IBM System Networking SAN24B-5 Switch

IBM Redbooks Product Guide

This IBM® Redbooks® Product Guide describes the IBM System Networking SAN24B-5 switch. The SAN24B-5 with Gen 5 Fibre Channel technology and Fabric Vision technology is designed to provide outstanding price and performance value, combining flexibility, simplicity, and enterprise-class functionality to unleash the full potential of high-density server virtualization, cloud architectures, and next-generation storage. The SAN24B-5 entry-level switch is configurable in 12 or 24 ports and supports 2, 4, 8, or 16 Gbps speeds in an efficiently designed 1U form factor. It includes a single power supply with integrated fans. A second optional power supply provides extra redundancy for increased resiliency.

SAN24B-5 provides a critical building block for today's highly virtualized, private cloud storage environments. It simplifies server virtualization and virtual desktop infrastructure management while meeting the high-throughput demands of solid-state drives. SAN24B-5 supports multitenancy in cloud environments through quality of service (QoS) and fabric-based zoning features. It can address demanding reliability, availability, and serviceability requirements to help minimize downtime to support mission-critical environments.

Figure 1 shows the SAN24B-5 switch.

Figure 1. IBM System Networking SAN24B-5 switch

Did you know?

- SAN24B-5 helps maximize resiliency with nondisruptive software upgrades and an optional redundant power supply.

- Fabric Vision technology´s powerful monitoring, management, and diagnostic tools simplify administration, increase uptime, and reduce costs.

- Customizable IBM Network Advisor health and performance dashboards help identify problems faster, simplify SAN configuration and management, and reduce operational costs.

- Ports-on-demand (PoD) capability allows you to scale from 12 to 24 ports.

Key features

The SAN24B-5 features advanced monitoring, diagnostics, reliability, availability, serviceability, and redundancy capabilities in an entry-level switch to maximize availability, optimize performance, and simplify administration. Enterprise-class features include the following items:

- Critical diagnostic and monitoring capabilities to help ensure early problem detection and recovery
- Non-intrusive and nondisruptive monitoring on every port to provide a comprehensive end-to-end view of the entire fabric
- Forward error correction to recover from bit errors in inter-switch links (ISLs), enhancing transmission reliability and performance
- Additional buffers to overcome performance degradation and congestion due to buffer credit loss
- Real-time bandwidth consumption by hosts and applications on ISLs to easily identify hot spots and potential network congestion
- A second optional power supply to enable dual power redundancy and enhance availability

Architecture and key components

The SAN24B-5 delivers industry-leading Gen 5 Fibre Channel technology within a flexible, simple, and easy-to-use solution. The base configuration includes 12 activated ports, with up to 24 ports on demand. In addition to providing best-in-class scalability, the SAN24B-5 is easy to deploy with the EZSwitchSetup wizard and the ClearLink diagnostic ports (D_Ports) feature, which simplify setup.

The 24 ports produce an aggregate 384 Gbps full-duplex throughput; any eight ports can be trunked for 128 Gbps ISLs. Exchange-based dynamic path selection optimizes fabric-wide performance and load balancing by automatically routing data to the most efficient and available path in the fabric, as shown in Figure 2.
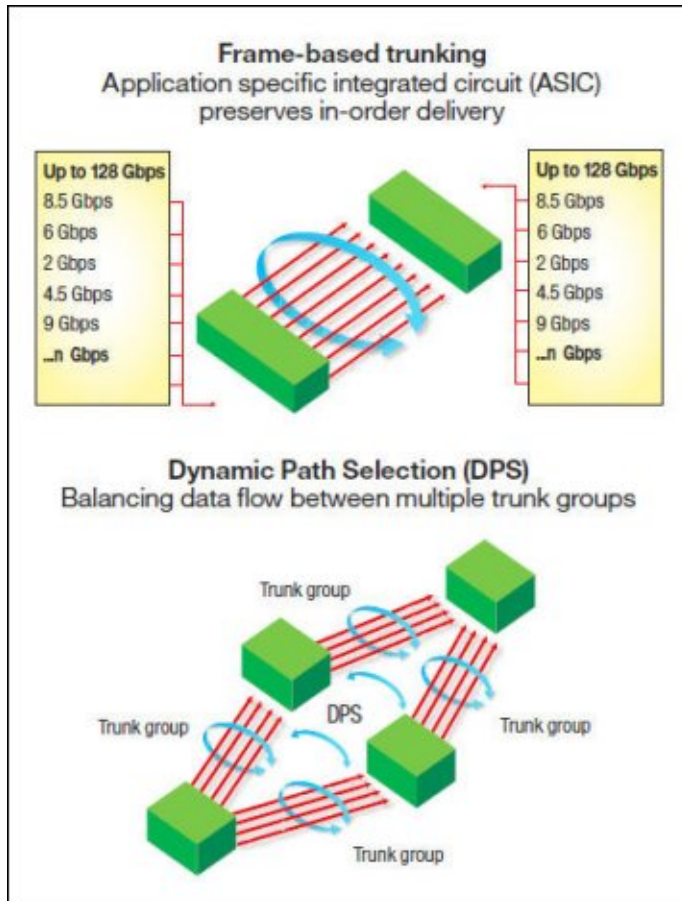
Figure 2. Exchange-based dynamic path selection

SAN24B-5 augments ISL Trunking to provide more effective load balancing in certain configurations. It provides a low total cost of ownership (TCO) because of its 12-port base configuration, easy administration, 1U footprint, and low-energy consumption, which is 0.22 watts per Gbps and 3.3 watts per port.

The SAN24B-5 can be deployed as a full-fabric switch or as an access gateway, which simplifies fabric topologies and heterogeneous fabric connectivity (the default mode setting is a switch). Access Gateway Mode uses NPIV switch standards to present physical and virtual servers directly to the core of SAN fabrics. This makes access gateway transparent to the SAN fabric, greatly reducing management of the network edge. In Access Gateway Mode, the SAN24B-5 can connect servers to NPIV-enabled b-type, m-type, and other SAN fabrics. Access Gateway Mode for the SAN24B-5 is supported only in 24-port configurations.

Organizations can easily enable Access Gateway Mode through IBM Network Advisor v11, or later, or a command-line interface. Key benefits of Access Gateway Mode are as follows:

- Improved scalability for large or rapidly growing server and virtual server environments

- Reduced management of the network edge, since access gateway does not have a domain identity and appears transparent to the core fabric

- Support for heterogeneous SAN configurations without reduced functionality for server connectivity

Accelerating fabric deployment with diagnostic ports

With ClearLink diagnostic ports (D_Ports), administrators can quickly identify and isolate optics and cable problems, reducing fabric deployment and diagnostic times. Organizations can also use D_Ports to run various tests through the IBM Network Advisor or command-line interface (CLI) to test ports, small form-factor pluggables and cables for faults, latency, and distance.

Simplifying server deployment with dynamic fabric provisioning

Dynamic fabric provisioning enables organizations to eliminate fabric reconfiguration when adding or replacing servers through the virtualization of host worldwide names (WWNs). It reduces or eliminates the need to modify zoning or logical unit number masking. It also enables preprovisioning of virtual WWNs, helping organizations eliminate time-consuming steps when they deploy new equipment or move devices within a switch.

Fabric operating system and management software

Fabric operating system (FOS), which is included with each SAN24B-5, contains all the functions necessary to operate a base system. The SAN24B-5 Gen 5 Fibre Channel base systems require FOS v7.0.1 or later to take advantage of the advanced functions delivered through Fabric Vision technology. The ClearLink diagnostic port (D-port), supported in FOS v7.0 or later, debugs the components associated with the link, such as transceivers and cables. This feature is supported only on the 16 Gbps ports.

The following items are part of the base FOS and do not require a license. When using FOS v7.2 or later, you have access to extra base functions, such as Server Application Optimization (SAO) and Adaptive Networking.

- *Advanced Web Tools* software enables graphical user interface (GUI) based administration, configuration, and maintenance of fabric switches and SANs.

- *Advanced Zoning* software segments a fabric into virtual private SANs to restrict device communication and apply certain policies only to members within the same zone.

- *Full Fabric* software allows switches to be connected, and is required to enable E_Ports.

- *Enhanced Group Management* enables extra device-level management functionality for IBM b-type SAN products when added to the element management, and allows large consolidated operations to groups of devices (such as firmware downloads and configuration uploads and downloads).

Advanced capabilities can be enabled with the following optional license activation features:

- *Advanced Performance Monitor* helps identify end-to-end bandwidth used by host/target pairs and provides for capacity planning.

- *Fabric Watch* constantly monitors mission-critical switch operations for potential faults and automatically alerts the administrator to problems before they become costly failures. Fabric Watch includes the port fencing capability.

- *Inter-Switch Link (ISL) Trunking* enables efficient Fibre Channel packet distribution across multiple ISLs between two IBM b-type SAN fabric switches and directors while preserving in-order delivery. Both b-type SAN devices must have trunking activated. The SAN24B-5 adds enhanced ISL Trunking support, uses 16 Gbps ports, and enables Fibre Channel packets to be distributed across up to eight ISLs, capable of 16 Gbps for a combined bandwidth of up to 128 Gbps.

- *Extended Fabrics* extend SAN fabrics beyond the Fibre Channel standard of 10 km by optimizing internal switch buffers to maintain performance on ISLs that are connected at extended distances.

- *12-port Activation* enables the SAN24B-5 switch with one extra increment of 12 ports that can be enabled on demand. The SAN24B-5 switch includes the first 12 ports activated in the base product.

- *Enterprise Bundle* offers a convenient method for ordering a set of optional features bundled into one feature number. It includes one license for each of the following items: Trunking Activation, Fabric Watch, Advanced Performance Monitor, Adaptive Networking, Server Application Optimization, and Fabric Vision. It requires FOS 7.2 or later to activate all Fabric Vision license features.

- *Fabric Vision license* offers a collection of breakthrough features and tools, bundled into an optional licensed feature. It includes Flow Vision and Monitoring and Alerting Policy Suite (MAPS) advanced technologies and capabilities. It requires FOS 7.2 or later.

Note: Some features do not apply or are unavailable when the switch is used in Access Gateway mode.

IBM Network Advisor software, which is the base management software for SAN24B-5, simplifies Gen 5 Fibre Channel management and helps users proactively diagnose and resolve issues to maximize uptime, increase operational efficiency, and reduce costs. IBM Network Advisor v12.0 or later is required for managing cloud environments and is also required in support of Fabric Vision license capabilities.

Fabric vision technology

Fabric Vision technology, an extension of Gen 5 Fibre Channel, provides outstanding insight and visibility across the storage network with powerful built-in monitoring, management, and diagnostic tools. SAN24B-5 with Fabric Vision technology helps administrators avoid problems, maximizes application performance, and reduces operational costs.

Fabric Vision technology includes several critical monitoring, management, and diagnostic capabilities that help to increase fabric resiliency, reduce downtime, and optimize application performance. The following features are included in base Fabric OS® (FOS) v7.0.1 release or later:

- *ClearLink Diagnostics* helps ensure optical and signal integrity for Gen 5 Fibre Channel optics and cables, simplifying the deployment and support of high-performance fabrics.

- *Bottleneck Detection* identifies and alerts administrators about device or ISL congestion, and abnormal levels of latency in the fabric.

- *Forward Error Correction (FEC)* enables recovery from bit errors in links, enhancing transmission reliability and performance.

- *Credit Loss Recovery* helps overcome performance degradation and congestion as a result of buffer credit loss.

The following advanced technologies and capabilities are available with the optional Fabric Vision technology license:

- *Monitoring and Alerting Policy Suite (MAPS)* provides a new, easy-to-use solution for policy-based threshold monitoring and alerting. MAPS proactively monitors the health and performance of the SAN infrastructure to ensure application uptime and availability. By using pre-built rule and policy-based templates, MAPS simplifies fabric-wide threshold configuration, monitoring, and alerting. Through IBM Network Advisor, administrators can configure the entire fabric (or multiple fabrics) at one time using common rules and policies, or customize policies for specific ports or switch elements. MAPS offers the following items:
    - o *Policy-based monitoring*:
        - Predefined monitoring groups and pre-validated monitoring policies that users can use. Predefined monitoring groups include switch ports attached to servers, switch ports attached to storage, E_Ports, short-wavelength SFPs, long-wavelength SFPs, and more. Predefined monitoring policies include aggressive, moderate, and conservative policies based on monitoring thresholds and actions.

- Flexibility to create custom monitoring groups (such as switch ports attached to high-priority applications and another group of switch ports attached to low-priority applications) and monitor each group according to its own unique rules.
- Flexible monitoring rules to monitor a counter for different threshold values, then take different actions when each threshold value is crossed. For example, users can monitor a CRC error counter at a switch port and generate a RAS log when the error rate reaches two per minute, send an email notification when the error rate is at five per minute, and fence a port when the error rate exceeds 10 per minute.
- Ability to monitor both sudden failures and gradually deteriorating conditions in the switch. For example, MAPS can detect and alert users if a CRC error counter suddenly increases to five per minute, or gradually increases to five per day.
- Support for multiple monitoring categories, enabling monitoring of the overall switch status, switch ports, SFPs, port blades, core blades, switch power supplies, fans, temperature sensors, security policy violations, fabric reconfigurations, CPU and memory utilization, traffic performance, FCIP circuit health, and more.
- Support for multiple alerting mechanisms (RAS logs, SNMP traps, email notifications) and actions such as port decommissioning and port fencing when errors exceed the specified threshold.

  o *CLI dashboard*:

  - Dashboard of health and error statistics to provide at-a-glance views of switch status and various conditions that are contributing to the switch status, enabling users to get instant visibility into any hot spots at a switch level and take corrective actions.
  - Overall status of the switch health and the status of each monitoring category, including any out-of-range conditions and the rules that were triggered
  - Historical information on the switch status for up to the last seven days; automatically provides raw counter information for a variety of error counters

  o *Fabric Performance Impact (FPI) Monitoring*:

  - Uses predefined thresholds and alerts in conjunction with MAPS to automatically detect and alert administrators to severe levels of latency and identifies slow drain devices that might impact the network. This feature uses advanced monitoring capabilities and intuitive MAPS dashboard reporting to indicate various latency severity levels, pinpointing exactly which devices are causing bottlenecked conditions.

  o *Proactive flow monitoring by using MAPS*:

  - MAPS can monitor flows that are established within Flow Vision and generate alerts based on user-defined rules, enabling users to monitor and be alerted when established thresholds are exceeded.

  o *Automated migration of Fabric Watch configurations to MAPS*:

  - Organizations currently using Fabric Watch can automatically import existing thresholds into a MAPS policy, enabling seamless migration from Fabric Watch to MAPS to access the new MAPS capabilities and usability enhancements.

- *Flow Vision* enables administrators to identify, monitor, and analyze specific application flows to simplify troubleshooting, maximize performance, avoid congestion, and optimize resources. Flow Vision includes these items:

  o *Flow Monitor* provides comprehensive visibility into flows within the fabric, including the ability to automatically learn flows and non-disruptively monitor flow performance. Administrators can monitor all flows from a specific host to multiple targets or LUNs, from multiple hosts to a specific target or LUN, or across a specific ISL. And, they can perform LUN-level monitoring of specific frame types to identify resource contention or congestion that is impacting application performance. Flow Monitor provides the following capabilities:

    - Comprehensive visibility into application flows in the fabric, including the ability to learn (discover) flows automatically.

    - Monitoring of application flows within a fabric at a given port.

    - Statistics associated with the specified flows to gain insights into application performance, such as transmit frame count, receive frame count, transmit throughput, receive throughput, SCSI Read frame count, SCSI Write frame count, number of SCSI Reads and Writes per second (IOPS), and more.

    - When NPIV is used on the host, users can monitor performance of virtual machine (VM)-to-LUN level.

    - Monitoring of various frame types at a switch port to provide deeper insights into the storage I/O access pattern at the LUN level, reservation conflicts, and I/O errors. Examples of frame types include SCSI Read, SCSI Write, SCSI Reserve, ABTS, and BA_ACC.

    - Flow Monitor is integrated with Monitoring and Alerting Policy Suite (MAPS) to enable threshold-based monitoring and alerting of flows.

  o *Flow Generator* provides a built-in test traffic generator for pretesting and validating the data center infrastructure (including route verification and integrity of optics, cables, ports, back-end connections, and ISLs) for robustness before deploying applications. With Flow Generator, users can do these tasks:

    - Configure a Gen 5 Fibre Channel-capable port as a simulated device that can transmit frames at 16 Gbps line rate.

    - Emulate a Gen 5 Fibre Channel SAN without having any hosts or targets or SAN testers, and pre-test the entire SAN fabric.

Specifications

Table 1 lists the IBM System Networking SAN24B-5 switch specifications.

Table 1. IBM System Networking SAN24B-5 switch specifications (part 1 of 2)

Item	Description
Product number	2498-X24 (AAS)
Base machine	**Base switch includes these components :** Power distribution unit (PDU) jumpers, fixed rack mount rail kit, installation guide, EZSwitchSetup CD (with manuals), service tools, RJ-45 wrap tools, wrist strap, and small form-factor pluggable (SFP) extraction tool, one integrated power supply and fan (replaceable) **Base switch:** Twelve ports activated; no SFPs included **Base switch includes these functions :** Advanced Web Tools, Advanced Zoning, Full Fabric, Enhanced Group Management, Fabric Operating System v7.0.1 or later. Also includes Adaptive Networking and Server Application Optimization when using FOS 7.2 or later.
Fibre Channel interfaces	● Auto-sensing of 2, 4, 8 and 16 Gbps port speeds ● D_Port (diagnostic port), E_Port, EX_Port, F_Port, M_Port (mirror port); optional port type control ● Access Gateway Mode: F_Port and NPIV-enabled N_Port
Transceivers	● 16 Gbps: hot pluggable SFP+, LC connector; 16 Gbps short-wavelength laser (SWL), long-wavelength laser (LWL), , extra long-wavelength laser (ELW) ● 8 Gbps: hot-pluggable SFP+, LC connector; 8 Gbps SWL, LWL, ELW
Hot-swap components	Power supplies, fan modules, small form-factor pluggables (SFPs)
Non-rack support	Non-rack installation support; requires country-specific power cords which must be ordered
Management software	HTTP, SNMP v1/v3 (FE MIB, Fibre Channel Management MIB), SSH; Auditing, Syslog; Advanced Web Tools, Advanced Performance Monitoring, Fabric Watch; IBM Network Advisor v11.1 or later; CLI
Servers supported*	● IBM Power Systems™ ● IBM System p® ● IBM System x® ● Other Intel processor-based servers with Linux, Microsoft Windows 2008 and Windows 2012 ● Selected Sun and HP servers

Table 1. IBM System Networking SAN24B-5 switch specifications (part 2 of 2)

Operating systems supported*	● Windows 2008, Windows 2012 ● Red Hat Linux, Red Hat Linux Advanced Server ● SUSE Linux, SUSE Linux Enterprise Server (SLES) ● IBM AIX® ● Other selected operating systems
Storage products supported*	● IBM FlashSystem™ 840 ● IBM XIV® storage system ● IBM System Storage® DS8000® storage servers ● System Storage SAN Volume Controller (SVC) ● IBM Storwize® V3700, V5000, and V7000 ● Other selected storage systems
Fibre Channel switches supported	System Storage and TotalStorage b-type and m-type SAN directors, switches, and routers; other directors, switches and routers manufactured by Brocade
Fibre optic cable	Fiber optic cables with LC connectors are required and available in various lengths in single-mode and multimode formats
Power cords	Jumper cables are included for installation; country-specific power cords must be ordered for desktop or stand-alone installation
Warranty	One year; customer-replaceable unit (CRU) and onsite; 9×5 next-business-day response, warranty service upgrades are available
Optional features	SFPs, fiber optic cables, upgrade power supplies, Twelve-port Activation, Advanced Performance Monitor, Fabric Watch, Enterprise Bundle**, Extended Fabrics, Trunking Activation, Fabric Vision

* For the most current and complete details, see the product details at the IBM System Storage Interoperation Center (SSIC): http://www.ibm.com/systems/support/storage/ssic/interoperability.wss
** The Enterprise Bundle includes one license for each of the following: ISL Trunking, Fabric Watch, Advanced Performance Monitor, Adaptive Networking, Server Application Optimization and Fabric Vision.

Physical characteristics

Table 2 lists the physical characteristics for the IBM System Networking SAN24B-5 switch.

Table 2. Physical characteristics

Specification	Description
Size	Width: 43.8 cm (17.24 in.) Depth: 4.3 cm (1.7 in.) Height: 44.3 cm (17.44 in.)
Weight	7.82 kg (17.25 lb) with one power supply, without transceivers

Operating environment

Table 3 describes the operating environment for the IBM System Networking SAN24B-5 switch.

Table 3. Operating environment

Item	Description
Temperature (operating)	0 to 40°C (32 to 104°F)
Humidity (operating)	10% to 85% noncondensing at 40°C (104°F)
Altitude (operating)	Up to 3,000 m (9,842 ft)
Airflow	Rear panel-to-door airflow

Electrical requirements

Table 4 lists the electrical requirements for the IBM System Networking SAN24B-5 switch.

Table 4. Electrical requirements

Item	Description
Nominal input voltage	85 - 264 V ac, universal
Input line frequency	47 - 63 Hz
Power consumption	80 W with 24 ports populated with 16 Gbps SWL optics 60 W for empty chassis with no optics
Heat dissipation	338 BTU per hr.
Inrush current	Maximum of 35 A

Related information

For more information, see the following resources:

● IBM System Networking SAN24B-5 switch product page:
  http://ibm.com/systems/networking/switches/san/b-type/san24b-5/

● IBM Offering Information page (announcement letters and sales manuals):
  http://www.ibm.com/common/ssi/index.wss?request_locale=en

  On this page, enter SAN24B-5, select the information type, and then click **Search**. On the next page, narrow your search results by geography and language.

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