IBM Connected 2013

Her Deneyim Bir Kazanım

DRC with IBM N-Series

ATACOM

Tamer YALNIZ

**Kurumsal Çözümler Proje Yöneticisi**

Agenda

- Atacom

- Sabiha Gokcen International Airport; challenge

- Sabiha Gokcen International Airport; solution

- IBM N-Series integrated data protection

- IBM N-Series MetroCluster™ overview

- MetroCluster failure scenarios

IBM Business Premier Partner Atacom of Turkey, formed in 1994, possessed the technical expertise and track record to implement a comprehensive solution that was capable of meeting all of customers requirements.

Atacom specializes in complex enterprise integrations, including integration of virtualized and distributed environments. Atacom already had achieved successful results in large, hub-and-spoke project implementations. Working in concert with IBM for the last 14 years, Atacom also provides pre-sales and post-sales engineering services that would ensure a smooth customer project implementations.
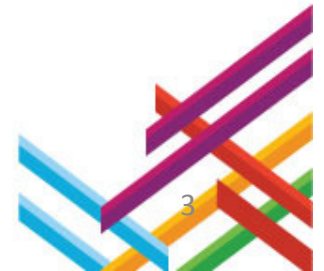
Sabiha Gokcen International Airport

- Headquartered in Istanbul, TURKEY
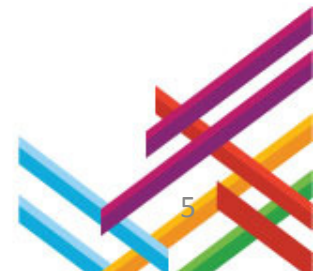- International Airport
- 4.000.000 travelers yearly

- Challenge

  - IT was struggling to keep pace with the company's exponential growth

  - Performance bottlenecks were becoming a critical issue

  - 24x7 operations prevented scheduled downtime

  - Continuous data availability was essential to customer satisfaction
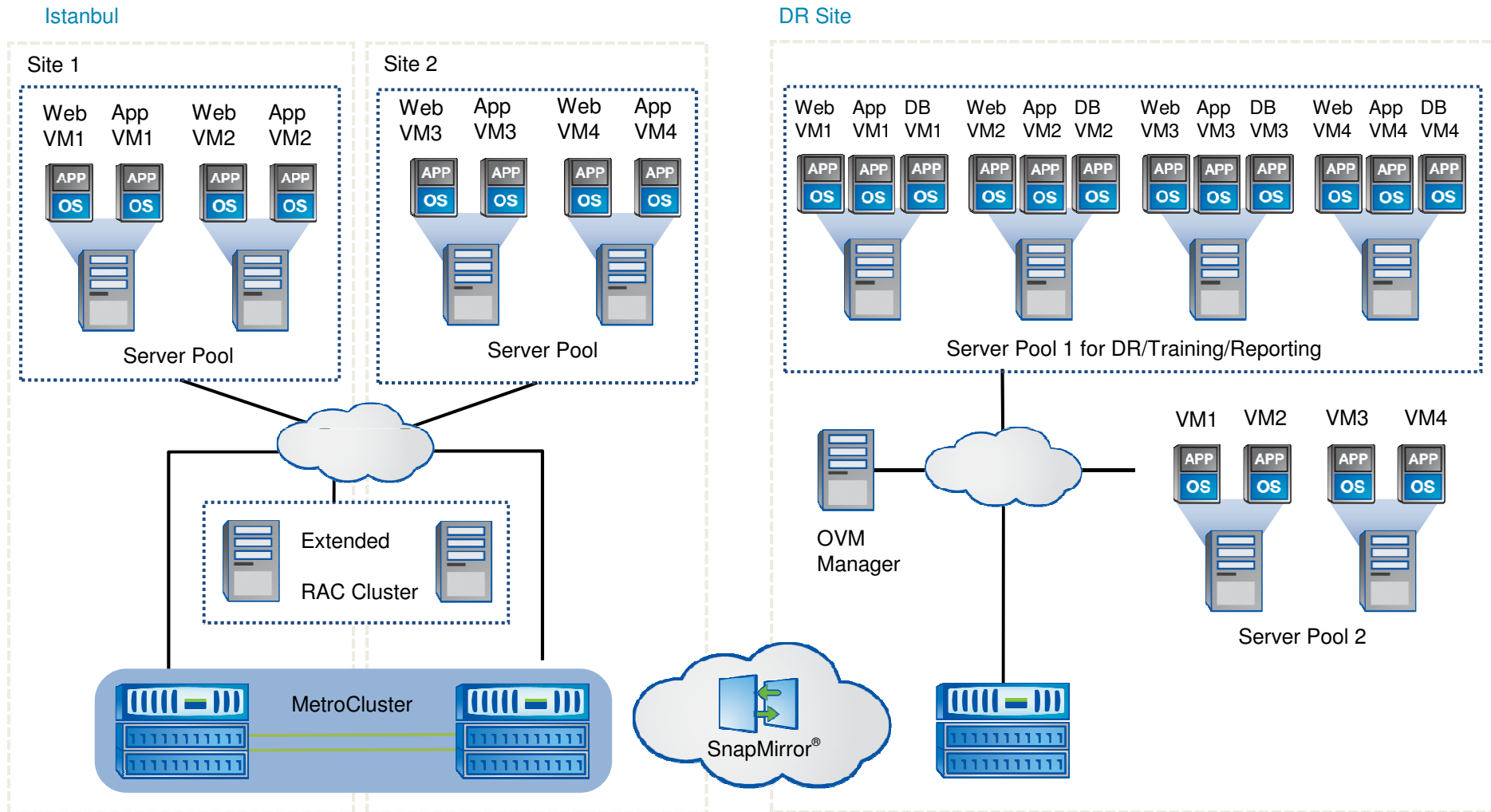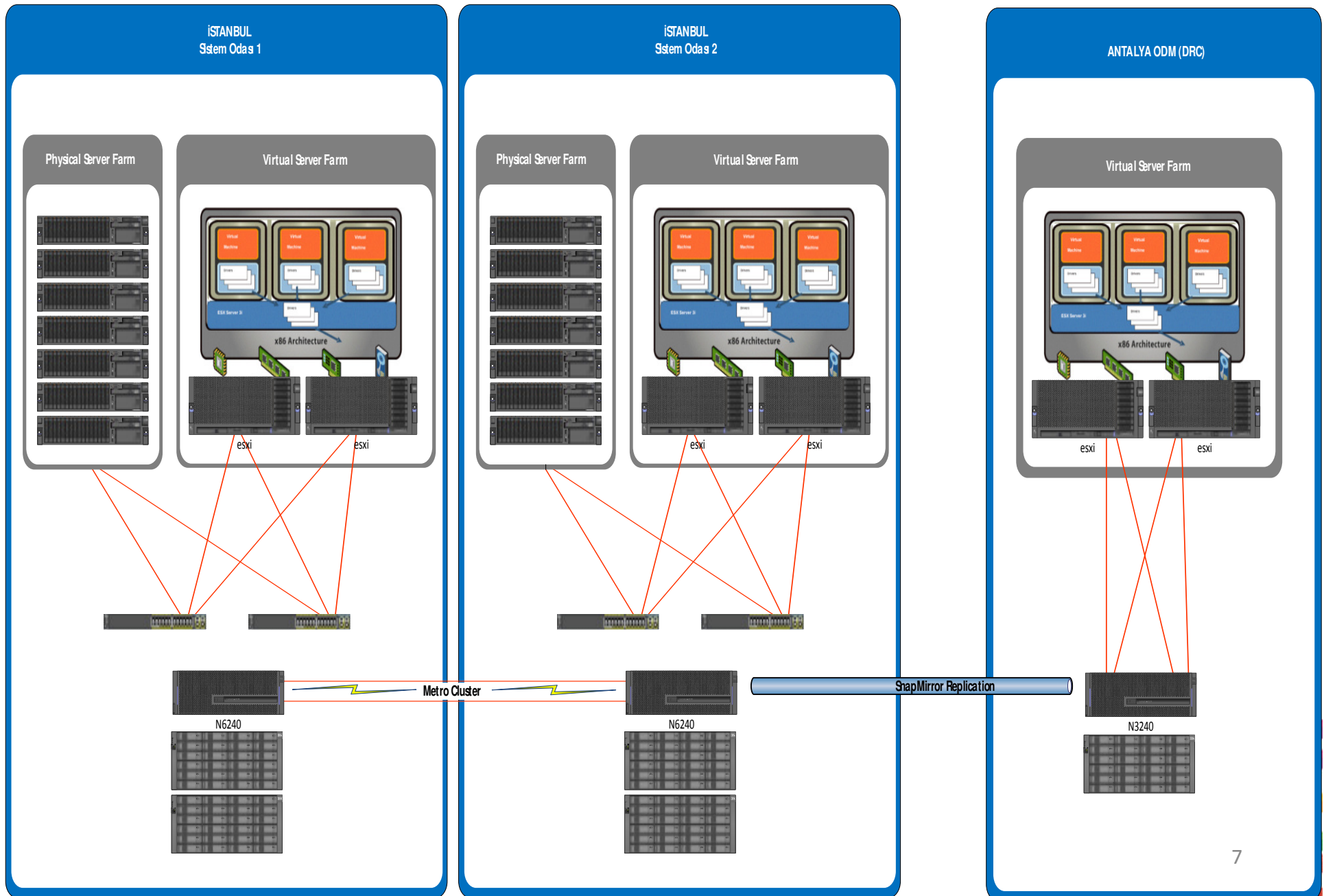
  - DRC replication

Choosing the partner

- Provide hole solution on single address
- Proved know how
- Presales engineering services
- Provide high quality post sales engineering
- References about similar projects

Istanbul

DR Site

Site 1

Web VM1	App VM1	Web VM2	App VM2
APP OS	APP OS	APP OS	APP OS

Server Pool

Site 2

Web VM3	App VM3	Web VM4	App VM4
APP OS	APP OS	APP OS	APP OS

Server Pool

Web VM1	App VM1	DB VM1	Web VM2	App VM2	DB VM2	Web VM3	App VM3	DB VM3	Web VM4	App VM4	DB VM4
APP OS	APP OS	APP OS	APP OS	APP OS	APP OS	APP OS	APP OS	APP OS	APP OS	APP OS	APP OS

Server Pool 1 for DR/Training/Reporting

Extended

RAC Cluster

OVM Manager

VM1	VM2	VM3	VM4
APP OS	APP OS	APP OS	APP OS

Server Pool 2

MetroCluster

SnapMirror®

İSTANBUL
Sistem Odası 1

İSTANBUL
Sistem Odası 2

ANTALYA ODM (DRC)

Physical Server Farm

Virtual Server Farm

Physical Server Farm

Virtual Server Farm

Virtual Server Farm

esxi   esxi

esxi   esxi

esxi   esxi

N6240

Metro Cluster

N6240

ShapMirror Replication

N3240

7

Acquisitions

- Non-distruptive migration to N-Series SAN

- Scalable SAN with ThinProvisioning

- SnapShot for point in time backup and recovery

- More then %50 space saving with Deduplication on some data spaces

- DRC on campus and replication beetwen Istanbul and Antalya

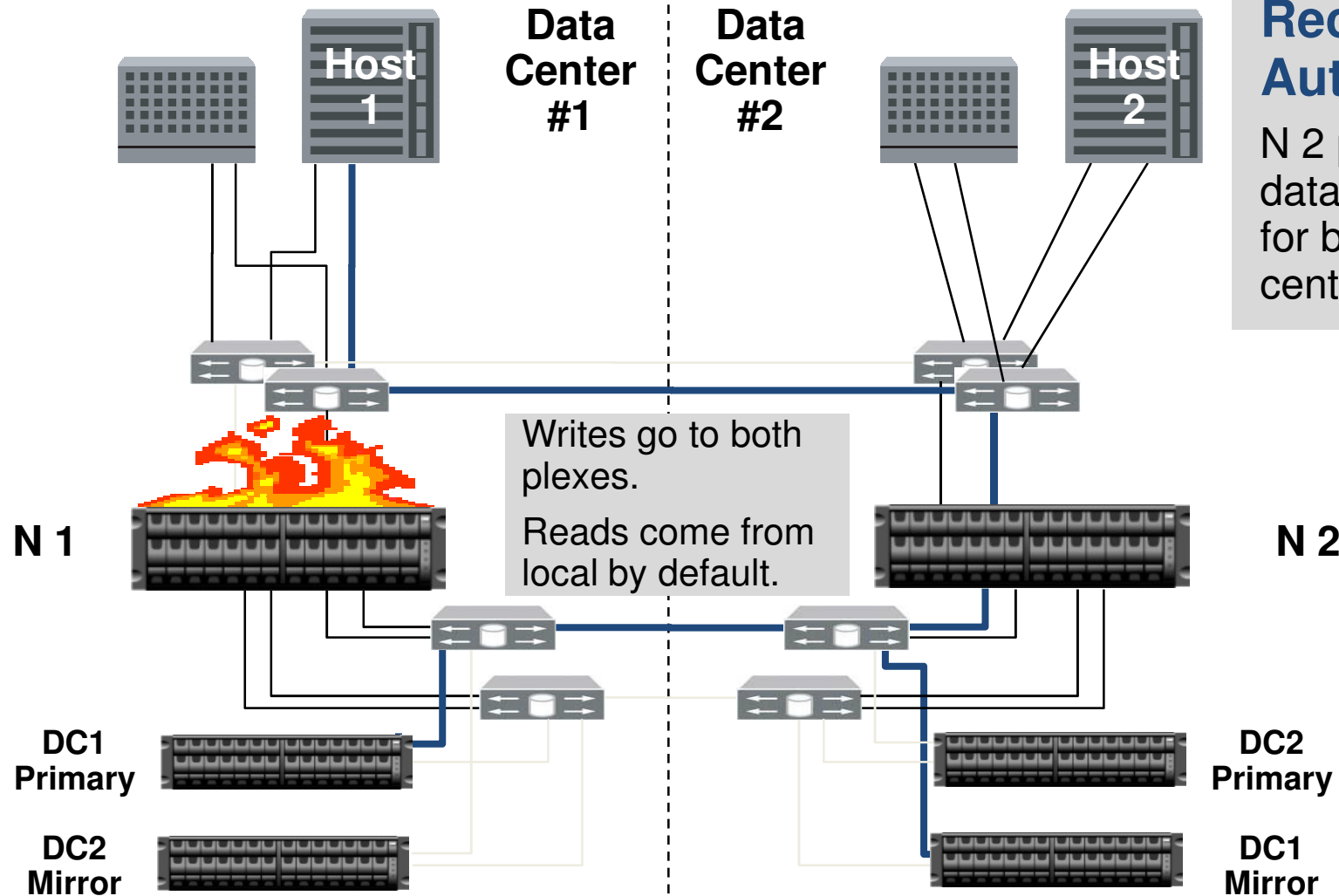- Bandwitdh efficient replication with Deduplication and Compression

Acquisitions

- Disaster recovery solution for VMs

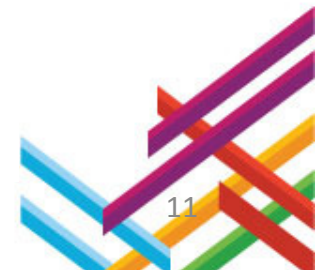- On time project implementation

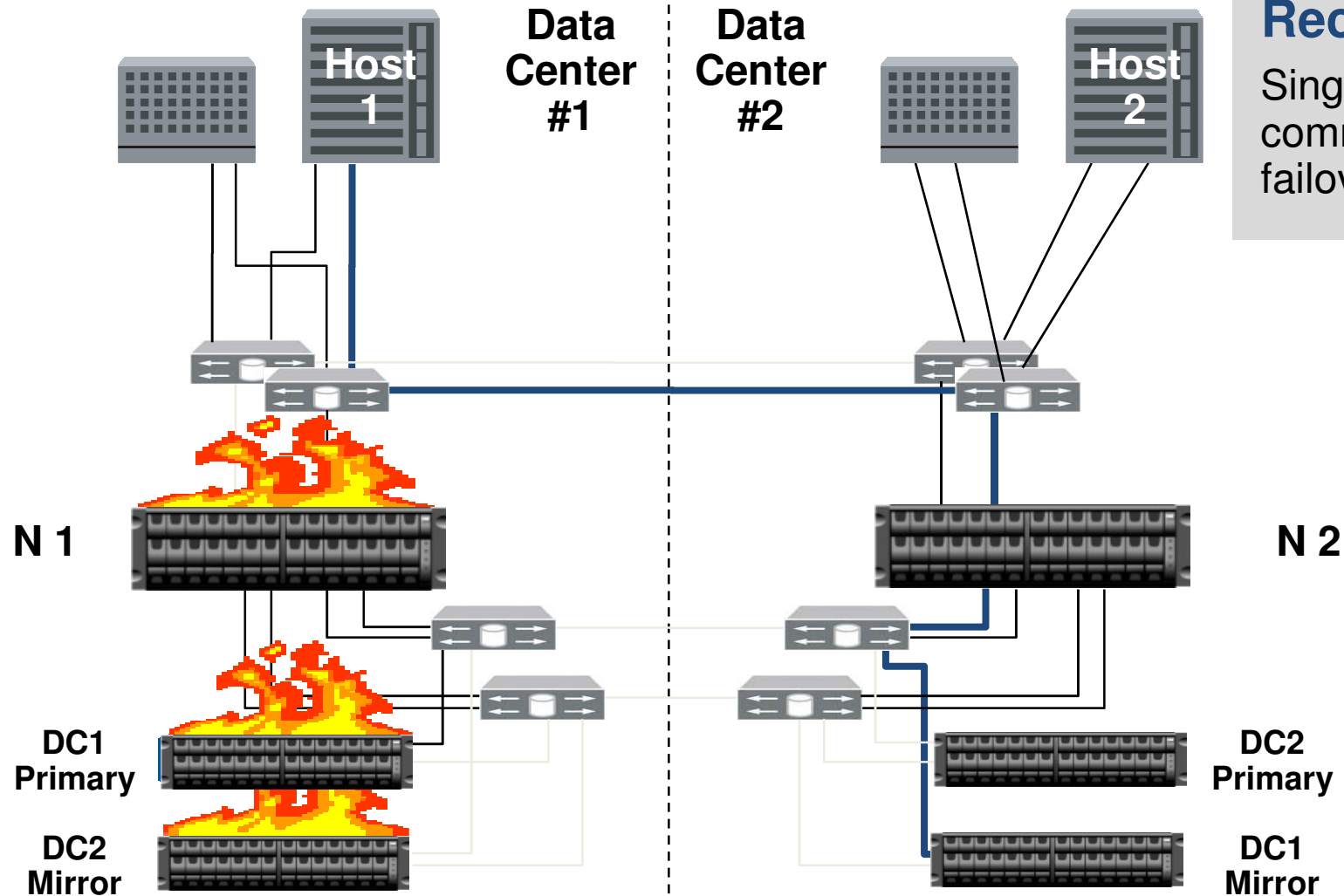- Succesful DR tests

Failure Scenarios Applied to Customer

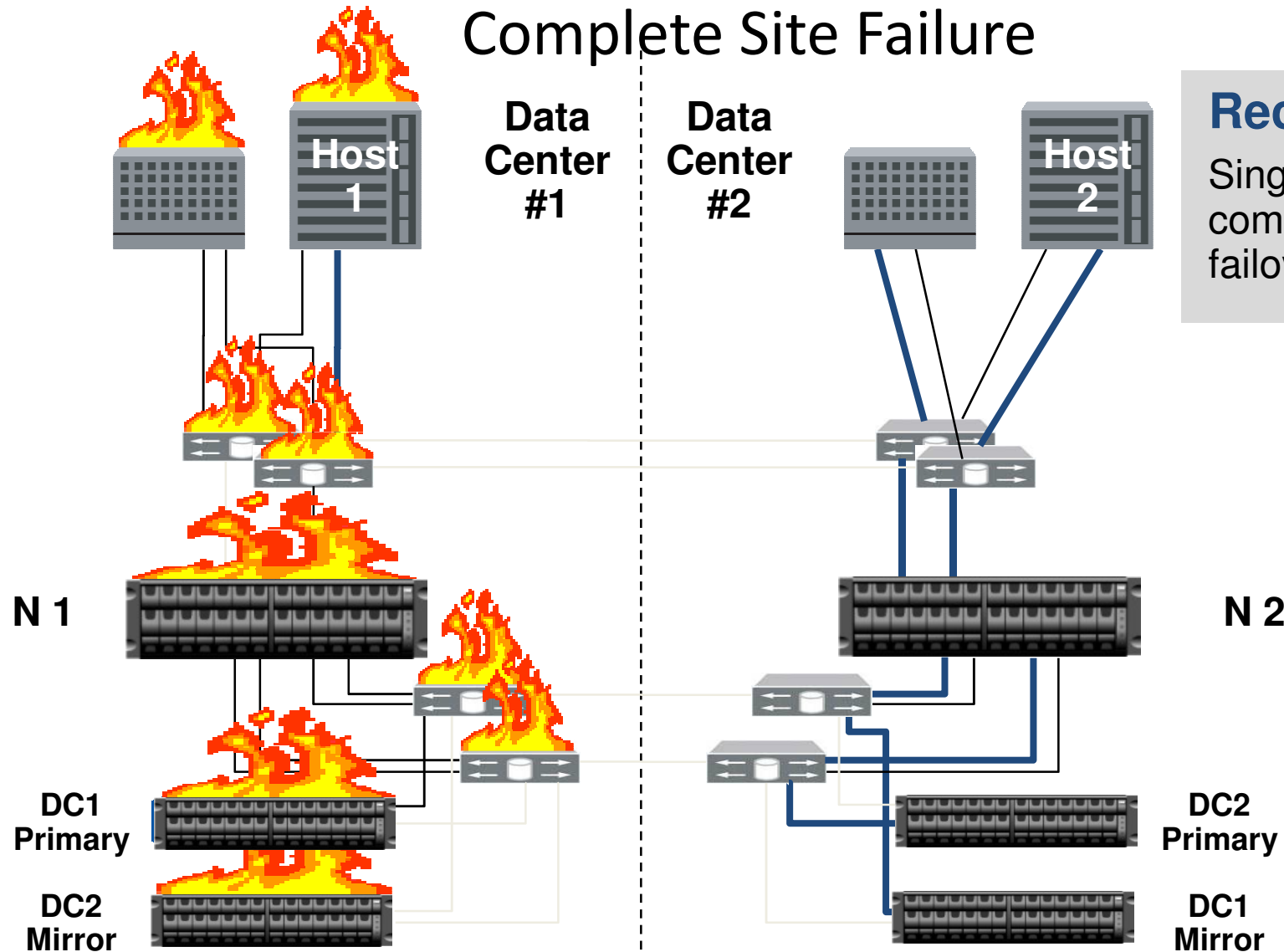# MetroCluster Failure Scenarios:
Storage Controller Failure

Data Center #1   **Data Center #2**

Host 1   Host 2

Recovery – Automatic

N 2 provides data services for both data centers.

N 1

Writes go to both plexes.

Reads come from local by default.

N 2

DC1 Primary

DC2 Mirror

DC2 Primary

DC1 Mirror

MetroCluster Failure Scenarios: Storage Array Failure

Data Center #1

Data Center #2

Host 1

Host 2

N 1

N 2

DC1 Primary

DC2 Mirror

DC2 Primary

DC1 Mirror

Recovery

Single-command failover

MetroCluster Failure Scenarios:
Complete Site Failure

Data Center #1

Data Center #2

Host 1

Host 2

Recovery

Single-command failover

N 1

N 2

DC1 Primary

DC2 Mirror

DC2 Primary

DC1 Mirror

MetroCluster Failure Scenarios:
Interconnect Failure

Data Center #1

Data Center #2

Host 1

Host 2

N 1

N 2

DC1 Primary

DC2 Primary

DC2 Mirror

DC1 Mirror
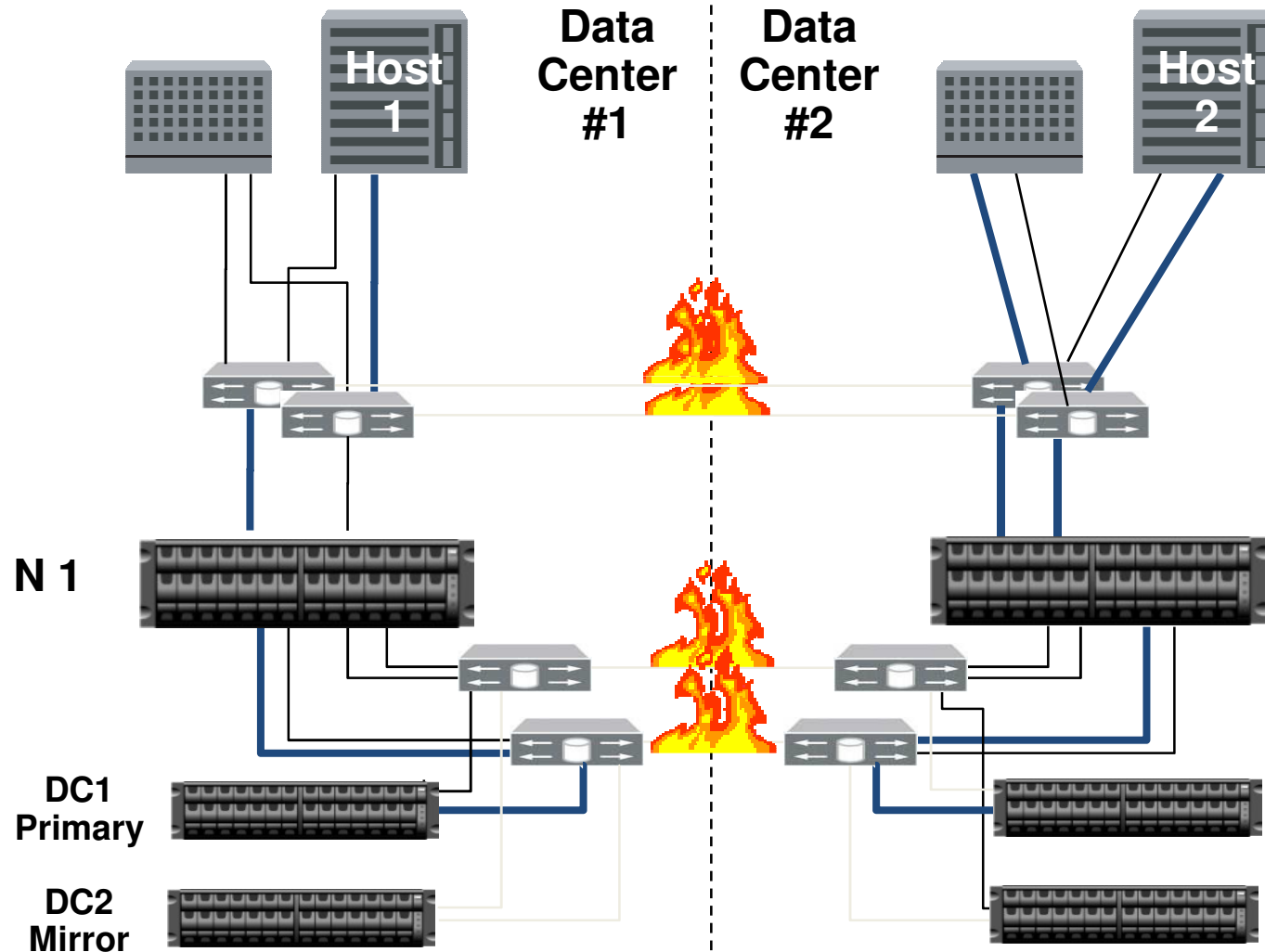
Recovery

- No failover; mirroring disabled

- Both controllers continue to run, serving their LUNs/volumes

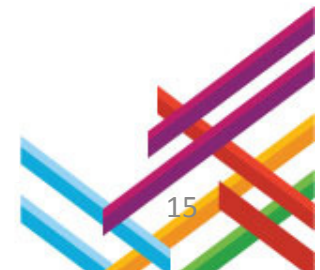- Resyncing happens automatically after interconnect is reestablished
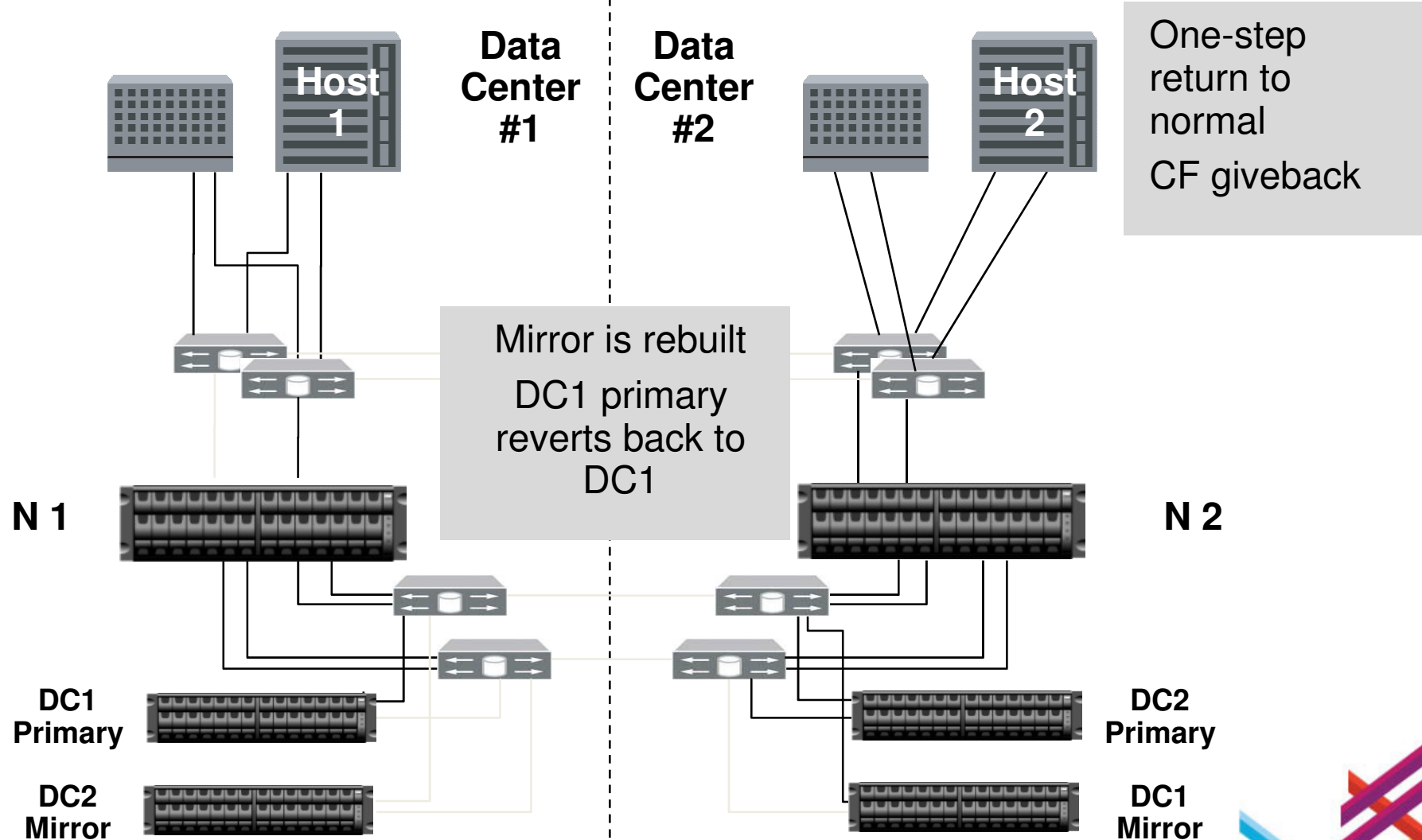
MetroCluster Failure Scenarios: Rolling Disasters
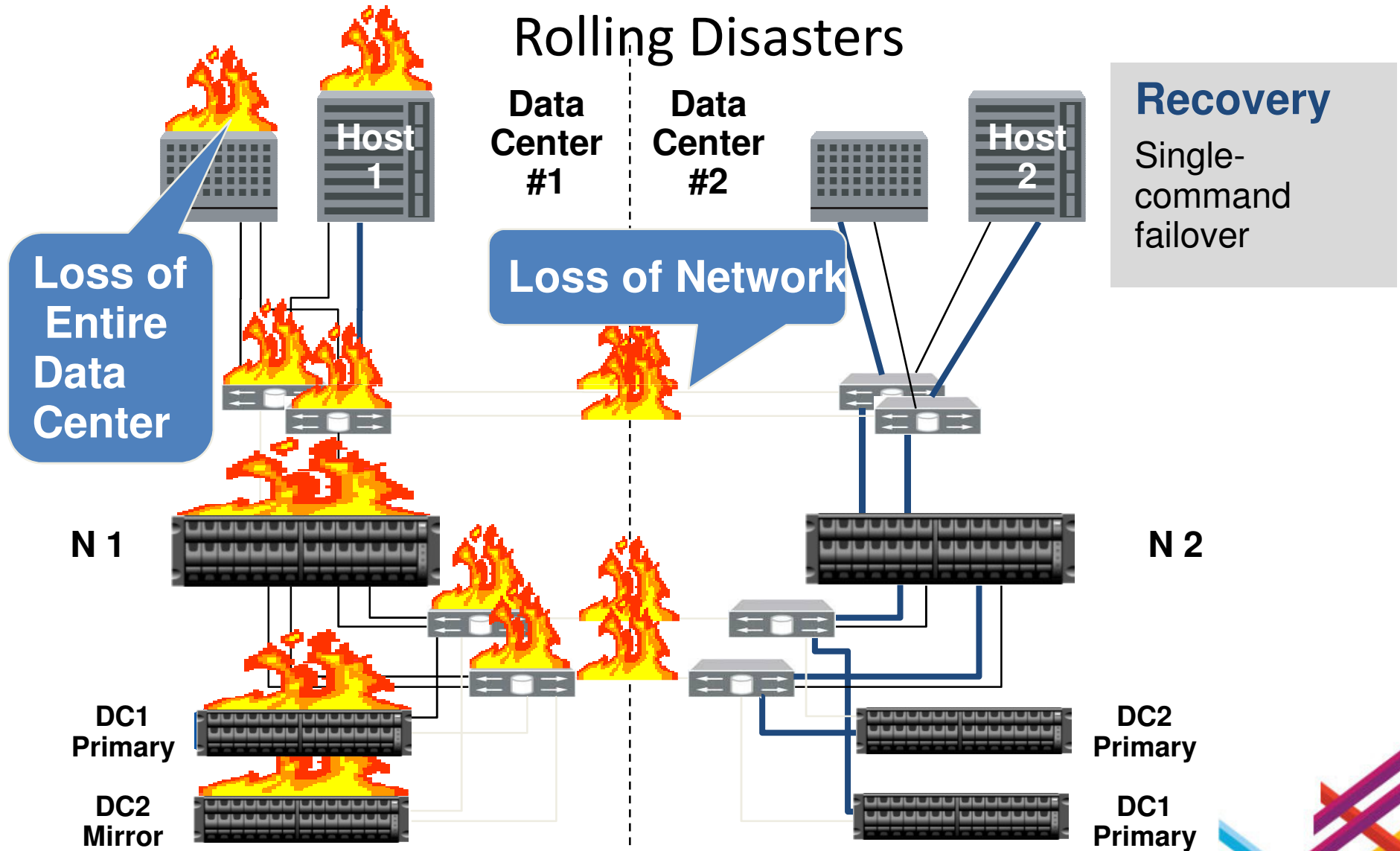
MetroCluster Failure Scenarios:
Return to Normal
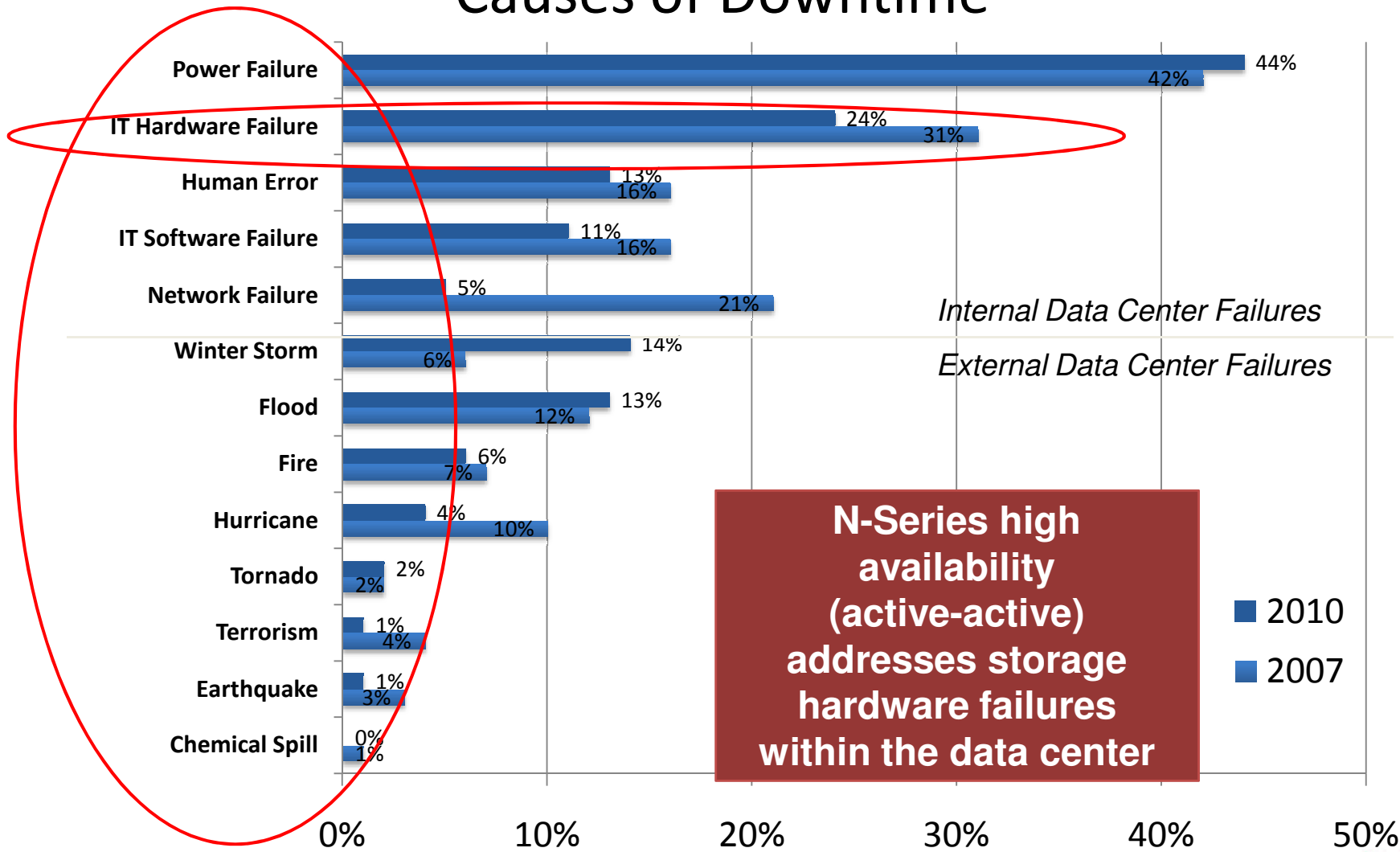
Host 1

Data Center #1

Data Center #2

Host 2

One-step return to normal

CF giveback

Mirror is rebuilt
DC1 primary reverts back to DC1

N 1

N 2

DC1 Primary

DC2 Mirror

DC2 Primary

DC1 Mirror

Causes of Downtime
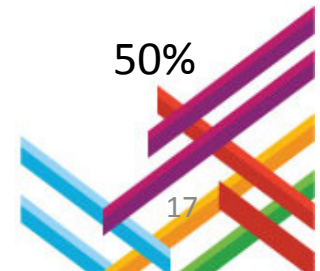
IBM N-Series Integrated Data Protection

Cost effective

- Single platform for data protection
- Up to 90% less capacity used
- Up to 70% less network utilization

Simple to use

- Roll out data protection in minutes
- Lower management overhead by up to 40%
- Single vendor for multiple data protection needs

Flexible

- Cover broader range of RPO and RTO
- Enable easy, rapid DR testing
- Deliver secure retention for compliance
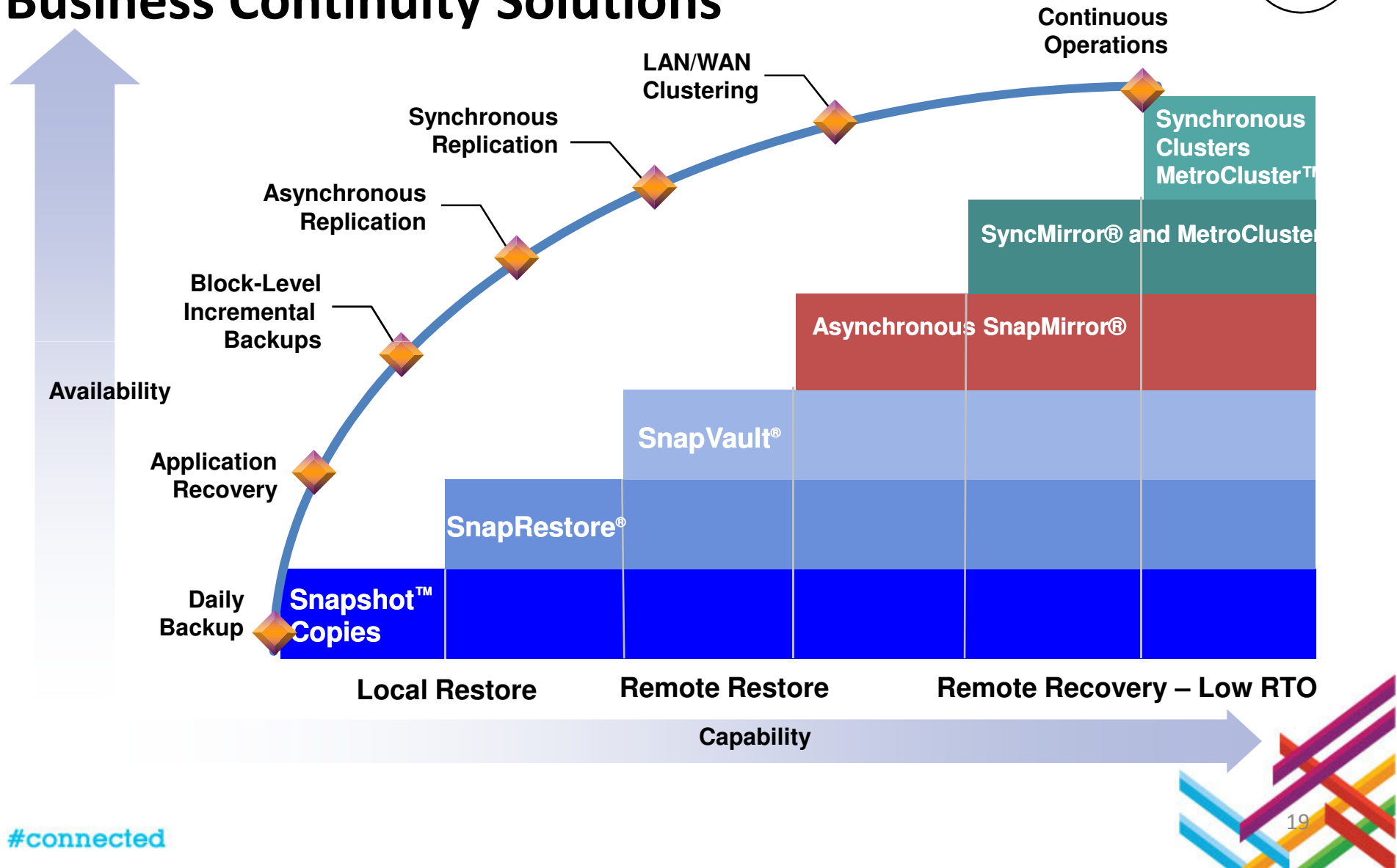- Use with physical and virtual systems and cloud

Extends the value of DP

- Accelerate test and business intelligence
- Lower development costs up to 95%

IBM N-Series Integrated Data Protection and Business Continuity Solutions

Continuous
Operations

LAN/WAN
Clustering

Synchronous
Replication

Asynchronous
Replication

Block-Level
Incremental
Backups

Availability

Application
Recovery

Daily
Backup

Synchronous Clusters MetroCluster™

SyncMirror® and MetroCluster

Asynchronous SnapMirror®

SnapVault®

SnapRestore®

Snapshot™ Copies

Local Restore   **Remote Restore**   **Remote Recovery – Low RTO**

Capability

MetroCluster Value Proposition

IBM N-Series MetroCluster provides continuous availability for business-critical data at half the cost and complexity of our competitors
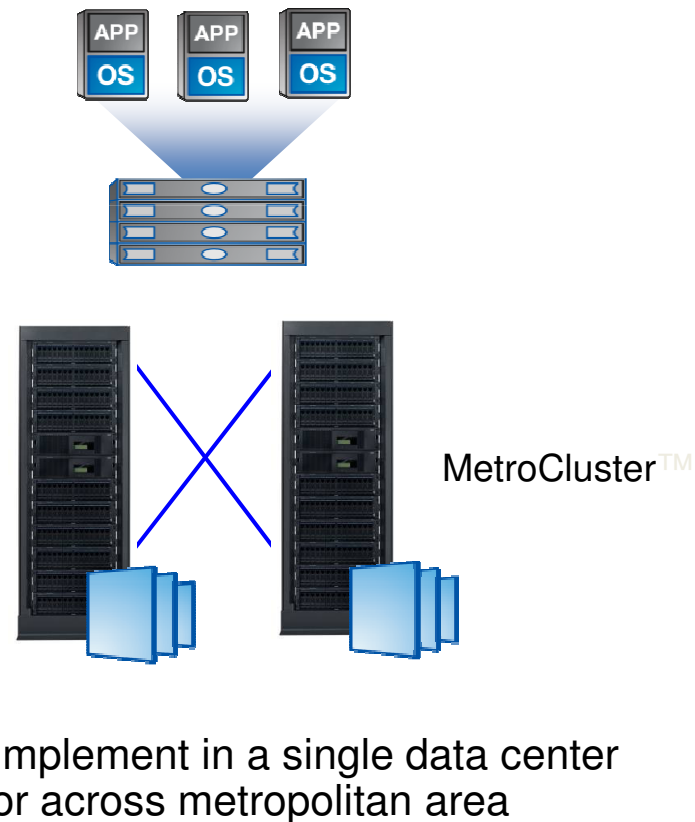
Zero RPO and no to low RTO

- Storage-level clustering at half the cost
- Aggregate-level mirroring of I/O
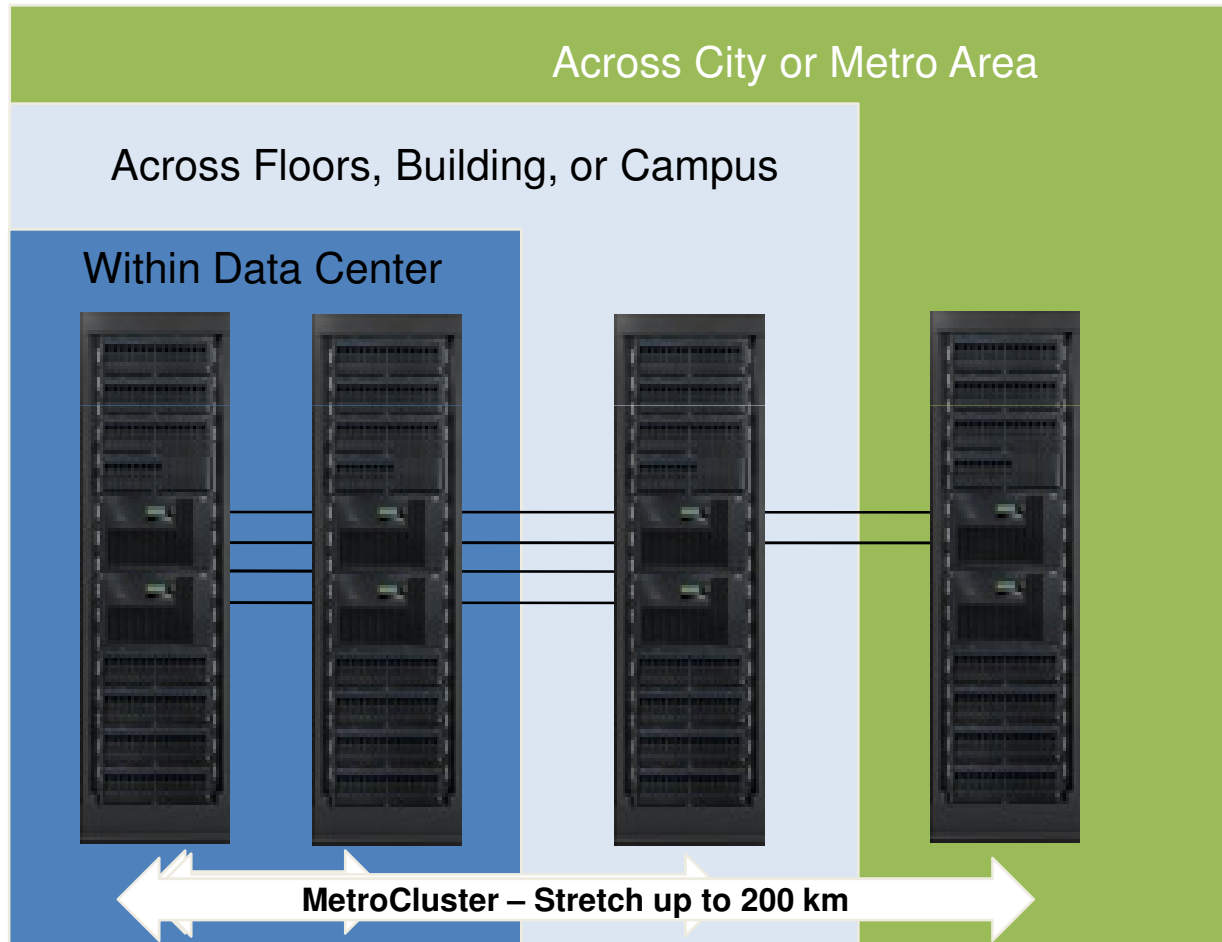- Single-command site failover
- Never lose a transaction

Enables clustering beyond data center

- 500m and 200km configurations
- Storage failover without scripting or reliance on host clustering

Extends benefit of storage efficiency
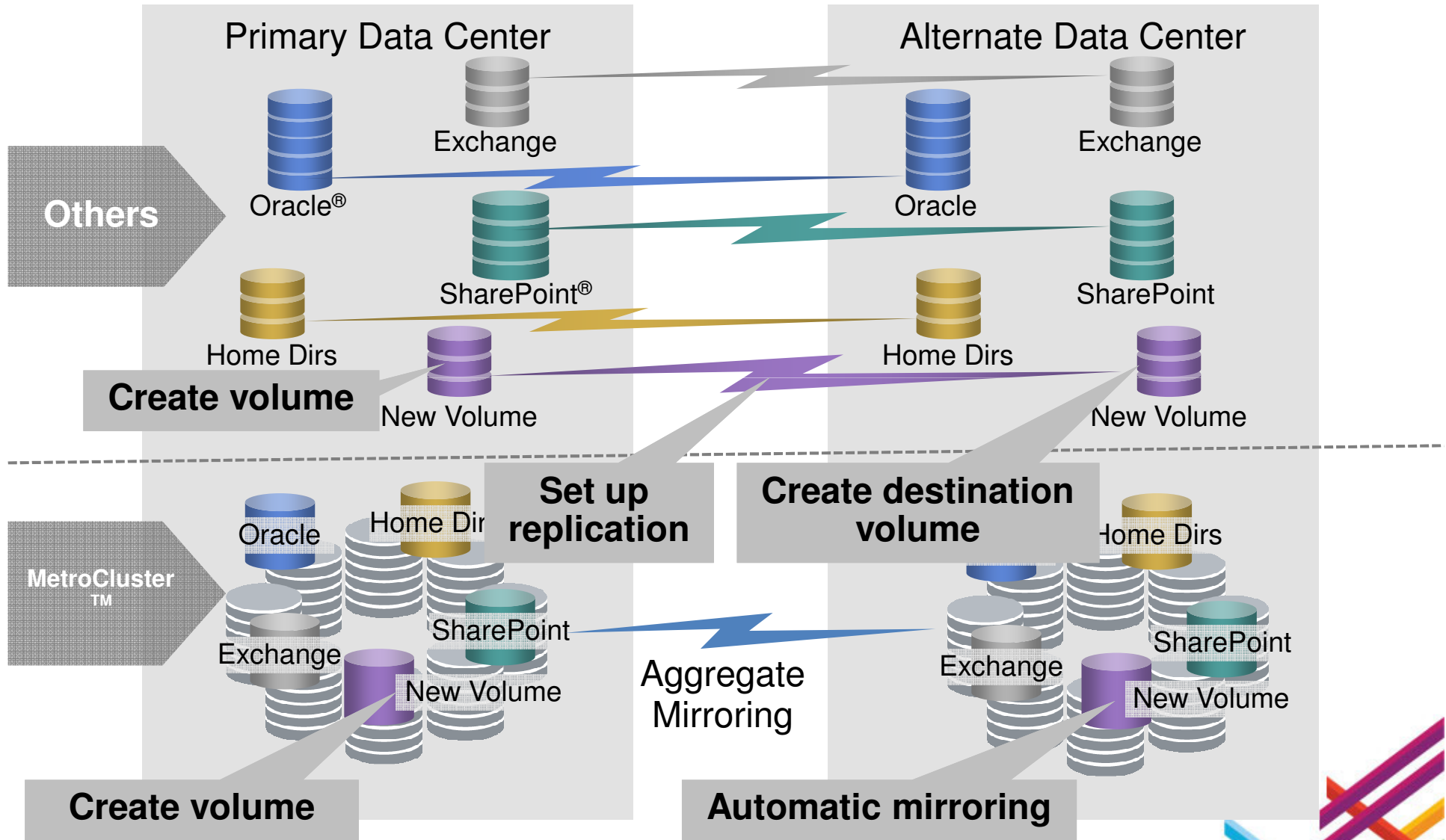
- Supports Snapshot™ copies, data deduplication, and compression
- Leverage third-party storage with V-Series or SAS/SATA with FibreBridge

MetroCluster™

Implement in a single data center or across metropolitan area

The MetroCluster Difference

Across City or Metro Area

Across Floors, Building, or Campus

Within Data Center
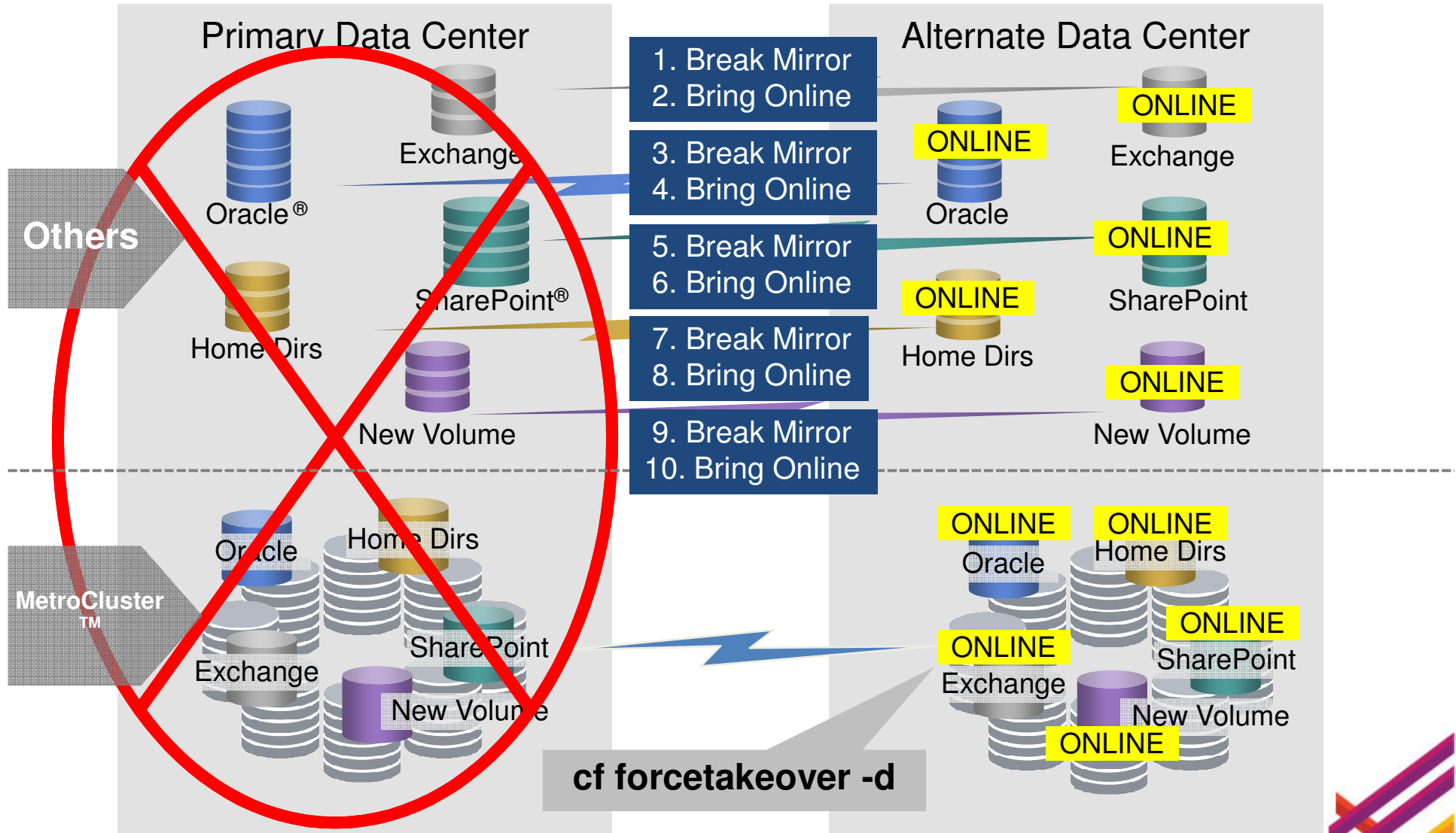
MetroCluster – Stretch up to 200 km

- IBM N-Series MetroCluster™ provides continuous availability within a single data center and across data centers in adjacent floors, buildings, and metro areas

- Support for N-Series N6000, N7000 series

The MetroCluster Difference: Automatic Protection

Primary Data Center

Alternate Data Center

Others

Exchange

Oracle®

SharePoint®

Home Dirs

Create volume

New Volume

Exchange

Oracle

SharePoint

Home Dirs

New Volume

Set up replication

Create destination volume

MetroCluster™

Oracle

Home Dir

Home Dirs

Exchange

SharePoint

New Volume

Aggregate Mirroring

Exchange

SharePoint

New Volume

Create volume

Automatic mirroring

The MetroCluster Difference: Automatic Protection

Primary Data Center

Alternate Data Center

Others

Oracle ®

Exchange

SharePoint®

Home Dirs

New Volume

MetroCluster ™

Oracle

Home Dirs

Exchange

SharePoint

New Volume

1. Break Mirror
2. Bring Online

3. Break Mirror
4. Bring Online

5. Break Mirror
6. Bring Online

7. Break Mirror
8. Bring Online

9. Break Mirror
10. Bring Online

ONLINE

ONLINE

Exchange

Oracle

ONLINE

SharePoint

ONLINE

Home Dirs

ONLINE

New Volume

ONLINE
Oracle

ONLINE
Home Dirs

ONLINE
SharePoint

ONLINE
Exchange

New Volume

ONLINE

cf forcetakeover -d

MetroCluster and IBM N-Series Storage Efficiency
Benefits Compound When Using Multiple Features

Save over 80%

Snapshot™ Copies
Point-in-time copies that write only changed blocks. No performance penalty.

Save up to 46%

RAID 6 Protection (RAID-DP®)
Protects against double disk failure with no performance penalty.

Save up to 33%

Thin Provisioning (FlexVol®)
Create flexible volumes that appear to be a certain size but are really a much smaller pool.

Save up to 95%
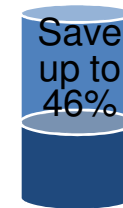
Deduplication
Removes data redundancies in primary and secondary storage.

Save up to 87%

Data Compression
Reduces footprint of primary and secondary storage.

Save over 80%

Virtual Copies (FlexClone®)
Near-zero space, instant "virtual" copies. Only subsequent changes in cloned dataset get stored.

Save up to 95%

Thin Replication (SnapVault® and SnapMirror®)
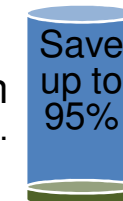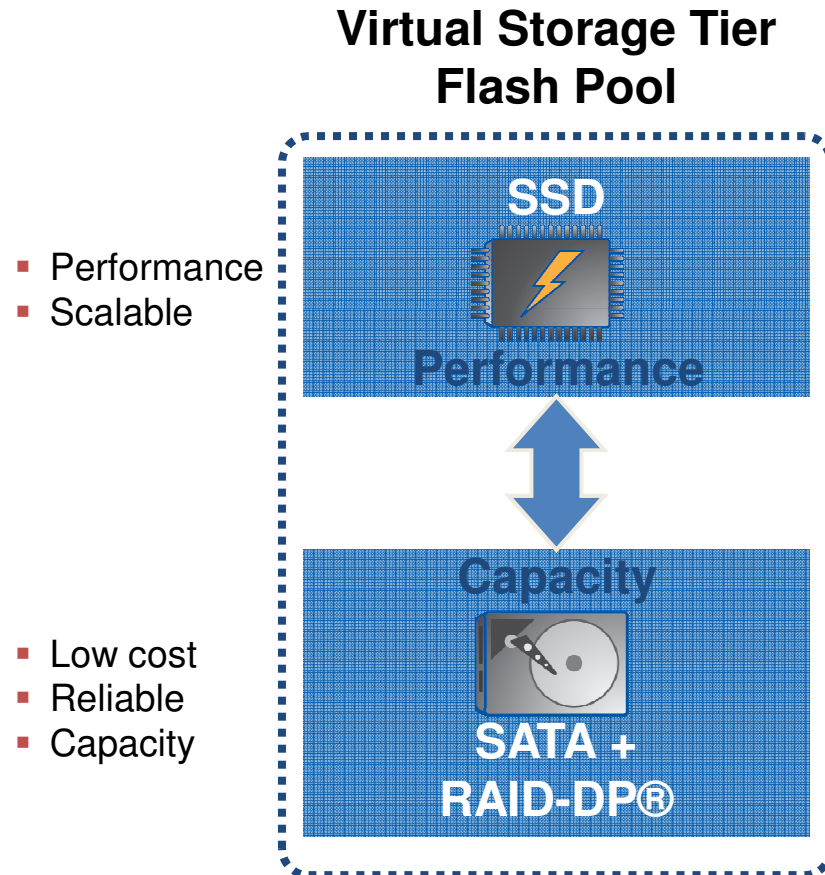Make data copies for disaster recovery and backup using a minimal amount of space.
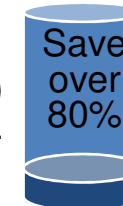
MetroCluster with VST and Flash Pool

Flash Pool™ allows customers to optimize storage for cost/performance and cost/capacity and work with MetroCluster™ to increase performance.

Virtual Storage Tier
Flash Pool

SSD

Performance

▪ Performance
▪ Scalable

Capacity

SATA +
RAID-DP®

▪ Low cost
▪ Reliable
▪ Capacity

Cost-efficient performance

▪ Get more performance out of high-capacity lower cost drives
▪ Low cost of operation
▪ RAID-DP reliability

Flexible

▪ Real-time data promotion
▪ Optimize for specific workloads, such as virtualization

Easy to manage and implement

▪ Scales on demand
▪ Ready to use right out of the box

N-Series Data Protection Solutions for Business Continuity and DR

MetroCluster™

Continuous availability for business-critical applications with lower cost and complexity
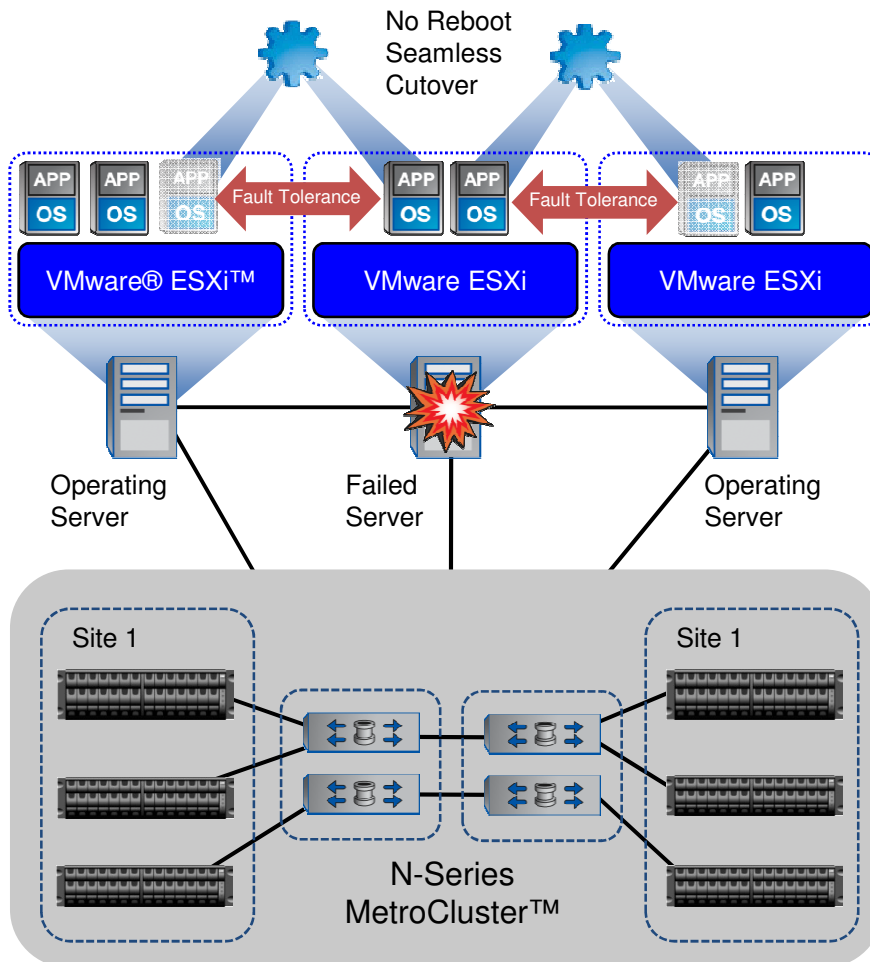
SnapMirror®

Efficient, high-speed, asynchronous replication of business-critical data across global networks

RTO

Hours

Minutes | MetroCluster | SnapMirror

Zero

Zero | Minutes | Hours

RPO
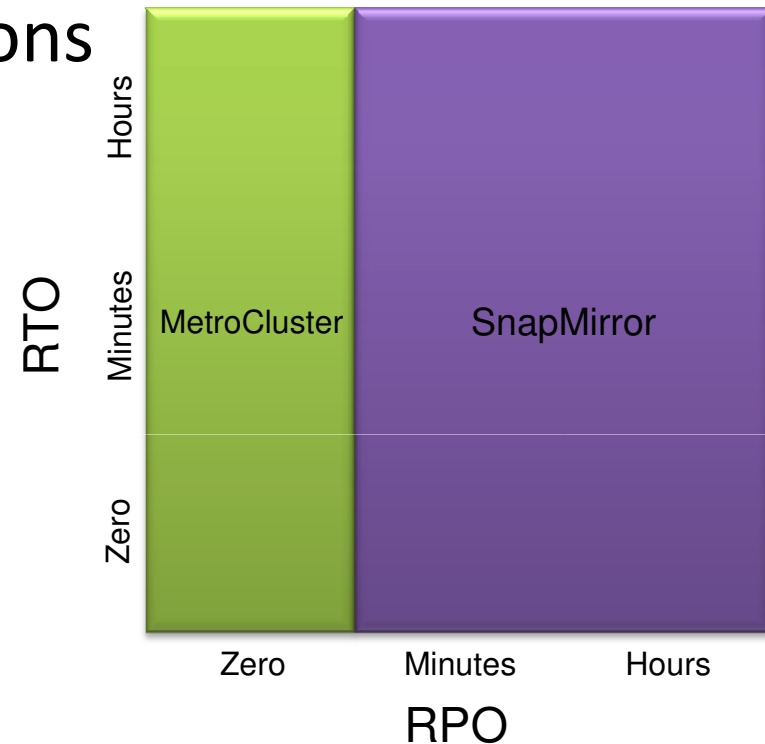
MetroCluster is a solution designed for organizations that have a data need for zero RPO and an application need for no to low RTO.

# MetroCluster for VMware Environments

No Reboot
Seamless
Cutover

Fault Tolerance   Fault Tolerance

VMware® ESXi™   VMware ESXi   VMware ESXi

Operating
Server

Failed
Server

Operating
Server

Site 1   Site 1

N-Series
MetroCluster™

- Complements VMware HA/FT
  – Same levels of availability for storage that VMware HA/FT provides for VMs

- Simplifies operations
  – Zero interdependencies
  – No application or OS agents

- Deploys with confidence
  – Tested and documented interoperability

- Support for VMware vSphere® 5

N-Series Solution for Hyper-V
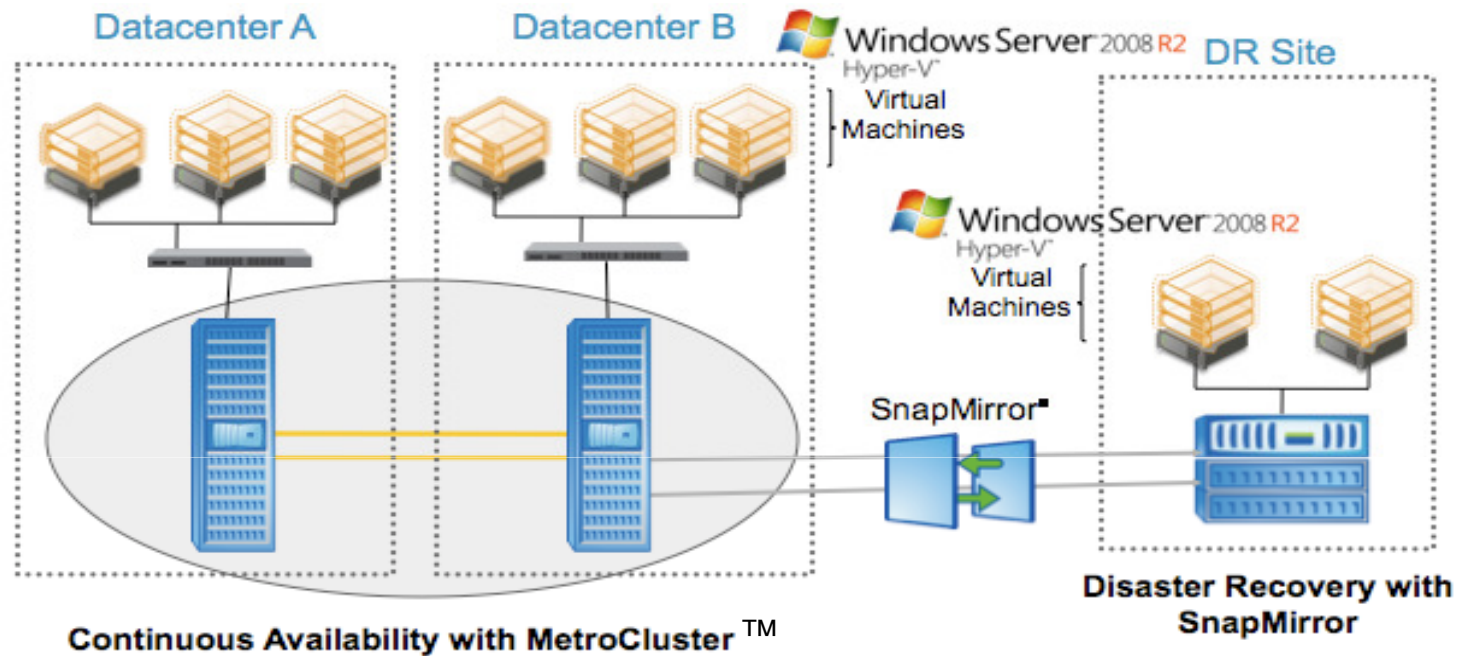
- Automatic failover within data centers or regional areas
- Practical continuous data availability and disaster recovery
- Replication of VMs and data
- Hyper-V™ VM and application consistency
- Asynchronous thin replication (SnapMirror)
- Synchronous replication for 0 RPO and near-0 RTO (MetroCluster)
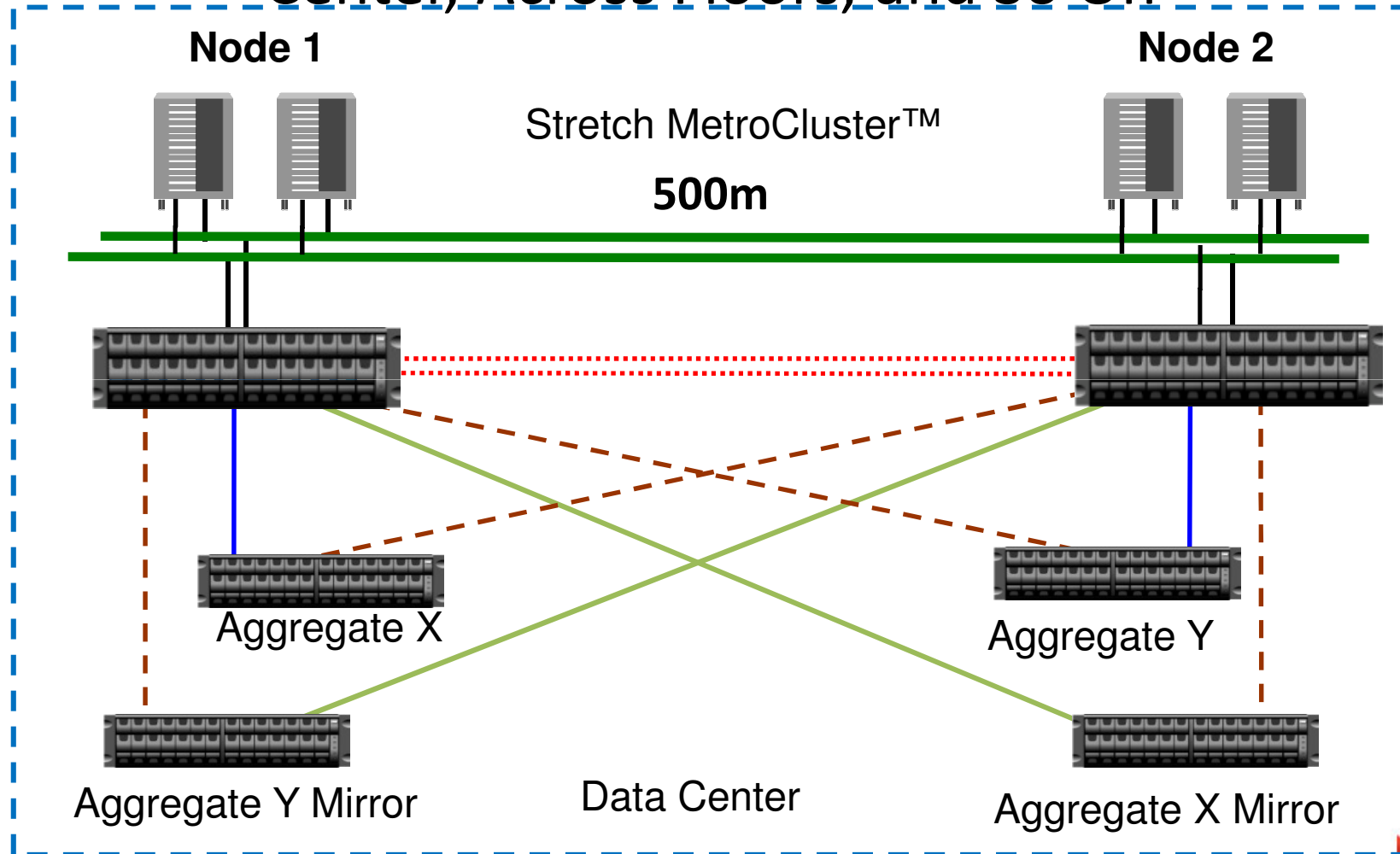
MetroCluster
Overview

How MetroCluster Protects
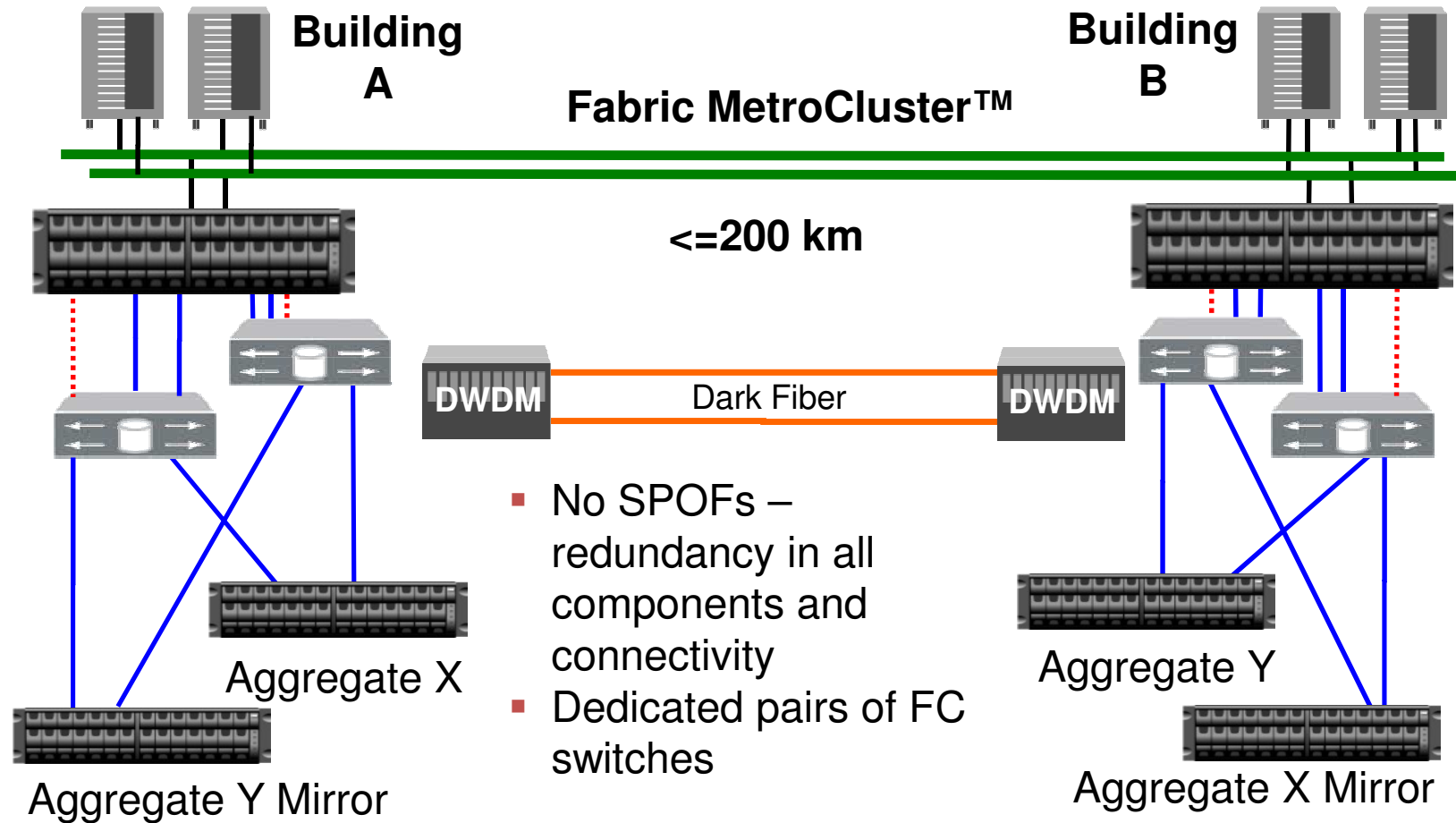

Site/Bldg A

Up to 200km

Site/Bldg B
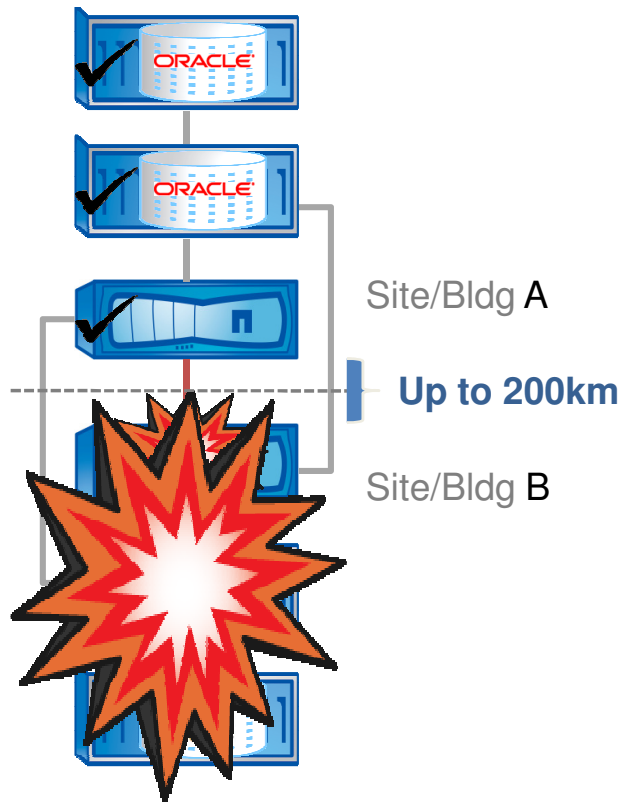
Protects against

- Controller failure

- Storage or rack failure

- Network failure

- Local data center failure

- Complete site failure

# MetroCluster Deployment in a Single Data Center, Across Floors, and So On

Node 1

Node 2

Stretch MetroCluster™

500m

Aggregate X

Aggregate Y

Aggregate Y Mirror

Data Center

Aggregate X Mirror

MetroCluster Deployment
Across City or Metro Areas

Building A

Fabric MetroCluster™

Building B

<=200 km

DWDM — Dark Fiber — **DWDM**

Aggregate X

- No SPOFs – redundancy in all components and connectivity
- Dedicated pairs of FC switches

Aggregate Y

Aggregate Y Mirror

Aggregate X Mirror

MetroCluster Components

Cluster License Provides automatic failover capability between sites

SyncMirror® Provides an up-to-date copy of data at the remote site; seamless transition on failover

Cluster Remote Provides a mechanism to declare a site disaster and initiate a site failover' with a single command. *This is the MetroCluster license.*

FC Interconnect Provides connectivity between sites that are more than 500 meters apart; enables controllers to be located a safe distance away from each other (up to 200km)
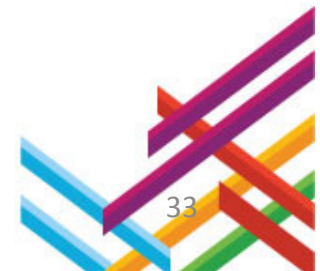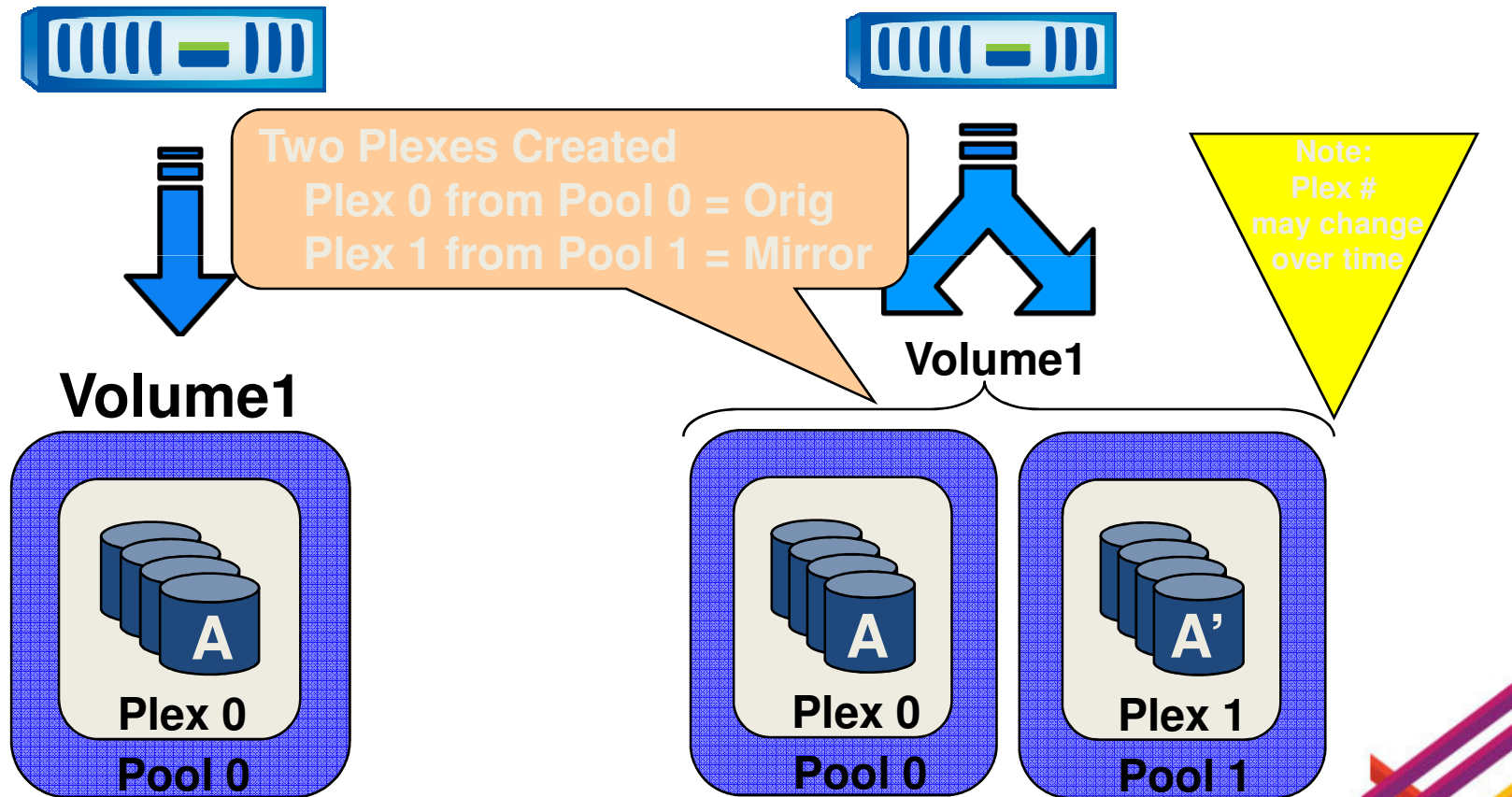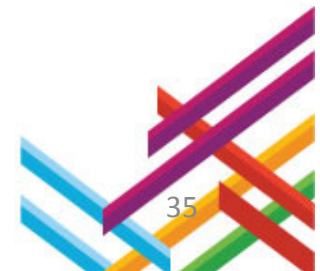
MetroCluster Component:
Cluster Remote License

- Provides single-command failover
- Provides the ability to have one node take over partner's identity without a quorum of disks

- All volumes are synchronously mirrored (using SyncMirror®) and are available during a site disaster

- Requires administrator intervention as a safety precaution against a "split brain" scenario (*cf forcetakeover –d*)

  - **IMPORTANT:** Site-specific disasters are not the same as a normal cluster failover.
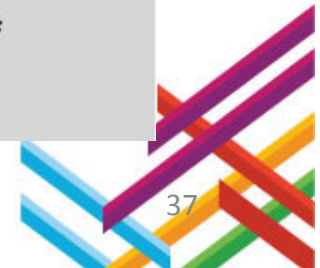
MetroCluster Component:
SAS Optical

Cable Type	Lengths	Connectivity	Connector Type
Multi-mode Active Optical Cable	1m, 2m, 3m, 5m, 15m, 30m, 50m	Controller to Shelf and Shelf to Shelf	QSFP to QSFP
Multi-mode Direct Cable Connect	Custom lengths up to 150m	Controller to Shelf and Shelf to Shelf	QSFP transceivers with MPO cable
Multi-mode Optical Patch Panel Connect*	5m & 30m Max total cable distance 150m	Controller to Shelf	QSFP Transceivers with MPO cable to LC, SC, or MTRJ breakout
Single-mode Optical Patch Panel Connect*	5m & 30m Max total cable distance 500m	Controller to Shelf	QSFP to LC, SC, or MTRJ breakout

- Used in Stretch MetroCluster configurations

- Allow for SAS connections up to 500m

- Can replace FibreBridge for stretch MetroCluster configurations
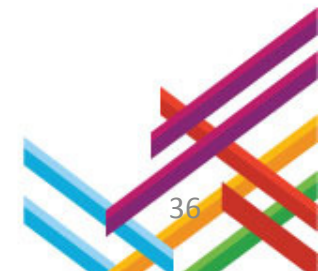
Multiple Subnet Support

\etc\mcrc

10.1.1.1xx

20.1.1.2xx

Options
Cf.takeover.use_mcrc_file 1

/etc/mcrc:
hostname nodeA
ifconfig e0a 20.1.1.200
netmask 255.255.255.0
ifconfig vip add 5.5.5.5
route add default 20.1.1.50 1
routed on
options dns.domainnam
netapp.com
options dns.enable o
options nis.enable off
savecore

FAS3000

FC Shelf

FC Shelf

Options
Cf.takeover.use_mcrc_file 1

/etc/mcrc:
hostname nodeB
ifconfig e0a 10.1.1.100 netmask
255.255.255.0
ifconfig vip add 7.7.7.7
route add default 10.1.1.50 1
routed on
options dns.domainname
netapp.com
options dns.enable o
options nis.enable off
savecore

FAS3000

FC Shelf

FC Shelf

"Twin" MetroCluster Configuration

HA pair (Site A)

MetroCluster1

HA pair (Site B)

HEAD A

HEAD A

HEAD B

HEAD B
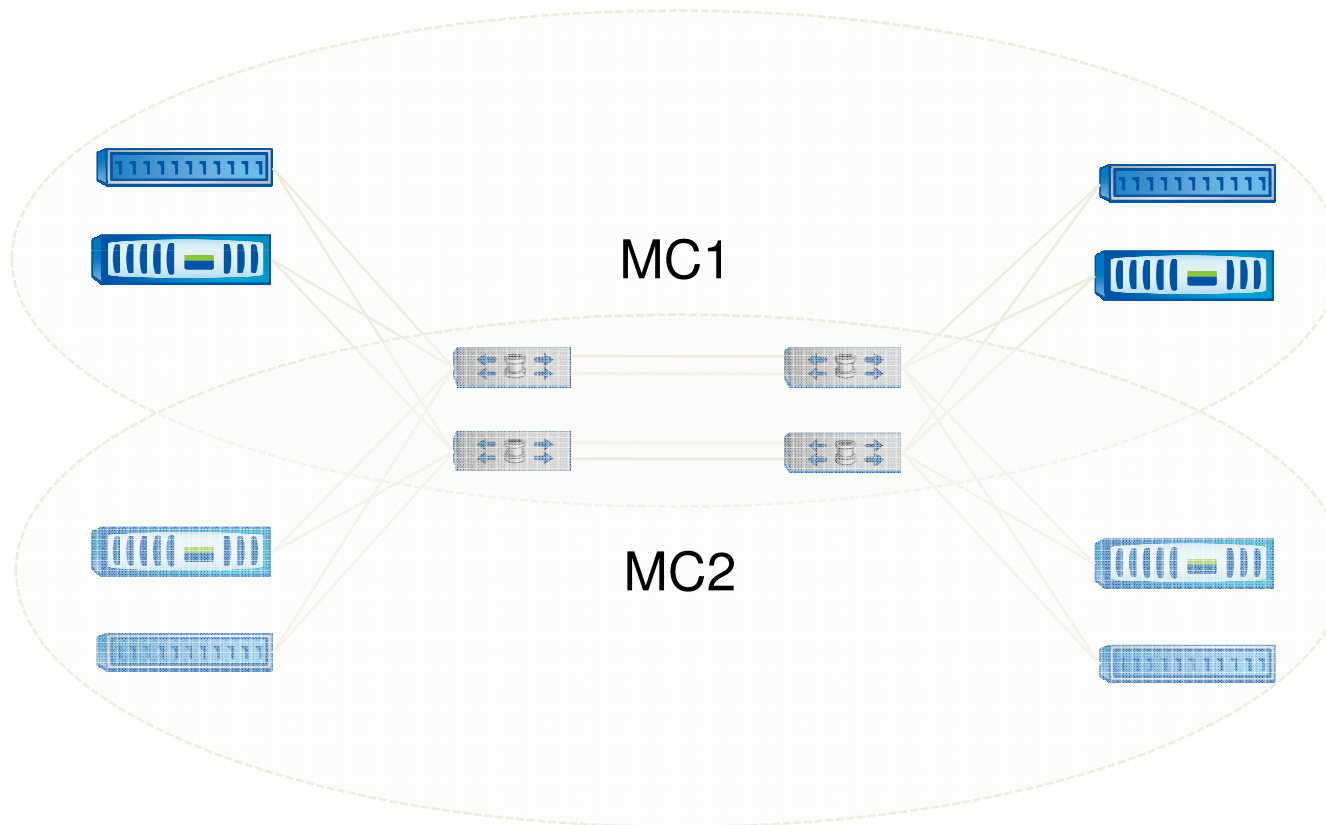
MetroCluster2

- 2 independent MetroCluster™ sites, but chassis pairs are leveraged
  - Does not offer both local and remote failover

Shared Switch Support in Data ONTAP 8.1

- 2 MetroCluster™ pairs can share 4 Brocade 5100 or 6510 switches

MC1

MC2

Flash Pool Support

- Flash Pool™

  - SAS + SSD

  - SATA + SSD

  - As of Data ONTAP® 8.2: EX40 + SSD not supported

- Flash Pool performance

  - No MetroCluster™ deviation from general Flash Pool performance guidelines

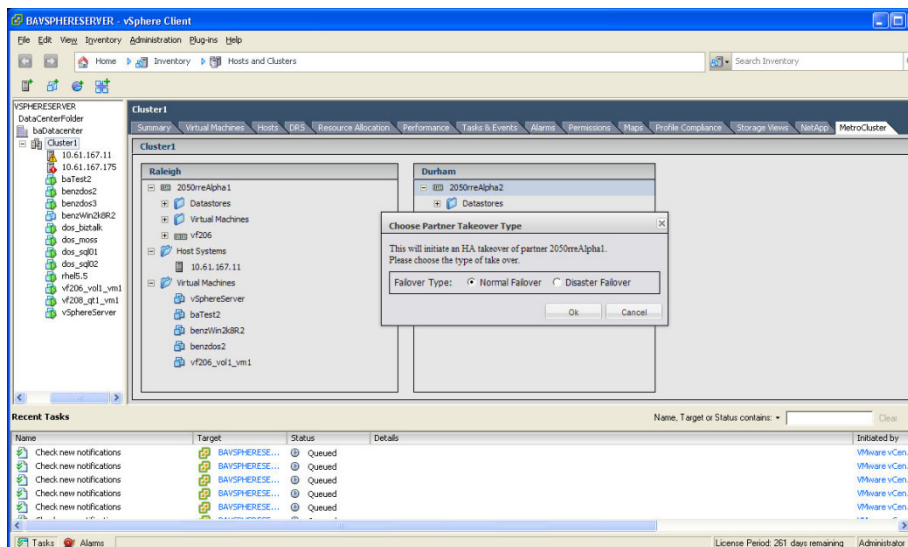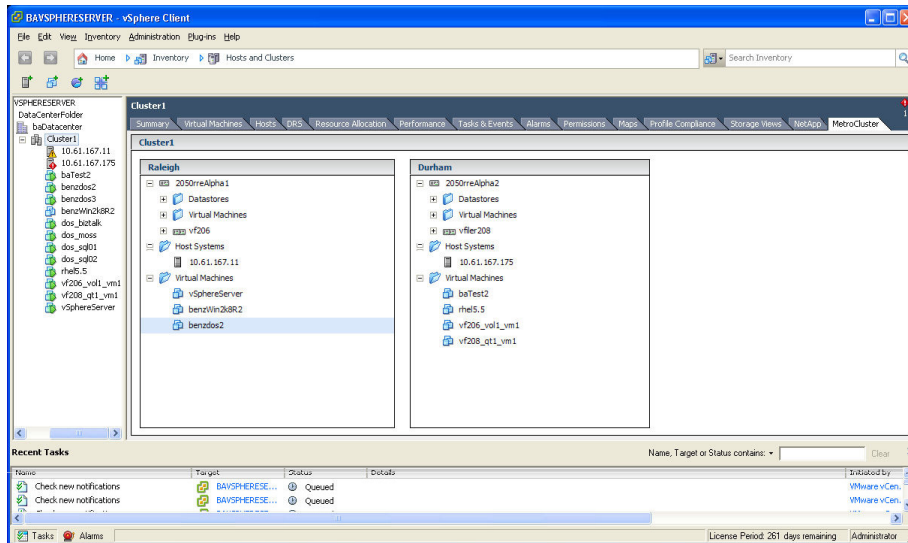 - Be aware of FibreBridge-related performance limits

MetroCluster Tools

MetroCluster Tiebreaker Solution

- Automates site failover (cfod)

- Availability

  - Via a PVR from RRE (Rapid Response Egg)

MetroCluster Easy Button

- **What Is It?**
  - Metro Cluster™ Mare vSphere® client plug-in (MCP)
  - MetroCluster tab in vCenter™ client

- **What does it do?**
  - MetroCluster site-centric view of vSphere cluster inventory, showing:
    - Controllers
    - Data stores
    - ESX® and ESXi™ hosts
    - Virtual machine
  - Perform controller takeover (normal or disaster) and giveback operations
  - Evacuate virtual machines from one site to the other
    - ESX and ESXi in maintenance mode
    - Requires VMware® DRS

- **How is it available?**
  - Solution is currently available through PVR

MetroCluster
Failure Scenarios

Active-Active Normal Operation

FCP, ISCSI, FCoE, NFS, CIFS, HTTP, FTP

system01.acme.com

system02.acme.com

A1
A2
A3
A4

B1
B2
B3
B4
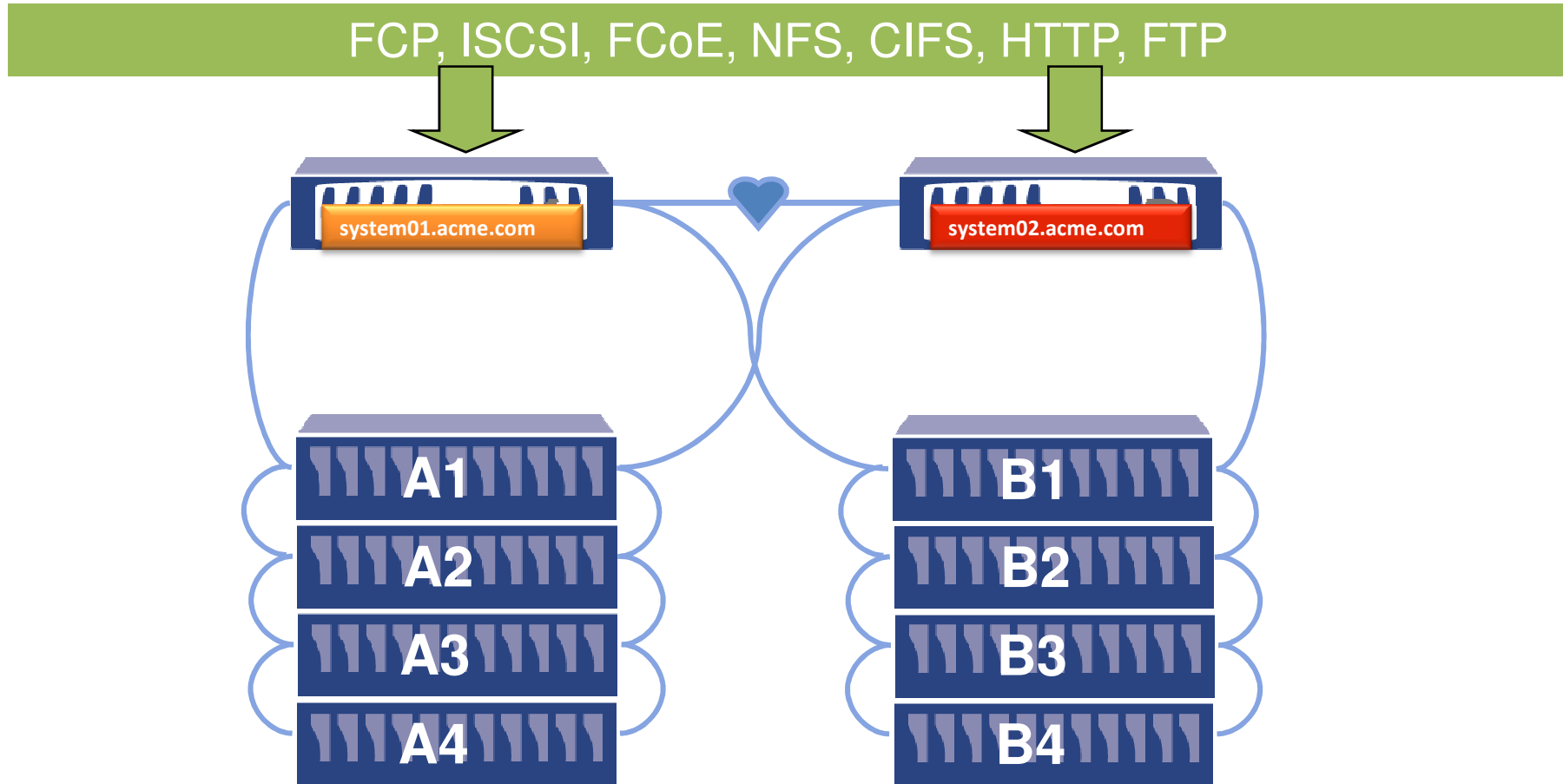
Active-Active Planned Downtime

FCP, ISCSI, FCoE, NFS, CIFS, HTTP, FTP

cf giveback

system01.acme.com

system02.acme.com

A1

A2

B1

B2

B3

B4

Planned Downtime Scenario
1. Issue **cf takeover** on system02
2. Identity moves to 2nd controller
3. I/O passes through 2nd controller
4. After maintaining 1st controller, issue **cf giveback**
5. Identity moves back to 1st controller
6. Normal operations continue
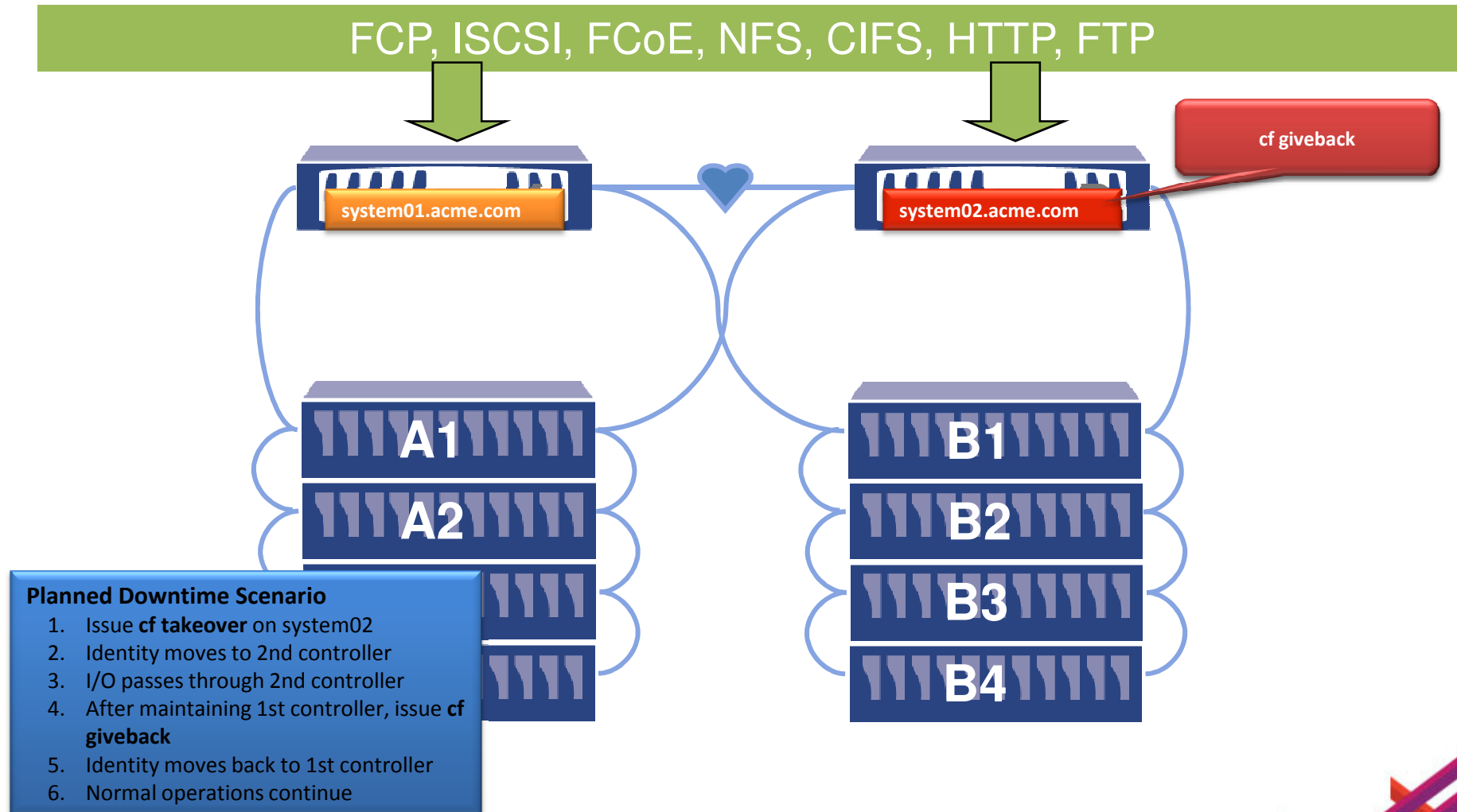
Active-Active Controller Failure

FCP, ISCSI, FCoE, NFS, CIFS, HTTP, FTP

system01 failed !
So takeover!

system02.acme.com

A1

A2

B1

B2

B3

B4

Controller Failure Scenario
1. 1st Controller fails
2. Identity moves to 2nd controller
3. I/O passes through 2nd controller
4. After repairing1st controller,
   issue **cf giveback**
5. Identity moves back to 1st controller
6. Normal operations continue
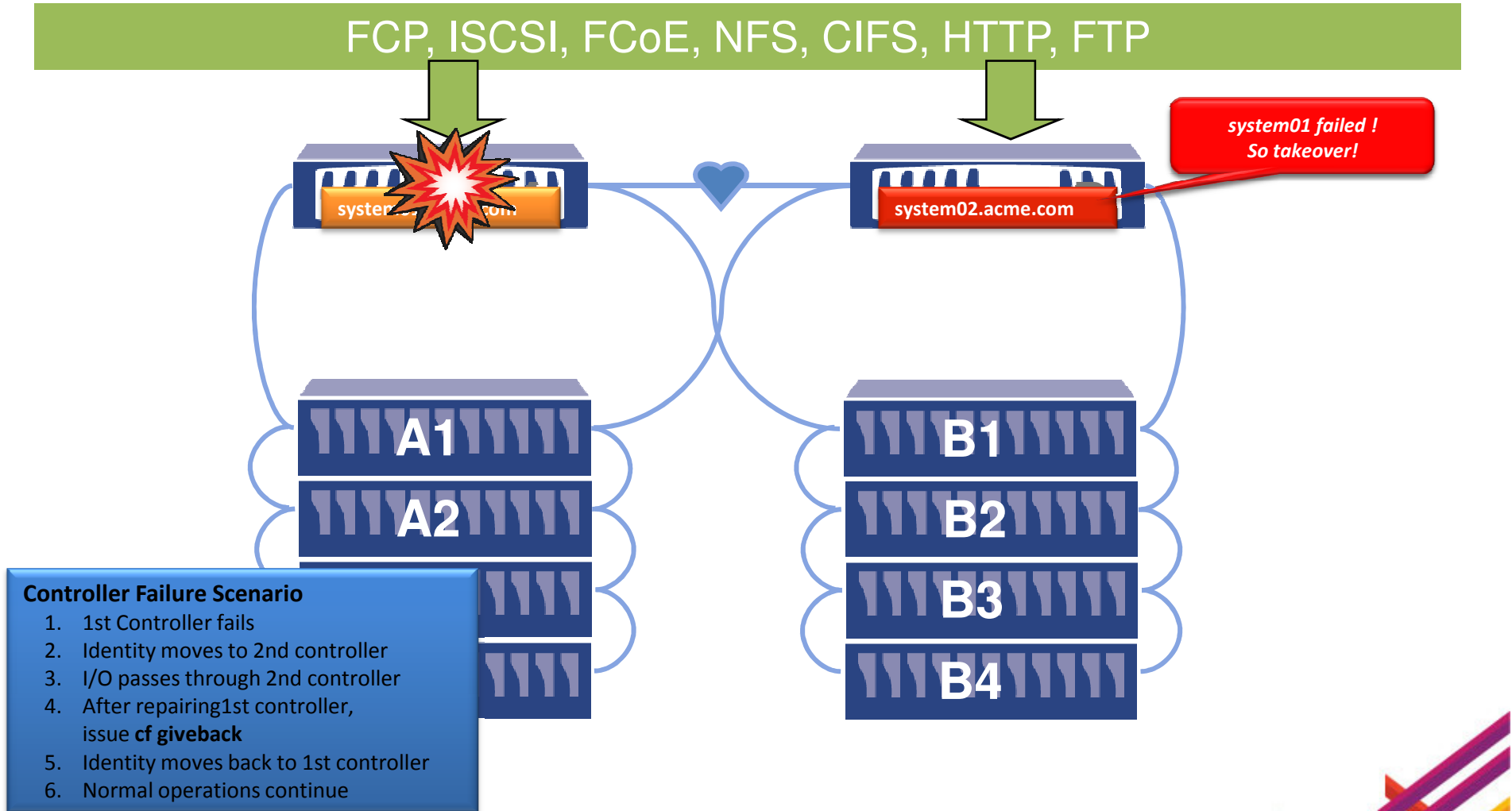
Metrocluster Disk Failure

Example with VMware HA

FCP, ISCSI, FCoE, NFS, CIFS, HTTP, FTP

system01.acme.com

system02.acme.com

MC Disk/Shelf Failure Scenario
1. All disks failed on Site A
2. Normal operation continue, data is accessed on Site B disks
3. No action for users/servers required
4. After bringing Site A disks online, mirrors are resynced automatically

B

A'
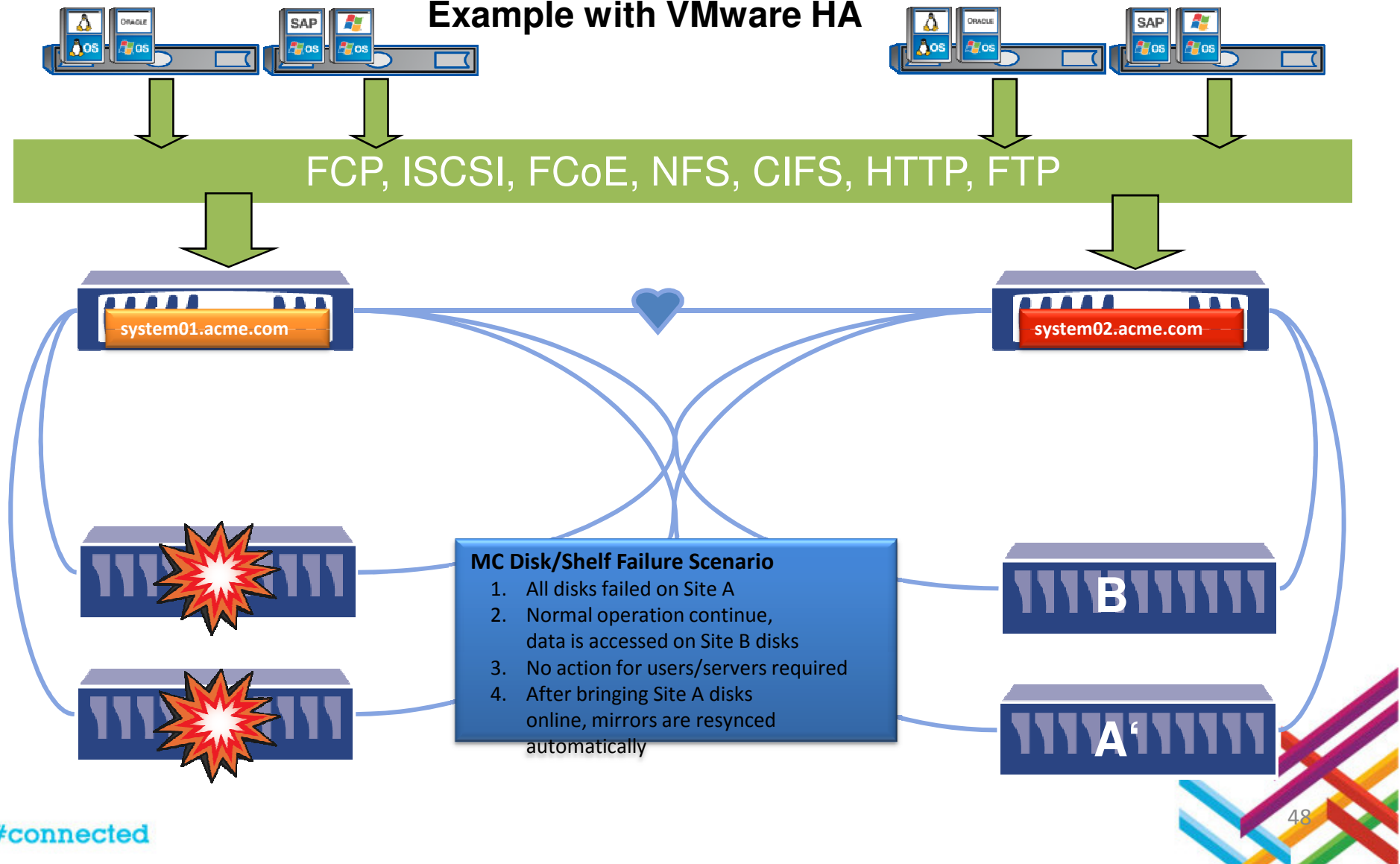
Metrocluster Site Failure

Example with VMware HA

FCP, ISCSI, FCoE, NFS, CIFS, HTTP, FTP

system02.acme.com

cf giveback

MC Site Failure Scenario (cont.)

6. VMware® HA brings datastores back online and starts the VMs
7. After bringing Site A back online, issue **cf giveback**
8. Identity moves back to 1st controller
9. Resync aggregates
10. VMotion® VMs back to Site A

B

A'
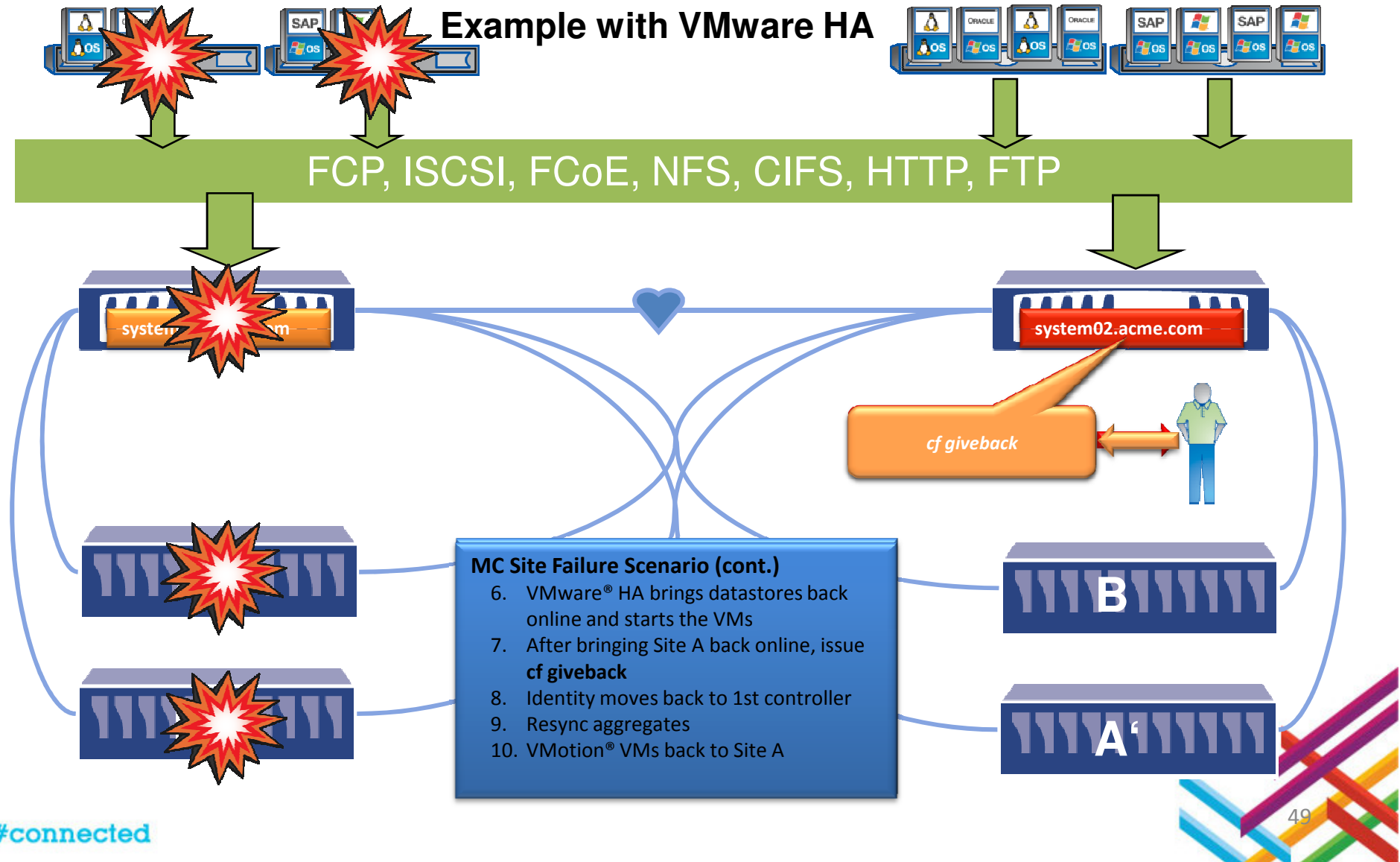
Questions ?

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