IBM® Storwize V7000 and

IBM® Storwize V7000F

Maximizing storage efficiency to transform the economics of data

Major Shifts and Disruption In The Storage Market

Cloud

Flash

Software-defined

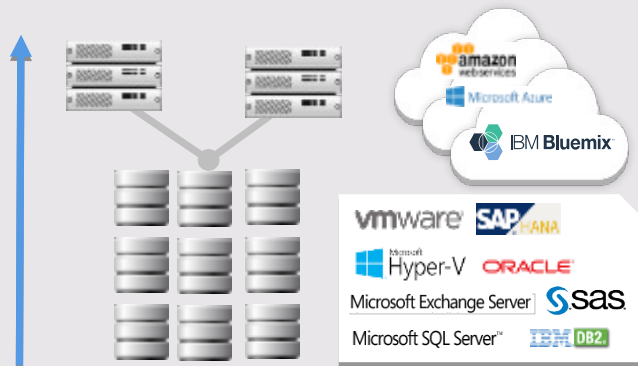Industry consolidation

Industry disruption

Clients are challenged with how to navigate into the future

Uncertainty can cause hesitation
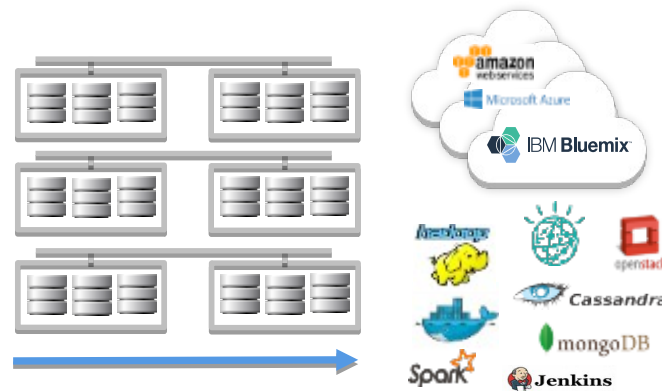
How Do You Move Forward?

Traditional Application Workloads

Modernize

Optimize and drive efficiencies, while continuing to deliver high levels of service delivery

New Generation Application Workloads

Transform

Deliver and operate new application infrastructure to support new Cognitive and agile workloads

Save here —————— **Invest here**

Helping Organize to Modernize and Transform

Traditional Application Workloads

Modernize:

Optimize and drive efficiencies, while continuing to deliver high levels of service delivery

Leverage automation, Flash and Cloud

New Generation Application Workloads

Transform

Deliver and operate new application infrastructure to support new Cognitive and agile workloads
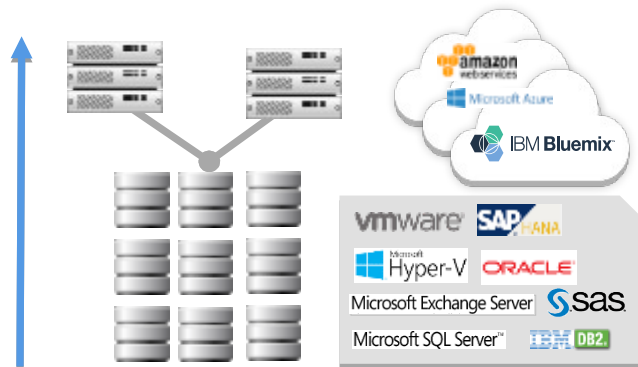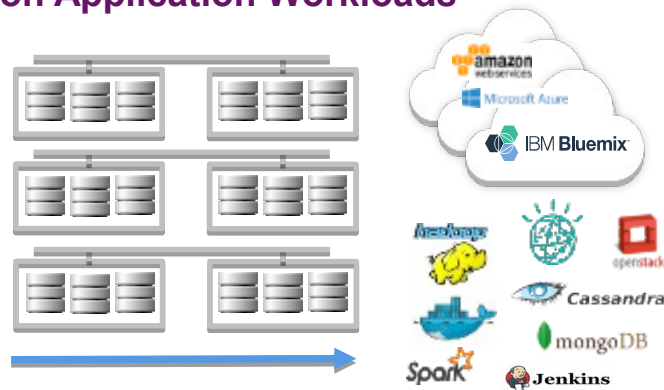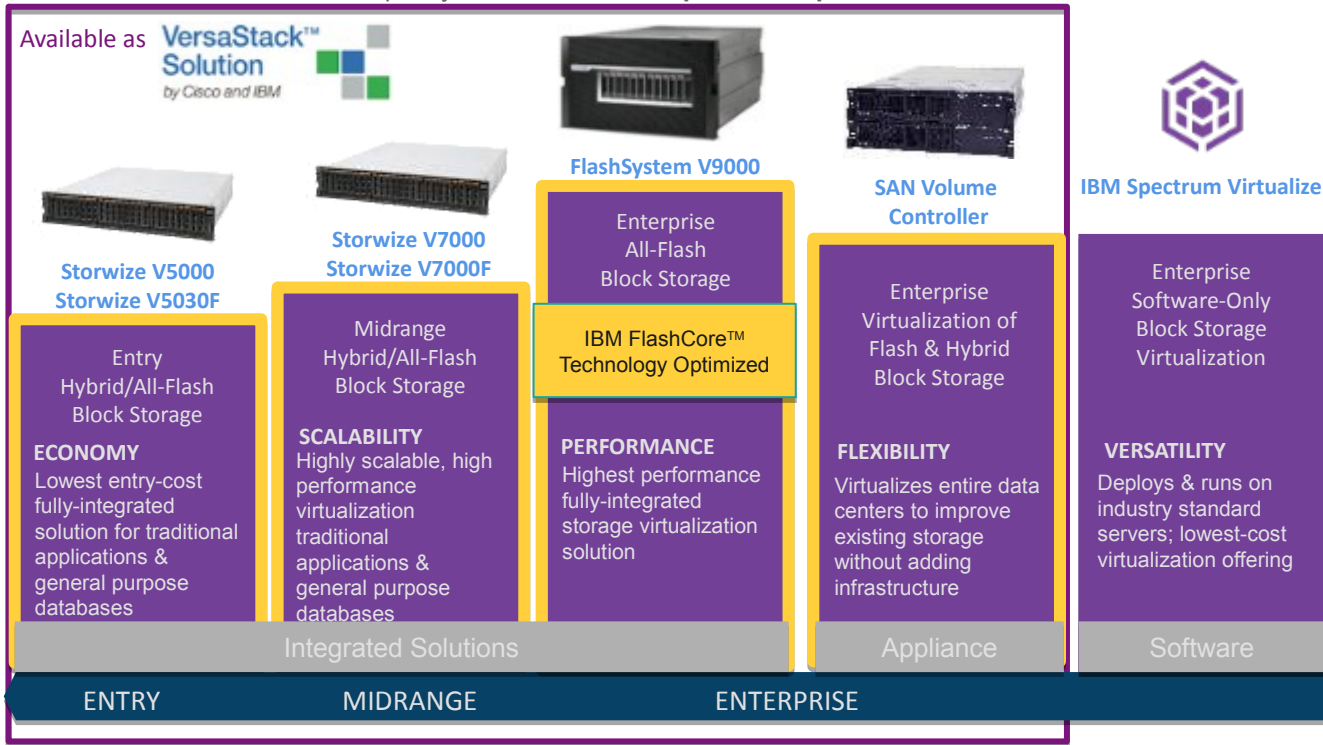
Leverage Software Defined, Flash and Cloud

Become more agile to the demands of the business

Virtualized Storage Infrastructure

Enterprise data services for heterogeneous environments

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

Available as VersaStack™ Solution *by Cisco and IBM*

FlashSystem V9000

SAN Volume Controller

IBM Spectrum Virtualize

**Storwize V5000
Storwize V5030F**

**Storwize V7000
Storwize V7000F**

Entry Hybrid/All-Flash Block Storage	Midrange Hybrid/All-Flash Block Storage	Enterprise All-Flash Block Storage	Enterprise Virtualization of Flash & Hybrid Block Storage	Enterprise Software-Only Block Storage Virtualization

IBM FlashCore™ Technology Optimized

ECONOMY
Lowest entry-cost fully-integrated solution for traditional applications & general purpose databases

SCALABILITY
Highly scalable, high performance virtualization traditional applications & general purpose databases

PERFORMANCE
Highest performance fully-integrated storage virtualization solution

FLEXIBILITY
Virtualizes entire data centers to improve existing storage without adding infrastructure

VERSATILITY
Deploys & runs on industry standard servers; lowest-cost virtualization offering

Integrated Solutions | Appliance | Software

ENTRY | MIDRANGE | ENTERPRISE

IBMStor

IBM Storwize V7000 and IBM Storwize V7000F

Maximizing storage efficiency to transform the economics of data

Accelerate critical business insight with **all-flash performance** to improve core application response time

Transform economics by converting CAPEX to OPEX using **cloud storage** to complement or replace on-premises storage

Improve your business agility with **unique heterogeneous data services** that maximize efficiency and flexibility for more than 400 storage systems

Support growing flash workloads with **up to 8x larger** system and **32PB of flash storage** in only four racks

IBM Storwize V7000 Hybrid Solution

Cost optimized flash for heterogeneous environments

EFFICIENT

- Lower TCO with flash-optimized compression
- Improve utilization by 2X with virtualization support for more than 400 systems
- Maximize storage efficiency withthin provisioning and snapshots
- Unique hardware upgrade path
- **Flash optimized with Hardware- Assist Real-time Compression**, distributed RAID, and multi-layer write caching.

FEATURE RICH

- **New fresh intuitive user interface**
- Transparent Cloud Tiering
- Asynchronous Replication
- Synchronous Replication
- VMware integrated
- Linked to OpenStack
- 600+ Storwize API

SCALABLE

- Scale-up and scale-out for capacity and performance so that you can grow your storage with your business
- High density expansion enclosure: **3x better drive density** with up to 92 drives in only 5U
- Management of **up to 32 PB** by a single Storwize V7000 system

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

Purpose-built for the cloud

IBM Storwize V7000F All-Flash Solution

Accelerate Storage Efficiency

FAST

- Powerful hardware platform with all-flash configuration and **increased memory option with up to 256 GB** per system
- Increase the data storage of flash and lower deployment cost with multiple capacity flash drive options: **1.92TB, 3.84TB, 7.68TB & 15.36TB flash drives**

FEATURE RICH

- **New fresh intuitive user interface**
- Transparent Cloud Tiering
- Asynchronous Replication
- Synchronous Replication
- VMware integrated
- Linked to OpenStack
- 600+ Storwize API

Purpose-built for the cloud

EFFICIENT

- Lower TCO with flash-optimized compression
- **Improve utilization by 2X** with virtualization support for **more than 400 systems**
- Maximize storage efficiency with thin provisioning and snapshots
- Unique hardware upgrade path
- Flash optimized with **Hardware- Assist Real-time Compression**, distributed RAID,   and multi-layer write caching.

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**

Scalability

- 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, **900GB** 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	V7000(F)
SAS chains (per controller)	2
Dense expansions	8
Drives/controller	760
Drives/cluster	3,040
Max cluster capacity, NL HDDs (raw)	29.7 PB[1]
Max cluster capacity, flash drives (raw)	32.0 PB*

[1]Storwize V7000 only
*Spectrum Virtualize maximum managed capacity/cluster = 32PB

Drives not interchangeable with 2U enclosures

Storwize V7000 supports 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			

Standard = 2U; Dense = 5U

Enclosure types can be mixed in any order on SAS chains

IBM 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 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 Spectrum Virtualize 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 to existing and new storage
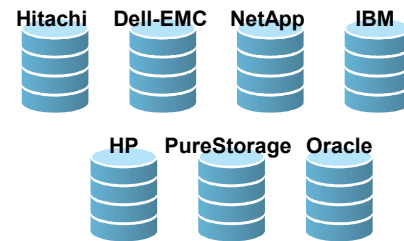
*"Storage virtualization has been key to providing **efficient and cost-effective storage** solutions for our data center"*

RICOH USA

IBM Storwize V7000 Tiering

Take the guesswork out of managing workloads across multiple tiers of storage

Policy-based data placement provides objective analysis of workload placement

Intelligent analytics make recommendations based on historical performance with automated, transparent migration to appropriate storage tier

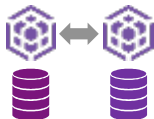**Set it and forget it** … unlike competitive tiering offerings

Flash Arrays

Active Data Migrates Up

Less Active Data Migrates Down

HDD Arrays
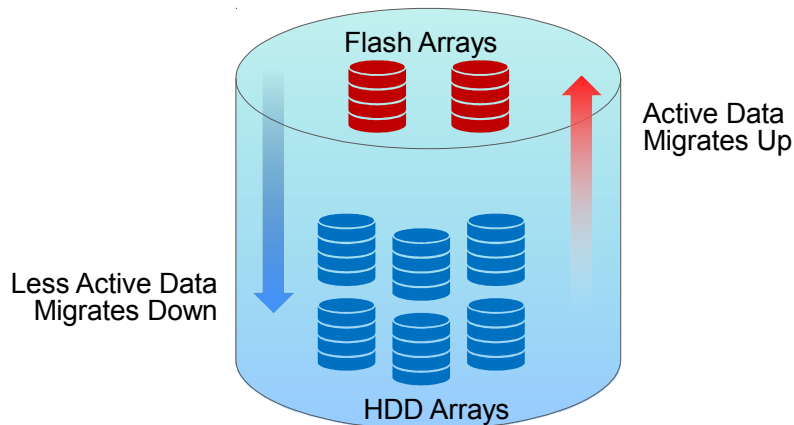
Increasing Data Security

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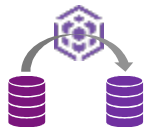
Eliminates storage downtime with nondisruptive movement of data from one type of storage to another

Encryption for Internal and 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
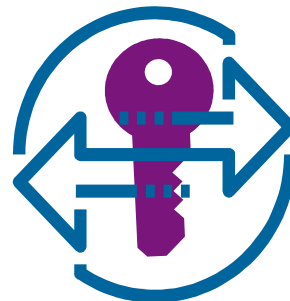
Encryption Key Management

Support to encryption key management software IBM Security Key Lifecycle Manager (SKLM)

- Help centralize, simplify and automate the encryption key management process
- Minimize risk and reduce operational costs

Improves availability of keys by providing greater redundancy

IBM Spectrum Virtualize supports up to four SKLM key servers

- One master, up to three clones

Supports use of SKLM and USB concurrently

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

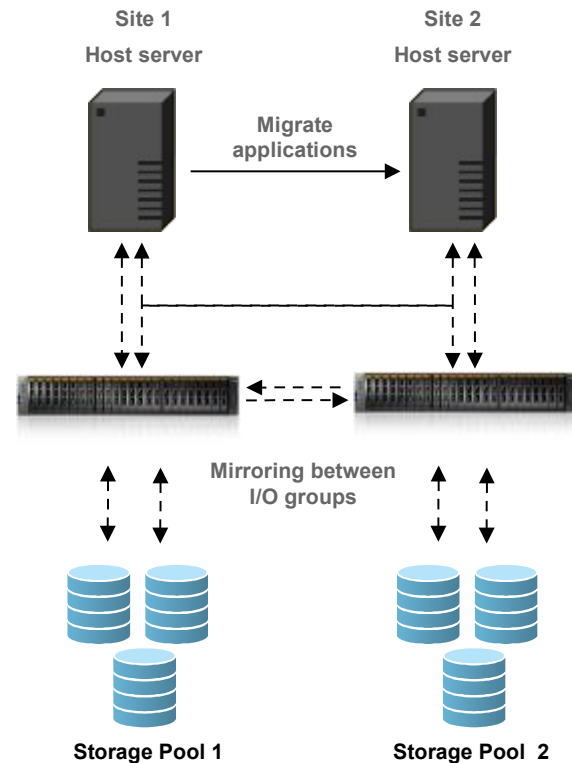# Extreme High Availability with IBM HyperSwap

Extreme high availability solution

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

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
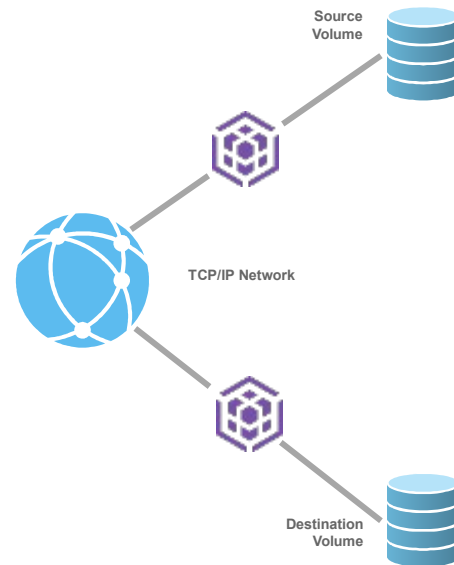
Enhancing Data Simplicity

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

Ease of Use

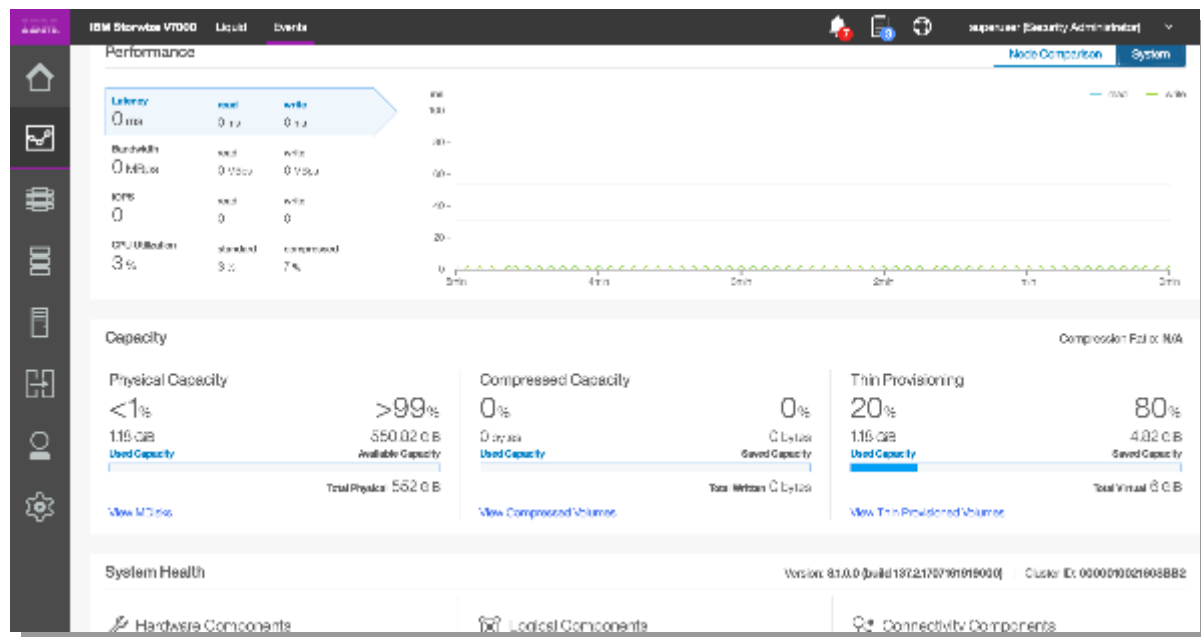**New fresh and modern** look and feel

- Consistent with other IBM Spectrum Storage software
- Preserves familiar panel layout to ease transition
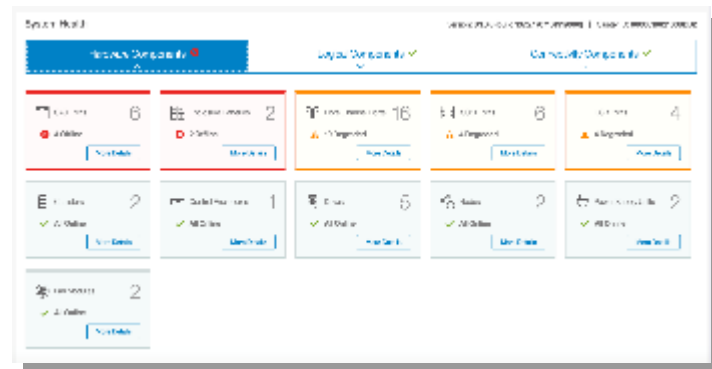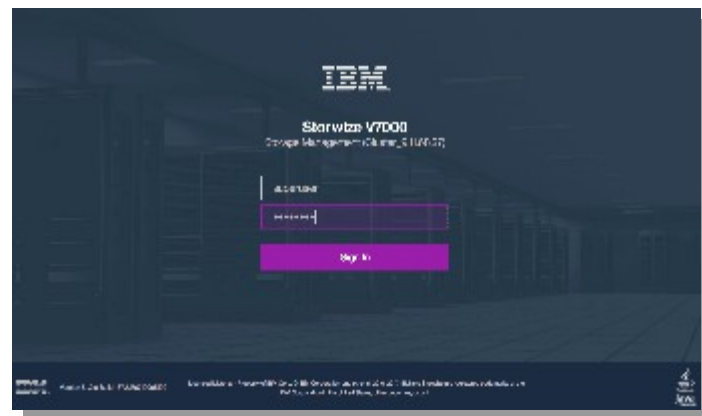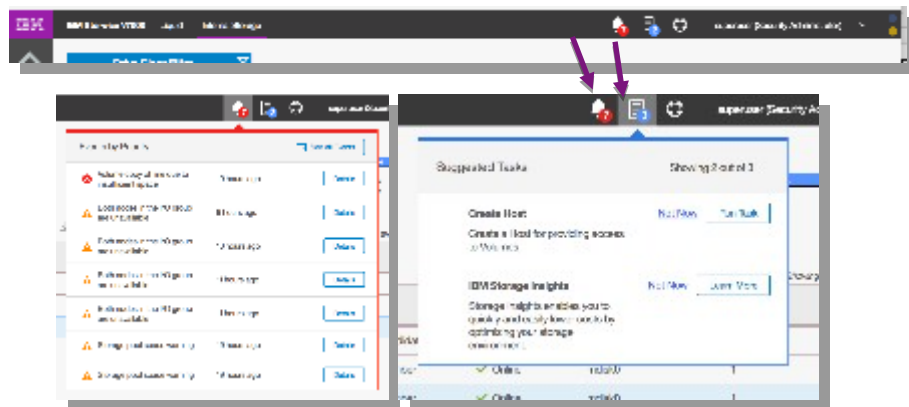
New GUI: Dashboard

"At-a-glance" view of system activity and state

- Performance

- Capacity

- System health

Transparent Cloud Tiering

IBM Spectrum Virtualize

Over 400 storage systems
from IBM and others

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

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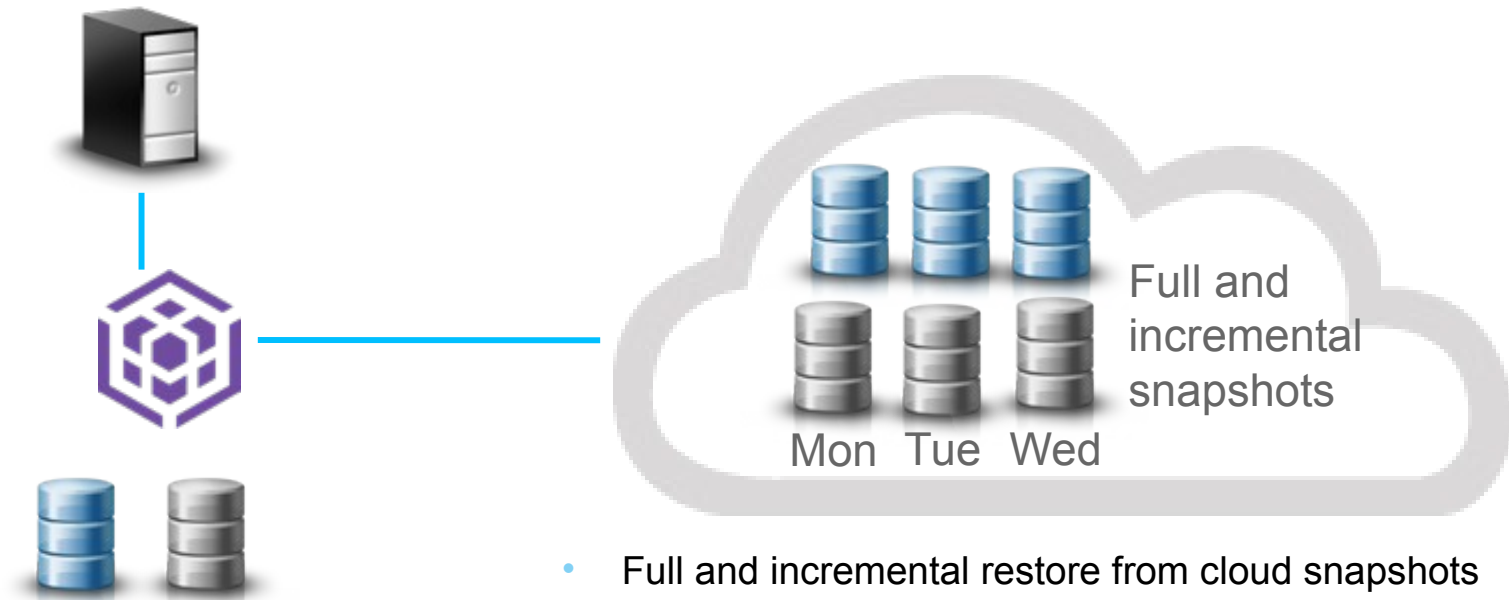
- Full and incremental restore from cloud snapshots
- Supports volume groups for mutual consistency
- Import and export of volumes between systems
- Supported cloud providers: IBM Softlayer, Openstack Swift, Amazon S3

Revitalize 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*