G00301082

Top Five Use Cases and Benefits of Software-Defined Storage

Published: 1 April 2016

Analyst(s): Julia Palmer, Dave Russell

Software-defined storage offers potential benefits to I&O leaders looking to increase storage solution flexibility and reduce costs. We highlight common SDS use cases and provide an overview of its benefits, limitations and vendor landscape.

Key Findings

- I&O leaders are looking for software-defined storage (SDS) products that offer the potential for better total cost of ownership (TCO), efficiency and scalability to address exponential-data-growth needs, and to benefit from innovations from hardware and software players independently.
- The SDS market remains fragmented, with no clear market leaders.
- Despite programmability and automation benefits of SDS, it is viewed as trailing compute and networking in overall maturity.

Recommendations

- Identify which SDS use case or cases described in this research align with your business objectives and current challenges, and build a plan to evaluate products that address these use cases. Investigate each software-defined storage product for its capabilities, and choose it for the appropriate use case, while understanding any current limitations.
- Implement SDS solutions that enable you to decouple software from hardware, reduce TCO and enable greater data mobility.
- Design an SDS architecture to enable storage to be a part of software-defined data center automation and orchestration framework, not a siloed platform.

Strategic Planning Assumptions

By 2019, 50% of existing storage array products will also be available as "software only" versions, up from 15% today.

By 2019, approximately 30% of the global storage array capacity installed in enterprise data centers will be deployed with software-defined storage or hyperconverged integrated system architectures based on x86 hardware systems, up from less than 5% today.

By 2020, 70% of storage provisioning and management functions will be integrated into the infrastructure platform, up from 10% today.

Analysis

SDS promises to deliver modern storage and data services as software-based capabilities that can leverage existing infrastructure or introduce commodity platforms to improve storage economics, as well as to provide data mobility, including cloud integration.

Gartner has observed significant SDS interest via client inquiries, discussions at our events and searches on gartner.com. According to the results of the December 2015 Gartner Data Center Conference storage survey, 48% of storage leaders are actively investigating or piloting SDS solutions (see the Appendix).

Gartner views SDS as offering these capabilities:

- It abstracts storage capabilities dynamically derived from physical or virtual devices and/or services — independent of location or class of storage — to offer greater agility and to deliver quality of service (QoS), while optimizing costs.
- It is available for use or licensing in the form of software, and *does not require an appliance or proprietary hardware to be purchased from the same vendor*. Some vendors may package SDS as a preintegrated hardware solution for faster delivery.
- It has one, or several, of the following key attributes: abstraction, instrumentation, programmability, automation, mobility, policy management and orchestration.

Software-defined storage solutions can be grouped in two categories (see Figure 1):

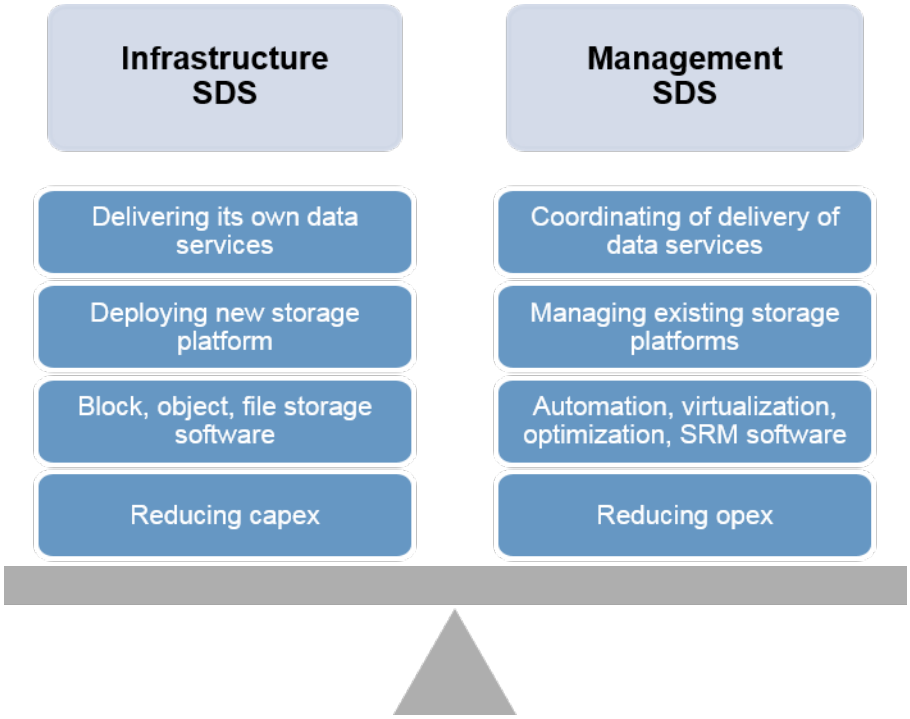
- **Infrastructure SDS** creates and provides data center services to replace or augment traditional storage arrays. Often, the goal is to improve capital expense (capex) by allowing a storage system to be deployed on lower-cost, industry-standard hardware.

  For example, infrastructure SDS products may allow enterprises to deploy a storage-as-software package on x86 server hardware, converting it to a storage system that can be accessible by file, block or object storage protocols.
- **Management SDS** interacts with existing storage systems to deliver greater agility of storage services. Management SDS products enable abstraction, mobility, virtualization, storage

resource management (SRM) and input/output (I/O) optimization of storage resources. Often, the goal is to improve operating expense (opex) by requiring less administrative effort.

For example, management SDS products may allow enterprises to deploy software to manage/virtualize/provision/optimize multiple storage arrays, and to move data between storage tiers and cloud.

Figure 1. SDS Categories



Categories above apply to the most, but not 100% of all solutions. There is some SDS product overlap between the two categories above.

Source: Gartner (April 2016)

Infrastructure SDS Use Cases

Use Case 1: Storage Platform TCO Reductions Through On-Demand Scalability and Exploitation of Commodity Hardware Resources

Applicability

- **Example 1:** Large IT business units looking to lower storage capex.
- **Example 2:** Storage solutions for unstructured data with rapid growth patterns.

- **Example 3:** DevOps scenarios where common data services and data mobility are desired, in addition to the elimination of proprietary hardware.
- **Example 4:** I&O leaders that foster IT as a core expertise and a business differentiator, as they are willing to invest in the new skills, training and potential change in delivery model.

Benefits

- **Cost:** Infrastructure SDS eliminates the need for high-priced proprietary storage hardware. I&O leaders will deploy storage software on industry-standard server hardware and will significantly lower opex of storage upgrades and maintenance costs.
- **Innovation:** Industry-standard hardware will quickly be able to take advantage of the latest innovations of server hardware, such as new CPU chips, solid-state and hard-disk drive (HDD) technology.
- **Availability:** Some SDS solutions offer a distributed scale-out approach, where redundancy is enforced in the software layer.
- **Performance:** SDS provides the ability to add on and scale performance and/or capacity by adding nodes, or by upgrading existing server hardware in an on-demand basis, versus the need to prepurchase in a monolithic design.
- **Flexibility:** The hardware platform has less vendor lock-in, better interoperability, and is easily scalable and upgradable by the IT team.
- **Agility:** Storage provisioning and management can be more easily integrated into the standard data center automation and management tools.

Limitations

- **Integration:** SDS integration with commodity servers needs to be embraced as a new discipline, and addressed with OEM/ODM providers to ensure interoperability.
- **Performance:** SDS performance will be based on hardware optimization, and rightsizing of software and hardware resources, and needs to be routinely monitored, measured and optimized.
- **Cost:** SDS cost needs to be carefully examined to ensure that the overall solution offers not only lower acquisition costs, but overall lower TCO due to increased IT responsibilities.

Sample Vendors and Products: Atlantis USX; DataCore Hyper-converged Virtual SAN; EMC ScaleIO; Formation Data Systems FormationOne; HPE StoreVirtual VSA; Hedvig Distributed Storage Platform; IBM Spectrum Accelerate; Maxta MxSP; Nexenta NexentaStor Nexenta Edge; Red Hat Ceph; Red Hat Gluster; Scality Ring; StarWind Virtual SAN Free; SwiftStack; Veritas InfoScale; VMware Virtual SAN

Use Case 2: Performance Improvement by Optimizing and Aggregating Storage I/O

Applicability

- **Example 1:** IT business units and I&O leaders seeking to improve performance, storage efficiency and utilization rates of previously deployed assets.
- **Example 2:** I&O leaders and application and server administrators looking to optimize application and workload performance, and to enable QoS and load balancing.

Benefits

- **Cost:** I/O optimization products can provide a nondisruptive boost to virtual machine (VM) or physical host performance without hardware upgrades.
- **Efficiency:** I/O optimization software will increase density by alleviating the "I/O blender" (see Note 1) problem that often plagues dense virtual machine environments.
- **Performance:** Adding storage capabilities closer to application and compute resources will result in faster transaction times and greater sustained I/O.

Limitations

- **Flexibility:** This SDS solution might increase complexities due to the introduction of the additional layer of software in the data path and any required host agents.
- **Cost:** ROI justification must be carefully examined against alternatives.

Sample Vendors and Products: Condusiv V-locity; Infinio Accelerator; ioFABRIC Vicinity; PernixData FVP; SanDisk ioTurbine; SanDisk FlashSoft

Management SDS Use Cases

Use Case 3: Better Provisioning and Automation of Storage Resources

Applicability

- **Example 1:** IT business units looking to streamline provisioning for a software-defined data center (SDDC) with predefined classes of storage services.
- **Example 2:** I&O leaders that manage heterogeneous storage resources today, or that plan to in the near future.
- **Example 3:** I&O leaders looking to extend the operational life of older arrays through storage abstraction.

Benefits

- **Cost:** Automation of repeatable manual tasks will reduce TCO for storage by improving IT productivity.
- **Reliability:** Reduction of human errors and minimizing risk.
- **Agility:** Ability to offer storage as a service to empower end users.

Limitations

- **Innovation:** Some of the products have a steep learning curve to be able to customize them to meet enterprise needs, and may require DevOps team interaction.
- **Integration:** Products could require integration with the rest of the SDDC tools.
- **Flexibility:** A compatibility support matrix for new storage solutions and SDS will need to be established and maintained.

Sample Vendors and Products: EMC ViPR Controller; IBM Spectrum Control

Use Case 4: Robust Utilization, Management and Life Cycle of Heterogeneous Storage Array

Applicability

- **Example 1:** IT business units and I&O leaders seeking to extend the operational life of previously deployed multivendor assets.
- **Example 2:** I&O leaders and application and server administrators looking to optimize capacity, performance, and mobility of applications and workloads.

Benefits

- **Cost:** Improved asset management will contain costs by extending the operational life of legacy deployments, perhaps by adding new data services on top of existing storage solutions.
- **Efficiency:** Abstracting and pooling storage capacity can allow for greater utilization by satisfying broader storage requests with smaller combinations of available storage resources.
- **Performance:** Aggregating disparate storage resources can improve overall I/O.

Limitations

- **Flexibility:** Some SDS virtualization tools might present an additional vendor lock-in.
- **Efficiency:** Some may only use a subset of SDS tool features, making the effective SDS product cost important to consider prior to purchase.

Vendors and Products: DataCore SANsymphony; FalconStor FreeStor; Hitachi Storage Virtualization Operating System; IBM Spectrum Virtualize; NetApp FlexArray; Primary Data DataSphere

Use Case 5: Tight Alignment of Storage With Broader Infrastructure Software Management

Applicability

- **Example 1:** IT organizations seeking to enable a full SDDC and/or a more highly automated data center. Storage infrastructure is being treated as a component of the data center platform, and needs to be delivered and controlled through SDS integration.
- **Example 2:** Appropriate for very mature data centers where business needs are well-understood and organizational maturity is such that broad cross-domain skills exist, to construct solutions that can account for a variety of business needs while meeting multiple and varied implementation trade-offs.

Benefits

- **Cost:** Reducing the need to overprovision and providing the ability to more rapidly satisfy storage capacity and availability requirements can lead to greater resource utilization that requires less hard-allocated physical resources and/or less administrative overhead.
- **Agility:** Today, storage is often opaque and detached from the other domains of IT. Storage is stateful, and, thus, has data gravity, which requires time in order to move data. Therefore, the ability to make storage more aligned with the rest of IT (and thus the business demands) can mean that the overall IT capability and speed to satisfy business demands are improved.

Limitations

- **Integration:** This SDS is only appropriate for enterprises with SDDC frameworks. This nascent approach will require additional DevOps resources to integrate SDS under the existing IT operations management platform.
- **Flexibility:** Legacy solutions might not be supported under the new framework.

Vendors and Products: OpenStack Block Storage Cinder; VMware Virtual Volumes

Potential Concerns

Despite the promise of SDS, there are issues that must be acknowledged:

- **Value:** Some storage point solutions have been repositioned as SDS to present a higher value proposition versus built-in storage features, and need to be carefully examined for ROI benefits.

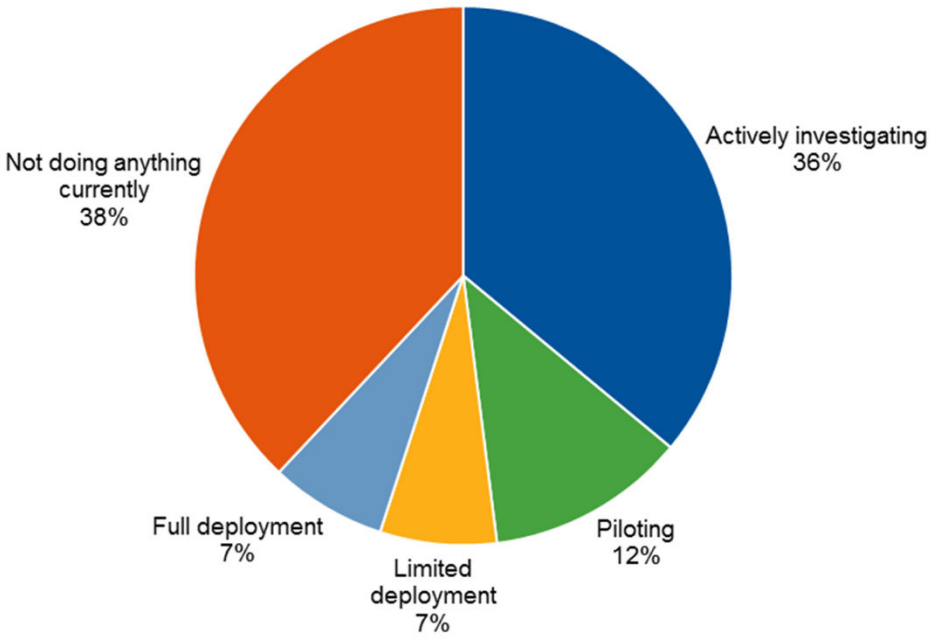
- **Interoperability:** While a few SDS solutions can be deployed in combination, most assume that a single SDS product will provide all data services and/or provisioning capabilities and do not work well when combined.
- **Support:** When deploying an SDS on top of x86 hardware, the initial onus of integration, troubleshooting and support may fall to the end user, versus the integrated storage array provider.
- **Skill and Culture:** This is cited as the top reason for concerns about SDS, as this type of deployment shifts requirements for storage implementations and ongoing administrative skill sets.

Appendix

Adoption Rate and Interest in SDS Technology

The following figures are based on polling results from the 2014 and 2015 Gartner Data Center, Infrastructure & Operations Management Summits.

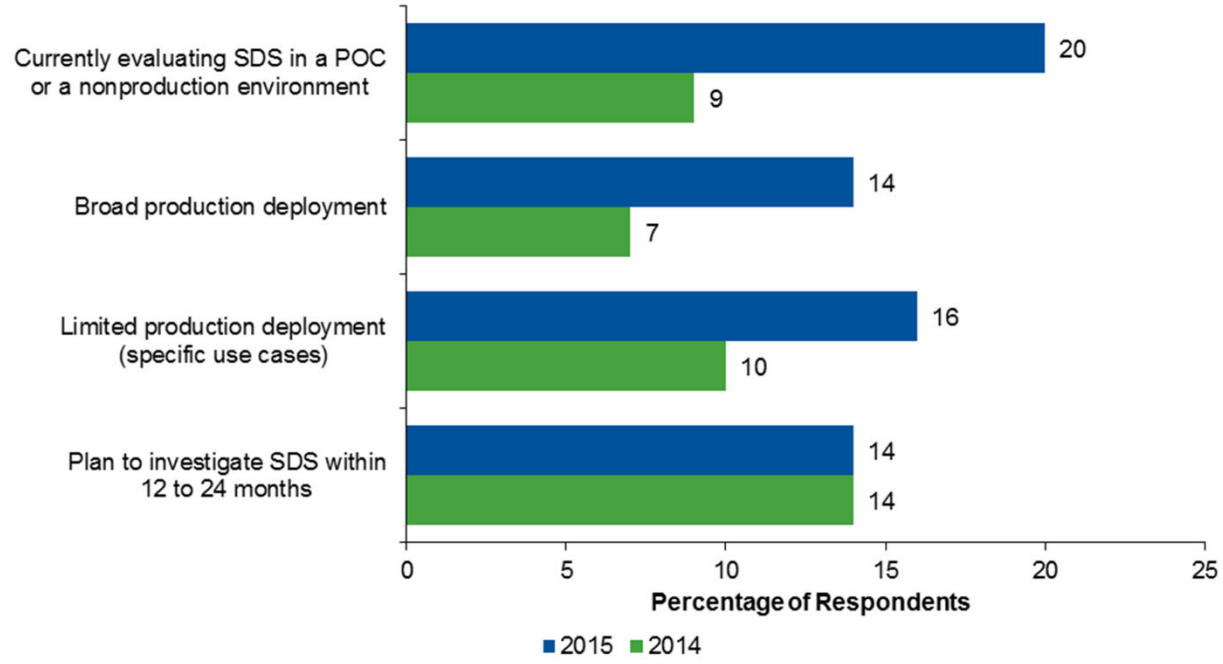
Figure 2. Adoption Stages of SDS



n = 105

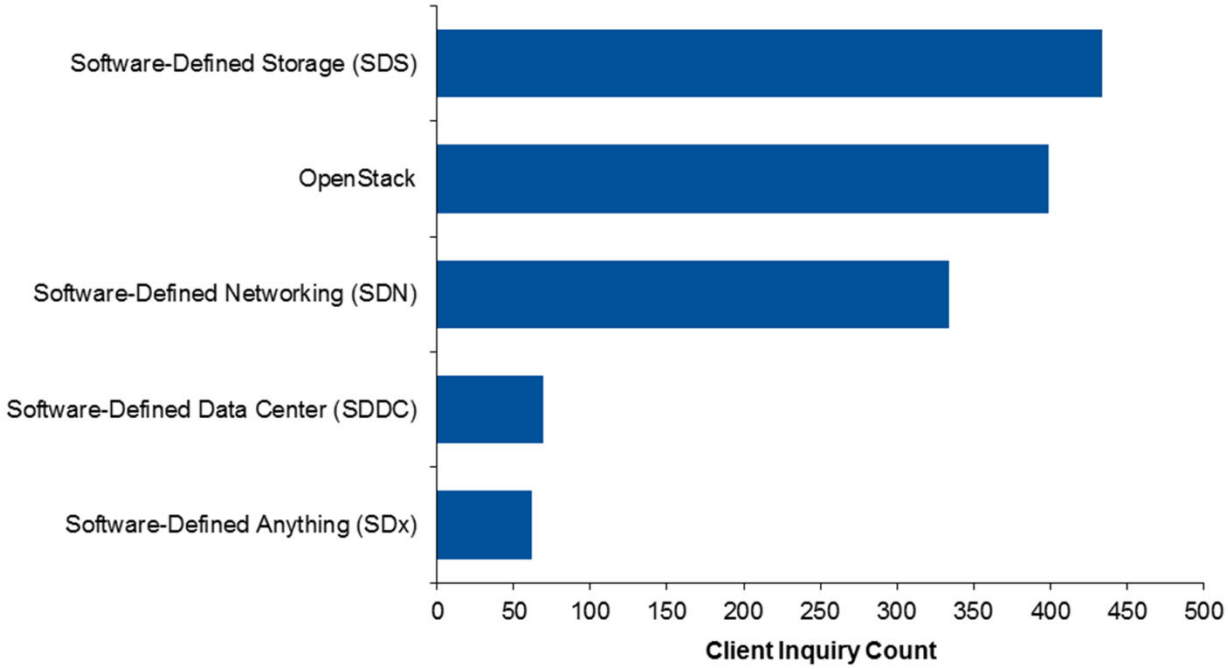
Source: Gartner (April 2016)

Figure 3. Where Are You With SDS?



Source: Gartner (April 2016)

Figure 4. Gartner Client SDS Inquiries Throughout 2015



Source: Gartner (April 2016)

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"How to Determine Whether Software-Defined Storage Is Right for Your Organization"

"Why Hardware Matters to the Success of Your Software-Defined Storage Deployment"

"Innovation Insight: Separating Hype From Hope for Software-Defined Storage"

"Best Practices for Software-Defined Storage Implementation"

"Market Trends: Block-and-File Software-Defined Storage"

"Multivendor SDS: A Complex and Costly Myth"

Note 1 I/O Blender

"I/O blender" has been used to describe the issue in which many VMs running on a single physical server make I/O traffic appear random. This randomness is caused by reads and writes that are being intermixed across several VMs, resulting in slower overall performance as storage array caching and prefetching algorithms become incapable of predicting what actions to take. This hampers performance, because the I/O must then be satisfied by the solid-state drives (SSDs) or hard-disk drives (HDDs) in the storage array. This results in a long I/O path, with a large number of intermediary devices in between that need to be traversed for an application or user to obtain or save the needed data.

GARTNER HEADQUARTERS

Corporate Headquarters
56 Top Gallant Road
Stamford, CT 06902-7700
USA
+1 203 964 0096

Regional Headquarters
AUSTRALIA
BRAZIL
JAPAN
UNITED KINGDOM

For a complete list of worldwide locations,
visit http://www.gartner.com/technology/about.jsp