# MAKING THE CASE FOR SOFTWARE-DEFINED STORAGE

## Managing Data Growth with Greater Agility and Cost-Efficiency

# IS YOUR DATA CENTER READY FOR PETABYTES?

Well aware that data is the new currency for business, enterprise leaders are seeking efficient and cost-effective ways to keep up with the velocity and volume of data generated by connected experiences enabled with cloud computing, changing file types growing in size and complexity, the Internet of Things, and mobile devices.

Enterprise storage architecture—reeling under the weight of massive data stores and business demands for rapid data-driven insights—is ripe for storage modernization. To manage growing pools of customer data, businesses must transition from conventional, purpose-built storage architectures that are conflicting with the need for greater agility, cost containment, and stronger security.

## The Need for a New Level of Flexibility

Traditional enterprise storage systems are siloed and increasingly complex to maintain, manage, and scale. This complexity and limited adaptability hamper efficiency, ultimately driving up total cost of ownership (TCO). Performance, cost, and the ability to scale are major roadblocks for storage—and data center—innovation.

Organizations need a cost-effective storage architecture that offers more flexibility for managing a wide variety of data—even on an enormous scale—and supports demand-driven resource allocation.

Software-defined storage represents the next evolution in modernizing storage architecture to meet the requirements of an application-centric, data-rich world where storage services must flex and scale intelligently (and cost-effectively) based on demand.


**The enterprise has taken responsibility for 85 percent of data generated.[1]**


**PERFORMANCE**


**CAPITAL EXPENSES**


**SCALING TO MANAGE GROWTH**

**Performance (50%), capital expenses (41%), and scaling to manage growth (40%) are the top-three pain points for today's data center managers.[2]**

# CREATING THE MODERN ENTERPRISE CLOUD INFRASTRUCTURE

Software-defined infrastructure (SDI) promises to revolutionize how organizations build data centers that are "cloud ready." SDI enables applications and services to define required hardware infrastructure, delivering optimal service levels and improved resource efficiency. Modernizing your storage infrastructure is essential to a broader initiative that begins, first, with a move away from proprietary approaches to industry-standard hardware for cost-efficient, software-defined storage.

### Scale-Out Storage Solutions:

- Independent scaling of compute, network, and storage.
- Improve storage and data management efficiency.
- Increase application performance.
- Reduce storage infrastructure costs.
- Improve user access to data.

**Agility wins: High-performing IT organizations deploy applications 30x more frequently with 200x shorter lead times, and 60x fewer failures.[3]**

With the robust foundation of pooled compute, network, and storage resources—all running on industry-standard hardware—enterprises can shift to more mature, cloud-ready states that enable greater levels of automation and provisioning for all workloads, including storage.

## Increase Agility with a Scale-Out Architecture

Traditional storage solutions like storage area networks (SANs) and network attached storage (NAS) offer a centralized, scale-up approach that has worked well in the past, yet can be inflexible and costly to maintain. As today's ever-growing data volumes continue to drive complexity and shift the storage landscape, businesses need to reach a new level of agility.

Software-defined storage uses scale-out storage solutions based on industry-standard servers. By design, these solutions improve resource utilization across systems. Workload-specific profiles with performance and latency attributes can be applied to bridge siloed storage systems and route service requests to the right device. Storage resources can be provisioned intelligently based on application requirements and the need to manage data both at rest and in transit. Moreover, this approach distributes data across multiple storage servers, providing seamless data access in the event of a system failure.

## Reduce Costs with a Software-Defined Approach

**Software-defined server-based storage helps prepare your data center to handle data on a massive scale with the efficiency of the large cloud service providers and addresses one of IT's greatest challenges for implementing storage innovation: cost.**

**Using relatively inexpensive, open-standard Intel® Architecture, you can take advantage of multiple storage resources. This includes solid-state drives with NVMe, external disk systems, object platforms, and cloud-based resources that you can combine to build a powerful storage infrastructure and deliver workload-optimized performance. With the ability to pool resources and better allocate them across your storage infrastructure, you can maximize your existing investments and reduce costs through greater total cost of ownership (TCO) efficiencies.**

**Other benefits:**

- **Tighter data control.** With flexible, scalable, and cost-effective storage services on premises, IT can make more-strategic decisions about where sensitive data resides.
- **Increased flexibility and scalability.** Software-defined storage can adjust to a defined set of loads, and then scale for additional loads easily and relatively inexpensively.
- **Rapid delivery of services.** IT becomes more responsive as a business partner, helping to speed agility and boost competitive advantage as a broker of rapid services delivery across the enterprise.


**68% of IT decision makers say cost is the biggest roadblock for storage innovation.[4]**

# SOLUTIONS FOR SOFTWARE-DEFINED STORAGE

Implementing software-defined storage changes the way you manage your cloud and your data center infrastructure. IT staff familiar with managing purpose-built systems must evolve their current environment and shift their approach to storage architecture toward a broader software-defined domain of multiple nodes and virtual environments. Enterprise developers, too, must think about how applications can leverage a scale-out environment.

No matter which solution you choose, the following platform and deployment options can help put both staffing and technology issues into perspective.

### Platform: Single Vendor or Open Source?

Software-defined storage solutions are available today that run on a broad array of hardware platforms. Your decision to implement a vendor-specific or open-source platform may be influenced by your existing architecture and your IT staff's skills and knowledge base. One obvious advantage of an open-source solution is the potential ability to avoid vendor lock-in, and therefore, the licensing fees.

Intel's long-standing relationships with hardware and software enterprise cloud vendors provide a greater choice for storage automation solutions. We are actively working with the OpenStack* ecosystem—including work on the Cinder*, Ceph*, Swift*, and Flocker* solutions. Other industry and open-source efforts include work with CoprHD*, NexentaEdge*, MxSP*, and HyperStore*. In addition, we are working closely with emerging players in storage, VMware and Microsoft, on optimizing solutions to take advantage of Intel architecture.

**Strong IT leads to competitive advantage: Firms with high-performing IT organizations were twice as likely to exceed their profitability, market share, and productivity goals.[5]**

## Intel® Technology Enables Scale-Out Storage Architectures

Intel® technologies are already helping data centers move to SDI and software-defined storage systems. Intel architecture-based solutions maximize infrastructure investments and include a portfolio of interoperable, scalable, and programmable products and technologies. This includes key software capabilities that significantly enhance the value of foundational Intel architecture in SDI hardware and software ecosystems.

One example is the ability to speed replication with erasure coding, which is optimized for Ceph* software on the Intel® Xeon® processor family.

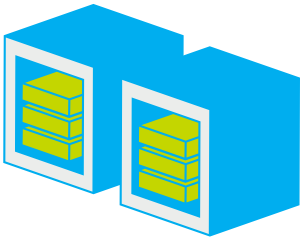
**Key storage-related products and technologies include:**

- **The Intel Xeon processor family** with storage workload optimization enables more-efficient storage, smarter data protection, and exceptional system performance.
- **The Intel® Solid-State Drive (Intel® SSD) Data Center Family with NVMe*** delivers more performance with fewer resources to boost storage density, speed, and reliability.
- **Intel® QuickAssist Technology,** a workload acceleration tool in Intel Xeon processor E5 and E7 families for compression and encryption offload.
- **Intel® Cache Acceleration Software (Intel® CAS)** improves application performance by using an Intel SSD as a cache for frequently accessed data.
- Intel security technologies verify that virtual servers boot into "known good states" (Intel® Trusted Execution Technology, or Intel® TXT); improve and accelerate data encryption (Intel® Advanced Encryption Standard New Instructions, or Intel® AES-NI); and deliver hardened security to help enforce data access and authentication privileges (Intel® Identity Protection Technology, or Intel® IPT).

There are also Intel technologies designed to speed and simplify development. Intel® Intelligent Storage Acceleration Library (Intel® ISA-L) is a set of algorithms that enable applications to optimize storage performance with enhanced data protection and integrity, as well as fast compression and strong encryption. Another is Intel® Storage Performance Development Kit (Intel® SPDK), which can enable fast packet processing using the Intel® Architecture.

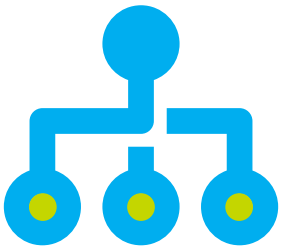
### Deployment Options

When deploying software-defined storage, you currently have several approaches to consider:



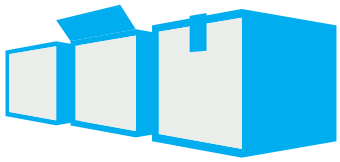
## Do-It-Yourself Solutions

Build your solution components from the portfolio of various hardware vendors, software vendors, and open-source options, and if available, follow a validated reference architecture. This offers you the flexibility and technology choices that come with an environment that is not defined by a single vendor.



## Turnkey Solutions

You could also deploy prevalidated server-based storage infrastructure solutions, making it easier to implement a scale-out solution from a single, trusted source under a service agreement.



## Converged and Hyperconverged Solutions

Another approach is to implement a converged infrastructure that minimizes compatibility issues between servers, storage systems, and network devices. Or you can opt for a hyperconverged infrastructure approach that uses a software-centric architecture to integrate compute, storage, networking, and virtualization resources in a single box.

# GETTING STARTED WITH SOFTWARE-DEFINED STORAGE: A CHECKLIST

If increasing agility and reducing TCO are now top priorities for your business, then implementing software-defined storage is the next step. This checklist can help you get started.

### Understand the business problem.

Work with your users to understand the business problem. What key business initiatives might benefit most from a more flexible storage approach? Do you need to improve quality of service delivery? What are the storage needs for your unique workloads?

### Assess your current storage infrastructure.

- Evaluate the operational costs of your current environment, such as space, HVAC, replacement costs, and performance. What can you do differently to increase flexibility?
- Consider opportunities to gain efficiencies by leveraging Non-Volatile Memory Express (NVMe) and solid-state drives (SSDs). These investments can pay off quickly by changing the full life-cycle management of your storage.

### Identify a pilot project.

Pinpoint the project that is best solved by moving to cloud-based workloads and software-defined storage with a high probability of success.

### Evaluate risk to your data.

Determine which data is strategic to your storage project, and identify legal and regulatory requirements with which you must comply.

### Consider your platform and deployment options.

Will you build your solution from a portfolio of vendors and open-source hardware and software, a prevalidated turnkey solution, or a converged or hyperconverged option?

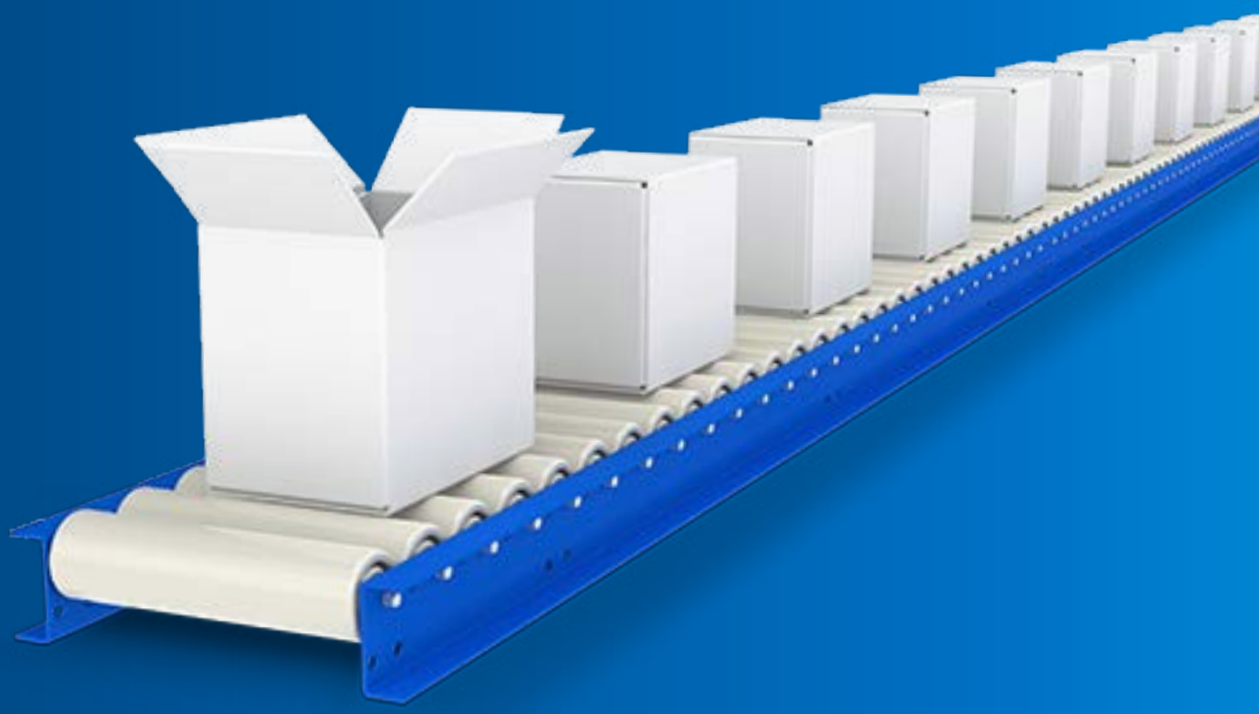
### Get educated.

- Read white papers, research studies, and analyst reports.
- See what other companies have learned when implementing server-based storage solutions. Build on their best practices.
- Find reference architectures of proven SDI solutions at Intel® Builders.

**Take the first steps with Intel Architecture–enabled software-defined storage solutions.**

**Find solution briefs, proof-of-concept publications, reference architectures, and vendor connections at Intel Builders.**

**Learn more at intel.com/cloud.**





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