



Virtual Instruments SAN Health Audit Brings SAN Maturity Best Practices to a Leading Financial Institution

Company Overview

Established over 100 years ago, this Financial Group serves more than 7 million personal, commercial, corporate and institutional customers in North America and internationally. Through its various operating divisions, including commercial and personal banking and wealth management, the institution strives to offer a great customer experience.

IT Environment

This company's data center houses multi-petabytes of data, with additional storage in secondary and disaster recovery sites. Storage is supplied primarily by EMC, with director-class switches by Brocade.

Challenges and Solutions Summary

This multi-national institution was experiencing an application slowdown related to its trading application. It allocated dozens of company and vendor resources, a "tiger team" that met every day during market open and market close, for many months.

- Customer was dealing with application latency (response time) issues that it suspected were storage-related.
- Customer had worked closely but unsuccessfully with its storage partners in an effort to determine the root cause of these performance issues for several months. The storage partners, working collaboratively, had not identified any significant SAN- or storage-related issues that correlated with the observed issues.

Virtual Instruments shipped in a VirtualWisdom PAK (Portable Assessment Kit), and tapped storage links using SANInsight TAPs and performed a detailed SAN Health Audit

Challenges:

- Finding contributing issues and root cause of problems that impact performance and availability
- Server / network / storage/ application performance problem diagnosis

Solution:

- Virtual Instruments SAN Health Audit discovered several discrete issues that, once uncovered, enabled the customer to take measures to avoid SAN related slowdowns or even outages

Benefits:

- Introduced best practices to help eliminate wasted staff time finger-pointing at vendors
- Gave IT operations staff the data to know where to spend time for the best payback
- Identified the most likely causes of application slowdowns
- Enabled the customer to eliminate configuration problems that could have led to application unavailability



NORTH AMERICAN FINANCIAL INSTITUTION CASE STUDY

Professional Services engagement. During that period, the team, including the customer's engineering and operations personnel and Virtual Instruments met to review the metrics provided by VirtualWisdom and to discuss the ongoing analysis. While the problem itself didn't occur during the time that VI instrumentation was in use, there were several anomalies observed in the environment that helped explain why it is prone to outages should other anomalies arise.

Virtual Instruments often finds that storage-related outages and/or performance incidents are not caused by a single issue but are the result of multiple, seemingly unrelated issues in the environment. The net result is that the SAN infrastructure, running in a somewhat vulnerable state is not able to deal with additional issues as they arise resulting in outages or "brownouts". Through this services engagement, the customer learned best practices related to identifying risk areas that when taken in total, often result in application performance problems.

Problems found

The customer engaged with Virtual Instruments to help find multiple SAN-related problems, remediate them, and just as importantly, provide guidance to help prevent similar problems from recurring in the future. VirtualWisdom's unique ability to measure, capture, and analyze SAN events, I/O workload and transaction latency was deemed essential to solve this application slowdown.

- **Connectivity and Errors**

Errors in the SAN can cause significant impact to performance and latency. There were several areas of concern found that could affect overall performance and reliability of the environment. An excessive number of SCSI inquiries were being made by many of the servers. While inquiries are a normal part of the reboot and device discovery process, they are usually not a normal part of steady state operations. In many five-minute time periods there were as many as 1,000 inquiries per server. The concern was that inquiries at this level would not be well-tolerated by some storage arrays and would lead to poor and unpredictable performance.

It was also noted that several physical layer problems were resolved during the analysis period. There were a number of Class 3 Discards, CRC Errors, SCSI Check Condition, Accepts and Aborts identified during this assessment. Servers and applications were being forced to retransmit data affecting overall performance and health of the environment. This added additional load and increased congestion in the fabric.

Virtual Instruments suggested that the links experiencing CRC's should have the SFP's and cables examined for issues and replaced as needed. Many ISL's and storage ports were experiencing Class 3 Discards while utilization levels were low. This behavior is indicative of slow draining devices in the environment. Virtual Instruments recommended that going forward, VirtualWisdom ProbeFCX will be used to identify and properly tune HBA settings and configurations to avoid these problems. Often, properly configuring Queue Depth settings, avoiding mixing link rates and alerting when high numbers of exchanges are pending can eliminate these issues. The SCSI Check Condition Errors appeared to be coming from the

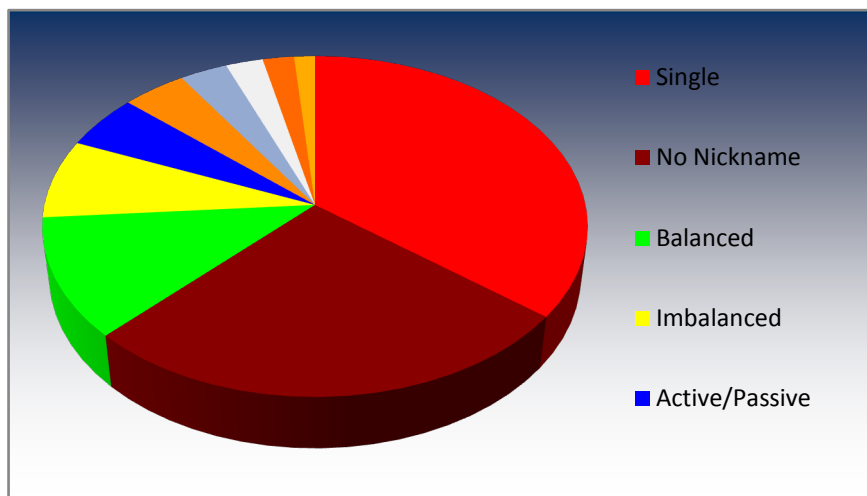
"Two weeks ago, if a storage resource issue was brought to the tiger team, it would take almost an entire afternoon to correlate the data needed to determine next steps in the troubleshooting process, and again the next day if there was a recurrence. With a tool like Virtual Wisdom, that process takes a matter of minutes. VirtualWisdom has given us the chance to monitor in real time, pause the activity seen and scroll through all the different dashboards to determine how that issue correlates across the infrastructure."

SAN Manager
Customer IT

several server HBAs. Virtual Instruments recommended that the HBA and storage vendors should be engaged to review these errors in greater detail.

- **Configuration**

Ensuring that redundant data paths are functioning as intended is important to availability and fault tolerance. There were over 1,000 HBAs that were visible to VirtualWisdom. Of those, 11% were operating in a balanced active/active mode. 5% were identified as acting in an Active/Passive mode. 35% of HBAs were identified as Single, meaning that no secondary data path could be identified for many of the servers on the SAN. There also were many servers where it appeared that all of the HBAs were attached to the same switch which could result in failures if the switch or fabric encountered errors.



Multi-pathing

- **Capacity Planning**

The SAN was largely underutilized with some areas of congestion. 7% of the storage ports had 51% of the traffic. This means that 93% of the storage ports had the other half of the traffic. Some of the ISLs were found to peak above 50%. If one of the paths were to fail, then the ISL peer would struggle to meet the expected performance requirement, which could result in degraded performance, increased latency and possibly an outage. There were some servers that were responsible for the majority of the traffic in the data center. The remaining portion of the environment could be optimized to reduce the number of storage ports by consolidating them.

VirtualWisdom Value

The VirtualWisdom SAN Health Audit is a key step in SAN maturity. It offers an initial baseline of the environment so progress can be tracked as improvements and optimization changes to the environment are made. And it provides a blueprint for avoiding SAN-related slowdowns. This analysis contains many findings and recommendations that are typical for initial SAN instrumentation and should not be perceived as any lack of planning or architecture of the environment.

“Without a doubt, I’ve never been part of an implementation for something of this magnitude that happened so efficiently, especially under the time constraints.”

SAN Manager
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