IBM Elastic Storage Server

Modern software-defined storage system

Highlights

- Reduce performance bottlenecks on critical IT workloads
- Run Hadoop and other big-data applications directly on enterprise storage
- Share data across applications with unified storage for file & object data
- Designed for five nines of availability with faster rebuild of failed disks
- Includes erasure coding for declustered RAID technology
- Deliver performance with auto load balancing and a parallel file system
- Scale capacity smoothly in building from terabytes to petabytes and beyond
- Deliver consistent performance for IBM Spectrum Scale

Today's exponential growth of data, transactions and digitally-aware devices is demanding larger and larger amounts of unstructured data storage and management across diverse workloads. As each department or division attempts to satisfy its own storage and performance needs, your organization can find itself with many disparate systems isolated from each other. This can result in expensive resource duplication, complicated management and isolated pools of data. In addition, the resulting islands of information may hold valuable insights that may not be accessible in such a fragmented environment.

Traditional RAID is no longer an effective mechanism for data protection for modern disk drives, since it can take several hours or even days to rebuild a failed drive. Advanced erasure coding to spread the data and shorten recovery time is required to avoid the catastrophic results of multi-disk failures with traditional RAID.

Software-defined storage for your business

IBM Elastic Storage Server is a modern implementation of software-defined storage, combining IBM Spectrum Scale software with IBM POWER8 processor-based I/O-intensive servers and robust, dual-ported storage enclosures. IBM Spectrum Scale is the parallel file system at the heart of IBM Elastic Storage Server. IBM Spectrum Scale scales system throughput as it grows while still providing a single namespace. This ability eliminates data silos, simplifies storage management and delivers high performance. By consolidating storage requirements across your organization onto IBM Elastic Storage Server, you can reduce inefficiency, lower acquisition costs and support demanding workloads.

Unique to IBM Elastic Storage Server is IBM Spectrum Scale RAID software that utilizes erasure coding instead of traditional RAID for data protection. By using erasure coding techniques, IBM Elastic Storage Server can rebuild disks in minutes, which can minimize the effects of multi-disk failures. IBM Spectrum Scale RAID is implemented completely in software, distributing data across the available physical storage. Requiring less overhead than traditional RAID, IBM Spectrum Scale RAID increases data capacity and data integrity. The software-defined storage solution has been tuned specifically to deliver the high performance and low latency sought with all-flash scale-out storage. IBM Elastic Storage Server is a building-block solution from IBM designed for high-performance shared storage to handle modern workloads driven by unstructured data.

The capabilities of IBM Elastic Storage Server include:

- **Declustered data:** IBM Spectrum Scale RAID distributes client data, redundancy information and spare space uniformly across disks. This distribution reduces the rebuild or disk-failure recovery process overhead compared to traditional RAID. Critical rebuilds of failed multi-terabyte drives full of data can be accomplished in minutes—rather than hours or even days when using traditional RAID technology.
- **Data redundancy:** IBM Spectrum Scale RAID supports highly reliable 2-fault-tolerant and 3-fault-tolerant Reed-Solomon-based parity codes (erasure coding) as well as three-way and four-way replication.
- **Tuned performance:** Software-defined IBM Spectrum Scale RAID software, explicitly coupled with large memory cache in the IBM Power server, allows IBM Elastic Storage Server to mask the inefficiencies and long latency times of nearline-SAS drives with low-latency flash storage, while still leveraging the high density of the drives themselves.
- **Simplified management:** The intuitive graphical user interface (GUI) for software and systems for management and monitoring of IBM Elastic Storage Server also integrates into IBM Spectrum Control.
- **Superior streaming performance:** The system can deliver more than 36 GB/s of sustained performance.
- **Scalability and extensibility with multi-site and cloud support:** Multiple deployment options for software-defined storage to scale in performance and capacity while still providing a single namespace. This means installations can start small and grow as data needs expand.

Designed for rapid deployment

IBM Elastic Storage Server is easy to deploy and ships pre-assembled and pre-configured with the right hardware and software. The complete IBM Elastic Storage Server hardware stack is fully validated with the various hardware drivers and IBM Spectrum Scale. Once the system

arrives on-site, services are available from IBM for fast configuration and integration into your data center's Ethernet or InfiniBand network.

Designed to scale

In today's world, data capacity needs rarely decrease. But whether you need more or less storage, IBM Elastic Storage Server is designed to scale using a building-block approach that also includes other storage. Each snap-together expansion block can add or reduce capacity, bandwidth, files or objects. Customer experience has shown near-linear scaling of performance as new IBM Elastic Storage Server nodes are added to form an IBM Spectrum Scale cluster.

Designed for a variety of workloads

IBM has implemented IBM Elastic Storage Server configurations for a variety of workloads—from high-velocity ingest through high-density cloud storage usage models, deploying the latest all-flash, SAS and nearline-SAS drives. Now in its second generation, IBM Elastic Storage Server is offered with all-flash storage (for latency-oriented workloads) with disk for higher-capacity storage, and in hybrid flash-plus-disk models. IBM offers configurations that can support more than five PB of raw, deployable storage in a single industry-standard 42U rack. For mixed workloads, the server supports varied configurations of building blocks, with placement rules for the creation and management of all data on the appropriate storage tier.

High-performance, data efficiency and multi-site redundancy make IBM Elastic Storage Server an ideal target for primary backup. You can meet demanding backup and restore objectives with support for multiple backup servers and the high-performance IBM Elastic Storage Server. IBM Spectrum Scale is supported by independent software vendors (ISVs) including Commvault and Veritas, as well as by IBM Spectrum Protect. Deployment with IBM Spectrum Protect is simple with IBM Spectrum Protect blueprints to guide you. With the user-experience approach common to IBM Spectrum Storage Suite, IBM Spectrum Protect administrators can quickly adapt to the IBM Elastic Storage Server GUI.

The Hadoop connector to IBM Spectrum Scale allows you to run your Hadoop applications directly on IBM Elastic Storage Server for in-place analytics, avoiding the overhead of copying data to isolated Hadoop Distributed File System (HDFS) storage. This ability to run Hadoop applications directly on IBM Elastic Storage Server not only eliminates lost time in copying data to HDFS but also prevents running analytics on stale data. With HDFS transparency federation in IBM Spectrum Scale, IBM Elastic Storage Server can now co-exist with HDFS storage. IBM and Hortonworks is a certified solution with reference architectures available, expanding the Hortonworks Data Platform (HDP) with IBM Data Science Experience and IBM Big SQL—providing new integrated solutions designed to help everyone from data scientists to business leaders better analyze and manage growing data volumes and accelerate data-driven decision-making.

For a wide variety of workloads, including SAP HANA, IBM Elastic Storage Server is easy and seamless to scale on demand; IBM Elastic Storage Server provides superior bandwidth for database startup and recovery, and provides full high-availability, disaster recovery and scalable (parallel) environments. Data protection includes end-to-end snapshot integration (including with SAP HANA DB Studio). IBM Elastic Storage Server is a certified Tailored DataCenter Integration (TDI) solution.

Designed for performance

Storing petabytes of data is of no value to business unless that data can be accessed, analyzed and retrieved quickly. Sustained streaming performance of data can reach 40 GB/s in each building block, growing as more blocks are added to a configuration. By combining the superior data movement capability of IBM Power Systems servers with the enhanced I/O subsystem, as well as adding the disk-management capability of IBM Spectrum Scale RAID, a complete storage solution can be deployed to support diverse workloads. With support for multiple 10GbE, 40GbE or 100GbE Ethernet and EDR or fourteen data rate (FDR) InfiniBand, IBM Elastic Storage Server has the architecture to deliver high data throughput to meet the demands of high-performance workloads, now common across every computing workload.

An integrated solution for IBM Spectrum Scale:

- Comes as an integrated system, preloaded with IBM Spectrum Scale software and IBM Spectrum Scale RAID
- Fully validated hardware and software stack ships pre-assembled
- Includes IBM Systems Lab Services on-site services at installation
- Fully compatible with IBM Elastic Storage System 3000

Enabled to support data service workloads:

- Apache Hadoop workloads with certified Hortonworks support
- Technical computing and analytics
- High-performance backup and restore target
- Shared infrastructure for file and object data

IBM Power Systems are designed for data:

- Massively parallel with 96 hardware threads: 12-core processor and 8 threads per core

- Up to five times the I/O bandwidth of typical x86 systems: 96 GB/s per socket
- Up to three times the cache of typical x86 systems
- As much as six times the memory bandwidth of typical x86 systems: 410 GB/s (peak) memory bandwidth to CPU
- Up to two times better per-core performance over Intel for Java
- Compression offload for simplification

Scalable networking with IBM and other networks:

- High-bandwidth: 10GbE, 40GbE or 100GbE Ethernet and EDR or FDR InfiniBand Remote Direct Memory Access (RDMA), low-latency networking Ethernet (RDMA over Converged Ethernet [RoCE])
- Storage allocation flexibility for analytic zones
- OpenPOWER Foundation-developed technologies combined with system optimizations for high-speed networks

[1] As reflected in field reports for production systems, reflecting millions of hours of total system operation over a two-year period.

Elastic Storage Server Models GS1S, GS2S, GS4S

Storage units	5147-024: 24-slot 2U enclosure for 2.5” SSDs
Number of drive enclosures	1, 2 or 4
Drive capacity	3.84 TB or 15 TB 2.5” SSDs
Number of drives	24 – 96 SSDs
Maximum usable capacity per ESS	60 TB (GS1S) to 1.1 PB (GS4S)

Elastic Storage Server Models GL1S, GL2S, GL4S, GL6S

Storage units	5147-084: 84-slot 5U enclosure for 3.5” HDDs
Number of drive enclosures	1, 2, 4 or 6
Drive capacity	4, 8 or 10 TB NL-SAS 3.5” HDDs
Number of drives	82 - 502 HDDs
Maximum usable capacity per ESS	600 TB (GL1S) to 3.9 PB (GL6S)

Elastic Storage Server Models GH12, GH14, GH24

Storage units	5147-024: 24-slot 2U enclosure for 2.5” SSDs; 5147-084: 84-slot 5U enclosures for 3.5” HDDs
Number of drive enclosures	Qty=1 or 2, 24 drive enclosures for SSDs; Qty=2 or 4, 84-slot drive enclosures for HDDs
Drive capacity	3.84 TB or 15 TB 2.5” SSDs; 4, 8 or 10 TB NL-SAS 3.5” HDDs
Number of drives	24 - 48 SSDs & 168 or 336 HDDs
Maximum usable capacity per ESS	60 TB SSD + 1 PB HDD (GH14) to 530 TB SSD + 2.5 PB HDD (GH24)

Elastic Storage Server Models GL1C, GL2C, GL4C, GL6C

Storage units	5147-106: 106-slot 4U drive enclosure for 3.5” HDDs
Number of drive enclosures	1, 2, 4 or 6
Drive capacity	10 TB NL-SAS HDDs
Number of drives	104 - 634 HDDs
Maximum usable capacity per ESS	0.7 PB (GL1C) to 4.6 PB (GL6C)

System information

Systems	IBM Power 5148-22L ESS Data Server (two per Building Block); IBM Power 5148-21L ESS Management Server (one per cluster)
Interconnects	Ethernet: 10GbE, 40GbE, 100GbE; Infiniband: 56 Gbps FDR, 100 Gbps EDR
Operating system	Red Hat Enterprise Linux (RHEL) Little Endian
Software	IBM Spectrum Scale: Data Access Edition or Data Management Edition xCAT
Supported RAID levels	Erasure coding: 3-way or 4-way mirroring, 8+2P or 8+3P, or a combination

Rack cabinets

Rack cabinet	IBM 7014-T42, IBM 7965-S42. IBM ESS is also supported in compatible racks from other vendors
Power	Multiple rack PDU options- see IBM ESS Planning information in IBM Knowledge Center
Scalability	IBM Elastic Storage Server (ESS) scales in a building block approach—capacity, bandwidth and the single namespace increases as more building blocks are added. Clusters using other servers and storage running IBM Spectrum Scale may be scaled out using IBM ESS units.
Services	• IBM Elastic Storage Server hardware installation is included at no charge. • IBM Lab Services are available for planning, configuration and implementation support. Complimentary services may be included with some ESS purchases, other services are at additional cost.
Warranty	Limited warranty: 3-year parts, customer-replaceable unit (CRU) or on-site labor, with individual nodes retaining the warranty and service upgrade offerings for that IBM machine type. Base support is 9x5, next business day. Warranty service upgrades are available at additional cost. Standard software subscription and support.

Capacities shown are approximate using 8+2P erasure coding and a single Data + Metadata pool.
Example configurations are shown for minimum and maximum capacity figures- other intermediate options are also available.

Why IBM?

IBM invests in solutions that put data to work, helping organizations realize the full potential of big data and analytics to better serve their customers while improving competitive advantage. IBM has the expertise and solutions to help businesses exploit advanced analytics to enable growth, mitigate risk and improve operational efficiency.

For more information

To learn more about IBM Elastic Storage Server, please contact your IBM representative or IBM Business Partner, or visit:

- **ibm.com**/systems/storage/spectrum/ess/
- **ibm.com**/storage

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