



Virtual Instruments VirtualWisdom Solution and Professional Services help resolve VMware™ performance problems at Large Financial Services Company

VirtualWisdom enables 'end-to-end' view of I/O from VMware ESX Server through SAN to disk array

The large financial services company is a major international provider of financial services and investment resources that help individuals and institutions meet their financial objectives. In addition to more than 300+ mutual funds, this company also offers discount brokerage services, retirement services, estate planning, wealth management, securities execution and clearance, life insurance and is continually expanding services to meet customer needs.

The company had built out a large set of servers, Fibre Channel SANs, and Tier 1 storage in order to setup a flexible environment for implementing virtualized physical servers. By using VMware ESX, time to market for expanding business applications would be faster and lower-cost than the traditional model of one application per physical server.

As the number of virtualized servers increased, the SAN infrastructure and connected Tier 1 storage exhibited serious problems to the point of full production outages requiring reboots of storage and/or servers. So much so that non-production test and development servers had to be shut down to prevent congestion and retries every Sunday evening or periodically when problems appeared. Eventually, all production applications were moved to other environments to mitigate the business impact of the SAN problems.

For a period of eight months, the application, VMware server and storage IT teams, along with personnel from their storage and server vendors worked through a litany of problems all impacting the SAN.

Large Financial Services CASE STUDY

Challenges

- Scaling up the IT environment to meet business requirements for continual expansion of financial services while maintaining a tight 'return-on-investment' model.
- Ramping up VMware ESX servers created serious performance issues and outages.
- Expensive production storage and server components were limited to non-production usage due to performance issues.
- Internal application, storage, and VMware server teams as well as external storage and server vendor personnel were spending hundreds of hours per month trying to rectify problems.

Solution

Virtual Instruments VirtualWisdom

- Virtual Instruments ProbeV
- Virtual Instruments ProbeVM
- Virtual Instruments TAP
- Virtual Instruments ProbeFCX
- Virtual Instruments ROVER
- Virtual Instruments Protocol Analyzer

Virtual Instruments Virtual Infrastructure Optimization & Best Practices Service

Benefits

- Restored use of expensive storage and server components to production use, using best practices to optimize performance and avoid performance issues and outages.
- Have gained full understanding of the I/O performance impact of VMware VMotion, VMware Distributed Resource Scheduler (DRS) and VMware High Availability (HA).
- Development of best practices for configuration and deployment of VMware ESX virtual machines and servers with their SAN.
- Dramatically reduced the admin resources and effort needed to monitor and troubleshoot the environment from ESX server to storage array.

The financial services company found that their point solution monitoring tools for VMware, Fibre Channel switches, and storage arrays could not provide the information needed to resolve a number of problems. These tools could only provide a limited view of the environment and none provided insight into the Fibre Channel communications network. The company's IT personnel realized that they needed to see the 'end-to-end' I/O between the servers and the storage arrays to understand the impact of adding VMware virtual machines was having on the SAN.

The company identified Virtual Instruments' VirtualWisdom as a possible solution to its SAN monitoring problems and to directly help address their issues. Because the problems centered on VMware ESX servers, the Virtual Instruments ProbeVM was essential as it provided I/O information for each virtual machine and ESX server. I/O utilization data from the virtual machines and ESX servers could be correlated with I/O information from the SAN into a single view to optimize performance and accelerate problem resolution.

Virtual Instruments' VirtualWisdom solution was installed and monitored by Virtual Instruments Professional Services. Monitoring of the VMware ESX virtual machines and servers together with the SAN revealed a number of issues that were affecting performance and availability.

QUEUE DEPTH SETTINGS

VirtualWisdom showed that part of the latency issue was caused by incorrect Queue Depth settings. During configuration, the queue depth settings were set too high on the storage array Fibre Channel ports and this resulted in increasing latencies for various applications. VirtualWisdom Professional Services worked with the company's storage administration personnel to develop 'best practices' around queue depth settings on the in-house storage.

Over the course of the problem the storage vendor changed their recommendation for Queue Depth settings. It was believed that this would help alleviate some of the problems. It wasn't clear if this change merely masked the underlying problem or if it had a direct impact on resolving it. It also wasn't clear what impact this change had on overall virtual infrastructure performance for all applications.

VirtualWisdom showed that this change did indeed improve latency in the SAN environment without impacting the overall latency as seen by the servers. Nevertheless, it showed that the Queue Depth settings by themselves did not resolve the problem for all applications in the environment or impact the reservation conflict storms seen when VMotion was applied to a SAN under load.

UNEVENLY PROVISIONED STORAGE PORTS

VirtualWisdom demonstrated that the server demand was not evenly distributed across the storage array controller ports. On an array with 32 ports there were two ports that were at or near the upper limit of utilization. A handful of ports had moderate traffic while the remainder had little or no traffic load to speak of (less than 3% on average). With proper layout it was assessed that the same performance could easily be achieved by having only half as many storage ports.

The customer plans to use VirtualWisdom going forward to layout the load evenly across the storage to maximize utilization, optimize performance and avoid unnecessary purchases of additional SAN hardware.

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DELAYED OR DROPPED TRAFFIC

One of the working theories by one of the storage vendors was that incompatibility between the switches was the causing traffic to be dropped and was the source of the poor performance. VirtualWisdom was able to prove conclusively that no frames were being dropped. The physical layer was healthy and error free and all communication was completing successfully even though it was with significant performance issues. This enabled the customer to focus on the real root cause of the performance issues and not rely on the theories put forth by competing storage vendors.

VMWARE VMOTION, DRS AND HA CAUSED SAN 'RESERVATION STORMS'

VirtualWisdom demonstrated that during higher load times such as virus scans and backups, VMotion and DRS can cause reservation storms that lead to unacceptable levels of latency and VMotion failures. More appropriate Queue Depth settings were used to mitigate the impact of these events. Care needs to be used that these settings don't affect overall performance when VMotion is not actively moving a VM. VirtualWisdom helped the user select optimal settings that yielded good performance while minimizing the impact of VMotion. Even with proper settings, monitoring with alerts is required to ensure that when multiple clusters access the same storage they don't cause outages while simply trying to optimize server memory.

SUMMARY

The Virtual Instruments VirtualWisdom solution, including VirtualWisdom ProbeVM, along with Virtual Instruments Virtual Infrastructure Optimization and Best Practices Services, were able to help this leading financial services company to narrow down the sources of performance issues and enable fast resolution that helped drive VMware ESX virtual machines and servers into full production. This also had the benefit of increasing server consolidation ratios.

Moving forward the company's application, storage, and VMware IT groups now have the confidence that they can meet new business requirements in a timely and cost-effective fashion.

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Other benefits that were derived from the VirtualWisdom solution and professional services included:

- Utilization of the existing virtual IT infrastructure could be improved through tuning and optimization
- Ongoing monitoring, reporting and alerting with VirtualWisdom is in the process of being implemented to ensure that performance continues to be optimal and uninterrupted as the user requirements in this environment changes over time.



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