCP/IP.

- ***Acknowledgement scheme***

HyperIP transport protocol retransmits only the NAK'd segments and not all the data that has already been successfully sent.

- ***Slow Start***

Configuration parameters allow HyperIP to start transmissions at a close approximation of the available session bandwidth.

- ***Dynamic adjustments***

When feedback from the receiver in the acknowledgement protocol is received, HyperIP quickly "zeroes-in" on the appropriate send rate for current conditions.

- ***Session Management pipeline***

HyperIP allows traffic from multiple TCP sessions to be aggregated over a smaller set of connections between the HyperIP devices, enabling a more efficient use of the bandwidth and less protocol overhead acknowledging many small messages for individual connections.

- ***Adaptive Block-level Compression of Data***

HyperIP applies, as required, block-level compression of the optimized data allowing more data to be shipped over the WAN link, without having to upgrade the circuit. This software-based algorithm is much more efficient than packet-level compression and allows the Veeam Backup & Replication application to offload compression for more efficiency in the replication process.

HyperIP's results with Veeam Replication over IP WANs

Performance results with Veeam Backup & Replication have been outstanding. Veeam Backup & Replication achieves bandwidth utilization consistently exceeding 90% from distances of hundreds of miles (with high bit error rates on dirty lines) and much farther.

- ***What does this mean to Veeam users?***

Veeam on native Ethernet TCP/IP fabrics with HyperIP provides a high-performance WAN throughput option for replication. Veeam Backup & Replication is no longer limited by TCP throughput issues and shortening replication window times. Packet loss and out-of-order packets are virtually eliminated by HyperIP, allowing for full utilization of the WAN link. Latency is minimal allowing the WAN to perform as well as a LAN. Compression is offloaded from the Veeam application freeing up CPU cycles on the server and allowing more WAN efficiencies without adding more bandwidth.

Summary and Conclusion

NetEx and Veeam have a common goal in ensuring performance and reliability of VMware data protection and disaster recovery. Since network conditions can sometimes result in lengthy backups, the combination of Veeam Backup & Replication and HyperIP WAN optimization virtual appliance ensures organizations can transfer data between locations securely, swiftly, and seamlessly.

***Veeam Software**, a premier-level VMware Technology Alliance Partner and member of the VMware Ready Management program, provides innovative software for managing VMware vSphere 4 and Virtual Infrastructure 3. Veeam offers an award-winning suite of tools to assist the VMware administrator, including #1 for VMware backup: Veeam Backup & Replication; Veeam Reporter, for VMware documentation, change management, and capacity planning; Veeam Monitor, for VMware performance monitoring and alerting across multiple vCenters; and Veeam Business View, a free add-on that works with other Veeam products to provide business categorization for the VMware vSphere environment. With its acquisition of nworks, Veeam's products include the nworks Management Pack and the nworks Smart Plug-in, which incorporate VMware data into enterprise management consoles from Microsoft and HP. Learn more about Veeam Software by visiting www.Veeam.com.*

NetEx has provided high-end networking tools for over 25 years to some of the world's largest and most sophisticated organizations. Today, NetEx focuses on virtual appliance-based WAN optimization software that is affordable and practical for solving WAN throughput issues for users, solution providers and IT service companies. The company is based in Minneapolis, MN. For more information about NetEx, visit www.netex.com or call +1-763-694-4300.