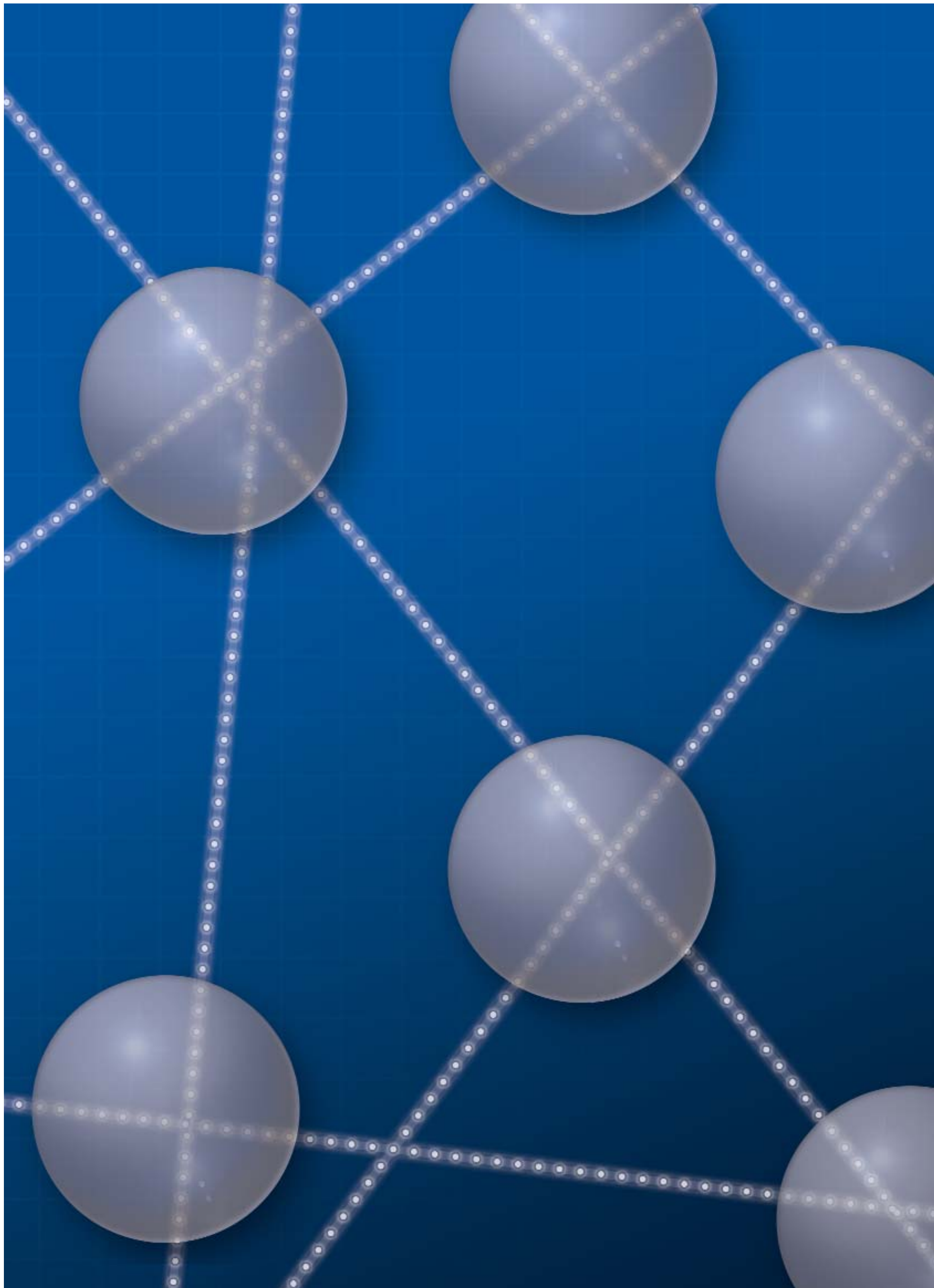
Finisar

NETWISDOM ENTERPRISE

NetWisdom Enterprise provides an unprecedented scope of diagnosis and prevention capabilities for complex, heterogeneous fibre channel storage area networks (SANs).



The Finisar NetWisdom® family of performance-monitoring products is designed to allow a new level of diagnosis and prevention on complex, heterogeneous fibre-channel Storage Area Networks (SANs). SAN administrators can implement all or portions of the NetWisdom family of products to address specific issues, verify service levels, and provide deep monitoring and analysis on multiple SAN tiers.

DIAGNOSIS AND, PREVENTION IN SAN PERFORMANCE MANAGEMENT

IT organizations that manage high levels of complexity in their Storage Area Network (SAN) infrastructures require a sophisticated set of capabilities for the diagnosis and prevention of SAN slowdowns. Your SAN complexity is driven by the heterogeneity of your storage subsystems, host bus adapters (HBAs), operating systems, fabric switches, Wide Area Networks (WANs), Metropolitan Area Networks (MANs), multi-site replication, storage and tape virtualization, and the continued growth of your data and bandwidth utilization. The consolidation of your infrastructure and SAN services, due to acquisitions and Information Lifecycle Management (ILM) architectures as well as the addition of new technologies and infrastructure, further complicate your SAN administrator's ability to characterize "normal" SAN operation.

Standard Storage Resource Management (SRM) products cannot provide the sophisticated diagnosis and prevention capabilities necessary to maintain such complex, heterogeneous, fast-changing SANs. Acute SAN problems and outages must be diagnosed swiftly, without vendor finger-pointing or time wasted in waiting for the appropriate analysis tools. Simultaneously, chronic problems must be proactively detected and resolved before they become acute. And in order to prevent chronic problems, your on-going IT practices must include baseline comparisons of Input/Output (I/O) performance, bandwidth utilization, and average I/O completions to verify that changes in your hardware, firmware, or configuration do not adversely impact your business-critical applications or SAN services.

NETWISDOM FAMILY OF PRODUCTS

NetWisdom consists of a family of products that can be used to achieve different levels of sophistication in SAN monitoring. The NetWisdom architecture maximizes the SAN administrator's ability to implement varying NetWisdom Enterprise configurations, based on the needs of the SAN or SAN tier, and to add product components incrementally as budget and time allow.

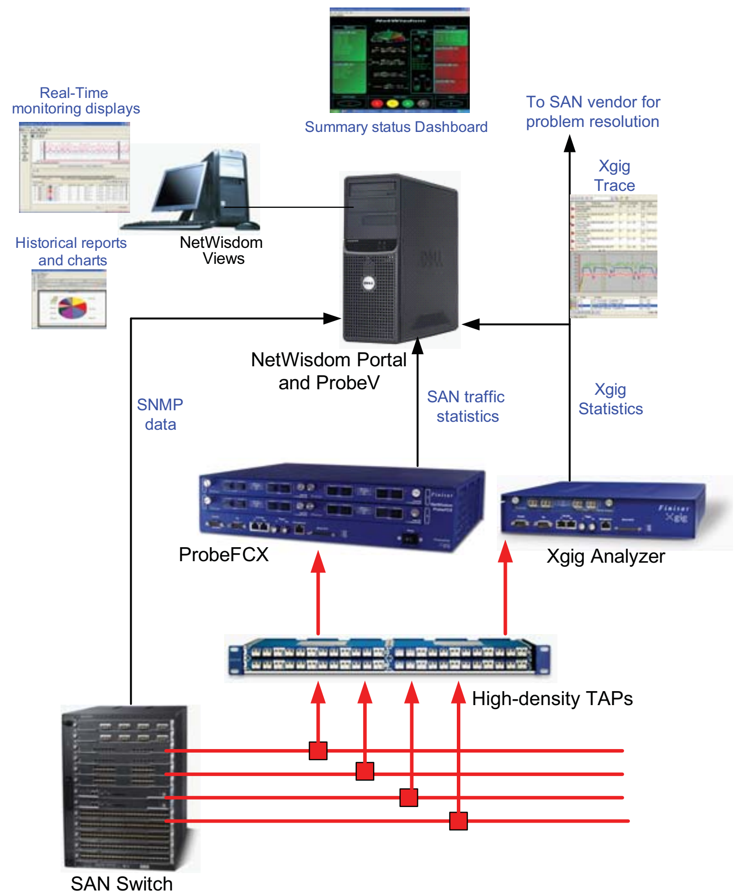


Figure 1: NetWisdom Product Components

NETWISDOM VIEWS

NetWisdom Views software allows users to access the NetWisdom database from their workstations in the form of reports, graphs, and tables (see figures 2 and 3). This powerful and flexible user interface is designed to support SAN administrators using NetWisdom for SAN diagnosis, monitoring, and problem prevention. Views software enables the monitoring and analysis of multiple fibre-channel links simultaneously and allows the user to debug at all levels of the protocol storage traffic of the SAN. Views software displays over fifteen predefined events, such as SCSI check condition, extended-link services, and link-up.

NetWisdom Views software allows the SAN administrator to review detailed metrics in either a table or a graph view and to chart historical trends. With the Real-Time Table View, the SAN manager can quickly determine which devices are active or have become disconnected from the link. The Fabric View allows the user to monitor a group of related statistics per end-device conversation and sort multiple conversations based on any metric (e.g. SCSI exchange completion times). The Graph View provides real-time comparison and combination of metrics, allowing trend-of-activity comparisons for device-level or link-level analysis.

All of the Views are updated either at regular intervals or at user-defined time periods of history summarizations. The Record and Playback feature of NetWisdom Views allows analysis and comparison of performance and health at an alternate time and date.

NETWISDOM PORTAL

NetWisdom Portal software resides on a Windows platform, controlling and collecting metrics from software ProbeVs and fibre-channel ProbeFCXs. The Portal co-resides with the ProbeV software. ProbeFCX probes send storage traffic packet metrics to the Portal every second, and ProbeVs send updates of SAN fabric metrics at five-minute intervals. The Portal collects end-to-end SCSI device conversations and link metrics from the ProbeFCX probes along with summary SAN fabric performance data and faults from the ProbeVs. Metrics are stored in a local database by the Portal. Metrics are coalesced into summaries periodically, based on user-defined policies, in order to optimally manage the database space.

Figure 2: NetWisdom Real-Time Tables

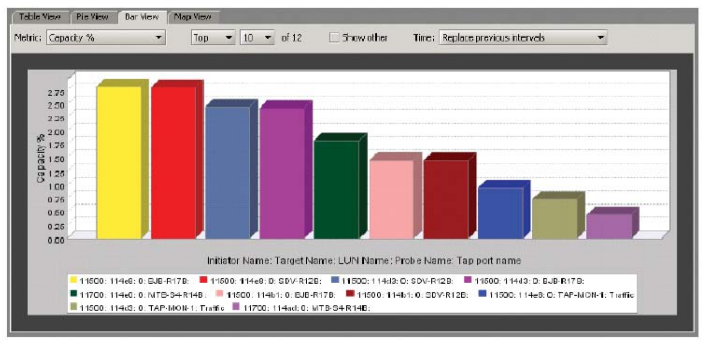


Figure 3: NetWisdom Graphs and Charts

The Finisar Xgig® Protocol Analyzer is integrated with the Portal, so that any alarms triggered by the ProbeV or ProbeFCX probes, which detect specific protocol faults and breaches of pre-defined thresholds, can trigger the Xgig and result in a capture of the SAN traffic data for offline diagnosis. NetWisdom alarms are user-programmable with selected faults or metric thresholds. Canned alarms for common SAN problems are also provided. Policies dictate the actions of NetWisdom based on the alarms, including sending SNMP traps, email notification, script execution, or automatically pointing a ProbeFCX probe or Xgig Protocol Analyzer at an identified fibre-channel link (so long as the ProbeFCX or Xgig hardware has connectivity to the link). The Portal also provides an interface to allow users to configure ProbeFCX probes and ProbeVs, to create alarms, and to monitor the overall health of the SAN.

Errors detected or diagnosed by the Xgig are reported to the Portal, giving the SAN administrator the additional analysis information and the resulting Xgig trace that describes the problem.

Figure 4: NetWisdom Dashboard

NETWISDOM DASHBOARD

NetWisdom Dashboard software is a real-time summary display that provides an overview of the SAN's performance and faults, based on the installed ProbeFCX probes and ProbeVs. NetWisdom Dashboard software can be installed in a Network Operations Center so that administrators can quickly determine the health of the SAN at a glance, identify the top ten servers/applications and view their SAN performance.

NETWISDOM VIRTUAL FABRIC PROBE (PROBEV)

NetWisdom Virtual Fabric Probes (ProbeVs) consist of software that collects status from SAN switches via SNMP. ProbeVs can collect data from local or remote SAN switches. Each ProbeV monitors all the ports of a particular fibre-channel switch and collects the metrics for each port, such as the number of frames and bytes, as well as the key faults for each port, such as loss of synchronization, link resets, link failures, packet discards, and CRC errors. The ProbeV calculates the throughput (in MB per second) for each port and the percentage of utilization based on link speed.

These metrics are generated and reported to the NetWisdom Portal by each ProbeV every five minutes. A single NetWisdom Portal can support up to 120 switches (when no ProbeFCX probes are present).

Figure 5: NetWisdom ProbeFCX

NETWISDOM FIBRE CHANNEL PROBE (PROBEFCX)

NetWisdom Fibre-Channel Probes (ProbeFCXs) analyze every packet on a fibre-channel SAN at line rates up to 4 Gbits per second. Each ProbeFCX contains up to 8 probes, and each probe is able to monitor in real-time in both directions of a single SAN link. A ProbeFCX probe can be dedicated to a single SAN link or, using a physical-layer switch (PLS), can rove among many SAN links to provide statistics about storage traffic to an application, storage subsystem, remote replication, virtualizer, or other key SAN devices or applications.

ProbeFCX probes detect application performance slowdowns by measuring every SCSI I/O transaction from start to finish, for both reads and writes. Exchange Completion Times (ECT) metrics are maintained for every server/volume combination (initiator/target/LUN). Latency through WANs and from servers to storage subsystems are measured. A baseline of all of these metrics can be created to verify that there are no impacts after server OS or device firmware upgrades, zone modifications, or other changes to the SAN.

Failing SCSI devices may be proactively detected by monitoring link errors and SCSI operation errors. Congested storage ports can be identified from the ProbeFCX queue depth metrics, which are measured by monitoring the number of active and pending SCSI exchanges to the same target port. ProbeFCX probes also detect and track fibre-channel and SCSI protocol faults.

A summary of changed metrics is reported to the NetWisdom Portal by the ProbeFCX probes every second, via an Ethernet connection.

Figure 6: Finisar Xgig Protocol Analyzer

Figure 8: Finisar High-Density TAP

XGIG PROTOCOL ANALYZER

Finisar's Xgig Protocol Analyzer is the industry standard used by all SAN fibre-channel device manufacturers to develop their products and to resolve SAN storage, switch, and HBA devices issues. The Xgig can be used independently by connecting it to an identified trouble link, using a Traffic Analysis Points (TAP), or it can be used in conjunction with the NetWisdom Portal. The Xgig is integrated with the NetWisdom Portal so that any alarms triggered by the ProbeV or ProbeFCX probes, which detect specific protocol faults and breaches of pre-defined thresholds, can trigger the Xgig and result in a capture of the SAN traffic data for offline diagnosis.

Any errors detected or diagnosed by the Xgig are reported to the Portal, giving the administrator the additional analysis information and the resulting Xgig trace that describes the problem. The industry-standard Xgig Analyzer Trace File (figure 7) can be sent to vendors for fast problem detection.

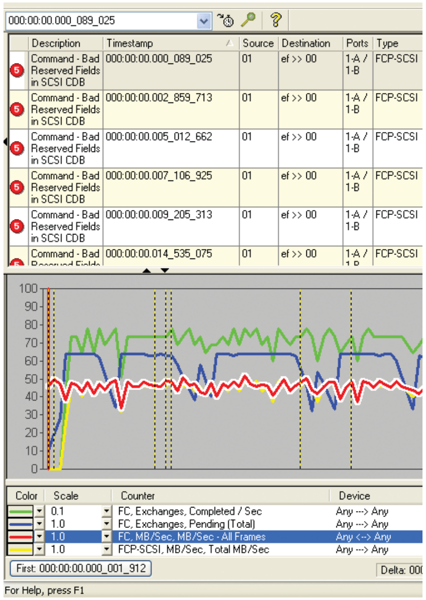


Figure 7: Xgig Expert Trace File

TRAFFIC ANALYSIS POINTS (TAP)

Finisar's Traffic Analysis Points (TAP) provides a permanent, fail-safe access point to fibre-channel network traffic on a SAN for failure analysis and NetWisdom diagnosis, as well as for performance monitoring. TAPs operate by transparently diverting some of the signal through the TAP to another port, which provides a copy of the traffic. TAPs are passive and therefore require no power, so that network traffic continues to pass though the TAP regardless of the state of power to the rest of the network. This creates a fail-safe TAP that does not introduce a point of failure. TAPs are available in high-density packaging, which provides 16 in a 1U-mountable rack (see figure 8). Once installed, access to SAN traffic is immediate and non-disruptive.

Finisar recommends that the NetWisdom ProbeFCX always be connected to the SAN behind a passive TAP (see figure 9). The High Density TAP splits off the receive portion and transmit portion of the SAN link traffic, as shown in the diagram below, and directs it to a ProbeFCX probe.

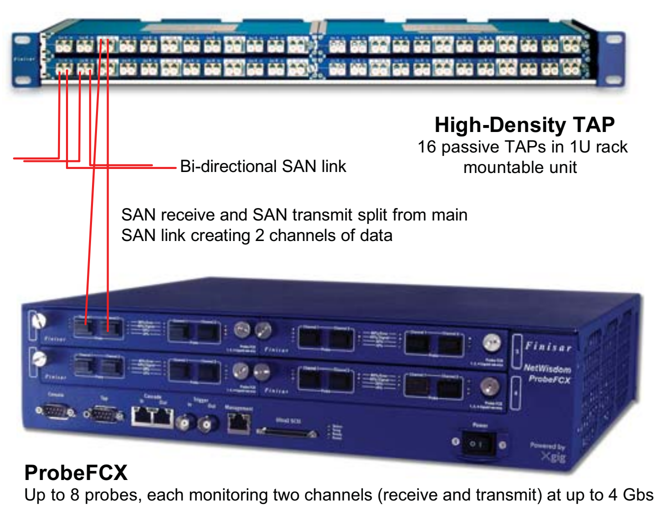


Figure 9: TAP Wiring to ProbeFCX

NETWISDOM ENTERPRISE CONFIGURATIONS

The NetWisdom architecture maximizes the SAN administrator's ability to implement varying NetWisdom Enterprise configurations, based on the business needs of the SAN or SAN tier, and to add product components incrementally as budget and time allow. Your IT organization's business goals determine the correct NetWisdom Enterprise configuration for either simple SAN fabric monitoring and alerting, proactive identification of potentially problematic SAN issues, or fastest diagnosis of SAN failures.

NetWisdom Express Configuration

Software-only SAN Fabric monitoring and alerting

NetWisdom Express is a light-weight configuration that provides status on the performance and health of heterogeneous SAN fabrics. This configuration consists of the NetWisdom Views, Portal, and one or more ProbeVs. A ProbeV is required for each SAN switch to be monitored. Figure 10 describes this configuration.

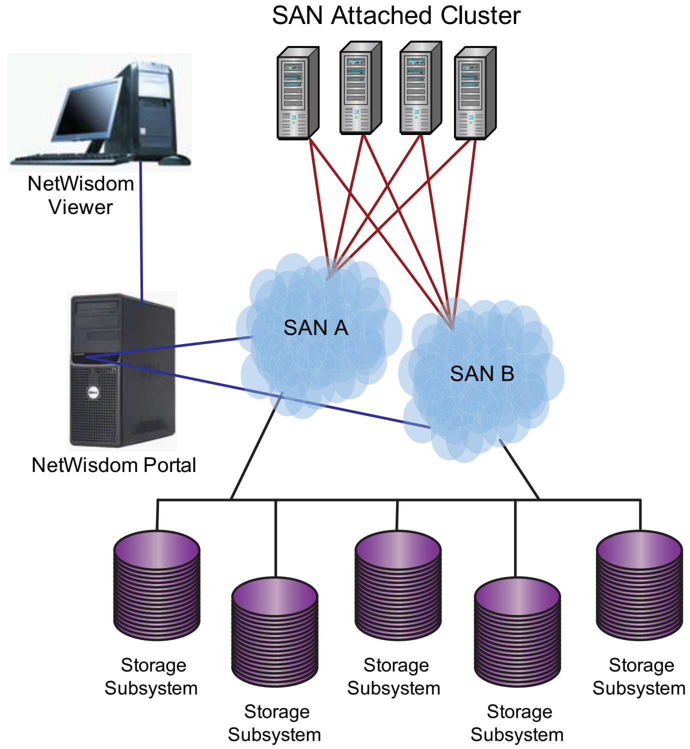


Figure 10: Software-Only NetWisdom Configuration

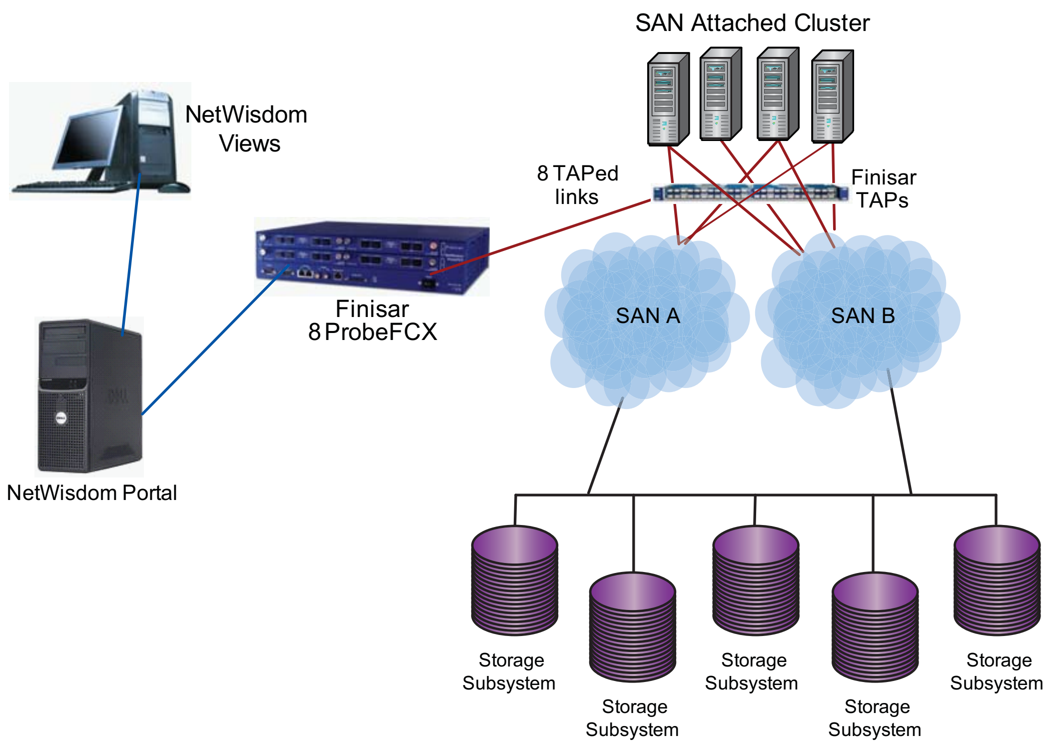


Figure 11: NetWisdom Enterprise Configuration for Dedicated SAN Link Monitoring

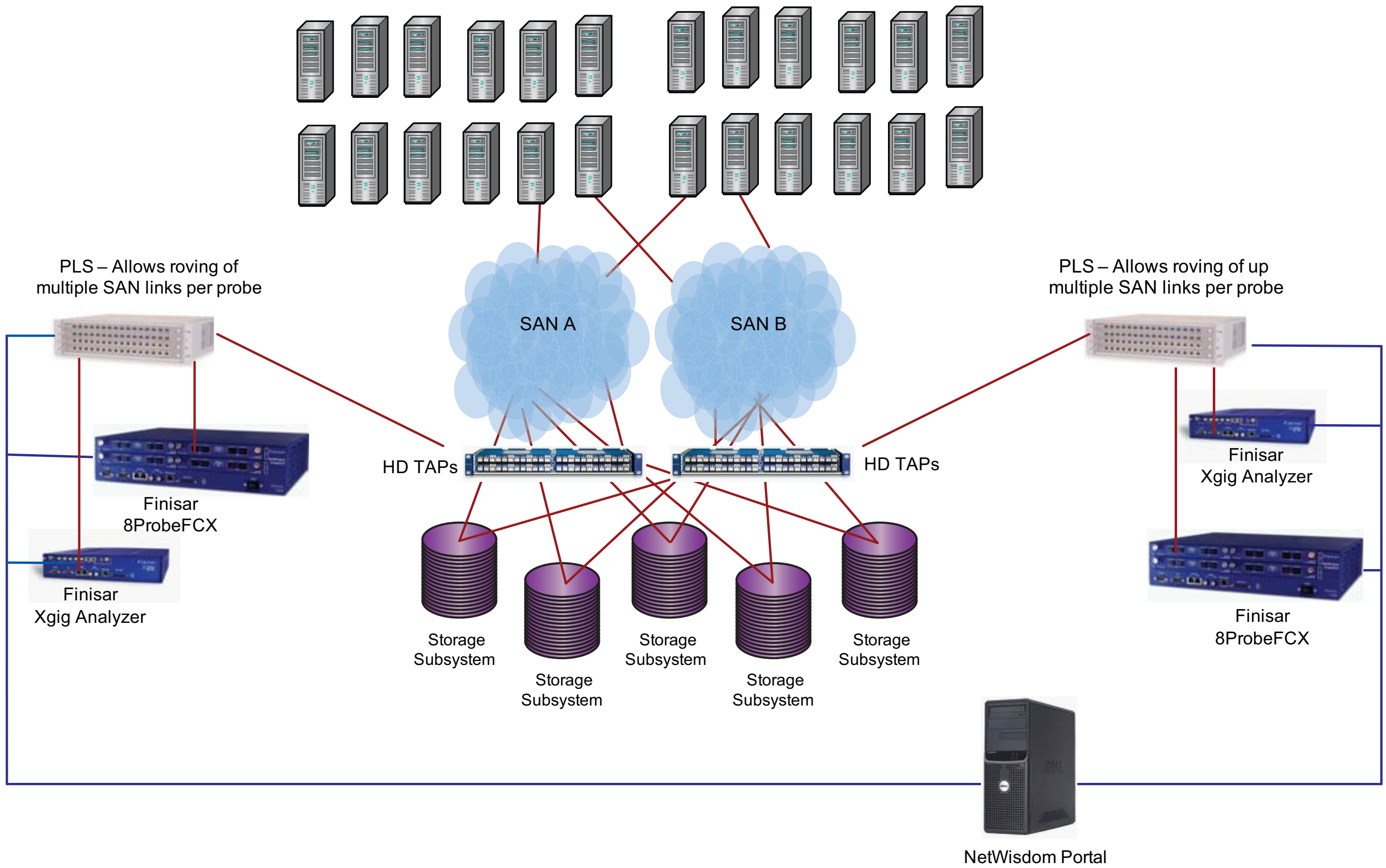


Figure 12: NetWisdom Enterprise Expert Configuration for Extending the Reach Using a PLS

NetWisdom Enterprise Configurations

Proactive identification of potentially problematic SAN issues

NetWisdom Enterprise configurations provide packet-level, real-time monitoring and proactive alerting of SAN fibre-channel links. This configuration consists of the NetWisdom Views, Portal, one or more ProbeFCX probes, and a TAP. The configuration can be dedicated to monitor a set of important SAN links for a mission-critical application server as shown in figure 11. It can also be dedicated to monitoring a replication service, virtualization appliance or storage.

An alternate NetWisdom Enterprise configuration expands the reach of the ProbeFCX probes by using a PLS to rove across many SAN links, as depicted in figure 12. The NetWisdom Enterprise configuration with a PLS reduces the cost of monitoring per link.

NetWisdom Enterprise Expert Configuration

Fastest diagnosis of SAN failures

The NetWisdom Enterprise Expert configuration enhances the NetWisdom Enterprise configurations by included an Xgig Protocol Analyzer. The Xgig provides in-depth diagnosis tools to quickly analyze any problem in the SAN. SAN vendors use the industry-standard trace created by the Xgig to identify their device issues. Xgig can be used either stand-alone or integrated with NetWisdom, which can trigger Xgig with an alarm from a ProbeV or ProbeFCX probe that has identified a performance slowdown or fault. Figure 12 depicts an example configuration of NetWisdom with the Xgig Protocol Analyzer.

NETWISDOM METRICS

NetWisdom provides important metrics for analysis, benchmarking, baseline comparison, historical trending, and key input to problem diagnostics. The NetWisdom family of products can provide different levels of sophistication in SAN monitoring, through the addition of metrics and the depth of the monitoring. Figure 13 differentiates the metrics provided by three typical NetWisdom architecture configurations.

NetWisdom Express remotely monitors SAN fabric ports via ProbeV software.

NetWisdom Enterprise uses ProbeFCX to view every packet in real time.

NetWisdom Enterprise Expert uses the Xgig Protocol Analyzer to perform detailed offline analysis of problematic storage traffic.

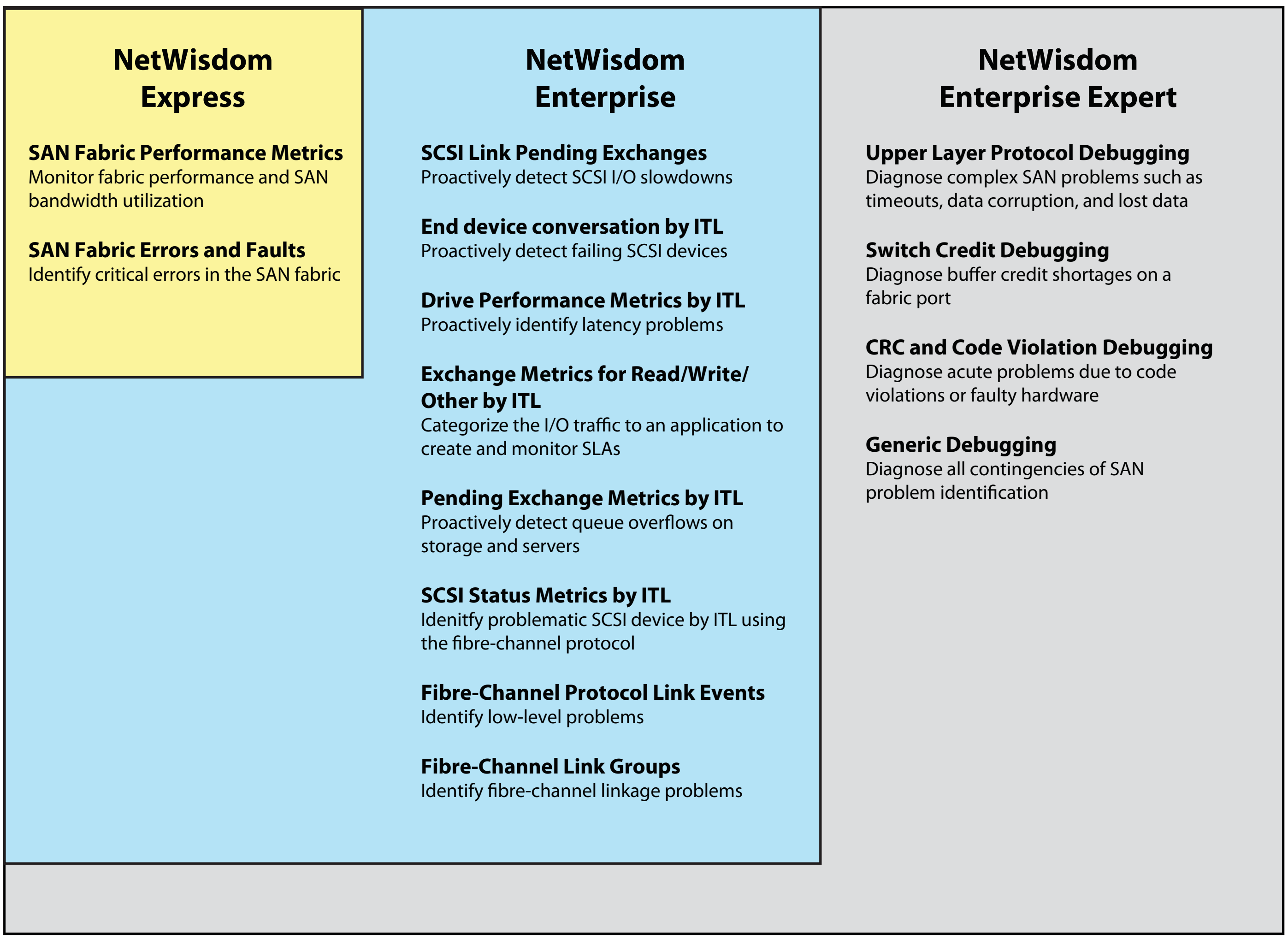


Figure 13: NetWisdom Comparative Metrics

SUMMARY OF NETWISDOM BENEFITS AND CAPABILITIES

BENEFITS	CAPABILITIES
Proactively identify I/O and utilization slowdowns within local and remote SAN fabrics	Baseline and compare SAN fabric performance (MB/S) and bandwidth utilization for fabric switch ports with ProbeV
Proactively identify failures within local and remote SAN fabrics	Detect critical fabric faults such as CRCs, dropped packets, loss of signal, or loss of synchronization with ProbeV
Proactively identify increased I/O latencies (in a fabric or WAN) before they impact an application or storage service	Baseline and compare average time to read first data for an application with ProbeFCX
Proactively identify I/O performance slowdowns for specific applications	Baseline and compare SCSI read and write exchange completion times for an application with ProbeFCX
Proactively identify problem SCSI devices before they fail	Detect SCSI check conditions and view SCSI sense data
Proactively identify protocol traffic that may be impacting an application or performance across the SAN	Detect SCSI and fibre-channel protocol faults and aborts by inspecting every packet with ProbeFCX
Determine if storage queue-depths are being exceeded (causing expensive re-tries or impacting data integrity) and identify congested storage ports	Monitor the number of pending SCSI exchanges to each storage port using ProbeFCX
Verify that SAN configuration settings (zoning and LUN mapping) are protecting storage and servers from undesired traffic	Identify SAN packet traffic to a server or storage port from an unauthorized or unexpected source via ProbeFCX
Identify remote replication slow downs due to WAN problems	Calculate latency times through WANs of remote replication SCSI traffic using ProbeFCX
Identify remote replication slowdowns due to storage subsystem resource constraints (CPU, cache) or an increase in the data being replicated	Baseline remote replication SCSI exchange times to detect slowdowns in the performance and detect if increased SCSI exchange activity or new LUNs appear in SCSI write exchanges
Verify that SAN configuration changes do not impact the SAN	Baseline the performance before and after any SAN configuration change, including zoning, LUN mapping, and VSAN modifications
Verify that SAN firmware or hardware changes do not impact the SAN	Baseline the performance before and after storage, HBA, or switch firmware changes
Verify in advance that a SAN or remote-replication infrastructure can handle the packet traffic load and is ready for production	Implement traffic generators and monitor performance and faults in pre-production SAN and WAN environments with ProbeFCX and ProbeV
Quickly diagnose fibre channel problems when slowdowns or application failures are detected	Capture traffic and diagnose problems using "Expert" and traceview software with the Xgig Protocol Analyzer
Provide key diagnosis data for SAN device support organizations without having to wait for them to debug the problem	Create an industry-standard "trace" report from Xgig Protocol Analyzer capture and send it to SAN device vendors for their analysis

ENTERPRISE OFFERINGS

PRODUCT NAME	 **E-8ProbeFCX**	 **E-2ProbeFCX**	 **E-2ProbeExpansion**
SOFTWARE COMPONENTS	NetWisdom Views and Dashboard Portal support for purchases probes ProbeFCX microcode		ProbeFCX microcode Portal support for 2 probes
HARDWARE COMPONENTS	Eight Enterprise SAN monitoring probes in a rack-mountable 2U chassis. Chassis consists of four blades, variable multi-mode SFPs (4,2,1 Gbs) and 50 micron cables * Single-mode available by request	Two Enterprise SAN monitoring probes in rack-mountable 2U chassis. Chassis consists of one blade, variable multi-mode SFPs (4,2,1 Gbs) and 50 micron cables * Single-mode available by request	Two SAN monitoring probes in a single blade to insert in an E2-ProbeFCX chassis, Variable multi-mode SFPs (4,2,1 Gbs) and 50 micron cables * Single-mode available by request
SYSTEM REQUIREMENTS	NetWisdom Portal platform system requirements **CPU:** 2 CPU, Intel Xeon 3 GHz with HyperThreading **MEMORY**: 4 GB of RAM. **HARD DRIVE**: 250 GB storage **OS**: Windows XP or 2003 Server **MEDIA**: DVD/CD-ROM Drive **OTHER**: 1024x768 SVGA or greater, Gigabit Ethernet, and Serial data port NetWisdom Views platform system requirements **CPU**: 1 CPU, Intel Xeon 3 GHz **MEMORY**: 2 GB of RAM **HARD DRIVE**: 120 GB storage **OS**: Windows XP or 2003 Server **MEDIA**: DVD/CD-ROM Drive **OTHER**: 1024x768 SVGA or greater, Gigabit Ethernet, and Serial data port		NA

PRODUCT NAME	 **NW Express**	 **HDTap**	 **Xgig Analyzer**
SOFTWARE COMPONENTS	Portal, Views, Dashboard, ProbeV	NA	Fibre-Channel Analyzer Microcode, Expert, Traceview
HARDWARE COMPONENTS	NA	Rack mountable passive TAPs in 4 quads of 4 TAPs. Standard multi-mode (MM) and 50 micron * Single-mode available by request	Fibre-channel analyzer in rack-mountable chassis. Chassis consists of 1 Xgig blade, Variable multi-mode SFPs (4,2,1 Gbs) and 50 micron cables * Single-mode available by request
SYSTEM REQUIREMENTS	NetWisdom Portal and ProbeV platform system requirements **CPU**: 2 CPU, Intel Xeon 3 GHz with HyperThreading **MEMORY**: 4 GB of RAM **HARD DRIVE**: 250 GB storage **OS**: Windows XP or 2003 Server **MEDIA**: DVD/CD-ROM Drive **OTHER:** 1024x768 SVGA or greater, Gigabit Ethernet, and Serial data port NetWisdom Views platform system requirements **CPU**: 1 CPU, Intel Xeon 3 GHz **MEMORY**: 2 GB of RAM. **HARD DRIVE**: : 120 GB storage **OS**: Windows XP or 2003 Server **MEDIA**: DVD/CD-ROM Drive **OTHER**: 1024x768 SVGA or greater, Gigabit Ethernet, and Serial data port	NA	Xgig Software Suite platform system requirements (this system is required in addition to the NetWisdom portal and view platforms) **CPU**: 1 CPU, Intel Xeon 3 GHz **MEMORY**: 2 GB of RAM. **HARD DRIVE**: 120 GB storage. **OS**: Windows XP or 2003 Server. **MEDIA**: DVD/CD-ROM Drive **OTHER:** 1024x768 SVGA or greater, Gigabit Ethernet, and Serial data port

Finisar

Finisar Corporation
1389 Moffett Park Drive
Sunnyvale, CA 94089
Phone (US Toll Free): 888.746.6484
Phone Intl: 408.400.1000
Email: networktools-sales@finisar.com
www.finisar.com