



U.S. Agency Uses VirtualWisdom® and a Health Audit Service engagement to Optimize the VMware vSphere and Fiber Channel SAN Environment

IT Environment

The Agency datacenter environment consists of blade servers running VMware's vSphere, Brocade 5100 switches, and EMC CLARiiON storage arrays.

IT Challenges

The primary areas of optimization focus are resource contention, utilization, performance, and potential root cause(s) for outages/slowdowns affecting the applications in the data center. The Agency wishes to increase their ability to proactively prevent potential issues which could result in slower application performance or SAN outages.

Solution Deployment

The Virtual Instruments Health Audit Service was implemented in Spring 2011. Metrics were gathered for 15 days, after which the VI PS team delivered the Audit report to the Agency IT management team. The Health Audit Service is designed to measure, analyze and make recommendations on resource contention, utilization, performance, and potential root cause(s) for outages/slowdowns.

VirtualWisdom Value

Once deployed, VirtualWisdom became an indispensable SAN optimization tool for the team. The value they see is focused around 4 areas:

1. **SAN Resiliency** – VirtualWisdom collects and reports on the existence of congestion. Also, VirtualWisdom detects if conditions exist that would affect the fault-tolerance and resilience of the data paths within the fabric. One example of this is where disk multipathing is used (e.g. a host has access to a disk LUN over multiple paths) but one of the paths may not be active or the paths are over 50% utilized, in which case a path outage would result in the remaining path being saturated.

SUMMARY

Challenges:

- Diagnosing SAN problems with a “trial and error” approach
- Implementing new projects and infrastructure with a limited ability to determine the impact in uptime and performance

Solution:

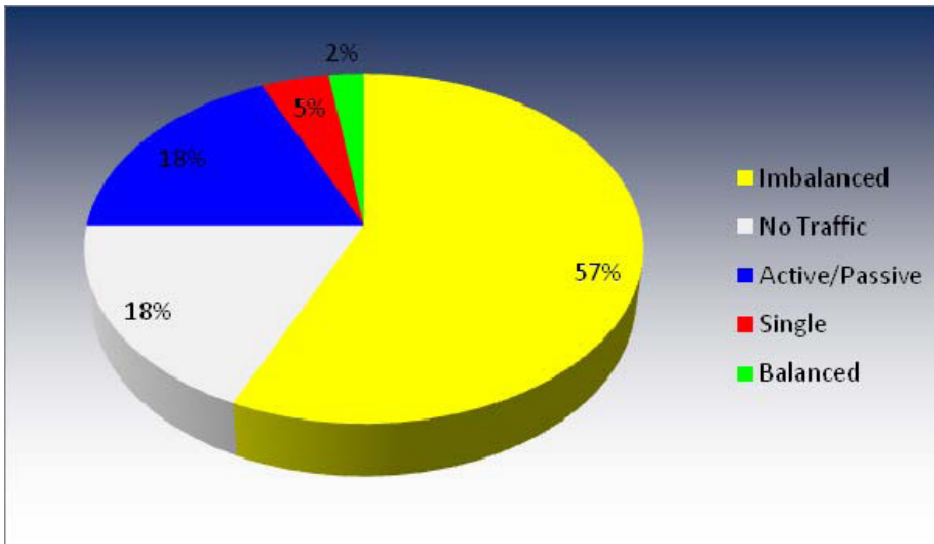
- Virtual Instruments VirtualWisdom and the Virtual Instruments Health Audit Service

Customer Benefits:

- **Application Performance and SAN Resiliency** – VirtualWisdom collects and reports on I/O transaction performance and latency as well as detects the existence of congestion
- **Problem Resolution** – VirtualWisdom is used to bring quicker resolution to issues with the SAN
- **Proactive Monitoring** - VirtualWisdom is used to monitor the SAN and

For all the servers that are running multiple-HBA ports, the goal is to have both HBAs with I/O loads within a certain range of equality if they are configured in an Active/Active fashion. Similarly, the traffic should be balanced on all the multi-pathed ISL (if applicable) and storage ports. It is important to optimize performance but it is even more critical to ensure that the active paths are not single points of failure. Any failure on the only active port could cause a complete outage to the applications supported by these devices.

VirtualWisdom’s multipath verification and redundancy showed that 2.3% of the HBAs are balanced while 56.8% are Active/Active but not balanced. The other 18.2% of the servers are configured as Active/Passive. Peers could not be identified for 4.5% of the HBAs. VI recommended that the environment should be reviewed to ensure that all servers are performing per their configuration. Also, they should find HBAs that don’t have peers, don’t require redundancy, or are actually do have peers with mismatched nicknames. The imbalanced HBAs should be checked to verify that they are all zoned to the same storage array or are behaving as expected. Report graph follows:



provide proactive alerts based on specific measurement thresholds and events

- **Predictive Cost Containment**
VirtualWisdom is used to help optimize existing SAN infrastructure

2. **Performance optimization.** VirtualWisdom collects and reports on I/O transaction performance and latency and detects the existence of congestion. Though the infrastructure response times in the Agency environment are acceptable, as exchanges time averaged less than 10 ms., VirtualWisdom detected a recurring nightly pattern of high latency around 22:20 hours. In some servers, the traffic congestion results in average exchanges reaching 200ms. The duration of high latency lasted for about 8 to 20 minutes depending on clusters.

In the graph below, the SAN Performance Probe Performance Trend dashboard shows high latency starting at 22:00 nightly. The one-hour Summary shows periodic events over multiple days.



Additionally, VMware Distributed Resource Scheduler (DRS) takes note of utilization disparity and moves VMs back and forth between servers every other day. DRS was detecting the nightly spikes and was using its algorithms to move workload around, but due to the nature of the workload it was not an effective balancing of workload. It appears that DRS was just creating more work for the cluster by performing these VMotion activities. The DRS threshold level was reviewed to make sure that it was working as intended.

3. **Proactive Monitoring** - VirtualWisdom is used to monitor the infrastructure and provide proactive alerts based on specific measurement thresholds and events. HBA queue depths are used to manage the maximum number of outstanding commands at any one time from an HBA to a storage port and/or LUN. VirtualWisdom identified several servers with queue depths that are set higher than are generally recommended. In a non-virtualized server environment, a queue depth setting of 8 or less may be appropriate to allow servers in the shared environment to have equal access to the same storage port. This helps reduce the number of slow-draining devices in the SAN. In the Agency environment, several servers which were not part of clusters appeared to have queue depth settings higher (32) than typically recommended.
4. **Predictive Cost Containment** – VirtualWisdom is used to help optimize existing infrastructure (and thereby reduce or delay the requirement for future investment) as well as serve as a baseline to provide valuable I/O workload input in future infrastructure strategic architecture and design decisions. VI found that the Agency SAN is largely underutilized with some pockets of high utilization. This is not unusual and in fact, is a common situation in nearly every SAN environment that VI reviews. At the Agency, storage ports' average utilization peaked at 46% while one-week average utilization of the busiest ports averaged 2.9%. Even with overall low utilization, load balancing between storage ports will help smooth out the pockets of high demand, improving overall system stability during peak demand.

Summary

As the Agency's operation continues to grow, the challenge of ensuring that mission-critical storage networks are, available 24x7 without disruption will also increase. VirtualWisdom enables administrators to set up alarms and trigger events to closely monitor and responded to critical SAN links (ISL, RDF, etc). VirtualWisdom's reporting capability allows users to create a report card for the environment on a timeframe of their choosing. VirtualWisdom increases resource utilization, storage and server administrator operational efficiency, allowing the Agency to automatically monitor virtualized servers and SAN health while proactively avoiding congestion and bottlenecks without having to increase head count.

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