IBM Storage SAN b-type Extension: Native IP vs FCIP

Tim Jeka, Broadcom Field Application Engineer

Accelerate with IBM Storage Webinars

The Free IBM Storage Technical Webinar Series Continues in 2019...

Washington Systems Center – Storage experts cover a variety of technical topics.

Audience: Clients who have or are considering acquiring IBM Storage solutions. Business Partners and IBMers are also welcome.

To automatically receive announcements of upcoming Accelerate with IBM Storage webinars, Clients, Business Partners and IBMers are welcome to send an email request to accelerate-join@hursley.ibm.com.

Located in the Accelerate with IBM Storage Blog:
https://www.ibm.com/developerworks/mydeveloperworks/blogs/accelerate/?lang=en

Also, check out the WSC YouTube Channel here:
https://www.youtube.com/channel/UCNuks0go01_ZrVVF1jgOD6Q

2019 Upcoming Webinars:

August 13 - Storage Optimization with IBM Spectrum Discover
Register Here: https://ibm.webex.com/ibm/onstage/g.php?MTID=e9d8fdebce95d49d5148972c8b5cd967a

August 22 - LinuxONE Servers and IBM Storage Synergies
Register Here: https://ibm.webex.com/ibm/onstage/g.php?MTID=e246d7bbd6b0af257384b0e93c9032eec

August 29 – New content search capabilities in IBM Spectrum Discover 2.0.1.
Register Here: https://ibm.webex.com/ibm/onstage/g.php?MTID=eea2e4a7977264229780d842beb9c7580

Today's Topics

- Market Dynamics of BC/DR Solutions/Needs
- IBM b-type SAN Extension Offerings
- IBM b-type SAN Extension Features & Value
- Understanding IBM's Native IP vs FCIP & Benchmark Results
- Understanding the client requirements and selecting the right infrastructure
- Understanding IBM's Native IP vs FCIP
- IBM Distance Solutions using b-type SAN Extension Examples
- Modernizing existing infrastructure
- Wrap up and Questions?

IBM Brocade SAN Extension Products

Business Continuance and Disaster Recovery Issues

Operational Resiliency Historical Issues

- **Performance Concerns (mostly hardware)**
  - IP switching devices are not designed for storage traffic
  - Replication throughput challenges over distance
- **WAN Sensitivity and Inconsistent Availability (mostly hardware)**
  - Cannot efficiently adapt to changes in WAN bandwidth and availability
- **Security comes with a performance penalty (hardware and software)**
  - Requires encryption that can adversely impact performance
- **Infrastructure and Management Tool (mostly software)**
  - Separate hardware and management tools for the FCP/FICON replication (using FCIP) and TS77XX grid replication (using IP)
- **Limited Network Visibility (mostly software)**
  - No warnings or insight to identify network problems and ownership

Mortal Enemies to Replication Performance

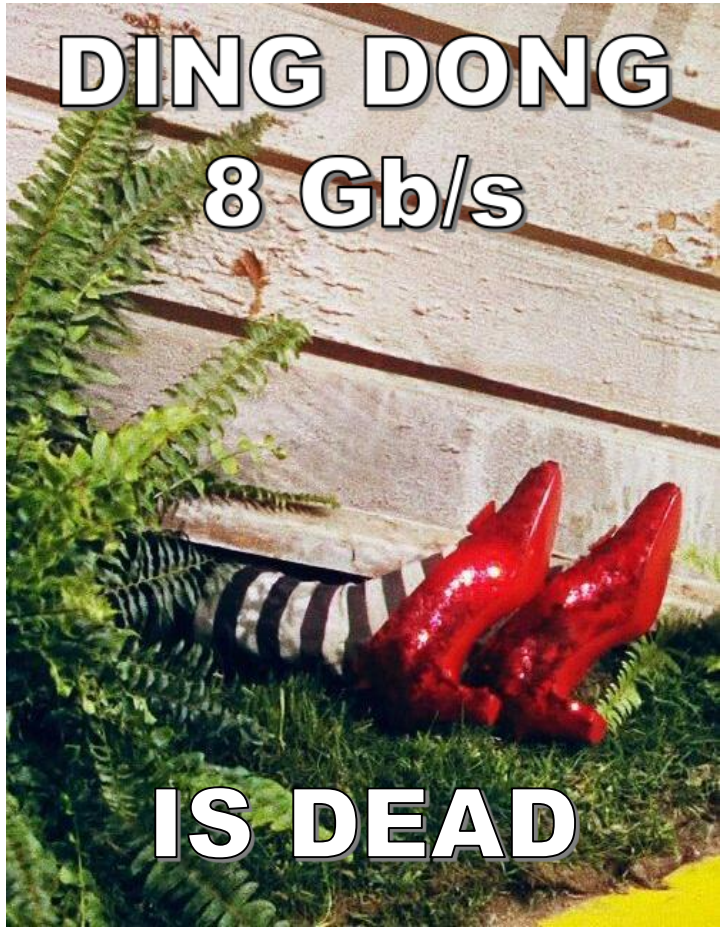
Latency: Slows every acknowledgement over the WAN, dramatically slowing performance for chatty protocols

Packet Loss: Protocol response is exponential back-off, causing replication performance to slow to a crawl

Ding Dong 8 Gb/s Is DEAD!

Finally, the last Brocade 8 Gb/s products are going EOL

- Both the 7800 Extension Switch and the FX8-24 Extension Blade are the last remaining 8 Gb/s platforms and EOL is long overdue
- EOL notices to OEMs and posted on Broadcom.com on 4/30/19
  - Last Time Order (LTO) date is 8/31/19
  - Last Customer Ship (LCS) date 10/31/19
  - End of Support (EOS) date is 10/31/24
- Customers who require additional units need to place their orders by 8/31/19
- 7800 and FX8-24 upgrade and license SKUs will be available for another 2 years until 8/31/21



IBM b-type Storage Extension Portfolio

SAN06B-R

8 Gbps, 1 GbE,
FCIP Only

Existing Small to Medium Business Solution

SAN18B-6

32 Gbps, 1/10 GbE,
FCIP & IP Extension

New Small to Medium Business Solution

SAN42B-R

16 Gbps, 1/10/40 GbE,
FCIP & IP Extension

Large Enterprise &

Mainframe FICON Extension

32Gb Extension Blade for Gen 6 Directors

32 Gbps, 1/10/40 GbE,
FCIP & IP Extension

Large Enterprise &

Mainframe FICON Extension

IBM SAN42B-R Extension Switch

24x 16G FC Ports
16x 1/10Gbe WAN ports
2x 40 Gbe WAN Ports

Purpose-built for both Fibre Channel and IP storage replication

Industry-leading performance and scalability

- Unprecedented 80 Gbps application throughput per platform
- Unique WAN-optimized TCP with IBM Extension Trunking and the industry's highest jumbo frame support
- Secure data flows over distance with 256-bit IPsec encryption without a performance penalty

High availability and reliability

- Improve load balancing and network resilience with IBM Extension Trunking, Adaptive Rate Limiting, and Fabric Vision technology
- Achieve always-on business operations with the industry's only non-disruptive firmware upgrades for FCIP

Simplified management

- Leverage advanced monitoring and reporting on system, flows, and WAN conditions to detect WAN anomalies and avoid unplanned downtime
- Validate and troubleshoot the physical infrastructure with built-in traffic generator and Flow Vision to accelerate deployment

Gen 6 Extension Blade for FC, FICON and IPEX

For IBM SAN512B-6 & SAN256B-6

32G FC Ports
1/10Gbe WAN ports
2x 40 Gbe WAN Ports

Industry-leading performance

- Accelerate data replication and secure data flows over distance at full line-rate speed with strong 256-bit AES encryption—up to 80 Gbps per blade
- Maximize utilization of WAN links through protocol optimization technology and expand WAN bandwidth with hardware-based compression

Enterprise-class availability

- Maximize availability with redundant, hot-pluggable chassis components and non-disruptive software upgrades
- Improve load balancing and network resilience with Extension Trunking, Adaptive Rate Limiting, and Fabric Vision technology

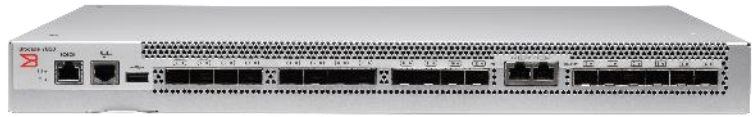
Unmatched flexibility and simplified management

- Consolidate Fibre Channel and IP replication traffic within a single blade with flexible multiprotocol port connectivity
- Consolidate operations management and extend Fabric Vision over distance for greater control and insight

Brocade 7810 Extension Switch – IBM SAN18B-6

Modern Replication Connectivity for IBM Storage

- **What is Happening?**
  - IBM SAN Team to Announce SAN18B-6
    - April 2, 2019
  - IBM & Brocade/Broadcom Field Focus
    - Driving refresh opportunity for previous generation platform (7800)
    - Approximately 5000 units of 7800 sold through IBM
      - Estimates of 30% of 5000 units were used with DS8K
      - 85-90% of units deployed in a 4 unit/site configuration
      - Approximately 250 DS8K clients targeted for refreshing and upgrading
- **New Opportunity**
  - IBM DS8K TCT
    - Available today with COS – Available with TS77xx 4Q19 (roadmap)
    - Distance & Packet Loss - impose limits to designs and deployment
  - IBM SAN18B-6 Removes/Reduces Distance and Packet Loss Limitations
    - Primary solution directed at Enterprise Market
    - Secondary market could lead to new TCT solutions with cloud



12×32 Gb/s FC ports
6×1/10 GbE FCIP WAN ports

Cost-effectively Replicate Data with IBM SAN18B-6 Extension Switch

Modern Replication Connectivity for Midrange Storage

Perfect to — Provide much higher replication throughput than a storage array can achieve on its own

Built to — Cost-effectively replicate data using less-expensive WAN connections

Optimal for — Small to medium-scale, multi-site data center environments implementing block, file, and tape data protection

12×32 Gb/s FC ports
6×1/10 GbE FCIP WAN ports

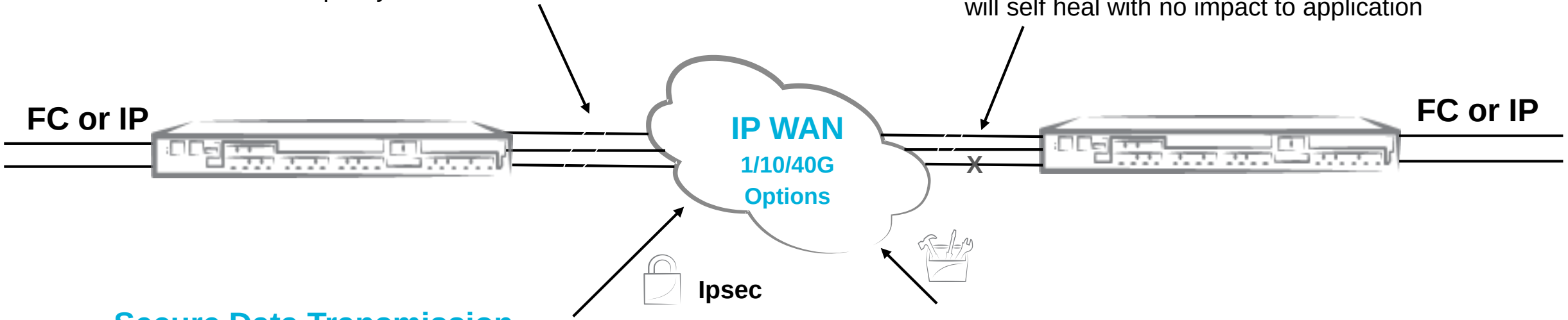
Powerful	Move more data faster over distance with up to 10 Gb/s replication throughput and consolidate FC and IP replication workloads
Reliable	Protect data from WAN disruptions and outages with Extension Trunking, Adaptive Rate Limiting, WAN Test Tool, and Fabric Vision technology
Secure	Secure data from threats over the WAN with unbreakable network encryption enabled without impacting performance and simplify compliance to meet security regulations

IBM/Brocade IPEX/FCIP Platforms

Client Value: Consistent Performance, Stability, Scale, Self Healing & Visibility

– **Bandwidth Aggregation/Scale**
- **All WAN circuits are a single logical element**
  – Add network capacity as needed

– **Load Balancing & Transparent Failover**
- **Traffic is shared across the logical elements available**
  – No single point of network failure and all transmissions will self heal with no impact to application



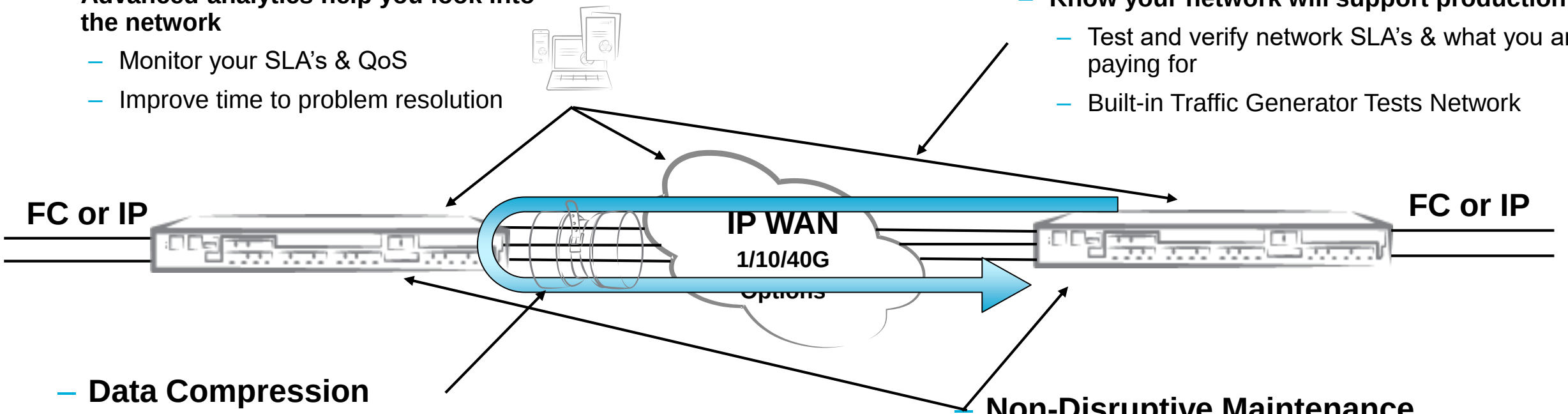
– **Secure Data Transmission**
- **Encrypt all Data Across the WAN**
  – Ipsec deployed on WAN circuits
  – No performance Impact

– **Storage Hardened Data Transmission**
  – **25 years of proven technology for long distance**
    – Self Healing Systems provide maximum protection and reliable data delivery

IBM/Brocade IPEX/FCIP Platforms

Client Value: Consistent Performance, Stability, Scale, Self Healing & Visibility

- **Network Insights**
  - **Advanced analytics help you look into the network**
    - Monitor your SLA's & QoS
    - Improve time to problem resolution
- **Network Validation Testing**
  - **Know your network will support production**
    - Test and verify network SLA's & what you are paying for
    - Built-in Traffic Generator Tests Network



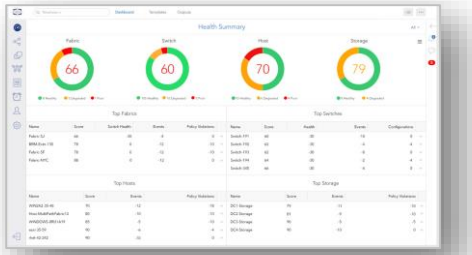
- **Data Compression**
  - **Maximize the network efficiency**
    - Compression of data reduces costs of network
    - 2:1 compression opens up ½ the b/w needed
- **Non-Disruptive Maintenance**
  - **Eliminate maintenance downtime for code updates**
    - IBM's SAN42B-R allows for hot-code loads

SAN18B-6 SANnav: The Next Generation of SAN Management

Today and Tomorrow

- Today's SAN18B-6 Setup and Management
  - CLI through Fabric OS (FOS).
    - Includes access to Fabric Vision management tools.
  - WebTools GUI.

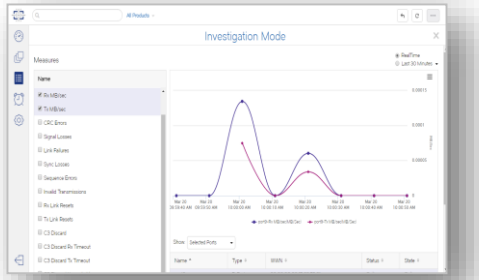
- Tomorrow SAN18B-6 Setup and Management
  - CLI through Fabric OS (FOS).
    - Includes access to Fabric Vision management tools.
  - WebTools GUI.
  - SANnav for enterprise level management
    - IBM should have SANnav available in 2H19
    - No version of IBM Network Advisor will support the SAN18B-6



Enhanced Monitoring

Modern health summary dashboard

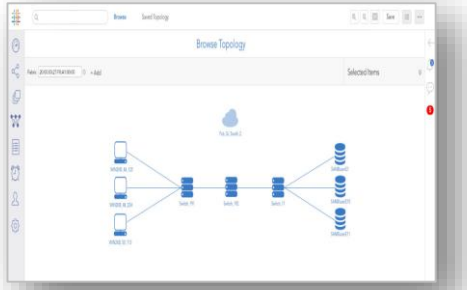
Context based topology view



Rapid Troubleshooting

Instant view of fabric-wide conditions

Powerful log analysis, historical and real-time data



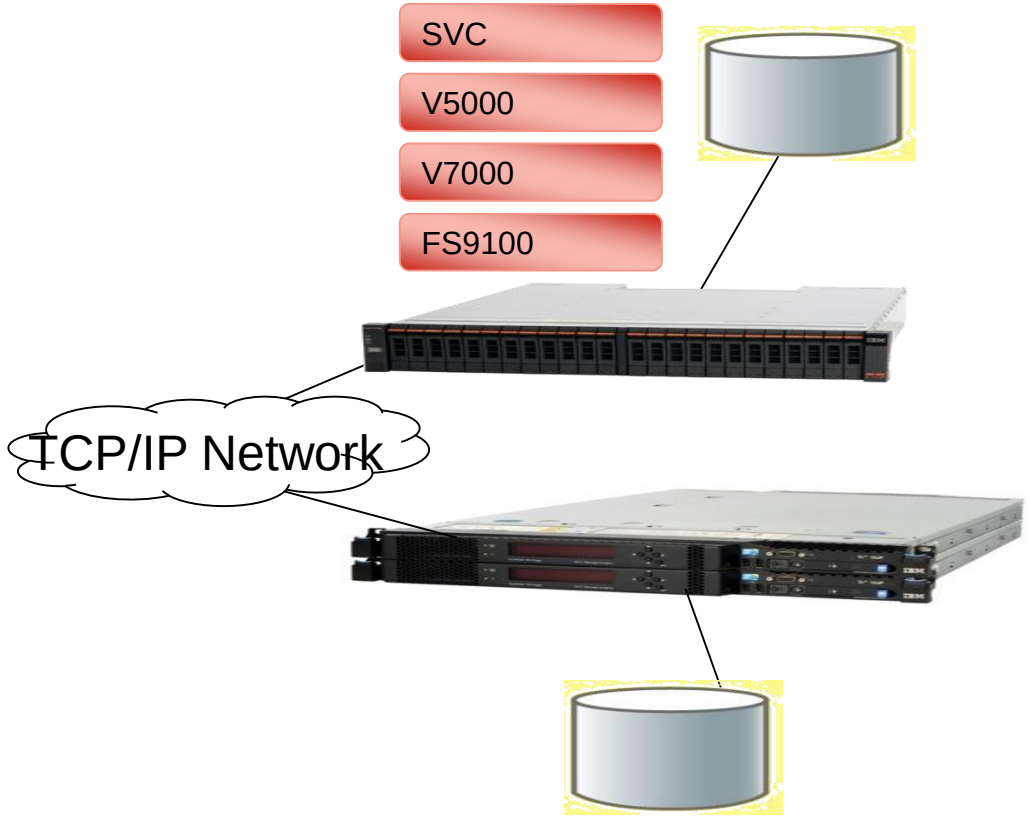
Flexible Deployment

Deploy on a single server or in a cluster of low-end servers

IBM b-type SAN18B-6 Value Props over SAN06B-R

Platform Attributes	Customer Benefit
Two generations newer platform	All the benefits of Gen 6 vs. an old Gen 4 platform: 32Gb/s FC, IO Insight/VM Insight, FOS 8.x (and 9.x)
SAN42B-R features	Fabric Vision over distance, WAN test tool, etc.
More efficient compression and encapsulation	Higher compression ratio, less bandwidth consumption for the same amount of replication traffic
Compatibility with SAN42B-R and 32Gb Ext Blade platforms	Ability to interface SAN18B-6 units in regional sites with SAN42B-R and 32Gb Ext Blade platforms at larger datacenter sites (no need to deploy separate SAN18B-6 units at core)
IP Extension support	Acceleration, encryption, high availability and bandwidth management also for IP replication
10 Gb/s Ethernet ports	Connect to modern routers with 10 Gb/s ports
Much longer supported life	SAN06B-R platform will be EOL in 2019

Native Storage IP-based Replication vs SAN18B-6 FCIP



IBM Spectrum S/W has Bridgeworks SANSlide Technology included in V5/V7/V9/FS9100/SVC

IBM Spectrum Virtualize

IBM Spectrum Accelerate

IBM Cognitive Systems OR

IBM Z OR

Heterogenous flash storage

Storwize V5010E / V5030E	Storwize V5100/F	Storwize V7000	FlashSystem 9110 / 9150	FlashSystem A9000	FlashSystem A9000R
					
Entry SAS Hybrid & AFA	Entry NVMe Accelerated Hybrid & AFA Solutions	Enterprise for Everyone NVMe Accelerated Hybrid & AFA Solutions	Enterprise Class NVMe accelerated Multicloud Enabled	**Cloud Service Providers**	**High End Enterprise**

Scale-out clustering
Simplified management
Flexible consumption model
Virtualized, enterprise-class, flash-optimized, modular storage
Enterprise class heterogeneous data services and selectable data reduction

Simplified management
Flexible consumption model
Large Grid scale
Full time data reduction

VersaStack™ Solution by Cisco and IBM

IBM FlashCore™ Technology Optimized

SVC

Enhanced data storage functions, economics and flexibility with sophisticated virtualization

NVMe FlashCore Module
Superior endurance & better performance FIPS 140-2
- Hardware Compress

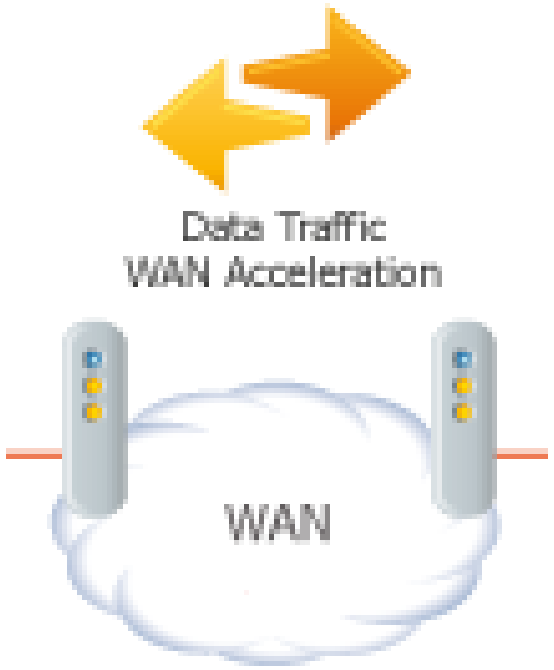
FlashSystem 900
Application acceleration
- Extreme perf
- Hardware Comp
- Targeting database acceleration

DS8882F	DS8884F	DS8886F	DS8886F
			
Rack Mounted	**Business class**	**Enterprise class**	**Analytic class**

Business Critical, deepest integration with IBM Z and IBM Power Systems, superior performance, highest availability, three-site/four-site replication and industry leading reliability

IP-based Replication with Integrated WAN Acceleration

- SVC
- V5000
- V7000
- FS9100



- Enables use of IP connections for remote mirroring
  - Transparent to servers and applications
  - Supports all Remote Mirroring modes
  - Global Mirror with Change Volumes preferred
- Straightforward configuration on existing IP infrastructure
- Integrates **Bridgeworks SANSlide** network optimization technology
  - No separate appliances required
  - Uses Artificial Intelligence to improve network bandwidth utilization **up to 3x**
- Included with Remote Mirroring license
- IP replication with integrated Bridgeworks SANSlide network optimization has it's place!

Bridgeworks SANSlide

SVC
V5000
V7000
FS9100

- IP connections may have long latency
  - Long distance connections
  - Many network “hops”
- Traditional solutions transmit data, wait for response, transmit more data
  - Results in poor network utilization, **as low as 20%**
  - Worse as latency becomes higher
- Bridgeworks SANSlide technology integrated with Storwize family IP replication
  - No separate appliances required
  - No additional cost
- Uses artificial intelligence technology to transmit data streams in parallel
  - Automatically adjusts to changing network latency
  - Improves network bandwidth utilization **up to 3x**
  - Independent of application or data type
- Deploy less costly network infrastructure
- Speed replication cycles for better remote data currency and faster recovery

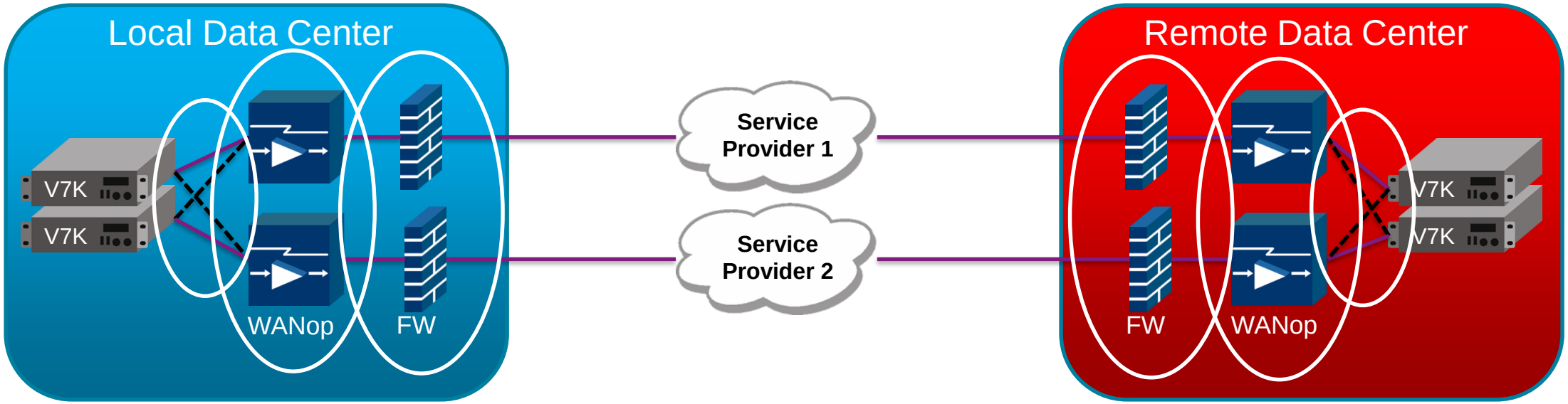
IBM Storwize SANSlide Deployment

- Native IP - WAN Optimization, Security & Resiliency/Scale – *Not Integrated*

WAN Resiliency/Scale - No Load Balancing, No Lossless Link Loss & 1Gbps B/W – ***Not Enterprise Class***

WAN Optimization – No QoS or Compression – External WAN Optimization Equipment Required– ***Additional Cost***

End to End Data Security – No WAN Encryption – External Equipment Required for VPN/Security ***Additional Cost***



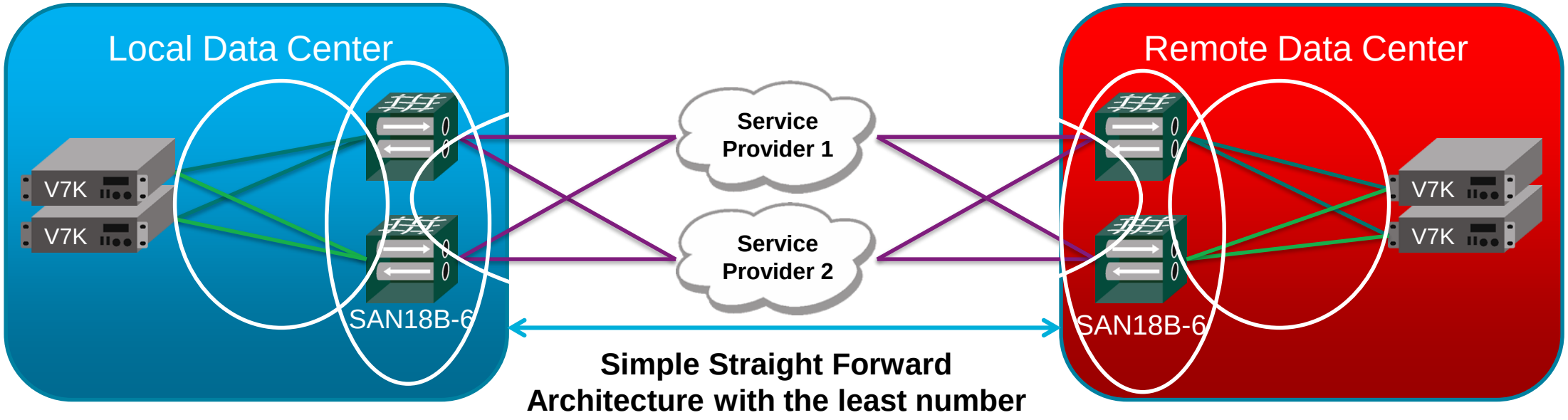
IBM Storwize with Brocade SAN18B-6 Enterprise Deployment

- FCIP - WAN Optimization, Security & Resiliency/Scale - Integrated

WAN Resiliency/Scale– Multipath, Trunking, Transparent link failover, Up to 6Gbps of B/W - *Integrated*

WAN Optimization – QoS & Compression Included – *Integrated*

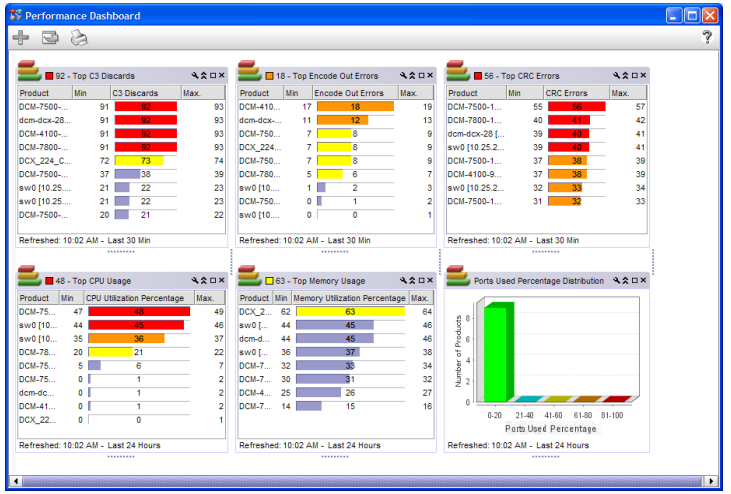
End to End Data Protection – IPsec included - *Integrated*



IBM Storwize DR Solutions

- Why Brocade FCIP is a better choice…

  - Brocade FCIP has comprehensive management platform
    - IBM Network Advisor…..Today!
      - A holistic approach for any Enterprise SAN
      - Integration into Fabric Vision
      - Configuration tools
      - Monitoring tools
      - Reporting/Trending tools
      - Diagnostic/Troubleshooting tools



Summary…..Why FCIP over Native IP?

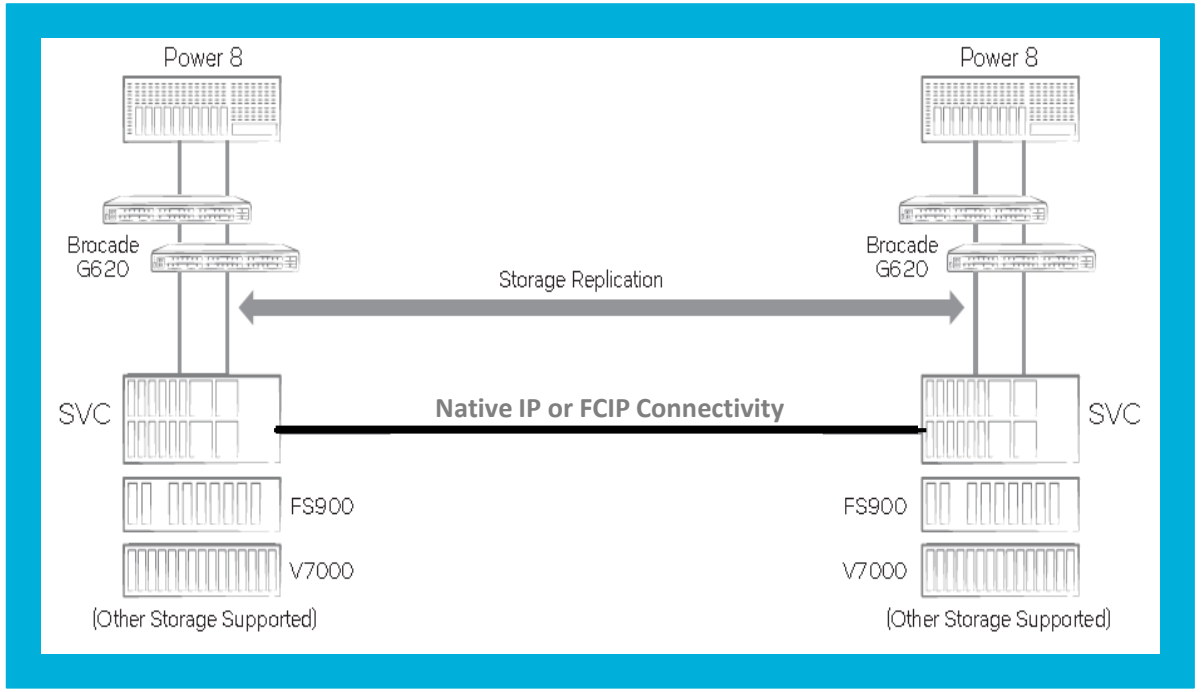
- FCIP Value Proposition over IP Only Solutions
  - FCIP does not require additional WAN Optimizers to increase efficiency
  - **FCIP includes compression to maximize link efficiency**
  - Native IP solutions do not have compression and external equipment increases cost
- FCIP does not require additional security gateway and firewalls
  - **FCIP includes encryption (Ipsec) to make the WAN secure**
  - Native IP solutions may not have any security and external equipment increases cost
- FCIP Routers are not limited in scalability
  - FCIP includes the ability to be shared by multiple v7000 arrays as needs expand
  - Native IP solutions are dedicated and cannot share resources
- FCIP has been hardened for storage over distance
  - FCIP has hardened TCP that offers maximum recovery of your most critical information
  - Native IP solutions only use standard TCP which can drop packets and not recover
- **FCIP does not limit your flexibility for network designs**
  - FCIP includes the ability to be dedicated to start and expand into fabric based topologies
  - Native IP solutions cannot integrate into or share common resources for flexible designs

IBM/Brocade
Driving New Opportunities
SVC Replication – Understanding Native IP vs FCIP Deployments

IBM SVC HA Multi-Site Solutions

Solution Overview

- **IBM SVC Replication**
  - **Provides Two Types of Replication**
    - Synchronous
    - Asynchronous
  - **Connectivity Between Sites**
    - Native IP between controllers (Bridgeworks Software) – Best suited for asynch
    - Fibre Channel over IP (FCIP) Extension Switches (Brocade 7800/7840)
  - **Performance Factors**
    - Available “bandwidth”
    - “Distance” between sites
    - “Network cleanliness/stablility”
    - “Security” with no performance impact



IBM SVC HA Multi-Site Solutions

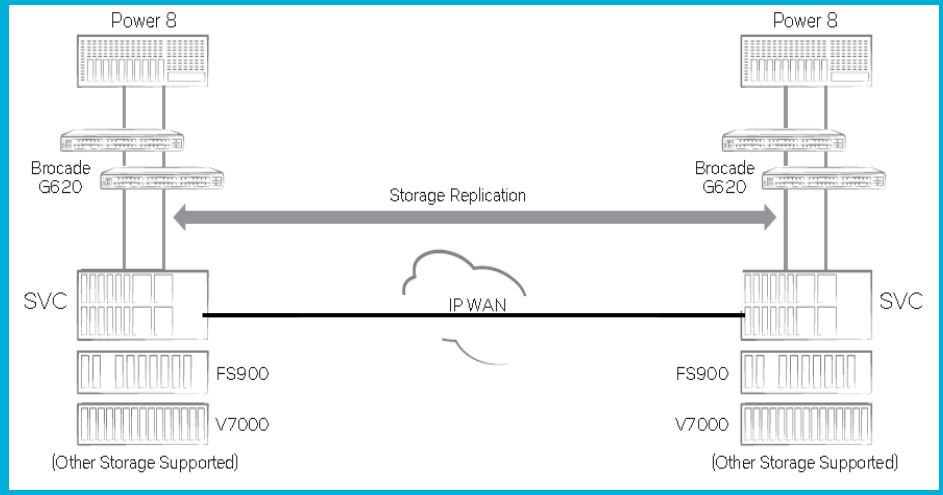
Inter-Site Options & Differences

Business & Technical Elements	Native IP	Fibre Channel over IP
Cost:	• Software Drivers (Bridgeworks) included in SVC offering – No charge	• Additional Equipment Costs
Network Connectivity:	• 1G and 10G Ethernet Options	• 1G, 10G and 40G Ethernet Supported with Variable Scale

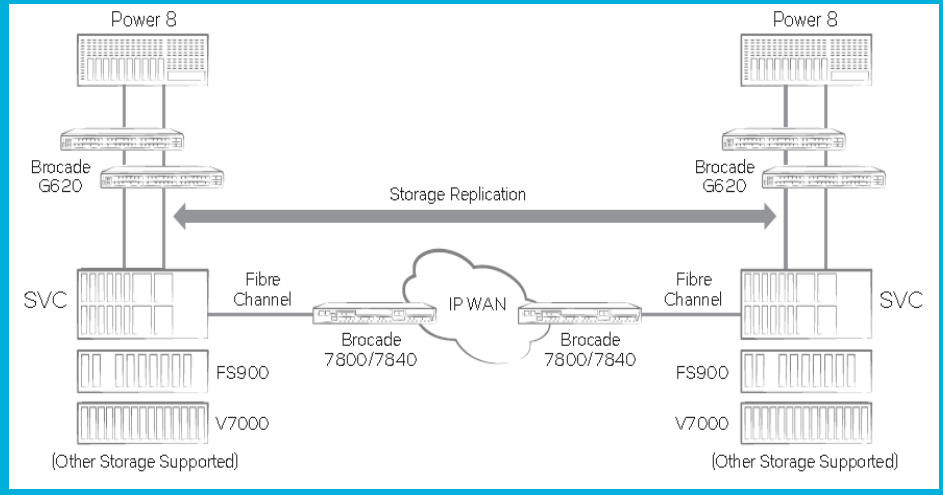
Distance guidelines:
• Round Trip Time (RTT) – time for a packet to travel to one site and back
• 1ms of latency ~ 100miles
	• 1G supports
	  • Up to 80ms of RTT (~4000 miles between sites)
	• 10G supports
	  • Up to 10ms of RTT (~500 miles between sites)
		• All WAN Speed using FCIP configurations support:
		  • 1 - 250ms of RTT
		  • Up to 12,500 miles between sites

Security:	• No	• Integrated H/W Encryption (Ipsec) – no performance impact
Compression:	• Yes, IP links can implement compression	• Yes, integrated S/W or H/W compression with IP Link at no additional cost
Network Mgmt:	• Yes, SVC System Mgmt and Tools	• Yes, Deep insights to IP WAN with Flow Vision for identifying failures or bad behaviour

Native IP WAN



Fibre Channel over IP WAN



IBM SVC/Flash Replication Testing

Native IP Replication vs. FCIP Replication Testing Results

NON-Compressed 10Gbps Interface

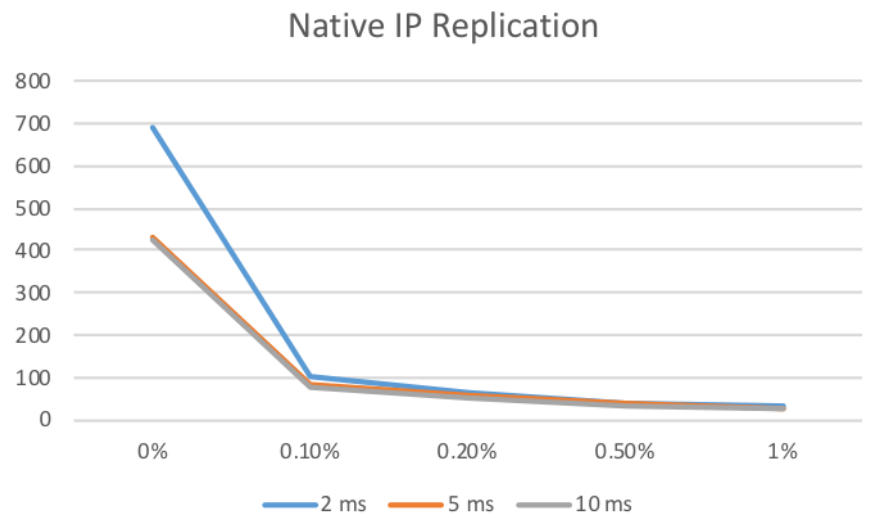
Native IP Replication

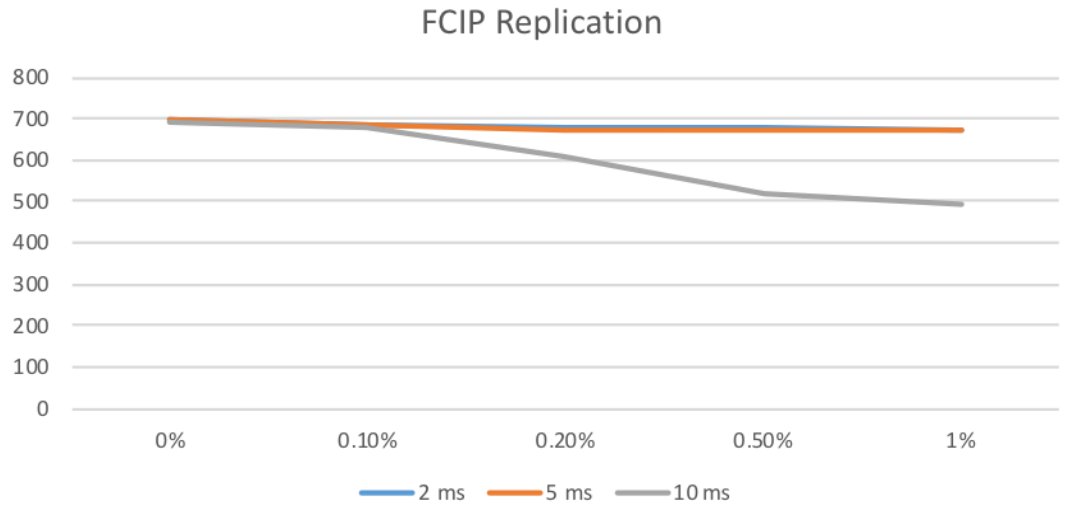
	0 ms	1 ms	2 ms	5 ms	10 ms
0%	680	N/A	690	430	425
0.10%	N/A	N/A	100	86	75
0.20%	N/A	N/A	64	55	50
0.50%	N/A	N/A	40	36	34
1%	N/A	N/A	30	28	25

NON-Compressed 10Gbps Interface

FCIP Replication

	0 ms	1 ms	2 ms	5 ms	10 ms
0%	705	N/A	695	695	694
0.10%	N/A	N/A	685	685	679
0.20%	N/A	N/A	680	670	611
0.50%	N/A	N/A	680	670	520
1%	N/A	N/A	675	670	490





IBM SAN18B-6 Implementation and Design Considerations

Design Options & Differences

Replication Testing Results:

•Native IP can be used with confidence up to 10ms of RTT with little or no packet loss

•***FCIP provides a higher level of performance with distance and network packet loss***

•FCIP provides predictable and stable performance results at virtually any distance

•Clients with SLA's on RTO/RPO should consider using FCIP at any distance

SVC Replication with Distance and WAN Packet Loss	FCIP Performance Multiplier (X) Factor vs. Native-IP			
IP WAN Packet Loss	~100 miles (RTT 2ms)	~250 miles (RTT 5ms)	~500 miles (RTT 10 ms)	500+ miles (RTT 11 - 250 ms)
0%	1X	2X	2X	Only FCIP Supported
0.10%	7X	8X	9X	
0.20%	11X	12X	12X	
0.50%	17X	19X	15X	
1%	23X	24X	20X	

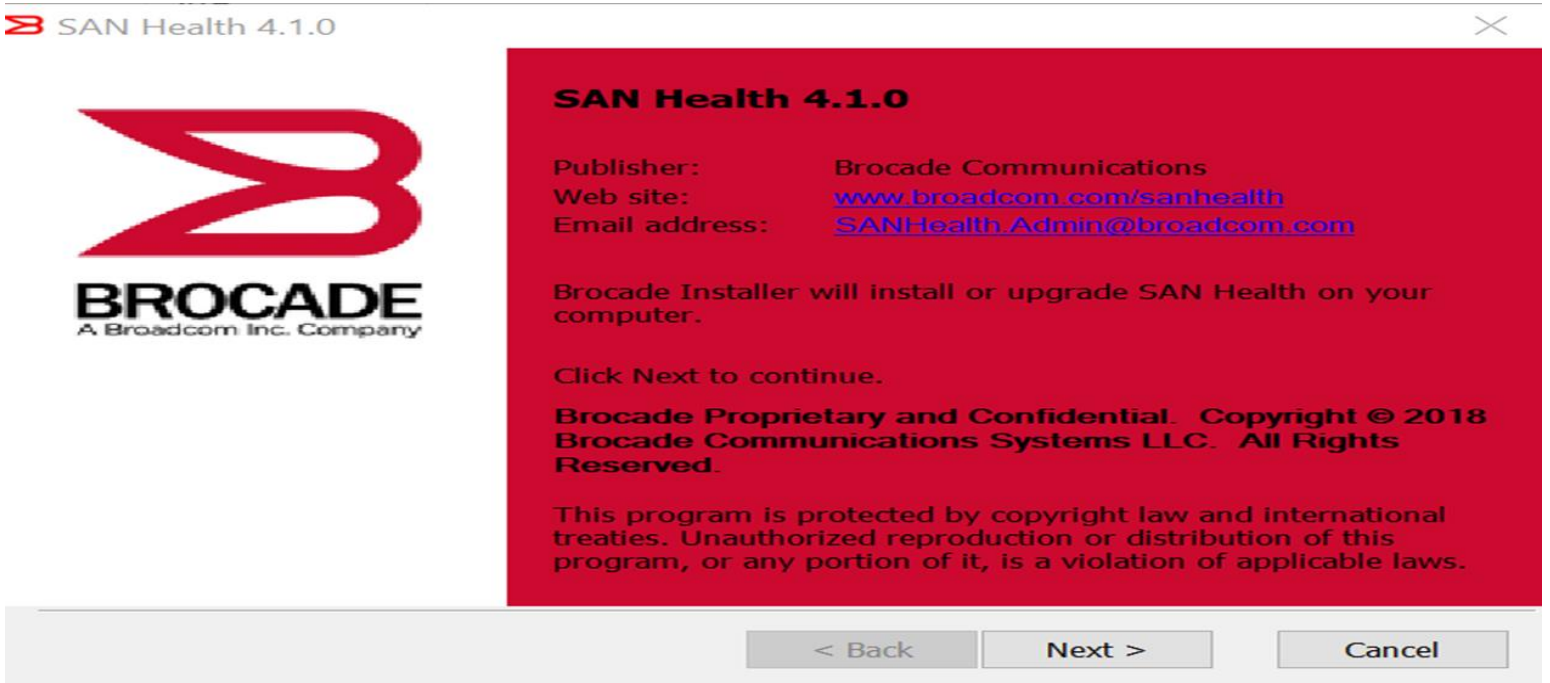
Qualification Questions & Guidelines

Determine What Solution Needs To Be Positioned

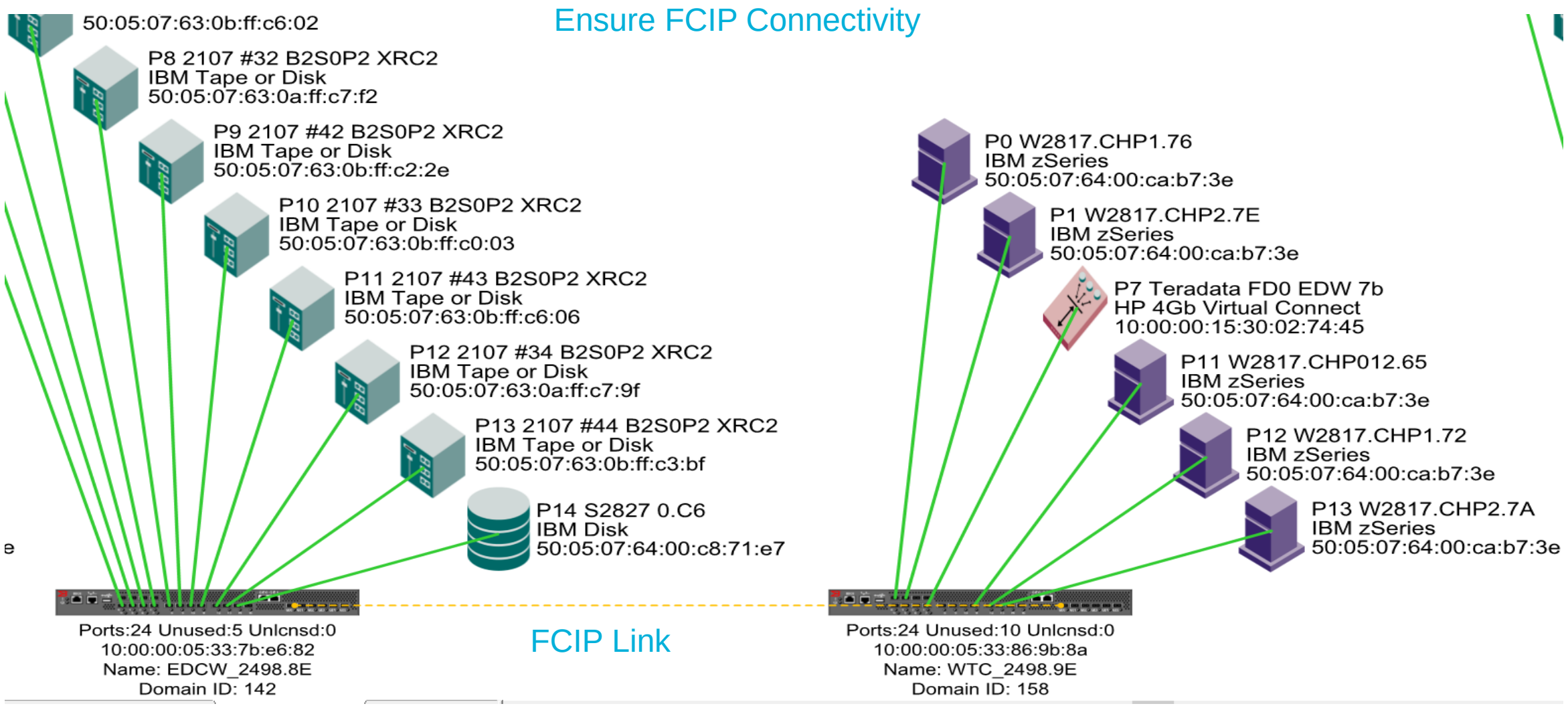
- **Qualifying Questions:**
  - Does the client need more than 1G network bandwidth. — If yes, SVC 10G or FCIP platform needs to be considered
  - Does the client need more than 10G network bandwidth — If yes, FCIP platforms should be considered
  - If a 1G WAN is used, is the distance between sites over 80ms of delay — If yes, FCIP platform must be used to support solution
  - If a 10G WAN is used, is the distance between sites over 10 ms of delay — If yes, FCIP platform must be used to support solution
  - Is the network (any speed) considered to be “lossy” (>.01% packet loss) — If yes, FCIP platform should be considered
- **Selecting The Right FCIP Platform:**
  - Does the client have existing FCIP platforms — If yes, determine is there is existing capacity available
  - Is the client focused on cost sensitivity — If yes, the IBM SAN18B-6 can be considered
  - Is this a small deployment of SVC Replication — If yes, the IBM SAN18B-6 can be considered
  - Is this a large deployment of SVC — If yes, the IBM SAN42B-R should be considered
  - Does the client need to consolidate multiple DR solutions — If yes, the IBM SAN42B-R should be considered
- **Technical Analysis:**
  - Each client and application requirements are different, each client should have a technical assessment of what is required

Washington Systems Center - Storage

SAN Health…The SAN Assessment Tool!
Time to Modernize the SAN Infrastructure….



San Health 7800 FCIP Audit Visio Output



SAN Health 7800 Audit Output….. Port Use, ISL/Trunk Summary, Bandwidth Utilization

SUMMARY FOR FXF MF HRO to EDCW A Pair (2 SWITCHES IN FABRIC)

Switch Name	Dom	IP Address	World Wide Name	Model	Spd	OSVer	Status	DaysUp	Pwr(W)	Mode	Serial Number	Ports(Total ports	Unused	Unlicnsd
IBM2498_R06_HRO_A	1	10.10.4.167	10:00:00:05:33:d1:b2:22	7800	8G	7.4.1d	Healthy	137	99	Native	ASS2511H00R	24 (24)	12	0
freight2498a	220	204.135.50.206	10:00:00:05:33:d7:9e:4a	7800	8G	7.4.1d	Healthy	137	99	Native	ASS2511H00L	24 (24)	14	0

PORT USE

	Port Counts			Attached Device Types					Inter Switch Links			Fan Out Ratios		Port Speeds							Long Distance Modes					
Switch Name	Total	r Unusd	Unlcd	Disk	Tape	Host	Aplnc	Gtwy	ISL	TrkMst	TrkSlv	Hst:Trg	Dvc:ISL	2G	4G	8G	16G	32G	1GE	10GE	10km	25km	50km	100k	300k	Auto
IBM2498_R06_HRO_A	24	12	0	4	0	0	0	0	0	0	0	0:4	4:0	0	4	12	0	0	0	0	16	0	0	0	0	0
freight2498a	24	14	0	2	0	0	0	0	0	0	0	0:2	2:0	0	0	16	0	0	0	0	16	0	0	0	0	0
TOTALS	**48**	**26**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**			**0**	**4**	**28**	**0**	**0**	**0**	**0**	**32**	**0**	**0**	**0**	**0**	**0**

ISL / TRUNK SUMMARY

From Switch				To Switch				ISL or	FSPF	Farthest	Dynamic	Available Bandwidth and Utilization					
Name	Dom	Area	Slot/Port	Name	Dom	Area	Slot/Port	Trunk Type	Cost	Pnt (Hops)	or Static	Speed	BW	Average	% Use	Peak	% Use
IBM2498_R06_HRO_A	1	16	16	freight2498a	220	16	16	FCIP ISL	500	1	D	2 Gbps	6	40.3 MB/s	-	94.7 MB/s	-

BANDWIDTH UTILIZATION STATISTICS

	All Active Ports			% BW used			All ISL Ports			% BW used			All Host Ports			% BW used			All Target Ports			% BW used		
Switch Name	Count	Avg	Peak	0-25	26-75	76-100	Count	Avg	Peak	0-25	26-75	76-100	Count	Avg	Peak	0-25	26-75	76-100	Count	Avg	Peak	0-25	26-75	76-100
IBM2498_R06_HRO_A	4	8.6	33	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8.6	33	4	0	0
freight2498a	2	8.2	15	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	8.2	15	2	0	0
TOTALS	**6**	**8.4**		**6**	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**6**	**8.4**		**6**	**0**	**0**

PORT MAP

Brocade 7800 Name:IBM2498_R06_HRO_A WWN:10:00:00:05:33:d1:b2:22 IP Address:10.10.4.167 Domain ID:1 — PERF CAPTURE (Duration se

Area	Slot/Port	Port ID	Status	Type	Speed	Name / Alias / Zone	ZonedTo	Model	Description	Port World Wide Name	Node World Wide Name	Media	SFP Type	Bound	Lng Dst	Avg Perf	Max Perf
0	0	010000	Online	F	4 G AN	port0	0	2107 DS8000	IBM TotalStorage DS8000	50:05:07:63:0a:33:46:e1	50:05:07:63:0a:ff:c6:e1	Long	BROCADE	SCSI	L0	16.4MB	30MB
1	1	010100	Online	F	4 G AN	port1	0	2107 DS8000	IBM TotalStorage DS8000	50:05:07:63:0a:38:46:e1	50:05:07:63:0a:ff:c6:e1	Long	BROCADE	SCSI	L0	17.8MB	33.4MB
2	2	010200	Online	F	4 G AN	port2	0	2107 DS8000	IBM TotalStorage DS8000	50:05:07:63:09:33:45:dc	50:05:07:63:09:ff:c5:dc	Long	BROCADE	SCSI	L0	0MB	0MB
3	3	010300	Online	F	4 G AN	port3	0	2107 DS8000	IBM TotalStorage DS8000	50:05:07:63:09:38:45:dc	50:05:07:63:09:ff:c5:dc	Long	BROCADE	SCSI	L0	0MB	0MB
16	16		Online	VE	2 Gbps	freight2498a		7800	Brocade Switch	10:00:00:05:33:d7:9e:4a					L0	40.3MB	94.7MB

Brocade 7800 Name:freight2498a WWN:10:00:00:05:33:d7:9e:4a IP Address:204.135.50.206 Domain ID:220 — PERF CAPTURE (Duration se

Area	Slot/Port	Port ID	Status	Type	Speed	Name / Alias / Zone	ZonedTo	Model	Description	Port World Wide Name	Node World Wide Name	Media	SFP Type	Bound	Lng Dst	Avg Perf	Max Perf
0	0	dc0000	Online	F	8 G AN	DS8800 B0C4P0	0	2107 DS8000	IBM TotalStorage DS8000	50:05:07:63:03:03:13:e6	50:05:07:63:03:ff:d3:e6	Long	BROCADE	SCSI	L0	8.5MB	15.2MB
1	1	dc0100	Online	F	8 G AN	DS8800 B4C4P0	0	2107 DS8000	IBM TotalStorage DS8000	50:05:07:63:03:23:13:e6	50:05:07:63:03:ff:d3:e6	Long	BROCADE	SCSI	L0	7.8MB	14.8MB
16	16		Online	VE	2 Gbps	IBM2498_R06_HRO_A		7800	Brocade Switch	10:00:00:05:33:d1:b2:22					L0	30.6MB	46.3MB

SAN Health 7800 Audit Output….. Port Details, Connectivity Before and After

PORT DETAILS FOR IBM2498_R06_HRO_B									
[PORT 0] port0 50:05:07:63:0a:33:c6:e1 2107 DS8000 IBM TotalStorage DS8000									
Port Status	Online	Port Type	F-Port	Port Speed	4 Gbps	Port Name	port0	LongDist Lvl	L0
Buffers Used	8	Node WWN	50:05:07:63:0a:ff:c6:e1	Port WWN	50:05:07:63:0a:33:c6:e1	Device Type	DISK	Derived Type	Target
Zoned To	0 Devices	Device Name	port0	Description	IBM TotalStorage DS8000	SFP Type	LongWave	SFP Vendor	BROCADE
SFP Serial Num	UDA111291004991	SFP Capable Of	2,4,8_Gbps	Model Number	2107 DS8000	Info From NS	PhysicalTarget	FC Address	020000
Bound To	SCSI	Class Of Srvc	2,3						
[PORT 1] port1 50:05:07:63:0a:38:c6:e1 2107 DS8000 IBM TotalStorage DS8000									
Port Status	Online	Port Type	F-Port	Port Speed	4 Gbps	Port Name	port1	LongDist Lvl	L0
Buffers Used	8	Node WWN	50:05:07:63:0a:ff:c6:e1	Port WWN	50:05:07:63:0a:38:c6:e1	Device Type	DISK	Derived Type	Target
Zoned To	0 Devices	Device Name	port1	Description	IBM TotalStorage DS8000	SFP Type	LongWave	SFP Vendor	BROCADE
SFP Serial Num	UDA111291004931	SFP Capable Of	2,4,8_Gbps	Model Number	2107 DS8000	Info From NS	PhysicalTarget	FC Address	020100
Bound To	SCSI	Class Of Srvc	2,3						
[PORT 2] port2 50:05:07:63:09:33:c5:dc 2107 DS8000 IBM TotalStorage DS8000									
Port Status	Online	Port Type	F-Port	Port Speed	4 Gbps	Port Name	port2	LongDist Lvl	L0
Buffers Used	8	Node WWN	50:05:07:63:09:ff:c5:dc	Port WWN	50:05:07:63:09:33:c5:dc	Device Type	DISK	Derived Type	Target
Zoned To	0 Devices	Device Name	port2	Description	IBM TotalStorage DS8000	SFP Type	LongWave	SFP Vendor	BROCADE
SFP Serial Num	UDA111291004791	SFP Capable Of	2,4,8_Gbps	Model Number	2107 DS8000	Info From NS	PhysicalTarget	FC Address	020200
Bound To	SCSI	Class Of Srvc	2,3						
[PORT 3] port3 50:05:07:63:09:38:c5:dc 2107 DS8000 IBM TotalStorage DS8000									
Port Status	Online	Port Type	F-Port	Port Speed	4 Gbps	Port Name	port3	LongDist Lvl	L0
Buffers Used	8	Node WWN	50:05:07:63:09:ff:c5:dc	Port WWN	50:05:07:63:09:38:c5:dc	Device Type	DISK	Derived Type	Target
Zoned To	0 Devices	Device Name	port3	Description	IBM TotalStorage DS8000	SFP Type	LongWave	SFP Vendor	BROCADE
SFP Serial Num	UDA111291004721	SFP Capable Of	2,4,8_Gbps	Model Number	2107 DS8000	Info From NS	PhysicalTarget	FC Address	020300
Bound To	SCSI	Class Of Srvc	2,3						
[PORT 16] freight2498b 10:00:00:05:33:d7:9e:ca 7800 Brocade Switch FCIP ISL to 10:00:00:05:33:d7:9e:ca									
Port Status	Online	Port Type	VE-Port	Port Speed	2 Gbps	Port Name	port16	LongDist Lvl	L0
Port WWN	10:00:00:05:33:d7:9e:ca	Device Type	SWITCH	Derived Type	ISL	Device Name	freight2498b	Description	Brocade Switch
Server Name	freight2498b	Information	FCIP ISL to 10:00:00:05:33:d7:9e:ca	Device Details	204.135.50.207	Firmware	7.4.1d	Model Number	7800

IBM SAN18B-6 Planning and Field Positioning

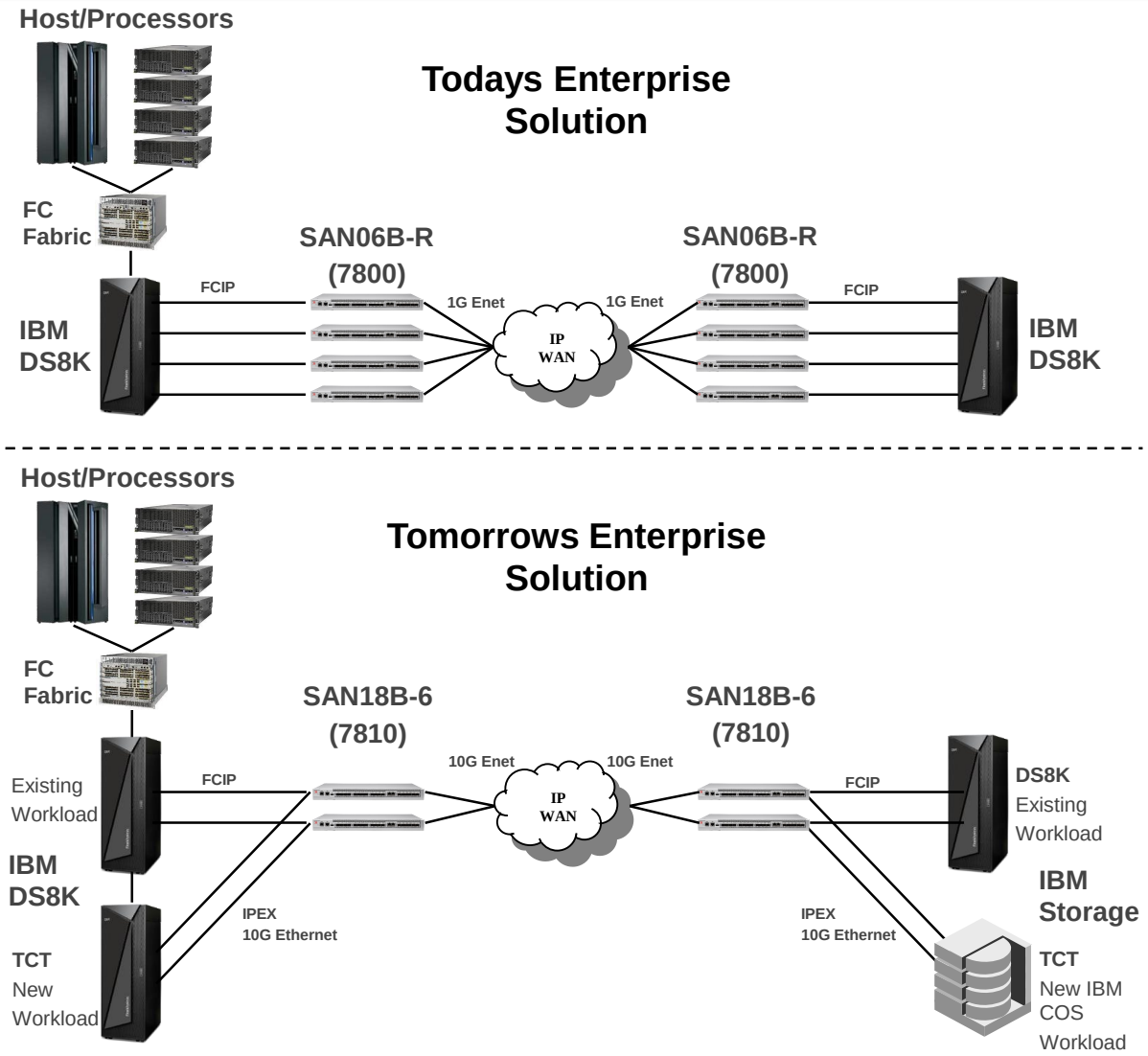
IBM DS8K & IBM SAN18B-6

Today vs Tomorrows Solutions:

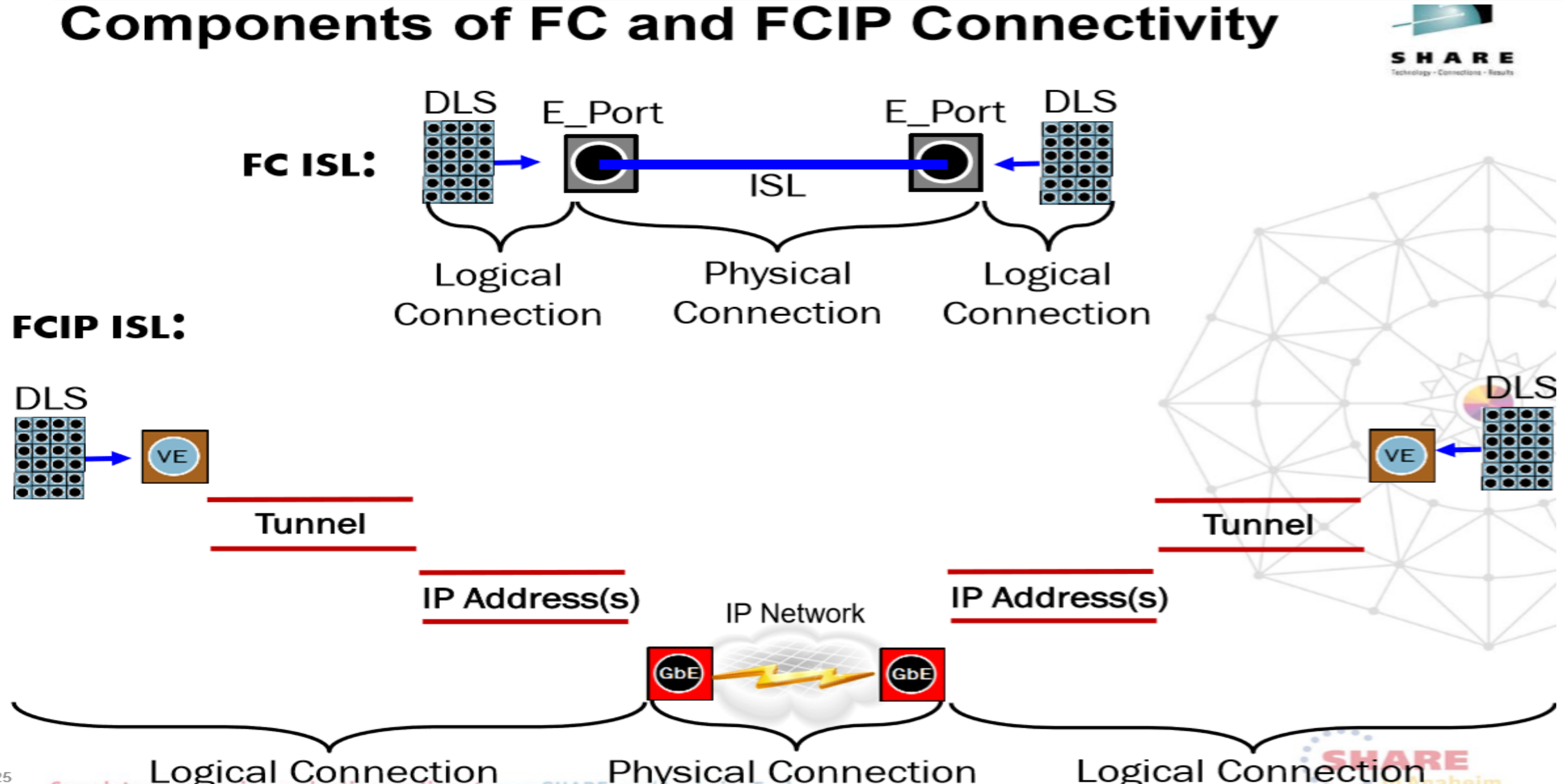
- **Todays Solution:**
  - FCIP Only
  - 1G IP WAN Only
  - Fewer Administrative Tools for isolating network problems
  - No opportunity to add new or different workloads
- **Tomorrow's Solution**
  - FCIP and IPEX (IP Extension) – supports both simultaneously
  - 10G IP WAN Connectivity – Up to 10G of Application Throughput
  - Most advanced trouble-shooting available for short time to problem resolution
  - Workload Expansion – Integrate Metro/Global Mirroring & TCT

Key Positioning Points:

- Consolidate Infrastructure, Reduce WAN cost & Maintain Security
  - Improved compression and throughput management
- New Workload Deployment
  - Leverage same WAN infrastructure for FCIP and IP based storage replication requirements
- SAN06B-R (7800) EOL Announcement (April 30,2019)
  - Align storage and network refreshes to new systems and value –leverage latest technology



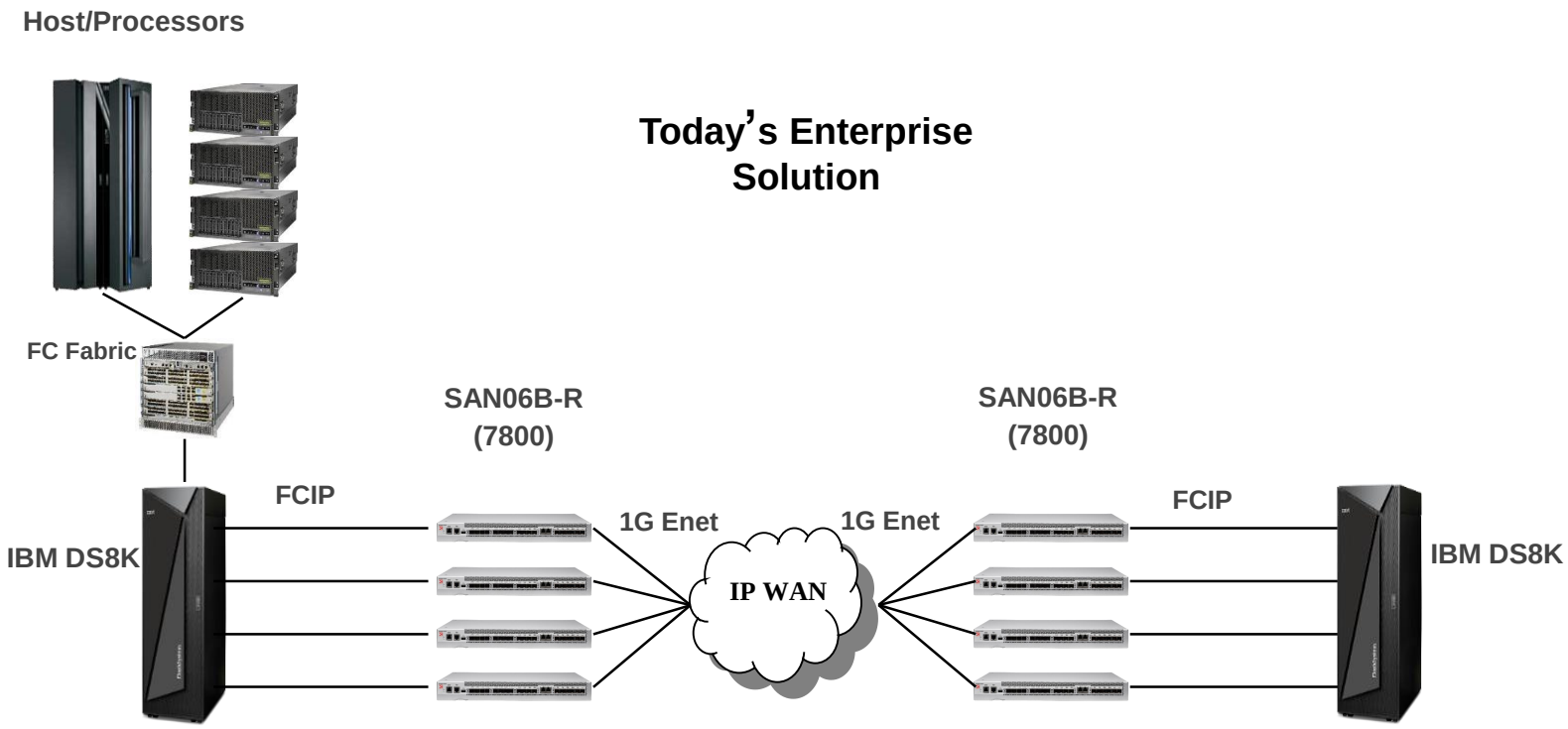
SAN06B-R Existing Configured Components



Migrating Todays Enterprise Solution

Leverage same WAN infrastructure for FCIP and IP based storage replication requirements

- Is the SAN18B-6 BW adequate (2.5 Gbps max)?
- Does the SAN18B-6 provide enough tunnels (4) / circuits?
- If the SAN18B-6 has the capacity...
- Assuming the same network and IP addresses will be reused...
- The network either needs to be the same subnets and capabilities as when the SAN18B-6 was in use.
- You cannot have both the old and new platforms online at the same time when using the same IP addresses, you'll get IP address conflicts on the network. However, you can disable all the ports on the SAN18B-6 and pre-configure the SAN18B-6 with all the ipif, iproute, fciptunnel and fcipcircuit information. Use the existing implementation as the template to configure the SAN18B-6.
- Cutover, disable all the ports on the SAN06B-R, enable all the ports on the SAN18B-6 such that both boxes are not online at the same time. It is possible to swing the existing cables over to the SAN18B-6, or new cabling to the network.
- If everything has been configured correctly, the tunnels will come up.



IBM SAN18B-6 (FCIP) For Tomorrow's Enterprise Solution

Host/Processors

FC Fabric

Single Managed Tunnel per Fabric
Bandwidth, QoS, IPsec, Compression, Failover

SAN18B-6
(7810)

SAN18B-6
(7810)

10G Enet

10G Enet

IP
WAN

Existing
Workload

IBM DS8K

FCIP

FCIP

DS8K
Existing
Workload

IBM
Storage

IPEX
10G Ethernet

IPEX
10G Ethernet

TCT
New
Workload

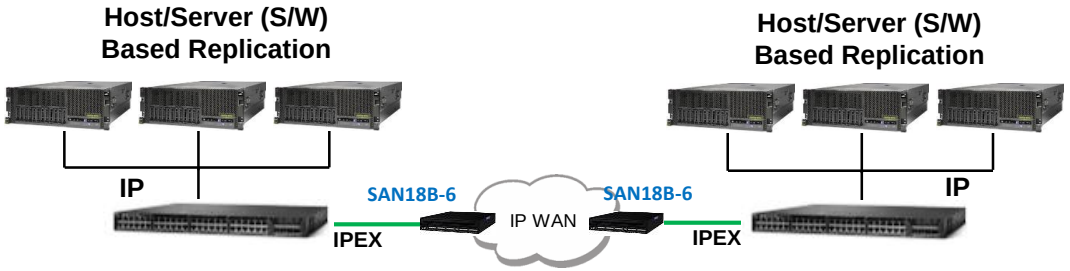
TCT
New IBM COS
Workload

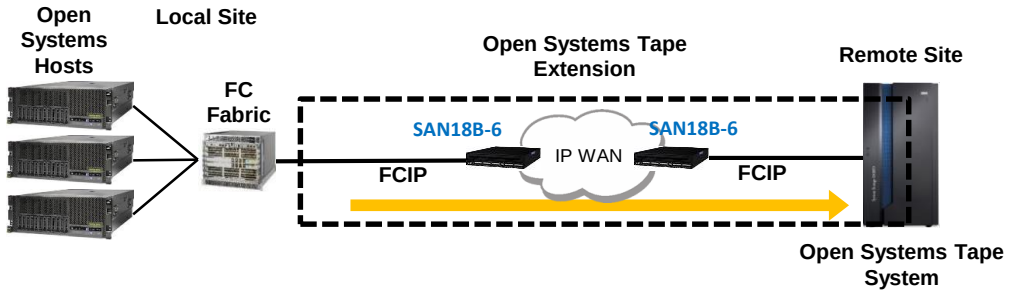
- SAN18B-6 Setup and Management
  - CLI through Fabric OS (FOS).
    - Includes access to Fabric Vision management tools.
  - WebTools GUI.
  - SANnav for enterprise level management
    - IBM should have SANnav available in 2H19

IBM SAN18B-6 Supported Configurations

Brocade SAN18B-6 Solution Support Guidelines

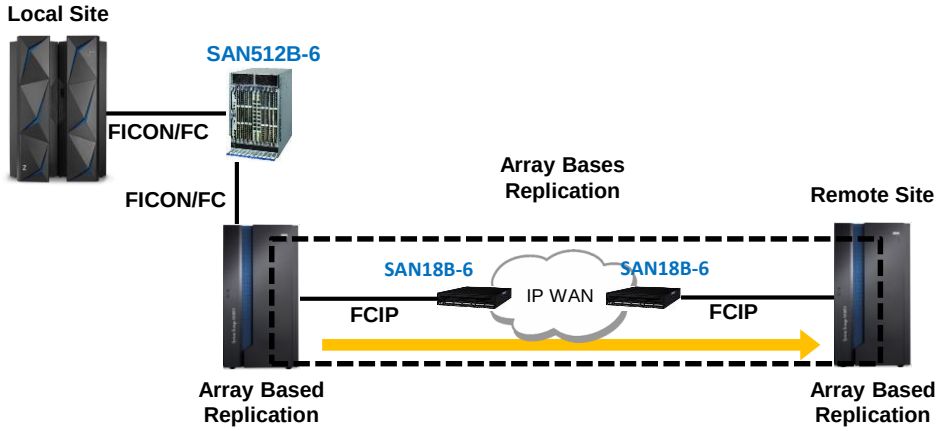
- **SAN18B-6 Supports**
  - Array-to-Array & Open Systems Tape Extension FCIP solutions
  - Array, NAS, VTL or Server driven storage solutions with IP Extension (IPEX)

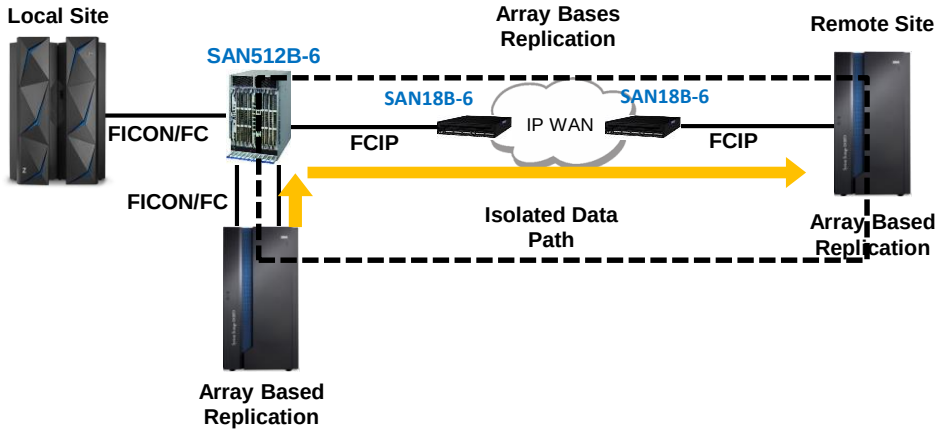




Brocade SAN18B-6 Solution Support Guidelines

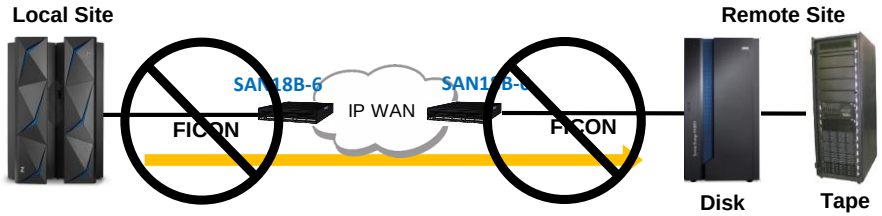
- **SAN18B-6 Supports** Array-to-Array FCIP solutions
  - Array, NAS, TCT or Server driven storage solutions with IP Extension (IPEX)

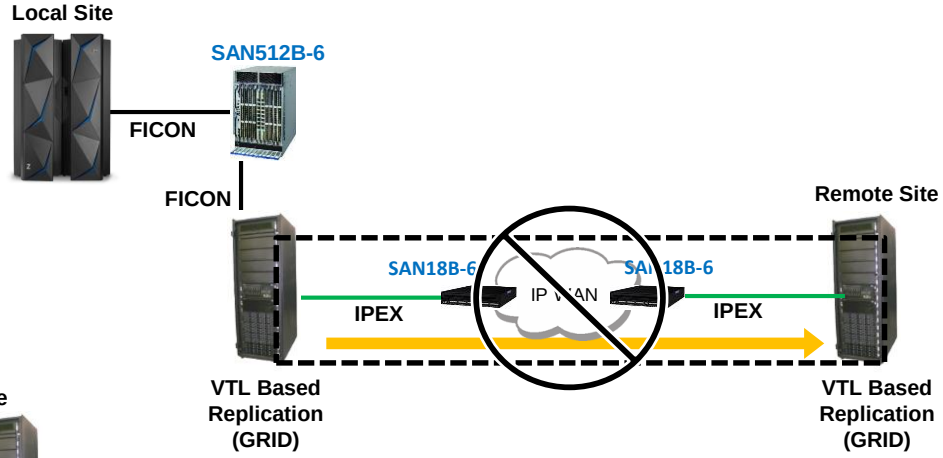


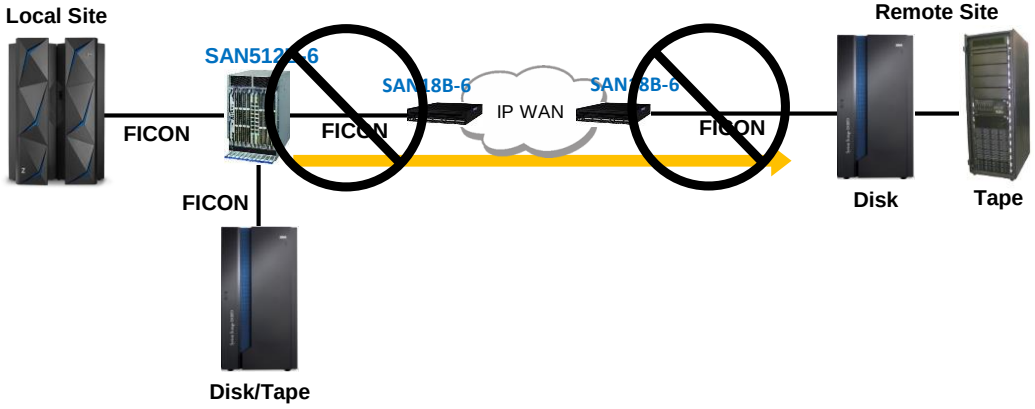


IBM/Brocade SAN18B-6 Solution Support Guidelines

- **SAN18B-6 *Does Not* Support:**
  - Being directly connected to an IBM z FICON (ECKD) port/channel
  - Being connected to a FICON SAN “port” supporting FICON (ECKD) traffic







IBM Storage Extension Solution Support Matrix

IBM Remote Solutions	Brocade SX6 Blade	Brocade SAN42B-R Switch	Brocade FX8-24 Blade	Brocade SAN18B-6 Switch	Brocade SAN06B-R 16/6 Switch	Brocade SAN06B-R 4/2 Switch
Metro Mirroring (FCIP Only)	Yes	Yes	Yes	Yes	Yes	Yes
Global Mirroring (FCIP Only)	Yes	Yes	Yes	Yes	Yes	Yes
GDPS (FICON Extension)	Yes	Yes	Yes	No	No	No
Tape Extension – OS (Pipelining - FCIP)	Yes	Yes	Yes	Yes	Yes	No
Tape Extension – MF (FICON Emulation - FCIP)	Yes	Yes	Yes	No	No	No
TS77xx GRID (IPEX)	Yes	Yes	No	No	No	No
TCT – DS8K to COS (IPEX)	Yes	Yes	No	Yes	No	No
TCT – TS7K to COS (IPEX)	In Development	In Development	No	In Development	No	No
TCT – DS8K to TS7K/COS (IPEX)	In Development	In Development	No	In Development	No	No
Spectrum Protect (IPEX)	In Development	In Development	No	In Development	No	No

Summary and Conclusions

- FCIP provides a robust DR/BC network solution for a variety of distances
- FCIP is ideal for both open systems, as well as System z environments
- FCIP takes advantage of the TCP protocol for error recovery and data integrity.
- FCIP protocol emulates technology provides high performance at very long (Global) distances.
- FCIP enables interconnection of two FC Fabrics using TCP/IP that is transparent to the FC switches, storage devices, and users.

Thank you!
Questions?