IBM® Storwize V7000, Storwize V5000 and IBM® Storwize V5000F

Presenter's Name – Presenter's Title

DD Month Year

Multiply your possibilities

Changing Nature of Business and Data

Respond to Business Pressures
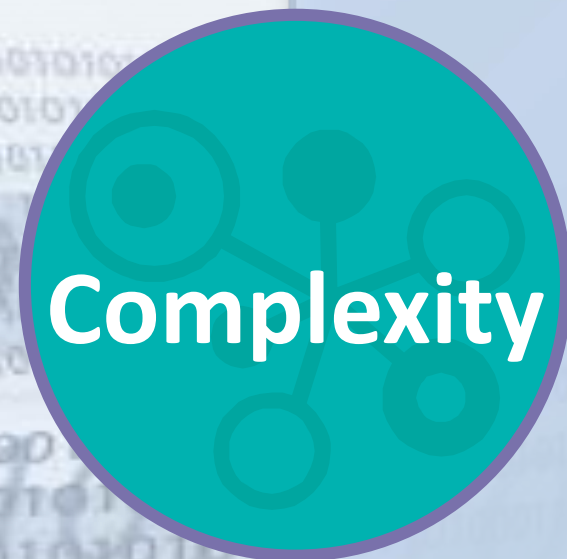
Support Data-Aware Applications

Control and Manage Data Growth

Enable Hybrid Cloud Platforms

*Harness Your Oceans of Data and Gain a Real Competitive Advantage*

Business Requirements Challenging Traditional Storage Approaches

Cost

Complexity

Inflexibility

- Blindly adding capacity

- Data trapped in storage "silos"

- Data duplication and more silos

- Extending refresh cycles

- Ad hoc cloud usage

IBM Storage & Infrastructure Offers New Approaches for the Cognitive & Cloud Era

Gain competitive advantage by harnessing your oceans of data

Maximize Performance

Enable New Workloads

Optimize Efficiency
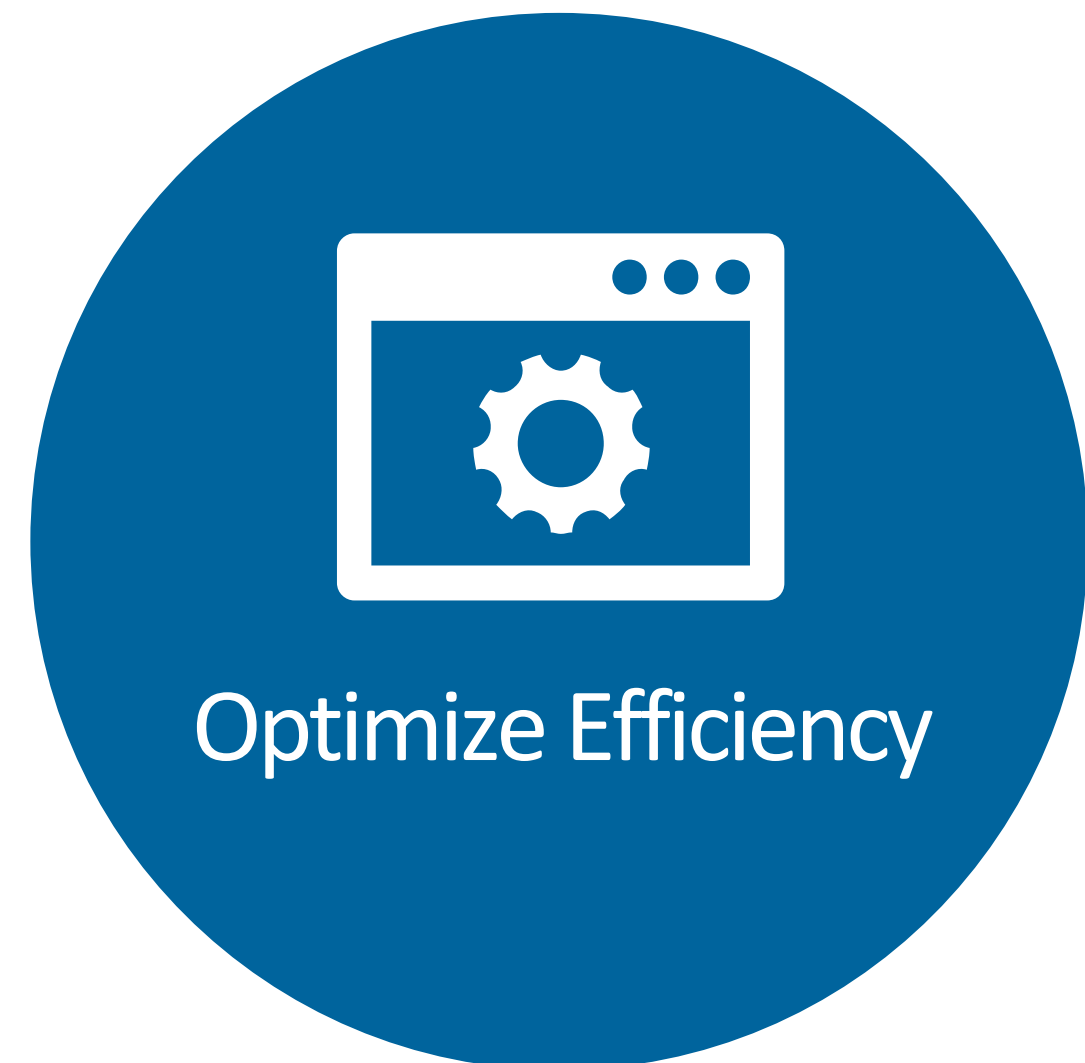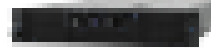
Flash	IBM Spectrum Storage

IBM Spectrum Computing, Optimized Storage Solutions

Storage Infrastructure Matters: Data Economics for Today and Tomorrow

Storage Systems

Tier 0 Acceleration
FlashSystem

Enterprise Storage Systems
FlashSystem A9000

XIV

FlashSystem V9000

FlashSystem A9000R

DS8880

Midrange & Entry Storage Systems
Storwize V7000

Storwize V7000 Unified

Storwize V5000

Tape and Virtual Tape Systems
ProtecTIER Deduplication

Tape Libraries

LTO7 and enterprise tape drives

TS7700

Software Defined Storage

IBM Spectrum Storage and Cleversafe
- IBM Spectrum Virtualize
- IBM Spectrum Protect
- IBM Spectrum Control
- IBM Spectrum Accelerate
- IBM Spectrum Scale
- IBM Spectrum Archive
- IBM Spectrum Conductor
- IBM Cleversafe

IBM Spectrum Storage

Software Defined Computing

IBM Spectrum Computing
- IBM Spectrum Symphony
- IBM Spectrum LSF
- IBM Spectrum Conductor

Integrated Infrastructure Solutions

VersaStack

PurePower

IBM Elastic Storage Server

IBM Spectrum Virtualize family

Comprehensive range of virtualized hybrid data systems

- One code base on all platforms
- One set of functions (selectively licensed)
- One client experience

SAN Volume Controller

Storwize V7000
Unified

Storwize V7000

Storwize V5000

Storwize V5030

Storwize V5020

Storwize V5010
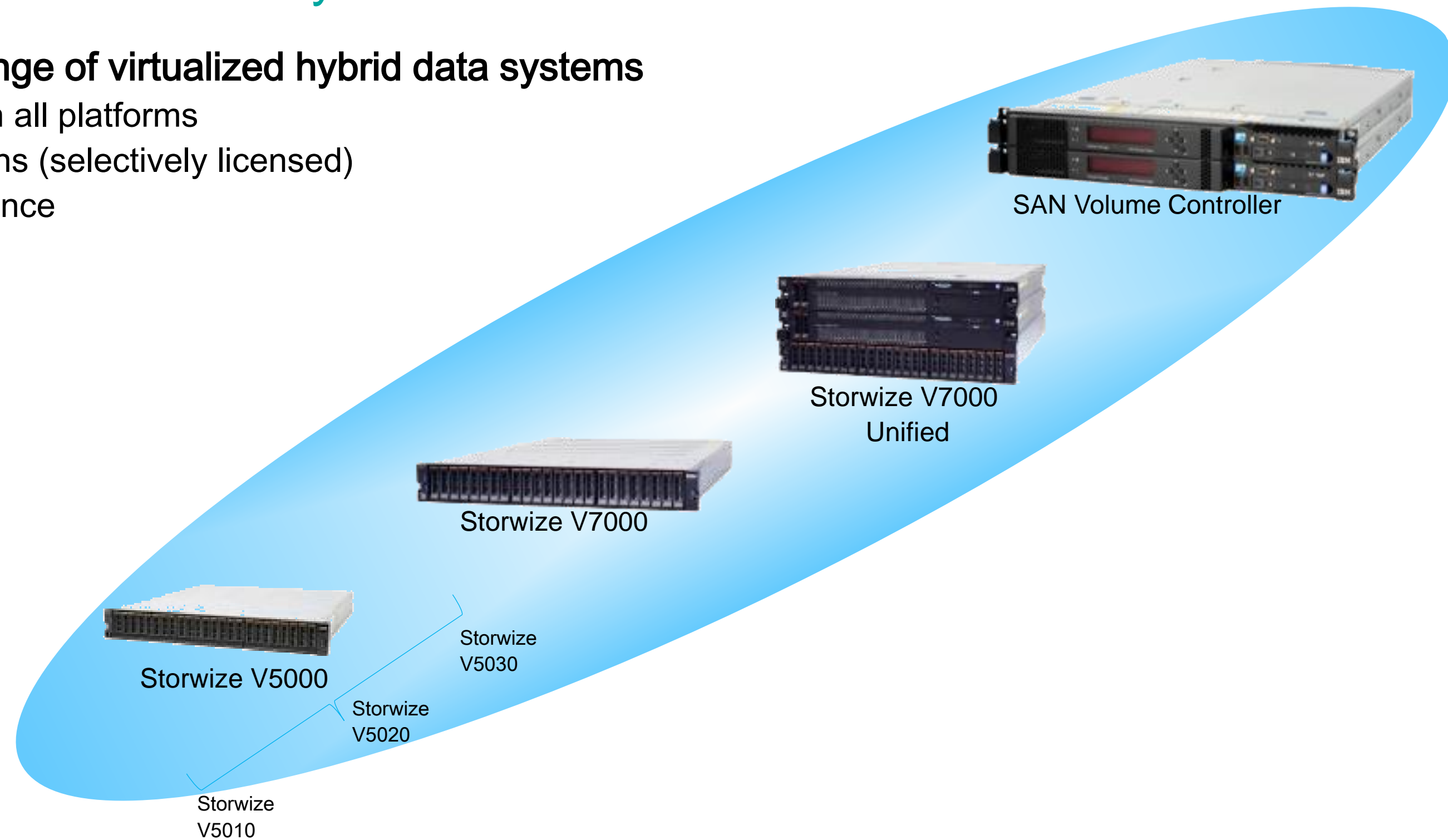
IBM Storwize Family
Keeps Getting Better!

All-flash and hybrid solutions built with IBM Spectrum Virtualize software virtualize external storage under single management, extending rich data services to externalized capacity **to reduce both cap-ex and op-ex.**

Storwize V5000
Storwize V5030F

New model

Entry-Midrange Hybrid or All-Flash Block Storage

ECONOMY

More performance & scalability for traditional applications & analytics in mid-size businesses

Storwize V7000
Storwize V7000F

New model

Midrange Hybrid or All-Flash Block Storage

SCALABILITY

Highly scalable, high performance virtualization for analytics & mixed workloads in mid-size businesses

Storwize V7000
Unified

Midrange Hybrid Unified Block & File Storage

CONSOLIDATION

Highly scalable, high performance consolidation of block & file data

Fully-Integrated Solutions

ENTRY   MIDRANGE
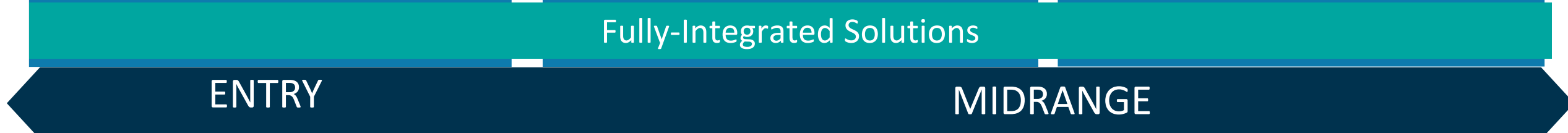
IBM Storwize V7000, V5000 and Storwize V5000F
Design Flexibility to Inspire Business Innovation
Be forward-thinking. Multiply your possibilities.
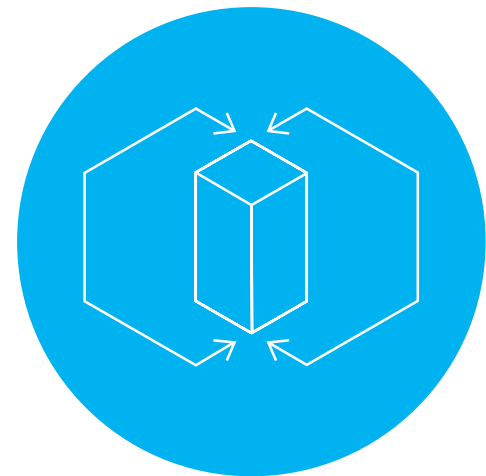
Drive innovation and competitive advantage with **all flash performance** to speed up the processing time for critical application workloads
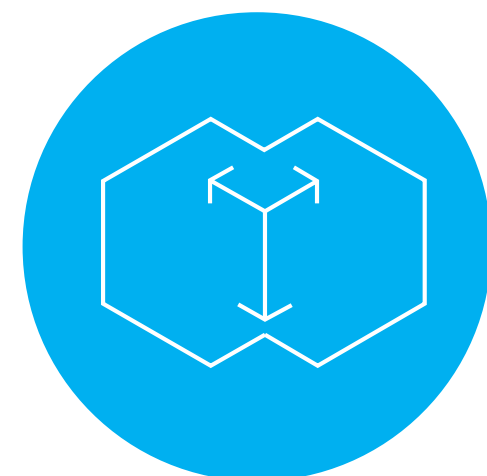
Optimized CapEx and OpEx with **5x more data** in the same footprint for lower acquisition costs and reduced energy consumption
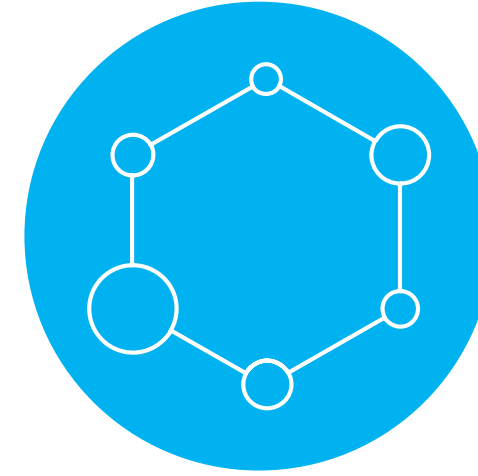
Start small, grow big Take advantage of **simple non-disruptive upgrade paths** enabled by common platform across the three IBM Storwize V5000 hybrid data systems
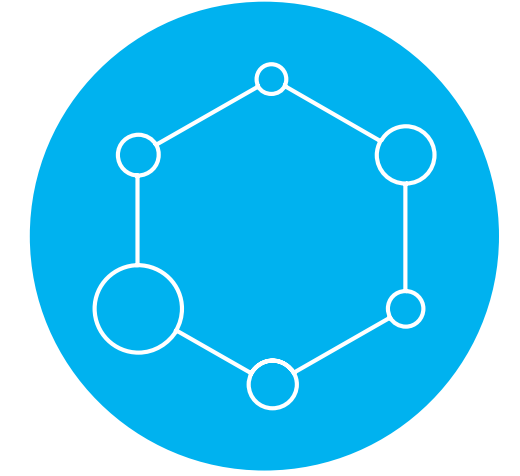
Safeguard your most valuable asset: Data. Protect critical data with **IBM Spectrum Virtualize encryption** in new and existing workloads and heterogeneous infrastructure

IBM Storwize V7000/V5000 Hybrid Solution
Scale big to drive innovation

EFFICIENT

- 5X more data stored with compression
- Flash-optimized with IBM Easy Tier
- Increase utilization of existing storage with external virtualization
- Improve network utilization with replication over IP
- Speed implementation and minimize disruption with data migration

FLEXIBLE

- Customize your storage with flexible software options
- Connectivity with intermix flexibility
- One-year or three-year warranty
- Non-disruptive upgrades from smaller models
- **New high density expansion enclosure: 3x better drive density** with up to 92 drives in only 5U
- Multiple drive options

FEATURE RICH

- Intuitive user interface
- **New powerful transparent cloud tiering**
- Asynchronous Replication
- Synchronous Replication
- VMware integrated
- Linked to OpenStack
- 600+ Storwize API

DEPENDABLE

- Five 9's availability
- Protect data from disclosure with encryption for internal and virtualized storage
- Get highest levels of data protection and availability with remote site replication options and IBM HyperSwap

IBM
Spectrum
Virtualize

IBM Systems

Introducing the New High Density Expansion Enclosure and New Drives

New high density expansion enclosures available for Storwize V7000, Storwize V5010, Storwize V5020 and Storwize V5030

- ✓ Supports business growth in space constrained data centers with up **3x better drive density**

- ✓ **92 drives** and **1.4PB** in a single 5U enclosure

- ✓ May be intermixed with 2U enclosures in same system

- ✓ Requires IBM Spectrum Virtualize V7.8 software

New drives supported in high density and 2U enclosures

- ✓ **15.36 TB** 2.5-inch flash drive

- ✓ **7.68 TB** 2.5-inch flash drive

- ✓ **10 TB** 7.2k NL SAS 3.5-inch HDD

Inside The New High Density Expansion Enclosure

Major Assemblies

Secondary Expansion Module (SEM) (2x)

System Fan Modules (4x)

3.5" HDD carrier (support 2.5 HDD)

ESM (2x)

Main Chassis with Drive Board and SIB

Slide Rail and CMA (*not shown*)

Power Supplies (2x)
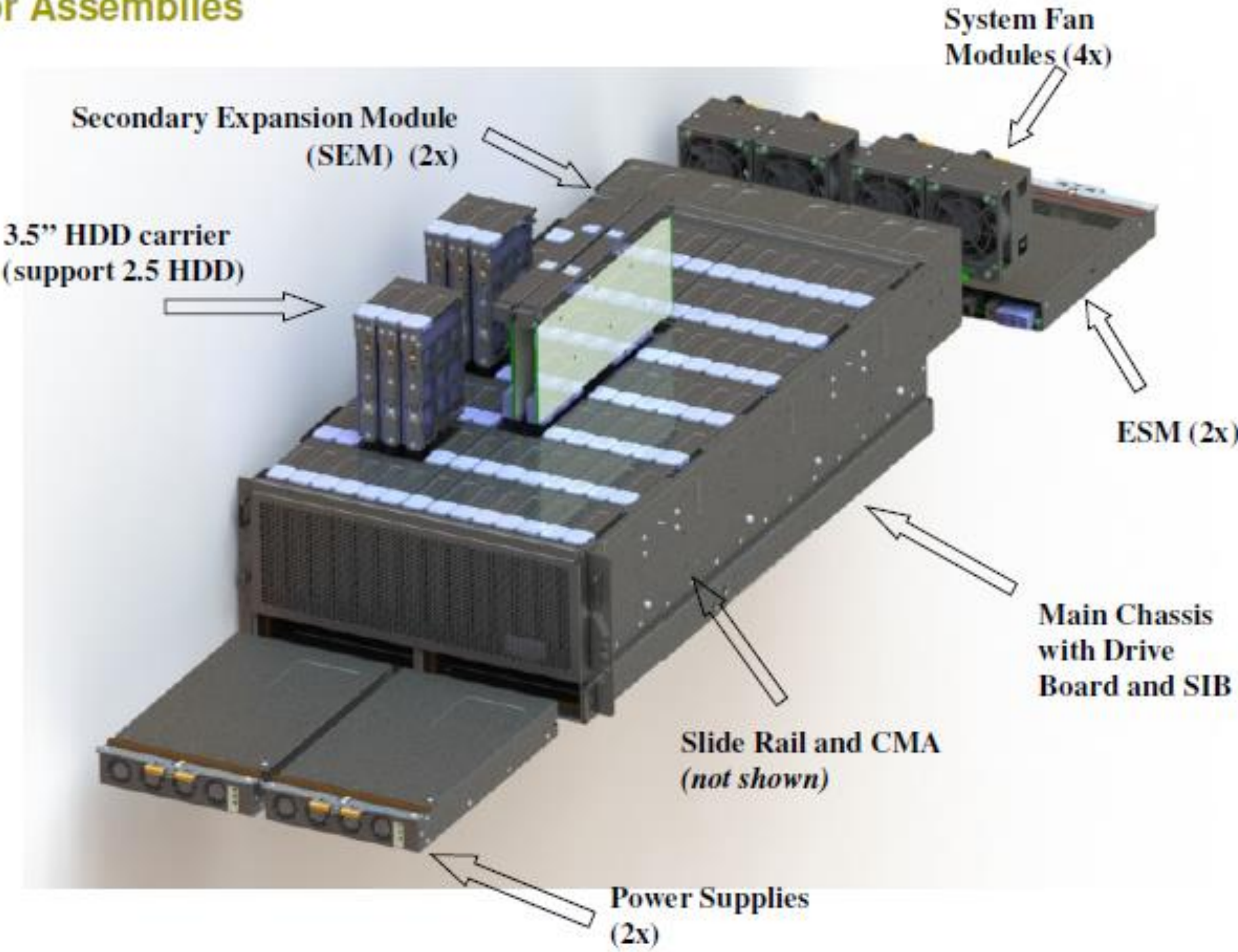
How Many High Density Expansion Enclosures?
Storwize systems will support up to four dense expansions per SAS chain

	Config 1	Config 2	Config 3	Config 4	Config 5
1	Standard	Dense	Dense	Dense	Dense
2	Standard	Standard	Dense	Dense	Dense
3	Standard	Standard	Standard	Dense	Dense
4	Standard	Standard	Standard	Standard	Dense
5	Standard	Standard	Standard	Standard	
6	Standard	Standard	Standard		
7	Standard	Standard	Standard		
8	Standard	Standard			
9	Standard				
10	Standard				

Standard = 2U; Dense = 5U
Enclosure types can be mixed in any order on SAS chains

Storwize V5000 Scalability

Both LFF and SFF drives supported in high density enclosure[1] (SFF drives in LFF carrier)
- High-capacity, archival-class nearline disk drives in 6 TB, 8 TB, and **10 TB** 7,200 rpm
- High-performance, enterprise class disk drives in 600GB 15,000 rpm, 1.2 TB, and 1.8 TB 10,000 rpm
- Flash drives in 1.6 TB, 1.92 TB, 3.2 TB, 3.84 TB, **7.68 TB,** and **15.36 TB**

System	V5010	V5020	V5030
# SAS Chains (per controller)	1	1	2
# Dense Expansions	4	4	8
# Drives/controller	392	392	760
# Drives/cluster	392	392	1,056
Max Cluster Capacity, NL HDDs (raw)	3.8 PB	3.8 PB	10.3 PB
Max Cluster Capacity, RI SSDs (raw)	5.7 PB	5.7 PB	15.4 PB

Model conversions now available: V5010 to V5020 or V5030, V5020 to V5030.

IBM Storwize V7000F and V5030F All-Flash Solution
Low cost flash for entry-level and mid-sized workloads

AFFORDABLE

- All-flash solution at entry level price
- Lower deployment cost with new flash drive options: **1.92TB, 3.84TB, 7.68TB & 15.36TB flash drives**
- Unique hardware upgrade path

EFFICIENT

- Lower TCO with flash-optimized compression
- Improve utilization by **2X** with virtualization support for **almost 400 systems**
- Maximize storage efficiency with thin provisioning and snapshots
- **Flash optimized with Real-time Compression , distributed RAID and multi-layer write caching**

FEATURE RICH

- Intuitive user interface
- **New powerful transparent cloud tiering**
- Asynchronous Replication
- Synchronous Replication
- VMware integrated
- Linked to OpenStack
- 600+ Storwize API

DEPENDABLE

- Five 9's availability
- Protect data from disclosure with encryption for internal and virtualized storage
- Get highest levels of data protection and availability with remote site replication options and IBM HyperSwap

IBM Storwize V5000 Hybrid and All-Flash
Multiply your possibilities

V5010	V5020	V5030	V5030F
Up to 392 Drives	Up to 392 drives	Up to 1056 drives	Up to 1008 drives
Small ☑Internal Virtualization ☑Thin Provisioning ☑Data Migration ☑Advanced GUI ☑Multi Host support ☑VMware & MS Integration ☑FlashCopy ☑EasyTier ☑Remote Mirror ☑Support for hybrid cloud configurations	**Medium** V5010 plus… ☑Higher Performance ☑Encryption	**Large** V5020 plus… ☑Clustering (2) ☑Higher scalability ☑Higher Performance ☑Compression ☑Ext Virtualization ☑HyperSwap	**Large all-flash** V5020 plus… ☑Clustering (2) ☑Higher scalability (not high density) ☑Higher Performance with all flash ☑Compression ☑VExt Virtualization ☑HyperSwap

Storwize V5000 family, built with IBM Spectrum Virtualize software, offers three hybrid models enabling an easily customizable and upgradeable solution for investment protection, with improved performance and enhanced efficiency

Storwize V7000/V5000 With IBM Spectrum Virtualize Transforms Storage

Improving data value

Reducing the cost of storing data by increasing utilization and using compression, and accelerating applications to speed business insights

Increasing data security

Helping protect data from disclosure, and enabling a complete high availability strategy including data and application mobility and full DR protection
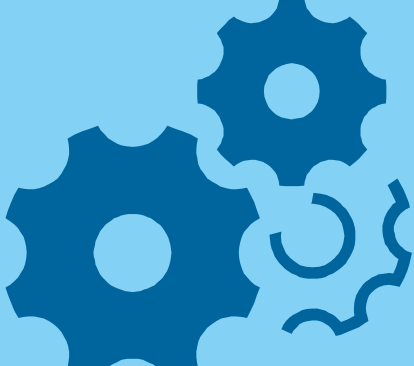
Enhancing data simplicity

Data strategy independent of infrastructure choice with tightly integrated functionality and consistent management across heterogeneous storage

Improving Data Value

Improves efficiency of your storage, increasing utilization up to double

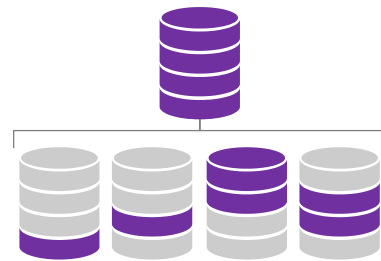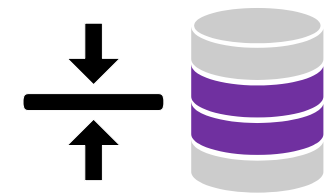**Increases amount of data you can store**, enabling up to 5x as much data to be stored in the same space

Improves storage performance so you can get more done with your data

Optimizes storage use by moving data to the most appropriate type of storage based on policies you define with IBM Spectrum Control

IBM Storwize V7000/V5000 Management

Physical storage is virtualized and "hidden" from servers

- Enables rapid, flexible provisioning and simple configuration changes
- Enables non disruptive movement of data among tiers of storage
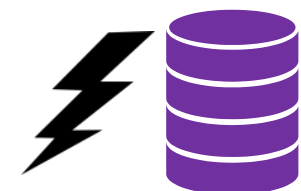- Enables data placement optimization to improve performance

Rich integrated function applies to all storage

- Functions including compression, replication, tiering, high availability, encryption
- Single user interface to manage all storage, regardless of vendor
- Move data transparently between different storage systems
- Extends life and enhances value of existing storage assets

Delivers agility and efficiency of software-defined storage to existing and new storage

Hitachi   EMC   NetApp   IBM

HP   Violin   Oracle
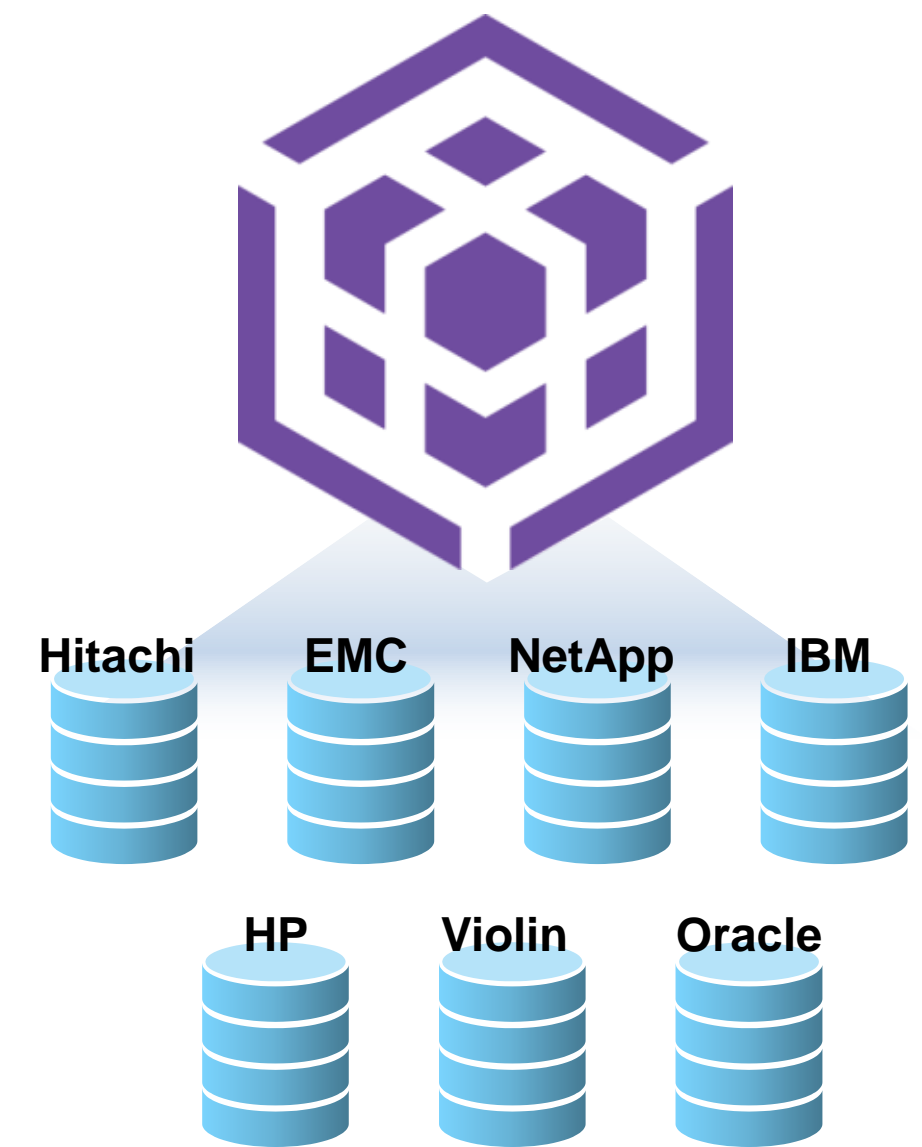
*"Storage virtualization has been key to providing **efficient and cost-effective storage** solutions for our data center"*

RICOH USA

Ease of use

In multi-petabyte, multivendor installations, ITG found personnel costs for use of IBM Spectrum Virtualize and IBM Spectrum Control averaged **63 percent less than for EMC** equivalents and **55 percent less than Hitachi**

Creating new volumes:
Simply select new volume preset
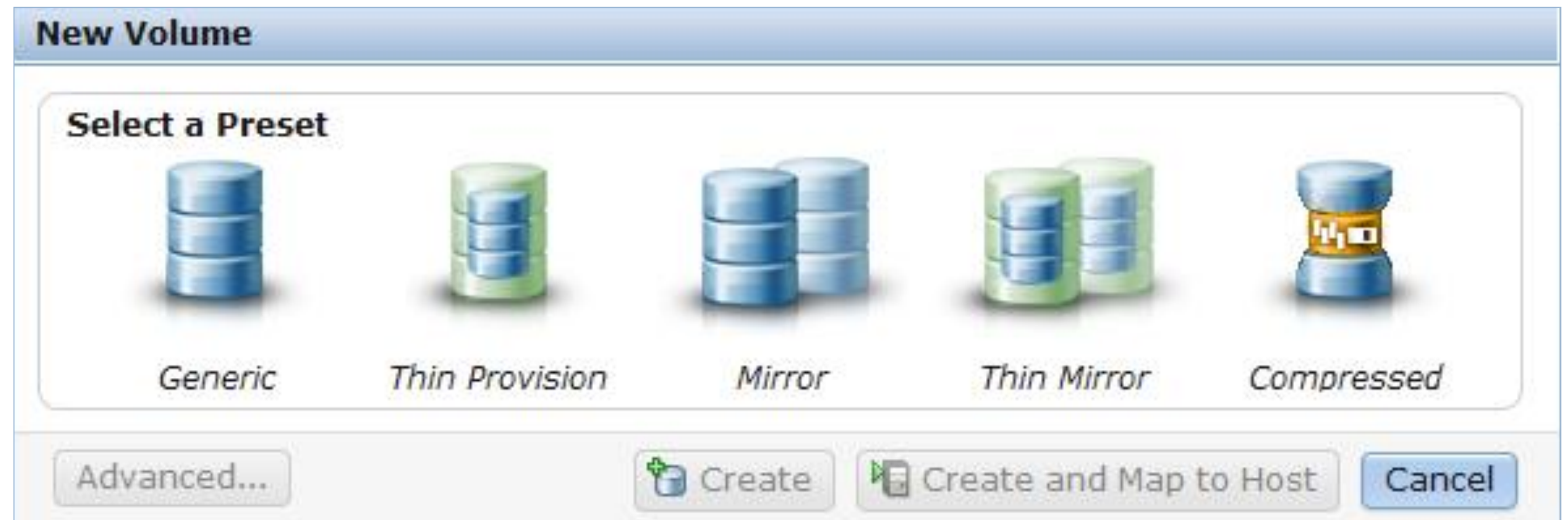
IBM Storwize V7000/V5000 Tiering

Constantly analyzes I/O and migrates data to **optimize performance**

Set it and forget it … unlike competitive tiering offerings

Flash Arrays

Active Data Migrates Up

Less Active Data Migrates Down

HDD Arrays
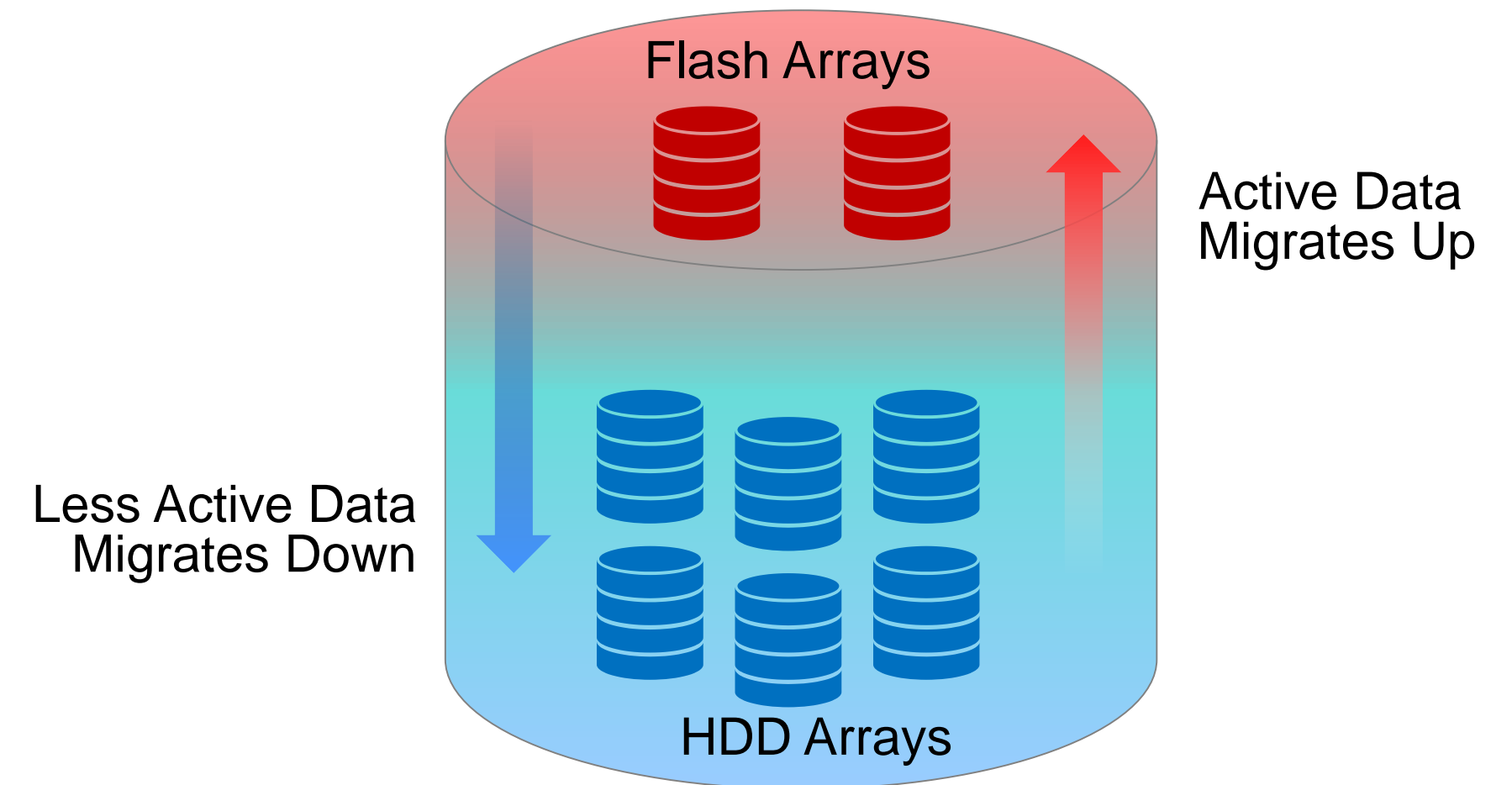
Improve performance

up to **3x**

… using as little as **5%** flash storage

IBM Storwize V7000/V5000 Real-time Compression

Shrinks active data up to **80%** without degrading application performance

Supports **active data**, unlike other storage compression solutions
- More data = more benefit

Cuts storage cost in half or more GUARANTEED
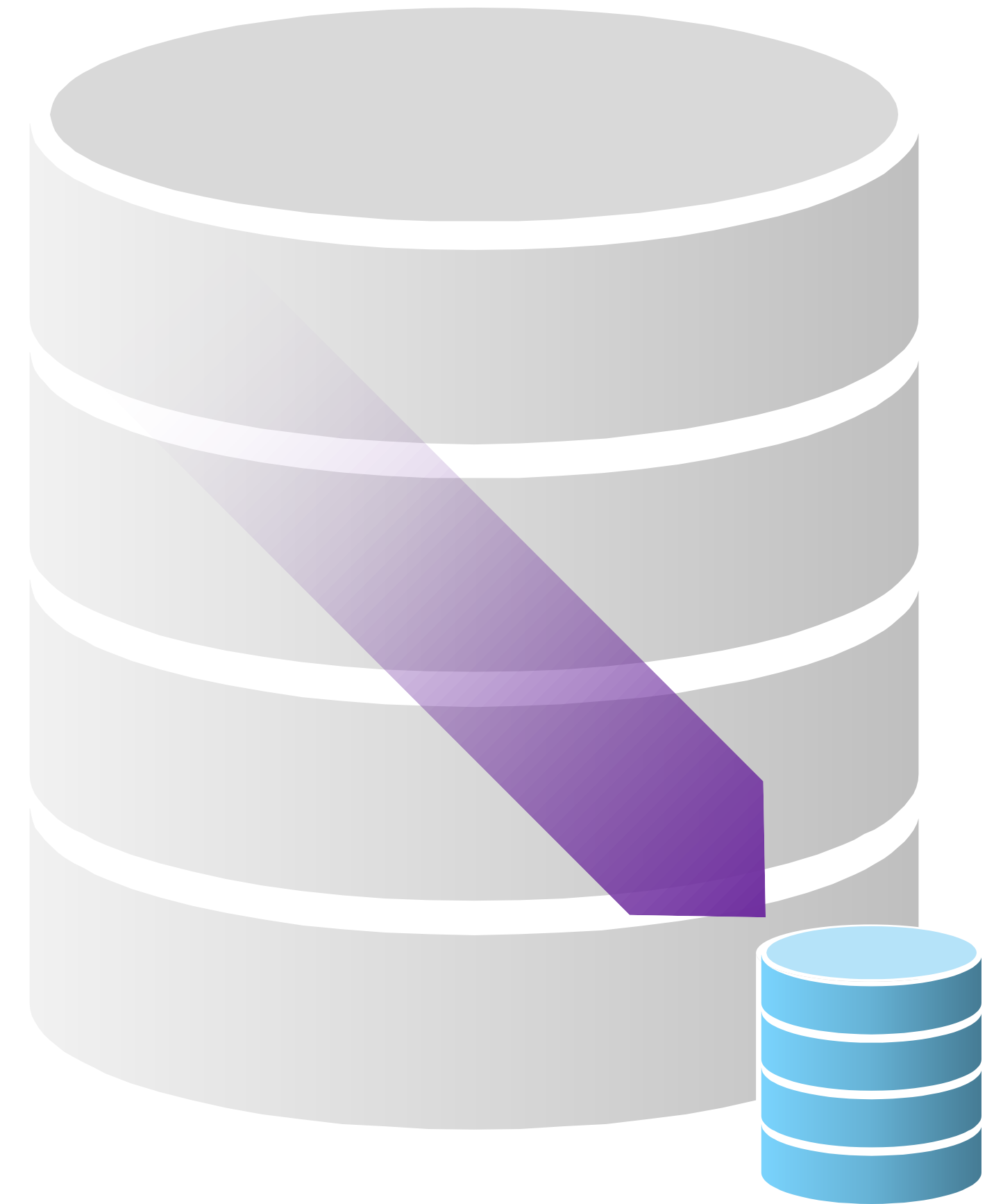
Storwize V7000/V5000 Storage Pool Balancing

Storage Pool Balancing

mdisk0 mdisk1   mdisk0 mdisk1   Tier 0

mdisk2 mdisk3 mdisk4   mdisk2 mdisk3 mdisk4   Tier 1

mdisk5 mdisk6 mdisk7   mdisk5 mdisk6 mdisk7   Tier 2
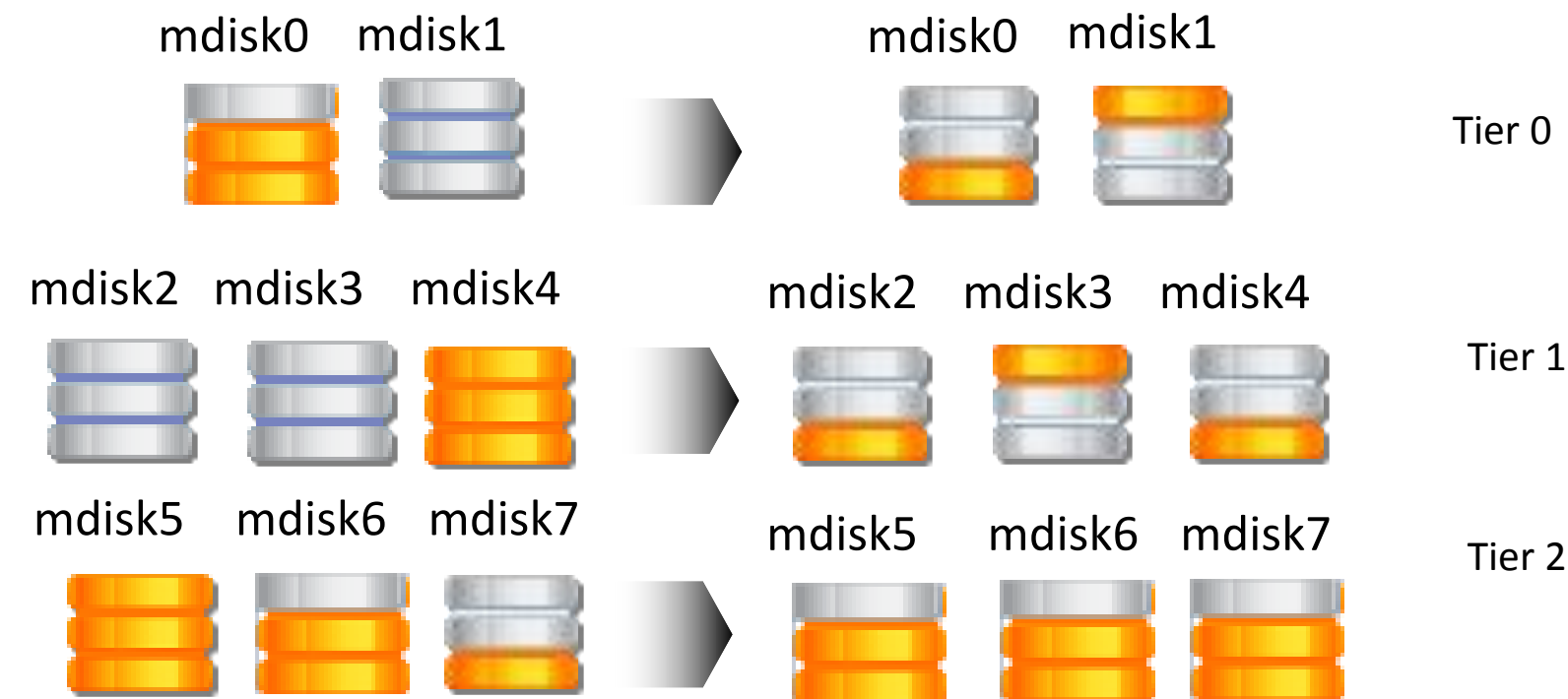
- Effortlessly, intelligently distribute workload across storage in a pool
- Maximizes system throughput
- Takes into account performance capability of different arrays
- Minimizes system tuning effort
- Eliminates manual movement when adding new storage to a pool
- Turned on by default for all storage pools
- No additional charge

Increasing Data Security
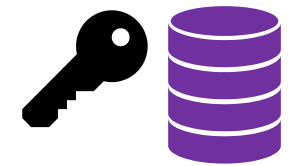
Improves data security with software based encryption
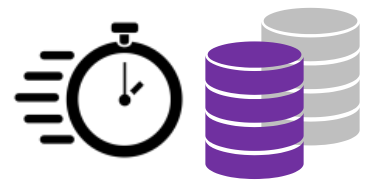
Improves data protection with 5-10x faster rebuild of data following a drive failure

Improves data availability with fully duplexed copies of data and automatic switchover across data centers

Eliminates storage downtime with nondisruptive movement of data from one type of storage to another

Storwize V7000/V5000 Delivers Encryption for External Virtualized Storage

Adds encryption to existing storage systems
- Helps to improve data security
- Eliminates capital expense for new storage systems or drives to enable encryption
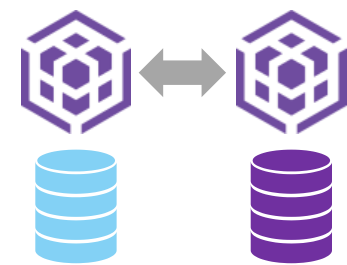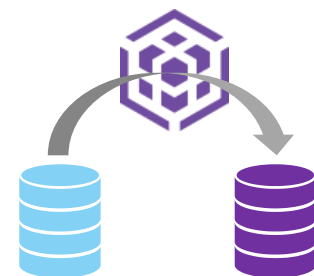- Reduces operating expense with single point of administration for encryption across multiple heterogeneous storage systems

Minimal impact on performance
- Takes advantage of Intel AES-NI processor instructions to perform encryption

IBM Spectrum Virtualize encryption addresses *all these use cases*

Typical encryption use cases
- Protection against disclosure of data when drives removed
  - Malicious removal of drives
  - Drives returned to vendor as part of maintenance actions
- Secure erasure of storage
  - Drives or arrays being reused for different data
  - System being sold or otherwise disposed of

Encryption Key Management

New!

Encryption function relies on USB flash drives to store keys

Solution is not adequate for some clients

    "No USB drives" policy

    Standardized on enterprise key management software for other platforms

IBM Spectrum Virtualize V7.8 supports use of IBM Security Key Lifecycle Manager

    Clients who prefer simplicity of USB flash drives may still use them

New encryption deployments can start with SKLM or USB drives

Storwize V7000/V5000 Delivers Improved Data Protection with Distributed RAID

- Improved RAID implementation
  - Faster drive rebuild improves availability and enables use of lower cost larger drives with confidence
  - All drives are active, which improves performance especially with flash drives

- Spare capacity, not spare drives

- Rotating spare capacity position distributes rebuild load across all drives

- More drives participate in rebuild
  - Bottleneck of one drive is removed

- More drives means **faster rebuild**
  - **5-10x faster** than traditional RAID
  - Especially important when using large drives

- No "idle" spare drives
  - All drives contribute to performance
  - Especially important when using flash drives

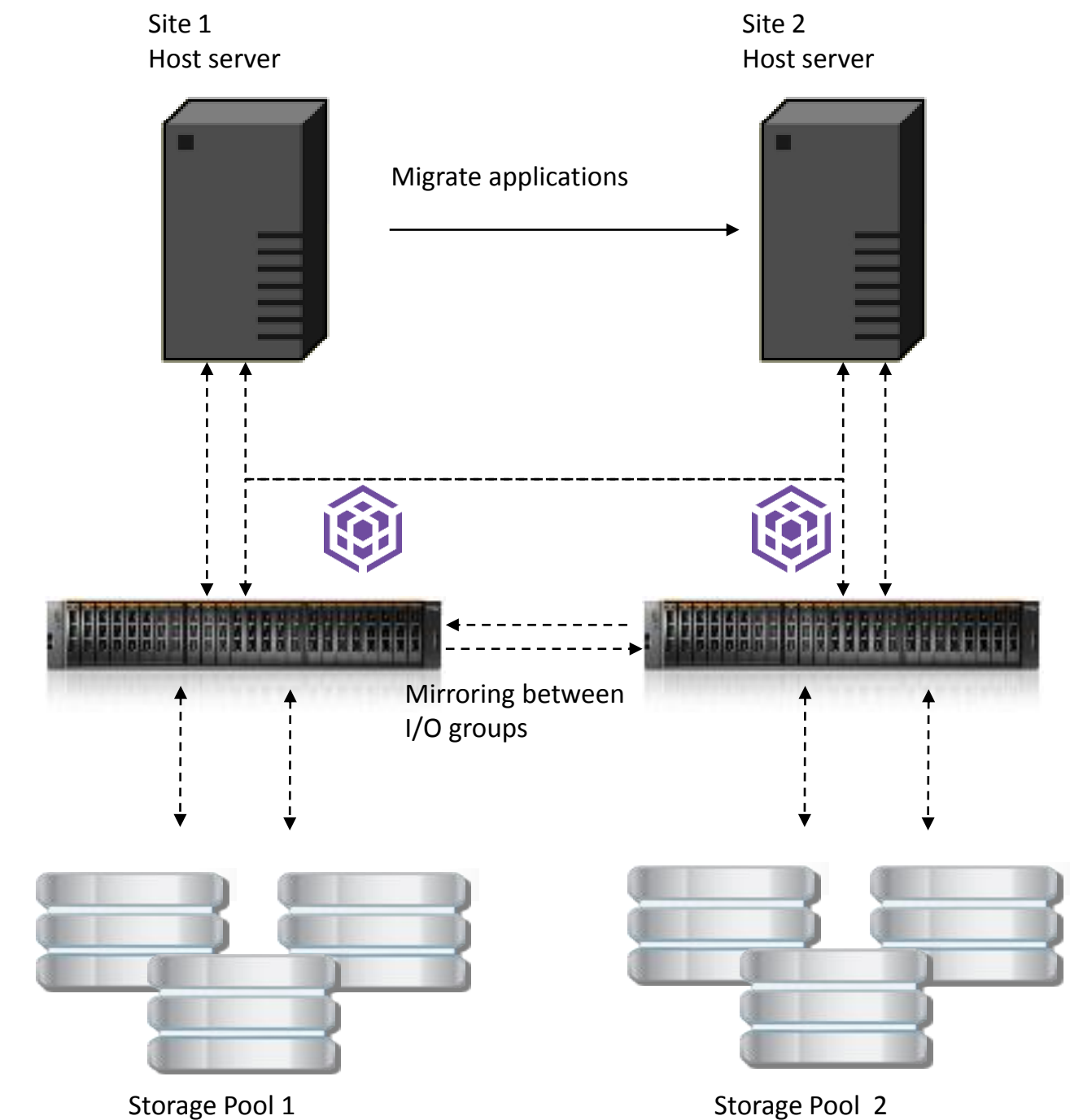# Storwize V7000/V5000 Delivers Extreme High Availability with IBM HyperSwap

Protect, share and move data

Completely redundant storage infrastructure even after site failure

Continuous data access with no performance impact

Freely move data without disruption across sites

Eliminate costs of downtime

Site 1
Host server

Site 2
Host server

Migrate applications

Mirroring between
I/O groups

Storage Pool 1

Storage Pool 2

Storwize V7000/V5000 Delivers Improved Disaster Recovery with IP Replication

Enables use of Ethernet connections for remote mirroring

Transparent to servers and applications

Includes Bridgeworks WANrockIT network
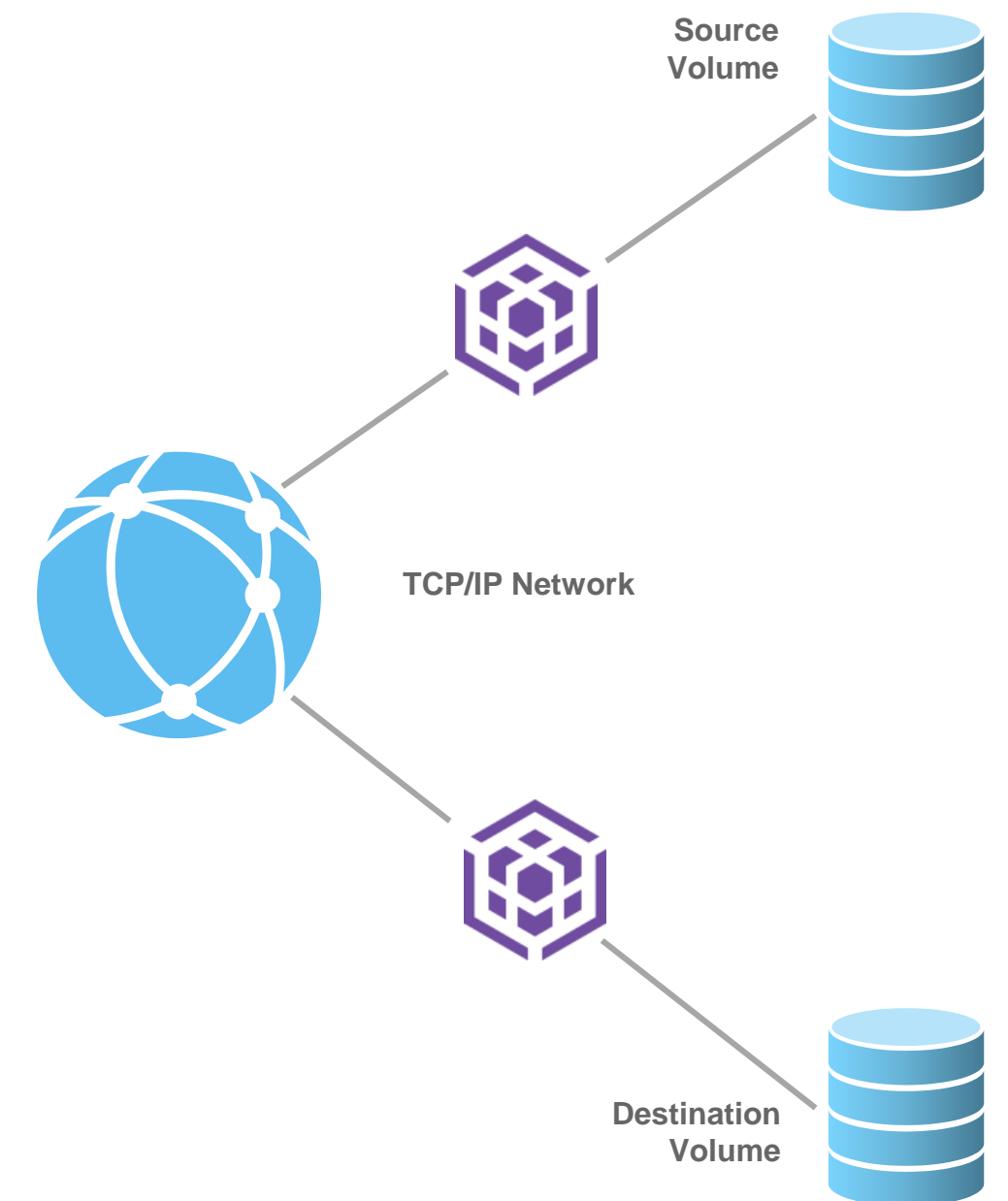optimization technology

  No separate appliances required

  Uses artificial intelligence to improve

  network bandwidth utilization **up to 3x**

Deploy less costly network infrastructure

Speed replication cycles for better remote data currency and
faster recovery

Source
Volume

TCP/IP Network

Destination
Volume

IBM Systems

Storwize V7000/V5000 offers FlashCopy option

FlashCopy (snapshot) function is optional for up to 4096 targets

Enables taking more or more frequent copies

   Support more VMs from a single master copy
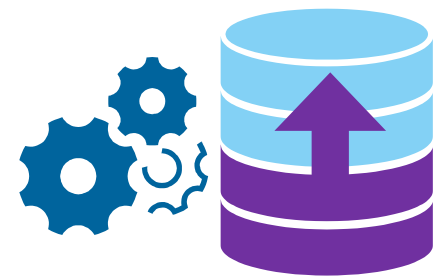
   Enables more work to proceed in parallel

More copies can reduce impact of having to use a backup copy

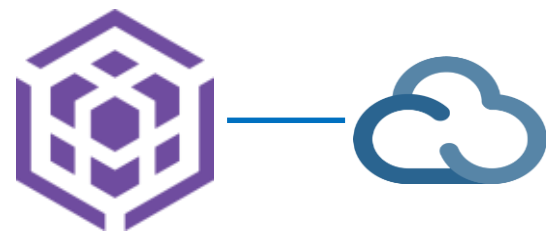   For example, taking a copy every hour instead of every day

   Reduces potential impact by up to 95%

Enhancing Data Simplicity

Improves agility with automated provisioning of storage as it is required by applications, integration with virtualization tools such as VMware vCenter, and easy deployment of new storage technologies

Enables hybrid cloud storage with ability to extend new or existing storage capacity, on demand into the cloud

Consolidates all your storage – no matter the vendor – for simplified management, consistent functionality, and greater efficiency
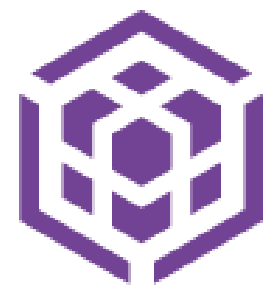
Enables flexibility in storage acquisition by supporting common capability across all types of storage so you can mix vendors with ease

Introducing IBM Spectrum Virtualize Transparent Cloud Tiering

New!

Interfacing **cloud storage** into an existing **on-premises storage** environment

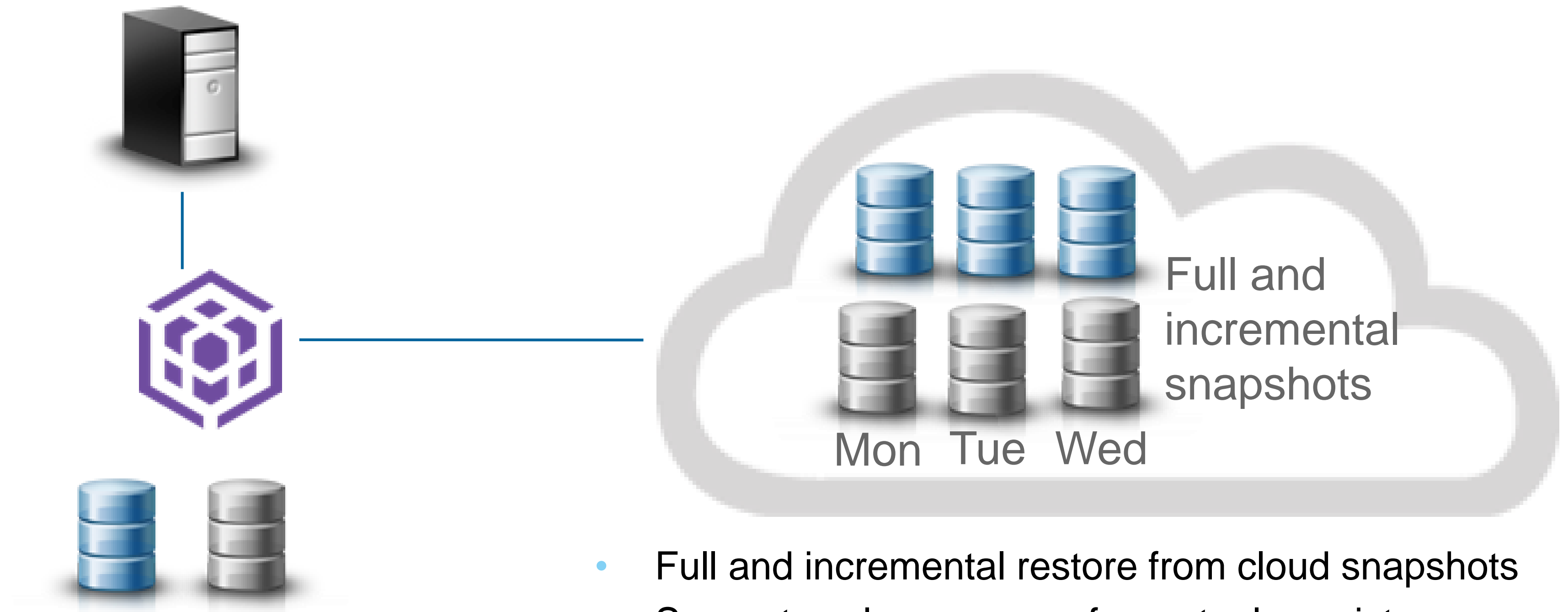Almost 400 storage systems from IBM and others

- Preserves **performance** of local storage
- Preserves **agility of deployment** of cloud storage
- Preserves **simplicity of configuration** across many host types
- Uses **existing SAN configuration skills**

IBM Spectrum Virtualize Cloud FlashCopy

Full and
incremental
snapshots

Mon Tue Wed

- Full and incremental restore from cloud snapshots
- Supports volume groups for mutual consistency
- Import and export of volumes between systems
- Supported cloud providers: IBM Softlayer, Openstack Swift, Amazon S3

Storwize V7000/V5000 Offers a Wide Range of ISV Integration

Enablement, **integration** and optimization for enhanced customer value

- ISV, software, and application support same as SVC

- **Reduce complexity, improve utilization** and cut costs

- Deliver continuous and reliable access to information

Targeted solution areas include:

- Database and performance optimization

- Backup / restore

- High availability, disaster recovery

- Server virtualization

- Operations management

Visible through dedicated partnerships and ongoing work with:

vmware

ORACLE

Microsoft

Symantec

SAP

*"With integral and complete VMware support and the ability to use flash drives and automatic tiering, the Storwize V5000 is an excellent storage solution for server virtualization. The scalability, advanced features, and performance, give the Storwize V5000 high-end enterprise capabilities for a product whose cost positions it clearly in the midrange for IBM." - **Randy Kerns, Evaluator Group***

IBM FlashSystem **33**

Storwize V7000/V5000 are part of Integrated Infrastructure Solution: VersaStack

A la cart All-Flash or Hybrid Infrastructure

Storwize V7000
Storwize V7000F

Storwize V5010, V5020, V5030
Storwize V5030F

FlashSystem V9000

Converged Infrastructure

Converged Infrastructure of:

Compute Storage Networking Management

VersaStack™
Solution
by Cisco and IBM

Proven. Industry Leading.

Versatile. Easy. Efficient.

Storwize V7000/V5000 with IBM Spectrum Virtualize
Proven, Efficient, Dependable

IBM Spectrum Virtualize software is the heart of
IBM SAN Volume Controller, IBM Storwize family,
IBM FlashSystem V9000, and VersStack

- Deployed on over **185,000** systems

- Managing over **309,000** enclosures of data

- Virtualizing, managing and securing **6 exabytes** of data

- Exceeding **99.999%** availability

- Supporting almost 400 IBM
  and non-IBM storage systems

**Enabling clients to do more with less**

3x performance with only **5%** flash
Up to **63%** lower personnel costs
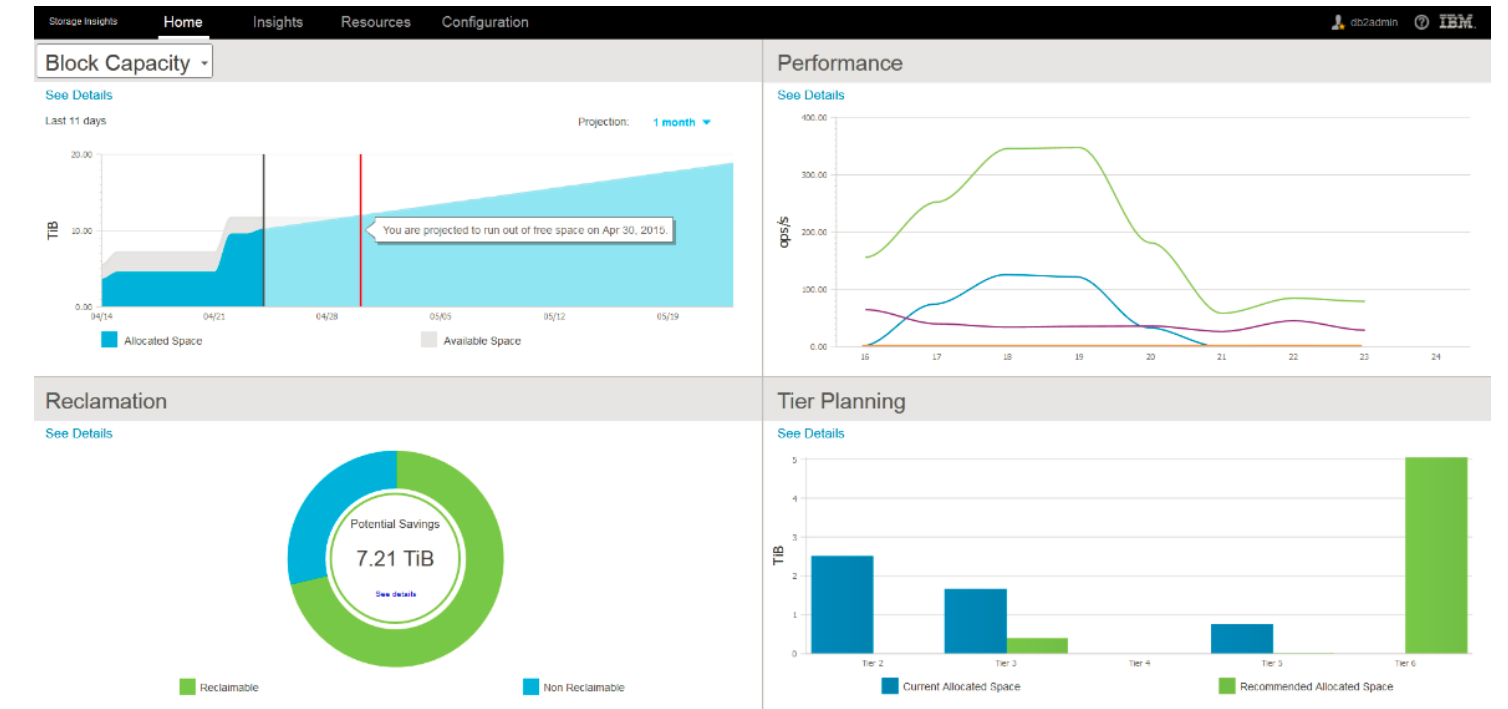Up to **100%** better storage utilization

Multiply Your Business Opportunities

➢ *Optimize data economics with a powerful combination of flash and storage virtualization*

➢ *Deploy the right all-flash or hybrid solution to solve your unique business and IT requirements*

➢ *Revitalize your existing storage with a combination of IBM Spectrum Virtualize and IBM Storwize family*
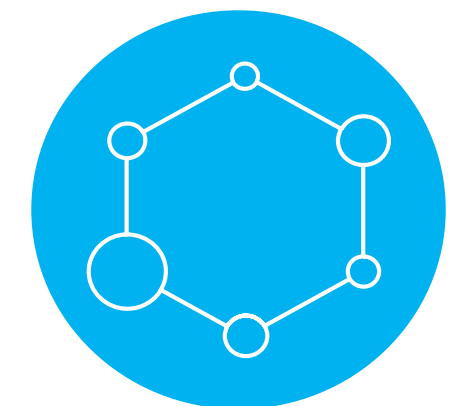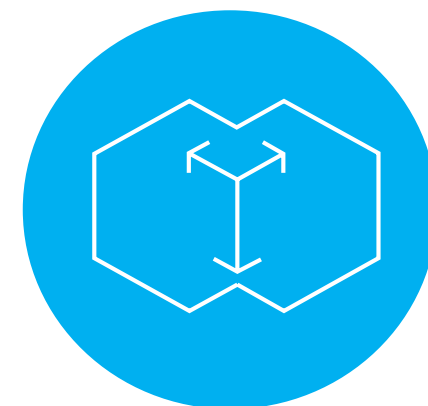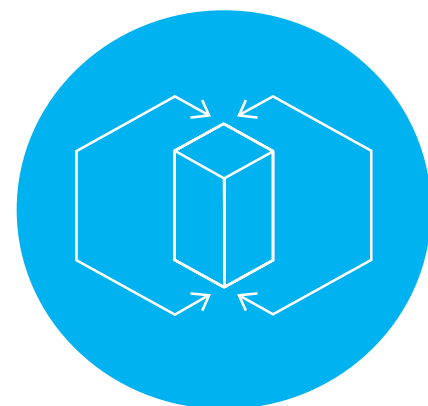
Storwize V7000/ V5000 can be optimized with IBM Spectrum Control Storage Insights

See what insights will be revealed about your environment!

- New cloud service to manage on-premises storage

- Delivers visibility and rapid insights into your storage environment:
  - ***Understand your environment and its usage***
  - ***Monitor capacity and performance***
  - ***Reclaim allocated, but unused volumes***
  - ***Optimize data placement with advanced analytics***
  - ***See storage as users see it, application and department views***

- Installs in just **5 minutes**, actionable recommendations flow in less than **30 minutes**

- Insights deepen over time

- No onsite management and maintenance required

- Simple, capacity-based subscription pricing model

Thank you.

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