



# Thinking Outside The (Server) Box

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Thinking  
Outside  
The

Box

# IBM and Red Hat: Hybrid Cloud Architecture Open Platform for Innovation and Growth

## Business Requirements

Build with the latest technology on any cloud

High-value cloud services across hybrid multicloud

Automation and app software and data portability with no lock-in

Open platform and cloud software stack

**World-class public cloud**  
IaaS & advanced services on IBM's public cloud

**Hybrid multicloud platform**  
Consistent stack and management for multicloud—with VMs and containers

## Business Outcomes

Innovate faster with greater agility

Create more insights from data

Improve ROI and competitive edge

### Expertise

Advise on cloud | Build for cloud | Move to cloud | Manage on cloud

### Advanced Services

AI | Hyper Protect | IoT | Blockchain | Analytics | ML | Quantum

### Capabilities

Application | Data | Integration | Automation | Management | Security

### Foundation

Common Services | RHEL | RH OpenShift | Multi-cluster Management

## Infrastructure



IBM Cloud



AWS



Azure



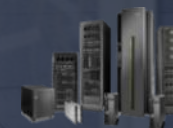
Google



Edge



Private Cloud



IBM Power Systems  
LinuxOne/z Sys. IBM Storage



# IBM FlashSystem Family

*Storage made simple for hybrid cloud*

Watch the demo  
[ibm.biz/flashsystemdemo](http://ibm.biz/flashsystemdemo)

Entry Enterprise



FlashSystem 5200



FlashSystem 5035  
FlashSystem 5015

Midrange Enterprise



FlashSystem 7200

High-End Enterprise



FlashSystem 9200  
and 9200R

Hybrid  
Cloud and  
Container  
Integration



IBM Spectrum Virtualize

**Consistent software capabilities**

IBM Storage Insights

# Enterprise-Class Storage Made Simple for Hybrid Multicloud

*IBM FlashSystem Family*



IBM Spectrum Virtualize Software

IBM Storage Insights (AI-based Monitoring, Predictive Analytics, and Proactive Support)

FlashSystem 5015

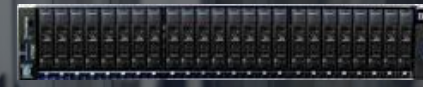
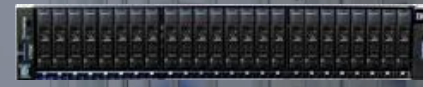
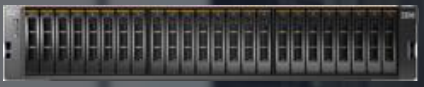
FlashSystem 5035

FlashSystem 5200

FlashSystem 7200

FlashSystem 9200

FlashSystem 9200R



VMware and Red Hat OpenShift Container Integration

3-Site Replication

Local and remote replication (snapshots, DR, copy/migrate to cloud)

Easy Tier AI-driven automated tiering

Transparent Data Migration

Data Reduction Pools

Scale-out Clustering

HyperSwap High Availability

Encryption

NVMe Flash and FC-NVMe Host Connections

High Performance Compression and Encryption with IBM FCM

Heterogeneous Storage Support for >500 storage systems

Storage Class Memory

# Meet the FlashSystem 5000 / 5200

These systems are simply...

**Fast** Up to 1.5M IOPS and 21GB/s  
in a single-image clustered system

**Efficient** configurable data reduction

**Operationally resilient**

2 & 3-site replication, enhanced HA,  
HyperSwap

**Data resilient** air-gap data copies

**Flexible**

SCM, IBM FlashCore, Flash, HDD

**Interoperable**

Virtualization & management of over 500  
heterogeneous storage systems



FlashSystem 5200



FlashSystem 5000

**Consistent software  
capabilities**



**Spectrum Virtualize |  
Storage Insights**



- These systems are simple...
- to configure
- to monitor
- to support
- to secure
- to connect to the cloud
- to scale
- to tier
- to integrate
- to orchestrate
- to protect
- to acquire
- to upgrade

# FlashSystem 5200



Up to 2.3PB of data  
in only 1U



IBM Spectrum  
Virtualize  
IBM Storage Insights

- End-to-end NVMe flash
- **High-end enterprise** capability for entry storage
- Compact 1U design for data center and hybrid cloud efficiency and constrained edge environments
- Up to 512GB cache per system for growing workloads
- Hybrid cloud and on-prem replication
- 4-way scale-out clustering
- Maximum 32PB usable capacity
- IBM FlashCore Modules
- Storage-Class Memory
- **66% more** performance with **1.5M IOPS** per system
- **40% more** throughput: **21GB/s** per system
- **70µs** latency
- All-flash and hybrid flash

# Capacity and Performance Growth Made Simple

*IBM FlashSystem 5200 cost-efficient scale-up and scale-out*

**SCALE UP**

**For the biggest business grow**  
Up to 32PB capacity



**For business application Growth**  
**CLUSTERING**  
Adds NVMe capacity  
Scales performance linearly  
up to 6M IOPS



**SCALE OUT**

From 3 drives (Ex 19.2TB):  
38TB Effective Capacity  
180k IOPS (70/30/50)

# SAS Expansions



2U 3.5" x 12 SAS enclosure  
(Hybrid only)



2U 2.5" x 24 SAS enclosure



5U 3.5"/2.5" x 92 SAS enclosure  
5015, 5035 support existing expansions  
from 5010E 5030E (aka FS5010/FS5030)

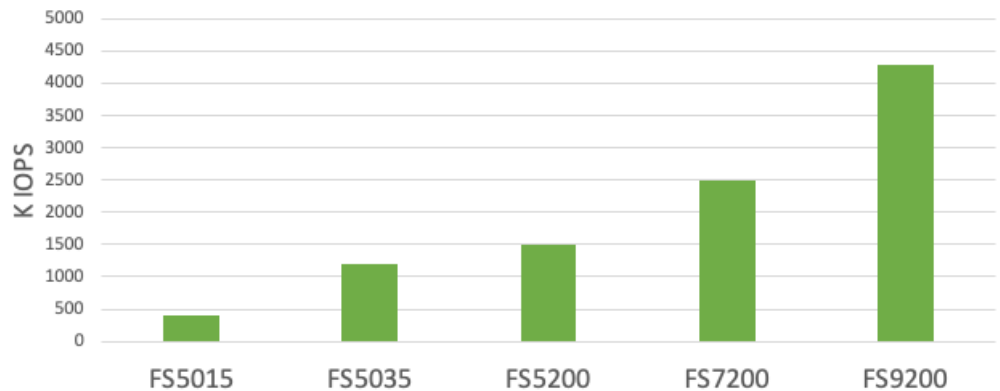
No expansion transfer between  
FS5100/FS5200

# 5200 Drive support

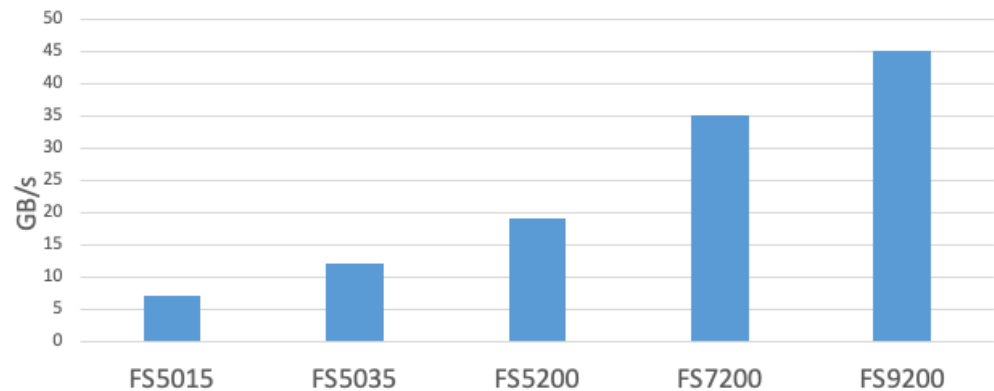
Types	Sizes				
FCM2.1	4.8TB	9.6TB	19.2TB	38.4TB	
SCM	375GB	750GB	800GB	1.6TB	
Industry Standard NVME	800Gb	1.92TB	3.84TB	7.68TB	15.36TB
SAS	Various, same drive capacities as 5010E 5030E				

# Portfolio Performance at a Glance

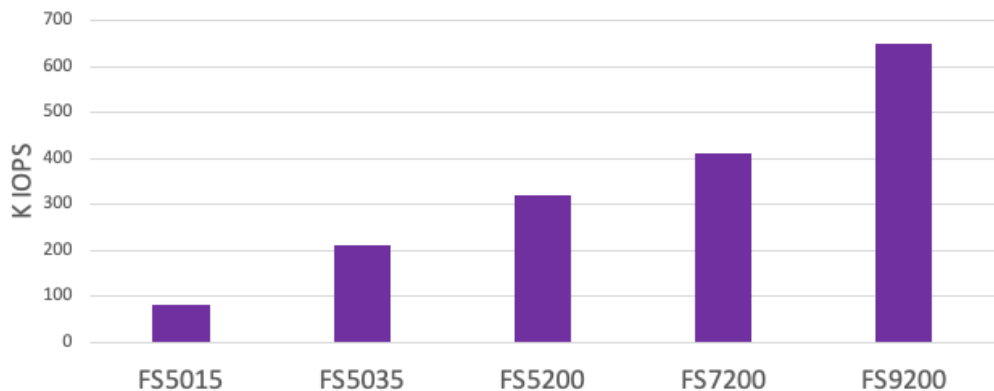
### Max IOPS (4KB)



### Max Bandwidth



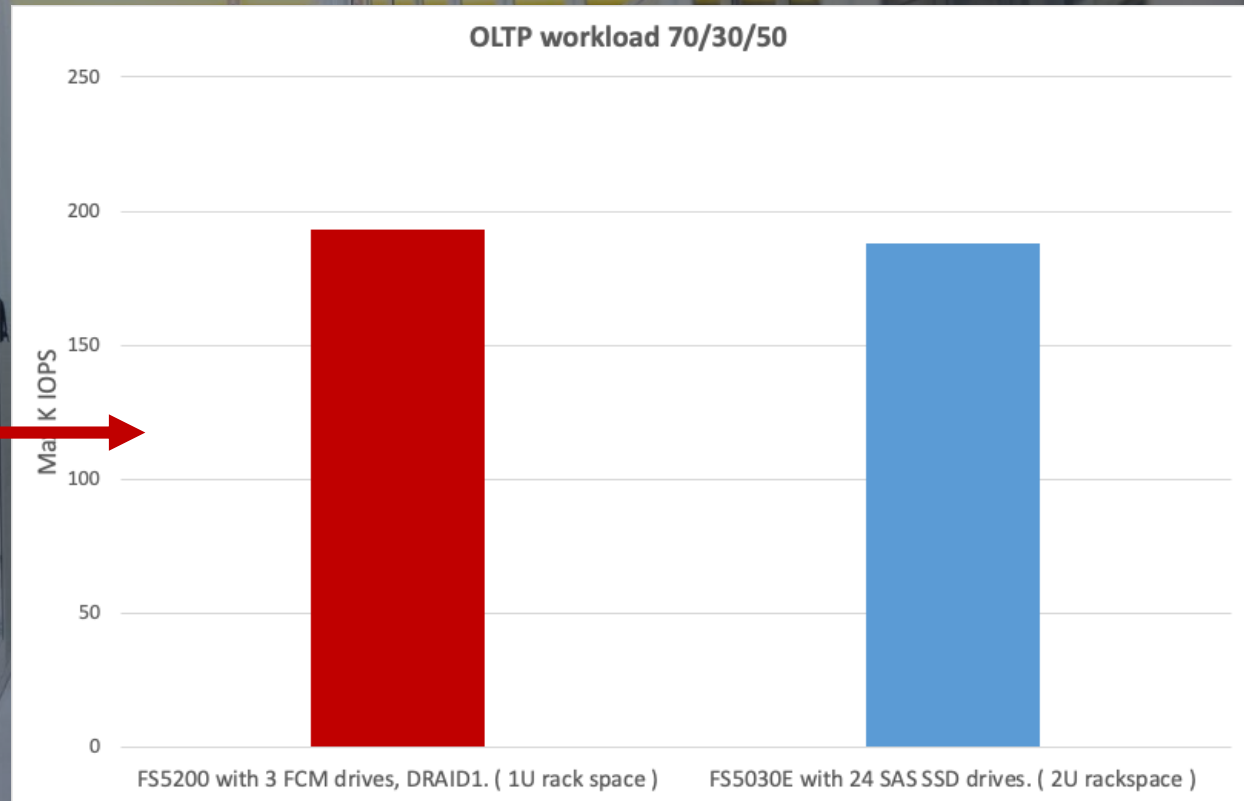
### OLTP (16KB) 70/30/50



# Entry-level FS5200 configuration

FlashSystem 5200 with only 3 NVMe FlashCore Modules delivers the same OLTP performance as FlashSystem 5030E with 24 SAS SSD drives.

FS5200 with only 3 drives reduces cost and rack space.



A photograph of a server room with rows of server racks. The racks are white with glass doors. In the background, several people are walking through the aisle. The ceiling has yellow lighting fixtures. The image is overlaid with a semi-transparent dark blue and yellow graphic at the top and bottom.

# Top Features (in my humble opinion)

# Simplify and reduce cost

*Modernization made Easy with nondisruptive migration included*



Built-in  
migration from  
over 500  
systems by  
IBM and all  
major vendors



- Save on management
- Save on rack space
- Save on power and cooling
- Save on network ports

# FlashSystem- simply flexible



	IBM FlashCore	NVMe Flash	Storage Class Memory	SAS Flash
Drive sizes	From 4.8 – 38.4TB	From 0.8 – 15.36TB	From 0.375 – 1.6TB	From 0.8 – 30TB
Protocol	NVMe	NVMe	NVMe	Serial Attach SCSI
	FlashSystem 5200	FlashSystem 5200	FlashSystem 5200	FlashSystem 5200

Host Connection Protocol	Number of cards per controller	Ports per card	Max ports per dual-controller system
32Gb Fibre Channel with NVMe-oF	2	2	8
16Gb Fibre Channel with NVMe-oF	2	4	16
10/25Gb Ethernet (RoCE v2)	2	2	8
10/25Gb Ethernet (iWarp)	2	2	8
10Gb Ethernet (iSCSI)	1	4	8
SAS	1	4	8

# IBM FlashCore Modules

- Unique IBM flash technology
- Hardware compression with no performance impact
- Hardware encryption with no performance impact



90%

In 2020, IBM clients chose FlashCore Modules for 90% of their FlashSystem flash capacity

Zero

Number of FlashCore Modules that have ever worn out

Guaranteed

reduction up to 5:1 highest performance 2:1 with IBM FlashCore

## Smart data placement

Position the most active data in SLC flash for highest performance

With drives up to 38.4TB, QLC flash provides the highest density available reducing rack space and lowering cost\*

- \*Note: DRAID1 not available for 38.4TB FCM

# IBM Storage...

*helping developers build once and  
deploy anywhere*

Support your operations and  
development environments

**Consistently automate tasks**  
One Platform with common APIs  
and tools

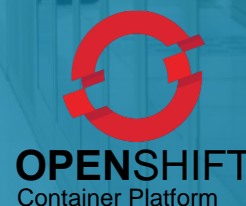
The VMware logo, featuring the word "vmware" in a lowercase, sans-serif font with a registered trademark symbol, set against a white rectangular background.

VASA, vVol, SRM



PowerVC  
PowerVM

## Container Support and Integration



These systems are  
simple...  
to orchestrate

Avoid risk and  
uncertainty  
everyone doing things  
their own way

Consistently automate  
tasks  
developers accomplish  
goals without needing  
infrastructure expertise

Ansible playbook integration



ANSIBLE



**RED HAT**<sup>®</sup>  
**ANSIBLE**<sup>®</sup>  
Automation

# These systems are simple... to support

Support process automation to enable faster resolution of issues

- Delivered securely from the IBM Cloud
- Watch the demo
- [ibm.biz/insightssupport](https://ibm.biz/insightssupport)

The screenshot displays the IBM support interface for a FlashSystem-AF7-9110-1. The dashboard includes a navigation bar with 'Dashboards', 'Insights', 'Resources', 'Groups', 'Reports', and 'Configuration'. A 'Get Support' button is highlighted in a yellow box. Below the dashboard, a modal window titled 'Get Support for FlashSystem-AF7-9110-1' offers two options: 'Create Ticket' (Report a problem to IBM) and 'Update Ticket' (Add log package to existing ticket). A 'Did you know?' section notes that log packages are automatically generated and sent to IBM. A second modal window, 'Create Ticket for FlashSystem-AF7-9110-1', shows the 'Collecting information for ticket' step, displaying system details with green checkmarks:

Storage system:	FlashSystem-AF7-91...	✓
Type:	FlashSystem 9100 - ...	✓
Serial number:	0000020421E003CA	✓
Version:	8.3.1.0 (build 150.15...	✓

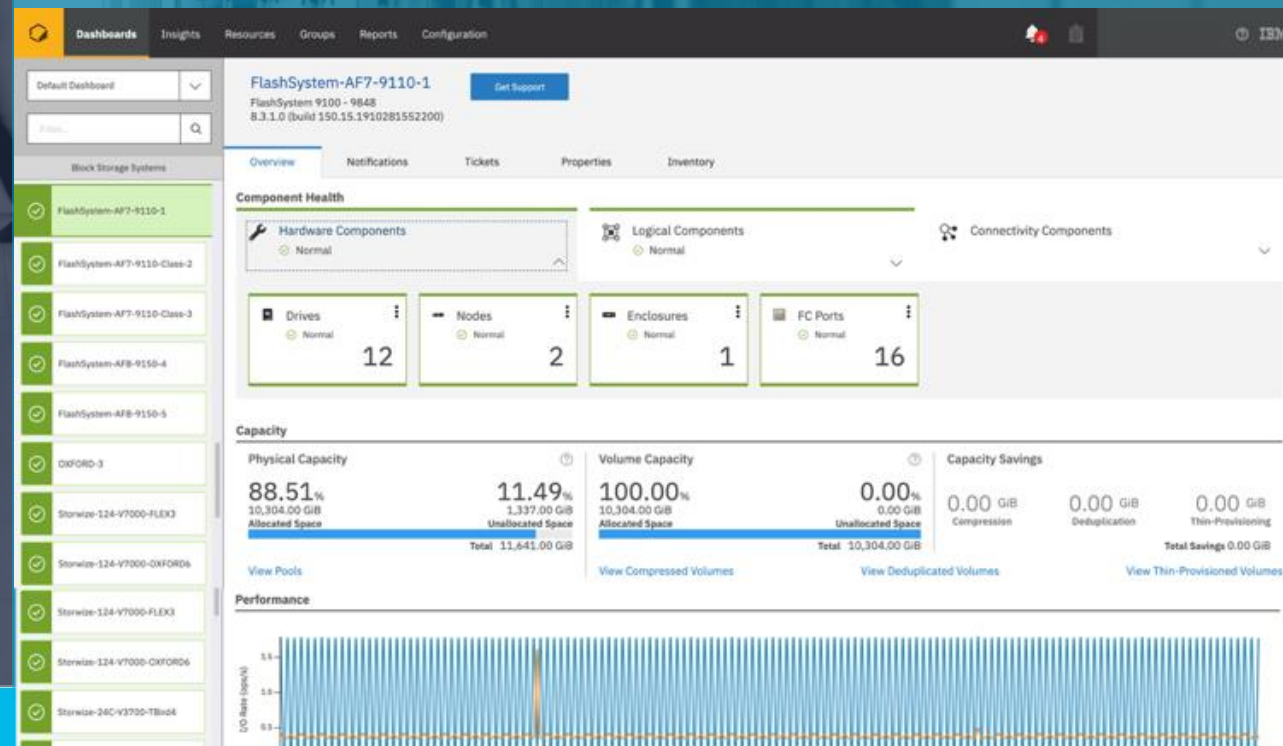
At the bottom, a progress indicator shows the current step is completed, with 'Back' and 'Next' buttons.

# These systems are simple... to monitor

Consistent operational view of all your storage

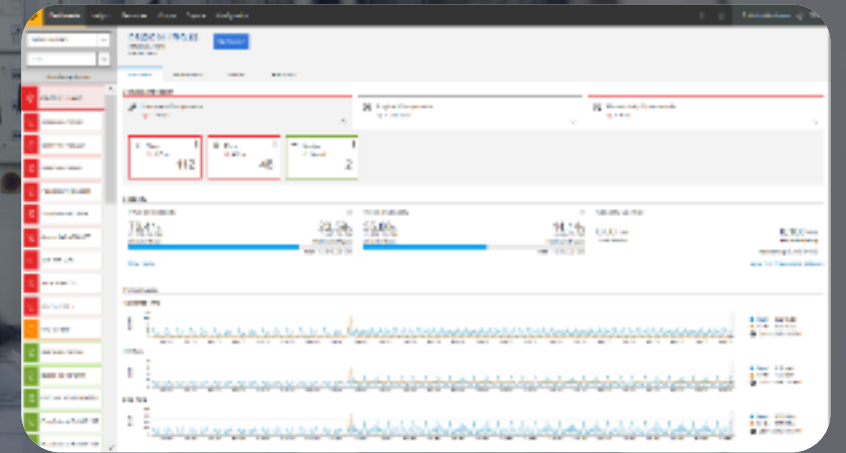
- Health
- Capacity
- Performance

Delivered securely from the IBM Cloud or on-premises



# How IBM Storage Insights addresses pain points

- Monitor all Storage Systems from across multiple datacenters from a single pane of glass.
- Improve the health of your Infrastructure with predictive alerts that include guidance to mitigate risks.
- Quickly find and fix issues with visual pointers to Systems that require immediate attention.
- Automatically send capacity and performance reports to multiple stakeholders at any frequency you choose
- IBM is now part of your operational team, maintaining Storage Insights on your behalf 24x7



# Making HA Affordable

IBM HyperSwap HA ultimate data resilience and business continuance



100% availability in the same space as other single systems

With more than just six nines availability, IBM FlashSystem 5200 delivers big-enterprise-level protection

Low cost high availability configurations with as few as 3 drives

Double systems without double cost\*



# FlashSystem solutions include replication

IBM Spectrum Virtualize provides **synchronous** replication known as

**Metro Mirror**

IBM Spectrum Virtualize provides **asynchronous** replication known as

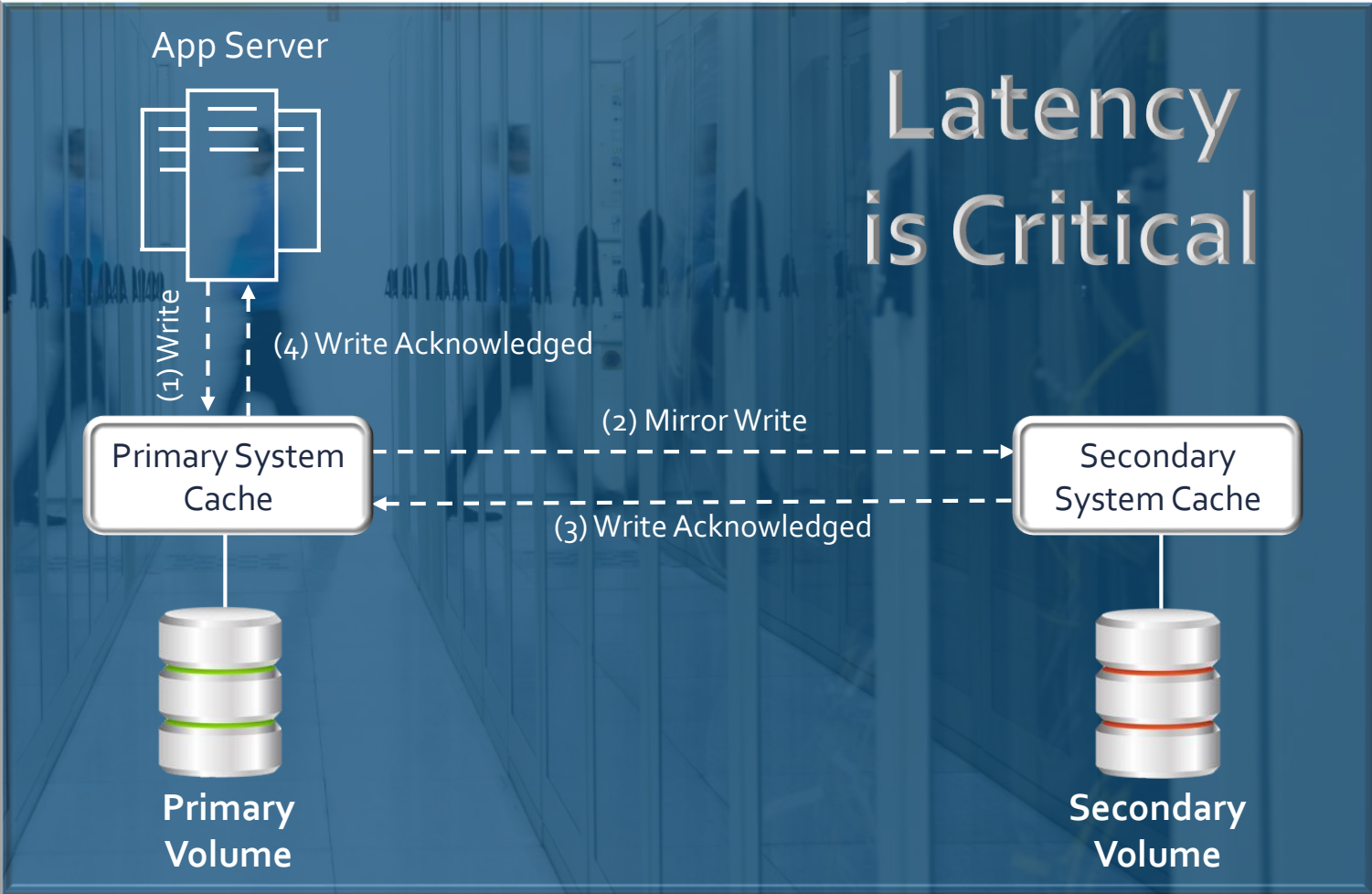
**Global Mirror**

IBM Spectrum Virtualize also has a periodic **asynchronous** replication mode known as

**Global Mirror with Change Volumes**

# Synchronous replication is part of all FlashSystem solutions

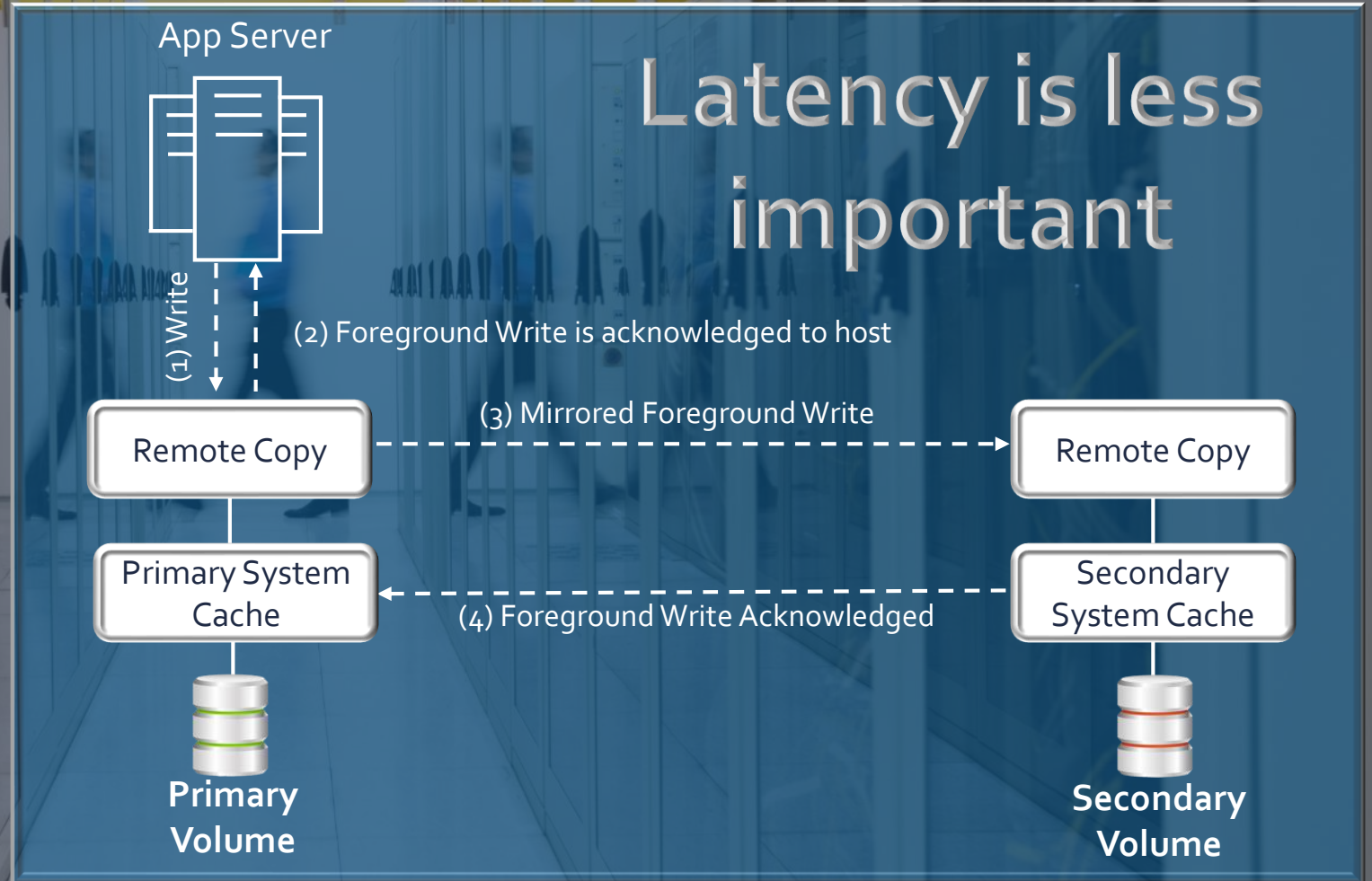
Synchronous replication is known as Metro Mirror



# Asynchronous replication is part of all FlashSystem solutions

Synchronous replication is known as Metro Mirror

Asynchronous replication is known as Global Mirror

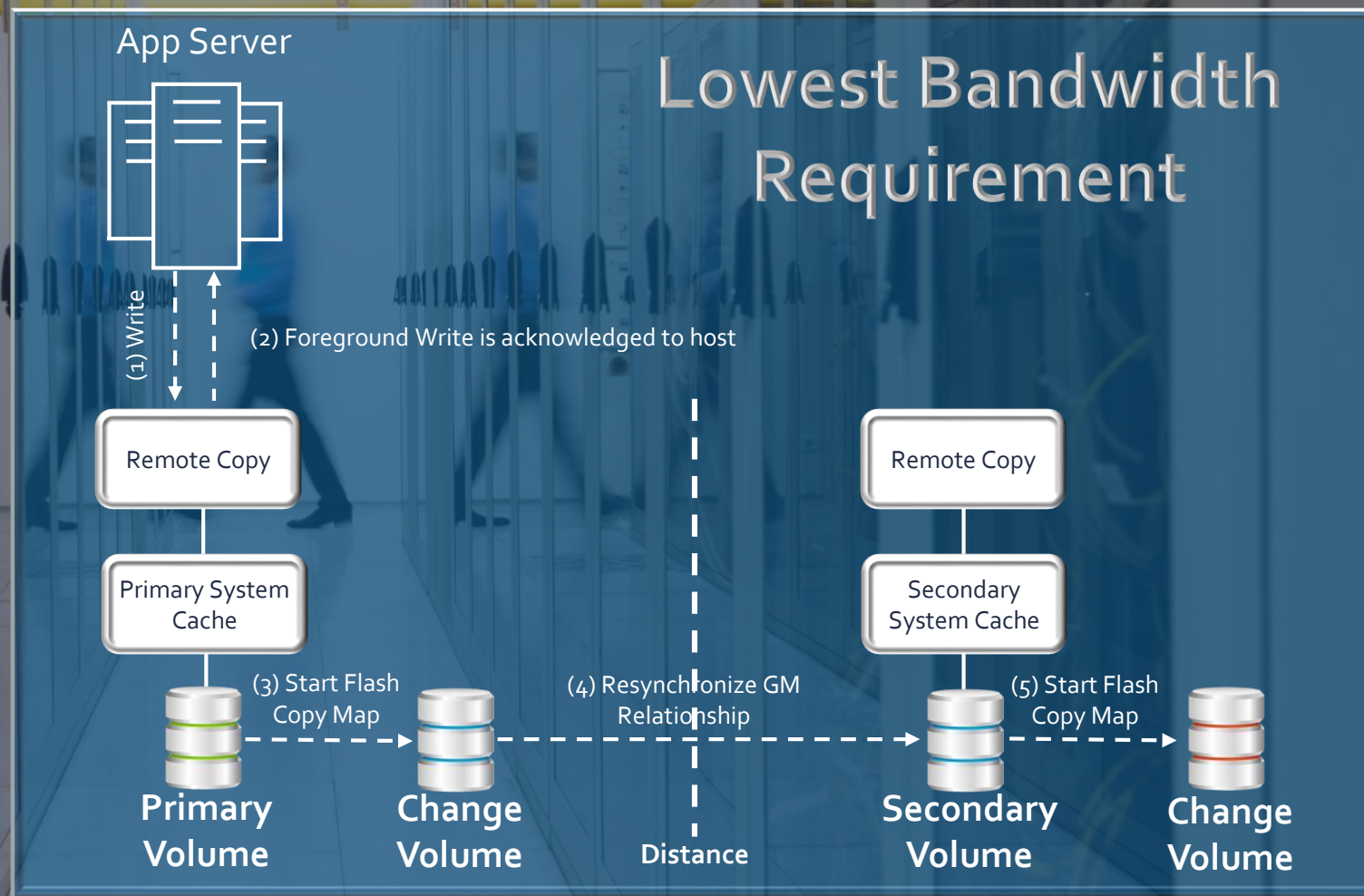


# Asynchronous with Change Volumes is part of all FlashSystem solutions

Synchronous replication is known as Metro Mirror

Asynchronous replication is known as Global Mirror

There is a periodic Asynchronous replication known as Global Mirror with Change Volumes (aka Cycle-Mode Global Mirror)



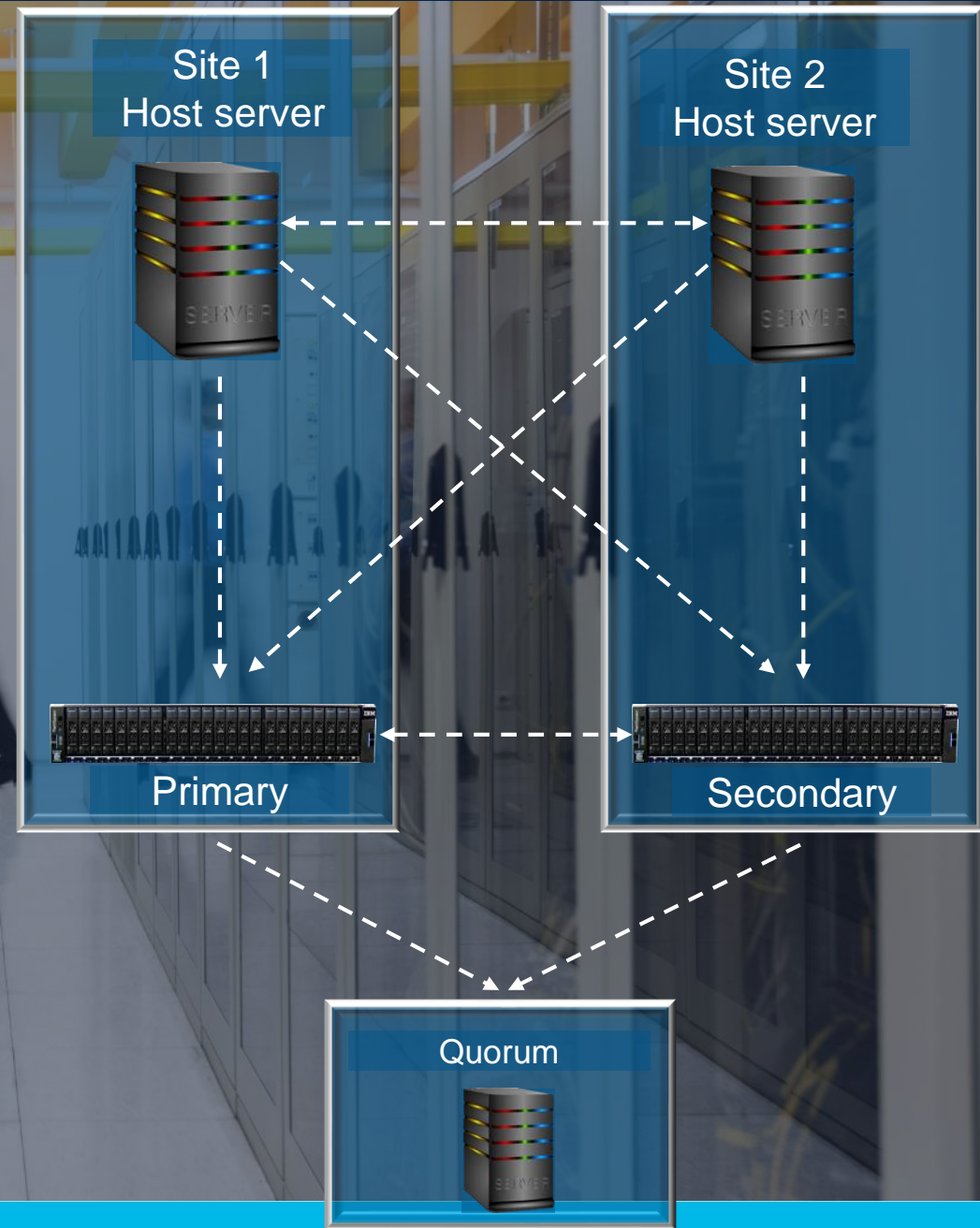
# Summarizing the differences between approaches

	Metro Mirror (MM)	Global Mirror (GM)	Global Mirror with Change Volumes
Typical RPO	0	< 5 minutes Typically 30 secs	Minutes/Hours
Typical RTO	Minutes	Minutes/Hours	Minutes/Hours
Sensitivity to bandwidth limitations	High	Medium	Low
Distance limit in kilometers	300	25000	25000

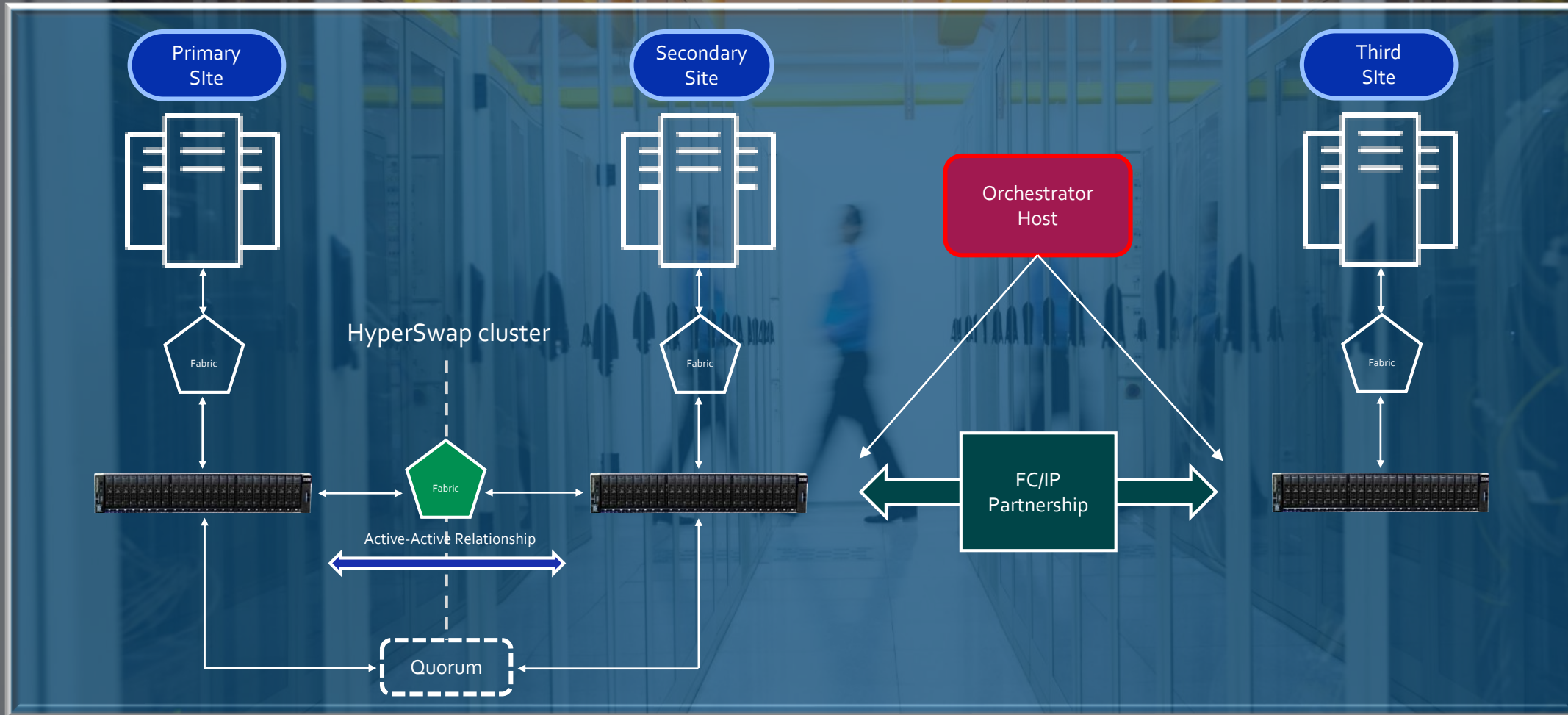
Remember, the choice of replication mode is typically more of a business decision than a technical decision.

# Up to 100% Availability with IBM HyperSwap

- Extreme availability (100%)
- Completely redundant
- Continuous data access
- Moves data without disruption
- Eliminate downtime costs



# FlashSystem 3-Site Data Protection for HA and DR

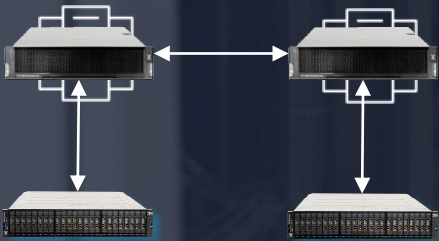


# IBM FlashSystem Data Resilience

SEDs – Self-encrypting Drives

Cryptographic erasure

**Enhanced High-availability**  
Zero RPO/RTO



Multi-Platform Support

**HyperSwap**  
Zero RPO/RTO



100% data availability guarantee

**Enterprise Disaster Recovery**  
>Zero RTO



2-site and 3-Site Options

Can be combined with HyperSwap

**Encryption**

FCM FIPS 140-2 Level 3



No performance impact

**Safeguarded Copy\***  
Immutable copies



Logical Air Gap

\*Not yet announced, coming soon

# Simple, innovative, flexible, safe and fast

HIGH-END



FlashSystem 9200



FlashSystem 9200R

MIDRANGE



FlashSystem 7200

ENTRY



FlashSystem 5200



FlashSystem 5035



FlashSystem 5015



IBM  
Spectrum  
Virtualize



IBM  
Storage  
Insights

# Key talking points

Cost

Performance

Reliability / Availability

Simplification of Storage

IBM FlashSystem delivers complete peace of mind -TODAY



Thank You