IBM Storage Networking SAN16C-R

Highlights

- Up to twelve 32 Gbps ports
- Hot-swappable, redundant power supplies
- Common software platform across IBM Storage Networking c-type family
- Up to 4 10 GbE ports, 2 25 Gbe ports, or 1 40 GbE port for FCIP and iSCSI
- Integrated DCNM SAN for easy management across many switches and fabrics

Departmental and remote branch-office SANs and large-scale SANs make Storage Networking solutions connectivity the ideal solution.

Enables high performance SAN extension solutions implementation, multiprotocol connectivity, and intelligent fabric services for open systems and mainframe environments.

IBM Storage Networking SAN16C-R , the next generation of the highly flexible, industry-leading IBM Storage Networking c-type switches, is an optimized platform for deploying high-performance SAN-extension solutions, distributed intelligent fabric services, and cost-effective multiprotocol connectivity for both open systems and mainframe environments. With a compact form factor and advanced capabilities, SAN16C-R is an ideal solution for departmental and remote branch-office SANs, as well as in large-scale SANs in conjunction with IBM Storage Networking c-type directors.

IBM Storage Networking SAN16C-R offers up to twelve 32 Gbps Fibre Channel ports, four 1/10, two 25, and one 40 GbE IP storage services ports in a fixed 1RU form factor. SAN16C-R connects to existing native Fibre Channel networks, protecting current investments in storage networks. The SAN Extension over IP application package license is enabled as standard on the two fixed 1/10 GbE IP storage services ports, enabling features such such as Fibre Channel over IP (FCIP) and compression on the switch without the need for additional licenses.

SAN16C-R

Main features and benefits

SAN16C-R switches provide unique multiservice and multiprotocol functions in a compact 1RU form factor:

- SAN consolidation with integrated multiprotocol support: SAN16C-R is available in a base configuration of four ports of 32 Gbps Fibre Channel for high-performance SAN connectivity and two ports of 1 GbE for FCIP storage services
- SAN switch with 32 Gbps connectivity in a 1RU form factor: SAN16C-R scales up to 12 ports with speeds up to 32 Gbps Fibre Channel in a fixed configuration switch. The base configuration comes with four ports of 32 Gbps Fibre Channel enabled for high-performance SAN connectivity, and it can be upgraded on site and online to enable an additional eight ports of 32 Gbps Fibre Channel by adding the R16 Upgrade license (feature code AJMT). The upgrade license also enables 10 Gigabit speed on the initial two Ethernet ports, two additional 1/10 Gigabit ports, two 25 Gigabit ports, or one 40 Gigabit port.
- Flexible FCIP port speed: In line with recent industry trends, SAN16C-R provides flexible connectivity options toward data center switches, routers, or DWDM systems, including 25 GbE speed. Both the 25 GbE and 40 GbE options can be very valuable for data with a lower level of compressibility, while the 1 GbE and 10 GbE options can satisfy the needs of small and medium organizations.
- IBM Fibre Connection support: SAN16C-R cost-effectively scales up for IBM Fibre Connection (FICON) mainframe environments.
- Intelligent application services engine: The standard SAN16C-R includes a single application-services engine that enables the included SAN Extension over IP software solution package to run on the two or more 1/10/25 GbE or 40 GbE storage-services ports. The SAN Extension over IP package provides an integrated, cost-effective, and reliable business-continuance solution that uses IP infrastructure by offering FCIP for remote SAN extension, along with a variety of advanced features to optimize the performance and manageability of FCIP links.
- Hardware-based virtual fabric isolation with virtual SANs (VSANs) and Fibre Channel routing with Inter VSAN Routing (IVR): VSANs and IVR enable deployment of large-scale multisite and heterogeneous SAN topologies. Integration into port-level hardware allows any port in a system or in a fabric to be partitioned into any VSAN. Included in the optional enterprise advanced software package, IVR provides line-rate routing between any of the ports in a system or in a fabric without the need for external routing appliances.

- Remote SAN extension with high-performance FCIP:

  – Simplifies data protection and business-continuance strategies by enabling backup, remote replication, and other disaster-recovery services over WAN distances using open-standards FCIP tunneling.

  – Optimizes utilization of WAN resources for backup and replication by enabling hardware-based compression, hardware-based encryption, FCIP write acceleration, and FCIP tape read-and-write acceleration. Up to 12 virtual Inter-Switch Link (ISL) connections are provided on the Ethernet ports through tunneling (3 tunnels for 1/10 GbE or 4 tunnels for 40 GbE IPS ports).

  – Leverages a powerful service engine chipset coupled with an optimized software stack to push up to 40 Gbps of traffic on the WAN link

  – Preserves IBM Storage Networking c-type family enhanced capabilities, including VSANs, IVR, advanced traffic management, and network security across remote connections.

- Advanced FICON services*: SAN16C-R will support FICON environments, including cascaded FICON fabrics, VSAN-enabled intermix of mainframe and open-systems environments, and N-Port ID Virtualization (NPIV) for mainframe Linux partitions. IBM control unit port (CUP) support enables in-band management of IBM Storage Networking Multiservice Switches from the mainframe management console. FICON tape acceleration reduces latency effects for FICON channel extension over FCIP for FICON tape read-and- write operations to mainframe physical or virtual tape. This feature is sometimes referred to as tape pipelining.

- Platform for intelligent fabric applications: SAN16C-R provides an open platform that delivers the intelligence and advanced features required to make multilayer intelligent SANs a reality, including hardware-enabled innovations to host or accelerate applications for data migration, storage backup, and data replication. Hosting or accelerating these applications in the network can dramatically improve scalability, availability, security, and manageability of the storage environment, resulting in increased utility and lower total cost of ownership (TCO).

- Intelligent network services: SAN16C-R uses VSAN technology for hardware-enforced, isolated environments within a single physical fabric, access-control lists (ACLs) for hardware-based intelligent frame processing, and advanced traffic management features such as fabric-wide Quality of Service (QoS) to facilitate migration from SAN islands to enterprise-wide storage networks.

- High-performance ISLs: SAN16C-R supports up to 12 Fibre Channel ISLs in a single port channel. Up to 8191 extended buffer-to-buffer credits (the default is 500) can be assigned to a single Fibre Channel port to extend storage networks over long distances.

- Comprehensive network security framework: SAN16C-R supports RADIUS and TACACS+, LDAP, Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, Simple Network Management

Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardware-enforced zoning, ACLs, and per-VSAN role-based access control (RBAC). Additionally, the IPS ports offer IP security (IPsec) authentication, data integrity, and hardware-assisted data encryption for FCIP.

- IP version 6 (IPv6) capable: IPv6 support is provided for FCIP and management traffic routed in band and out of band.
- Sophisticated diagnostics: SAN16C-R provides intelligent diagnostics, protocol decoding, and network-analysis tools, as well as integrated Call Home capability for added reliability, faster problem resolution, and reduced service costs.

SAN16C-R

VSANs

VSANs are ideal for efficient, secure SAN consolidation, enabling more efficient storage network utilization by creating hardware-based isolated environments with a single physical SAN fabric or switch. Each VSAN can be zoned as a typical SAN and maintains its own fabric services for added scalability and resilience. VSANs allow the cost of SAN infrastructure to be shared among more users, while helping ensure complete segregation of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis.

IVR

In another step toward deploying efficient, cost-effective, consolidated storage networks, SAN16C-R supports IVR, the industry's first routing function for Fibre Channel. IVR allows selective transfer of data between specific initiators and targets on different VSANs while maintaining isolation of control traffic within each VSAN. With IVR, data can transit VSAN boundaries while maintaining control plane isolation, thereby maintaining fabric stability and availability. IVR is one of the feature enhancements provided with the enterprise software license and eliminates the need for external routing appliances, greatly increasing routing scalability while delivering line-rate routing performance, simplifying management, and eliminating the challenges associated with maintaining separate systems. Deploying IVR means lower total cost of SAN ownership.

FCIP for remote SAN extension

Data distribution, data protection, and business continuance services are significant components of today's information-centric businesses. The capability to efficiently replicate critical data on a global scale not only helps ensure a higher level of data protection for valuable corporate information, but also increases utilization of backup resources and lowers total cost of storage ownership.

- SAN16C-R switches use open-standards FCIP to break the distance barrier of current Fibre Channel solutions, enabling interconnection of SAN islands over extended distances.
- SAN16C-R dramatically enhances hardware-based FCIP compression performance for both high-bandwidth and low-bandwidth links, providing immediate cost savings for expensive WAN infrastructure. The SAN16C-R achieves up to a 43:1 compression ratio, with typical ratios of 4:1 to 5:1 over a wide variety of data sources.
- SAN16C-R supports hardware-based IPsec encryption for secure transmission of sensitive data over extended distances. Hardware enablement of IPsec helps ensure high throughput. Used together, hardware-based compression and hardware-based encryption provide high-performance, highly secure SAN extension capabilities.

Mainframe support*

SAN16C-R is mainframe ready and will support IBM zSeries FICON and Linux environments provided with the Mainframe package*. To be qualified by IBM for attachment to all FICON-enabled devices in an IBM zSeries operating environment, the SAN16C-R switch will support transport of the FICON protocol in both cascaded and noncascaded fabrics, as well as an intermix of FICON and open-systems Fibre Channel Protocol traffic on the same switch. VSANs simplify intermixing of SAN resources among IBM z/OS, mainframe Linux, and open-systems environments, enabling increased SAN utilization and simplified SAN management. VSAN-based intermix mode eliminates the uncertainty and instability often associated with zoning-based intermix techniques. VSANs also eliminate the possibility that a misconfiguration or component failure in one VSAN will affect operation in other VSANs. VSAN-based management access controls simplify partitioning of SAN management responsibilities between mainframe and open-systems environments, enhancing security. FICON VSANs can be managed using the standard Data Center Network Manager (DCNM), the command-line interface (CLI), or IBM CUP-enabled management tools, including SA/390, Resource Measurement Facility (RMF), and dynamic channel path management (DCM).

The Mainframe Package* will be required for all SAN16C-R–integrated FICON channel extension features. In combination with SAN extension capabilities, it enables FICON tape read-and-write acceleration.

Advanced traffic management

The following advanced traffic-management capabilities are integrated on the SAN16C-R:

- Virtual output queue: Helps ensure line-rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.
- Port channels: Allow users to aggregate up to 12 physical ISLs into a single logical bundle, providing optimized bandwidth utilization across all links. The bundle can consist of any speed-matched ports from any module in the chassis, helping ensure that the bundle can remain active even in the event of a module failure.
- Fabric Shortest Path First (FSPF) multipathing: Provides the intelligence to load balance across up to 12 equal-cost paths and, in the event of a switch failure, dynamically reroute traffic.

The following additional advanced traffic-management capabilities are available on the SAN16C- R with the optional Enterprise license package (feature code AJJ4) to simplify deployment and optimization of large-scale fabrics:

- QoS can be used to manage bandwidth and control latency, and to prioritize critical traffic for specific applications.
- IVR eliminates the need for external routing appliances, greatly increasing routing scalability while delivering line-rate routing performance, simplifying management, and eliminating the challenges associated with maintaining separate systems.
- SCSI flow statistics collects logical unit number (LUN)–level SCSI flow statistics, including read, write, and error statistics, for any combination of initiators and targets.
- Up to 8191 buffer-to-buffer extended credits (500 default) can be assigned to an individual port for optimal bandwidth utilization across long distances.

Comprehensive solution for robust network security

To address the need for failure-proof security in storage networks, SAN16C-R includes an extensive security framework to protect highly sensitive data crossing today’s enterprise networks:

- Anticounterfeit technology and secure boot with a tamper-proof chipset on the motherboard to assure , hardware authenticity and software integrity.
- Smart zoning enables IBM c-type product family fabrics to provision the hardware access control entries specified by the zone set more efficiently, avoiding the superfluous entries that would allow servers (initiators) to talk to other servers, or allow storage devices (targets) to talk to other storage devices. This feature makes larger zones with multiple initiators and multiple targets feasible without excessive consumption of hardware resources. Smart zones can correspond to applications, application clusters, hypervisor clusters, or other data center

entities, saving the time that administrators previously spent creating many small zones, and enabling the automation of zoning tasks.

- Intelligent packet inspection is provided at the port level, including the application of ACLs for hardware enforcement of zones, VSANs, and advanced port-security features.

The following additional advanced security-management capabilities are available on the SAN16C-R with the Enterprise license package to further help ensure the security of large-scale fabrics:

- Switch-to-switch and host-to-switch authentication helps eliminate disruptions that may occur because of unauthorized devices connecting to a large enterprise fabric.
- Fibre Channel - Security Protocol (FC-SP) Encapsulated Security Payload (ESP) supports encrypted data to flow through the switch.
- Port security locks down the mapping of an entity to a switch port to help ensure that SAN security is not compromised by the connection of unauthorized devices to a switch port.
- VSAN-based access control allows customers to define roles in which the scope of the roles is limited to certain VSANs.
- FC-SP provides switch-switch and host-switch Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) authentication supporting RADIUS and TACACS+ to help ensure that only authorized devices access protected storage networks.
- Comprehensive IPsec protocol suite delivers secure authentication, data integrity, and hardware-based encryption for FCIP.
- Digital certificates are issued by a trusted third party and are used as electronic passports to prove the identity of certificate owners.

• Fabric binding for open systems helps ensure that the ISLs are enabled between only switches that have been authorized in the fabric binding configuration.

Advanced diagnostics and troubleshooting tools

Management of large-scale storage networks requires proactive diagnostics, tools to verify connectivity and route latency, and mechanisms for capturing and analyzing traffic. With the IBM Storage Networking c-type family, IBM delivers a comprehensive tool set for troubleshooting and analysis of storage networks. The IBM Storage Networking c-type family integrates the industry’s most advanced analysis and diagnostic tools, which are included as standard on the SAN16C-R.

- Power-on Self-Test (POST) and Cisco Online Health Monitoring System (OHMS) provide proactive health monitoring.
- SAN16C-R implements diagnostic capabilities such as Fibre Channel traceroute to identify the exact path and timing of flows, and Switched Port Analyzer (SPAN) to intelligently capture network traffic.
- After traffic has been captured, it can be analyzed with the Fabric Analyzer tool, an embedded Fibre Channel analyzer.
- Comprehensive port-based and flow-based statistics facilitate sophisticated performance analysis and service-level agreement (SLA) accounting.

Ease of management

To meet the needs of all users, the SAN16C-R provides three principal modes of management: CLI, DCNM, and integration with third-party storage management tools.

DCNM SAN is the network industry's first converged SAN and LAN management solution. DCNM is able to manage all NX-OS-based devices, including IBM Storage Networking c-type products. The intuitive graphical user interface simplifies day-to-day operations of unified fabrics in today's highly virtualized data center environments.

The main functions supported by DCNM include:

- Monitoring of events and performance historically and at scale
- Wizard- and template-based provisioning of technologies and services based on NX-OS
- Dynamic topology views with extended visibility into virtual infrastructure
- Resource management through trend analysis of inventory and performance
- Rule-based event notification and filtering
- RBAC to provide separation between the network and storage teams

The solution is designed to scale to large enterprise deployments through scale-out server architecture with automated failover capability. These capabilities provide a resilient management system that centralizes infrastructure and path monitoring across geographically dispersed data centers. DCNM base management functions are available at no charge; advanced features are unlocked with the DCNM advanced license (feature code AJJ7). The DCNM application can be installed on Linux and Microsoft Windows operating systems and supports both PostgreSQL and Oracle databases.

An HTTP/HTTPS programming interface is also available under the name of NX-API. It supports all non-interacting commands and can be used to collect information from the switch or make configuration changes to it.

Advanced software packages

SAN16C-R can be further enhanced through additional optional licensed software packages that offer advanced intelligence and functions. Currently available software packages include the following:

• Enterprise Package (feature code AJJ4): This package includes a set of traffic engineering and advanced security features, such as IVR, QoS, switch-to-switch and host-to-switch authentication, LUN zoning, and read-only zones, that are recommended for enterprise SANs

• DCNM Advanced License (feature code AJJ7): This is the licensed version of DCNM that provides server federation, historical performance monitoring for network traffic hot-spot analysis, centralized management services, and advanced application integration

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SAN16C-R Fabric Switch Specifications

*FICON and related features will be supported on the SAN16C-R in a post-General Availability release.

Why IBM?

IBM offers a vast portfolio of hardware, software and services that can help organizations of all sizes address their IT infrastructure requirements in a comprehensive and integrated way. With IBM, organizations can create a more flexible, robust and resilient infrastructure to support critical business operations.

For more information

To learn more about IBM Storage Networking SAN16C-R Fabric Switch, please contact your IBM representative or IBM Business Partner, or visit the following website: **ibm.com**/systems/storage/san/ctype/SAN16C-R/

Next steps

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