Bart Claeys – IBM System Storage Software Solutions Architect
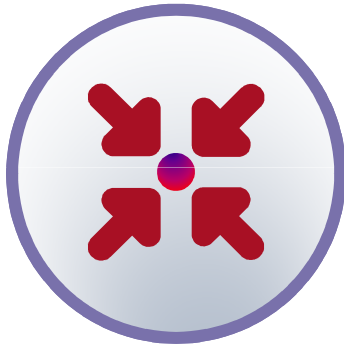
June 2015

IBM® Software Defined Storage

Achieving Storage Agility and Improved Economics

IBM Connect 2015

Changing Nature of Business and Data

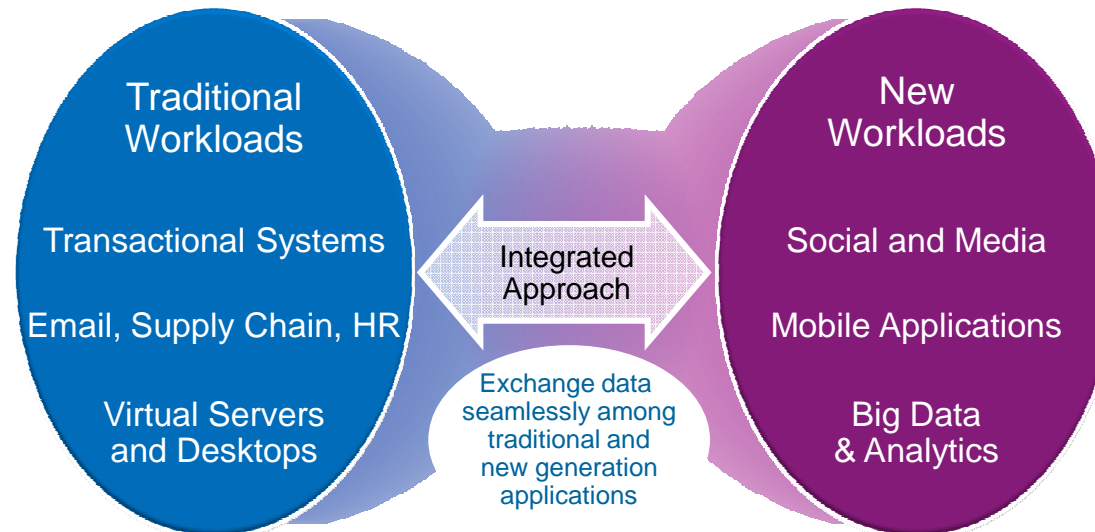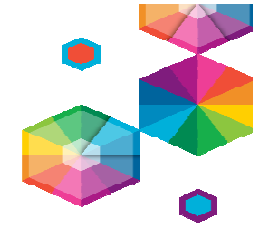| Business Pressures	New Applications	Data Growth	Hybrid Cloud

Free data *from constraints of hardware and* **realign with** *new business processes and applications*

These industry shifts introduce the need for New Data Economics

Traditional Workloads

Transactional Systems

Email, Supply Chain, HR

Virtual Servers and Desktops

Integrated Approach

Exchange data seamlessly among traditional and new generation applications

New Workloads

Social and Media

Mobile Applications

Big Data & Analytics

Systems of Record

- Benefit from simplified infrastructure
- Require cost efficiency through improved virtualization and automation
- Drive controlled data growth of structured data

Systems of Engagement

- Require massive scale and rapid pace
- Accelerate business insights
- Rely on data elasticity for unstructured data and support diverse hardware

Business SLAs Challenge 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

Transition and Disruption

Infrastructure

Hardware Commoditization: Data is no longer static on a single device

Cloud and Mobile: New, dynamic access requirements on network and content. Self service management

Abstraction: Virtualization and hybrid can mean complexity on operations and architecture

Trend to open: Movement away from proprietary technology and standard orchestration interfaces/devops

Application and Workloads

Hybrid applications: Compute and data distribution, scale-out object, analytics…

Application Orientation: Containers and policy around the application

Recovery Objectives: At the business level not the infrastructure element

Questions on ownership: Overlapping responsibility and confusion

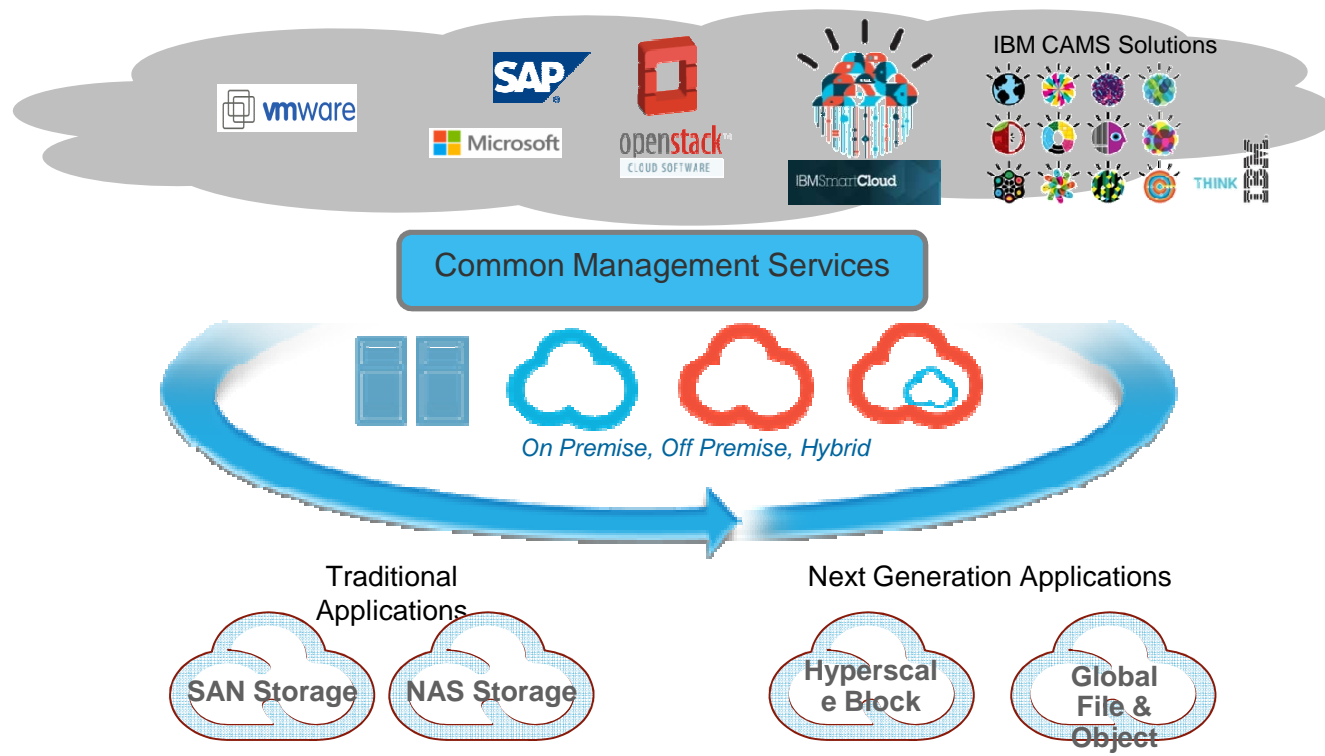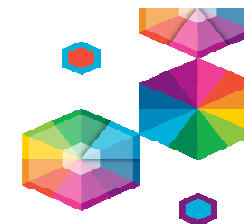**Security and Privacy:** Static and in-flight content with audit capability

Keeping the business running, whilst transitioning and evolving

IBM - Software Defined Storage - Vision

vmware

SAP

Microsoft

openstack CLOUD SOFTWARE

IBM CAMS Solutions

IBMSmartCloud

THINK

Common Management Services

On Premise, Off Premise, Hybrid

Traditional Applications

Next Generation Applications

SAN Storage

NAS Storage

Hyperscale Block

Global File & Object

A New Approach – IBM Software Defined Storage

Securely "Unbox" From Traditional Storage Devices

Agility	Control	Efficiency
First self-tuning enterprise-class solution enabling deployment of storage infrastructure for clouds in minutes	**Deepest insight and optimization** of on-premise and cloud storage - security, cost, performance - via analytics	**Best automatic data placement and management** across storage systems, media, and cloud to meet both service levels and reduce cost up to 90%

9

Exploring IBM Software Defined Storage Capabilities
IBM Spectrum Storage Family

Storage and Data Control

Storage Management	Policy Automation	Analytics & Optimization	Snapshot & Replication Management	Integration & API Services	Self Service Storage	Data Backup and Archive

Spectrum Control
Virtual Storage Center

Spectrum Protect
Tivoli Storage Manager

Data Access

Traditional Applications

New Generation Applications

Virtualized SAN Block	Hyperscale Block	Global File & Object	Active Data Retention

Spectrum Virtualize
SAN Volume Controller

Spectrum Accelerate
Based on XIV Software

Spectrum Scale
GPFS/Elastic Storage

Spectrum Archive
LTFS

IBM Storwize, XIV, DS8000, FlashSystem and Tape Systems

Non-IBM storage, including commodity servers and media

SOFTLAYER
an IBM Company
and non-IBM clouds

10

InterConnect2015

#ibminterconnect

Announcing IBM Spectrum Storage Family

> $ 1 Billion Investment

Agility	Control	Efficiency
Speed **Spectrum Accelerate™**	**Insight** **Spectrum Control™**	**Utilization** **Spectrum Virtualize™**
Elasticity **Spectrum Scale™**	**Governance** **Spectrum Protect™**	**Placement** **Spectrum Archive™**

Get It Your Way: Software, Service or Appliance

Proven Technology, Open Standards, Modular Adoption

IBM Spectrum Storage Family
Securely 'unboxing' storage to revolutionize data economics

Family of Storage Management and Optimization Software

| Control | Protect | Archive |
| Virtualize | Accelerate | Scale |

Any Storage　　**Flash Systems**　　**Private, Public or Hybrid Cloud**

IBM Spectrum Control	Analytics-driven data management to reduce costs by up to 50 percent
IBM Spectrum Protect	Optimized data protection to reduce backup costs by up to 38 percent
IBM Spectrum Archive	Fast data retention that reduces TCO for active archive data by up to 90%
IBM Spectrum Virtualize	Virtualization of mixed environments stores up to 5x more data
IBM Spectrum Accelerate	Enterprise storage for cloud deployed in minutes instead of months
IBM Spectrum Scale	High-performance, highly scalable storage for unstructured data
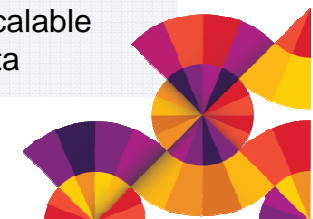
IBM Spectrum Storage Family Business Value

Simplified storage management

Supports all applications, data types, 100's of heterogeneous storage systems, and clouds

Scalability with data anywhere

Enables elastic scalability with high performance for new analytics, big data, social and mobile applications

Improved data economics

Leverages commodity hardware and intelligently moves data to the right location at the right time, from Flash for fast access to tape and cloud for the lowest cost

Openness.

Supports industry standards including OpenStack and Hadoop to to complement IBM innovations with ones from other providers and communities

Why IBM for Software-Defined Storage

IBM understands both software and storage
IBM Research has driven development of core storage technologies

IBM understands data
IBM uniquely offers leading data-centric software such as analytics, content management, and database

IBM understands cloud
IBM is a leading cloud provider with over 40 global data centers powering thousands of customers

IBM understands infrastructure
IBM delivers storage management and optimization capabilities required to create leading edge infrastructures

SDS at IBM is not new and IBM was recently ranked the **#1 provider of SDS platforms**

New: IBM Spectrum Accelerate

IBM Spectrum Accelerate

✦ Enterprise cloud storage in minutes

✦ Self-tuning with low management overhead

✦ Leverage commodity servers

✦ Deploy on premise or on the cloud
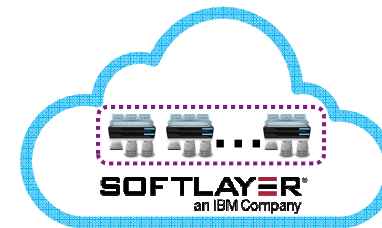
Based on proven grid-scale technology from XIV System deployed in 100,000+ servers

New: IBM Spectrum Storage Family Futures

Storage Insights

Beta

✦ Analytics driven data and storage management from the cloud

✦ Insights into cloud and on premise storage environments

✦ Deploys in as little as 30 minutes

SOFTLAYER®

Multi-Cloud Storage Gateway

Alpha Preview

✦ Integrated seamless data movement to and from clouds

✦ Secure, available, efficient, and trusted data

✦ Leverage cloud for backup, disaster recovery, archiving, & data sharing

IBM Spectrum Storage Business Value

Simplified storage management

Unified and streamlined storage management and data protection across all applications and data types, wherever that data is stored

Scalability with data anywhere

Elastic scalability with high performance for new analytics, big data, social and mobile applications. This includes unifying silos to deliver data without borders, securely, with built-in hybrid cloud support

Improved data economics

Leverages commodity hardware and intelligently moves data to the right location at the right time, from Flash for fast access to tape and cloud for the lowest cost tier

Openness

Supports industry standards including OpenStack and Hadoop to ensure the ability to complement IBM innovations with ones from other providers and communities

IBM Spectrum Control
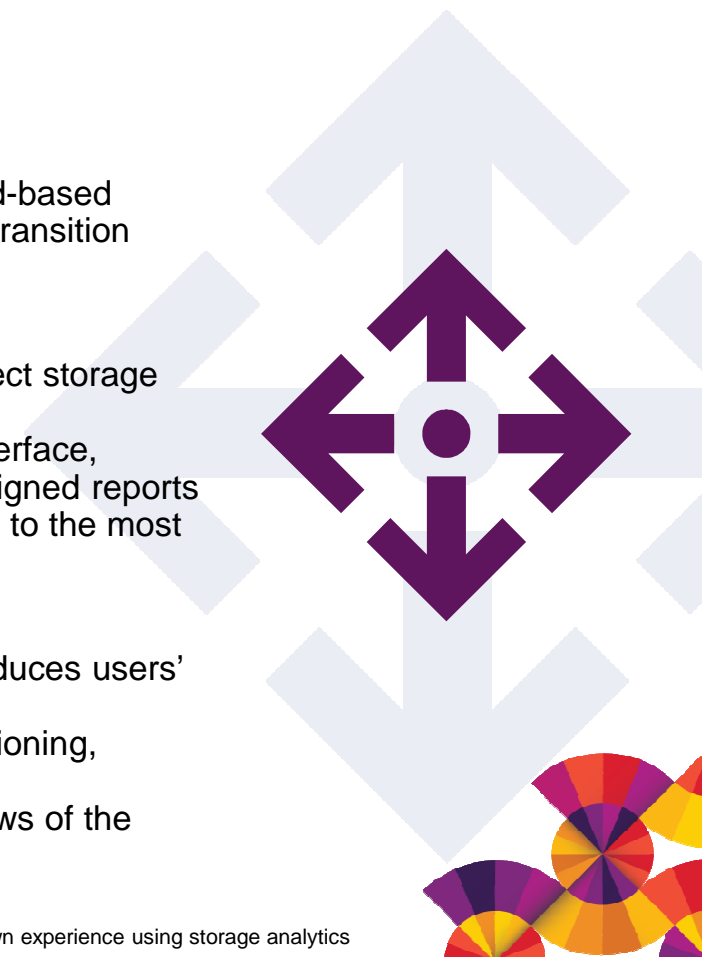*Extend Storage Economic Benefits to Operations*

Overview
✦ Storage virtualization platform and storage management solution for cloud-based and software-defined storage. IBM Spectrum Control helps organizations transition to new workloads and updated storage infrastructures

Key Capabilities
✦ A single console for managing all types of data on disk, flash, file and object storage systems
✦ Simplified visual admin tools – including an advanced web-based user interface, VMware® vCenter™ plug-in & Cognos® Business Intelligence with pre-designed reports
✦ Analytics-driven tiered storage optimization that automatically moves data to the most cost-effective tier

Benefits
✦ First to Market volume-level, cross-platform automated storage tiering, reduces users' cost of storage up to 50%[1]
✦ Cloud and Software Defined Storage – Service catalog, automated provisioning, optimized utilization of pools of storage
✦ Intelligent Performance Management with application and department views of the storage infrastructure

18

1. Based on IBM's own experience using storage analytics

IBM Spectrum Control Storage Insights

Overview
✦ SoftLayer cloud-based storage and data reporting provides key insights into usage without need for major software deployment

Key Capabilities
✦ Identify and categorize storage assets
✦ View performance history for application workloads
✦ Reclaim unused / wasted storage space
✦ Optimize data placement within the infrastructure

Benefits
✦ Helps reduce storage and administrative costs
✦ Simplified management and deployment
✦ Provides deep understanding of storage and data usage
✦ Enables capacity planning and performance management

IBM Spectrum Control Storage Insights is available now at
Visit https://www-304.ibm.com/software/support/trial/cst/forms/nomination.wss?id=5993

Storage Economic Benefits Extended to Operations

| Manage disk, flash, file, and object data from a single console	Integrate with virtual and cloud environments	Improve productivity through analytics and automation

citi

VMware admins manage 12PB of storage for 70k VMs

Cut storage provisioning time **from 2 weeks to 5 minutes**

FRANCISCAN MISSIONARIES OF OUR LADY HEALTH SYSTEM

Saving 15 hours a week in performance troubleshooting based on improved storage environment visibility
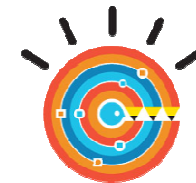
European education institution

From days to minutes on turnaround for client provisioning requests

Automated expiration to reclaim wasted space

IBM Spectrum Protect
Transformed Economics for Data Protection

Overview
✦Comprehensive data protection and recovery solution for virtual, physical and cloud data. Provides backup, snapshot, archive, recovery, space management, bare machine recovery and disaster recovery capabilities

Key Capabilities
✦Protects virtual, physical, and cloud data with one solution
✦Reduces backup and recovery infrastructure costs by up to 38 percent [1]
✦Delivers greater visualization and administrator productivity
✦Simplifies backups by consolidating administration tasks

Benefits
✦Application-aware and VM-aware data protection for any size organization
✦Simplified administration
✦Built-in efficiency features: Deduplication, incremental 'forever' backup
✦Integrated multi-site replication and disaster recovery

1. Average of individual customer Analysis Engine Reports from Butterfly Software (PDF, 1.40MB), May 2013, n=450. The savings include cumulative 36-month hardware, hardware maintenance and electrical power savings. Excludes one-time TSM migration cost.

Transformed Economics for Data Protection

| Single data protection solution for virtual, physical, and cloud | Simplify backups by consolidating administration tasks | Enable cloud backup with vCloud and OpenStack integration |
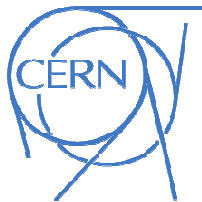
More than 40PB of data protected

Protecting **1GB of new data** every second every day

Two times more backups per storage administrator

Insourced recovery operations **saving 75% in administrative time**

VMware recovery time **reduced by 96%**

IBM Spectrum Archive
New Storage Economics for Active Archive

Overview
✦ Network attached unstructured data storage with native tape support using Linear Tape File System, delivers the best mix of performance and lowest cost storage

Key Capabilities
✦ Seamless virtualization of storage tiers
✦ Policy based placement of data
✦ Single universal namespace for all file data
✦ Security and protection of assets
✦ Open, non-proprietary, cross platform interchange
✦ Integrated functionality with IBM Spectrum Scale

Benefits
✦ Use data stored on low cost tape as easily as disk
✦ Optimize data placement for cost and performance
✦ Enable data file sharing without proprietary software
✦ Access data anywhere, any place, any time, in any format
✦ Scalable, low cost

23

New Storage Economics: Active Archive Use Case

Policies govern transparent data movement	Inactive data reaches lowest cost tier quickly	No change to applications

Primetime Emmy Engineering Award 2011, IBM Corporation and Fox Networks Group Linear Tape File System in a broadcast environment

High-speed access to large files

Low cost, long-term storage

Preserve data for generations

Not big data. HUGE data!

High performance analytics combined with long term data retention

IBM Spectrum Virtualize
Transformed Economics of Traditional SAN

Overview
✦ Highly scalable storage virtualization system providing common functionality, management, and mobility across heterogeneous storage types

Key Capabilities
✦ Pools storage from multiple systems
✦ Compresses data with high performance with Real-time Compression for extraordinary efficiency
✦ Enables non-disruptive movement of data among storage systems
✦ Supports ultra high availability multi-site configurations

Benefits
✦ Improves storage utilization up to 100%
✦ Supports up to 5x as much data in the same physical space
✦ Simplifies management of heterogeneous storage systems
✦ Enables rapid deployment of new storage technologies for greater ROI
✦ Improves application availability with virtually zero storage-related downtime

25

Transformed Economics of Traditional SAN

Complement virtualized servers	Enhance the value of existing storage – supporting 250+ IBM & non-IBM systems		Improve flexibility and responsiveness

SSB

Stuttgarter Straßenbahnen AG

50% reduction in total cost

Push button data mobility

UPMC

University of Pittsburgh Medical Center

67% reduction in storage and facilities cost

Continuous migrations with **zero disruptions**

SICOOB

SicoobCredicitrus

30% reduction in space

Reuse of existing systems

Middle Eastern Regional Telco

70%+ reduction in space

Storage provisioned in **minutes** *not* hours

IBM Spectrum Accelerate
Redefining Economics of Storage Systems

Overview
✦ Software based on IBM XIV storage that extends XIV enterprise capabilities, such as tuning-free consistent performance, to new delivery models needed by next-generation application environments

Key Capabilities
✦ Enterprise cloud storage in minutes, leveraging commodity hardware
✦ Hotspot-free performance and QoS without any manual or background tuning needed
✦ Advanced remote replication, role-based security, and multi-tenancy
✦ Deploy on premise or on the cloud
✦ Hyper-scale management of dozens of PB
✦ Best in class VMware and OpenStack integration

Benefits
✦ Enterprise-class function and data availability
✦ Maximized business agility and flexibility
✦ Simplified acquisition and rapid deployment
✦ Minimized administration and training costs
✦ Exceptional ease of use

27

Redefining Economics of Storage Systems

The ***CIO*** can dynamically scale storage infrastructure for new generation applications apps with ***minimal upfront investment and 50% less operational costs*** than traditional integrated SAN storage

The ***storage administrator*** supporting new generation applications can ***provision storage automatically*** in a self-serviced manner while ***guaranteeing enterprise level SLA's***

The ***cloud administrator / datacenter operator*** can ***deploy new storage capacity*** on their own in less than a day, ***as easy as with virtual servers***

Reduce capital expenses by using existing infrastructure for storage rather than investing in scale-up storage solutions designed for peak performance **Reduce operational expenses** by enabling self-service storage

Realize continuous high performance and reduce service time by allowing for hardware replacement without requiring external technician involvement

Easily order and deploy a storage solution online **Accommodate growth in the most cost-effective manner** by easily adding new nodes and re-purposing storage

IBM Spectrum Scale
Unleash New Storage Economics on a Global Scale

Overview
✦ Data management supporting high performance, scale-out file and object storage for multiple use cases (Technical Computing, Big Data, Cloud) – up to Yottabytes of data

Key Capabilities
✦ Single global namespace (enabling single file system across multiple sites) with high performance access scales from departmental to global, multisite needs
✦ Automated tiering, data lifecycle management from Flash (6x acceleration) to Tape (10x savings)
✦ Enterprise ready: data security (encryption), availability, reliability, large scale proven
✦ Open: POSIX compliant, integrated with OpenStack and Hadoop (37% faster)

Benefits
✦ Improves performance by removing data-related bottlenecks
✦ Enhances collaboration across geographies
✦ Lowers cost by eliminating duplicate data
✦ Enables sharing with a single file system for multiple applications
✦ Reduces cost per performance by placing data on most applicable storage (for example, flash to tape)
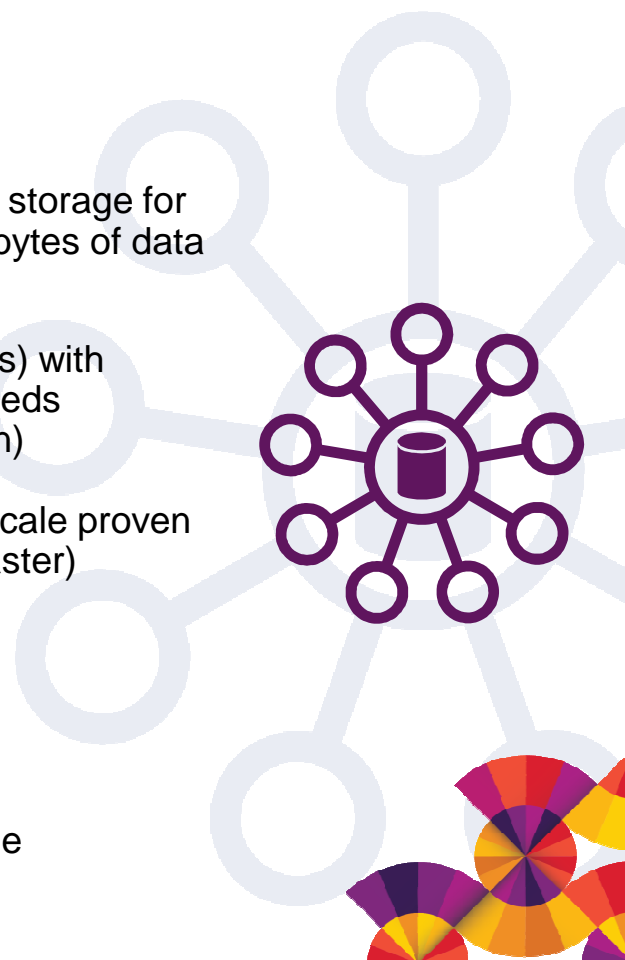
New Storage Economics on a Global Scale

Low latency global data access	Linear scale out capacity and performance	Enterprise storage services on standard hardware

Vestas Wind Systems A/S

50% performance boost on I/O intensive semiconductor simulations

Continuous data availability across hardware outages

20PB of information
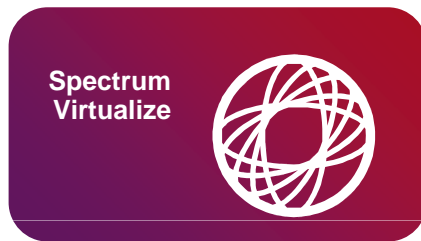
Response times for wind forecasting data **reduced by 97%**
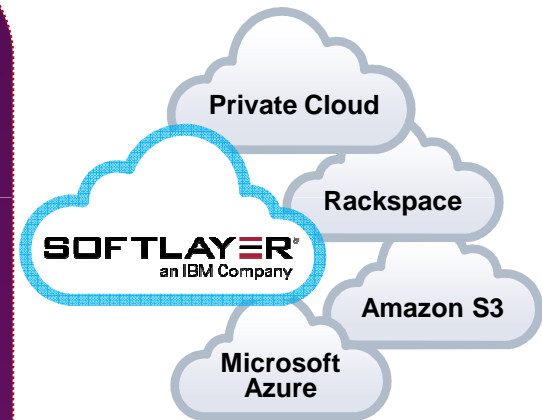
230x faster I/O performance for genomic and scientific computations

Multi-Cloud Storage Gateway
Hybrid Use Cases: The Future of Storage Economics

Spectrum Virtualize

Spectrum Scale
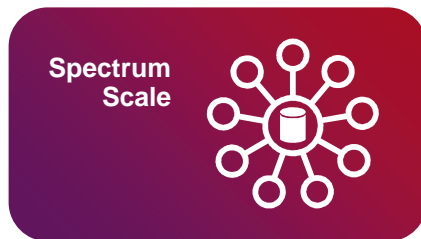
Backup

DR

Tiering

Archive

Data sharing

Compressed

Encrypted

Replicated

Integrity Validated

Multi-cloud Storage Gateway

SOFTLAYER an IBM Company

Private Cloud

Rackspace

Amazon S3

Microsoft Azure
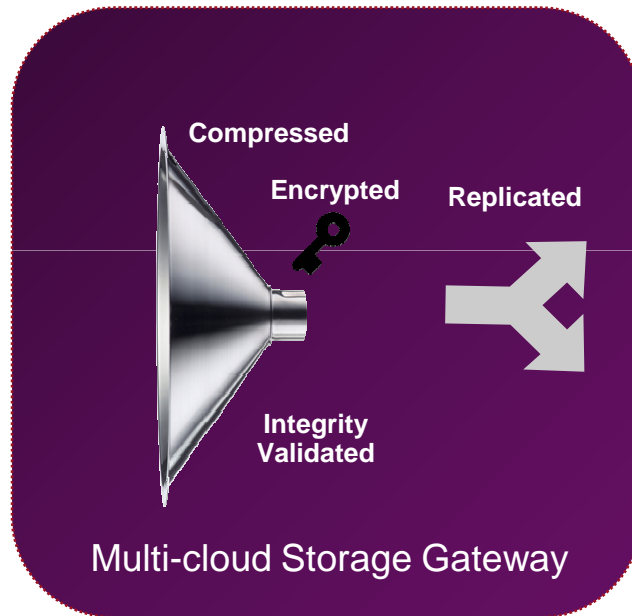
Note: The Multi-cloud Storage Gateway is a planned future enhancement

31

Hybrid Use Cases: The Future of Storage Economics

The **storage administrator** supporting **traditional applications** can configure SVC to use **cloud storage as a target for snapshots.**

How? Once configured, the client can use cloud storage like any other FlashCopy target.

The **storage administrator** supporting **new generation applications** can configure on-prem Elastic Storage to **utilize cloud storage as an additional storage tier**

How? Once configured, the client can use cloud storage like any other storage tier. Policies direct movement of cold data to the cloud storage tier or application owners can manually move data to that tier, for example to run a temporary analytics job using cloud resources.

For these use cases, cloud storage is either an OpenStack Swift object store (like Spectrum Scale with its Swift interface) deployed on or off premises, or an Amazon Web Services S3 object store.

From Hardware to Software-defined Storage, IBM Can Help

Existing infrastructure (Traditional SAN / NAS)	New infrastructure (Common building blocks)
✦ Transform the economics of your traditional SAN leveraging Spectrum Virtualize with little or no outage time (can be less than 30 min)	✦ Plan and architect for new generation Software-defined Storage grids leveraging elastically scalable clusters of common building block servers and storage.
✦ Unleash new storage economics on your file storage with instantaneous IP switchover for zero application downtime	✦ Deploy the environment on-premises.
✦ Leverage IBM/BP services expertize	✦ Connect to the cloud for hybrid use cases

Transforming From Traditional to Software-Defined Storage

Transform the Economics of your Traditional SAN	Redefine the Economics of Storage Systems	Unleash New Storage Economics on a Global Scale
Hybrid Use Cases – The Future of Storage Economics		Extend Storage Economic Benefits to Operations
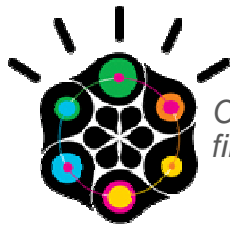
Oil and gas firm

Control over a traditional SAN infrastructure that had doubled in size in just 16 months

Government agency

Data refresh cycle time reduced from **5 hours to 2 minutes**

Storage requirements **reduced by 80%**
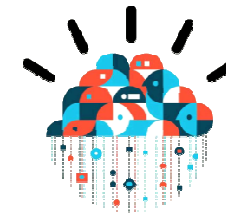
Aerospace company

Synchronized global sharing of critical information to worldwide flight crews

35

The IBM Spectrum Storage Difference

Built using technologies proven in over fifty thousand client deployments

Flexible deployment on cloud, as appliance, and as software on client choice of hardware

Complements and transforms existing infrastructure to support next generation applications

Comprehensive family of offerings addresses full range of software defined storage requirements

#1 From the #1 provider of SDS platforms

2015 Strategic Vision – Data Protection

Recognized leader in hybrid data protection
Deliver differentiated hybrid data protection capabilities and partner with clients to ensure successful transformation to the cloud

2015 Roadmap summary			
Modernize data protection	**Efficiently protect hybrid environments**	**Next Generation Deduplication**	**Data Protection Simplification**
• TSM SUR HW snapshots • GPFS snapshots • HP 3PAR snapshots	• Native Object Storage • Fast transfer - IBM Aspera • Encryption at rest	• Inline server dedupe • Online DB reorg • Goal - 100 TB daily	• Self service file recovery –VE • Simplified License reporting • Virtual Appliance option

Client Value			
Unparalleled RTO	**Fast and secure, low cost cloud object storage**	**Software defined alternative**	**Increased Productivity**
• Application consistency • Instant restore • Granular recovery	• Cloud storage tier • No need for cloud gateway • Built in security	• Reduce TCO • Cloud "Friendly" • Highly available	• Reduced admin time • Deploy TSM Servers quickly • Quickly report on licensing

InterConnect2015

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2015 Strategic Vision – Data Management

Recognized leader in hybrid data management
Capture mindshare and market share by executing a strategy that enables clients to both manage data from the cloud and data in the cloud

Product Roadmap		
Advanced data management and control	**Data management from the cloud**	**Hybrid data management for next-gen workloads**
• Flash systems support • New capacity analysis reports • Enhanced SAN troubleshooting	• Data classification and organization • Capacity and performance insights • Storage reclamation and optimization	• Public cloud storage support • Enhancements to optimization algorithms and policies • SDS packaging and pricing

Client Value		
Reduce capital expenditures	**Improve operational efficiency**	**Increased time to value**
• Optimal data placement • Improved capacity utilization • Transparent management	• Greater IT efficiency • Manage storage based on business objectives • Increased data availability	• Cloud deployment in less than 1 hour • Instant capacity and performance insights • Integrated orchestration

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Thank You

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Any performance data contained in this document was determined in a controlled environment. Actual results may vary significantly and are dependent on many factors including system hardware configuration and software design and configuration. Some measurements quoted in this document may have been made on development-level systems. There is no guarantee these measurements will be the same on generally-available systems. Some measurements quoted in this document may have been estimated through extrapolation. Users of this document should verify the applicable data for their specific environment.

Following are the two frames with previous quotes as back up (can't fit large graphic in these to maintain consistency).

The two in deck flow are same content without quotes.

IBM Spectrum Control
Extend Storage Economic Benefits to Operations

Overview
✦ Storage virtualization platform and storage management solution for cloud-based and software-defined storage. IBM Spectrum Control helps organizations transition to new workloads and updated storage infrastructures
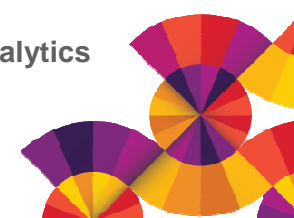
Key Capabilities
✦ A single console for managing all types of data on disk, flash, file and object storage systems
✦ Simplified visual admin tools – including an advanced web-based user interface, VMware® vCenter™ plug-in & Cognos® Business Intelligence with pre-designed reports
✦ Analytics-driven tiered storage optimization that automatically moves data to the most cost-effective tier

Benefits
✦ First to Market volume-level, cross-platform automated storage tiering, reduces users' cost of storage up to 50%[1]
✦ Cloud and Software Defined Storage – Service catalog, automated provisioning, optimized utilization of pools of storage
✦ Intelligent Performance Management with application and department views of the storage infrastructure

"…what we find is an excellent example of an integrated storage management environment that can centrally manage a heterogeneous storage environment, that can automate a wide variety of storage management tasks (including virtualization and provisioning), and that enables storage to easily be integrated into a cloud computing environment."

Clabby Analytics

1. Based on IBM's own experience using storage analytics

IBM Spectrum Protect
Transformed Economics for Data Protection

Overview
✦ Comprehensive data protection and recovery solution for virtual, physical and cloud data. Provides backup, snapshot, archive, recovery, space management, bare machine recovery and disaster recovery capabilities

Key Capabilities
✦ Protects virtual, physical, and cloud data with one solution
✦ Reduces backup and recovery infrastructure costs by up to 38 percent [1]
✦ Delivers greater visualization and administrator productivity
✦ Simplifies backups by consolidating administration tasks

Benefits
✦ Application-aware and VM-aware data protection for any size organization
✦ Simplified administration
✦ Built-in efficiency features: Deduplication, incremental 'forever' backup
✦ Integrated multi-site replication and disaster recovery

*"What's different now is that we'll no longer experience data 'explosions.' Tivoli Storage Manager **allows us to keep pace with and manage data growth seamlessly** and in ways we've never been able to before."*

Piedmont Healthcare

1. Average of individual customer Analysis Engine Reports from Butterfly Software (PDF, 1.40MB), May 2013, n=450. The savings include cumulative 36-month hardware, hardware maintenance and electrical power savings. Excludes one-time TSM migration cost.