Brocade's SilkWorm Multi-Protocol Router

Jim Zucchero

SE Manager HP Account Team
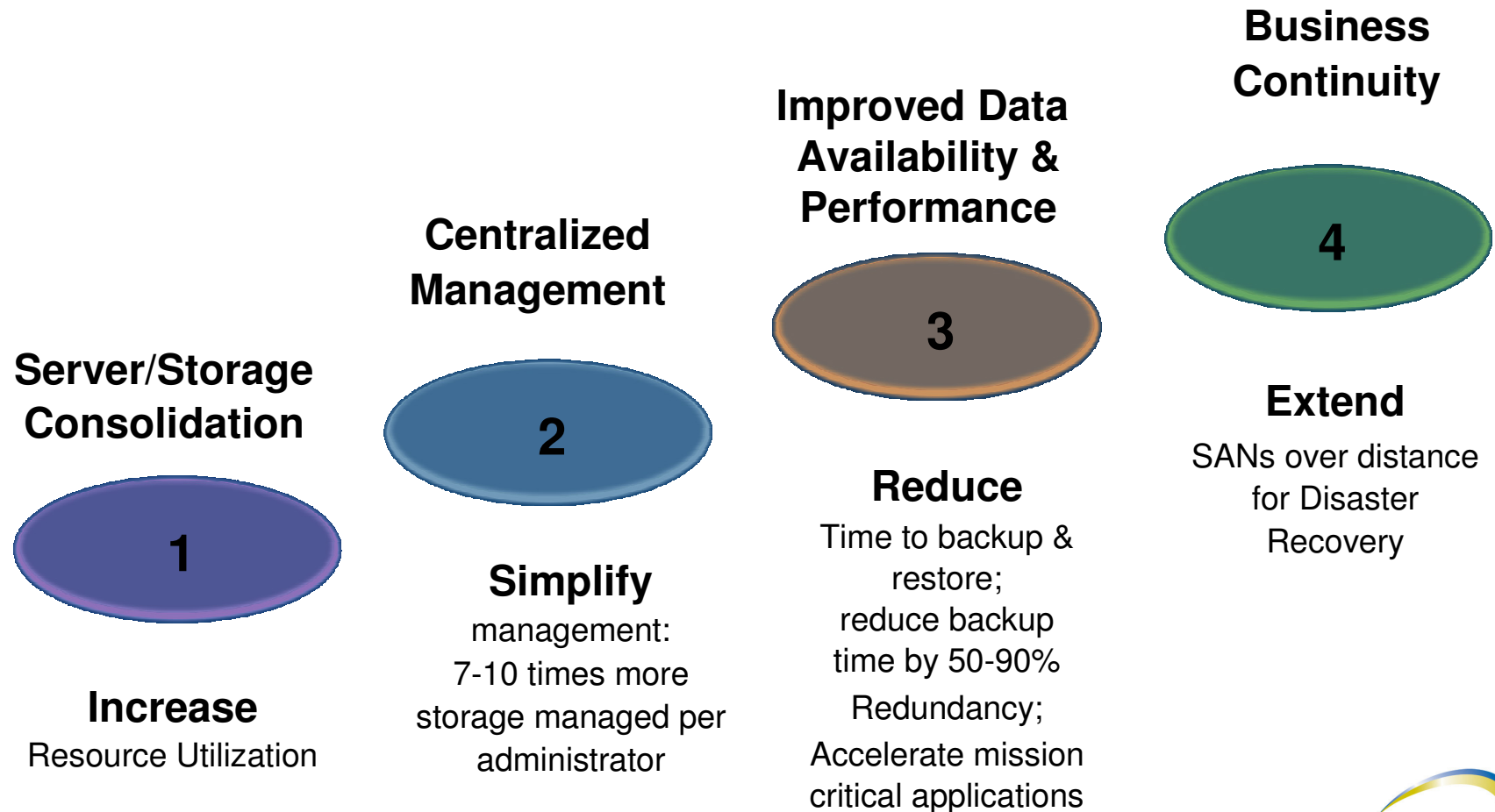
Brocade Communications Systems

Storage Market Drivers
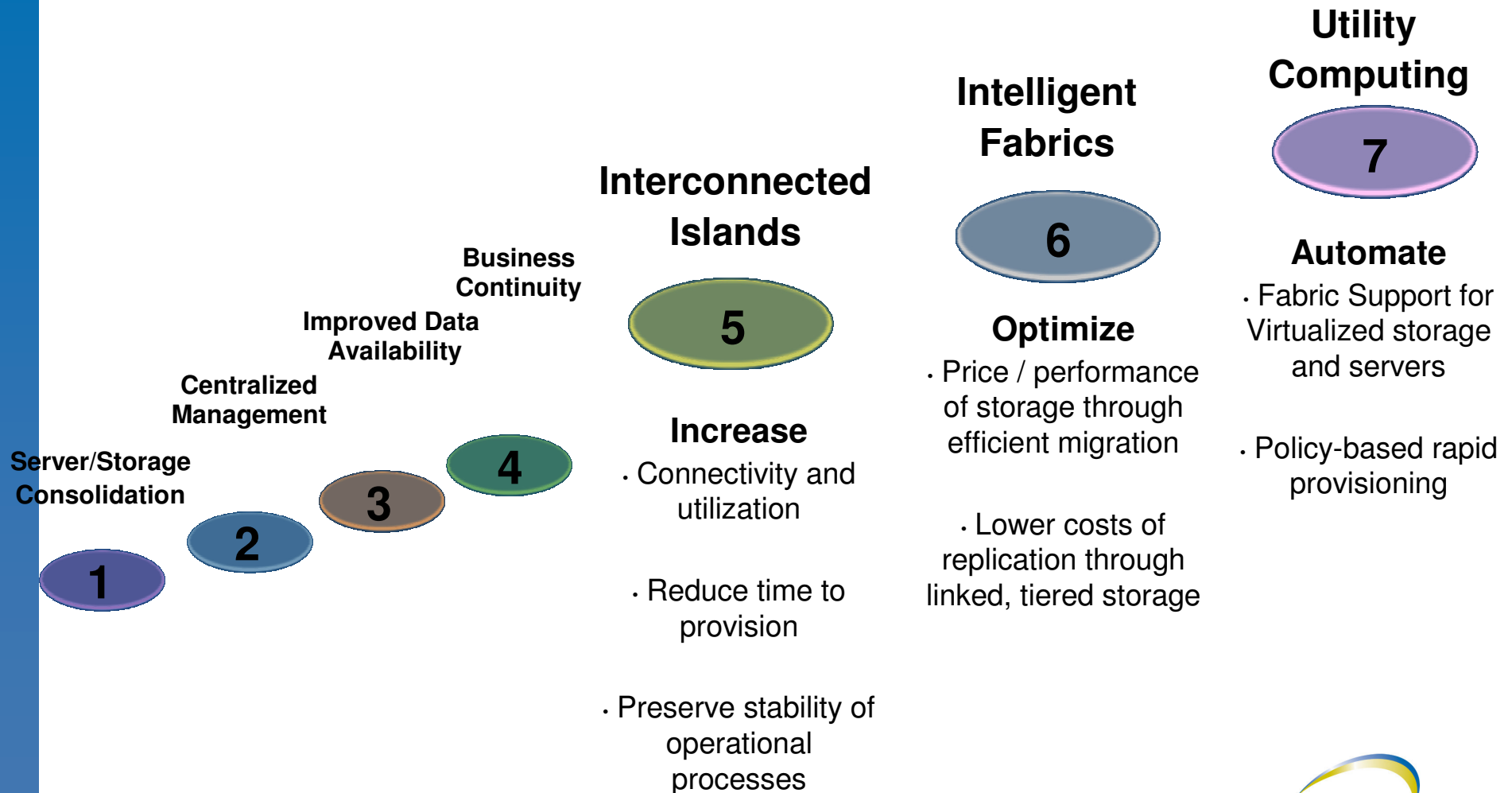
SAN Market Drivers Today…….
Save Money, Time, Reduce Operational Risk

Server/Storage Consolidation

1

Increase
Resource Utilization

Centralized Management

2

Simplify
management:
7-10 times more
storage managed per
administrator

Improved Data Availability & Performance

3

Reduce
Time to backup &
restore;
reduce backup
time by 50-90%
Redundancy;
Accelerate mission
critical applications

Business Continuity

4

Extend
SANs over distance
for Disaster
Recovery

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The Future of Networked Storage
Extending the benefits; depth and breadth

Utility Computing

7

Intelligent Fabrics

6

Interconnected Islands

5

Business Continuity

Improved Data Availability

4

Centralized Management

3

Server/Storage Consolidation

2

1

Increase
- Connectivity and utilization

- Reduce time to provision

- Preserve stability of operational processes

Optimize
- Price / performance of storage through efficient migration

- Lower costs of replication through linked, tiered storage

Automate
- Fabric Support for Virtualized storage and servers

- Policy-based rapid provisioning

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4

Storage Connectivity Challenges

TODAY'S CHALLENGES

Isolated SAN Islands
- Capacity in the wrong place

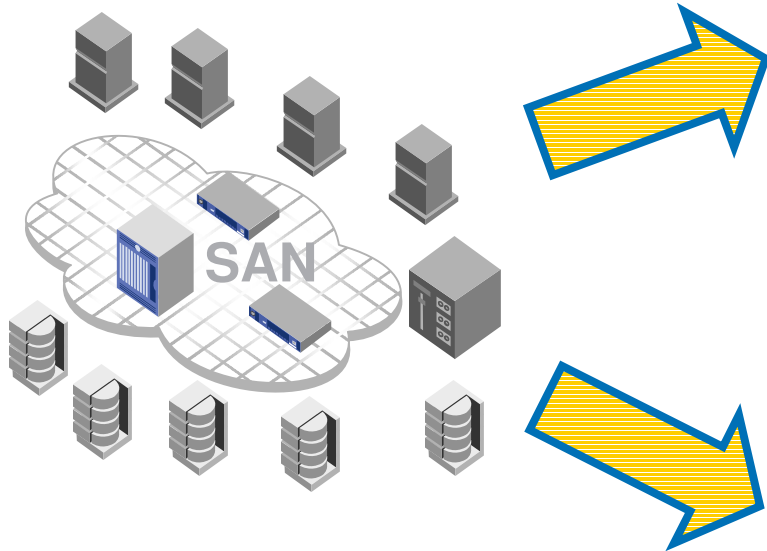Cable management
   complexity
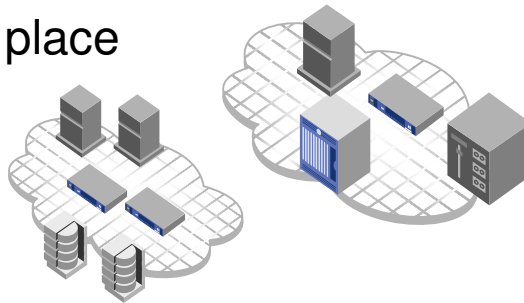
Dedicated HBAs for Tape

Multi-site fabrics

Stranded servers on
   Ethernet
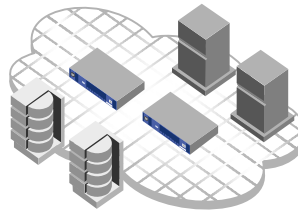
# SAN Innovation Will Evolve Along Two Dimensions

Fabric Intelligence

- Automated, policy-based data movement
- Automated, policy-based provisioning
- Automated, policy-based content management

Fabric Connectivity

- Higher link speeds
- Lower costs
- Investment Protection
- Multiprotocol
- Simplified management
- Increased security
- Greater fabric interoperability
- Routing

SAN

Brocade SilkWorm Multiprotocol Router
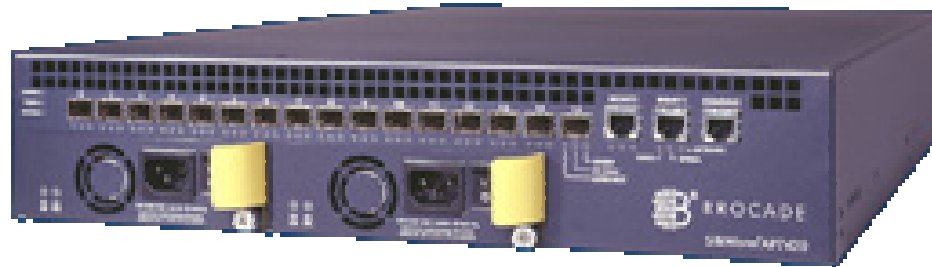
Top-Level Specifications

- Multiprotocol (1-2 Gbit/sec FC, IP) native *at each port*

- 16 ports, individually software selectable
- 1 ASIC per port, processing scales linearly

- Line rate applications processing

- Same hardware that will host storage applications

- Seamless integration with more than 60,000 existing Brocade fabrics

- XPath™ Technology (FAIS)

7

Brocade SilkWorm Multiprotocol Router

- 16-Port SilkWorm Multiprotocol Router
  - 8-Port base configuration with 16-port upgrade via optional software key
- Key Features
  - 16 Multi-Protocol Ports
  - 1/2Gbps Auto-sensing Fibre Channel or 1Gbps Ethernet
  - XPath Architecture with per-port processing and control path
  - Comprehensive FOS interoperability with 60,000 Brocade fabrics
- Supported SFP's include SWL, LWL, ELWL
- Management via CLI, API, FM
- Dual/redundant Ethernet ports
- FRU's
  - Dual-redundant Hot-Swap Fan Trays
  - Dual-redundant Hot-Swap power supplies
  - SFP's
  - *No mother-board FRU*

Brocade SilkWorm Multiprotocol Router Physical Specs

- Height: 2.0U (3.46 inches – 8.79 cm)

- Width: 16.8 inches (42.67 cm)

- Depth: 25 inches (63.6 cm)

- Weight: 40 lbs (18.2 kg)

- Power: 100-240 VAC, 47-63 Hz auto-ranging

- Operating temperatures: 50-104°F (10-40°C)

- Air flow: fan-side to cable-side
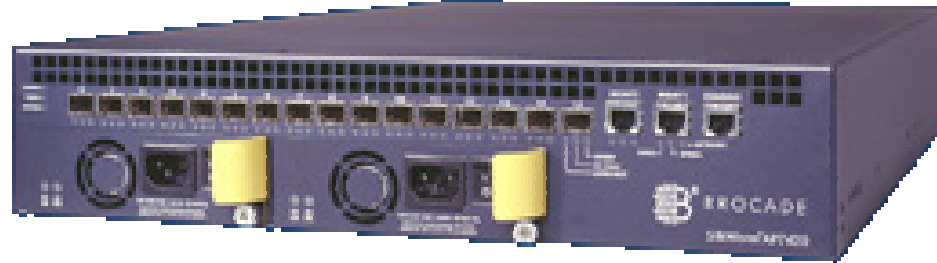
Brocade SilkWorm Multiprotocol Router Management Interfaces

- The Multiprotocol Router and XPath OS support a variety of management interfaces:
  - Console (via Serial Port)
  - Telnet (via Management Ports)
  - WEB TOOLS
  - SNMP
  - Fabric Access API
  - Fabric Manager – MPR support in the 4.2 Release
  - Switch Configuration File (I.e. `configupload`)
  - Partner Applications

Fibre Channel Routing Services (FCRS)

Brocade SilkWorm Multiprotocol Router FC to FC Routing Technical Benefits
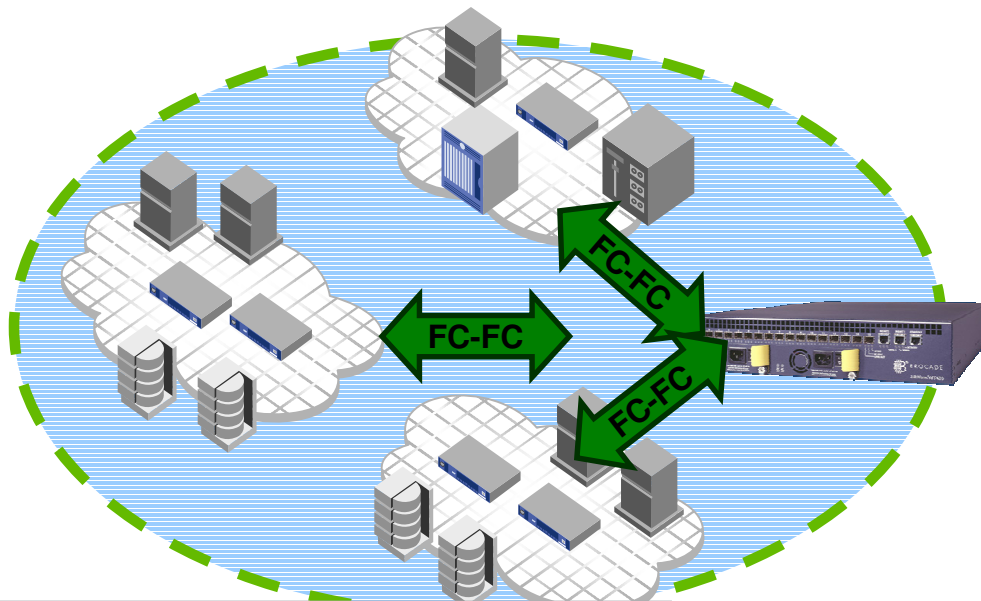
FC-to-FC Routing Service

– Logically connect SAN islands
– Enable shared resource access across multiple fabrics without merging them
– Maintain administration and fault isolation of separately managed fabrics

– Shares resources *between* SAN fabrics w/o merging the fabrics
– Enable phased change management
– Increase individual SAN fabric availability and reliability
– Increase overall Meta-SAN fabric scalability
– Ease individual SAN fabric serviceability

Brocade SilkWorm Multiprotocol Router FC to FC Routing Business Benefits
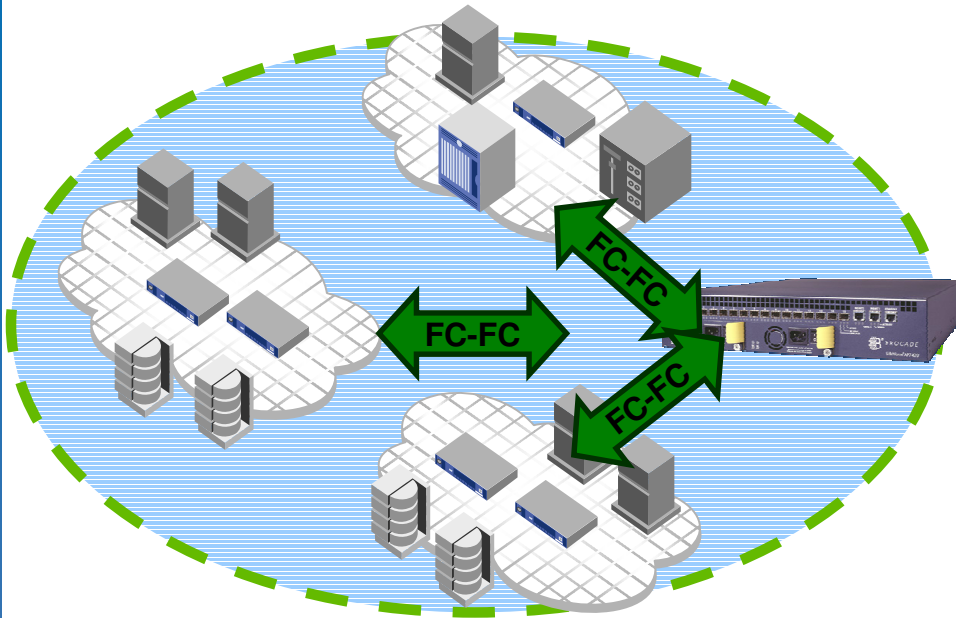
FC-to-FC Routing Service

– Logically connect SAN islands

– Enable shared resource access across multiple fabrics without merging them

– Maintain administration and fault isolation of separately managed fabrics

- Current business infrastructure remains in tact

- Cost Savings

- Non-disruptive implementation

- Human errors are still contained by the SAN island

- Enterprise resources now attainable for company wide use

FC-to-FC routing – General Terminology

- **Edge Fabric**
  - a SAN that is attached to a Multiprotocol Router
  - retains its own separate fabric settings, services, name servers, zoning databases, routing tables, domain ID spaces, etc…
  - can communicate with other edge fabrics over the Multiprotocol Router Backbone Fabric

SAN "1"

SAN "*n*"

Edge fabrics

[1...*n*]
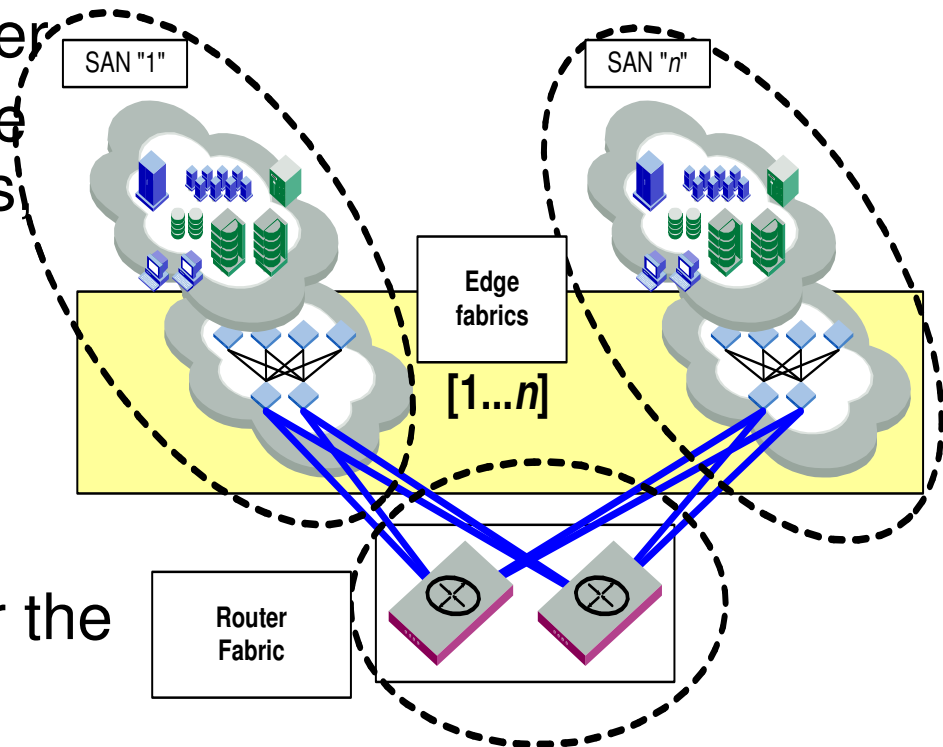
Router Fabric

Backbone Fabric

- Routers can be networked together over a Backbone, or "BB" Fabric
- Allows greater Meta SAN scalability and design flexibility
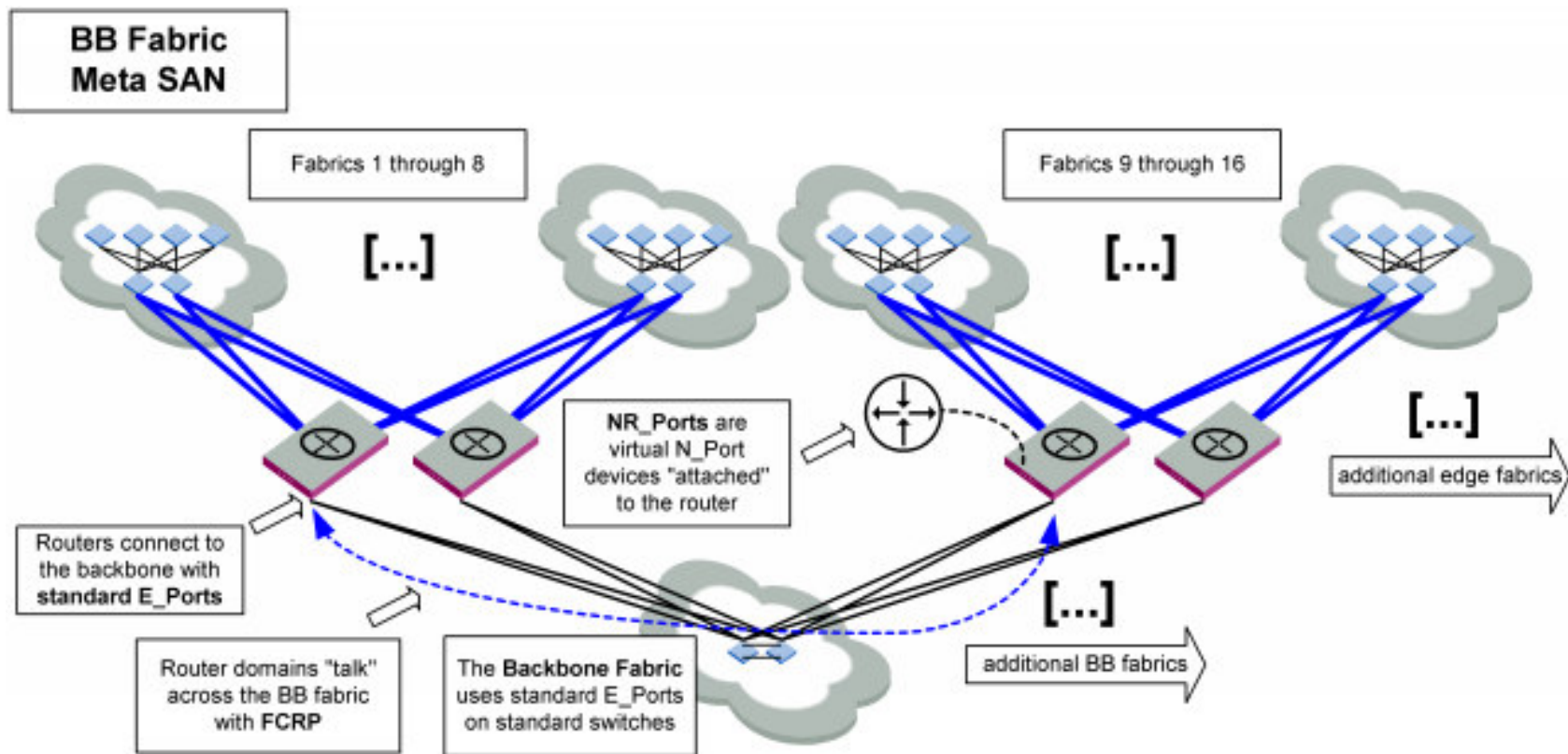
Meta SAN

- Includes all devices, software, edge fabrics, and backbone fabric
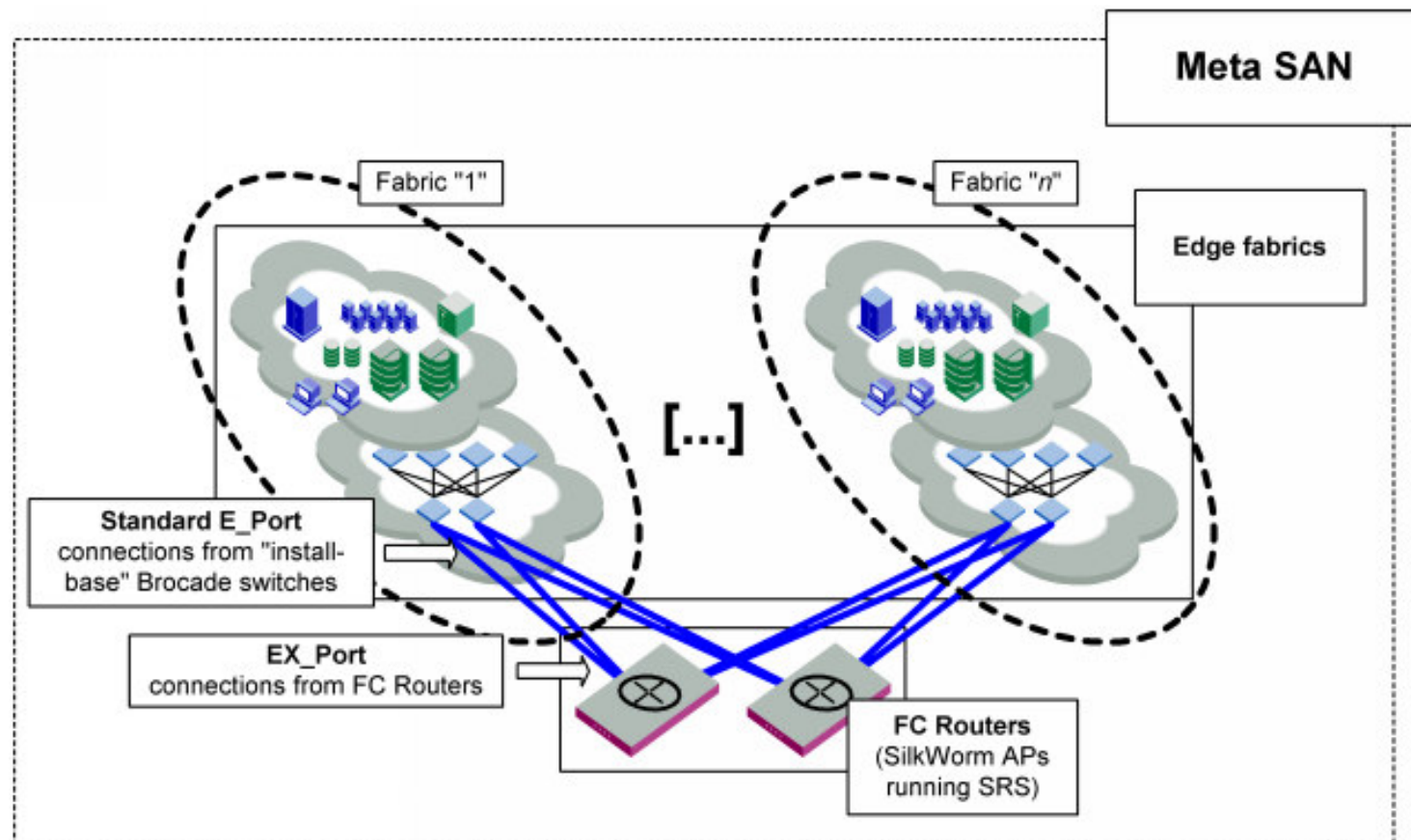
Router Enables Device Exporting

- Any sub-set of devices from each edge fabric can be exported

- Only exported devices can appear on name servers of other fabrics

Exporting Devices

A host exported from Fabric 2 now also appears in the name server on Fabric 1

A storage array port exported from Fabric 1 appears in Fabric 2
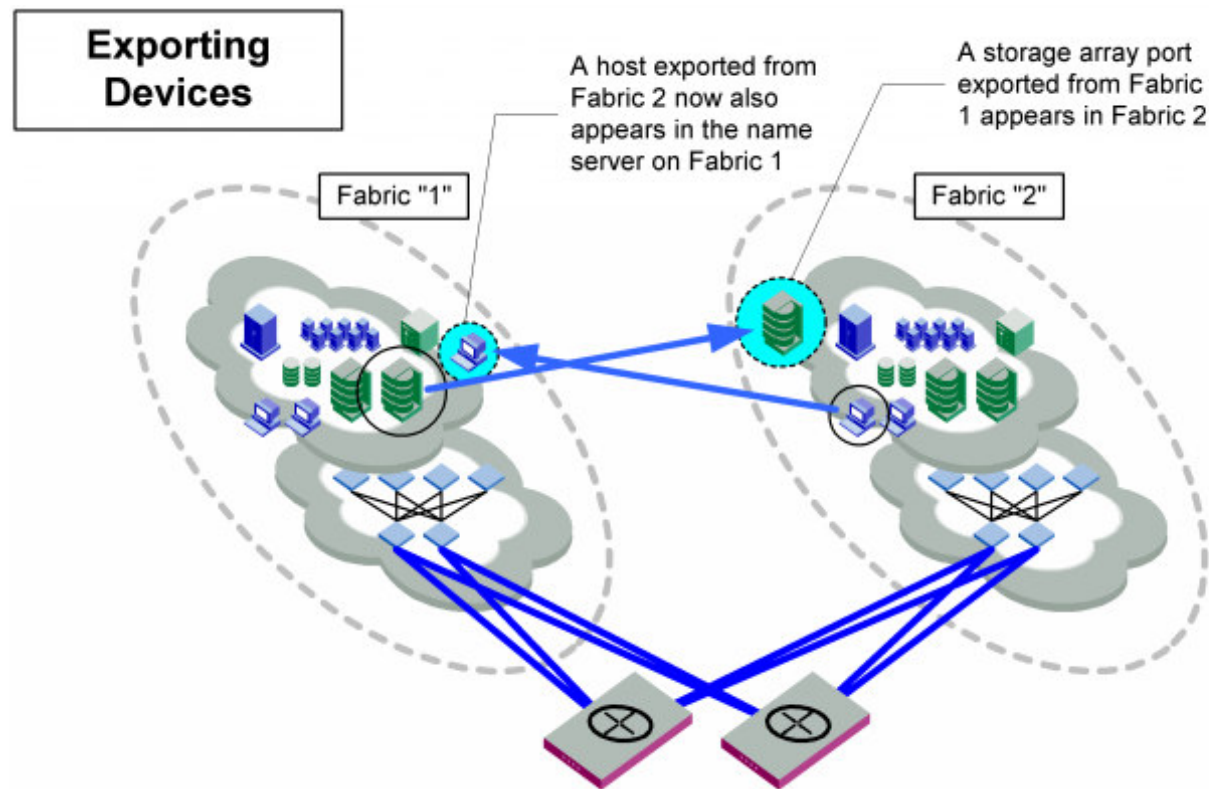
Fabric "1"

Fabric "2"

Connecting SAN Fabrics That Run Different Versions of Fabric OS

FOS 2.6   FOS 4.1   FOS 3.0.2   FOS 4.0   [...] addtional fabrics

FOS 2.6   FOS 4.1   FOS 3.0.2   FOS 4.0   [...] addtional fabrics

LSANs support overlapping membership and can span across fabrics in a Meta SAN

FC Routers provide both connectivity and isolation
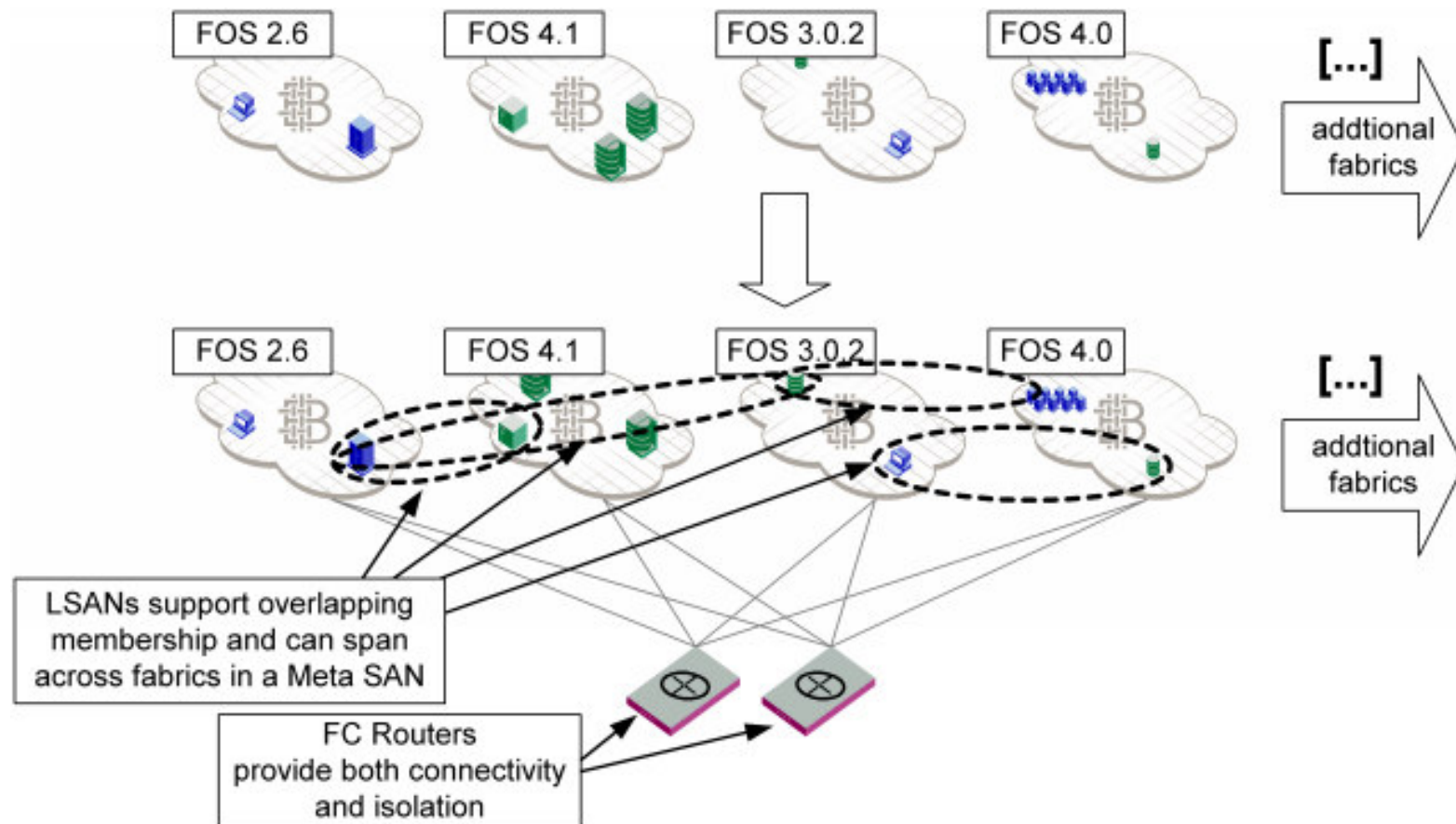
Connecting SAN Fabrics That Have Conflicting Parameters

Fabric ID = 1
PID format = 1
Domain IDs = 1, 2, 3, 4

Fabric ID = 4
PID format = 0
Domain IDs = 1, 2

Fabric ID = 15
PID format = 0
Domain IDs = 1, 6, 8, 9

Fabric ID = 19
PID format = 1
Domain IDs = 1, 2

[...]

Island Consolidation Meta SAN

Each fabric can have its own set of domain IDs, its own zoning, its own PID format, its own TOVs, etc.

This example shows many small fabrics which *could* be merged from a scalability standpoint, but not without makeing many changes to resolve conflicts. The conflicts simply do not impact FCRS routed networks.

Introducing Logical Private SAN (LSAN)

- SAN Router allows creation of a Logical Private SAN (LSAN)

- Think of LSAN as a new type of Zone that can existing in multiple fabrics (in the past, each zone can only lives in its own fabric)

- LSAN allows secure way of sharing resources across fabrics (devices export/import from one fabric to another fabric)
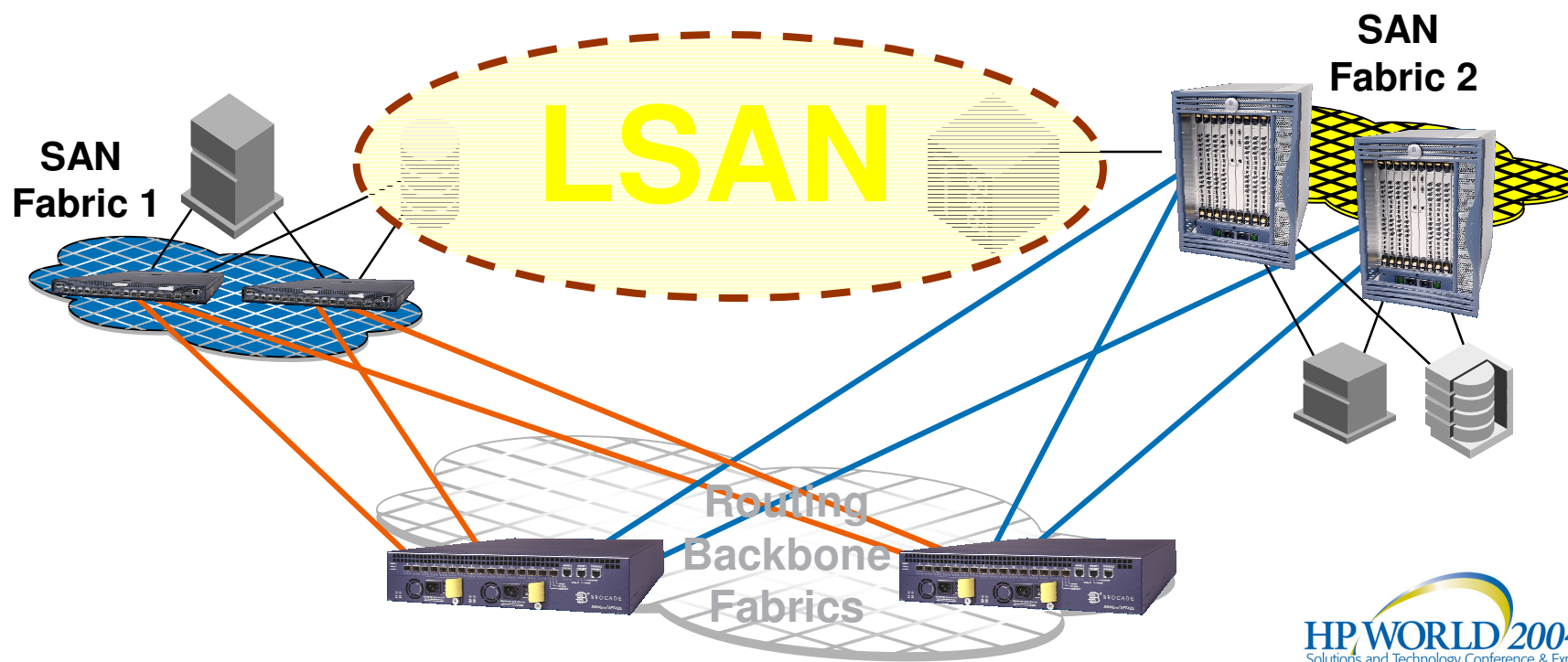
FC Routing Enables Logical SANs
LSANs

SAN Fabric B

SAN Fabric A

SAN Fabric C

LSAN 1

LSAN 2
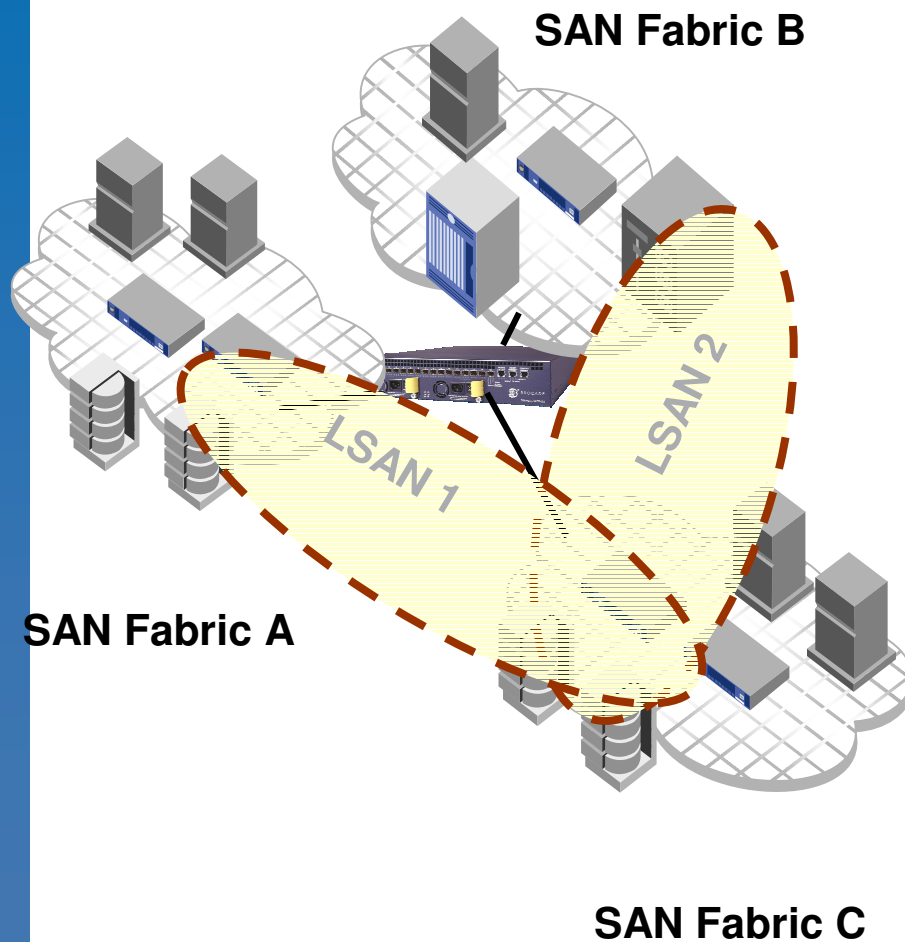
- Optimize resource utilization:
  - Consolidate resources from separate SAN islands
- Scale SANs:
  - Minimize risk and complexity of large fabrics
  - Right-size SANs based on application and business constraints
- Improve management, fault isolation, and stability
- Protect and extend investments (LSANs require no changes to existing switches or edge devices)

LSAN Zones: Managing LSANs

- LSANs are created and managed with standard FC zoning
- Admin(s) create "LSAN_xxx" port WWN or alias zones on each fabric, router automatically creates appropriate LSAN

LSAN Zones

Fabric 1

Fabric 2

LSAN Zones

An LSAN is created by building LSAN Zones., which are indistinguishable from regular zones to edge fabrics
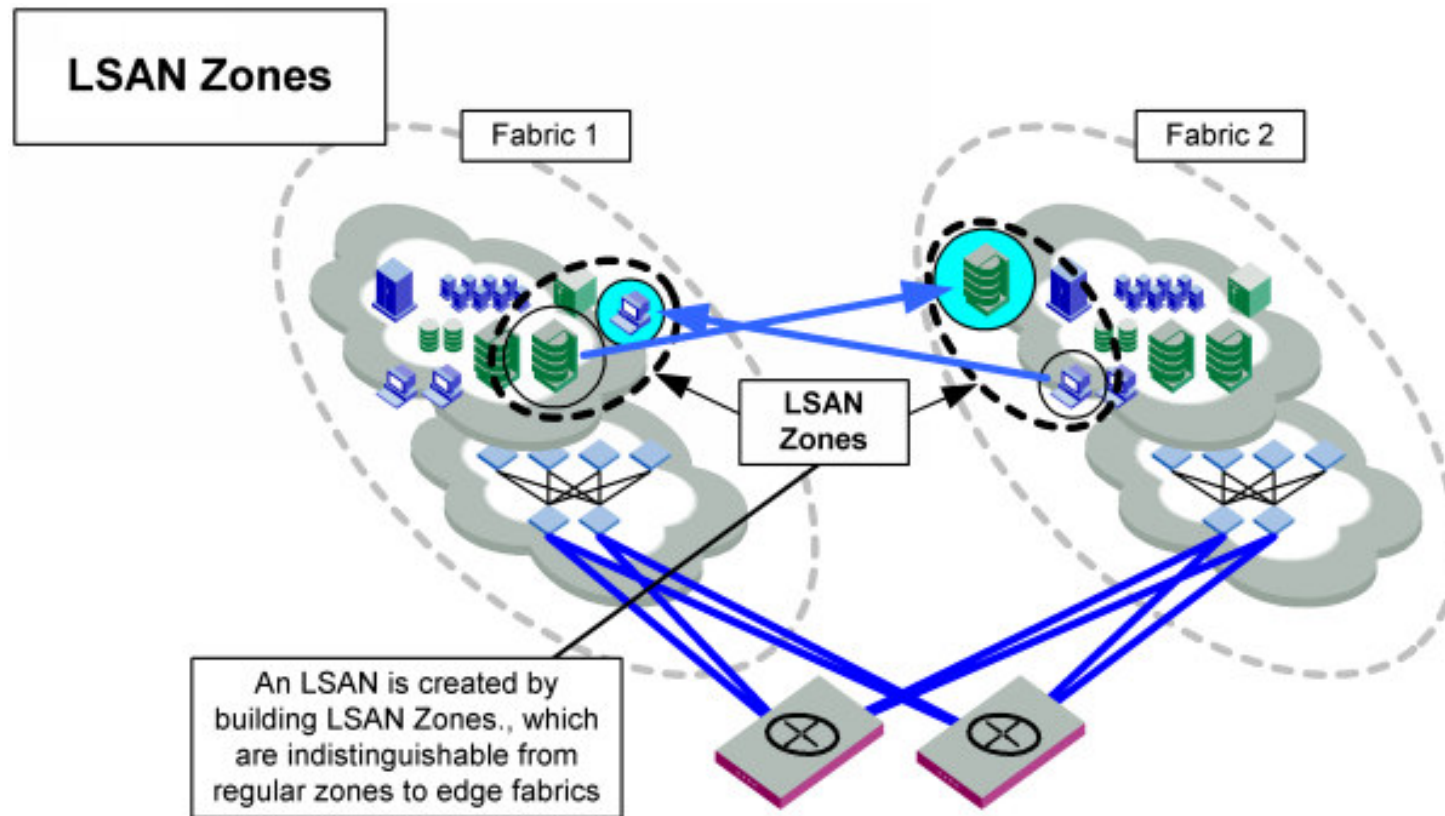
Logical Private SAN (LSAN)
Capabilities and differences from VSANs

LSAN	VSAN
Securely **Connects** fabrics and devices on different SAN Islands	**Divides** a switch or set of switches into logical fabrics
High level of isolation and fault tolerance	**Limited** isolation and fault tolerance
Based on storage industry **standardized** zoning methods - applicable to **installed base** of SANs	**Proprietary** frame-tagging technique among Cisco switches only – requires rip and replace
Share devices selectively across LSANs	**Limited designed for sharing** Domain ID conflicts must be resolved fabric wide
Multiprotocol support	**FC only**
Evolution: extension of proven zoning techniques. If you can zone, you can LSAN!	**Revolution:** requires new learning of new function for storage administrators and users

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FCIP

FCIP – Overview

- leverage existing IP-based networks to connects SANs

- longer-than-FC-distance connectivity

- can be combined with FC-FC Routing functionality to build LSANs across IP networks

What is the FCIP Tunneling Service?

- a licensed application that runs on the Brocade Multiprotocol Router

- connects SANs over IP networks

- can be combined with FC-FC Routing functionality to build LSANs across IP networks

FCIP Protocol Model

FCIP Tunnel

FC-IP		FC-IP	
FC-2	TCP	TCP	FC-2
FC-1	IP	IP	FC-1
FC-0	LINK	LINK	FC-0
	PHY	PHY	

IP Network

To Fibre Channel   **To Fibre Channel**
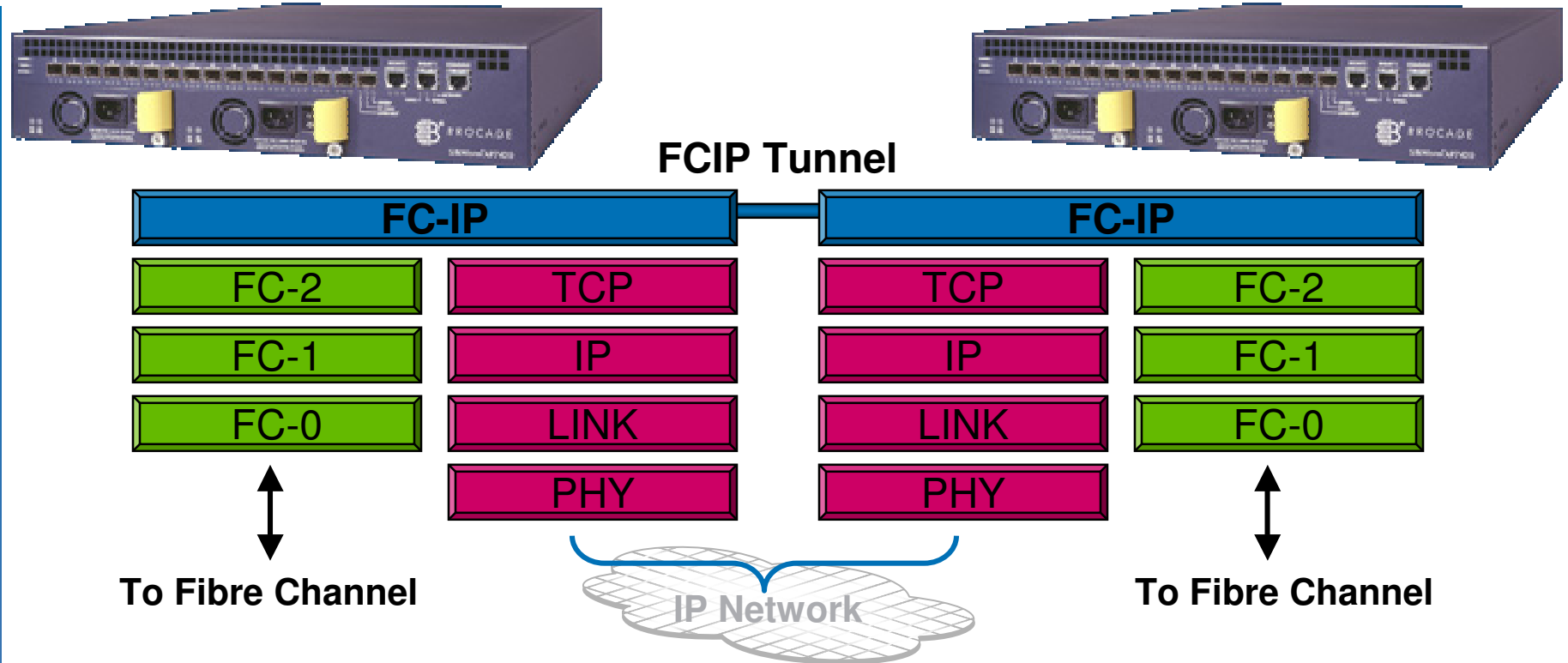
- FC Frames are encapsulated into IP Packets
- A typical FCIP Link connects two FC Fabrics that become two portions of a unique consolidated Fabric. The MP Router allows isolation of each segment

Brocade SilkWorm Multiprotocol Router FCIP Tunneling Service Benefits
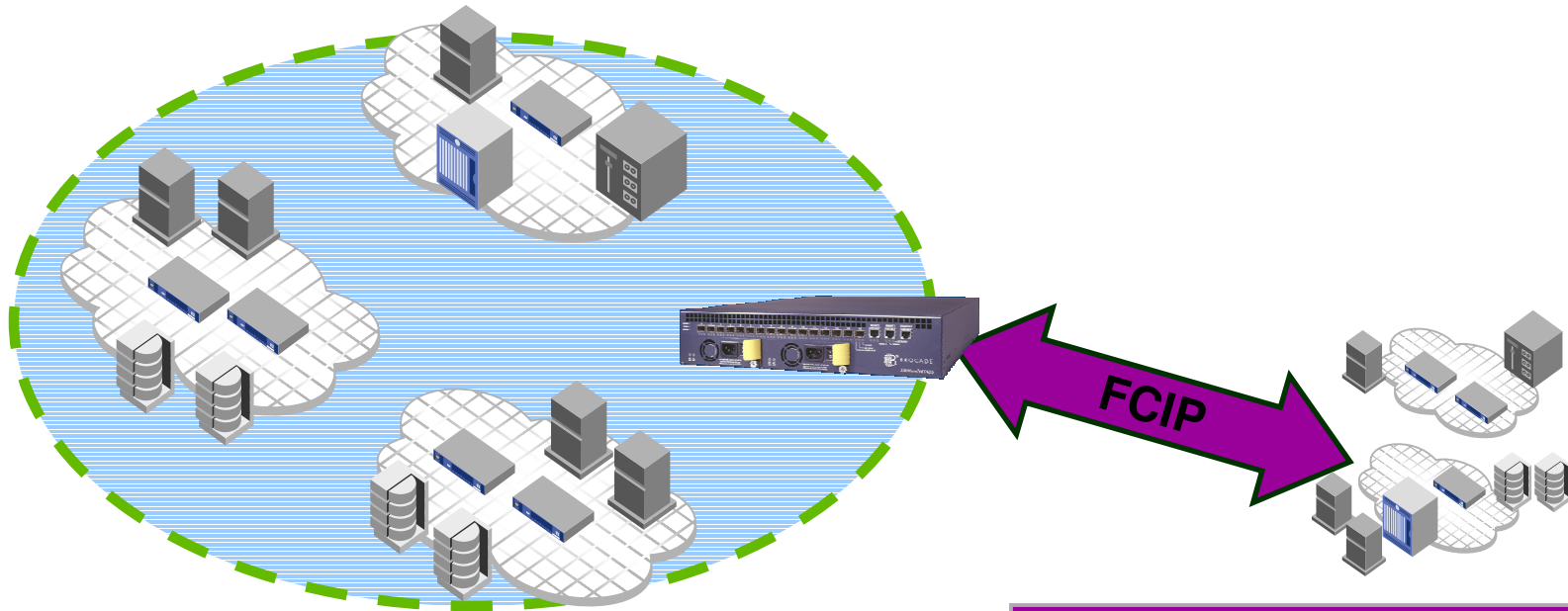
FCIP

What are the benefits?

– Unified SAN environment across geographies, functions, and departments

– Leverage IP networks for distance connectivity

– Foundation for business continuance applications

FCIP Tunneling Service

– Seamlessly, reliably extend Brocade SANs across MAN/WAN IP networks

Implementing FCIP (cont.)

- Brocade supports FCIP tunnels between two SilkWorm Multiprotocol Routers
  - Can have other SilkWorm switches attached on either side
  - Only one FCIP tunnel per port
- To implement FCIP between two Multiprotocol Routers, configure the TCP/IP network-connected switch ports as *Virtual E_Ports* (*VE_Ports*)
  - Commands: `porttype, portcfggige,` `portcfgfcip`
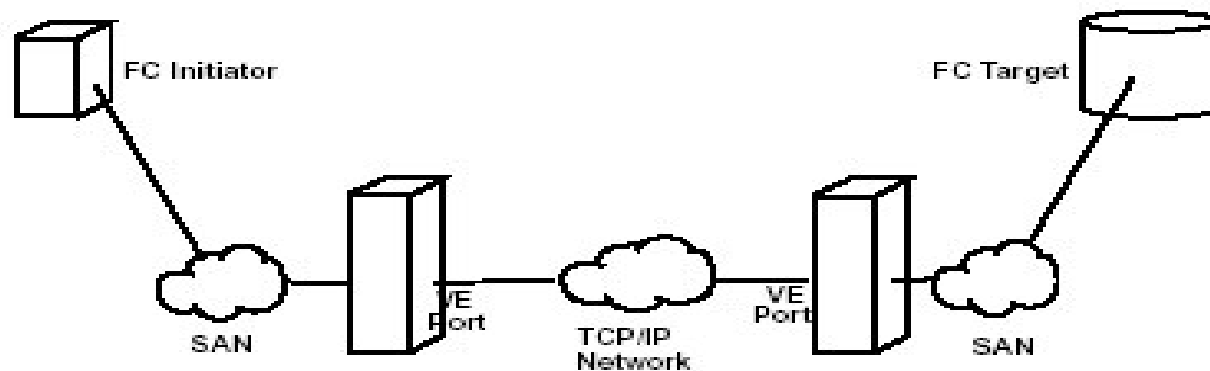
iSCSI

What is the iSCSI Gateway Service?

iSCSI initiator   Windows Host

IP-SAN
(Fan-in network)   Ethernet link

GE switch

iSCSI
gateway   iSCSI-VLAN

iSCSI CDB's and Frames translated to FCP

FC link
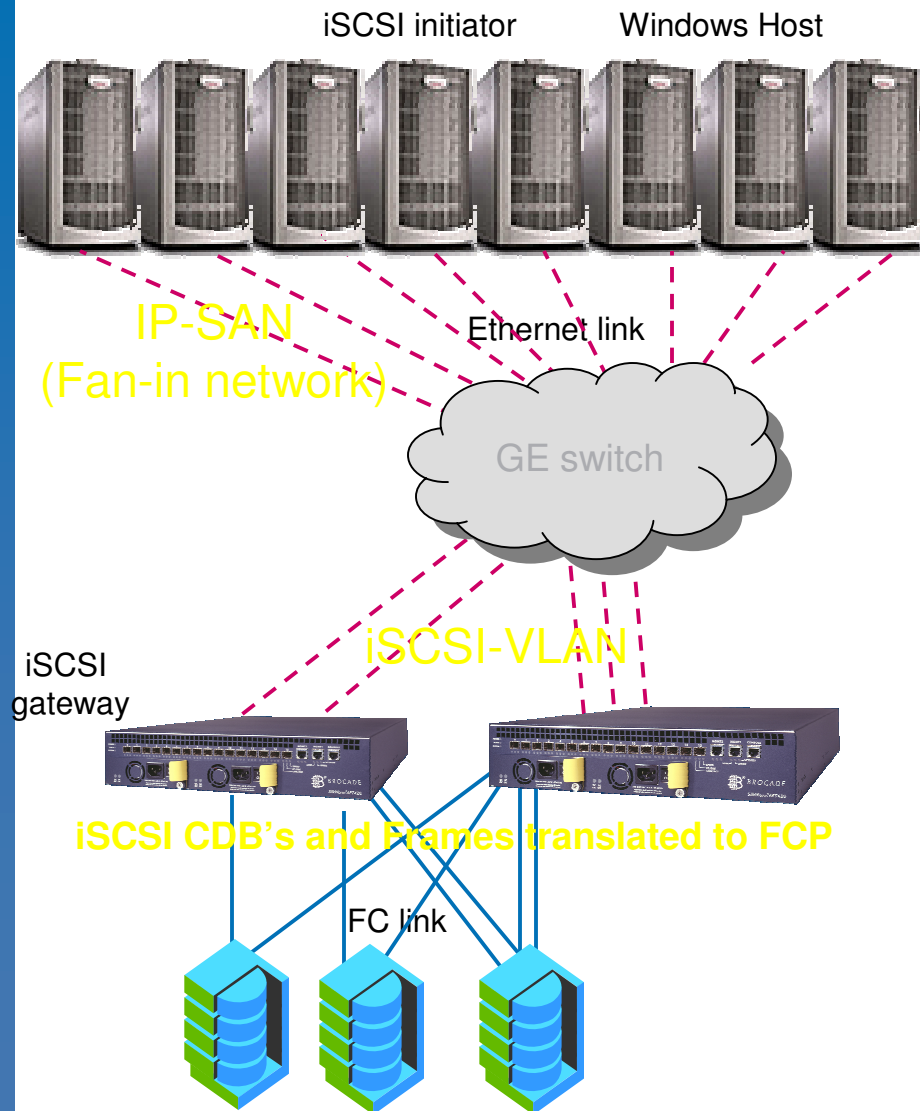
– a licensed application that runs on the Brocade Multiprotocol Router
– provides a gateway service for iSCSI Servers (initiators) to connect to SAN connected storage resources through the Multiprotocol Router

Brocade SilkWorm Multiprotocol Router iSCSI Gateway Service Benefits
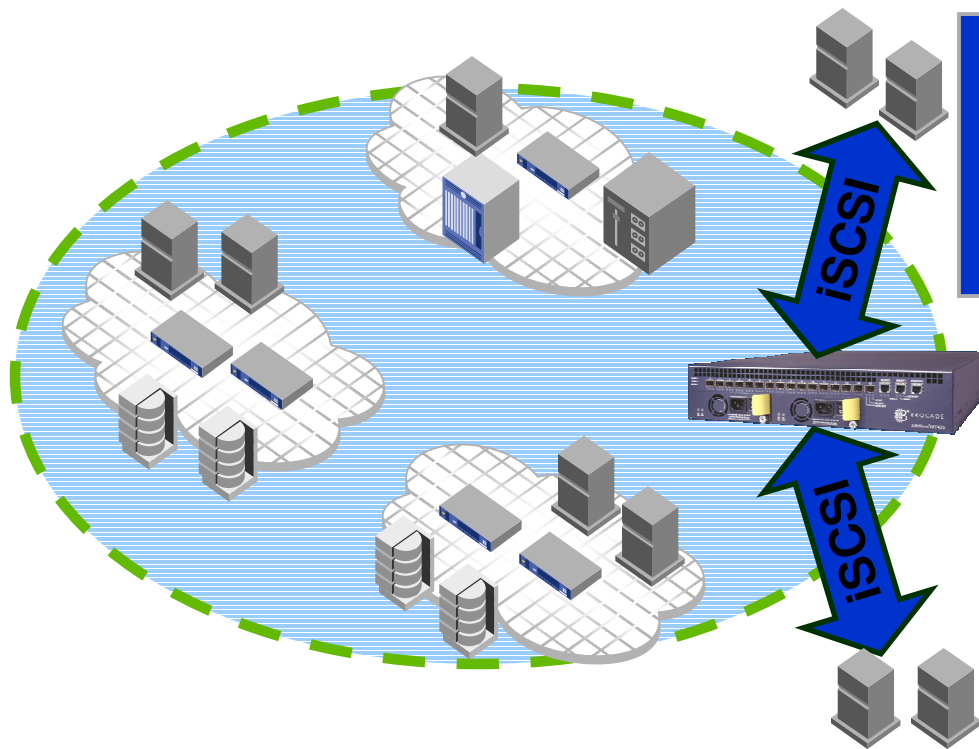
iSCSI

iSCSI

iSCSI-to-FC Gateway Service

– Bridge from iSCSI to Fibre Channel SANs

– Connect lower-cost Ethernet-connected servers to Brocade SANs

- **What are the benefits?**
  - Unified SAN environment across geographies, functions, and departments
  - Share Fibre Channel resources with low-cost servers using Ethernet networks
  - Extended access of valuable SAN assets through an iSCSI gateway

Enabling Intelligent Storage Connectivity
Brocade Multiprotocol Router

TODAY'S CHALLENGES

Isolated SAN Islands
   - Capacity in the wrong place

Cable management
   complexity

Dedicated HBAs for Tape

Multi-site fabrics

Stranded servers on
   Ethernet
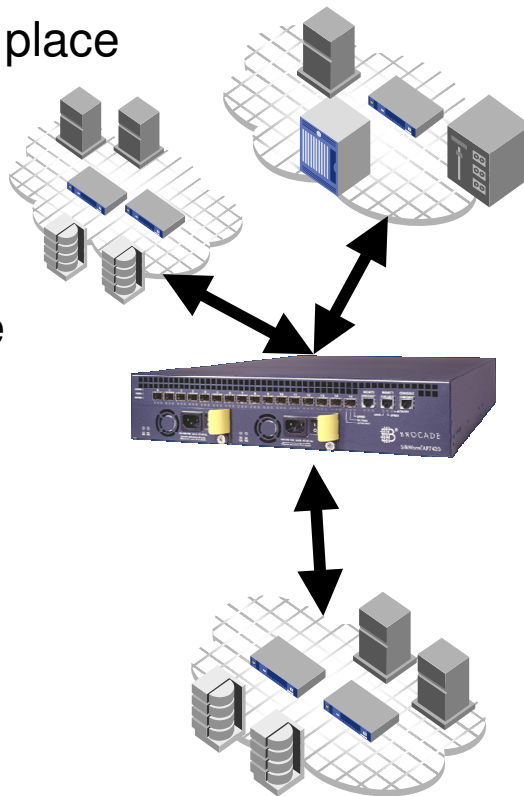
SOLUTIONS

FC - FC Routing
   - Connect islands - "Wire once"
   - Keep fabrics independent
   - Non disruptive
   - Compatible with what you have
   - Managed by Zones
   - Highly Available links

iSCSI - FC Routing
   - Connect low-cost servers
      to managed FC storage

SAN - SAN using FCIP
   - Connect fabrics over distance
   - Merged or separate fabrics

Multi-Protocol Router
Use Cases

A New Market for Extending SANs
SAN Connectivity Opportunities are Vast!

- Data Migration
  - Migration to new 2G storage on 2G SAN from old 1G storage & SAN
  - Data Migration between different vendor SANs: storage network, disk, tape
  - Storage and/or application rebalancing between fabrics

- Resource Optimization
  - Increased utilization of storage, sharing not possible before
  - Creation of a shared tape service for the enterprise
  - Sharing of distance connectivity resources for DR / backup
  - "On-Demand" provisioning of inter-SAN resources
  - Connect stranded Ethernet servers

- Consolidation
  - Datacenter consolidation, facilitating moving data to new location
  - Tape consolidation of multiple backup activities
  - New SAN designs with central pools and hosts on edge fabrics

- Isolation
  - Isolation of vendor equipment or business units
  - Moving production data to development / test SAN
  - Test Lab automation, easy selective sharing of resources

Heterogeneous SAN Connectivity
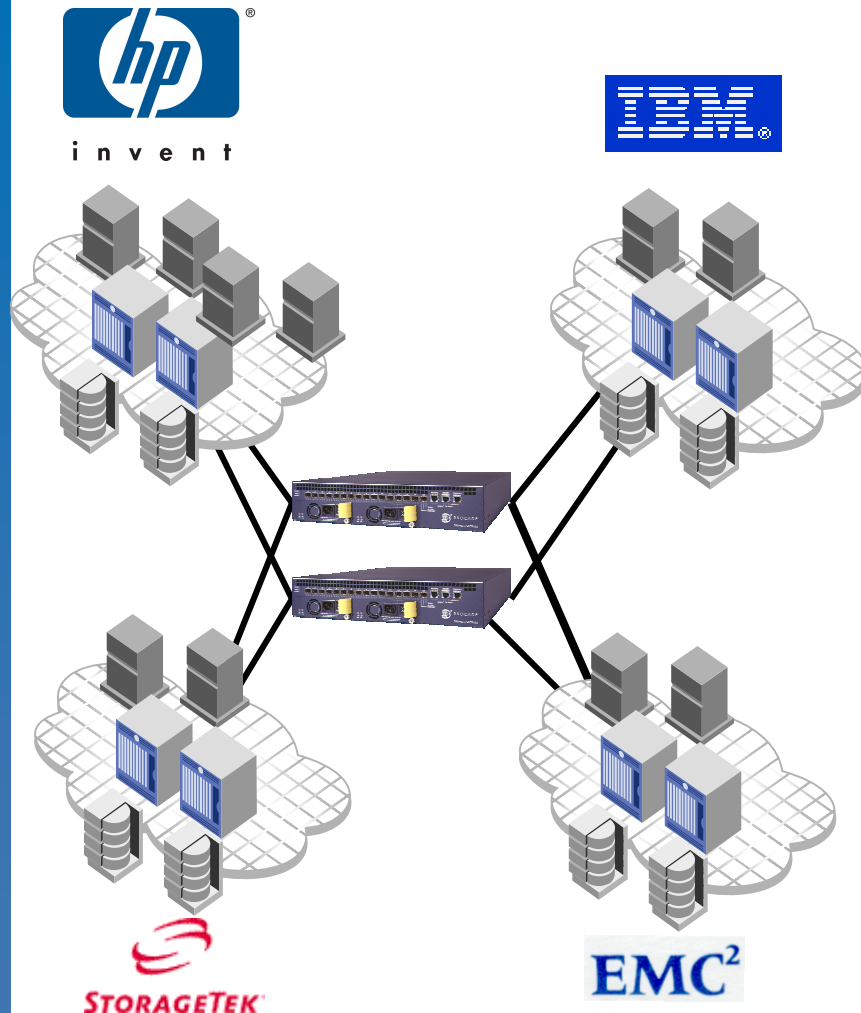
- Simplified scalability of SANs

- Interconnects islands using routing

- Connect and organize heterogeneous resources
  - Different vendors
  - Different firmware levels
  - 1Gbits and 2 Gbits

- Selective sharing or full consolidation

- Streamlines Data Migration

- Increase storage utilization

- Redistribute and share resources

Infrastructure Migration

Vendor A   Vendor B
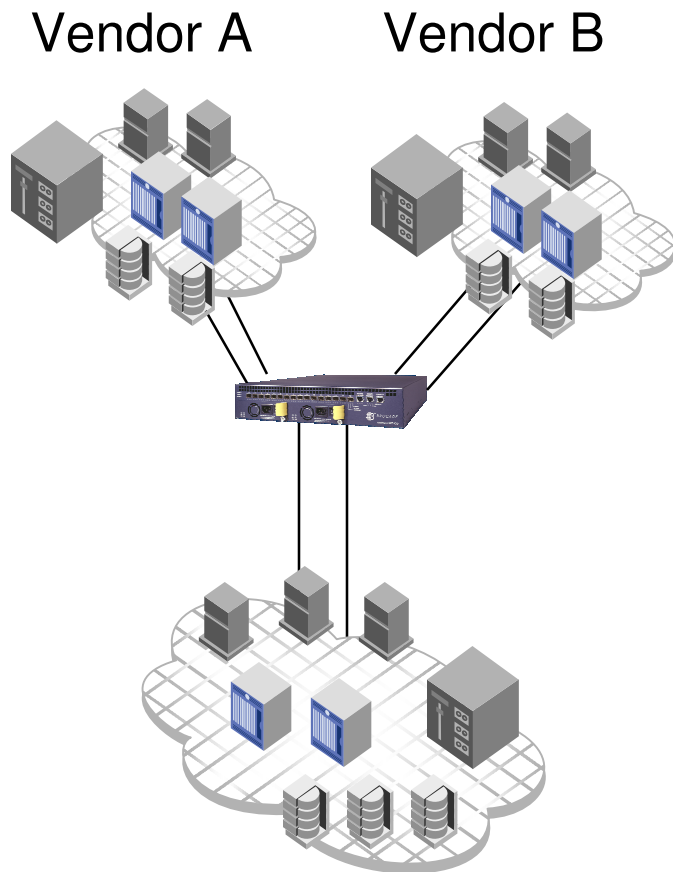
- Migrate servers, storage and fabrics
- Connect new fabric seamlessly to old fabric
- LSANs storage targeted for migration
- Use familiar tools for data movement
- No need to orchestrate fabric merge
- Increased operational savings
  - Time
  - Resources need
- Increased ROI on infrastructure migration
- Estimated 30% savings on resources
- While minimizing risk and downtime!!

Tape Backup Consolidation

Backup SAN

FCIP

SAN 8

SAN 1

SAN 7
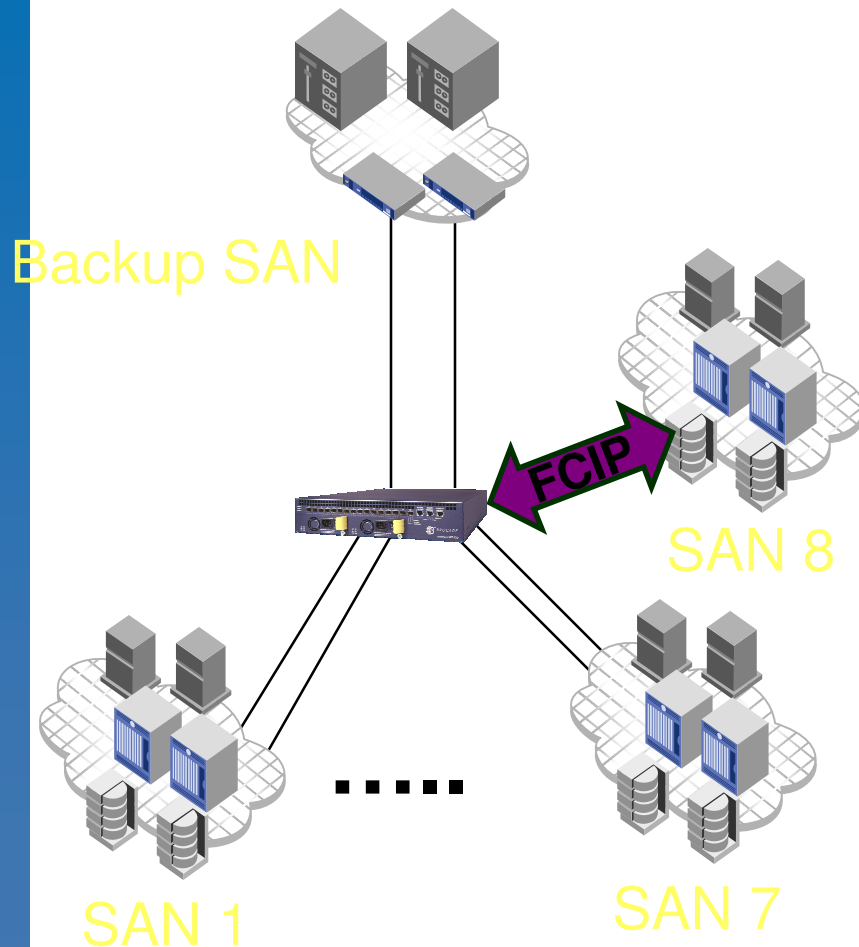
- Centralize tape libraries in one fabric
- Use router to connect all "disk fabrics"
- Backup/restore to/from "backup fabric"
- Backup remote offices (FCIP)
- Reduced management overhead
- Increased asset utilization
  - Tape libraries and tape drives
  - HBAs, backup servers, media
  - Software licenses
- Improved quality of backup & restore
- $500K/yr savings for medium business

Test Lab Automation "On-Demand" Provisioning

Unix

Windows

Vendor A

Vendor B
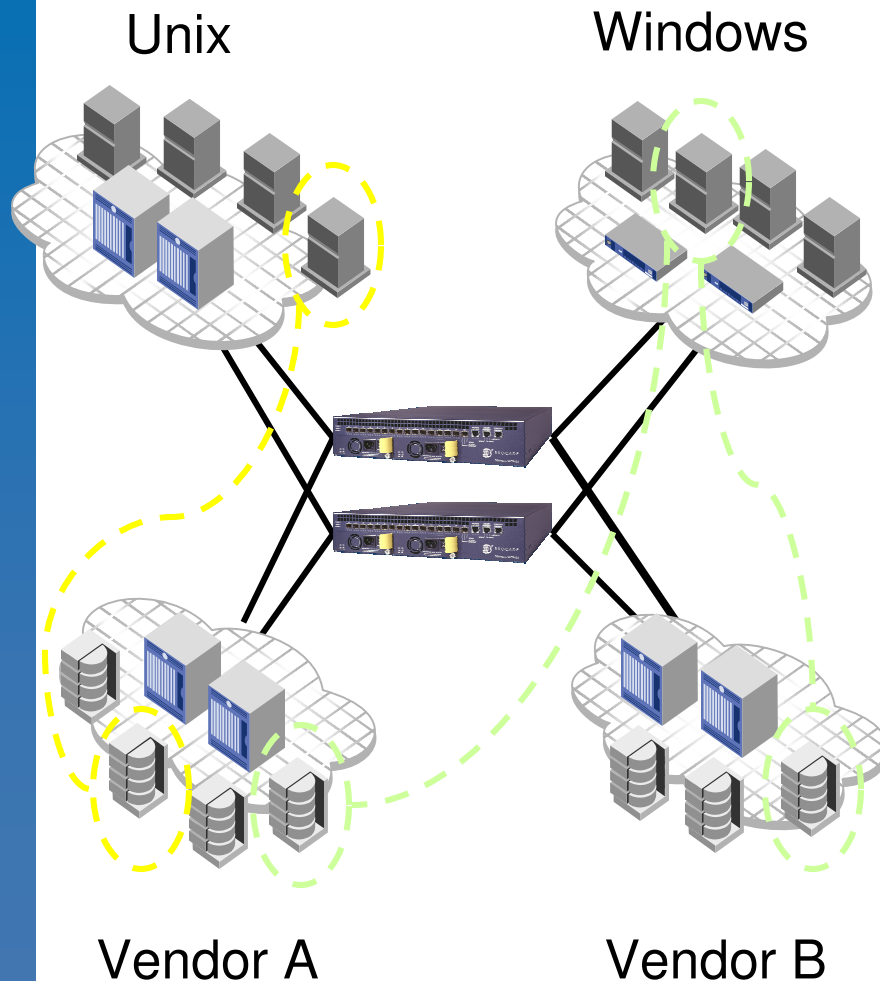
- Connects heterogeneous resources

- Secure and selective sharing

- Increases operational efficiency
  - Connect "On-Demand" and instantly
  - No need to run cables
  - No lengthy patch plans
  - No need to move equipment/re-rack
  - No need to move/configure switches
  - No need to update firmware levels

- Saves on average 2-4 man days per test

Data Movement – Production & Test
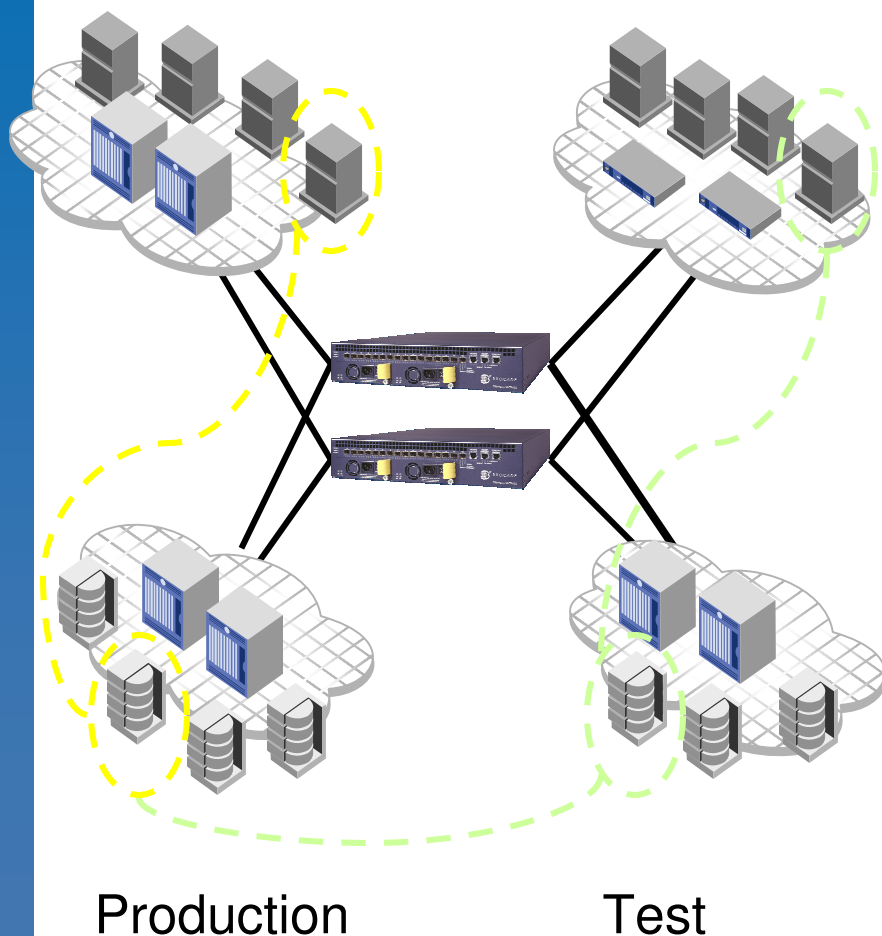
Production   Test

- Many uses cases such as:
  - Data mining
  - Development with copy of production data
  - Test new configurations, firmware
- Separate administration
- No re-cabling – facilitates change control
- Minimize risks
  - Isolate production from development/test
  - More time for development and testing
- Accelerate time to market or deployment
  - Migration from development to production
  - Lower development/test costs
  - Higher ROI for development/test initiatives

Distance Connectivity – Disaster Recovery

IP Cloud
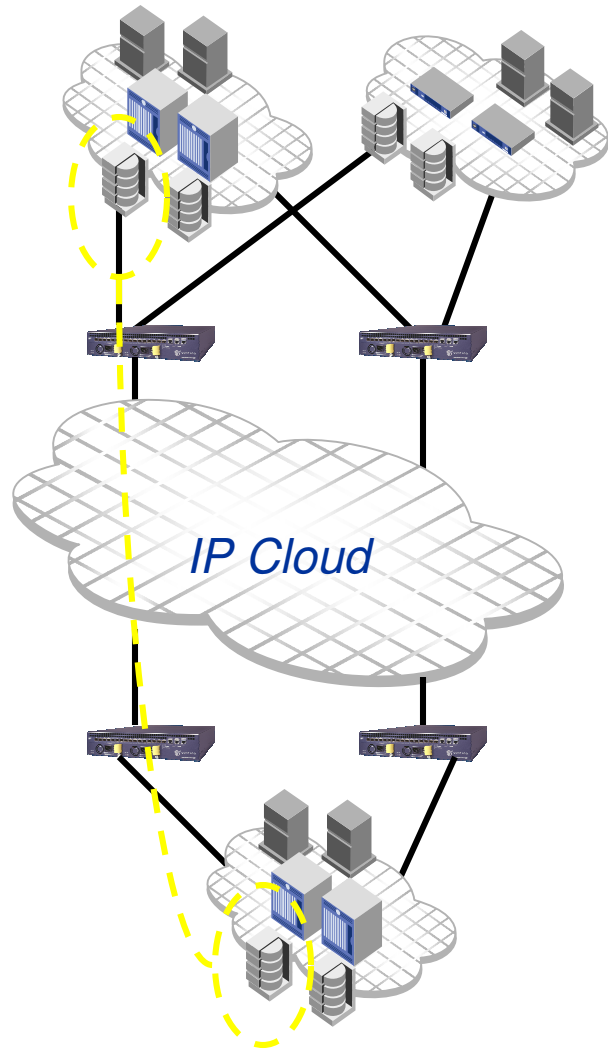
- Move data between geographies
- Leverage IP networks
- Maintain isolation between fabrics
- Selective and secure sharing
- Integrated within the Brocade framework
- Foundation for business continuance
  - Remote replication
  - Backup over IP
- Simple, cost-effective foundation for utility computing

Connect Stranded Servers

**Fan Out
Ethernet**

iSCSI

FC SANs
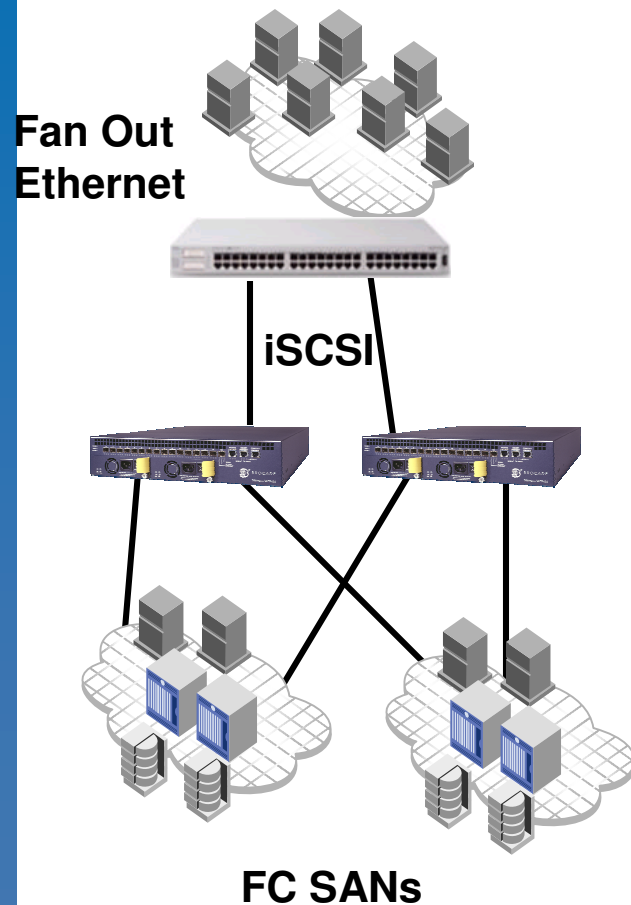
- Share FC resources with Ethernet servers
- iSCSI to FC gateway
- Low-cost connectivity
- Fan-out to large number of servers
- Maintain isolation
- Selective and secure sharing
- Integrated within the Brocade framework
- Simple, cost-effective foundation for utility computing

Multi-Protocol Router Manageability

SAN Management Strategy

3rd Party Applications

3rd Party Applications

Fabric Manager

Web Tools
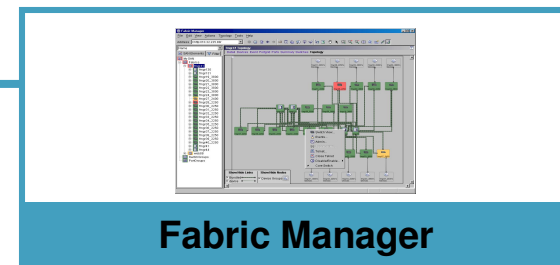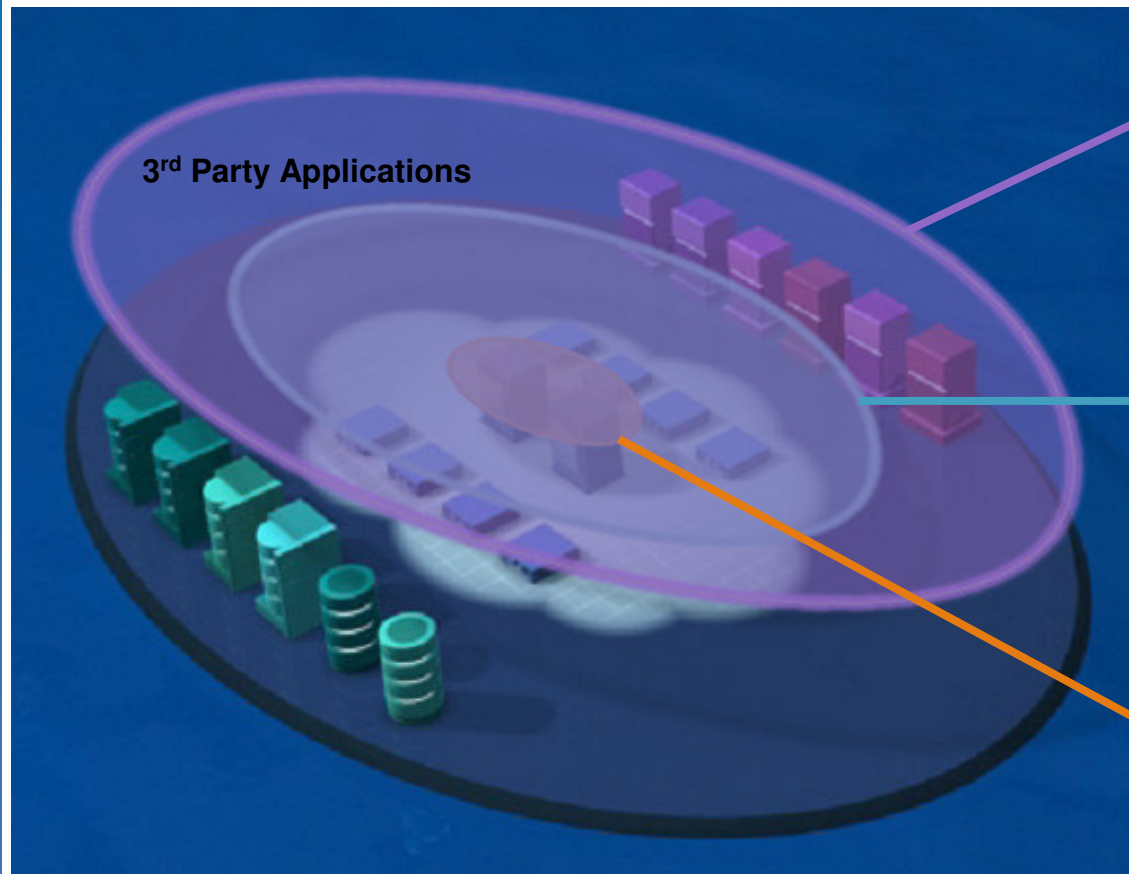
Fabric Manager Description
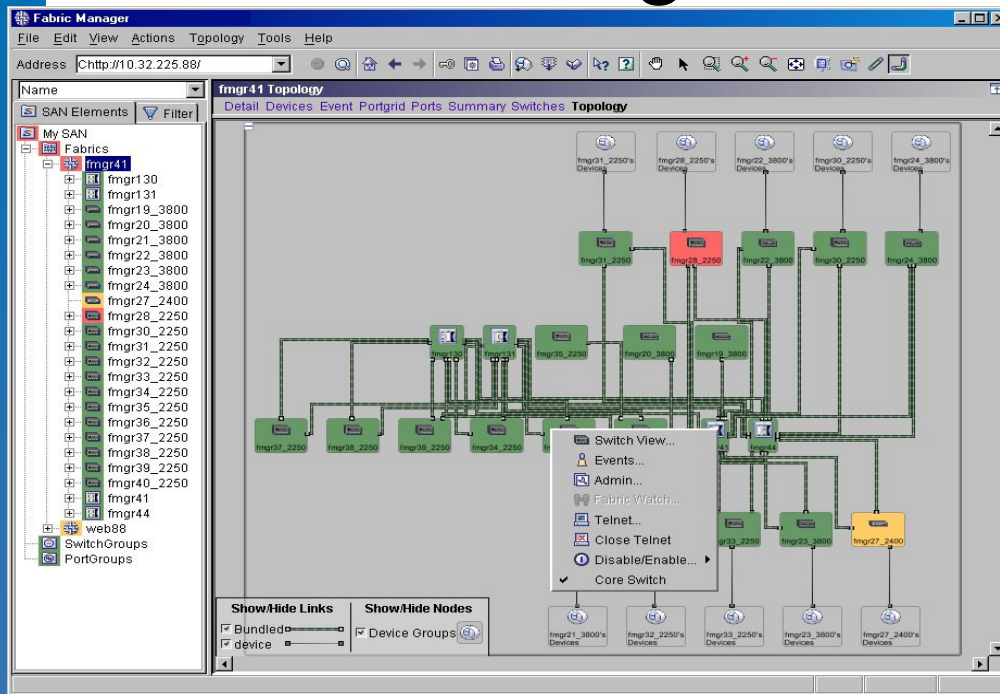
Function

- Manage large groups of Brocade switches and multiple fabrics

- Logical switch and port grouping

- Multiple views (Explorer Tree and Visual Icon Topology)

- Aggregated reporting

- APM

Customer Benefit

- Host-based for centralized management

- Simplifies administrative tasks such as change management, firmware downloads, and configuration management

- Reduces cost of ownership by increasing productivity

- Lowers down time with real-time health monitoring, alert management, and call home support

Discovery

Devices View
Displays "Virtual Target" and "Virtual Initiator"

Ports View

Share Devices Wizard
Select Devices From Fabrics

LSAN View
From Edge Fabric

Topology Changes
Logical View
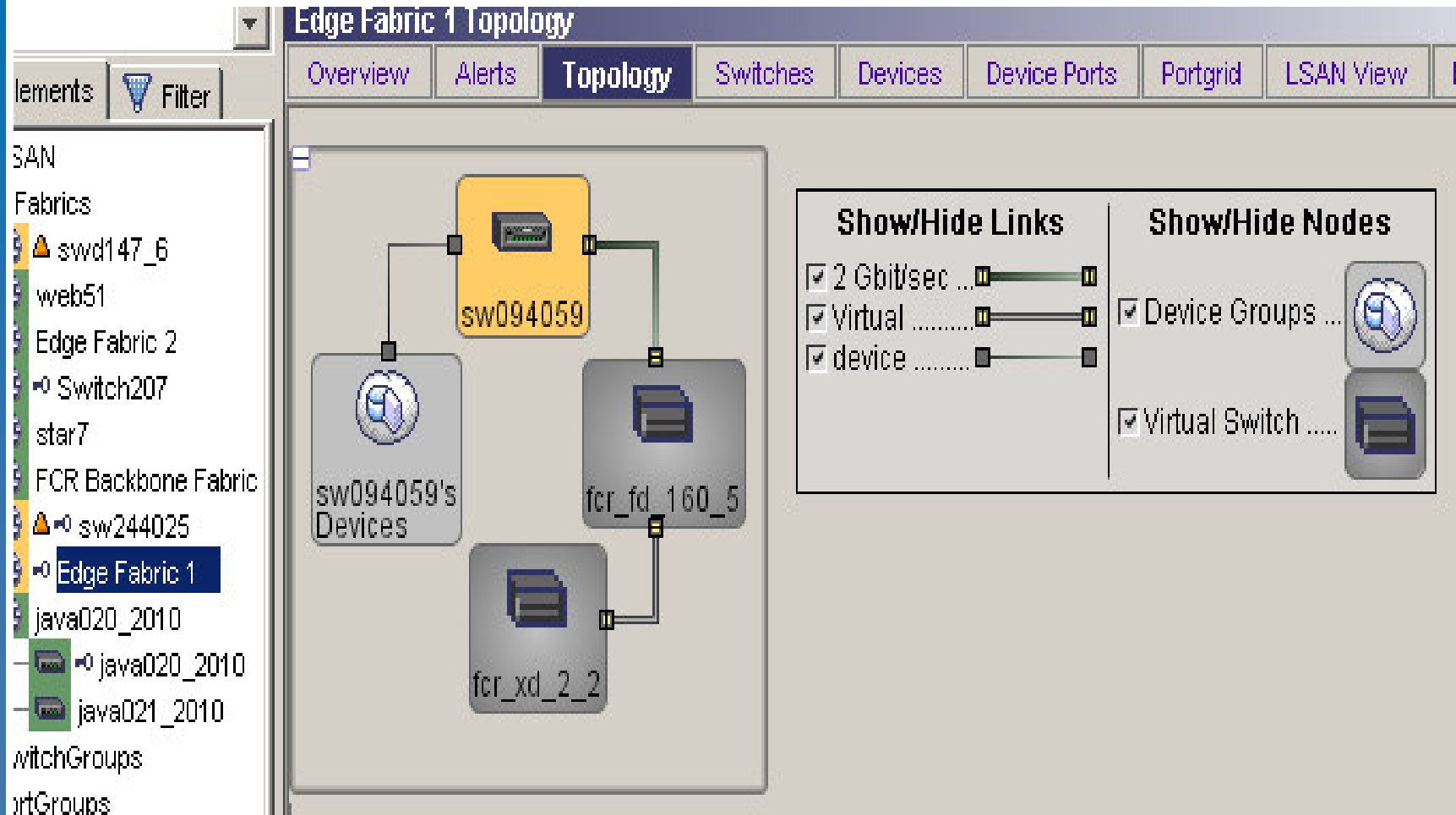
Multi-Protocol Router & Fabric Manager P/Ns

Multi-Protocol Router Product Information

- ## A7437A

  – Multi-protocol Router Base 8-port

  – Multi-protocol Router providing Fibre Channel subnet routing and FCIP tunneling services

- ## A7438A

  – Multi-protocol Router Full 16-port

  – Multi-protocol Router providing Fibre Channel subnet routing and FCIP tunneling services

- ## A7439A

  – Multi-protocol Router Upgrade License

  – Flexible port upgrade license to increase the base 8-port model to 16 ports

Fabric Manager
Product Information

- A7390A
  - Fabric Manager Base Edition
  - Supports up to 10 domains/switches

- A7389A
  - Fabric Manager Enterprise Edition
  - Supports up to eight fabrics and/or 200 domains/switches

- A7391A
  - Fabric Manager v3 to v4 Enterprise license upgrade

- A7392A
  - Fabric Manager Base to Enterprise license upgrade

Thank You