



Do You Know the Health of Your Network? — With NetWisdom, You Would

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Management Summary

Driving down the highway at 65 MPH is not the time to learn - for the first time - that you have engine trouble. When your accelerator is on the floor and you s-l-o-w from 65 to 50 to 35, or your car comes to a complete stop, what can you do? Well, you can say, “*What Happened?*” Unfortunately, that does little good. Today’s automobile manufacturers have tried to prevent these occurrences from happening by embedding the most sophisticated processors throughout the entire car to continually monitor the health of everything from your engine to the braking system to the transmission. Some conditions will turn on an idiot light, such as the *check engine light*, to alert you to some pending failure. However, without the correct diagnostic equipment, you have no idea as to which of a hundred possible conditions turned that light on. You can take your car to a gas station, but if that station does not have the right equipment for your make and model, the service writer can do little but send you to the nearest dealership for your vehicle for trouble-shooting. New services, such as *On*Star*, are available to monitor the condition of the sensors and notify you of possible failures. In this way, you can avoid an unexpected, and lengthy, visit to the service garage.

Similar scenarios occur in the data center of every enterprise. With hundreds, and even thousands, of high-tech nodes to monitor, the IT staff maintaining a mission-critical network cannot be sure of the origin of a failure when an outage occurs. Moreover, how do you track down the guilty node when response time slows? Is the problem with a server? Which server is it? Is it in the storage network? Is it in the communications infrastructure? What is the cost to your enterprise of an hour of downtime? Worse, what is the cost of an undiagnosed slowdown, with multi-second or even multi-minute response times while queries are navigating a network that has turned into the equivalent of dirty engine oil? **The data center staff needs equally high-tech diagnostic tools to maintain the infrastructure and troubleshoot glitches before they become problems.** One company has recognized this problem and has come up with an answer.

Finisar has developed an early warning system similar to that found throughout your auto. With *NetWisdom*, Finisar enables your IT staff to monitor and measure thousands of sensors that are embedded throughout your network in every server, storage array and communications switch. The data center can now predict, *and preempt*, unexpected outages or slowdowns, eliminating lengthy response times over the enterprise network. To learn how you can gain control of your network, please read on.

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The Enterprise Data Center Chaos

Enter any enterprise-class data center and what do you see? The simple answer is *at least one of everything!* The typical data center has a myriad of servers: *scale-up* to do mission-critical application functions and *scale-out* to do I.T. infrastructure activities such as file, print, and web services. While many of these servers will have x86 processors built around either Intel or AMD architectures, a decade of mergers and acquisitions often results in a heterogeneous mix of platforms, including current systems built with proprietary architectures from IBM (*POWER*) and Sun (*SPARC*), as well as end-gamed platforms from HP (*HP-PA*). If you're lucky, you might even spot a dinosaur, sorry, make that a mainframe. The data center staff is also charged with the responsibility of integrating a virtual plethora of storage products into this environment, disk and tape devices acquired from all of the leading system vendors, such as Dell, HP, IBM, etc., as well as storage providers, such as EMC and Hitachi. Oh, and by the way, let's not forget about the communications infrastructure with adapters, directors, routers, and switches from Adaptec, Brocade, Cisco, and any number of others, from D to Z, who have been providing networking solutions to enterprise data centers around the globe.

In an attempt to create order out of chaos, every CIO worth his salary has been implementing a variety of **consolidation** projects to change the data center paradigm, to reduce, if not eliminate, some of the **complexity** out of the I.T. architecture. The data center staff consolidates any numbers of inefficient x86 platforms, running at between 15 – 20% server utilization, into **scalable Windows** and **Linux** servers running on the latest multi-core architectures. They then **virtualize** these servers with a complementary mix of applications to take advantage of every compute and I/O cycle available. After that, or many times while this is going on, the enterprise attaches all of these compute engines, storage devices, and communications infrastructure onto a storage area network (SAN), a single wire **designed to simplify data center operations**. Oh yes, the data center staff can then join in communal prayer hoping that nothing goes wrong! **Unfortunately, without the proper diagnostic tools in place, that staff is now blind as far as being able to identify the source of a system crash, or even a network**

slowdown, as it may originate in another part of the infrastructure. This can limit the staff's ability to prevent mission-critical application slowdowns and blackouts and lead to wasteful fire fighting and finger pointing. It can lead to unnecessarily long resolution times, as the staff cannot be sure of the source of any communications issue. At a cost ranging from thousands of dollars to millions of dollars per hour, depending upon application set and enterprise size, the risk is greater than most executives would care to face. As the old saying goes, "you don't know what you don't know".

Who is Finisar?

One company with the tools and services necessary to diagnose your IT infrastructure, and pinpoint the guilty spark plug, or node, is Finisar. Finisar Corporation, founded in 1988 to develop and manufacture network transceivers, has now evolved into a leader in the development of fiber optic subsystems and high-performance network test systems over both local area networks (LANs) and storage area networks (SANs). Finisar introduced the *Xgig Protocol Analyzer* and *Xgig Expert* software in 2003, the industry's first distributed scalable analysis platform for SANs and LANs. A global company with over 4,200 employees, Finisar is at the forefront of the optical communications industry, delivering breakthrough products for storage and networking. Finisar has now broadened its sights to target a telecommunications industry deeply involved in retooling its legacy infrastructure, to deliver a broad range of essential solutions. Building on Xgig, Finisar has developed a set of tools, *NetWisdom Enterprise Solutions*, to monitor performance and diagnose network issues.

You may not have heard of Finisar, but their fingerprints are all over your data center. Whenever you have a complex networking problem, and your service partner, whether it is IBM or Sun, Cisco or Brocade, or any number of others, needs to gain visibility to all of your network traffic, they will attach a Finisar Xgig Analyzer to your SAN in order to diagnose the issues, either directly or thru a Finisar *TAP*¹. The Xgig *enables* the technician to access all point-to-point conversations within the SAN, from all vendors and diagnose the problem. The problem with this is, when the network is back up to

¹ Traffic Analysis Point or Traffic Access Port.

speed, the engineer will remove the Xgig until the next time. If he did not install a TAP to connect the Xgig, the Xgig has become a part of the network solution. The data center staff may not want the analyzer removed for fear that the problem will recur. If the Xgigs and TAPs were a permanent part of your network architecture, not only would you not have a prolonged slowdown or outage waiting for the Field Engineer (FE), you do not have to rip your cables to connect the analyzer to the links, which may hide the problem and make the diagnosis so much harder and longer. As with the On*Star service in your car, Finisar in the data center could help you prevent problems from occurring in the first place.

Finisar's Enterprise Solution

Your network is a heterogeneous mix of servers, storage devices, and I/O controllers, communicating between unique nodes along a SAN. No single hardware vendor provides you with all of the tools necessary to continually monitor network performance along the SAN and troubleshoot problems when they arise. As mentioned above, when all else fails, your service provider can, and will, deploy a Finisar performance analysis solution to debug the network. Unfortunately, for the data center, this deployment may include the installation of any number of TAPs throughout the network, bringing it down, to capture all transactions. This does take time, as does their removal when the problem has been resolved. What is the cost to your enterprise for the slowdown, or worse, outage? On the bright side, it might be only \$50,000 per hour. On the dark side, it could be millions depending on the size of the enterprise and the applications effected. Did I mention that we could be talking about a four-hour problem, an eight-hour problem, or possibly much longer? In the words of the late Sen. Everett Dirksen: *A million dollars here, a million dollars there; pretty soon it adds up to real money!*

What would it be worth to you if you could prevent the outage in the first place, or at worst, enable you to resolve the problem in minutes rather than hours or days? Deploying your own Finisar enterprise solution just might do that! Yes, there is a cost, but all insurance has a cost, and we continue to buy it to protect our families and ourselves. The important question to ask is, what will be the cost to the enterprise (and your job) if you do not have this infrastructure in

place? Finisar's tiered monitoring solution collects critical information from all SAN infrastructure components into a *NetWisdom Enterprise Server* through a network of pre-installed TAPs, via a variety of switches, probes, and protocol analyzers in order to protect your networks.

Traffic Analysis Point (TAPs)

Finisar deploys TAPs throughout the SAN to gain **read only access** to traffic flowing on a physical connection (link) between two or more nodes within a network. These TAPs are passive optical splitters² that do not add any latency to the network traffic and are not a point of failure. Finisar High Density TAPs are rack-mountable 16-port passive devices that provide exact replica of the traffic through the TAP ports, where a probe or an analyzer can be connected to provide transparent, non-disruptive access to all Fibre Channel (FC) traffic for monitoring, analysis, and diagnosis. **By pre-installing TAPs in your SAN, the data center can conform to best management practices for the monitoring and debugging of mission- and business-critical links through a non-disruptive instrumentation layer, enabling network maintenance activities when, not if, traffic jams throttle your performance.** A pre-installed TAP can pay for itself in less than a minute given the cost of downtime.

ProbeFCX SAN Probe

Where the Xgig is the hunter, searching out root causes of problems on the SAN, the Finisar *ProbeFCX* is the gatherer, analyzing every packet in real-time on FC SAN links and storing the data in the NetWisdom data repository. A ProbeFCX can be dedicated to a single SAN link by connecting directly to a TAP port, or, connected to a Rover, tap into multiple SAN links to provide statistics about storage traffic to any SAN device or application.

The ProbeFCX monitors all the traffic and every FC/SCSI transaction in real-time at 4Gb/s to detect an application performance slowdown. It maintains metrics for every server/volume pair, measuring latency on the SAN from servers to storage systems, as well as through wide-area networks. It provides NetWisdom with a baseline of metrics to verify that there are no impacts from future upgrades or changes to the applications.

² Finisar is a market leader in delivering optical technology products.

In addition, ProbeFCX can be used proactively to detect failing devices by monitoring link errors and SCSI operation errors. By examining queue depth metrics, i.e., the number of active and pending SCSI exchanges to the same port, it can provide NetWisdom with data on congested storage ports

Rover Switch

The *NetWisdom Enterprise Rover* enables the data center to share a pool of monitoring devices and analyzers, such as ProbeFCX or an Xgig. The Rover maximizes the number of SAN links that NetWisdom can manage via a single monitor, lowering the cost of SAN monitoring and analysis. It is a non-blocking, any-to-any connectivity switch that NetWisdom controls to switch a ProbeFCX between SAN links (via the appropriate TAP). NetWisdom determines Rover behavior by managing the number of SAN links that a single probe will monitor, based on user policies, and the length of time that the Rover will collect data from each SAN link before moving on to the next link in the Rover's group³. The data center can also establish a policy to dedicate a probe to a single SAN link in order to provide a steady stream of data and faster notification of errors or performance slowdowns. NetWisdom Enterprise Rover enables a tiered monitoring architecture for tiered storage infrastructures.

The Rover is rack-mountable and available in three configurations: 1U to support 8-links, 3U for the 32-link model, and an 8U version to support up to 144 links, and is scalable to thousands of SAN links. All three models support 4Gb/s connections and carry full enterprise-class redundancy.

Xgig Protocol Analyzer

The Xgig Protocol Analyzer is the tool used by all FC SAN equipment manufacturers to develop and validate their switches, HBAs and storage arrays, and by FEs to diagnose and resolve enterprise SAN issues. An Xgig is available with one, two, four, or eight analyzers in a rack-mountable 2U chassis.

The FE typically connects an Xgig to an identified trouble link, generating a diagnostic trace that he can analyze to resolve the problem. Unfortunately, the FE with the Xgig and the proper training may not be readily available.

³ A Roving Group is a user-defined grouping of links monitored by a single probe.

Exhibit 1 – Finisar Services

- **Troubled Link and SAN Fabric Assessment** – Enables NetWisdom to delve into the physical layers of the SAN to find the source of any performance problem or fault;
- **Replication Assessment** – Helps the IT staff to plan and execute replication projects, to anticipate and prevent any potential issues, and to diagnose any remote replication problems;
- **Application Assessment** – Ensures that SAN data paths supporting mission-critical applications are free of error, operating optimally, and have the capacity to fully support a growing SAN; and
- **SAN Health and Performance Scan Service** – Identifies performance and behavior anomalies and trouble spots on the SAN.

How much time, and money, would *your enterprise* save if there were an Xgig and pre-installed TAPs in the data center to analyze traffic issues when a failure occurs?

In addition, Xgigs deployed along with NetWisdom Solution can reduce the time to problem resolution by automating the capture and analysis of data from identified trouble links. NetWisdom can set alarms to warn data center staff of a fault or the breach of a pre-set threshold, identified by a probe, and then can point an Xgig analyzer to that link for traffic capture.

NetWisdom Software and Services

NetWisdom is more than just a one-size-fits-all application. All enterprises are different, from the largest enterprises to the SMB around the corner. They all need to manage varying levels of complexity, requiring a scalable set of capabilities for the diagnosis and prevention of network slowdowns. NetWisdom has extensive filtering and alerting capabilities that can create threshold requirements for all the metrics it collects and alert on any violations. NetWisdom further offers flexibility in defining alarm thresholds that make it easier to alert for true problems without alerting for non-issues such as a server reboot or normal I/O patterns. NetWisdom provides historical performance, error, alerts, and event trending information for end-to-end application I/O conversations. If the appli-

cations are running slow, it can go back in time and identify when the application I/O profile changed and what were the performance, alert, event and error characteristics at that time. It can also be configured to trigger the Xgig analyzer, to collect an industry standard trace prior to the event and after the event to enable fastest root cause analysis.

Finisar provides the data center with a family of products and services to choose from, with three levels of software functionality to match the data center's needs and expertise, and multiple services to enable them to deploy, monitor, troubleshoot, and manage, the SAN (See Exhibit 1, on the previous page).

NetWisdom Express

The entry level of the Finisar family is *NetWisdom Express*. It uses a virtual probe, *ProbeV*, to collect statistics remotely from a heterogeneous set of fabric switches via an SNMP interface. It monitors fabric performance and SAN bandwidth utilization, identifying critical errors in the SAN fabric. It does not require any of the Finisar hardware equipment.

NetWisdom Enterprise

NetWisdom Enterprise builds upon the functionality in the Express version by adding ProbeFCX SAN probes and Rover Switches to view every packet on the monitored SAN links in real-time and collect protocol level metrics and faults. It uses ProbeFCX to view each packet, using Rover to extend its range to large numbers of SAN links. Enterprise proactively detects SCSI I/O slowdowns, failing SCSI devices, latency problems, and queue overflows on storage and servers. By monitoring each application I/O request in real-time from the time it leaves the server HBA, through the SAN fabric, to the storage array then back to the application server, immediate visibility is gained into exactly how well the SAN infrastructure is meeting the application's demands.

NetWisdom Enterprise Expert

NetWisdom Enterprise Expert represents the high end of the NetWisdom software family. Building upon the functionality delivered in the Enterprise version, Expert adds the functionality necessary to manage the Xgig Protocol Analyzer. This extends the metrics collected by performing a detailed offline analysis of problematic storage traffic. As with ProbeFCX, the Expert version can extend the view of the Xgig

to many SAN links by connecting through a Rover. NetWisdom can automatically trigger the Xgig analyzer to collect traces from a troubled link before and after appropriate trigger points, enabling the SAN administrators to get visibility into exactly what was going on when an event occurred.

The Expert version will diagnose complex SAN problems such as time outs, data congestion, and lost data, as well as buffer credit shortages on a fabric port. Further, it will diagnose acute problems due to code violations or faulty hardware and all contingencies of SAN problem identification.

Conclusion

Best management practices dictate that you must instrument the SAN. Acquisition costs pale in comparison to cost of an hour of downtime, or limping along for days, waiting for a scheduled maintenance period to install the necessary hardware. There is a virtual plethora of tools available to monitor applications, hosts, switches, and storage. There are also an equal number of storage management/framework tools available. So, why select a NetWisdom Enterprise solution? While all of the tools mentioned perform well within their specific realm, they do not have the ability to identify early symptoms of storage infrastructure issues such as a device responding poorly or starting to fail, changing I/O patterns, increased response times or queue depths, and slower remote links. NetWisdom does.

It is the only solution that provides real-time SAN traffic monitoring, baselining, and advanced filtering and alerting, along with historical trending and rapid root cause analysis. NetWisdom proactively identifies evolving issues across a heterogeneous storage environment, between SAN fabrics, and even across datacenters – and it does it on a single management view. When the cost of an hour of downtime exceeds the acquisition cost of a tool that can keep your network operational, **the question should not be whether you could afford to deploy NetWisdom; the question is whether you can afford not to!**



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