Whitepaper for U.S. Federal Government Agencies

VIRTUAL INSTRUMENTS

12 Ways VirtualWisdom® Enhances Existing SAN and VMware Management Tools

The only hope of meeting today's IT-enabled missions and avoiding skyrocketing costs, involves utilizing virtual data center technologies augmented with more modern management tools. There are many legacy tools, but none provide a complete end-to-end solution enabling IT to avoid wasteful over-provisioning while at the same time, ensuring adherence to Service Level Agreements (SLAs).

Fortunately, there is a new category of products to help fill the gaps in today's management tools. According to a 2009 study by the Taneja Group, "Virtual Infrastructure Optimization will be one of the most pivotal technologies in defining the capabilities of the next generation data center", and they go on to name Virtual Instruments' VirtualWisdom as a leading example.

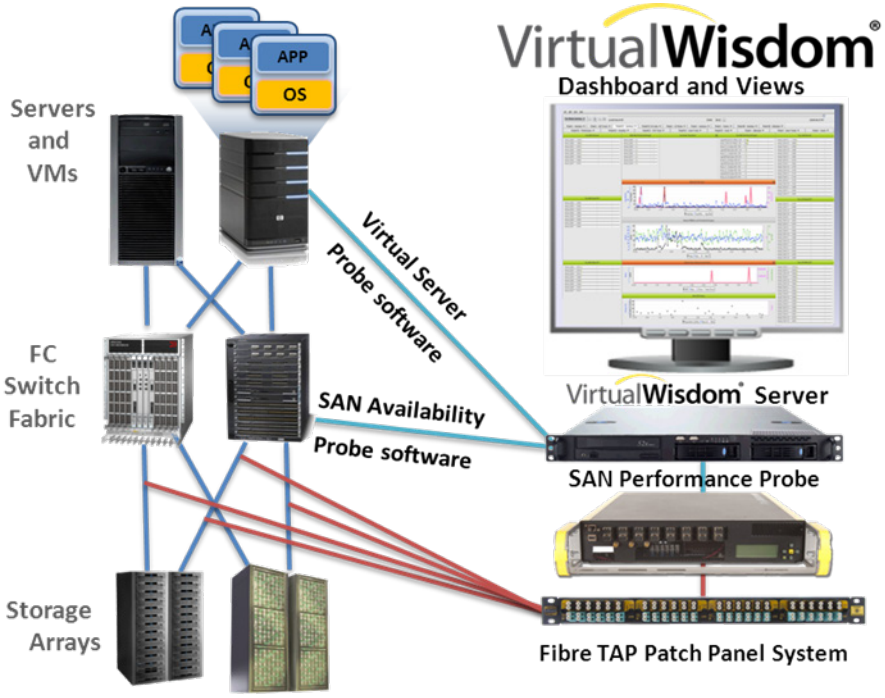
Virtual Instruments is a leading provider of innovative solutions to instrument, measure, analyze, and optimize storage area networks and virtualized infrastructures (*see figure 1*). VirtualWisdom provides real time, continuous SAN monitoring that enables the gathering of detailed VM to LUN statistics from high traffic fabric links to increase performance and reliability. VirtualWisdom provides visibility to all Host/VM/LUN conversations allowing the accurate measurement of application transaction times within the virtualized environment, and highlighting SAN-induced latency issues that dramatically impact service level agreements.

By using a dedicated hardware based probe, VirtualWisdom offers access to in-depth performance data of production SAN environments. Virtual Instruments' protocol analyzer service can be used in conjunction with VirtualWisdom to provide full trace capture capabilities to diagnose difficult performance problems and faults in detail. VirtualWisdom is like a virtual SAN administrator. It constantly scans, provides alerts, then an expert set of tools to zero in and resolve problems. It provides crucial a SAN monitoring, analysis and optimization platform that greatly enhances existing storage and virtual infrastructure solutions.

Summary:

- **Performance optimization with lowered risk.** Virtual Instruments provides the ability to accurately tune your SAN for maximum performance while reducing data integrity risks
- **Continuous real time measurement and monitoring** at the physical Fibre Channel layer provides the most complete and accurate performance information that can be gathered
- **Minimize disruption and downtime.** The heterogeneous intelligent troubleshooting and diagnostic capabilities significantly reduce the time required to resolve trouble tickets, minimizing disruptions and outages
- **Instantly proves whether or not the SAN is the cause of application slowdowns** avoiding the common "rip and replace" exercises that are so costly in time and effort
- **Planning can be significantly improved** by a modeling capability that enables "what if" analysis. Risk of deploying a private cloud infrastructure is significantly mitigated

Today's most common solutions such as Enterprise Management Frameworks, Storage Resource Management, and specialized element managers all lack physical, real-time monitoring of the I/O path. Virtual Infrastructure Optimization solutions such as VirtualWisdom, are the only products that can non-intrusively optimize the performance of applications, including virtualized applications, in continuous real-time by measuring actual SAN I/O traffic data.



Let's start by reviewing the existing performance analysis solutions and their primary capabilities.

STORAGE RESOURCE MANAGEMENT (SRM)

Some Leading Examples:

- Aptare Storage Console
- EMC Ionix Control Center
- EMC Ionix Storage Configuration Advisor
- EMC Ionix Smarts
- HDS Storage Server Manager
- HDS IT Operations Analyzer
- HDS Tuning Manager
- HDS Storage Command Portal
- HDS Virtual Server Reporter
- HP StorageWorks Essentials
- IBM TotalStorage Productivity Center BE
- NetApp SANscreen
- Symantec Veritas CommandCentral Storage
- SolarWinds Profilers

- **Full heterogeneous device support.** VirtualWisdom is not dependent on SAN storage device firmware levels, or new API releases. New devices are supported instantaneously
- **Pre-emptive fault detection.** By continuously monitoring devices and comparing to the known good baseline, VirtualWisdom can diagnose deteriorating devices before they fail
- **Interfaces with existing management frameworks** to deliver alerts and key metrics to help enable a completely consolidated view of the entire SAN infrastructure, including replication sites
- **Change Management.** Can help determine if configuration changes are affecting SAN performance. This greatly enhances the use of storage virtualization techniques, because tiering changes can be made, tested, and implemented without impacting or even involving server or application administration staff.
- **Deploy as a product or service.** For federal agencies wishing to augment existing IT staff with specialists, or who are constrained by budget cycles, VirtualWisdom is available as a Professional Services consulting engagement

Capabilities:

SRM products typically provide centralized visibility and control across most physical and virtual heterogeneous storage environments. By focusing on storage capacity (vs. performance) management, centralized monitoring, provisioning and application to spindle mapping, SRM helps improve storage utilization, optimizes storage resources, increases data availability and reduces capital and operational costs associated with the storage devices.

Many of these tools are “manager of managers”, collecting information from other monitoring tools to provide the topology view, enable provisioning and capacity planning. They may also include host agents, sometimes as options.

The enterprise-class tools such as EMC Ionix ECC, HDS SSM, HP StorageWorks, etc. support, to some extent, a heterogeneous SAN environment. Their promise is a “single pane of glass” for most SAN administrative functions. As they collect information from SAN switch fabric managers, storage array monitoring tools and hosts, these SRM tools typically do not provide any additional performance or health information than the SAN component element managers themselves but may provide more complete and aggregated reporting, including topology rendering. In the area of SAN troubleshooting, these tools typically identify the failed component and the data paths affected by the failed component, up to and including the application. But as we shall see, this is only the first step in optimizing how applications perform in a shared or virtualized storage environment.

The vendors of these SRM products spend a fair amount of effort differentiating their products across several dimensions, including degree of heterogeneous device support, use of agents, application awareness, change management, provisioning, ease of use, and many others. However, in the realm of performance management and troubleshooting similarities vastly outweigh differences when compared with a purpose-built solution such as VirtualWisdom. So, for purposes of this discussion, in the dimension of performance management and troubleshooting, we treat all SRM products as essentially identical and call out any minor differences.

APPLICATION AND VIRTUALIZATION MONITORING TOOLS

Some Leading Examples:

- Aternity FPI
- VMware AppSpeed
- BlueStripe FactFinder
- eG Innovations eG Suite
- Embotics V-Com
- Fortisphere VE
- Knoa EPM
- ManageIQ EVM
- NetApp / Akorri BalancePoint
- Netuitive SI
- Quest Foglight & Spotlight
- Reflex Systems VMC
- Surgient VA
- Veeam Monitor and nworks
- VizionCore vFoglight

Capabilities:

Application and virtualization monitoring tools are very good at optimizing the server environment, but sorely lack adequate network monitoring and analysis capabilities and can't be used to find the root-cause of most performance bottlenecks. Because the biggest cause of application latency is in I/O, these tools miss the biggest opportunity to tune the environment to get higher application performance and higher server consolidation ratios (more VMs per physical server), and they do little to de-risk deployments of mission critical applications.

SAN SWITCH FABRIC MANAGERS

Some Leading Examples:

- Brocade Network Advisor (formerly Data Center Fabric Manager)
- Cisco Fabric Manager

Capabilities:

SAN switch fabric managers (switch monitoring tools) are primarily designed to enable proper switch provisioning, zoning, and capacity management. They manage and secure the flow of data across single-vendor supplied multiple fabrics from a central view. They help IT organizations achieve their goals related to SLAs, security, and compliance while simultaneously containing operating expenses.

As with the SRM tools, in the realm of performance management and troubleshooting, the similarities of these tools strongly outweigh their differences when we compare them with a purpose-built solution like VirtualWisdom. So, for purposes of this discussion, in the dimension of performance management and troubleshooting, we treat all SAN switch fabric manager products as essentially identical, and call out any minor differences.

NETWORK MONITORING FRAMEWORKS

Some Leading Examples:

- CA UniCenter/Spectrum
- HP OpenView
- IBM Tivoli Monitoring

Capabilities:

Enterprise frameworks are designed to offer a wide, but not deep, view of the IT infrastructure. These tools indicate when an application is impacted, when a server has problems, or when a storage array has issues. Typically these are the most-relied-upon tools for IT Network Operations Centers, and are not relied on by application, server, SAN or storage administration teams as primary tools for performance optimization.

STORAGE VIRTUALIZATION MANAGERS

Some Leading Examples:

- IBM San Volume Controller (SVC)
- LSI SAN Volume Manager (SVM) / HP Storage Virtualization Services Platform (SVSP)
- HDS USP-V
- EMC Invista
- DataCore SANsymphony

Capabilities:

Storage virtualization is designed to combine storage capacity from multiple, often heterogeneous disk systems into a reservoir of capacity that can be better managed as a business resource and not as separate boxes. Whether host, switch, appliance, or array-based, they help increase storage utilization by providing host applications with more efficient access to capacity through flexible provisioning tools. By vastly simplifying data migration, they make it easier to match application SLAs with the proper storage tier. And they support advanced copy/snapshot services to enhance data protection. Finally, they provide some level of management reports, but none attempt to specialize in performance measurement or analysis.

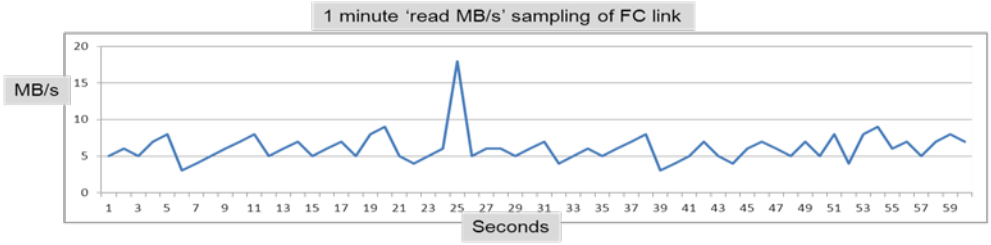
HOW VIRTUALWISDOM COMPLEMENTS EXISTING IT MANAGEMENT TOOLS:

1. **VirtualWisdom adds continuous real time monitoring and filtering that calculates statistics based on seeing "all" the fibre channel frames traveling through the virtualized infrastructure and fibre channel SAN.**

Why this is important:
Traditional SRM and switch monitoring solutions take SAN statistics at preset intervals. Metrics are sampled or averaged, and detailed performance information is lost as a large amount of traffic passes through between the intervals. When statistics are aggregated, such as total MB/sec capacity on a particular port, they cannot provide visibility into the individual application transactions that make up the traffic on that port. In the graph below, other SAN management products would report this graph as an average of a little over 6MB/s, and would completely miss the outlier event at 18MB/s.

"Nearly 90% of all the performance problems that I run into come from mis-configured storage."

Scott Drummonds
Performance Specialist
Group Manager, VMware



To use an analogy, imagine watching a film where you only see one frame out of a thousand. You will get a very good feeling for what is happening, but you'll certainly miss some important content. Using another analogy, imagine the statistics on a military checkpoint that stops cars to fine one 'bad guy'. Statistically, there are very few bad guys, but you need to find them all so you have to stop every car, not every few cars, or an 'average' of cars. So it is with SAN transactions. Even one is bad news.

VirtualWisdom does more than simply measure and monitor; it filters and alerts. The intelligent probes automatically gather, analyze and report on relevant statistics taken from every SAN transaction. So in real time or for any historical period, it can report on metrics like the top 10 most utilized ports or the LUNs with the worst write exchanges. For SRM and switch managers, you can get reports on port utilization, but there's no inherent intelligence to quickly lead to trouble spots. VirtualWisdom finds problems; for instance, it can graph the 10 worst ports against a meaningful metric. VirtualWisdom doesn't force the IT staff to review every metric or device; it already knows where the problem is and presents it. Think of VirtualWisdom as a virtual SAN administrator that filters and alerts on any metric it collects. Non-specialized tools expect you to know where the problem is, and to know when a metric represents a trouble spot. VirtualWisdom has an extensive set of predefined filters and alerts, which are a

result of our expert knowledgebase developed by working with storage administrators, storage vendor QA and field service organizations for most of the common SAN issues.

VirtualWisdom's performance statistics and calculations are gathered by hardware, which provides the most complete performance information on a continuous real time basis. This offers thorough statistical analysis on complete application transaction times, absolute maximum / average / minimum response times, all CRC errors that occurred, logins/logouts, aborts, etc. The comprehensive performance statistics accessible with our hardware-based probe approach offers an opportunity to accurately measure complete application transaction times from the VM to the LUN to improve enforcement of service level agreements. Visibility into this in-depth performance data provides the ability to fully analyze and proactively tune your SAN for optimal performance.

This perfectly complements the abilities of SRMs, switch managers, and other IT tools, none of which are designed for performance analysis or performance optimization. Of course, all make the claim to be a "single pane of glass".

Host, virtualization and application monitors are traditionally blind to SAN I/O. They are optimized for host-based performance optimization tracking CPU and memory usage, and even application design. Once VirtualWisdom identifies a problem with the host / application, the server/application teams use their tools to troubleshoot and optimize the host/virtual server infrastructure.

Network management frameworks consume and aggregate reporting from SRM tools, VirtualWisdom, and switch managers, but do not organically measure, monitor, troubleshoot, or optimize SAN I/O transactions.

2. **VirtualWisdom instantly proves whether or not the SAN is the cause of application slowdowns**

Why this is important:
It's easy for application problems to be blamed on the SAN, and hard to prove otherwise. With the trend to more deployments of private clouds, finding and remediating the cause of application slowdowns becomes even more difficult, and more important. Even with today's SAN management tools, root cause analysis can easily take weeks, resulting in a lot of "rip and replace" exercises. We have heard a number of stories about months-long investigations involving half-a-dozen vendors and hundreds of hours of the IT staff's time. VirtualWisdom's advanced filtering and alerting mechanisms dramatically reduce the false positives allowing you to focus on real issues. Virtual Instruments' solution quickly proves if the issue is in the SAN or not. Historical trending capability enables you identify when the problem manifested itself and provides the various metrics at that precise time. It can automatically trigger a Virtual Instruments Protocol Analyzer to capture relevant traces for the fastest root cause analysis.

At best, the management product you are probably using today reports IOPS or MB/s, which are readily available, but only moderately worthwhile as measures of true storage performance. By far, the best measure of performance is the effect of the SAN on application response time for every transaction. Looking at IOPS or MB/s is like looking at an automobile speedometer, and guessing how long it takes to go to the PX for a loaf of bread. And with the tools you're probably using, it's even worse than that. Extending our analogy, other so-called performance tools look at a number of trips to the PX and tell you what your average speed was, and they won't tell you if one of the trips took 50% longer than the others, or if one of the trips resulted in a crash. Looking at application latency is like having a stopwatch and reporting on exactly how long each trip takes to get to the PX and return with that bread. And with latency measurement, you would know, in real time, if one of those trips takes 50% longer than normal.

3. **Modeling substantially improves the planning and optimization of your SAN and VMware virtualized infrastructure**

   Why this is important:
   A typical challenge for IT is to predict the effect of a change in the infrastructure on application performance. Today most professionals rely on 'rule of thumb' and gut feel, usually augmented by crude I/O statistics, often captured at a single network, storage, or server component. With VirtualWisdom, using the captured and recorded transactions of the actual production environment, administrators and planners can do 'what-if' or 'what would have been' analyses on many conditions. For instance, to consolidate storage ports, you can collapse the number of ports using VirtualWisdom's User Defined Contexts (UDC) and infer the effect on SAN latency to the applications served by those ports. UDCs offer the ability to combine SAN traffic workload to assess the workload impact on different components within the virtual infrastructure (e.g. VMware servers, ISLs, SAN ports, storage targets) when changed to the infrastructure are made. For example, you can use the UDC's modeling capability to reduce the number of ESX servers and increase your virtual machine load and determine the effect on applications, all without touching or impacting your production environment.

4. **VirtualWisdom adds a dedicated traffic and protocol approach to monitoring applications to ensure accurate knowledge about the data movement and data integrity throughout the SAN.**

   Why this is important:
   Storage resource management, switch managers and host/virtualization/application monitors typically provide monitoring with software agents. Typically, these other tools utilize software APIs to poll and gather metrics at 10 second to 5 minute intervals to minimize the actual effect of performance measurement on the SAN being measured. Though they call themselves "out of band", they are referring to the data path, and for non-performance-oriented functions like capacity management, they are indeed out of band. They do not affect capacity reporting, but they do affect performance and performance reporting, and not it a good way.

   SANs, by design, are optimized for two primary objectives: (1) moving data through to its destination as fast as possible and (2) ensuring data integrity. The higher the traffic load on the network, the more the software agent's priority will fall in an effort to concede to the primary SAN functions of rapid data movement and maintaining data integrity. Worse, some agents, by querying the SAN devices, actually take cycles no matter what the application / transaction load may be. Imagine a Navy pilot landing on an aircraft carrier. Every 5 seconds, you interrupt him, asking how the landing is going. He's either going to ignore you ensuring you don't really find out what's happening, or your queries distract him, ensuring a less-than-optimal landing. So we hope he chooses the lesser of two evils; he ignores you. This happens with SAN management products that poll. SAN management solutions like VirtualWisdom which are truly out of band are like radar, in this analogy. They report in real-time, with no effect on the devices being monitored.

   Unfortunately, with agents, SMI-IS, and device APIs, this means lower monitoring capability and accuracy at the SAN's peak times, when gathering performance data is the most critical. For IT staff supporting high traffic networks, complementing their existing SRM / switch manager infrastructure with VirtualWisdom's dedicated hardware for true 24X7 monitoring, is a necessity. They need to know data is protected and monitored with the utmost accuracy possible. If they cannot view complete performance data about their networks, something might be missed-and that something could lead to a performance degradation or service disruption.

5. **VirtualWisdom adds event recording and real time capture capabilities.**

   Why this is important:

SAN components usually don't fail catastrophically; they degrade or exhibit intermittent problems. It is often difficult to pinpoint problems and bottlenecks in a production SAN, let alone correct them. VirtualWisdom can identify not only a device failure when a device stops responding to the metric collection queries from the software, or when the traffic through the device comes to a halt or when the device logs out, but also a deteriorating or a misbehaving device. It does this by continuously monitoring and comparing to the known good baseline. Our solution finds whether the device is logging in and out often, if it is sending too many RSCN requests, if there are too many SCSI errors, or even if there is light loss on the link. These early indications of misbehavior are essential in preventing application slowdowns and blackouts. Also, you can quickly verify if multi-pathing is working correctly and is transferring data equally down both active-active paths.

To try to isolate a problem, SAN administrators typically use a process of elimination - swapping out a SAN component starting from the cheapest components (cabling, GBIC, HBA, etc.) until they think the problem is solved. However, this potentially could make the problem worse and they don't know if they actually fixed the problem as the root cause was never in fact determined. In addition, requesting outside field service for onsite troubleshooting often requires significant time delays and additional support costs while users continue to experience the performance problem or disruption. For intermittent and reoccurring problems, VirtualWisdom event recordings and trace captures allow for the reproduction and pinpointing of errors for quick, efficient problem resolution.

With Virtual Instruments solutions in place, SAN administrators have the ability to record and play back metric recordings of intermittent problems before they build up and disrupt the SAN. SRM / switch managers keep histories, but they do not take into account every transaction; they are aggregates or samples. Going back to our security checkpoint analogy, you need to stop every car, not a sample of cars, if you want to catch the "bad guy", aka the "bad transaction".

The troubleshooting and diagnostic capabilities offered by VirtualWisdom will significantly reduce the time required to resolve trouble tickets which in turn minimizes disruptions and outages.

6. **VirtualWisdom adds performance trending of SAN device components to identify hardware degradation and preemptively replace components before they actually fail.**

Why this is important:
Doctors measure patients' absolute cholesterol levels to help warn of serious health risks like heart attacks. How many of us would accept a physician who waits to see other indirect signs of heart problems, signs that are easier to observe? It is always better to take direct measurements when possible. SRM tools can see errors at higher layers of the network stack, finding Fibre Channel/SCSI errors at lower hardware levels would depend on whether the error is severe enough to filter up to the higher network protocol layers. This dependency leads to the high probability that many hardware related errors go undetected, leading to performance bottlenecks, hardware device failures and could eventually lead to a disruptive network failure. VirtualWisdom's complete ability to view the lower Fibre Channel/SCSI levels of the network stack provide visibility into error statistics such as CRC errors, physical link errors, protocol errors, code violations, etc.

What would you and your physician give to be able to get a report on your lowest and highest cholesterol levels for any points in history, and compare them with what you were eating and what exercise you were getting at those times? While SAN switch monitors may be able to see some lower levels, VirtualWisdom adds the ability to do historical trending and correlation for any time period, not limited to 30-minute snapshots, or port limits, or event limits, or polling cycle limits of individual device performance (i.e. response times, exchange times, etc.). VirtualWisdom provides the capability to preemptively isolate devices before they degrade,

enabling replacement of devices before they actually fail, avoiding costly unplanned network and application downtime. This flexible, proactive analysis of hardware failures is key to maintaining SAN network uptime and ensuring maximum return on a SAN investment.

7. **VirtualWisdom adds the ability to gather in-depth Fibre Channel network statistics such as pending exchanges to tune queue depths for maximum performance.**

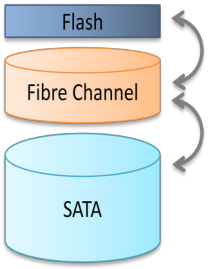
   Why this is important:
   One more example of the relevant use of comprehensive Fibre Channel network statistics is the optimal setting of queue depths, which has always been a delicate balancing act for a deployed storage area network. Setting queue depths too low on a HBA could significantly impair the application's performance, while setting it too high could risk overrunning the storage queue and losing data. VirtualWisdom's ability to view real-time and historical trends of pending exchange data allows the administrator to see how the queues are actually being used in their production network. This provides the ability to accurately tune queue depths within a network for maximum performance while limiting data integrity risks, thus resulting in higher performing SANs. No other management technology monitors at this level.

8. **VirtualWisdom adds the ability to determine if configuration changes affect SAN performance by examining SAN latency.**

   Why this is important:
   Yet another example of the relevant use of comprehensive Fibre Channel network statistics is the use of end-to-end latency. This is particularly important in private cloud deployments which make extensive use of virtualization, which further reduces the transparency of problem cause and effect. You can use VirtualWisdom to compare performance and health before and after SAN changes to catch configuration problems before they impact business. Switch Fabric managers usually only report latency for FCIP tunneling only. If SRM tools report it (most do not), they do it by using heavyweight host agents, which as we have discussed, actually affect the statistics they are monitoring. Although some host / virtualization / application monitors can track application latency, which is useful in detecting problems, they cannot see into the SAN to track latency to determine where the problem lies.

9. **VirtualWisdom enables more effective use of storage tiering, especially in environments using storage virtualization techniques.**

   Why this is important:



   This benefit is closely related to #8, but because of the potential effect to capital and operating spending savings, is worth calling out. As mentioned previously, VirtualWisdom can be used to compare performance and health before and after SAN changes to catch configuration problems before they impact business. Many agencies hesitate to provision their mission critical applications on tier II storage or SATA drives, for fear that performance won't meet requirements. Picking the right storage tier can be risky, because most IT shops do not have the right instrumentation. Or, their ILM and HSM projects stall because there's no way to know how tiering will impact users. Or finally, they are hesitant to deploy to private cloud infrastructures for their inability to track and build meaningful SLAs.

   With VirtualWisdom, IT organizations have the latency data and other information needed to properly plan and optimize the storage environment so that lower cost tier II storage or SATA drives can provide tier I performance. Organizations that combine sophisticated storage planning with our real-time alerting capabilities can prevent user impact as demands change, enabling them to see avoid wasteful spending. The organization can use tier II or tier III storage for all applications except those that actually demand tier I attributes, such as mission-critical-class replication. When the ILM decision is based on performance, VirtualWisdom offers the real-time analysis that proves the effect of the storage on application response time. Using less expensive storage can result in $5K-$10K per terabyte savings and reduce overall storage

costs by up to 60%.

10. **VirtualWisdom adds remote replication performance and health troubleshooting.**

    Why this is important:
    Today, government IT relies heavily on remote replicated sites to ensure "5 nines" of availability. VirtualWisdom provides the visibility into performance and health of the remote replication process and how remote replication might be impacting the application performance or recovery point objectives (RPO). It provides visibility into remote replication throughput and response requirements, enables stress testing of remote replication infrastructure, provides insight into remote link throughput and latencies and identifies any misbehavior in the remote replication infrastructure either in the primary SAN, the remote SAN, or on the WAN link/equipment. It alerts on events such as increased response time for remote acknowledgements, link resets from the remote array, extended RPO time due to slow replication process, and misbehaving equipment in the remote site that may impact application performance. SRM tools are not typically tied into the replication infrastructure.

11. **VirtualWisdom includes support of all SAN devices: legacy, "other" vendor, or bleeding-edge new components, scaling to the largest environments**

    Why this is important:
    Either through M&A, consolidation, or simply technology refreshes, IT is being asked to support legacy systems, components from "other" vendors, and the newest device from their favorite vendor in ever-larger environments. SRM, switch managers, and others are dependent on APIs and/or adherence to emerging SMI-S or SNMP standards. Today, even the storage vendors own SRM products usually don't fully support their new devices on day one. In a typical large government SAN, the existing tools usually cover a large part of the infrastructure, but not everything. Most products in this category do a good job of supporting that vendor's SAN components, but are notoriously weak at supporting products from other vendors.

    VirtualWisdom is not dependent on SAN component device firmware levels, add-on switch licenses, or new API releases that always accompany a new storage array. New or legacy devices are supported instantaneously, as long as they are fibre channel devices. Virtual Instruments protocol analyzers represent an industry standard solution which vendors themselves use to test their equipment and provide an impartial picture to identify issues and resolve problems quickly.

12. **VirtualWisdom is available as a Professional Services consulting engagement.**

    Why this is important:
    Most SAN management solutions require a substantial commitment of time, personnel and equipment. It's not unusual for an agency to report that it can take months to fully deploy an SRM-type project, with a commitment of several hundred man-hours. For both civilian and DOD agencies wishing to augment their existing IT staff with specialists, and who are constrained by budget cycles, or who have other uses for capital spending, VirtualWisdom is available as Professional Services offering from Virtual Instruments and our federal resellers and integrators.

Summary:

Because of its unique design and continuous real time physical layer monitoring, Virtual Instruments' VirtualWisdom can perform crucial functions that other systems are not designed to provide. Virtual Instruments can play a significant role in maintaining SAN health, optimizing storage tiering and removing the risk of putting mission critical applications in virtualized environments.

As an important bonus, VirtualWisdom is available as a product or service offering through federal integrators.

When other solutions fail, many government data centers rely on VirtualWisdom as the ultimate performance analysis and virtual infrastructure optimization solution.

VIRTUAL INSTRUMENTS

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