SERVICE EXPRESS

Enhancing Security, Resiliency, and Scalability with IBM FlashSystem Storage

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In 2008, IBM i became a stand-alone OS that ran on IBM Power Systems

Greatest OS on the Planet

Most Powerful Servers on the planet

Greatest OS on the Planet

Power Systems

Most Powerful Servers on the planet

IBM Storage

An amazing and robust storage platform!

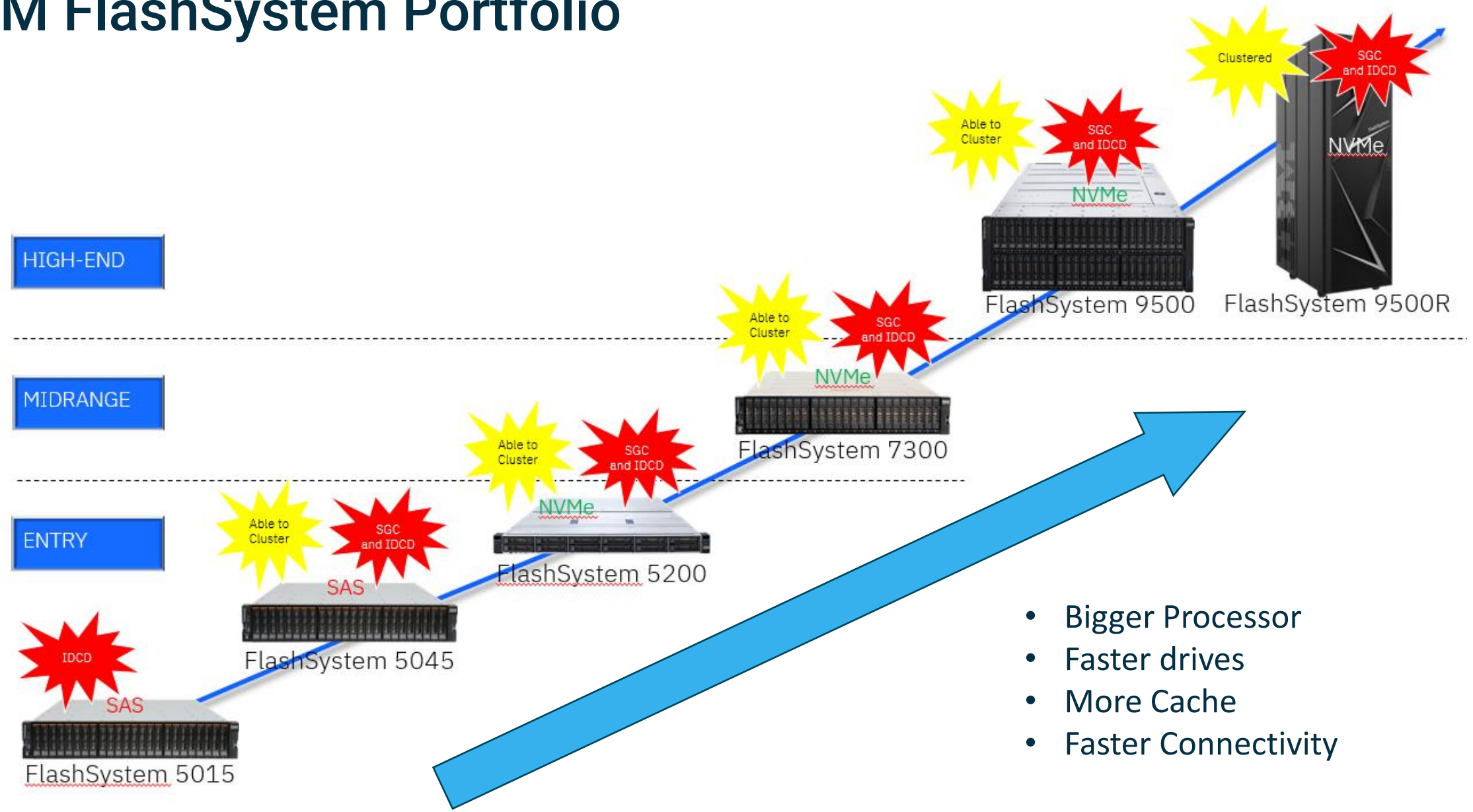
SAN Storage

SAN Control Enclosure

Storage Disks & Modules

Storage Software

IBM FlashSystem Portfolio



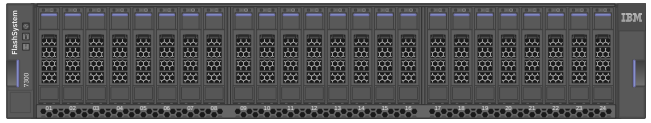
- Bigger Processor
- Faster drives
- More Cache
- Faster Connectivity

Rack density

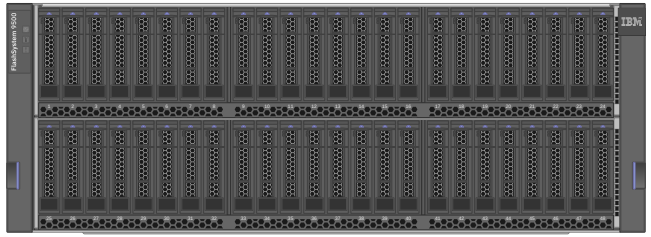
FS5015
Max usable (DRAID) control enclosure: 573TB
SAS SSDs and SAS HDDs

FS5045
Max usable (DRAID) control enclosure: Up to 2.8PB (With 5:1 via DRP)
SAS SSDs and SAS HDDs

FS5300
Max usable (DRAID) control enclosure: 1PB (3:1 Data reduction via FCM)
SAS SSDs, SAS HDDs, NVMe SSD’s, FCM’s, SCM



FS7300
Max usable (DRAID) control enclosure: 2.3PB (3:1 Data reduction via FCM)
SAS SSDs, SAS HDDs, NVMe SSD’s, FCM’s, SCM



FS9500
Max usable (DRAID) control enclosure: 4.5PB (3:1 Data reduction via FCM)
SAS SSDs, NVMe SSD’s, FCM’s, SCM

FlashSystem 5000 - Key differences

FlashSystem 5015

2U height, AC or DC power
SAS back-end → 24x SAS SSD / 10k RPM HDD or
SAS back-end → 12x NL-SAS HDD
2-core Broadwell DE CPUs
64GB cache max
4x 1GbE on-board ports
8x host ports max – 16Gb FC / 10GbE* / 12Gb SAS
2,048 volumes
2,048 FlashCopy mappings
4PiB FlashCopy capacity
Inline threat detection – controller only

FlashSystem 5045

2U height, AC or DC power
SAS back-end → 24x SAS SSD / 10k RPM HDD or
SAS back-end → 12x NL-SAS HDD
6-core Broadwell DE CPUs
64GB cache max
4x 10GbE on-board ports
8 host ports max – 16Gb FC / 10GbE* / 12Gb SAS
8,192 volumes
8,191 Snapshots
4PiB Snapshot capacity
Inline threat detection – controller only
Encryption
Volume Group Snapshots - Safeguarded copy, Internal Scheduler
HyperSwap

FlashSystem 5300

1U height, AC power
NVMe back-end → 12x NVMe FCM / SSD / SCM
Inline compression with FCM
12-core Ice Lake CPUs with QAT
512GB cache max
4x 25/10GBE flexible on-board ports with options:
- SFP28, SFP+, RJ45
16x host ports max – 32Gb FC / 10GbE or 8x 64GbFC
8,192 volumes
15,863 Snapshots
10PiB Snapshot capacity
Inline threat detection + RTD – Controller and FCM4
Encryption + Secure Boot
Volume Group Snapshots - Safeguarded copy, Internal Scheduler
HyperSwap + PBHA
PBR
Storage Insights Integration
Embedded VASA Provider
Vvols replication
NVMe over FC or TCP
TCT

IBM FlashSystem 5015

Inline Data Corruption Detection

Dual Active-Active Array Controllers with SAS to Flash Media
Dual-ported 2.5” SAS bays (24)

SAS SSDs and HDDs adhering to 2.5” industry standard form factor

FlashSystem 5015
One 2-core CPU for a total of 4-cores per system

Up to 64GB of cache per system

Up to two host adapter cards per system

Up to 400K IOPS and 8.0GB/s per system

IBM FlashSystem 5045

Dual Active-Active Array Controllers with SAS and Flash Media
Dual-ported 2.5” SAS bays (24)

SAS SSDs and HDDs adhering to 2.5” industry standard form factor

Safeguarded Copy and Ransomware Threat Detection

FlashSystem 5045
One 6-core CPU for a total of 12-cores per system

Up to 64GB of cache per system

Up to two host adapter cards per system

Up to 1.2M IOPS and 12GB/s with ability to cluster 2-ways

Canister LEDs

USB Port

Dedicated Technician port (always on)

Management and I/O ports (10GbE)

Onboard 12Gb SAS (expansion)

Battery LEDs

Optional HIC

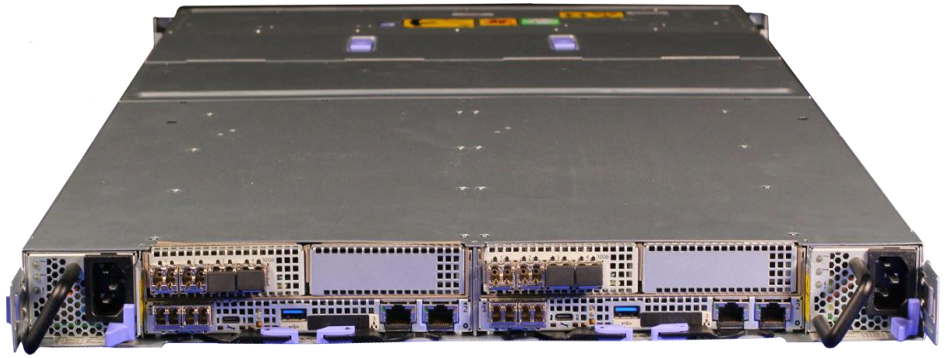
FlashSystem FS5300

~1.45x IOPS

1.3x Gb/s

1 rack unit

Front



Rear

- Holds up to 1.3PB of raw effective capacity.
- Supports up to 16-32Gb/s or 8-64Gb/s Fibre Channel ports.
- Comes with built-in 10/25Gb/s Ethernet ports
- Includes SW-based ransomware threat detection (RTD) and typically also has HW-based RTD

IBM FlashSystem 7300

Dual Active-Active Array Controllers with 24 dual-ported NVMe Flash bays

- Two 10-core Cascade Lake CPUs per controller
- 40-cores per system
- Up to 1.5TB of cache per system
- Up to 3.5M IOPS and 50GB/s per system
- Ability to cluster multiple systems (4)
- Up to 12 Storage Class Memory (SCM) drives to accelerate workloads
- Up to 24 NVMe FCM3 with hardware Compression and Encryption
- Up to 24 NVMe industry standard SSDs
- Ability to intermix all three drive types within the control enclosure
- FlashSystem 7300 delivers 99.9999% uptime
- FlashSystem 7300 delivers Ransomware Threat Detection

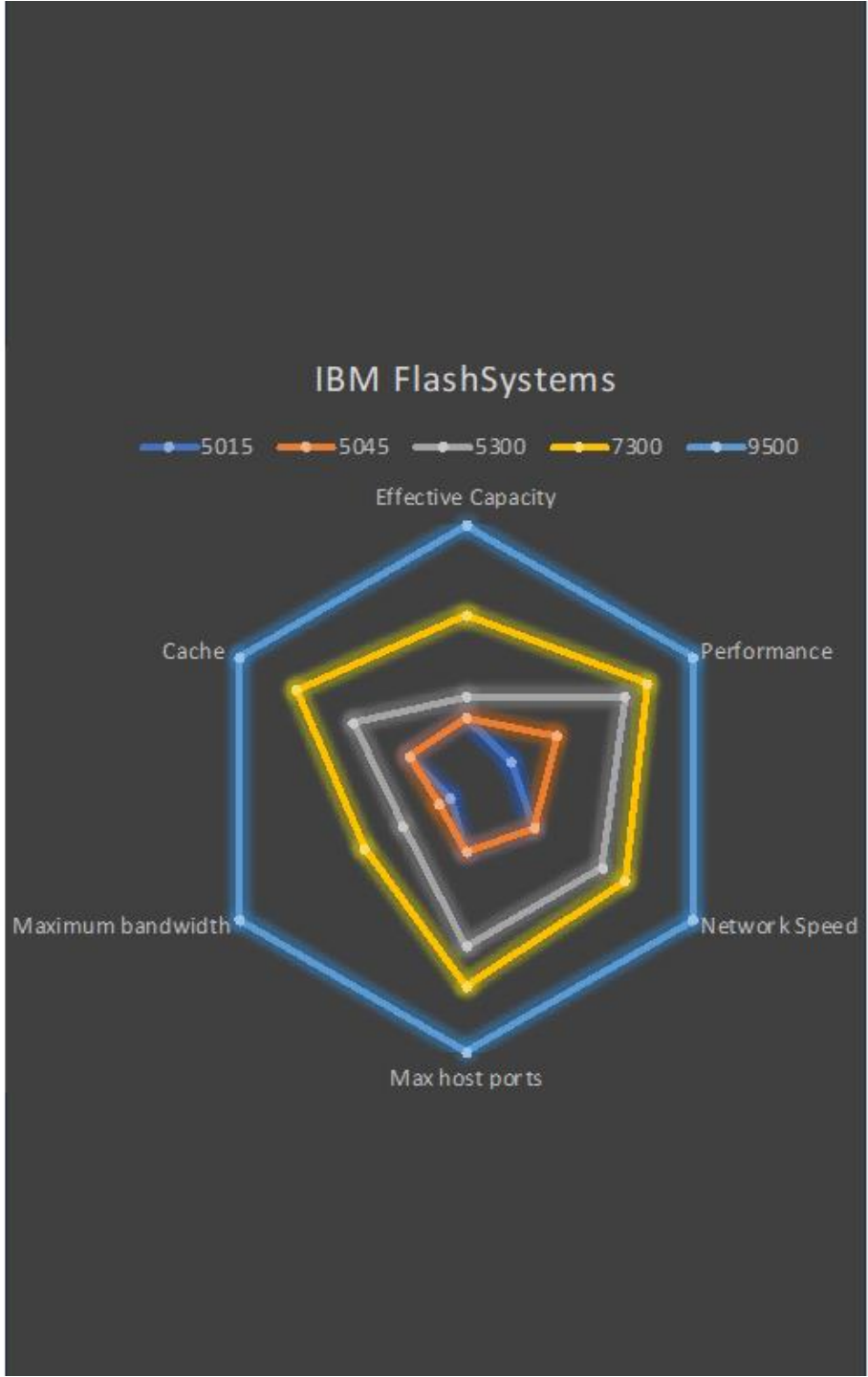
IBM FlashSystem 9500

Dual Active-Active Array Controllers with 48 dual-ported NVMe Flash bays

- Two 24-core Ice Lake CPUs per controller
- 96-cores per system
- Up to 3TB of cache per system
- “Hero Numbers” are up to 8M IOPS and 100GB/s per system
- Ability to cluster multiple systems
- Up to 12 Storage Class Memory (SCM) drives to accelerate workloads
- Up to 48 NVMe FCM4 with hardware Compression and Encryption
- Up to 48 NVMe industry standard SSDs
- Ability to intermix all three drive types within the control enclosure
- FlashSystem 9500 / 9500R deliver 99.9999% uptime
- FlashSystem 9500 delivers Ransomware Threat Detection and Quantum Safe Encryption

IBM FlashSystems	Entry Hybrid SAS options	Entry NVMe All-Flash	Mid-Range NVMe All-Flash	High-End NVMe All-Flash
Product specifications	**IBM Storage FlashSystem 5000**	**IBM Storage FlashSystem 5300**	**IBM Storage FlashSystem 7300**	**IBM Storage FlashSystem 9500**
Maximum bandwidth (reads)	12 GB per second	28.6 GB per second	50 GB per second	100 GB per second
Response times (reads)	< 70 microseconds	< 50 microseconds	< 50 microseconds	< 50 microseconds
Effective maximum capacity within single enclosure*	570 TBs (2U enclosure)	1.8 PBe (1U enclosure)[5]	3.8 PBe (2U enclosure)	7.9 PBe (4U enclosure)
Processor/PCIe Gen	Intel Broadwell DE	Intel Ice Lake, Gen 4 PCIe	Intel Cascade Lake, Gen 3 PCIe	Intel Ice Lake, Gen 4 PCIe
Maximum front-end host ports	8	16	24	48
FlashCore Module capacities supported	Not applicable ((supports industry standard modules)	4.8, 9.6, 19.2 and 38.4 TB	4.8, 9.6, 19.2 and 38.4 TB	4.8, 9.6, 19.2 and 38.4 TB
Use cases	- Server and desktop virtualization - Production and development databases - Containers - Data center edge	- SAP - Oracle - Server and desktop virtualization - Production database - Containers - Workload consolidation	- SAP - Oracle - Server and desktop virtualization - Production database - Containers - In-memory database	- SAP - Oracle - Server and desktop virtualization - Production database - Containers - In-memory database

[5] Results based on 1U control enclosure: 12 drives of 38.4TB each = 460.8TB configured in a 9+Q+P+S DRAID-6 array, after RAID overhead and metadata provisioning, deliver 302.12TB of usable capacity, with a 3:1 compression and 2:1 deduplication ratio equal 1.81PB of effective capacity.



FlashSystem features comparison

Features/Abilities	FlashSystem 5300	FlashSystem 7300	FlashSystem 9500
Required rack units	1	2	4
# & type of CPUs /# of cores per system	2x Ice Lake CPUs Total of 24 Cores	4x Cascade Lake CPUs Total of 40 Cores	4x Ice Lake CPUs Total of 96 Cores
Max # of drives in control enclosure	12	24	48
Drive types in control enclosure	NVMe SSD, FCM, SCM	NVMe SSD, FCM, SCM	NVMe SSD, FCM, SCM
Drive Types in expansion enclosure	SAS SSD, SAS HDD	SAS SSD, SAS HDD	SAS SSD
Max number of drives supported	416	832	464
Software Ransomware Threat Detection	Yes	Yes	Yes
Hardware Ransomware Threat Detection	Yes, with FCM4s	Yes, with FCM4s	Yes, with FCM4s
Supports PBR and PBHA	Yes	Yes	Yes
Supports Safeguarded Copy	Yes	Yes	Yes
Volume Count and total capacity of Snaps	15,864 / 10PiB	32,100 / 20PiB	65,000 / 40PiB
Secure & Trusted Boot	Yes	-	Yes
Externally accessible batteries	-	-	Yes
Externally accessible boot drives	-	-	Yes
Externally accessible card cages	-	-	Yes
Number of HBA expansion card slots	4	6	12
Built in 10/25GbE ports	4 – 10/25	4 – 10Gb	0

FlashSystem features comparison

Features/Abilities	FlashSystem 5300	FlashSystem 7300	FlashSystem 9500
Power	AC (2x 1500W PSU)	AC (2x 2000W PSU)	AC (4x 2000W PSU)
Max performance (Hero numbers)	2.2M IOPS 28GB/s	3.5M IOPS 45GB/s	8M IOPS 100GB/s
Expert Care	Basic, Advanced, Premium	Basic, Advanced, Premium	Advanced, Premium
External Storage Virtualization	Yes	Yes	Yes
Dedicated 1Gb Management Port	Yes	-	Yes
Clustering	2-Way	4-Way	2-Way
Host Mappable Volumes	8192	15,864	15,864

Disk options

	SAS HDD	SAS SSD	NVMe SSD	FlashCore Module	SCM SSD
Type of Media	Rotating Media	3D NAND	3D NAND	96-layer NAND	Optane, zSSD
Protocol	SCSI	SCSI	NVMe	NVMe	NVMe
Physical Size	2.5”	2.5”	2.5”	2.5”	2.5”
Capacities	2TB – 20TB	1.92TB – 30TB	800GB – 15.36TB	4.8TB – 38.4TB	375GB – 1.6TB
Differentiator	None	None	None	Compression, Encryption	Ultra low Latency
Speed	3ms - 5ms	<1ms	150µs - 250µs	70µs - 100µs	~15µs

NVMe SSD's

SAS BUS INTERFACE

PCIe BUS INTERFACE

	SAS HDD	SAS SSD	NVMe SSD	FlashCore Module	SCM SSD
Type of Media	Rotating Media	3D NAND	3D NAND	96-layer NAND	Optane, zSSD
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SOLID STATE - Non Volatile Storage
(FLASH STORAGE)

Bus interfaces

SAS (serial attached SCSI)

- SAS doubles the SATA transfer rate (up to 12 Gb/s)
- Operate between 7200 rpm and 15000 rpm.
- Better mean time to failure.
- Generally, more expensive and suited for use in servers.
- Typically used in enterprise servers.

PCIe (PCI Express)

- Originally designed as an interface for linking motherboard-mounted peripherals (Graphics cards, Network cards)
- Minimal latency, high bandwidth, and high performance.
- Enables SSDs to blaze past the SATA & SAS limitation.
- Specification optimized for NAND flash and next-generation solid-state technologies.

SAS SSD's

SAS BUS INTERFACE

PCIe BUS INTERFACE

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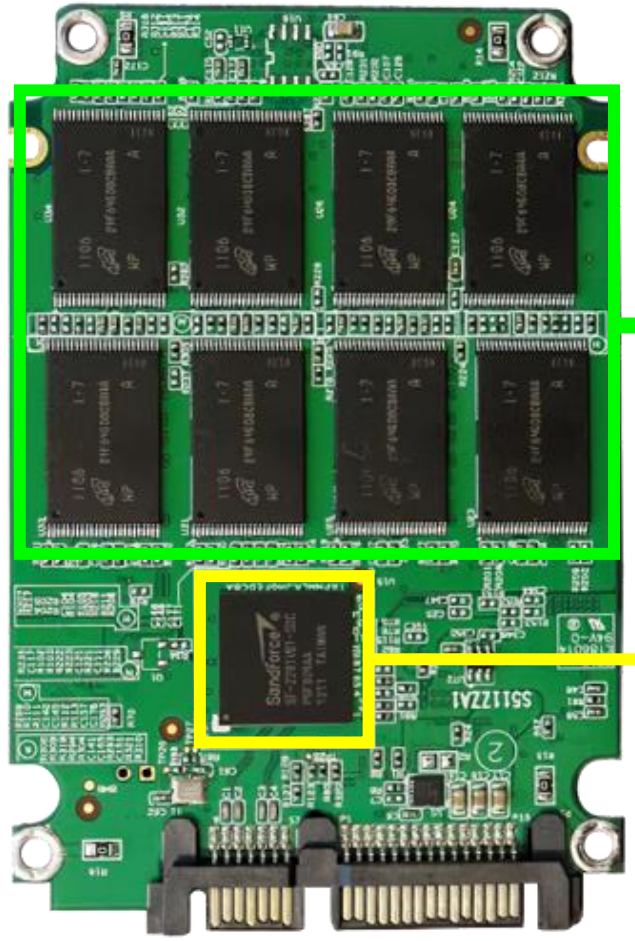
SOLID STATE - Non Volatile Storage
(FLASH STORAGE)

SAS SSD's

2.5" SFF

- SSD has lower latency, faster read/writes, and supports more IOPs (input output operations per second) compared to HDD.
- Use less power and do not generate heat or noise.
- SSD has no moving parts; it is essentially a memory chip.
- Requires additional blocks of storage to replace sectors that burn out.
- Measured in drive writes per day.



NVMe SSD's

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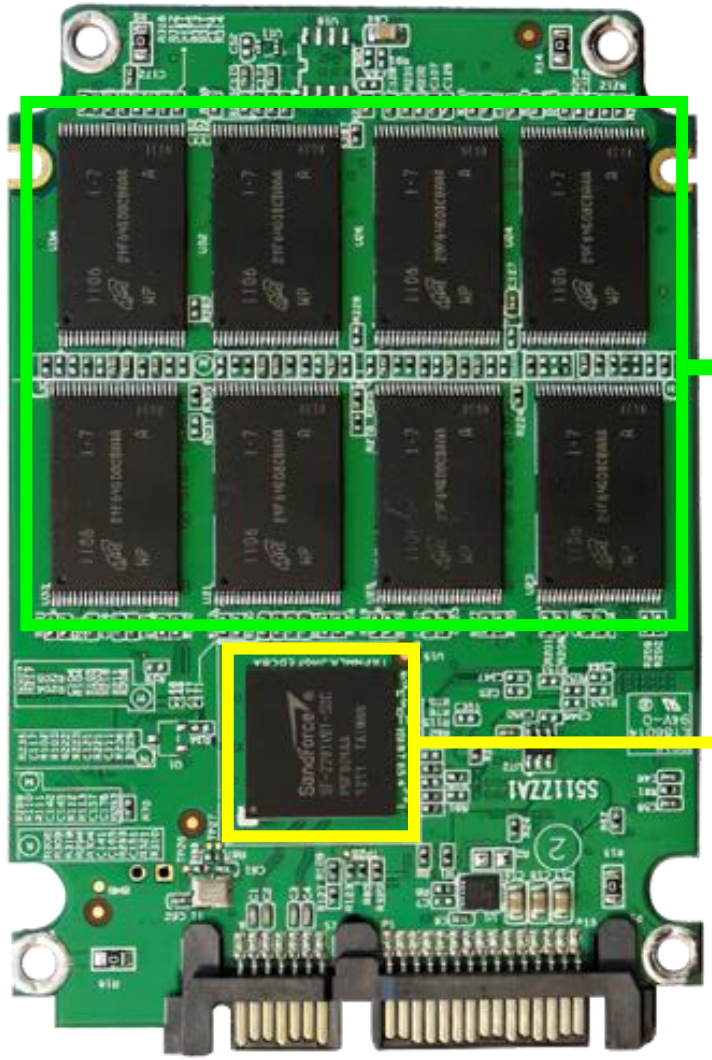
SOLID STATE - Non Volatile Storage (FLASH STORAGE)

NVMe SSD’s

- Use the same exact NAND Flash as what we saw in the SAS SSD.
- The difference in performance is because of the NVMe PCIe vs SAS interface.
- Requires additional storage to replace burned out sectors.
- Life span measured in drive writes per day.



FlashCore Modules

SAS BUS INTERFACE

PCIe BUS INTERFACE

FlashCore Module

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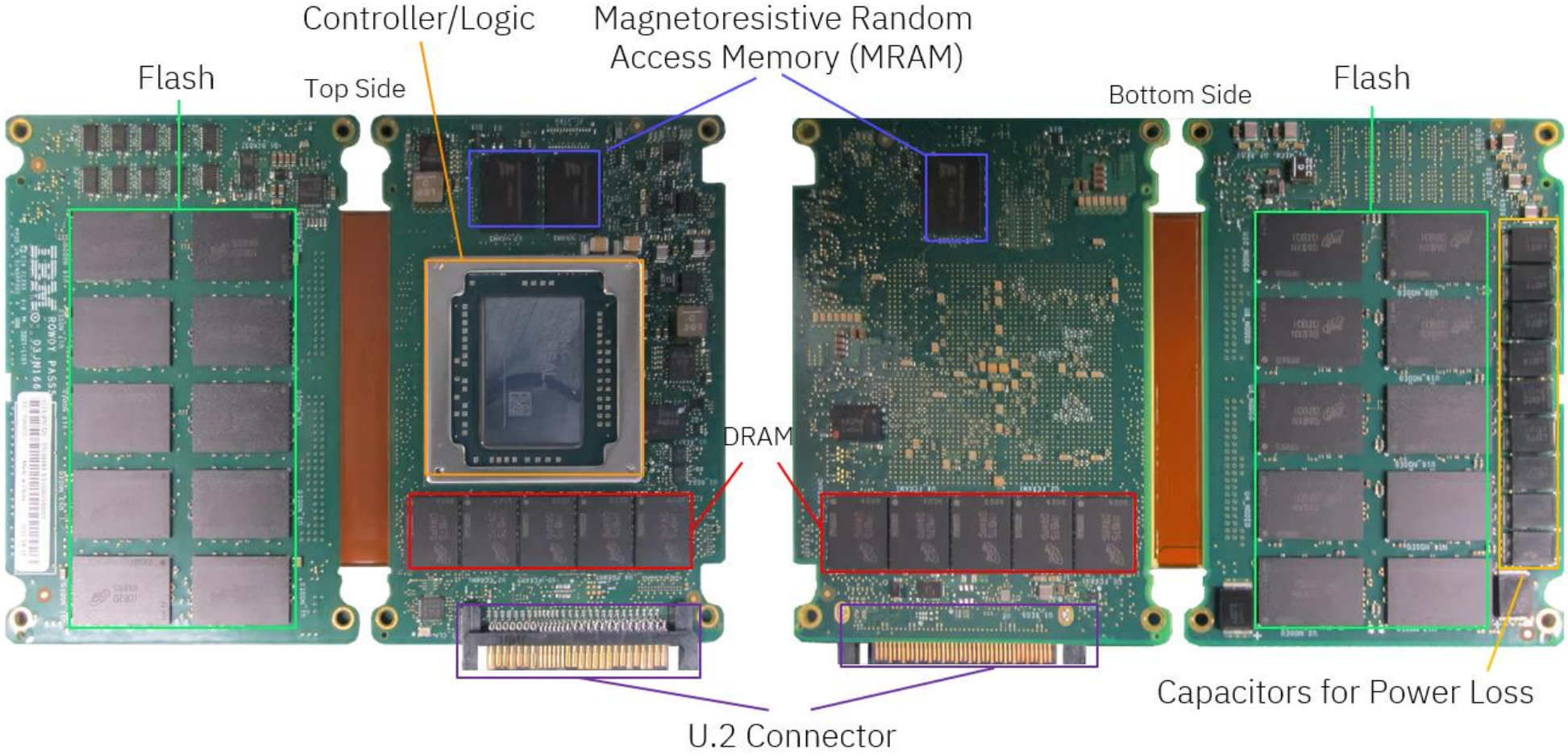
SOLID STATE - Non Volatile Storage (FLASH STORAGE)

IBM Flashcore Modules

- Hardware compression and encryption with no performance penalty.
- Special access to the Flash cells
- Continually assesses health of each block.
- Highest capacity flash drive available in the market
- High-performance, high reliability flash
- Ransomware threat detection

Technically Superior FlashCore Modules



Side-by-side comparison of FCM and SSD

FRONT

BACK

Abilities	FCM	SSD
Extensive Built-in Encryption	✓	✗
Extensive Built-in Compression	✓	?
Extensive Health Binning	✓	✗
Extensive Heat Segregation	✓	✗
Variable Voltage	✓	✗
Variable Stripe RAID (Intra Module RAID)	✓	✗
~70µs latency	✓	✗

2.5” SFF

SERVICE EXPRESS

Flashcore 3 to 1 Compression

- Built-in hardware-based data reduction delivers up to 3-to-1 compression with no performance penalty.

This amount of physical capacity purchased…		…delivers up to this amount of effective capacity
FCM4 – 4.8TB	>>>	14.4TB*
FCM4 – 9.6TB	>>>	28.8TB
FCM4-19.2TB	>>>	57.6TB
FCM4-38.4TB	>>>	115TB

SCM (Storage Class Memory)

SAS BUS INTERFACE

PCIe BUS INTERFACE

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SOLID STATE - Non Volatile Storage (FLASH STORAGE)

SCM (Storage Class Memory)

- Combines properties of both storage and memory.
- Uses persistent memory to improve the endurance/speed
- Different type of flash to achieve groundbreaking performance.
- Small capacities and high price
- Massive improvement in performance (IOPS)
- Typically used with tiered storage like Easytier.

- SCM blurs the distinction between…

  Memory: Very fast, expensive, and volatile.

  Storage: Slow, Cheap, and non-volatile.
- Features of SCM

  Solid State (No moving parts).

  Short access times (within an order of magnitude of DRAM).

Storage Virtualize delivers common capabilities

- Internal Storage Virtualization
- External Storage Virtualization
- Virtual Disk Mirroring
- HyperSwap
- 3-Site Replication “ENHANCED”
- Metro Mirror - synchronous remote replication
- Global Mirror - asynchronous remote replication
- Global Mirror over IP - remote replication over the Internet
- Importing and exporting existing LUNs via Image Mode
- Unmap capability
- IBM Cloud Private
- Container support
- Thin Provisioning
- Fast-write cache
- Auto tiering (Easy Tier)
- Transparent Cloud Tiering
- Compression
- Deduplication
- FlashCopy (Snapshot)
- FlashCopy rollback
- Distributed RAID 1, 5 & 6
- Encryption of data at rest
- Data migration and pooling
- AI Predictive Analytics – SI/SI Pro

DRAID - Distributed RAID

Traditional RAID 6

Whatever the size of the RAID group, there will be two drives used for parity along with the likelihood of one drive set aside for a spare. In the event of a failure, all drives must write parity data to the spare which creates a bottleneck with the rebuild.

Distributed RAID 6

Whatever the size of the RAID group, there will be two parity drives as well as a spare but the capacity is included in the group rather than being a separate drive. All drives contribute to the overall performance of the RAID group. In the event of a failure, all drives simultaneously write parity data to the spare capacity, thus eliminating bottlenecks.

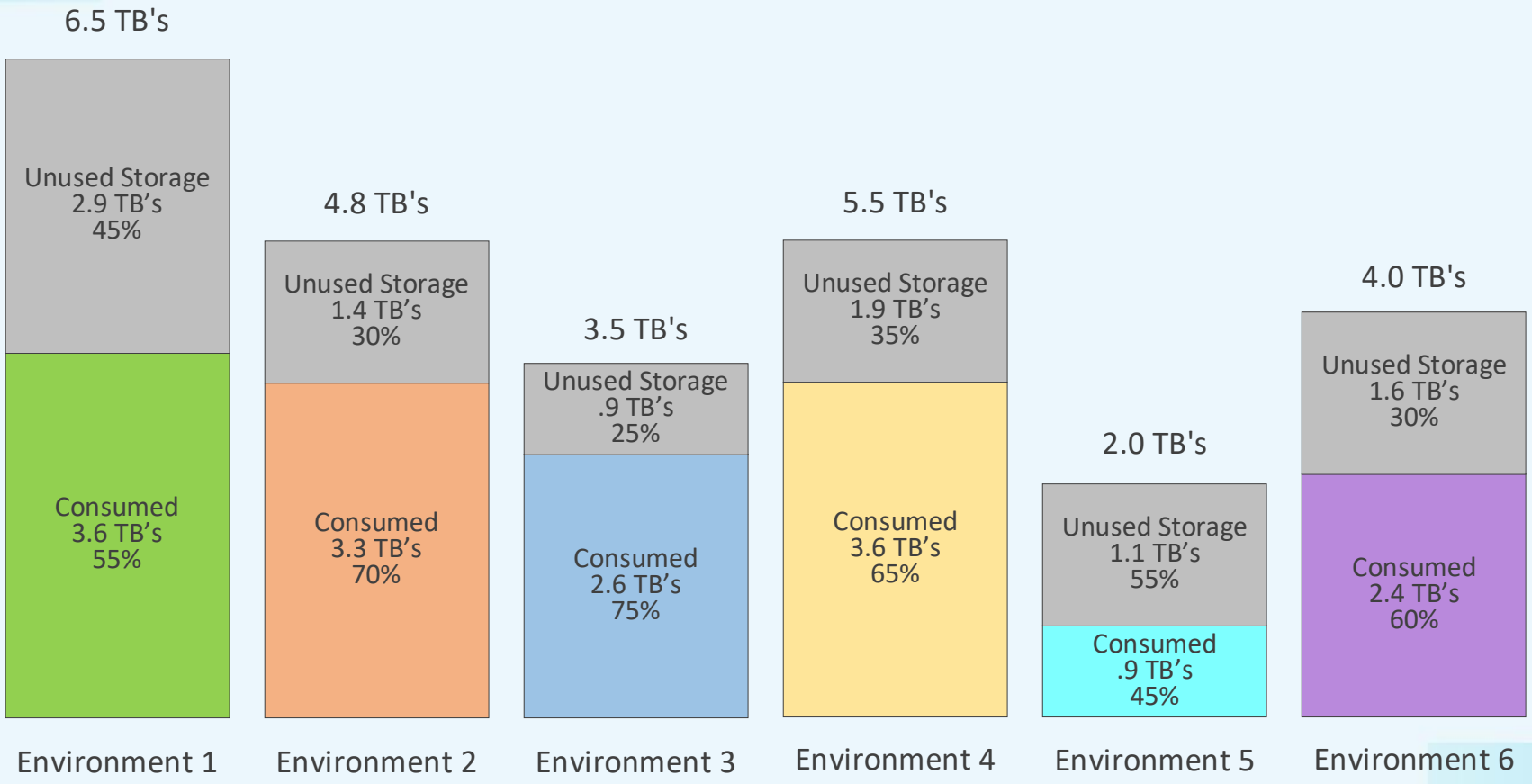
DRAID - Distributed RAID

- Enables all drives to contribute to performance, while Traditional RAID does not!
- 5-10X faster rebuild times compared to Traditional RAID
- RAID expansion is much easier then traditional RAID.
  - You can Non-disruptively grow existing RAID groups

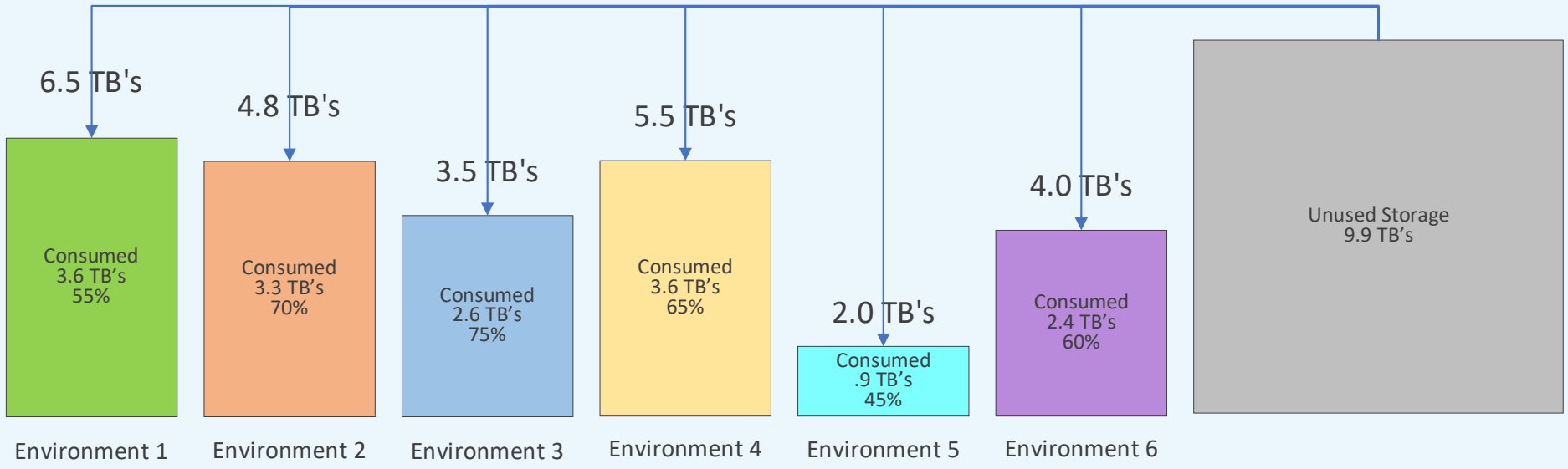
Thin Provisioning

- Virtual storage allocations instead of hard allocation.
- Tricks the environment into thinking it has more storage than it physically has.
- Allocates storage on demand as the partition needs it.
- Valuable for storage supporting multiple environments
- Save $$$
- IMPORTANT… Make sure there is storage to allocate when the environment needs it.

Typical Hard Storage Allocation



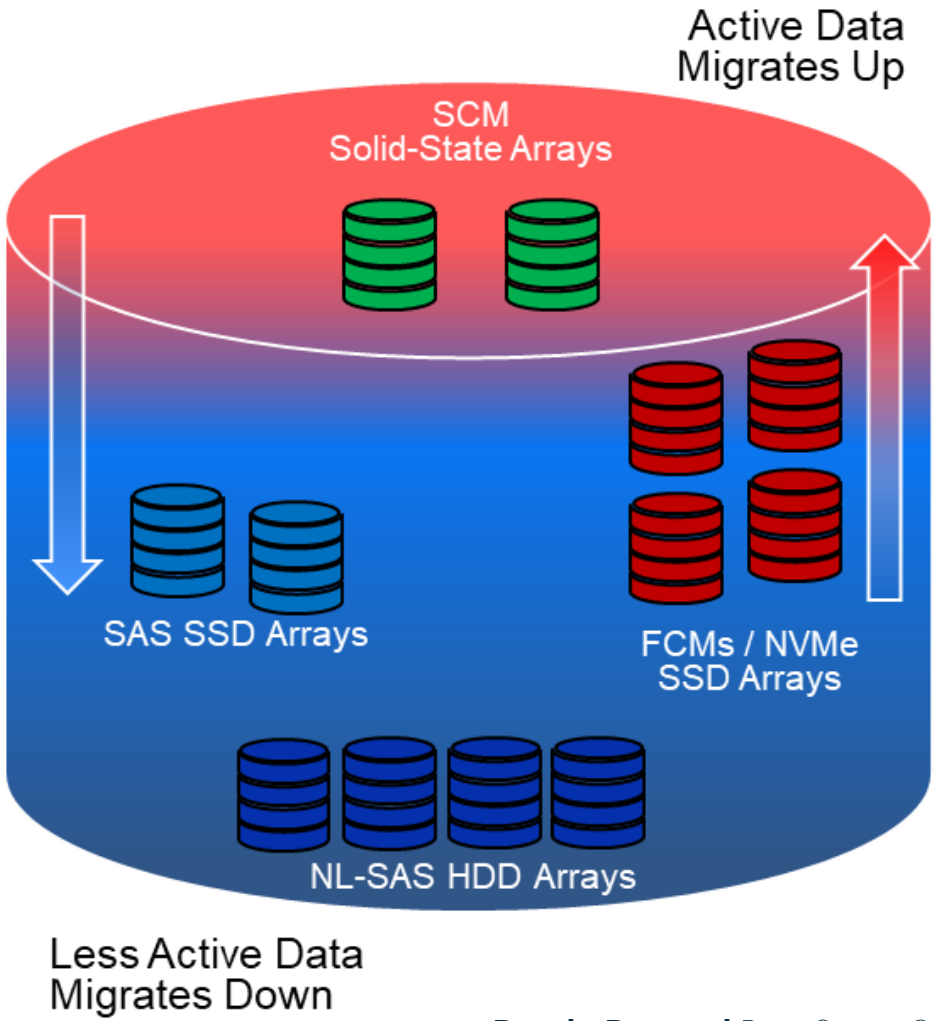
Thin Provisioned Storage



Easytier (Tiered Storage)

- "Easytier" (Mixing of Spinning and SSD Storage)
- Keeps costs under control, while delivering the right performance levels for active data
- AI based data placement to performance and cost optimize infrastructure
- Set it and forget it … unlike competitive tiering

IBM Easy Tier can improve performance up to 3x, using as little as 2% solid-state storage

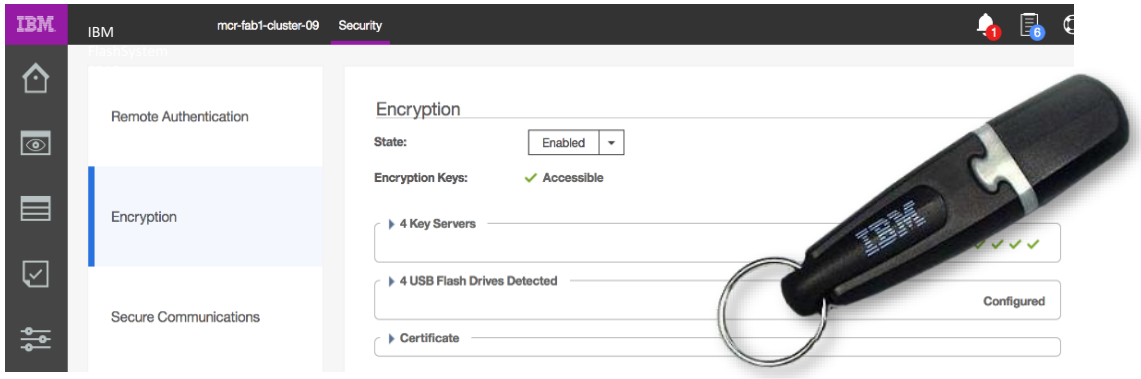


SAN – Multi tenant support

- SAN can provide storage cross platform and OS.
- Can serve up storage for IBM i and your x86 environments from a single storage device.
  - Should be on completely separate disk units.
- Centralized storage management.
- Cost savings.

SAN storage offers Encryption at rest

- Protects from the physical theft of the file system storage devices
- Helps to satisfy information security or regulatory requirements.
- No encryption in flight.
- Encryption master keys are stored in one of two ways.
  - **USB flash drives**
  - **A key server (SKLM)**



IBM FlashCore Module 4s (FCM4s)

Unique IBM flash technology

- Hardware compression with no performance impact
- Hardware encryption with no performance impact
- 100% of I/O is examined for Ransomware Threat Detection
- Ransomware alerting requires IBM Storage Insights Pro

90%

In 2023, IBM clients chose FlashCore Modules for 90+% of their FlashSystem flash capacity

Zero

Number of FlashCore Modules that have ever worn out

Ransomware Threat Detection

- “IBM’s storage solutions remain among the most technologically advanced on the market, making them ideal to protect critical enterprise data. The new ransomware detection features only solidify that position.”
- by “Steve McDowell in Forbes”

IBM FlashSystem Ransomware Threat Detection Pipeline

1.

IBM FlashCore modules collect and analyze detailed ransomware statistics from every I/O with no performance impact.

Built-in compression delivers up to 3x capacity

IBM Storage Virtualize

2.

IBM Storage Virtualize runs an AI engine on every FlashSystem that is fed ML models developed by IBM Research trained on real-world ransomware

The AI engine learns what's normal for the system and detects threats using data from FCM

IBM Storage Insights Pro

3.

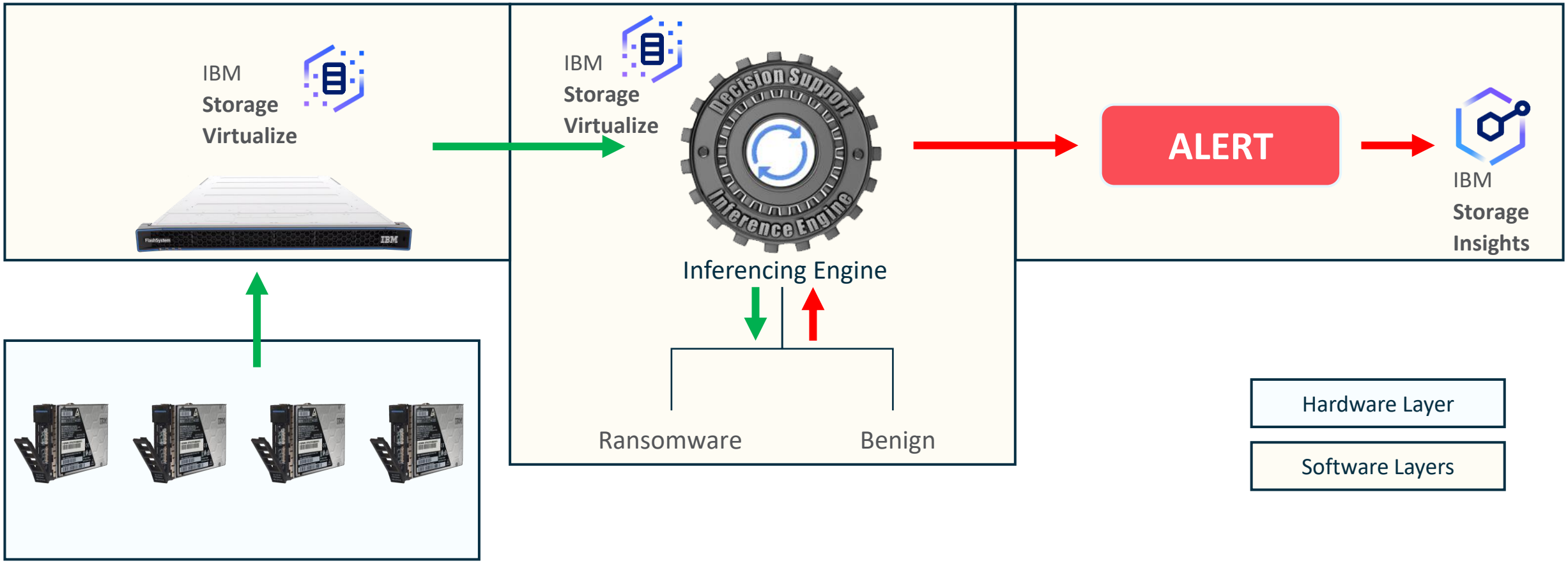
IBM Storage Insights Pro collects threat information from connected FlashSystems, alerts trigger SIEM/SOAR software to initiate a response

Statistics are fed back to IBM to improve ML models

Ransomware Threat Detection with Storage Virtualize

Proven Machine Learning (ML) model trained on real-world ransomware

Non-disruptive patchable updates to keep up with new attack patterns



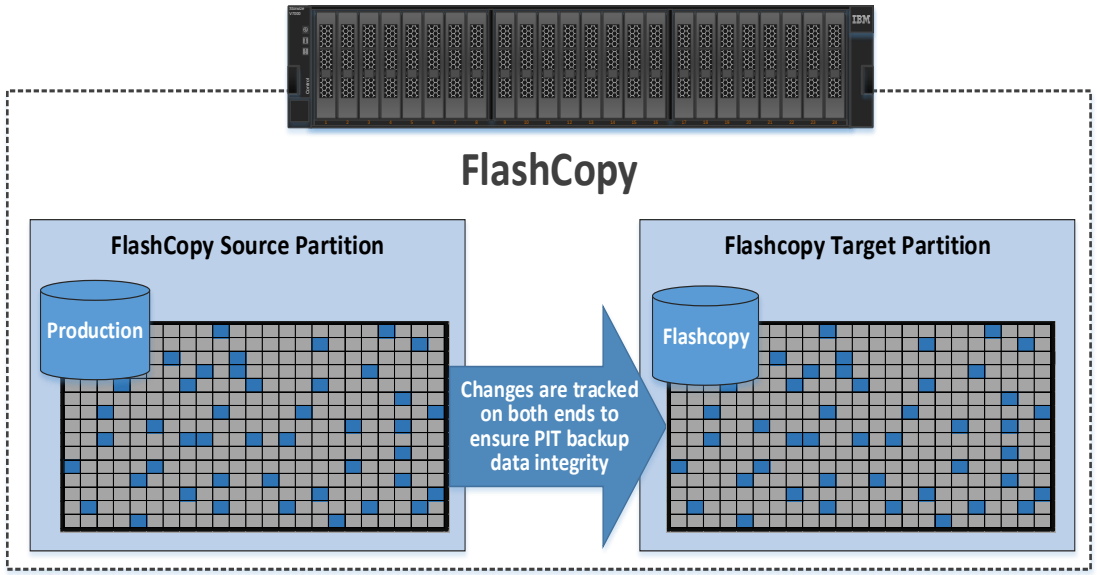
What’s required to enable RTD with FCM4?

- Storage Virtualize 8.6.3 or later
- FCM4 with 4.1 firmware
- Storage Insights Pro
- DRAID6 array containing only FCM4
- DRAID array must have been created with Storage Virtualize 8.6.2 or later. Arrays created on older software (ex: 8.6.0) will not be able to use RTD without recreating the array.

    - *Volumes must not be using DRP deduplication or compression. Volumes must not be in Easy Tier pool with mixed SAS and FCM tiers.

Flashcopy

- Rapidly perform a point-in-time copy of one or more storage volumes.
- Source volumes can remain online and active



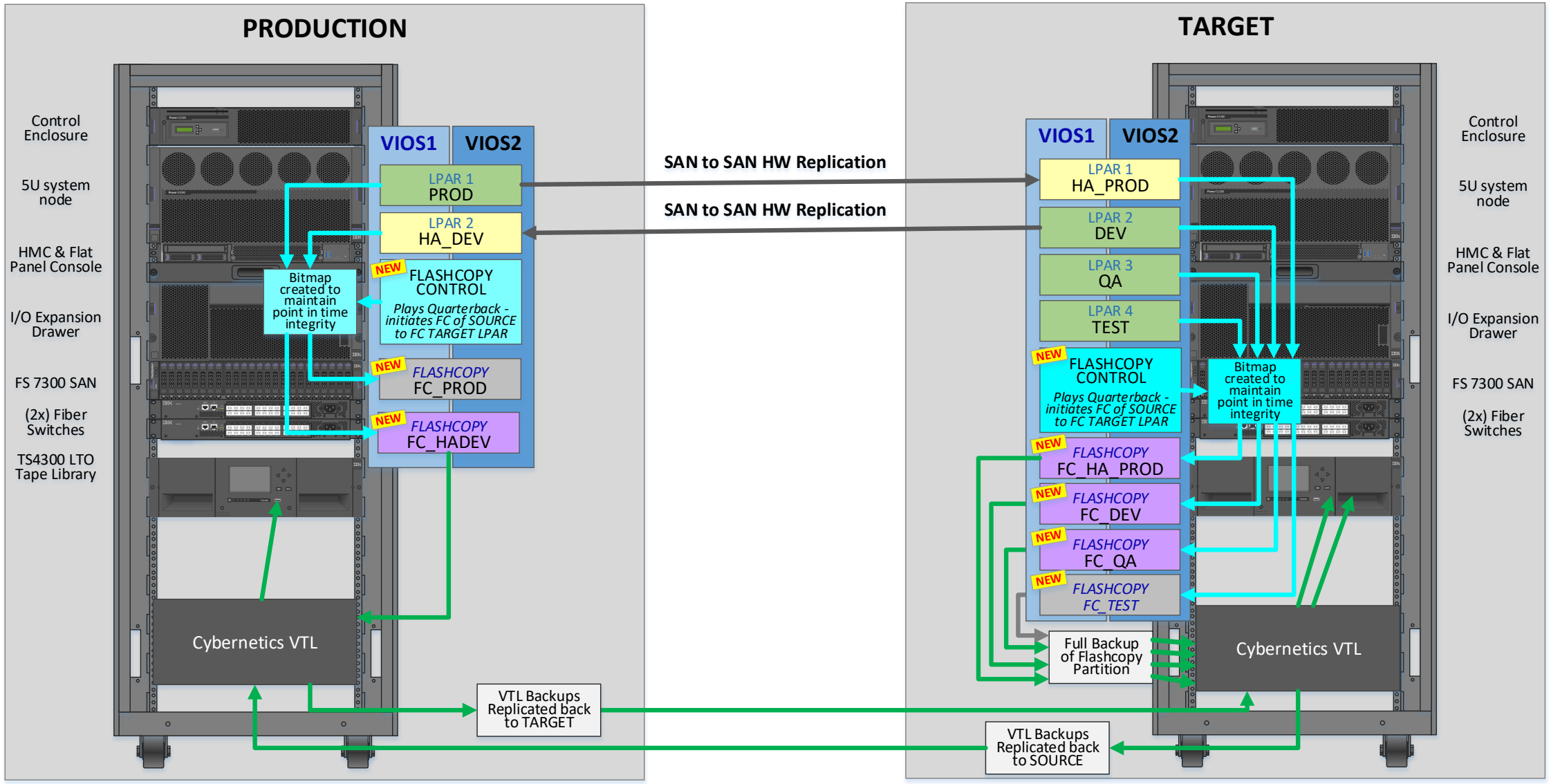
Common Use Cases…

- Flash out a copy of your production environment to perform a full point in time backup.
- Flash out a copy of production for application development and testing.
- Flash out a copy of your data for analytics & data mining.
- Creating copies of production data sets for quality assurance.

Lab Services Full System Flashcopy Toolkit

- Creation of the FlashCopy (warm flash/cold flash) within an external storage unit
- Fully automate the quiesce of the source partition
- Spin up the backup for save operations
- Provides integration with IBM’s BRMS
- Full system backup without ending user jobs
- Ease of Management utilities across multiple nodes

FlashCopy


PRODUCTION
TARGET
Control Enclosure
5U system node
HMC & Flat Panel Console
I/O Expansion Drawer
FS 7300 SAN
(2x) Fiber Switches
TS4300 LTO Tape Library
VIOS1
VIOS2
LPAR 1 PROD
LPAR 2 HA_DEV
Bitmap created to maintain point in time integrity
NEW
FLASHCOPY CONTROL
Plays Quarterback - initiates FC of SOURCE to FC TARGET LPAR
FLASHCOPY FC_PROD
FLASHCOPY FC_HADEV
Cybernetics VTL
VTL Backups Replicated back to TARGET
SAN to SAN HW Replication
SAN to SAN HW Replication
LPAR 1 HA_PROD
LPAR 2 DEV
LPAR 3 QA
LPAR 4 TEST
FLASHCOPY FC_HA_PROD
FLASHCOPY FC_DEV
FLASHCOPY FC_QA
FLASHCOPY FC_TEST
Full Backup of Flashcopy Partition
VTL Backups Replicated back to SOURCE

Safeguarded Copy

- Automatic creation of regular immutable backup copies
  - Immutable means it can NOT be written or read by an application
  - Automatically created and deleted based on a predefined schedule
- Isolated air-gap copies (offline by design)
- Proactive monitoring for signs of attack
  - Identify Safeguarded Volume to recover based on time index of identified attack.
- Fast restore from copies on primary storage
- Data is accessible only after a Safeguarded copy is recovered to a separate recovery volume.

Safeguarded Copy is a differentiator

- Safeguarded Copy (SGC) is a protection mechanism for creating immutable data on an IBM FlashSystem array.
- All NVMe-models of FlashSystem support the immutable Safeguarded Copy feature
- SGC creates a copy of data to prevent it from being compromised, either accidentally or deliberately.
- SGC provides clients the ability to quickly recover from logical corruption or destruction of primary data.

Business-critical data that needs to be resilient

Immutable Safeguarded Copies of business-critical data reside on the primary storage for rapid-recovery but remain hidden from view, therefore bad actors are unable to get to them.

Safeguarded Copy… What's required?

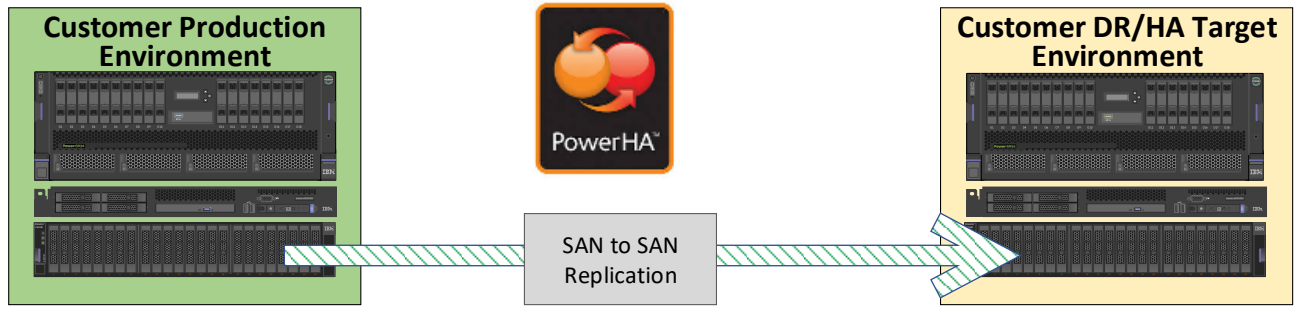
- FlashSystem External Storage
  - Additional storage capacity required to support Safeguarded copies.
  - Sizing can be performed via Storage Modeller (StorM)
- FlashCopy license
- Automation and scheduling
  - Can be done natively in current version
  - For additional functionality you can integrate with Copy Services Manager (CSM) and Copy Data Management (CDM)

Lab Services Full System Replication Toolkit

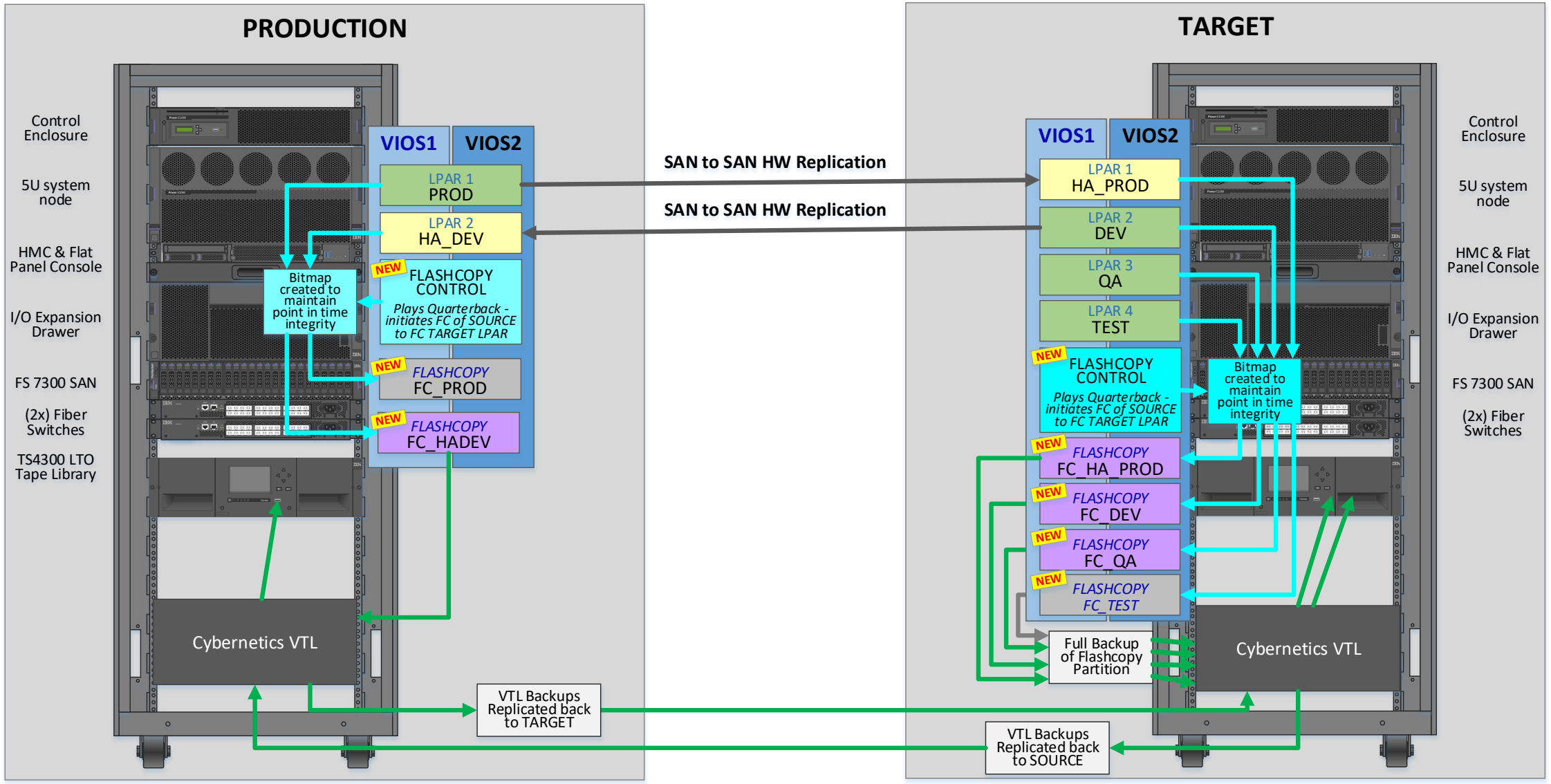
- Simplify and automate operation of a multi-site disaster recovery solution for IBM i.
- Active/Inactive single command automated failover
- Protects from hardware outages, enables easy disaster recovery validation testing

SAN to SAN Replication

- Offloading replication to SAN.
- Block level replication of data. (Make “SAN A” look exactly like “SAN B”).
- Data that has not made it to storage is not replicated.
- Options
  - PowerHA with iASP
  - SAN to SAN remote mirroring
    - Lab Services toolkit.
    - Still requires PowerHA license



FlashCopy + SAN to SAN Replication



Policy Based Replication

- Complete ground up rewrite over the last 5 years of the async replication solutions to replace Global Mirror.
- Policies define how replication must be configured, which the system implements, to ensure that every volume is configured correctly.
- All remote provisioning is managed by the system reducing the burden on storage admins
- Removes opportunities to make mistakes
- Auto-manages itself to adapt to the current conditions without causing performance problems, with reporting and alerting if RPOs are exceeded.

Importance in using policies

Consistency

- Policies define how replication must be configured, and how the system implements it, to ensure that every volume is configured correctly.

Simplicity

- All remote provisioning is managed by the system reducing the burden on storage admins

Automated

- Replication auto-manages itself to adapt to the current conditions without causing performance problems.
- Reporting and alerting if Recovery Point Objectives (RPOs) are exceeded.

Configuring replication

Configuring replication is greatly simplified with the new approach.

1

Partner systems together, and confirm the certificates are correct.

2

Follow the step-by-step walkthrough to define the policies for remote provisioning.

3

Create a replication policy, defining the RPO and the systems involved.

4

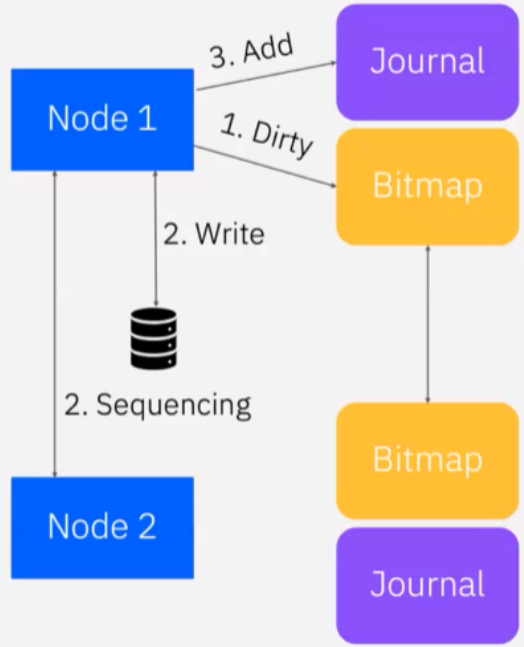
Assign replication policy to a volume group and the system will automatically configure and start replication.

Journaling Mode

- Low latency
- 10’s of m/s but can very to minutes with bursts of workload

Journaling mode

- Writes are buffered in an in-memory journal that allows for many seconds of writes to absorb replication performance problems without host impact.
- Journal sizes vary from 8 GiB to 32 GiB per node.
- Volume groups will always try to replicate in this mode as it provides a better recovery point.

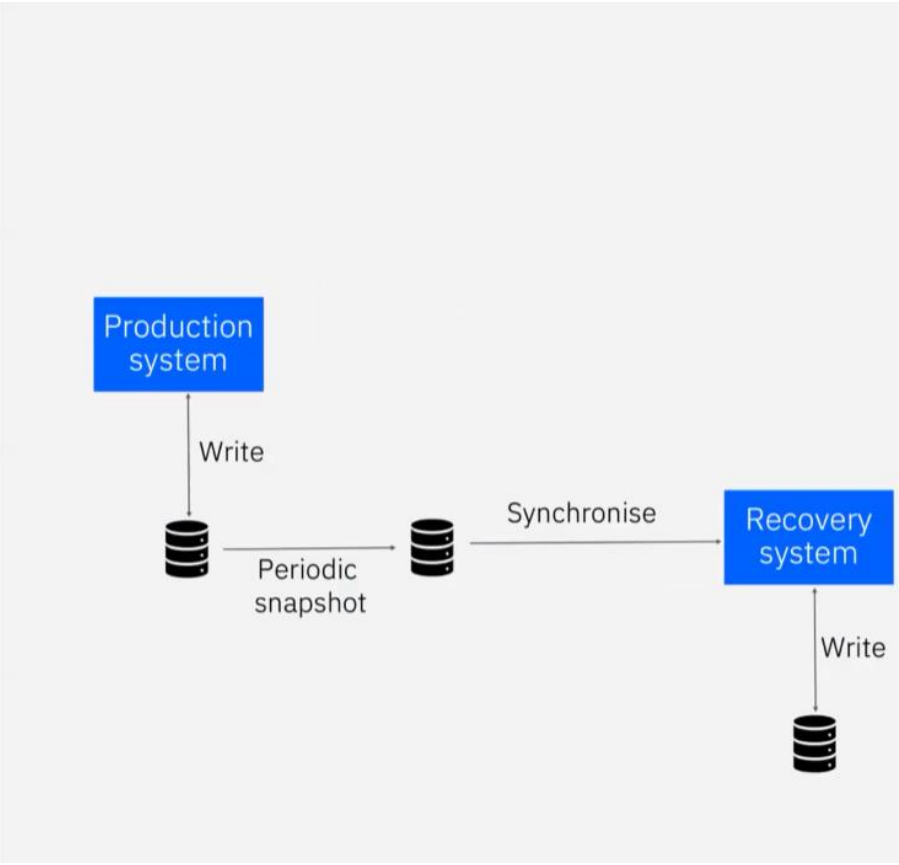


Cycling Mode

- Similar to Global Mirror with Change Volumes
- Periodically takes a snapshot and it will synchronize with that.
- Reduces the bandwidth requirements needed on the link
- Higher recovery point.
- Will operate by itself to ensure it's cycling multiple times within the RPO defined
- It's adaptive and will periodically evaluate if it can switch back to journalling mode.

Cycling mode

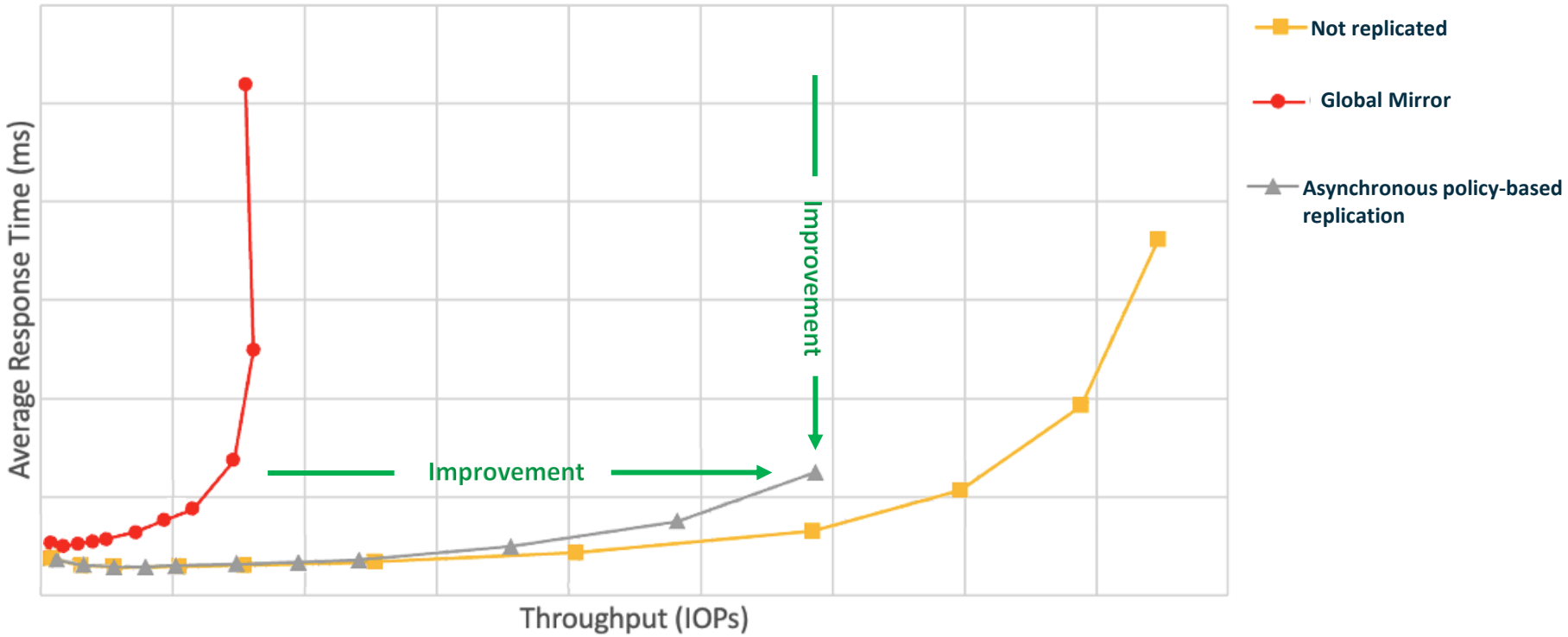
- Uses change volumes to periodically copy data from the production system to the recovery system.
- Cycling frequency is based on the time until the RPO is exceeded.
- Reduces the bandwidth required for replication.
- Volume groups may be switched to this mode if journaling mode cannot be sustained.



Performance gains from ground-up redesign

The entire replication path was re-written from scratch, with emphasis on throughput, response times and scalability.

Resulting in storage systems that gained massive increases in throughput, with significantly lower response times.

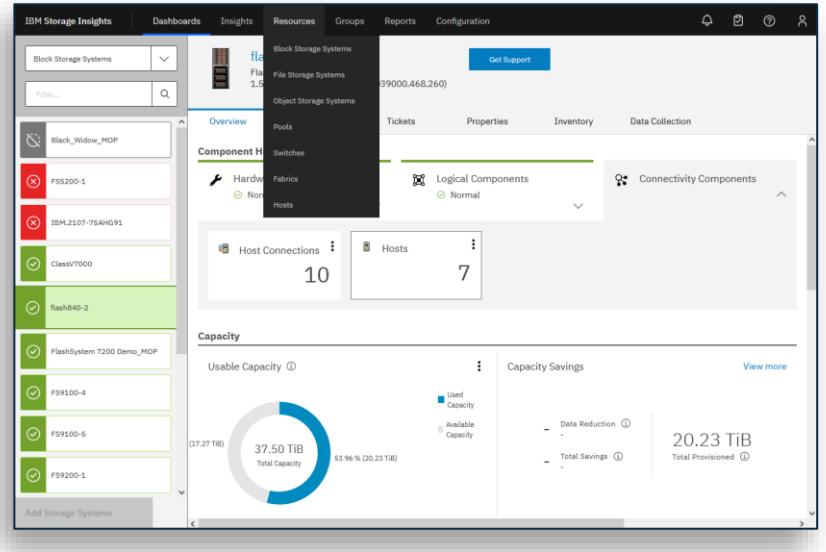


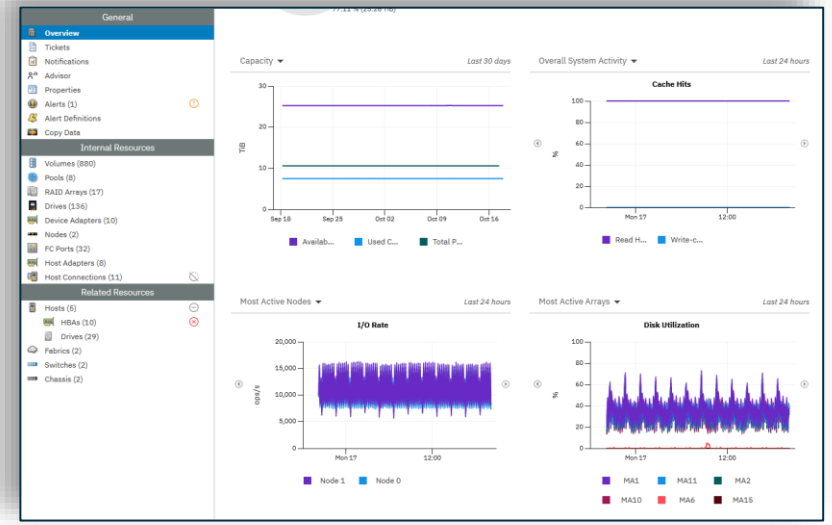
2x FS9500 connected via FC (16K/70/30/50)

Storage Insights

Why clients should use Storage Insights

- To guide focus toward what's important
- It's included for no extra cost with IBM Storage warranty and maintenance*
- See device health and get prioritized notifications and alerts to let clients know when to act
- Analyze performance across storage, fabric, and hosts
- Avoid potential problems with AI-driven advisories
- Raise and manage support cases
- See capacity trends and use volume reclamation to maximize storage efficiency





Storage Insights & Spectrum Control

		IBM Storage Insights (Cloud service)	IBM Storage Insights Pro (Cloud service)	Spectrum Control (On-premises application)
Monitoring	**Inventory management**	IBM Storage	IBM Storage, non-IBM storage, fabric and hosts	IBM Storage, non-IBM storage, fabric and hosts
	Health	Yes	Yes	Yes
	Metadata collection	Every 5 minutes	Every 5 minutes	User defined down to 1 minute
	Capacity	Storage system level	Down to a volume level	Down to a volume level
	Performance	Storage system level	Component level	Component level
	Data availability	24 hours (IBM can see up to 2 years for support)	Up to 2 years Performance data up to 1 year	User defined, stored on-prem
Services	**Notification & advisory dashboards**	Yes	Yes	No
	Log collection	Yes	Yes	No
	Raise tickets, see ticket history	Yes	Yes	No
Analytics	**Alerting**	No	Pre-defined & custom	Pre-defined & custom, ability to trigger custom response
	Reporting	Pre-defined templates	Pre-defined & custom templates, REST API	Pre-defined & custom templates, REST API access, Cognos Analytics integration
	Best practice advice	Yes	Yes	No
	Inline threat detection (ransomware alerting)	No	Yes	No
	Capacity reclamation	No	Yes	Yes

How is Storage Insights licensed

Purchased	IBM Storage Insights	Entitlement
	Included with your IBM Storage	
Expert Care Basic or Advanced	**Storage Insights**	
Expert Care Premium	**Storage Insights Pro**	Entitled for Expert Care duration
Storage as a Service	**Storage Insights Pro**	Entitled for STaaS duration
Spectrum Control Select	Includes **Storage Insights Pro**	By enclosure
Spectrum Control	Includes **Storage Insights Pro**	By SCU
Subscription	**Storage Insights Pro** with availability guarantee	By capacity
Virtual Storage Center Bundle	Includes **Spectrum Control** and **Storage Insights Pro**	By SCU (Starter edition by capacity, Storwize edition by enclosure)
Storage Suite	Includes **Spectrum Control** and **Storage Insights Pro**	By capacity

IBM Storage Expert Care

IBM Storage Expert Care

- Integrates and prepackages hardware and software support services into a tiered support model, helping organizations to choose the right fit of services – including the number of years of support, response times from initial contact to fix.

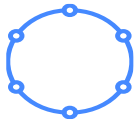
Included with the “Premium” Expert Care tier services:

Hardware Services

24x7 same day onsite repair

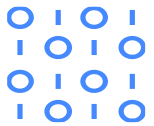
Enhanced response Time

30 minutes initial response for severities 1 and 2 issues



Predictive Support

Predictive analytics support, capacity planning, monitoring, and reporting



Technical Account Manager

Proactive and personal support from a highly specialized subject matter expert

IBM Remote Code Loads

Remote software microcode updates twice per year

IBM Storage Expert Care
IBM FlashSystem

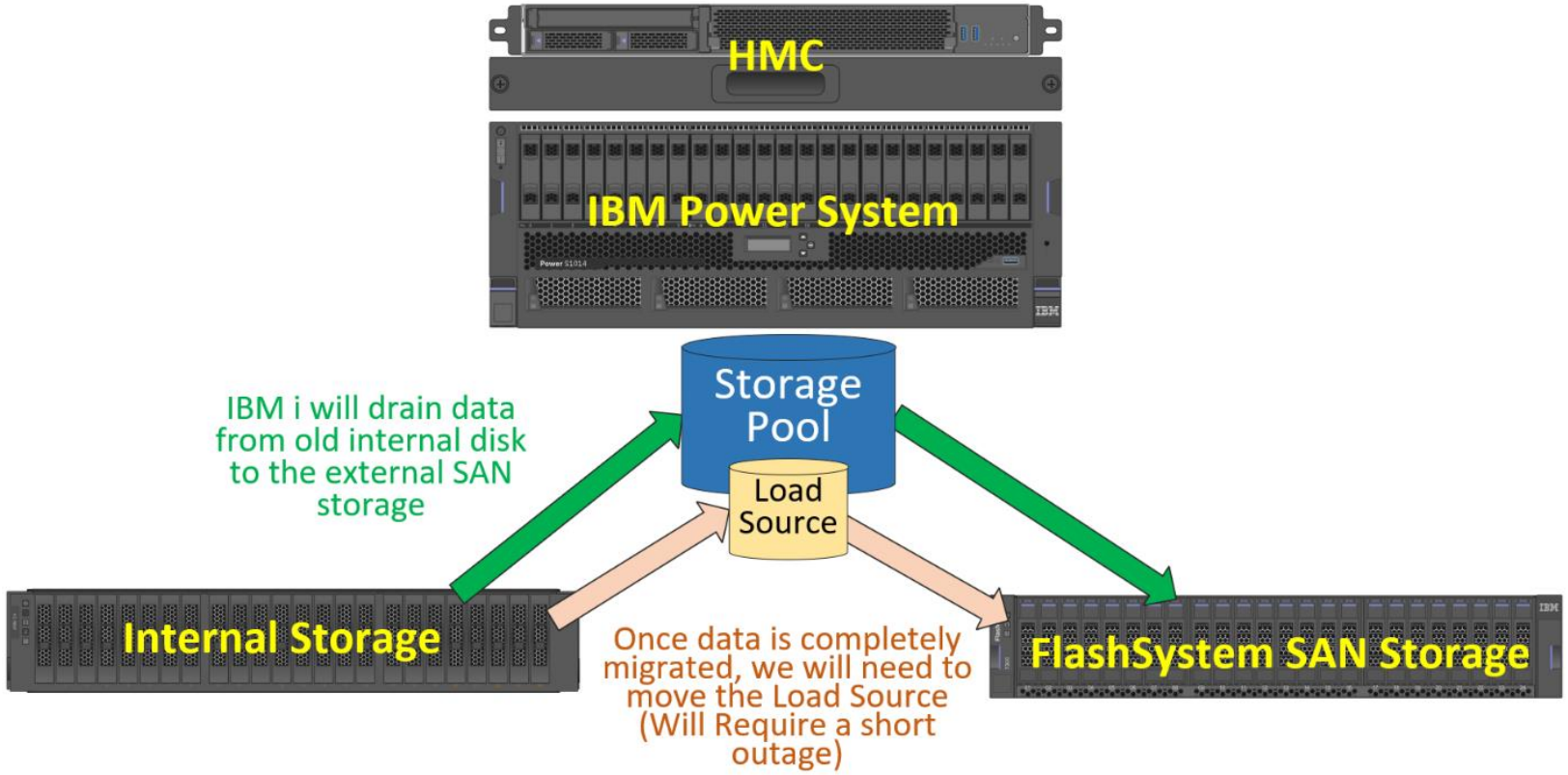
Choose the level of support required for the duration needed.

Services	Base Warranty	**Basic** IBM FlashSystem 5045	**Advanced** IBM FlashSystem 5045	**Premium** IBM FlashSystem 5045
IBM Hardware Maintenance (IBM onsite repair)	FS 5015/ 5045/ 5200/ 7200/ 7300 - 9x5 next business day, IBM On-site Limited FS 9200/ 9500 – 24x7 same day, IBM On-site Repair	9x5 next business day, IBM On-site Repair	24x7 same day, IBM On-site Repair	24x7 same day, IBM On-site Repair
IBM Storage Virtualize fixes/updates/new releases	Included for 1 year	Included for number of years selected	Included for number of years selected	Included for number of years selected
Support Line for Storage (24x7 remote technical support)		Included for number of years selected	Included for number of years selected (5200, 7300 & 9500 LMC –machine type 4983)	Included for number of years selected (7300 & 9500 LMC – machine type 4983)
IBM Software Maintenance (24x7 subscription/support)	90 days		Included for number of years selected (FS9500 – *not applicable to machine type 4983*)	Included for number of years selected (7200, 9200 & 9500 – *not applicable to machine type 4983*)
Predictive Support with IBM Storage Insights			Included for number of years selected	
Predictive Support with IBM Storage Insights Pro				Included for number of years selected
IBM Storage Technical Account Manager				Included for number of years selected
Enhanced response time – 30 min for Severity 1 and 2				Included for number of years selected
IBM Remote Code Load upgrade (2x per year)				Included for number of years selected

SERVICE EXPRESS

The migration from internal to external storage…

Moving to SAN is much simpler then you might think…



Decoupling the Storage & OS from the processor

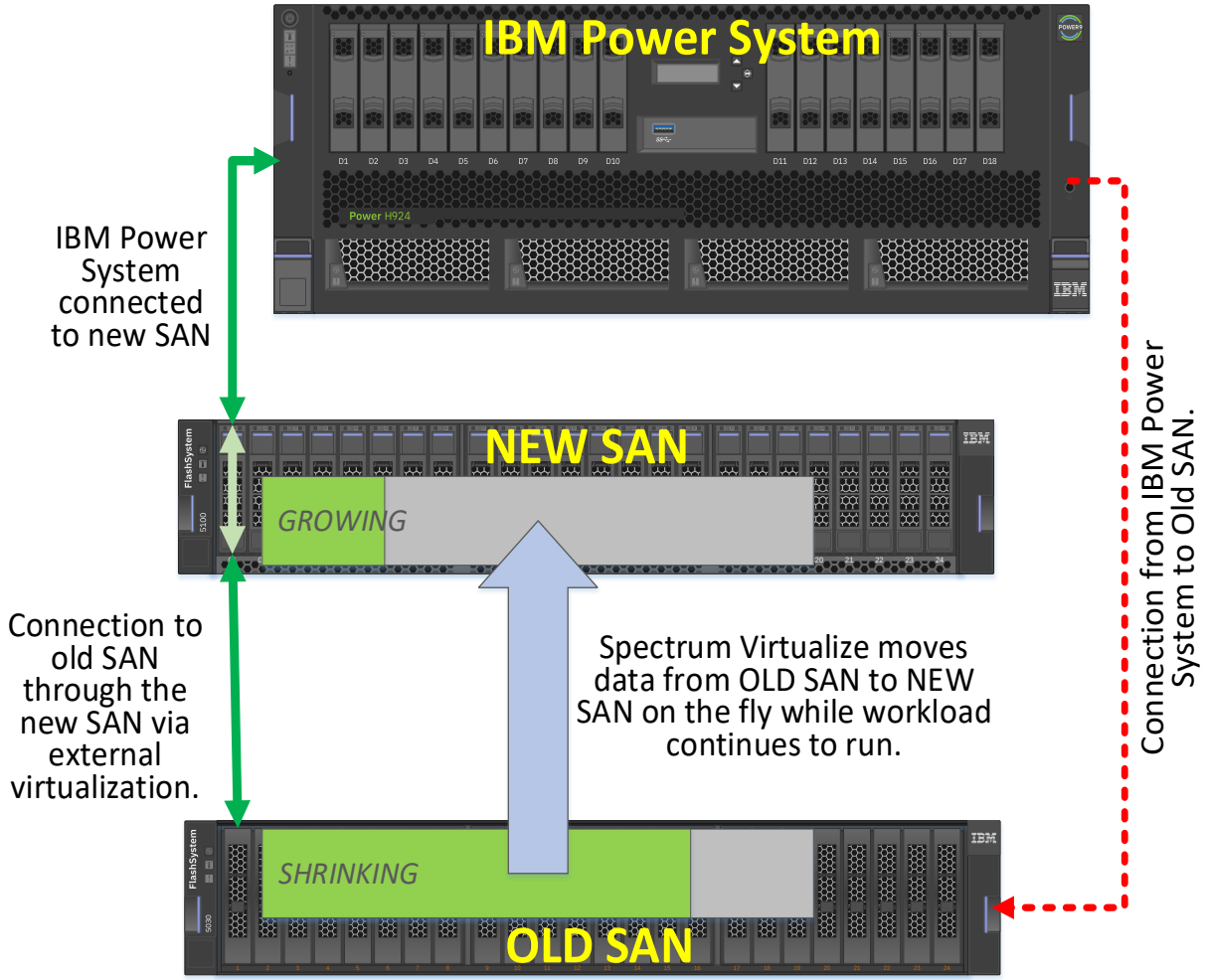
IBM Power Upgrade

- Plug and play IBM Power migrations…
- Migrate from one IBM Power Server to another by simply moving a couple Fiber cables.
- With IBM i it requires small outage for the final migration of the load source.

SAN Storage Migrations

- Transparent data movement with Storage Virtualize.
- By virtualizing both the old & new SAN the move becomes simple, transparent, and painless.

Can offset Server and Storage investment to balance out IT expenditures.

Painless storage upgrades

- Uses Storage Virtualize external storage virtualization and transparent data migration.
- Allows new SAN to virtualize the existing SANs storage underneath it.
- Data in current pool (existing SAN) can be moved to new storage pool (New SAN) while workload on IBM Power continues to run.