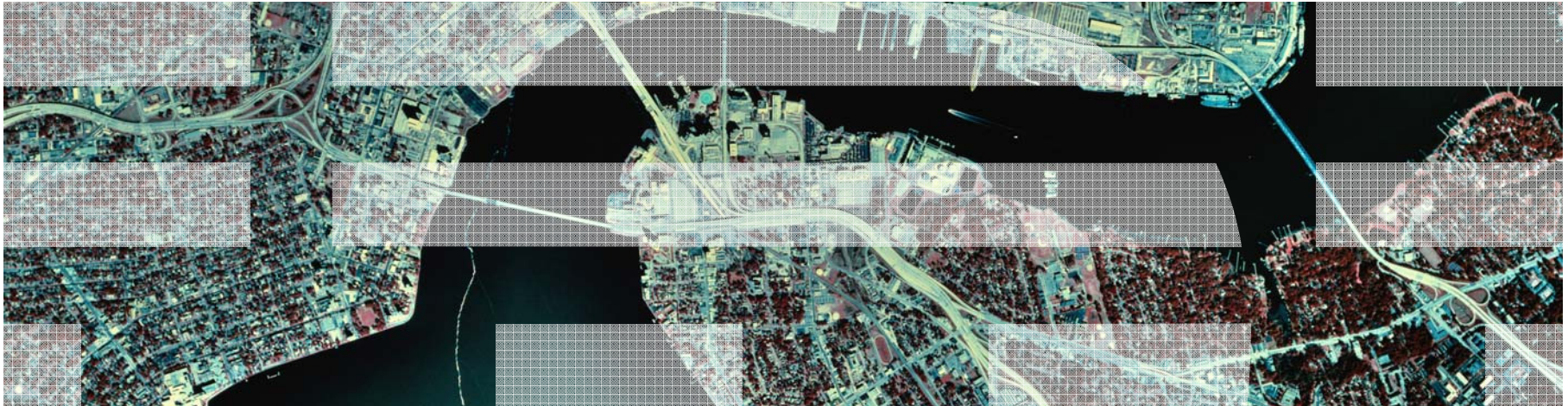




IBM System Storage Private Cloud Launch

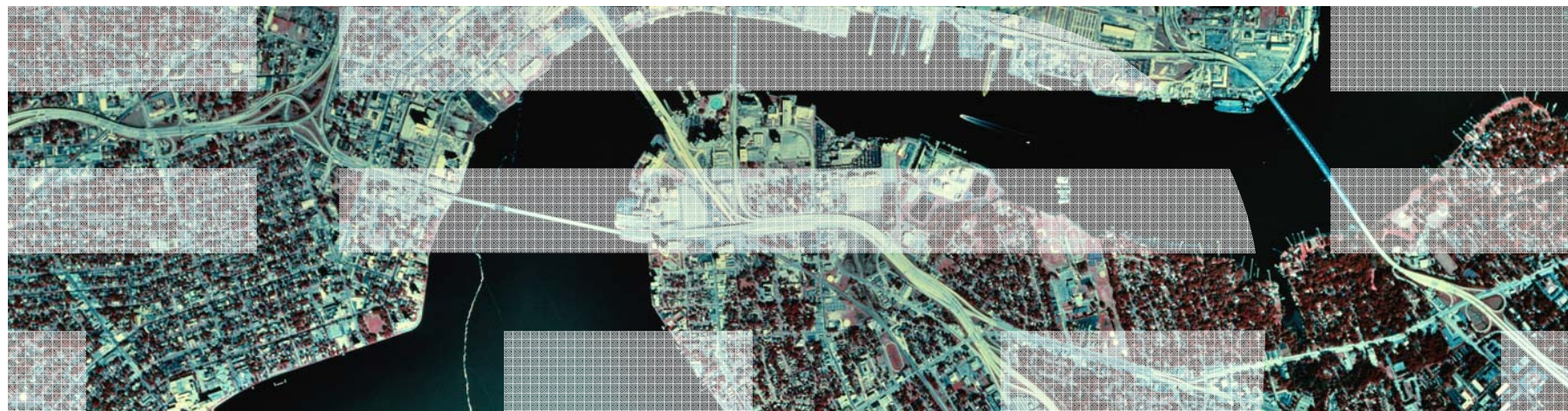
Reliable, Scalable, High-Performance Foundations for Private Cloud Storage



Agenda

- Introduction
- IBM System Storage SAN48B-5 Overview
- IBM System Storage SAN768-2 and SAN384B-2 Overview
- Enabling Private Cloud Storage

Introduction



CONSOLIDATION



CLOUD

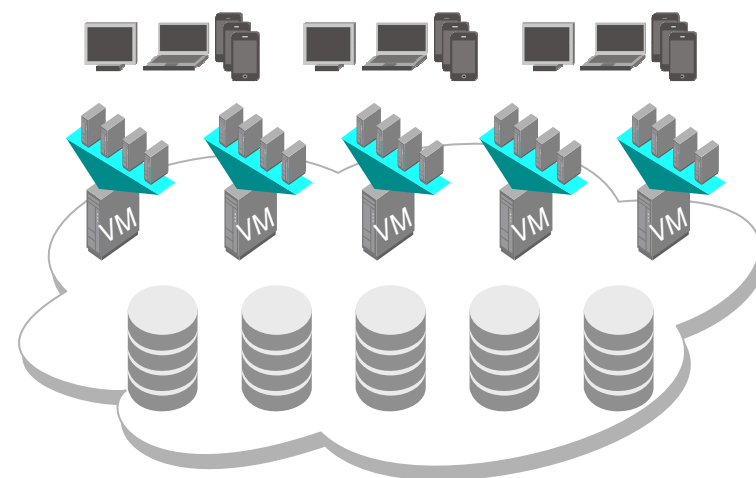
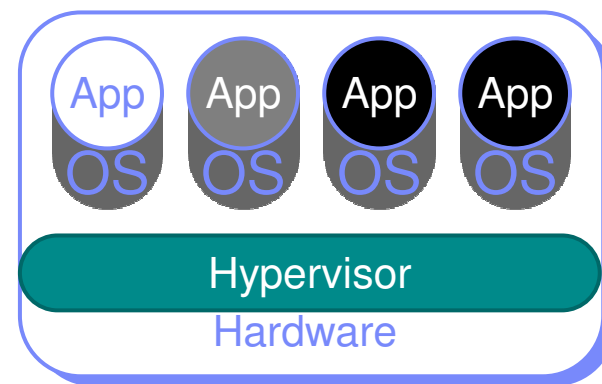


VIRTUALIZATION

Continuous Growth

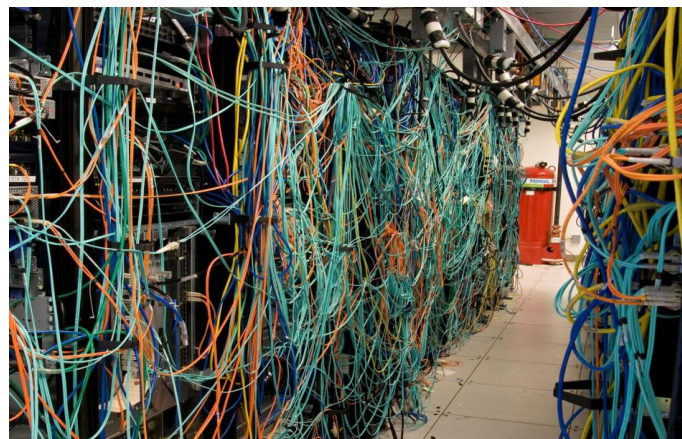
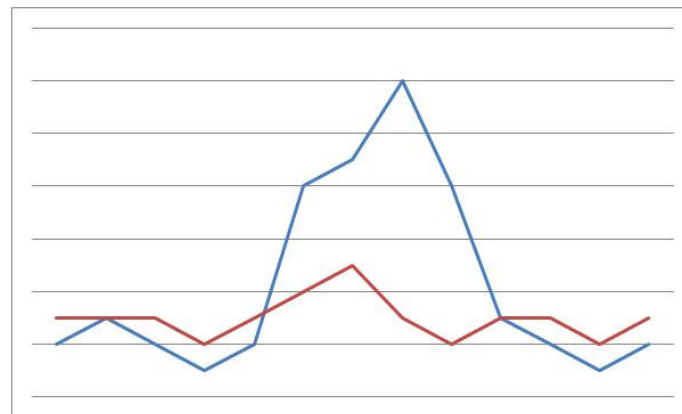
Planning for the future

- Server hardware
 - More cores, more memory, faster buses
- Virtual servers
 - A 10X growth in Virtual Machines (VMs) installed by 2012
 - Hundreds of virtual desktops per server
- Storage
 - Adoption of Solid State Drives (SSDs)
 - More than 900 Exabytes of data by 2010
 - More than 35 zettabytes of data forecasted by 2020



Increasing Complexity and Inefficiency

- **Dynamic business requirements**
 - Peak and unpredictable workloads
 - 24x7 operations
- **Infrastructure complexity**
 - Too many elements
 - Disparate management frameworks
- **Geographic locality**
 - Operational complexity across data centers
- **Data center design**
 - Legacy designs are inefficient



Business Objectives

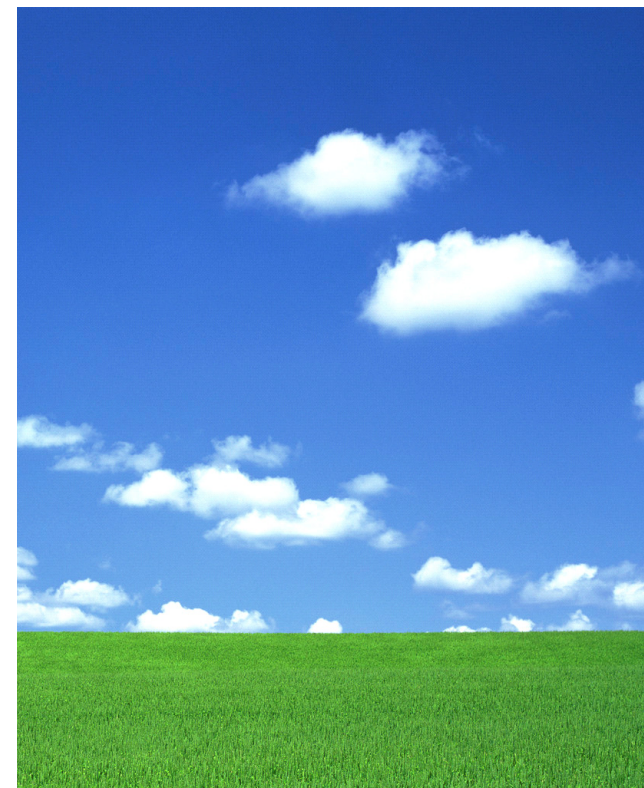
Requiring IT to do More with Less

- Non-stop access to information
 - Fast, reliable
- Move at speed of business
 - Scale with growth and application needs
 - Deliver new services on demand
 - Rapidly adjust to changing conditions
- Reduce costs
 - CapEx and OpEx
 - Maximize investments
 - Gain efficiencies



Transition to Private Cloud Architectures

- Private cloud architectures
 - Simplify infrastructure
 - Become more agile
 - Realize CapEx and OpEx savings
- IBM fabric-based solutions
 - Essential foundation for cloud-optimized networks
 - Simple, flat, and high-performance
 - Highly resilient and scalable networks
- Deliver complete benefits of virtualization in private clouds



Cloud-Optimized SAN Platforms

Fibre Channel is the foundation for private cloud storage



SAN768B-2 and SAN384B-2
Fabric Backbones



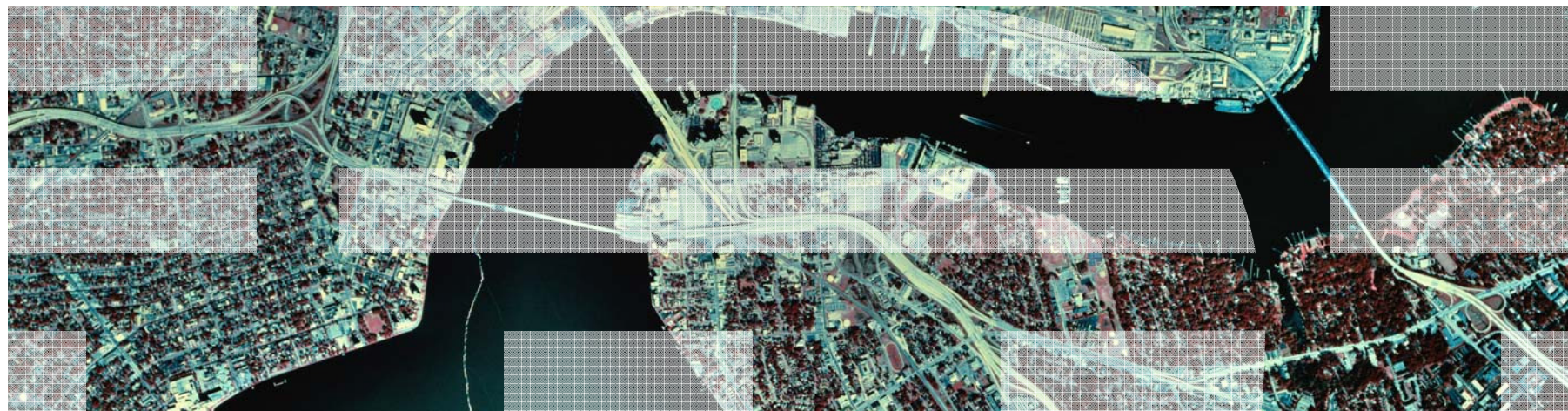
SAN48B-5 Switch

- IBM Fibre Channel SAN solutions provide highly reliable, scalable, high-performance foundation for private cloud storage networks
- Enhanced Fibre Channel technology and innovation ease the transition to private clouds
 - Proven foundation for virtualized data centers
 - Enables hyper-scale virtualization for emerging workloads
- IBM 16Gbps fabric backbones and switches transform existing storage assets into cloud-optimized storage networks



Introducing the new 16 Gbps SAN switch

IBM System Storage SAN48B-5



SAN48B-5: SAN Switch for Private Cloud

Unmatched Flexibility

- 24 to 48 ports on-demand flexibility for “pay-as-you-grow” scalability
- Reversible airflow options
- Small footprint (1U and less than 18 inches deep) for flexible deployments

Simple and Easy to Use

- Intuitive, three-step deployment with EZSwitchSetup
- Easily connects servers to the fabric with automatic recognition and provisioning
- Real-time power monitoring
- Cable and optics diagnostics
- Access Gateway mode



Metro-Cloud SAN Connectivity

- Configurable ports for 10 Gbps metro optical connectivity
- In-flight encryption and compression
- Industry-leading extended distance support of native Fibre Channel up to 7500 km at 2 Gbps

Optimized SAN Performance for Cloud Apps

- Optimized for emerging workloads—VDI-shared storage and SSD arrays
- 16 Gbps Fibre Channel investment protection
- QoS and traffic engineering enhancements
- 128 Gbps ISL Trunks

Slide 11

I28

Change the boxes color/writing

IBM_USER, 30/06/2011

SAN48B-5 16 Gbps Fibre Channel Switch



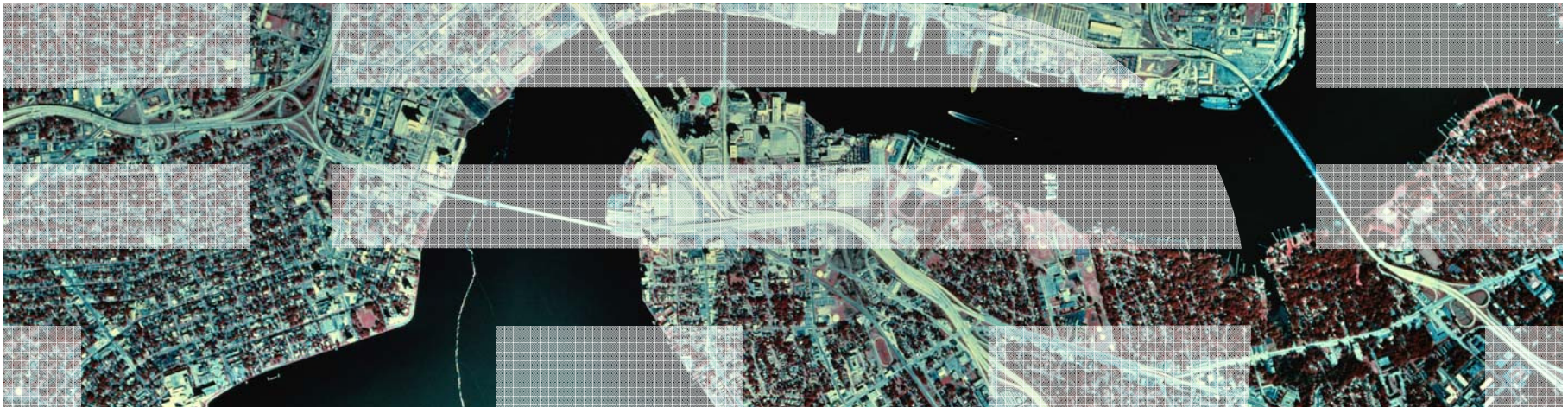
Front View



Back View

- 48×16 Gbps Fibre Channel front-end ports that support 2, 4, 8, 10, and 16 Gbps speeds
- 24-port base switch with 12 Ports On Demand (POD) license
- 1U with reversible airflow option SKUs—front-to-back and back-to-front
- Less than 18 inches (443 mm) in depth—accommodates compact cabinet enclosures
- Dual-power supplies with integrated fans
- Ethernet, console, and USB management ports
- Standard Fibre Channel features: trunking, NPIV, E/F/EX/D/M port types, Virtual Fabrics
- Support for in-flight encryption and compression on all ports
- Support for optic/media diagnostic features and real-time power monitoring

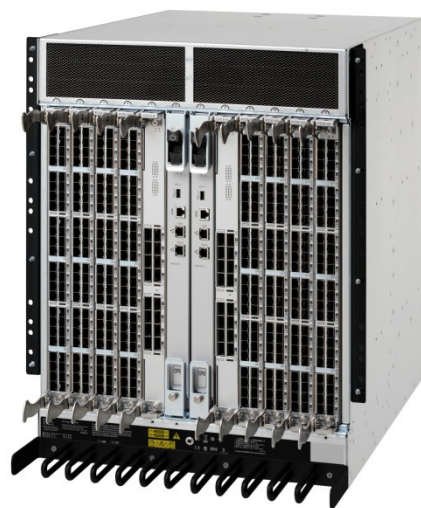
IBM System Storage SAN768B-2 & SAN384B-2



SAN768B-2 & SAN384B-2 Backbone Family

Proven scalability, performance, and reliability

Two backbone models



SAN768B-2

- Up to 384 × 16 Gbps Fibre Channel ports or up to 512 × 8 Gbps Fibre Channel ports
- Large enterprise fabric core



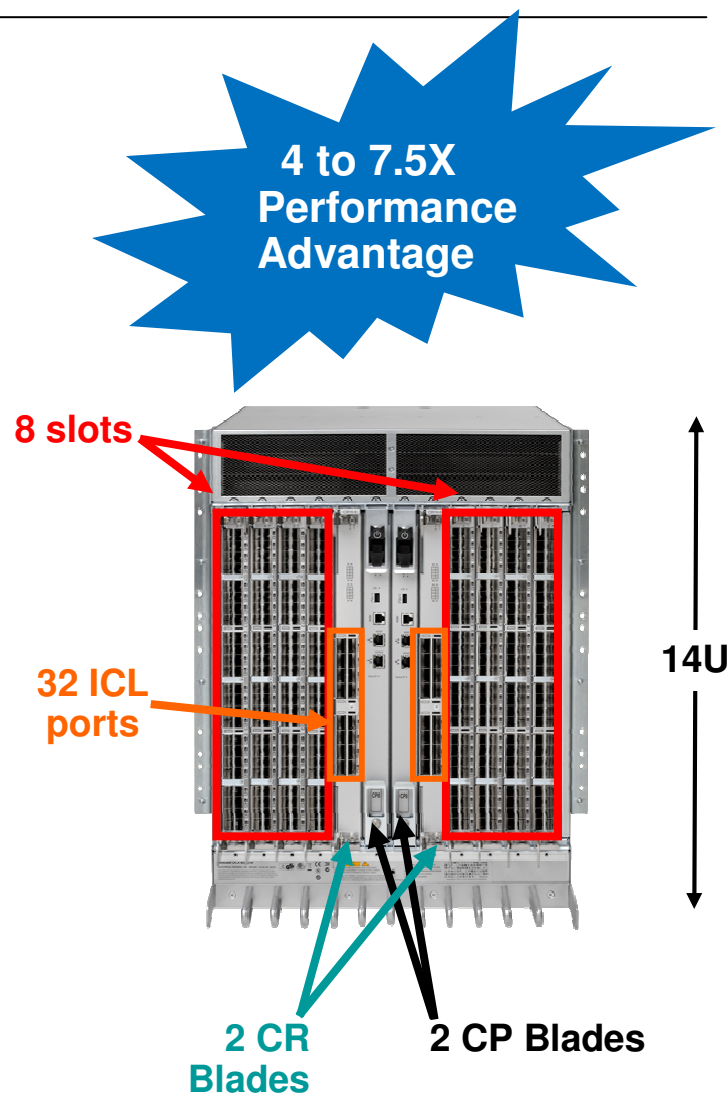
SAN384B-2

- Up to 192 × 16 Gbps Fibre Channel ports or up to 256 × 8 Gbps Fibre Channel ports
- Midsize enterprise fabric core
- Large enterprise edge or application engine

SAN768B-2

Large enterprises

- Up to 384 ports at full 16 Gbps speed
- Up to 32 optical Inter-Chassis Link (ICL) ports
- 8.2 Tbps total chassis bandwidth
 - 6.1 Tbps universal ports
 - 2.1 Tbps ICL bandwidth
- 512 Gbps bandwidth per slot
- 12-slot vertical card cage
 - Two control processor (CP8) blades
 - Two core routing (CR16-8) blades
 - Eight slots for port and specialty blades



SAN768B-2

No single point of failure; redundant hot-pluggable components

Power supplies

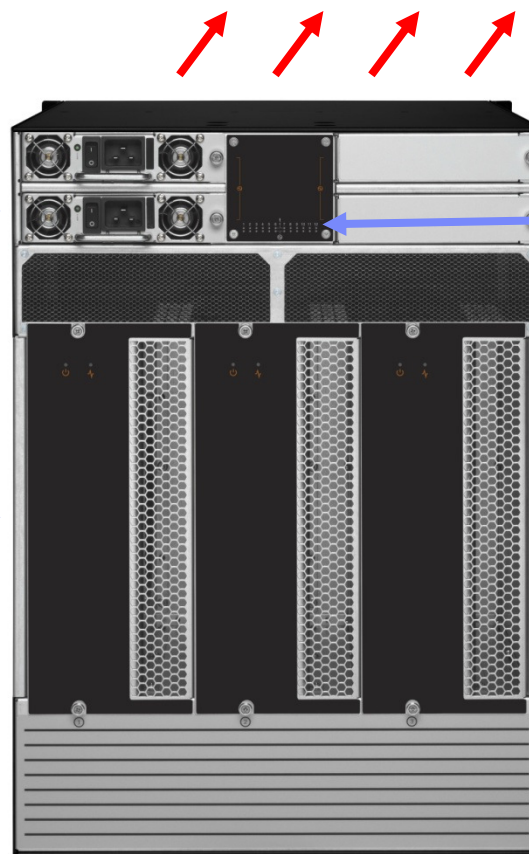
- Two ship standard; four bays
- Standard: 2000 W, 180-264 VAC
- Optional: 1000 W, 85-132 VAC
- Same FRUs as SAN384B-2

3×220 mm cooling fan FRUs

- Same FRUs as SAN384B-2
- Two required for operation

Passive Backplane

(No electronic components such as memory, CPU, or capacitors)



Two WWN cards
(behind plate)

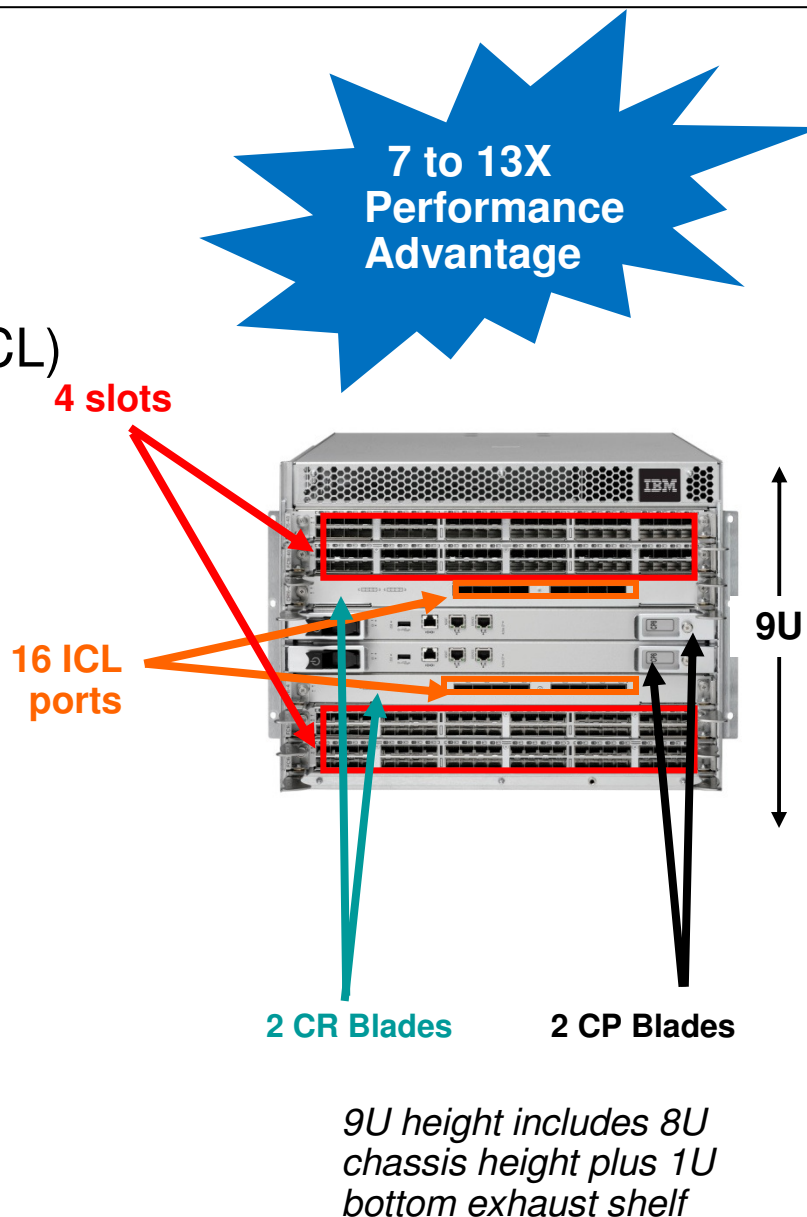
Non-port side to
port side airflow

SAN768B-2 rear view

SAN384B-2

Midsize enterprises

- Up to 192 at full 16 Gbps speed
- Up to 16 optical Inter-Chassis Link (ICL) ports
- 4.1 Tbps total chassis bandwidth
 - 3.1 Tbps universal ports
 - 1.0 Tbps ICL bandwidth
- 512 Gbps bandwidth per slot
- 8-slot horizontal card cage
 - Two control processor (CP8) blades
 - Two core routing (CR16-4) blades
 - Four slots for port and specialty blades



SAN384B-2

No single point of failure; redundant hot-pluggable components

Power supplies

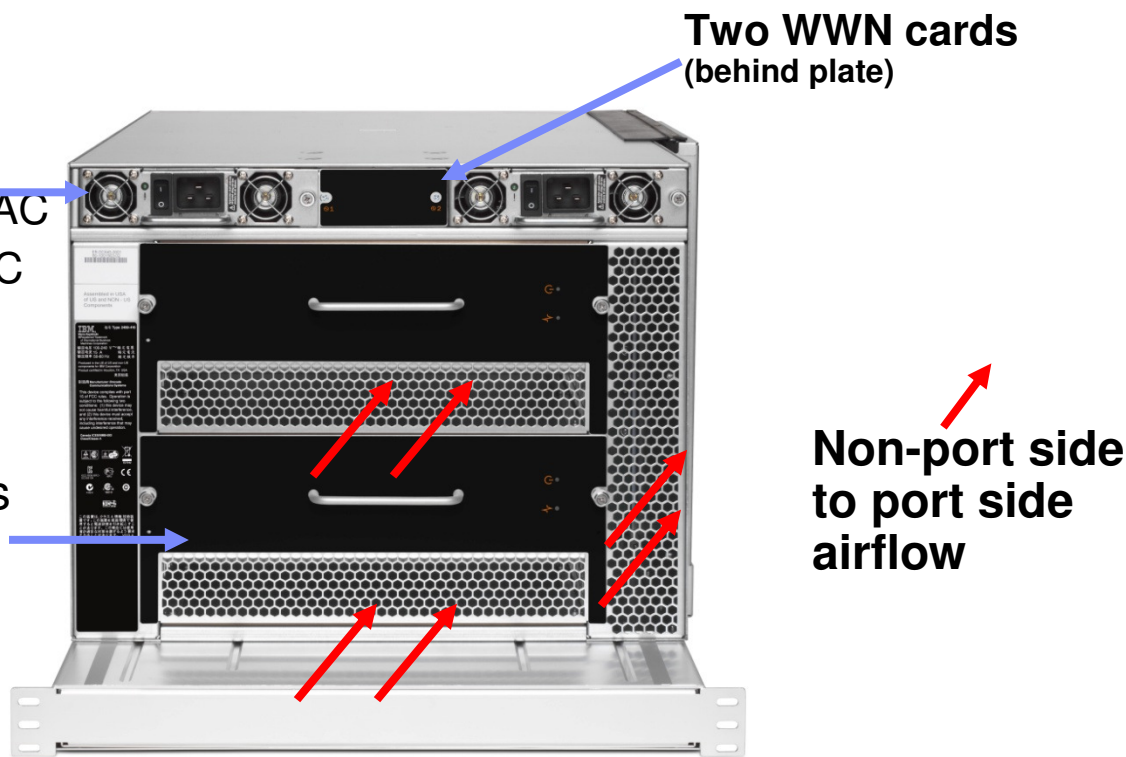
- Two ship standard; two bays
- Standard: 2000 W, 180-264 VAC
- Optional: 1000 W, 85-132 VAC
- Same FRUs as SAN768B-2

2x220 mm cooling fan FRUs

- Same FRUs as SAN768B-2

Passive Backplane

(No electronic components such as memory, CPU, or capacitors)

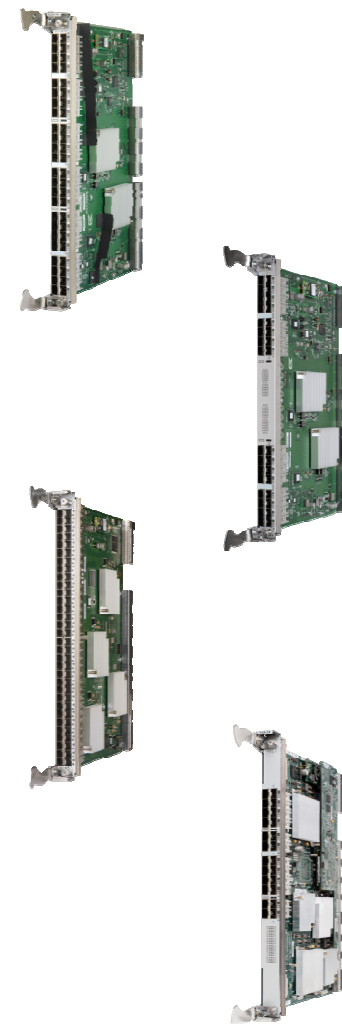


SAN384B-2 rear view

SAN768B-2 and SAN384B-2 Backbone Family

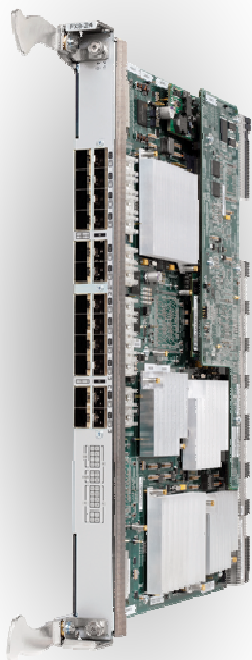
Blade options

- 48- and 32-port 16 Gbps Fibre Channel blades - faster
 - Universal Fibre Channel ports (E, F, D, M, and EX)
 - 10 Gbps SWL and LWL SFPs and 16 Gbps SWL SFPs; auto-negotiate slower speeds
 - 2/4/8/10/16 Gbps speed
- 64-port 8 Gbps Fibre Channel blade – higher density
 - Universal Fibre Channel ports (E, F, M, and EX)
 - All 64-ports at 8 Gbps with local switching
- Specialty blades extend the functionality and deliver unmatched value for SAN768B-2 and SAN384B-2
 - FCIP SAN extension blade



Extension Blade (FC# 3890)

Replicate data across any distance



▪ Optimum flexibility

- Twelve 8 Gbps Fibre Channel ports, 10×1 Gigabit Ethernet (GbE) ports
- Optional 10 GbE port upgrade with up to 20 Gbps bandwidth
- Up to four blades per SAN768-2/SAN384B-2 chassis
- Mainframe or open systems

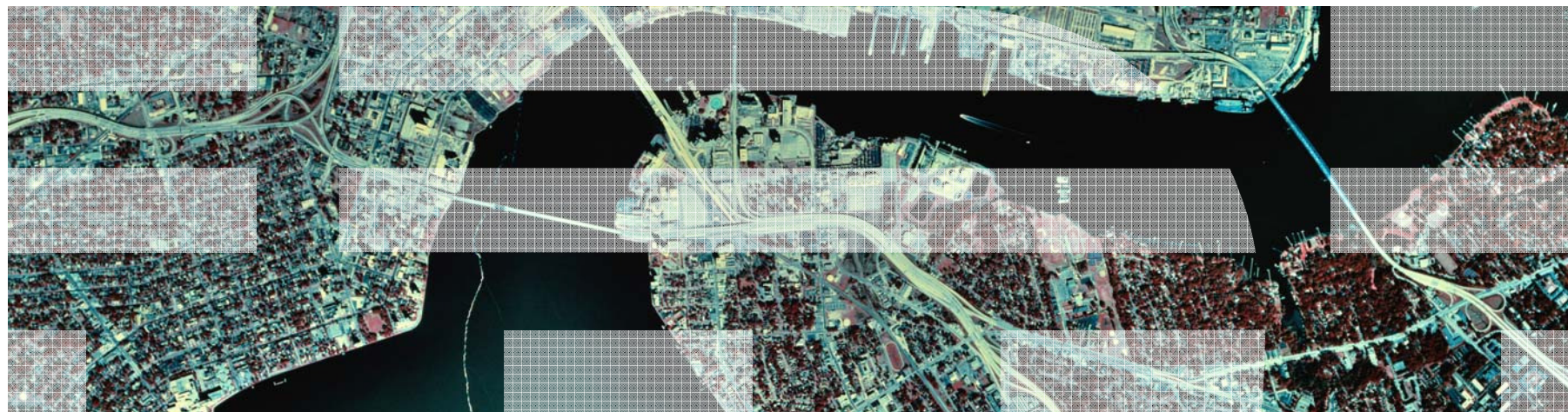
▪ Extraordinary performance

- Higher port density, bandwidth, and throughput
- New 10 Gbps FCIP solution
- FCIP Trunking maximizes FCIP tunnel bandwidth
- Adaptive rate limiting and advanced compression optimize network resources

▪ Value-added solutions

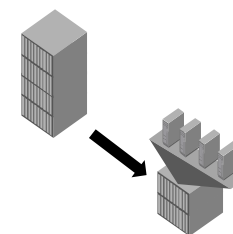
- Extends replication and backup over any distance
- Enables faster, more reliable data replication, backup, and recovery

Enabling Private Cloud Storage



The Steps to Private Cloud Storage

- Leverage the Fibre Channel foundation
- Architect the fabric for hyper-scale virtualization
- Extend capabilities between data centers
- Simplify management and administration
- Optimize performance by workload



Virtualization



Private Cloud

Enabling Private Cloud Storage

Fibre Channel fabrics for highly virtualized data centers

Flexible Fabrics

- 128 Gbps ISL trunks
- Scale-up Ports on Demand (PoDs)
- Airflow and cooling flexibility

Metro Cloud Connectivity

- Integrated DWDM and dark fiber
- In-flight encryption and compression
- Resilient metro links

Operational Simplicity

- Unified SAN management
- Cable and optics diagnostics
- Real-time power monitoring

Cloud-Optimized Performance

- Higher IOPs
- Twice the bandwidth
- Energy-efficient ASICs



IBM SAN Foundation

- Multi-tenancy: Integrated routing and Virtual Fabrics
- SLA-driven: Adaptive Networking and QoS
- End-to-end: HBA to storage management and services
- Dynamic services: SAN Extension

ISLs and Frame-Based Trunking

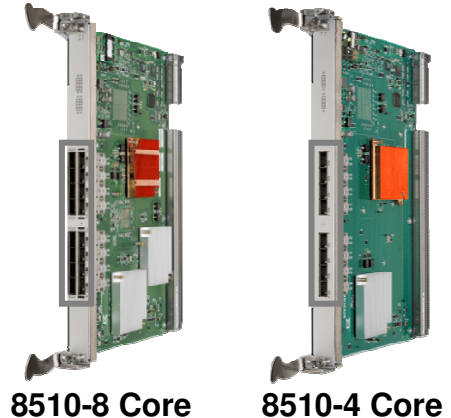
- 16 Gbps optimized Inter-Switch Links (ISLs)
 - Quadruples ISL connection and trunk speeds vs. 4 Gbps
 - Consolidate up to four 4 Gbps ISLs in a single 16 Gbps ISL
- 128 Gbps high-performance, resilient frame-based trunk
 - Combine up to eight 16 Gbps links in a single trunk
 - Consolidate up to 32 4 Gbps ISLs in a single 8-link trunk
- Preserves ports for servers and storage



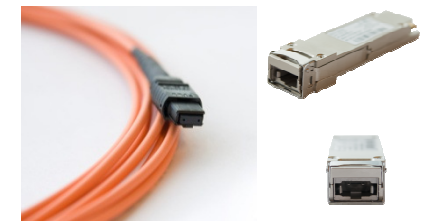
Scale-Out Optical ICLs

Backbone scalability, performance, and reliability

- Maximizes performance and scalability of SAN fabrics
 - Connect up to six chassis (core-edge)
 - Each ICL port delivers 64 Gbps (4×16 Gbps) bandwidth
 - 32 × ICL ports per IBM SAN768B-2 chassis
 - 16 × ICL ports per IBM SAN384B-2 chassis
 - Up to 2 Tbps ICL bandwidth (four times existing)
 - Up to 50 m universal optical cables
- Minimizes latency between chassis
 - Lower-latency switching through the backplane vs. ISLs
 - Does not count as a hop for FICON environments
- Maximizes load balancing and availability
 - Frame-based trunking is automatically enabled between four ICLs
 - DPS distributes exchanges across all frame trunks
 - If an ICL fails, traffic automatically flows over the remaining ICLs



New core routing blades
with optical ICL ports

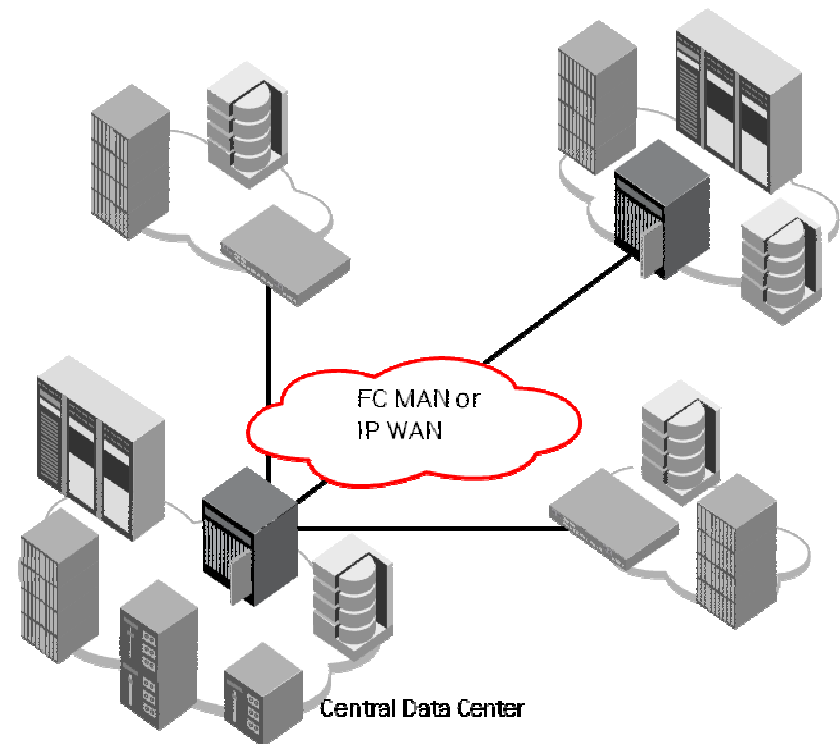


New ICL optics QSFP
(4×16 Gbps)

Integrated Metro and Geo SAN Connectivity

Replication and backup over distance

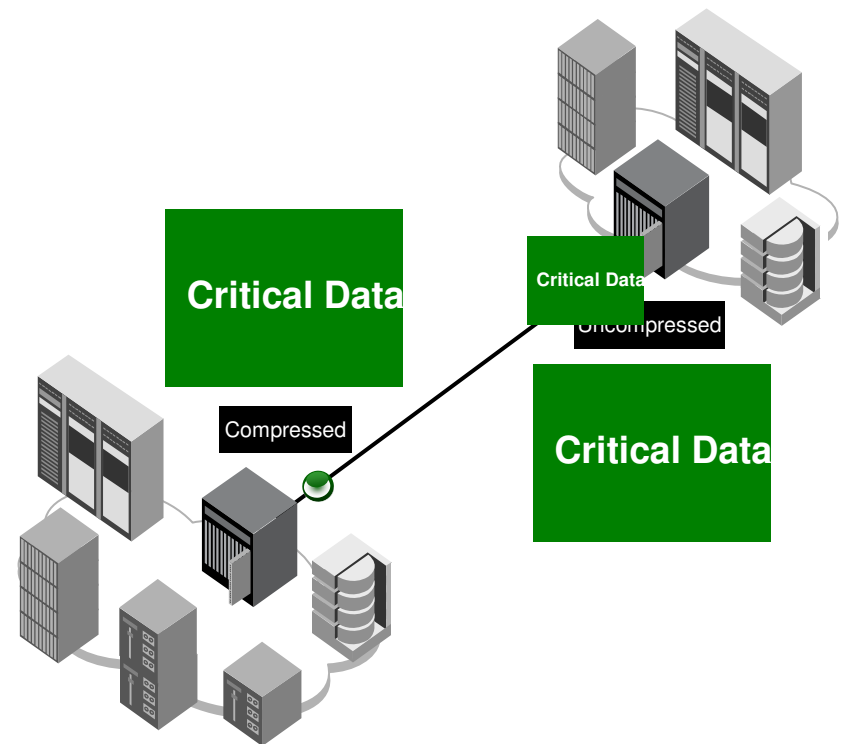
- Integrated high-performance metro and geo connectivity
- Native Fibre Channel or FCIP extension support
 - Native 10/16 Gbps Fibre Channel over DWDM or dark fiber up to 100 km
 - Supports 1/10 GbE over IP WAN links beyond 100 km
- Integrated advanced extension support
 - In-flight data encryption at wire speed
 - In-flight data compression at wire speed



In-flight Compression over ISLs

Move more data or reduce bandwidth costs

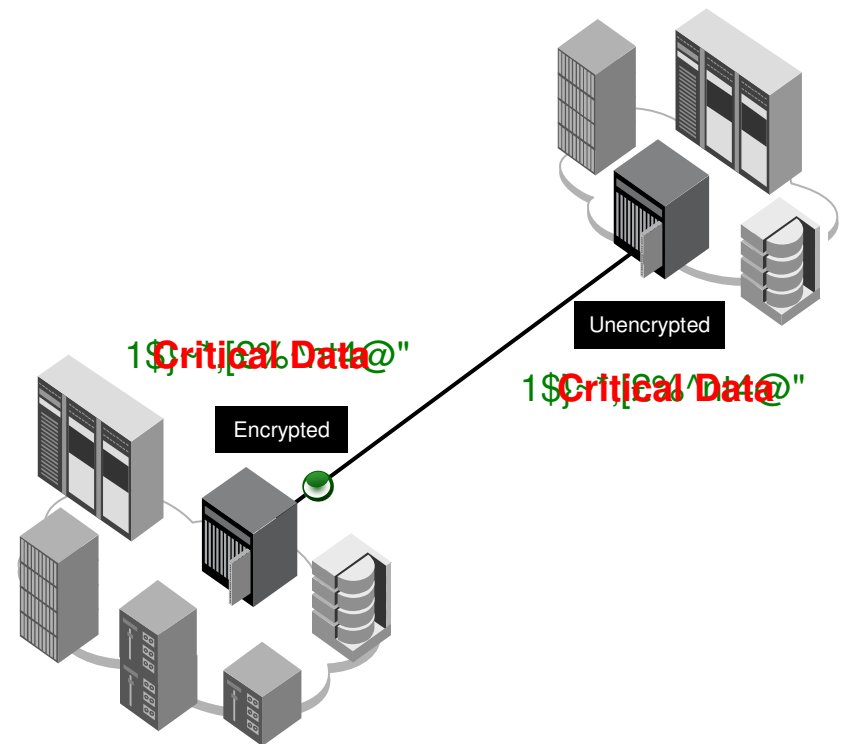
- Disk or tape traffic gets compressed on ISL and gets uncompressed at the receiving switch
- Provides up to 2:1 compression
- Provides up to 128 Gbps of bandwidth per blade
- Requires no license and can be used in conjunction with in-flight encryption



In-flight Encryption over ISLs

Minimizes the risk of unauthorized access

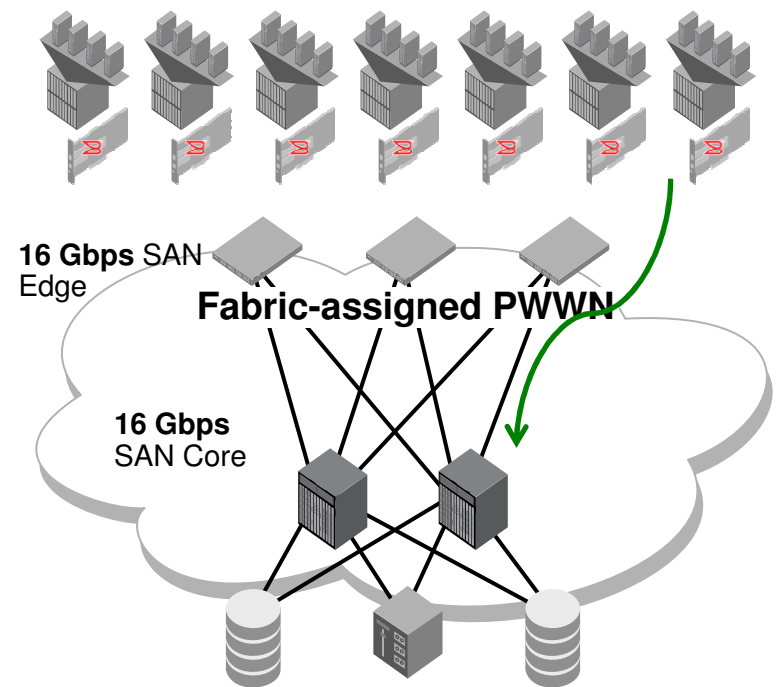
- Encrypts data on 16 Gbps ISLs
 - Switch-to-switch encryption, not at-rest encryption
 - Useful over Fibre Channel long-distance links
- Uses AES-GCM algorithm for both authentication and encryption
- Uses 256-bit encryption key
- Keys do not expire as long as the link stays active
- New set of keys enabled upon port disable/enable
- Port-level authentication must be enabled before enabling encryption



Dynamic Fabric Provisioning

Simplify server deployment and reconfigurations

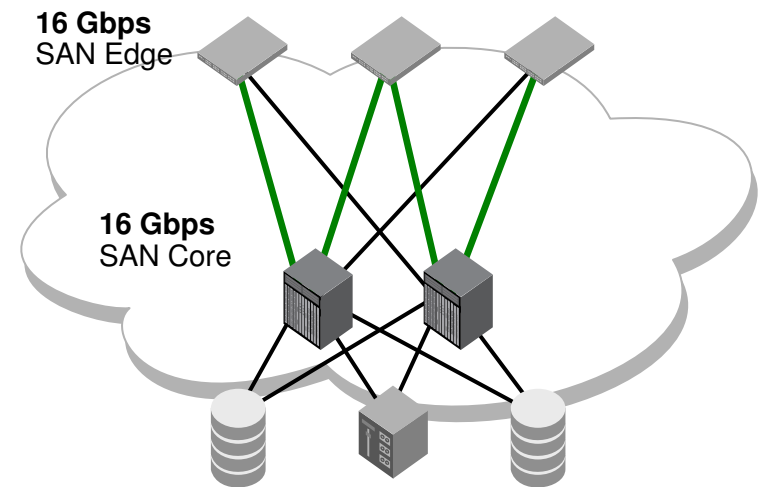
- Eliminates fabric reconfiguration when adding or replacing servers
- Reduces or eliminates the need for modifying zoning and LUN masking
 - Pre-provision fabric ports with virtual WWNs
 - Boot LUN zones, fabric zones, and LUN masks
- Flexibility to move devices within a switch
 - Migrate virtual WWNs with a move command
- Enables accurate asset management
 - Map virtual WWNs to actual devices in the fabric
- Simplifies management, reduces OpEx



End-to-End Optics and Link Validation

Ensure fabric link level integrity

- Identify and isolate optics and cable problems faster
- Reduce fabric deployment and diagnostic times
 - Hours instead of days
- Non-intrusively verify transceiver and cable health
 - Test electrical and optical transceiver components
 - Monitor and trend transceiver health based on uptime
 - Conduct cable health check
 - Monitor and set alerts for digital diagnostics
- Ensure predictable application performance over links
 - Provide granular latency and distance measurement for buffer credit assignment
 - Simulate application-level I/O profiles



Access Gateway Mode

Solving interoperability, scalability, and management challenges

- Simplify SAN connectivity through NPIV technology
 - Deploys as a full fabric switch or Access Gateway
 - Connects transparently to Brocade, McDATA and Cisco fabrics
 - Eliminates additional switch domains and switch management tasks
 - Accelerates server deployment and replacement with no disruptions for fabric re-configuration
- Maximizes performance and availability of the fabric
 - Supports frame-based trunking to optimize and balance performance, bandwidth and availability
 - Increases availability with non-disruptive fault recovery from path failure
 - Isolates the SAN from disruptions due to server maintenance
 - Leverages QoS to assure bandwidth for critical servers, virtual servers or applications

IBM Network Advisor 11.1

Manage SAN backbones and switches

Ease of use

- Out-of-the-box group management of directors and switches, including 16 Gbps FC platforms
- Automation of manual, repetitive, time-consuming, and error-prone tasks

Configuration management

- Simple wizards to configure Fibre Channel, FICON, FCIP tunnels, encryption switches, and HBAs/CNAs
- Integrated SAN diagnostics, policy monitoring, and bottleneck detection
- Host Views shows integrated HBA/CNA, storage, SAN fabric, and switch topology
- Wizards-based zoning configuration, including LSAN zoning and zoning reports
- Simplified management of virtual fabrics

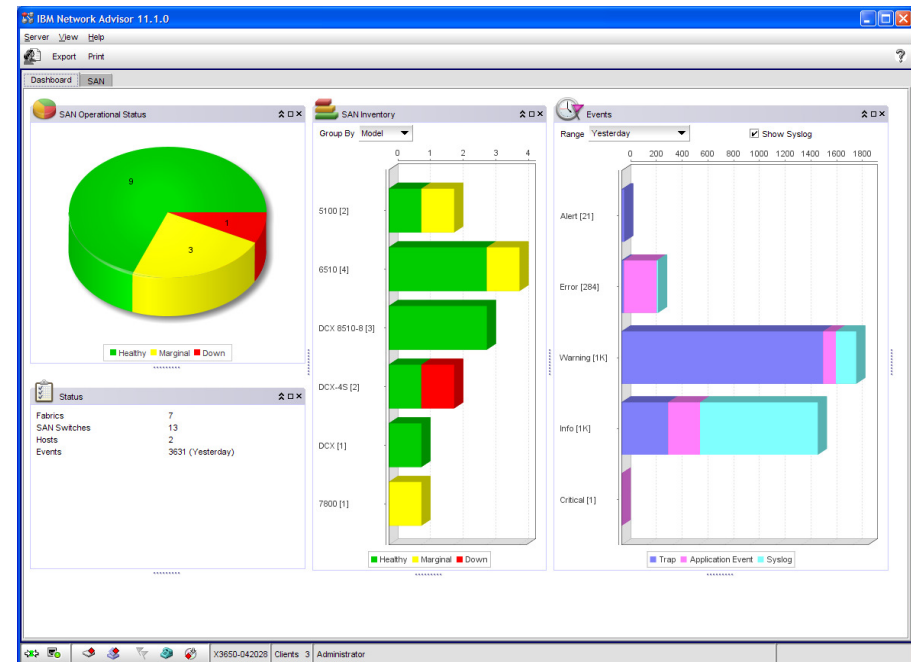


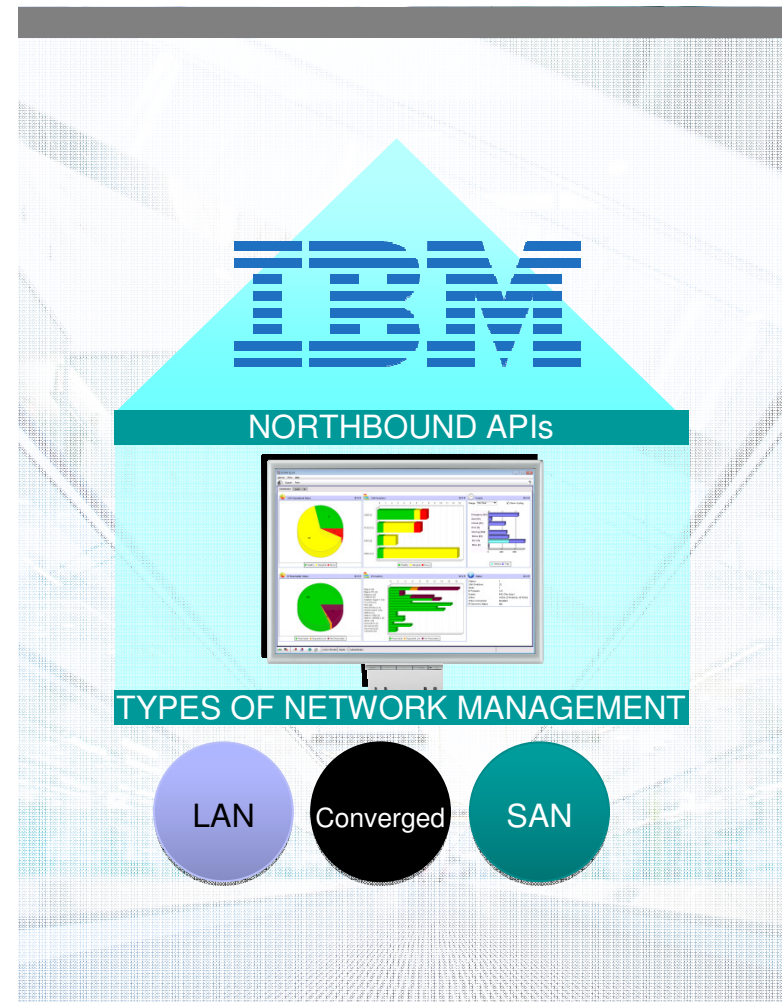
Image and change management

- Monitor configuration changes
- Support image management, including snapshot
- Back up switch configuration

Protect Customer Investments

End-to-end service orchestration with leading partner products

- Open architecture with industry-standard APIs
 - SMI-S, Launch-In-Context, published DB schema, SNMP Forward
- Ready-to-go integration with leading orchestration frameworks and service delivery platforms
- Seamless migration from current b-type solutions



Integration with VMware vCenter

Bridging operational gaps

- Provides VM-to-storage LUN visibility
- Enables VM-to-storage proactive port monitoring
- Provides visibility into SAN performance statistics
- Enables forwarding of SAN performance and fault events
- Empowers vCenter administrators with bottleneck identification

The screenshot displays the vSphere Client interface with the 'Testing1' view selected. The 'Connectivity' tab is active, showing 'Switch Port Statistics' and 'EE Monitors'.

Switch Port Statistics

Host	Virtual Machine	Switch/AG IP	Switch/AG Port	Switch/AG Port Number	Switch/AG Port Status	Switch/AG Name
10.32.149.18	Fabric 85 Virtual Machine 2	10.32.149.185	20:02:00:05:1E:90:68:C8	2	Online	DCFMTVT1_85
10.32.149.18	Fabric 85 Virtual Machine 2	10.32.149.85	20:00:00:05:1E:34:DF:CA	0	Online	DCFMTVT_85

Results 1 - 2 of 2.

EE Monitors

Monitor Name	Virtual Machine	Source Fabric	SID	Source Switch	Source	Source Port	Destination F
150000-1502e2	Fabric 85 Virtual Machine 2	10:00:00:05:1E:34:DF:CA	150000	10.32.149.85	20:00:00:05:1E:0A:36:29	10:00:00:05:1E:0A:36:29	10:00:00:05:1E:0A:36:29

Results 1 - 1 of 1.

Recent Tasks table:

Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Time	Start Time

License Period: 35 days remaining | Administrator

Integration with Microsoft SCOM

Enables visibility into SAN infrastructure

- Provides server-to-SAN network visibility
- Allows visibility into SAN performance statistics
- Enables forwarding of SAN performance and fault events
- Empowers SCOM administrators with bottleneck identification
- Automatic Call Home support for faster resolution

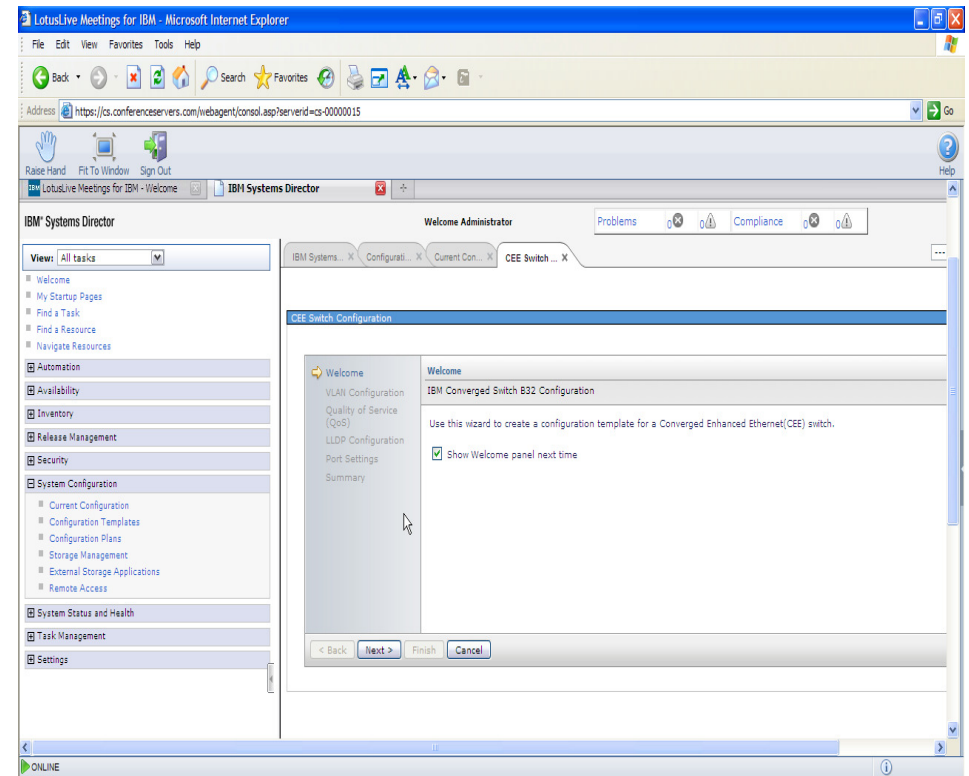
The screenshot shows the SCOM console interface. The left-hand navigation pane is titled 'Monitoring' and contains a tree view. Under 'Network Advisor Management Pack', the 'Network Advisor Service' is selected, and a red box highlights the 'Network Advisor Service' and 'Network Advisor Service' items. The main content area is titled 'Fabric Details' and shows a table of switch details.

Switch/AG IP	Switch/AG Name	WWN	Managed Port Count	Status	Model	Firmware	Domain ID	Description	State	Virtual Fabric ID
0.0.0.0	for_id_100	50:00:51:EB:88:35:CF:0E	0	Operations	Not Available	v410	1	--		
10.32.116.241	SW200E	10:00:00:05:1E:05:80:7B	16	Healthy	Brocade 200E	v6.2.0d	2	Fibre Channel Switch	Online	
10.32.116.246	Elna116246	10:00:00:05:1E:53:EF:86	32	Healthy	Brocade 8000	v6.3.0a	3	Fibre Channel Switch	Online	
10.32.116.245	homSpr111	10:00:00:05:1E:57:AD:46	24	Healthy	Brocade S100	v6.2.0d	45	Fibre Channel Switch	Online	
0.0.0.0	for_id_140	50:00:51:EB:88:33:8E:71	0	Operations	Not Available	v410	140	--		

Integration with IBM Systems Director

Provides end-to-end monitoring and management

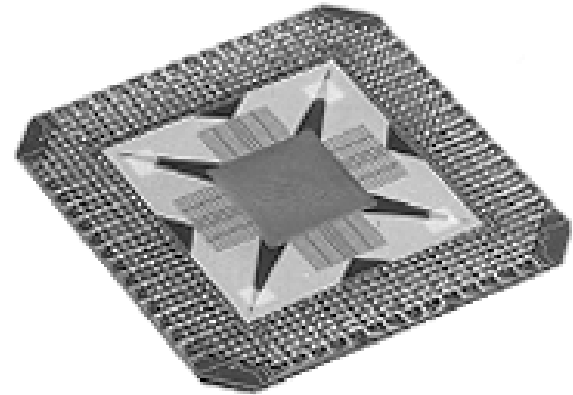
- View as a single solution
- Easily configure, monitor, and manage both Fibre Channel and IBM converged (FCoE) switches
- Avoid network downtime with end-to-end visibility
- Streamline fault isolation



Advanced Switching ASIC

Seventh-Generation Condor3

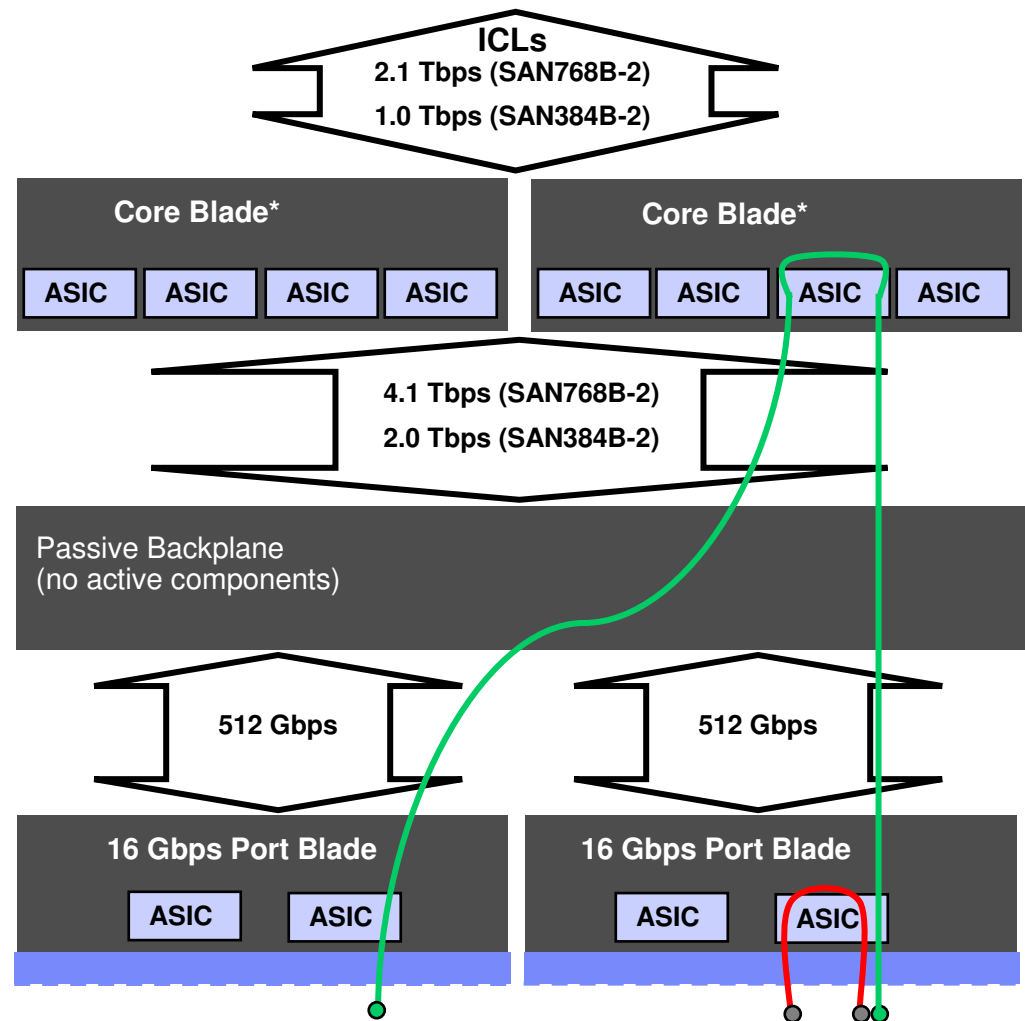
- Extraordinary performance
 - 16/10/8/4/2 Gbps speed
 - 420 million frames switched per second
 - 768 Gbps of bandwidth
- Enhanced efficiency
 - Less than 1 watt/Gbps
- Great investment protection
 - Compatible with 30 million existing SAN ports
- More scalable across distance
 - 8000 buffers (four times existing)
 - Up to 7,500 km distance at 2 Gbps



SAN768B-2 & SAN384B-2 Backbones

Switching architecture

- “Cut-through” frame routing
 - Entire frame does not need to reside in ASIC before being switched—minimizing latency
- Frame latency
 - 2.1 μ sec between ports if crossing backplane
 - 700 ns between locally switched ports
- Local switching
 - Data traffic within same port group does not cross backplane
 - 32-, 48-port blades: two port groups
 - 64-port blade: eight port groups
 - Doesn't consume slot bandwidth

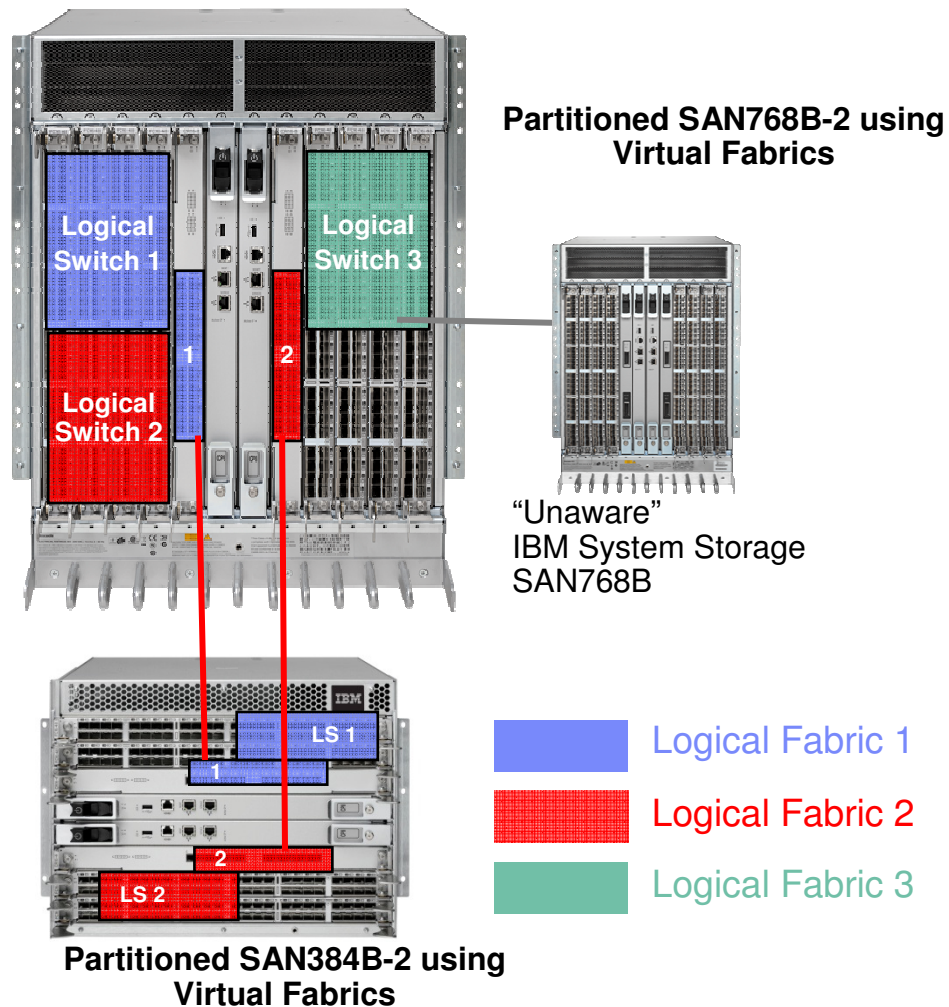


* CR16-8 blade (SAN768B-2): four ASICs
 CR16-4 blade (SAN384B-2): two ASICs

Local Switching
 (Traffic in same port group doesn't consume slot bandwidth)

Multi-Tenancy Support: Virtual Fabrics

Logically partition a physical SAN



- Partition SAN768B-2 & SAN384B-2 into logical switches
- Connect logical and “unaware” switches to form logical fabrics
- Isolate and manage by application, business group, customer, or traffic type

Thank You

