Integrated, Synergistic Replication Networks:

Better Performance, Simplified Management, Fewer Unplanned Outages

16536

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#SHAREorg

in Seattle 2015

Abstract

This session will cover the concept of an integrated, synergistic replication network, and the value that they bring to an organization: improved network performance, simplified management, and fewer unplanned outages. The latest technology enhancements for long distance replication networks will also be discussed.

Agenda

- Introduction: why worry, be paranoid, and IT resilience
- Enterprise trends in disaster recovery and business continuity
- End to End connectivity architecture and teams
- Integrated replication networks
- Some use cases

Today's Data Center Challenges and Requirements

Protect more data, improve data access, simplify management

Data Growth	High-Availability Demands	Bigger, Faster Connections
World's info doubling every two years	SLA requirements and recovery expectations are rising	Distance replication at higher data rates

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Threats to Data Are Everywhere, Are You Ready?

Evaluate your exposure

Data center outages are frequent and organizations find themselves ill-prepared

Acts of Nature

"Fire takes down Samsung Data Center"

"Power outage takes down Livestream & StackExchange"

"Hurricane Sandy flooded and took down New York Data centers"

Acts of People

- **"Vandals cut fiber-optic lines, disrupting Silicon Valley"**
- **"Anchor shuts down Middle East"**
- **"Vehicle crash Triggers Amazon Power Outage"**

A force of nature or one faulty circuit, and it could all be destroyed.

Be prepared

- Data availability and business continuity offer a vital competitive edge that is crucial to the success of organizations.
- Organizations must adopt proven business continuity and recovery management strategies, in addition to storage technologies, to successfully address operational risk, availability, and security challenges.
- One way to address these challenges is to plan and implement a resilient IT architecture.

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IT resilience

- The ability to rapidly adapt and respond to any internal or external disruption, demand, or threat and continue business operations without significant impact.
  - Continuous/near continuous application availability (CA)
  - Planned and unplanned outages
- Broader in scope than disaster recovery (DR)
  - DR concentrates solely on recovering from unplanned events
- **Bottom Line**
  - **Business continuance is no longer simply IT DR**

3/2/2015

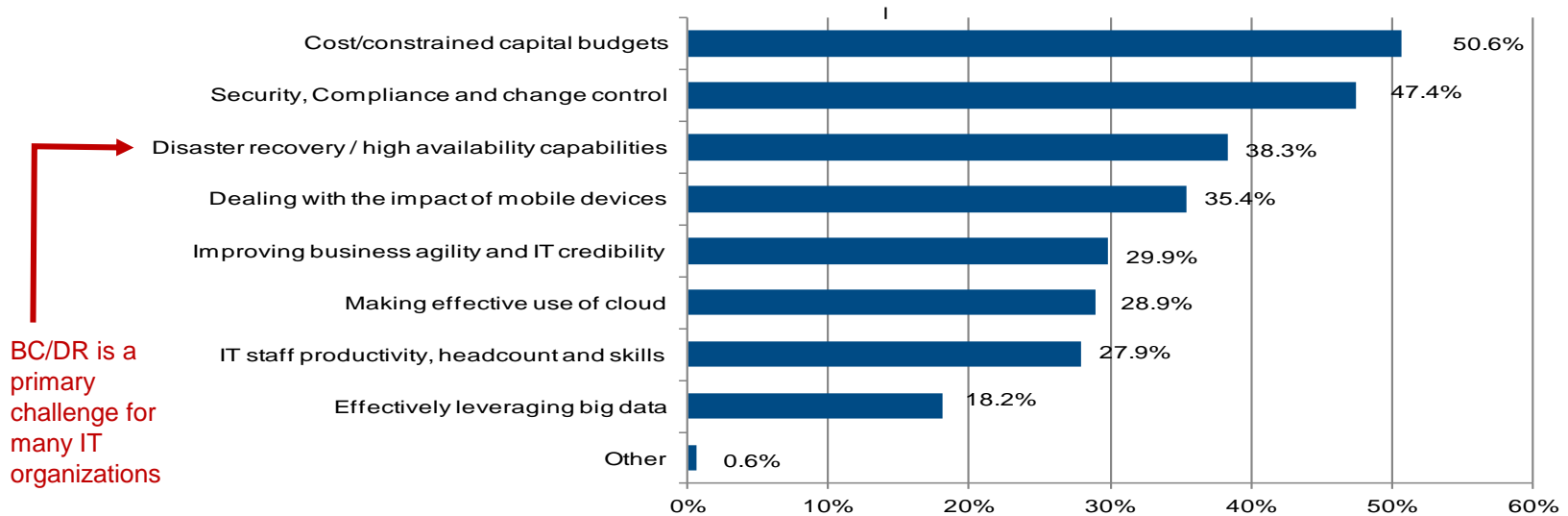# Enterprise trends in disaster recovery and business continuity (DR/BC)

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BC/DR Continues to be a Primary IT Challenge

What do you see as the primary challenges your IT organization faces in the next 12 to 18 months with regards to meeting your data center operational and architectural goals?

Challenge	Percentage
Cost/constrained capital budgets	50.6%
Security, Compliance and change control	47.4%
Disaster recovery / high availability capabilities	38.3%
Dealing with the impact of mobile devices	35.4%
Improving business agility and IT credibility	29.9%
Making effective use of cloud	28.9%
IT staff productivity, headcount and skills	27.9%
Effectively leveraging big data	18.2%
Other	0.6%

BC/DR is a primary challenge for many IT organizations

Source: IDC market analysis perspective, WW and US storage systems, storage software and storage solutions markets, 2013

Meeting SLAs on BC/DR is a Top Storage Challenge

Most Pressing Storage Challenges
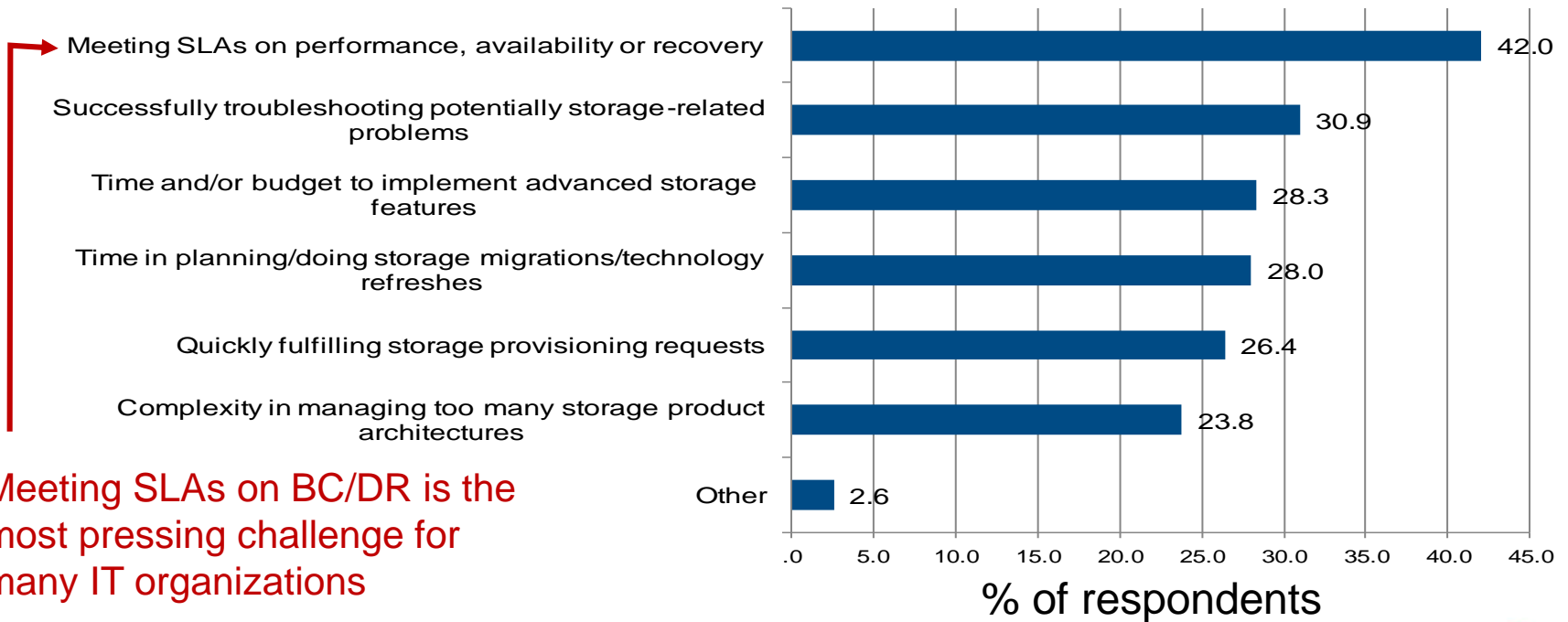
Meeting SLAs on BC/DR is the most pressing challenge for many IT organizations

Source: IDC market analysis perspective, WW and US storage systems, storage software and storage solutions markets, 2013

Recent Studies of BC/DR Networks

Aberdeen Group in-depth analysis of data center downtime

- In-depth analysis of factors surrounding data center downtime

- Data from survey used to identify and characterize top performers in reducing downtime
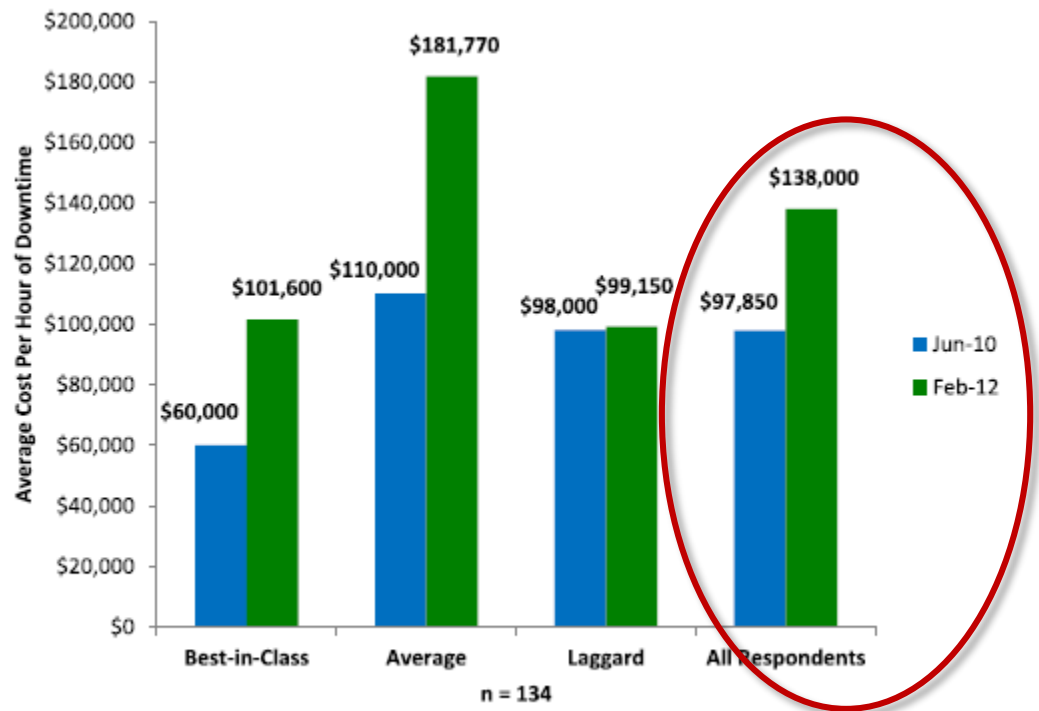
Definition of Maturity Class	Mean Class Performance
Best-in-Class: **Top 20%** of aggregate performance scorers	▪ Recorded fewer than1 business interruption over the last 12 months ▪ Averaged only 6 minutes of downtime per each event ▪ Took less than 1 hour to restore 90% of business operational functionality after the last interruption
Industry Average: **Middle 50%** of aggregate performance scorers	▪ Recorded 2.3 business interruptions over the last 12 months ▪ Averaged 1 hour of downtime per each event ▪ Took 2 hours to restore 90% of business operational functionality after the last interruption
Laggard: **Bottom 30%** of aggregate performance scorers	▪ Recorded 4.4 business interruptions over the last 12 months ▪ Averaged 9 hours of downtime per each event ▪ Took 11 hours to restore 90% of business operational functionality after the last interruption

Source: Aberdeen Group, February 2012

Recent Studies of BC/DR Networks

Aberdeen Group survey tracked cost per hour of downtime

- Average cost per hour of downtime between
  - June 2010 (blue)
  - February 2012 (green)
- Average cost per hour of downtime for all respondents increased by 38%

Source: Aberdeen Group, February 2012

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Recent Studies of BC/DR Networks

Aberdeen Group survey reported annual cost of downtime

- Best-in-class organizations increased their data center performance to the point where they *lose virtually nothing to data center downtime*

- Laggards total cost more than 10x total cost for Best-in-class

Yearly Cost Metrics	Best-in-Class	Industry Average	Laggards
Business interruption events	.3	2.3	4.4
Time per business interruption event (hours)	.1	1	9
Total disruption (hours)	.03	2.3	39.6
Average cost per hour of disruption	$101,600	$181,770	$99,150
Total cost of business interruption events	$3,048	$418,071	$3,926,340

Source: Aberdeen Group, February 2012

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Recent Studies of BC/DR Networks

Ponemon Institute Study, "Cost of Data Center Outages," 2013

- Benchmark research estimated costs of unplanned data center outages
  - Confirms Aberdeen Group study
- 91% of data centers had experienced an unplanned data center outage in the past 24 months
- Cost of a data center outage has increased since 2010.
  - Cost of data center outages now between $45 and $95 per square foot
  - $74,223 to a maximum of $1,734,433 per organization
  - Overall average cost is $627,418 per incident

Recent Studies of BC/DR Networks

Ponemon Institute Study key findings from 67 data centers nationwide

- Total cost of partial and complete outages can be a significant expense for organizations
- Total cost of outages is systematically related to
  - The duration of the outage
  - The size of the data center
- Certain causes of the outage are more expensive than others
  - Specifically, IT equipment failure is the most expensive root cause

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Recent Studies of BC/DR Replication Networks

Configuration and management complexity have a major impact

- The IT Process Institute "Visible Ops Handbook"
  - 80% of unplanned outages due to configuration change and management errors made by staff/administrators

- Gartner
  - "Through 2015, 80% of outages impacting mission-critical services will be caused by people and process issues"
  - More than 50% of those outages will be caused by change configuration, integration & management issues.

- Enterprise Management Association (EMA)
  - "60% of availability and performance errors are the result of misconfigurations and management issues."

End to End Connectivity Architecture

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New Directions for BC/DR Networks

Z Systems environments are often sub-optimal

- Span multiple, geographically dispersed data centers
  - Different groups and stakeholders have implemented different strategies and components and seldom meet to discuss
- Functional groups are silo'd and the network is not engineered as a complete, E2E solution
  - No overall responsibility for BC/DR network planning, deployment & monitoring
- Resulting in a sub-optimal architecture with
  - Lower performance & higher costs
  - Changes and updates difficult & complex
  - Less flexibility, resilience, and availability

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New Directions for BC/DR Networks

Build E2E connectivity architecture teams in System z environments

- Establish a true, coordinated E2E extended distance architecture
  - Managed by a team responsible for E2E connectivity
- Identify a single point of control and ownership
  - With representation from all departments involved working together
- Less fractured infrastructure that is simpler to manage
- Today: Data center SAN teams go to LAN team for add'l network bandwidth for BC/DR solution
- *Next generation: SAN team becomes focus for IP connectivity to architect integrated BC/DR network solution*

Why Mainframe Professionals Should Worry About IP

Control everything you can in order to extend data center stability to IP

- Management requires that you provide the most robust, highly available and performance-predictable environment possible

- Increasingly you must provide the same robust, five-9s of availability, predictability, and scalability across and between data centers
  - But LAN/WAN and FCIP technologies have historically not been highly available or predictable

- Solution is to take charge of all of the components, including the IP network

Integrated Synergistic Replication Networks

What Is an Integrated BC/DR Network?

The optimal network architecture to support enterprise BC/DR goals

- Mandates *integrated E2E* planning, deployment, and monitoring

- Develops a *resilient IT architecture* for robust BC/DR

- Implements *simplified management* using a "single pane of glass" approach
  - FICON/SAN, FCIP, and IP connectivity managed by a common management software tool
  - Brocade Network Advisor (BNA)

What Is an Integrated BC/DR Network?

Builds IT resilience into network architecture

- The ability to rapidly adapt and respond to any internal or external disruption, demand, or threat and continue business operations without significant impact, resulting in
  - Continuous/near continuous application availability (CA)
  - During both planned and unplanned outages

What Is an Integrated BC/DR Network?

Simplified management for SAN, IP, and converged networks

- Unified management for SAN, IP, application delivery, and converged networks
  - One management GUI across FC, FICON, FCIP, IP protocols
  - Custom views based on operator specialization
  - Flexible user management with Role-Based Access Control (RBAC)
- Seamless integration with IBM orchestration frameworks
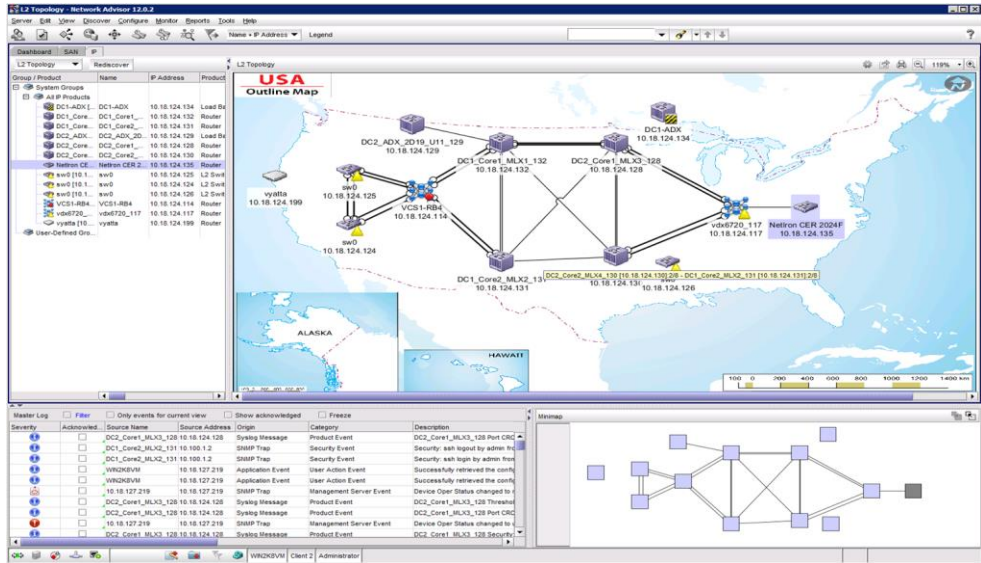
Challenges of Designing a Resilient IT Architecture

Multi-sourcing/multi-vendors often cannot provide a synergistic environment

Competing Goals	Management Overhead	Operational Efficiency
• Achieving up-time requirements, reducing costs, and ensuring efficiencies • While still architecting for growth and scalability	• Cannot meet all of your strategic goals • While monitoring, managing, and troubleshooting a disparate collection of vendors, hardware, and services	• Difficult in a multi-vendor environment • Change management • Incident management • Performance reporting and reviews

Requirements for BC/DR Solutions for System z

Mandatory for regulatory compliance, and even company survival

- Eliminate single points of failure to increase system resiliency and maximize data availability
- Incorporate failover software to prevent or better tolerate system outages
- Streamline data backup & recovery processes to reduce time to recovery
- Enable high-performance remote backup, electronic vaulting, and mirroring at data centers separated by great distances
- Comply with corporate regulatory compliance requirements
- **Provide encryption for data in flight and/or at rest**

WAN Network Example

IP Networking group told mainframers that multiple paths connected the two building sites and showed them a diagram like this.
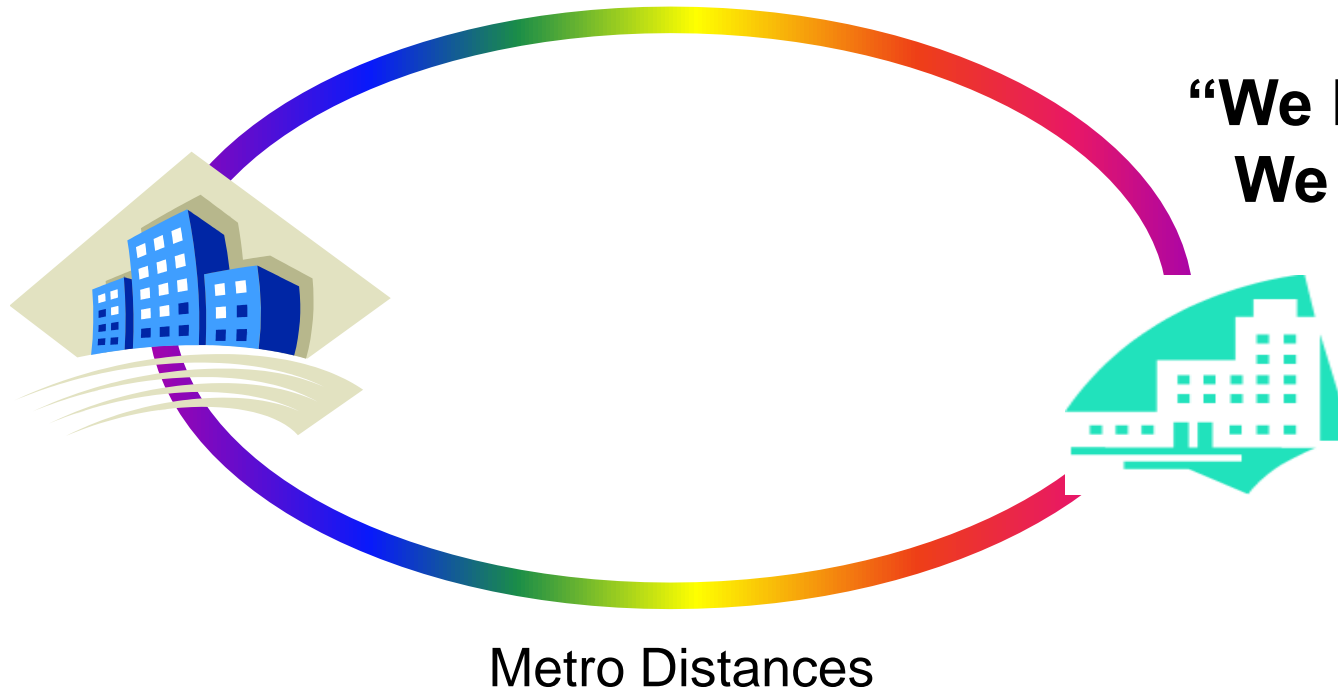
"We have you covered! We have your back"

This mainframe group believed them since they had never worried about WAN connectivity before anyway.

Metro Distances

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WAN Network Example

In reality, the two WAN trunks ran along a railroad right-of-way, one trunk on each side of the tracks. No more than 12 feet separating the trunks.

As luck would have it, and **always** seems to happen, the railroad was working on the tracks and cut both trunks and severed site-to-site communications!
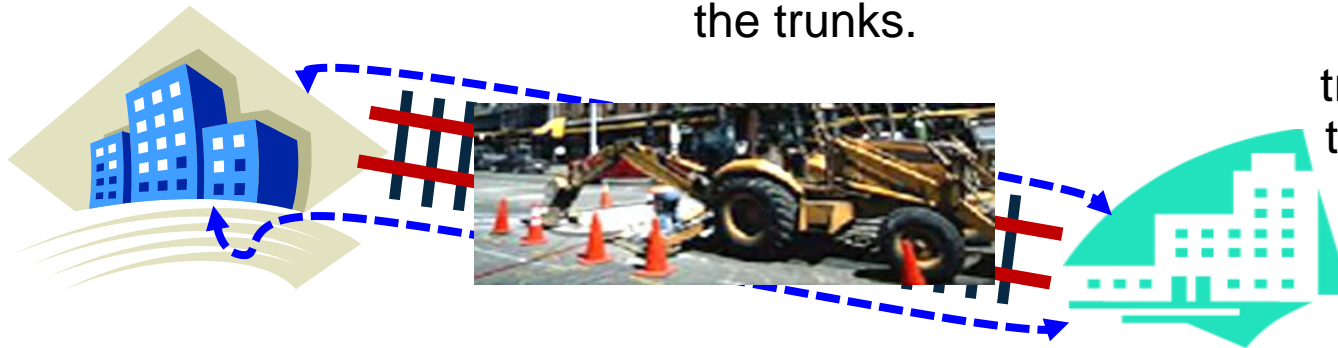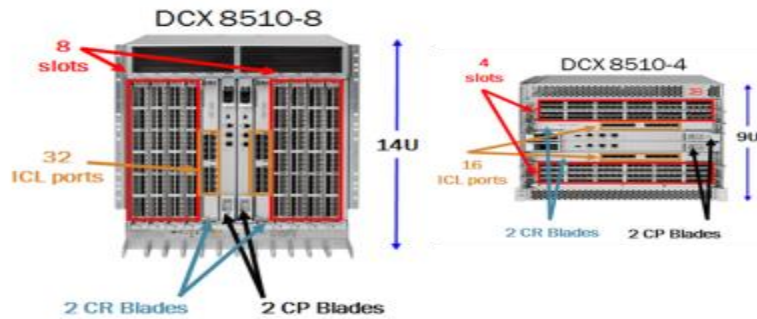
So The Moral Of This Story is:

If you are not in charge of your links NOBODY IS!

Hardware Components

Resilient, synergistic networks

DCX 8510 Gen5 FICON/FCP Directors

MLX Series High-Performance, Multiservice Routers

Ultra High Performance, Superior RAS

FX8-24 Extension Blade
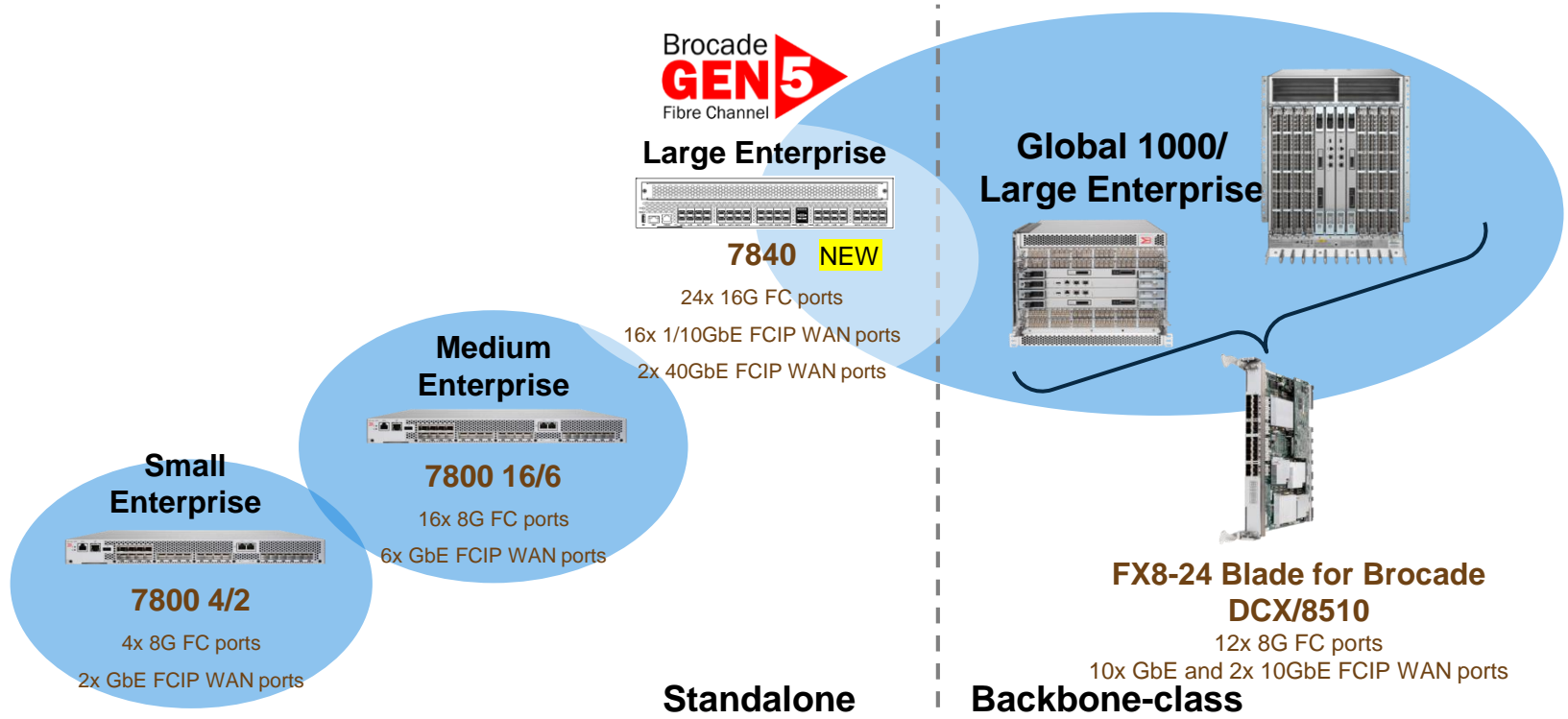

7840 Extension Switch

7800 Extension Switch

VDX 6740 Extension Switch

Brocade Distance Extension Product Line

Extensible platforms that help move more data faster and farther than ever

Solution Price Range (Hardware and Software)

Brocade GEN5 Fibre Channel

Large Enterprise

7840 NEW

24x 16G FC ports
16x 1/10GbE FCIP WAN ports
2x 40GbE FCIP WAN ports

Global 1000/ Large Enterprise

Medium Enterprise

7800 16/6

16x 8G FC ports
6x GbE FCIP WAN ports

Small Enterprise

7800 4/2

4x 8G FC ports
2x GbE FCIP WAN ports

FX8-24 Blade for Brocade DCX/8510

12x 8G FC ports
10x GbE and 2x 10GbE FCIP WAN ports

Standalone

Backbone-class

Product Flexibility, Scalability, and Performance Requirements

Brocade MLXe Core Routers

## *Multiservice IP/MPLS SDN routers*

- Visibility capabilities non-disruptively and transparently tap into a production network with no loss in performance.

- Filters and extracts relevant network traffic based on rules configured statically or dynamically

- Industry-leading port density, low latency, high throughput, and scalability

- Increased analytics into network data and traffic

  – Processes captured data to evaluate network and
    application conditions, and generate actionable metrics and reports used for network planning

MLX Traffic Monitoring

- sFlow-based traffic analysis reduces network downtime
  - Configurable sampling
  - Actions such as enable/disable ports
  - Traffic In/Out Accounting
  - Filtering based on products, ports, L2-L4 protocol parameters, etc.

- ASIC-based sFlow support for fast, low network impact monitoring
  - Reduces cost and complexity of provisioning probes in the network

- Ability to generate multiple user-defined customized reports for granular network traffic analysis

- Shipping with pre-defined reports

- Scheduled execution and emailing
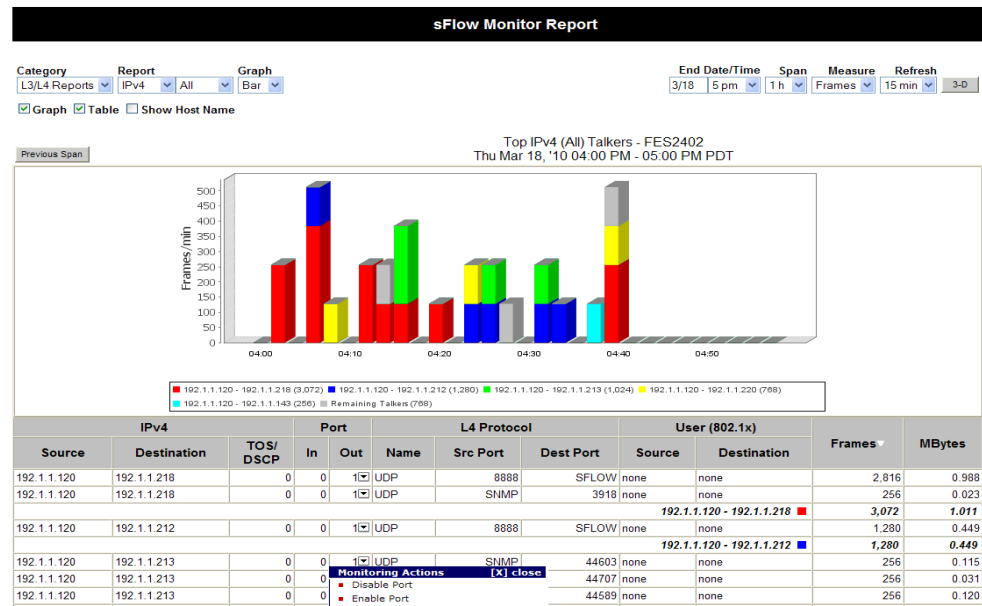
Brocade Network Advisor (BNA)

Supports Brocade IP and SAN for unified network visibility & control

- Fewer management software tools and associated servers
  - Simplify troubleshooting and problem resolution
  - No need to cross-reference other management tools
- Mainframe/storage teams have control over their data AND their data's E2E network.
  - More and better insight into E2E performance
- With BNA 12.x dashboard-based management, with customization for your environment

Monitor and Alert

Troubleshoot and Diagnose

Brocade Network Advisor

Configure and Provision

Analyze and Report
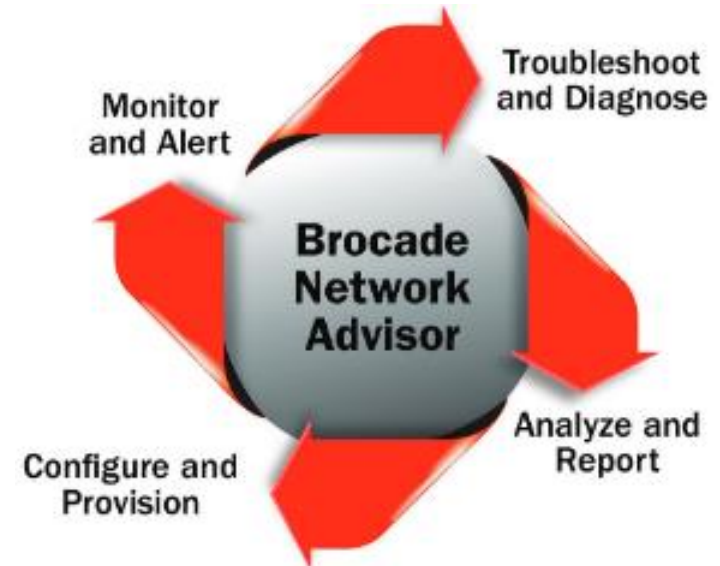
Brocade Fabric Vision Technologies

Gen 5 Fibre Channel enhanced management features for optimized SANs

- Unprecedented insight and visibility across the storage network with powerful built-in monitoring, management, and diagnostic tools to
  - Simplify monitoring, increase availability & dramatically reduce costs
- Integrated into *Brocade Network Advisor* (BNA)
  - Instant visibility into hot spots at a switch level for rapid corrective actions
- *Monitoring and Alerting Policy Suite (MAPS)*
  - New, easy-to-use solution for policy-based threshold monitoring and alerting
  - Admins can use pre-built common rules/policies or customize
- *Flow Vision* enables admins to identify, monitor, and analyze specific application data flows

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Brocade Fabric Vision Technologies

*Monitoring and Alerting Policy Suite (MAPS)*

- Ensures application uptime and availability
- Policy-based monitoring including
  - Pre-defined monitoring groups and pre-validated monitoring policies
  - Create custom monitoring groups and monitor each group according to its own unique rules
  - Monitor both sudden failures & gradually deteriorating conditions in the switch
- Proactive flow monitoring
- Advanced monitoring capabilities and intuitive MAPS dashboard

Brocade Fabric Vision Technologies

Flow Vision

- Admins can identify, monitor, and analyze specific application data flows
  - To maximize performance, avoid congestion, and optimize resources
  - Allows fabrics, switches, and ports to be managed as groups
- *Flow Monitor*
  - Monitors all flows from a specific host to multiple targets/LUNs, from multiple hosts to a specific target/LUN, or across a specific ISL
- *Flow Generator*
  - Built-in traffic generator for pre-testing and validating data center infrastructure
  - Includes route verification and integrity of optics, cables, ports, back-end connections, and ISLs

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7840 Fabric Vision Use Case Example

7840   IP WAN   7840

Initiator   Target
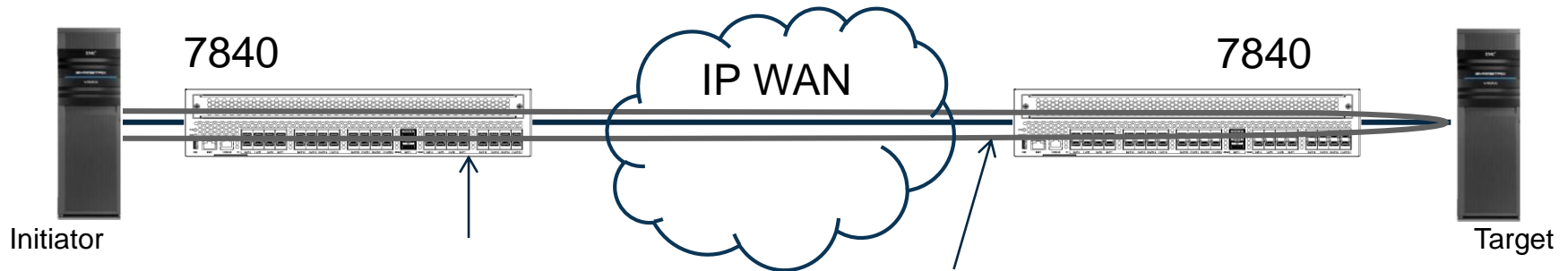
- Brocade Fabric Vision reports real time I/O response time, jitter, IOPS and data rate per SID, DID and LUN combination.
- Brocade Fabric Vision alerts when WAN rate, WAN latency or other WAN conditions (retransmits, duplicate acks, etc.) exceeds threshold.
- User can compare IO response time with WAN latency and other WAN condition alerts to see which of WAN and target is causing the abnormal delay.

- Replication I/O's are experiencing long response time, jeopardizing RPO but the customer does not know whether it is caused by WAN congestion or by slow responding target
- Using Brocade Fabric Vision, the customer can pinpoint WAN or target to troubleshoot slow response time
- Fabric Vision per flow real time statistics reporting allows monitoring to ensure RPO and usage reporting for individual replication and backup operations

Embedded IPsec for Brocade MLXe

Industry's first wire-speed, embedded IPsec encryption module

- For secure multi-site or inter-data center connectivity

- 256-bit IP-layer encryption with Suite B
  - Strongest Suite B Algorithm Suite 2 Encryption support in hardware

- For transporting data over a third-party WAN
  with 17x performance of today's solutions

- 4 x 10 GbE plus 4 x 1 GbE card with IPsec

- Cost-effective offload of IPsec from security appliances
  - Total throughput of 44 Gbps
  - Industry's first terabit IPsec router: grow as necessary up to Tbps per MLXe-32

Use Cases of Integrated Replication Networks

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Who is implementing?

Some of the largest mainframe environments in the world

- Largest US/4th largest insurance company in the world.
- Largest national govt. mainframe environment in the world
- 4th largest bank in the world
- 10th largest bank in the world
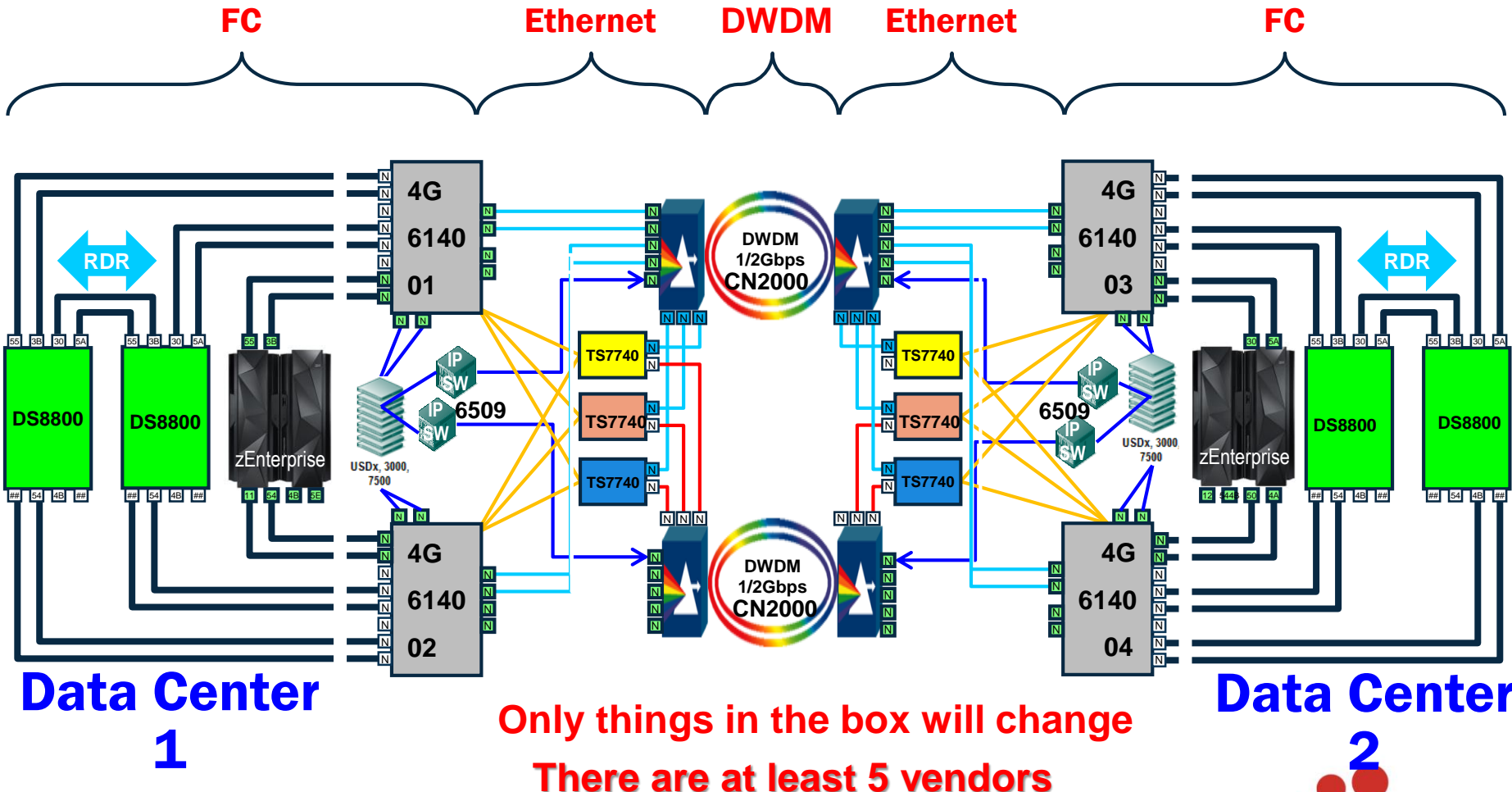- 16th largest bank in the world
- 34th largest bank in the world

- **Best in class organizations focused on minimizing unplanned outages**

Example Use Case
"Patient zero" IT Environment "The Before"

- Previous IT environment
  - Ciena CN 2000 for WAN
  - Cascaded McDATA 6140s for FICON - XRC
  - CNT Edge 3000s, USDX, and Brocade 7500 for Tape Duplexing Environment
  - Cisco 6509 used for IBM 7700 Tape Grid
  - Several Managements Platforms to manage these elements

- Compelling event
  - Lease expirations: FICON Directors, older FCIP hardware
  - DASD and System z upgrades

- Business / Technology drivers
  - Increased Performance
  - Consolidated solution went from 3 vendors to 1
  - Simplified Management from 5 separate tools to 1

Multi-Sourced: HSM, XRC and Virtual Tape, etc.

FC   **Ethernet**   **DWDM**   **Ethernet**   **FC**

Data Center 1

Data Center 2

Only things in the box will change

There are at least 5 vendors

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Integrated network: HSM, XRC and Virtual Tape, etc.
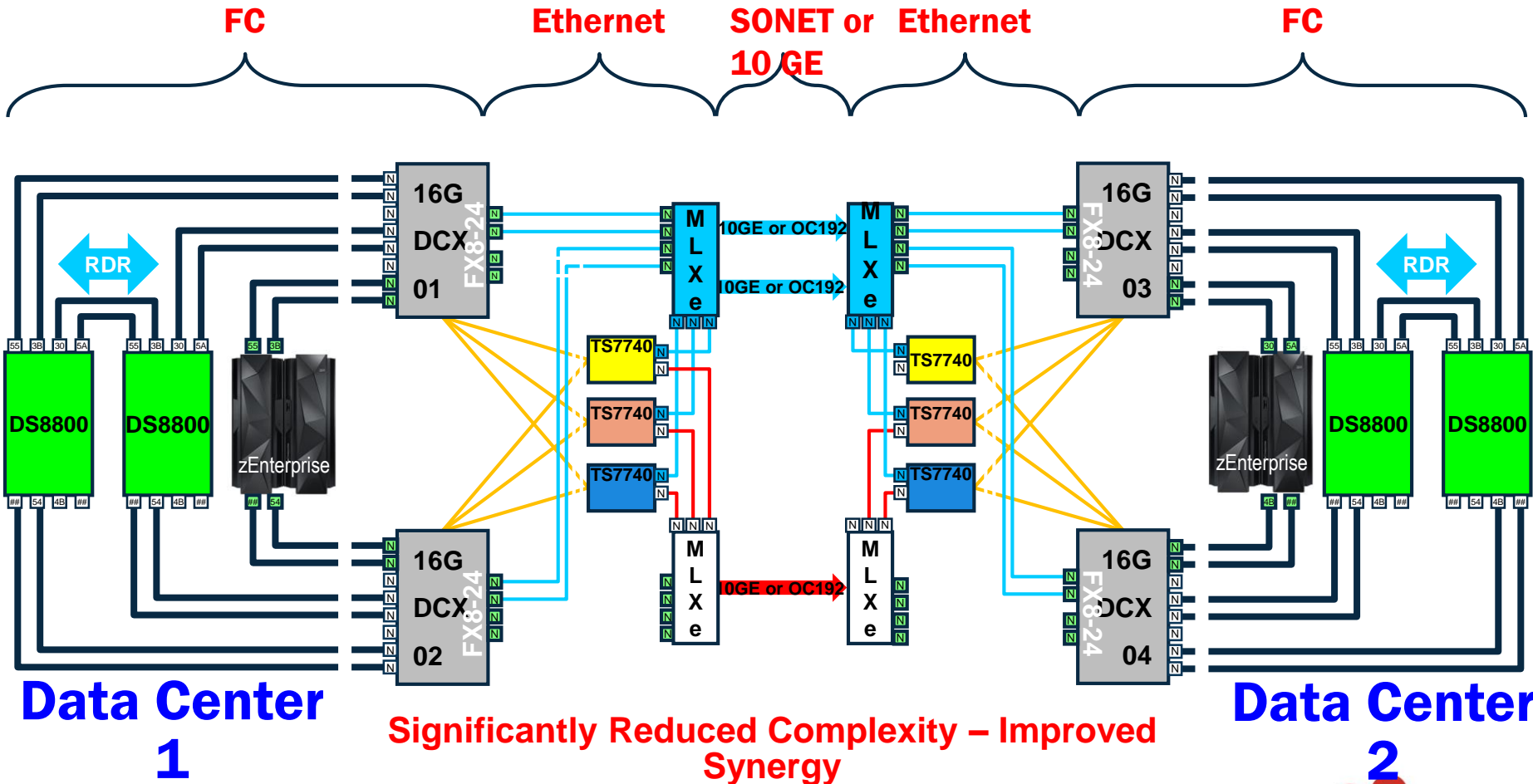
Significantly Reduced Complexity – Improved Synergy
All managed with Brocade Network Advisor

Brocade Resilient IRN Architecture

For E2E, integrated, synergistic BC/DR network
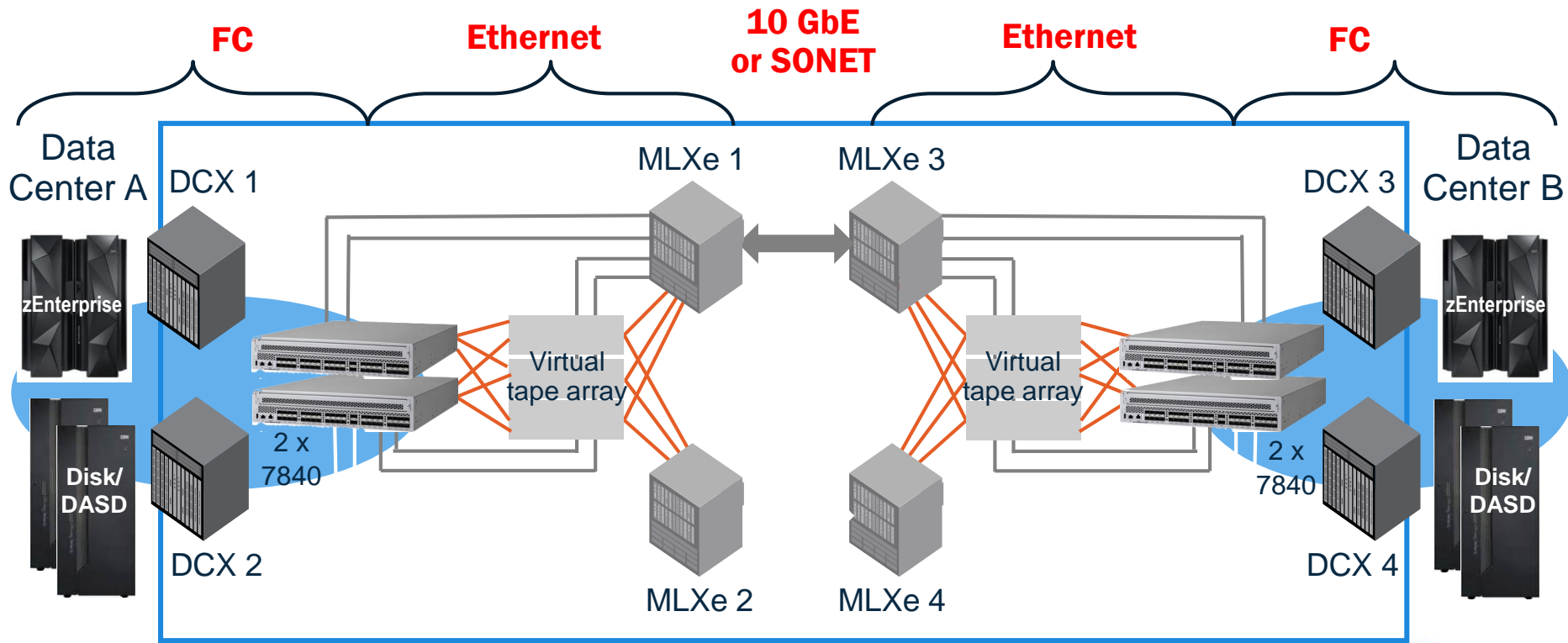
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Large US financial customer implementation
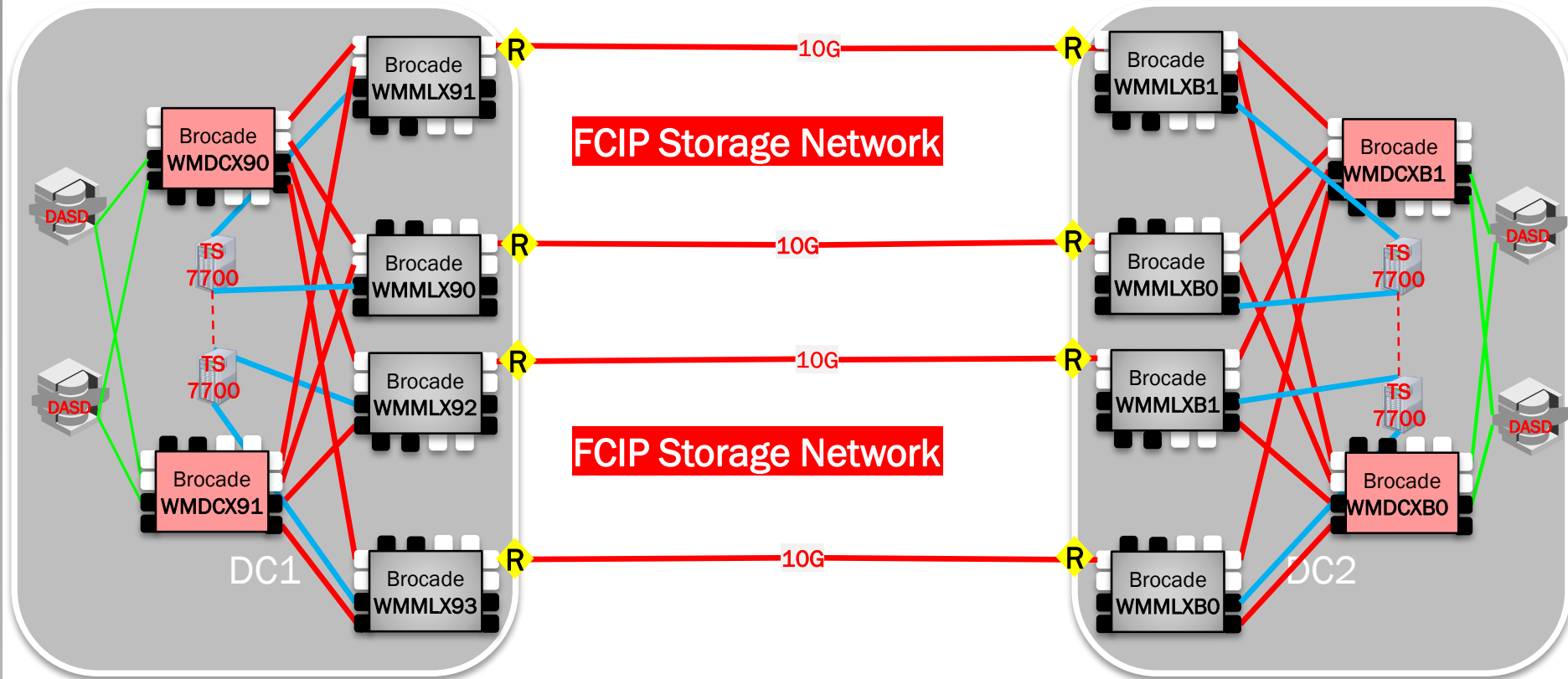
BC/DR network architectures must evolve to be <u>integrated</u> end to end, <u>synergistic</u>, and <u>simpler to manage</u>

Next-generation data centers have already begun the evolution to be integrated end to end, synergistic, and simpler to manage

Additional reading/reference material

- IBM Redbook: System z End-to-End Extended Distance Guide

- Brocade Bookshelf: Brocade Mainframe Connectivity Solutions

- IBM Redpaper: TS7700 and Brocade Integrated Grid Network.

- Enterprise Executive August 2014 article.

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