If you go back 24 months the term Software Defined Storage (SDS) did not even exist. Today IT vendors, analysts and journalists are discussing Software Defined “everything” while SDS has become “hot”. However, just like with many buzzwords and acronyms, vendors in particular are often guilty of applying their own definition to the term, resulting in confusion and sometimes delays in harnessing the potential of the technology.

This paper is part of the Data & Storage Asean’s “technology explained” series and provides an overview of what SDS actually is. It also discusses what some vendors will have you believe the technology is; and key considerations for why and how IT departments might implement SDS.

Background

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What is Software Defined Storage?

SDS is a data storage methodology in which the management and function of the storage, usually controlled by software, is completely separated from the actual physical storage hardware including media and controllers. More than this SDS is an approach to managing storage by function and service rather than by hardware.

SDS provides one simplified management platform that enables the simplified management of all and any storage related tasks across storage hardware from multiple vendors.

The aim of SDS is to remove the complexity of managing storage hardware, and enable management of storage by function and service. Allocation of hardware to achieve these functions and service levels is an automated function of the SDS system itself.

SDS will also drive efficiencies by creating a layer of abstraction over storage hardware and enabling storage functions to lever off any type of hardware from commodity Just a Bunch of Disks (JBOD) to enterprise arrays.

SDS is part of a stack of technologies that work together in order to deliver what has been tagged as the “Software Defined Data Center” (SDDC). A SDDC comprise of three defined components:

1 - Software Defined Compute
2 - Software Defined Networking
3 - Software Defined Storage

These three components need to integrate seamlessly but exists separately. Each function has to be discrete as the challenge of each area is entirely different. It should be stated however that implementing SDS is not dependent on it being part of a software defined data centre (SDDC).

Are Virtual Volumes the same as Software Defined Storage?

Confusion exists over the difference between virtualised volumes and SDS. The concept of virtualised volumes was pioneered by companies like Veritas (now Symantec) with their Foundation Suite product.

Strictly speaking virtualising a volume is a component of a total SDS solution. A Virtual Volume is one of the key aspects of storage abstraction. By using disk virtualisation, multiple physical platters can be presented and managed as a single volume.

It should be clear that true SDS means virtualising arrays and disks from different vendors, possibly stored in different locations. Many hardware storage vendors have developed unique, proprietary techniques to enable value-added services. SDS needs to mimic this in-built intelligence in the hardware, and provide a number of popular storage management functions.
Orchestration

Defined as a control and management layer that is removed from the physical storage, orchestration enables the management of numerous types of storage from different vendors. The type of hardware itself becomes less important than the performance and features of the storage. Orchestration enables management by service level and function rather than storage hardware.

Encapsulation

Think of encapsulation as the Storage Hypervisor that sits over the storage array creating a virtual rather than physical view of the storage. The concept behind encapsulation is very similar to the idea of Virtual Volume Management such as the Foundation Suite pioneered by Veritas. For some vendors their SDS solution is really nothing more than encapsulation (the virtualising of storage). In reality, it is better to think of encapsulation as a component of a total SDS implementation.

Separation

Management or control should be separated from the data path. This is a key element for truly scalable SDS. By moving control out of the data path, performance is not compromised. Applications still get direct connection to the physical storage without the Orchestration layer becoming an extra layer between the data and the application or server.

Intelligence

Another key feature differentiating SDS from virtualised volumes is SDS’ inherent level of “intelligence” or “understanding” of the storage hardware that it is abstracting and orchestrating. This is critical to managing storage by service level. By understanding the characteristics of the hardware it is abstracting The SDS platform can pool together different hardware based on criteria like performance that are then made available to applications or servers based on the required performance characteristics required.

Elasticity

SDS is a critical development in support of cloud-based computing. Whilst you do not need to be a cloud provider or build a private cloud to benefit from SDS, it is true that cloud and XaaS is a key driver behind SDS. Essentially every aspect of cloud-based computing should be as “elastic” as possible. This means you grow and shrink your consumption of IT resources based on your needs - minute to minute or hour to hour. Compute, networking and storage needs are never required in a linear fashion (e.g. your need for compute resources may decrease whilst storage increases). SDS needs to integrate seamlessly into the cloud infrastructure but enable administrators to effortlessly grow and shrink allocated storage by user or application or business as required.
Management Simplicity

SDS should provide a single platform that enables complex tasks to be managed effortlessly. An analogy we can use to explain this is that of an F16 fighter pilot. The technology they control to make the plane function is incredibly complex. However, it has been abstracted and automated so that the pilot does not need to make any complex calculations to control the plane. This simplification allows the pilot to focus on what they do best — flying the F16!

SDS is the same, administrators should need only to define the class of storage they want to provide and the SDS platform should have the intelligence to mobilise the underlying hardware to deliver. The skill and training required to manage a complex storage infrastructure is reduced by implementing SDS.

Application API’s

Another critical feature of a fully rounded SDS implementation is that it can communicate effectively with the applications it supports. Application APIs ensure that applications can still access data directly from the underlying storage via hypervisors.

Predictive Capability

It makes sense for an SDS platform to be able to calculate and predict future storage requirements. This capability is currently not commonly found in many existing SDS solutions, but the nature of SDS means building in predictive capability is eminently possible. By predicting storage requirements SDS can automatically re-allocate resource based on analysis of what is going to be required.

Utilise Commodity Hardware

SDS should be able to incorporate commodity hardware into the pooled abstracted storage. This should include not just storage hardware but commodity servers with built-in storage in order to deliver enterprise class performance from commodity components.
What about Vendor Specific SDS solutions?

SDS is currently a “hot topic” and we are seeing many vendors coming to market with their version of ‘software defined storage’ offerings.

Inevitably this can cause confusion and raises the question as to whether some of these vendor specific solutions are truly software defined.

As an example is VMware’s Virtual SAN, which on one level is software defined storage in that it virtualises storage under server hypervisors. However whilst the technology is good and offers many excellent features in a VMware-based environment, it may not be completely right to classify it as a truly open software defined storage solution. The storage hypervisor sits within the compute hypervisor, which means that there is no separation of control and data path. In addition the storage hypervisor does not always retain all the characteristics of the storage beneath it. So whilst on one level Virtual SAN is an example of software defining storage it is not an example of a free standing open SDS platform.

Another example of a SDS based offering is ViPR from EMC. The ViPR solution does tick many of the SDS “boxes” and in many respects is an excellent example of SDS remaining true to the principles of what SDS should be. It includes Open API’s and has a control path separate from the storage hypervisor path. However as of this writing, it is limited to providing orchestration or management over the five types of EMC storage. So for an EMC house the solution is excellent but at the present time it doesn’t have the ability to incorporate commodity and third party hardware - an approach common to many enterprises that have a two or more vendor policy.

Conclusion

Software Defines Storage is an emerging and evolving technology. It is tied together with cloud and the emerging Software Defined Data Centre, although can be implemented independently of either of these. Whilst vendor specific versions of SDS may not strictly adhere to all aspects we would expect to see in an open SDS-based implementation they may well serve the purpose within certain implementations.

For example, Virtual SAN still provides excellent storage virtualisation within a VMware environment, and if that is all you need then it’s a great solution with a VMware hypervisor environment.

However if you are looking to truly evolve your storage operations to keep pace with evolving demands, and want to transform the process of managing storage from a hardware centric model to service centric model, then you will need to look at open and hardware agnostic SDS technologies such as Federator from ProphetStor.

The driver for moving to SDS may be very specific - such simplifying storage management. However, best practice dictates that even if you are making the move from a largely “physical” storage infrastructure to an “abstracted” storage infrastructure, it is highly recommend to see beyond this single driver, consider what is possible and what you may need as your computing demands change over time.