Software Defined Storage
The New Storage Platform

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Abstract

Software Defined Storage - the Nextgen Storage

This session will appeal to Development Managers, System Integrators and Data Center Managers that are seeking a fundamental understanding of SDDC and SDS. The session will delve into the emergence of Software Defined Storage and how its role in Software Defined Data Center (SDDC) heavily contributes to creating IT as a Service. Not limited to developers, the session will also bring a clear understanding of the value of SDDC/SDS to the Developers, System Integrators and the IT community. The audience will receive the fundamental grounding in this new technology, and how they can adopt in their IT environment.
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IT Industry Journey - Roadmap

Cloudization
On-Premises > Private Clouds > Public Clouds
DC to Cloud-Aware Infrast. & Apps. Cascade migration to SPs/Public Clouds.

Automation
Automatically Maintains Application SLAs
(Self-Configuration, Self-Healing©IMEX, Self-Acctg. Charges etc.)

Virtualization
Pools Resources. Provisions, Optimizes, Monitors Shuffles Resources to optimize Delivery of various Business Services

Integration/Consolidation
Integrate Physical Infrast./Blades to meet CAPSIMS ©IMEX
Cost, Availability, Performance, Scalability, Inter-operability, Manageability & Security

Standardization
Standard IT Infrastructure- Volume Economics HW/Syst SW
(Servers, Storage, Networking Devices, System Software (OS, MW & Data Mgmt. SW)

Analytics – BI
Predictive Analytics - Unstructured Data
From Dashboards Visualization to Prediction Engines using Big Data.

IT Industry Roadmap

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New Role of IT: ITaaS

Virtual Workspace
Manages access to services, applications and data for any device

Hybrid Cloud
 Seamlessly extend your data center to the Public Cloud

Software Defined Data Center
Virtualizes the entire datacenter

Management & Automation
Storage
Compute
Ntwk. & Security
Data Centers & Cloud Infrastructure

Public Cloud Center
- ISPs
- Vertical Clouds
- IaaS, PaaS, SaaS
- Switches: Layer 4-7, Layer 2, 10GbE, FC Stg
- Application Servers: HA, File/Print, ERP, SCM, CRM Servers
- Tier-1 Edge Apps: Web 2.0, Social Networks
- Core Optical
- Edge

Enterprise VZ Data Center
- On-Premise Cloud
- Database Servers, Middleware, Data Mgmt
- Tier-3 Data Base Servers
- Caching, Proxy, FW, SSL, IDS, DNS, LB, Web Servers
- Tier-2 Apps: Application Servers, HA, File/Print, ERP, SCM, CRM Servers
- Tier-1 Edge Apps: Web 2.0, Social Networks
- Core Optical
- Edge

Supplier/Partner
- Remote/Branch Office
- Home Networks
- Wireless

Internet
- ISP
- Core Optical
- Edge
RAID - First SW Defined Storage 1988

Virtualization: Impact on IT Infrastructure

Virtualization: TCO Savings
995 Pre-Virtualization (VZ) Servers → 78 VZ Servers

Power/Cooling & Data Management

Multiple VMs create I/O Blender Effect

Bottlenecks in Physical Servers sharing Memory

Virtualized Server Penetration
50% of all servers in 2011 growing to 85% by 2016

Virtualization led Workload Consolidation provides >20x Savings in RE, Pwr., HA
Diverse Workloads Exploding

- Next Gen Cloud Applications:
  - HDFS / Object Storage
  - Eventual Consistency
  - Tolerance For Data Loss
  - Software-Based Resiliency

- Traditional Applications:
  - Block / File Storage
  - Transactional Consistency
  - Little Tolerance For Data Loss
  - Hardware-Based Resiliency

- Performance:
  - 2012: 6M
  - 2016: 48M
  - Increase: 700%

- Capacity:
  - 2012: 83M
  - 2016: 141M
  - Increase: 70%
Apps leveraging IT-as-a-Service w/SDDC

- B-Intelligence
  - Big Data
- Entertainment-Social Networks
- HPC & Commercial
- Bioinformatics & Healthcare
- Productivity/VDI

Data: IMEX Research & Panasas
Workloads: Key to Infrastructure Arch.

Workloads need Infrastructure Optimized for Cost, Availability, Performance ...

*IOPS for a required response time (ms) *= (#Channels*Latenity-1)
Big Data Analytics: Next IT Frontier

![Diagram showing Big Data Market Growth](chart.png)
Workload/SLA Optimized Systems

Applications/Software as a Service

- SaaS
- PaaS
- IaaS

Cloud Computing
- Private CloudEnterprise
- HybridCloud
- Public Cloud ServiceProviders

Platform Tools & Services / APIs

Operating Systems

Virtualization

Resources (Servers, Storage, Networks)

Management

Application’s SLA dictates the Resources Required to meet specific requirements of Availability, Performance, Cost, Security, Manageability etc.
Software Defined Data Center: Positioning IT for the Mobile-Cloud Era

3. Apps and Services
   On-Demand Hybrid Control

2. Dynamic Resource Assignment

1. HW Agnostic and Elastic

Storage & Availability
- Policy-Based Control and Automation of Infrastructure Services

Compute
- Abstraction and Pooling

Network & Security

Automation
- XaaS: Self-Service Catalog, Lifecycle Management

Operations Management
- Analytics-Based Operations Enabling Self-Healing, Self-Regulating IT

4. Fully-Automated Ecosystem
Virtualization Opens New Opportunities

Virtualization Platform Has:
- Inherent knowledge of Application’s SLA requirement
- Global View of Infrastructure
- Is Hardware agnostic

Virtualization Platform

Hypervisors

VM App OS
VM App OS
VM App OS
VM App OS

Software Defined Storage
- Policy Driven Control Plane
- App Centric Data Services
- Virtualized Data Plane

Storage Pools
Software Defined Storage: Bringing Operational Model of Compute to Storage

Software-Defined Storage

Policy-Driven Control Plane

App-Centric Data Services

Virtualized Data Plane

Software-Defined Data Center

All infrastructure is virtualized and delivered as a service, and the control of this data center is entirely automated by software.

Software-Defined Storage

Heterogeneous storage resources are abstracted into logical pools, consumed and managed through app-centric policy-based automation.
Location for Control & Policy

Where do you put the control plane?  How Do You Do Data Planes/Services?

- Database
- Collaboration
- ERP
- Middleware

<table>
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<th>VM</th>
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<td>App OS</td>
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Hypervisor

IaaS

Control & Policy

Proc

Software Defined Storage (Anil Vasudeva, IMEX Research), Storage Networking Industry Association. & Author All Rights Reserved.
VM Storage Policy

- Capacity
- Performance
- Availability
SDS: Control Plane Manages & Automates

1. Manages Data Plane... And Arrays Directly
   Standardize Management Across Existing & New Architectures

2. Integrates With OpenStack & Hypervisors

Virtualization & Management Of Storage Drives Efficiency
SDS is a Programmable Platform

Virtual Cloud

Infrastructure & Application Software Vendors Add Value

REST APIs

Control Plane

Data Plane

REST APIs

Scale Out NAS Storage

High End Storage

Mid-Range Storage

Open Storage

Block Storage

File Storage

Object Storage

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VSAN: Radically Simple Storage

Key Features
- Policy-driven per-VM SLA
- Scale-out storage
- Built-in resiliency
- SSD caching
- Converged Compute & Storage

Key Components
- Hybrid storage system which leverages
  Aggregates local SSD’s as a cache and
  local HDD’s to provide a distributed data
  store for VM consumption
- Distributed object-based RAIN architecture
  provides no single point of failure
- Scale-Out Storage: 3-8 nodes in 1.0, >8
  planned for near future
Self-Tuning Dynamic Storage for VMs

Storage Layer Hypervisor

Hypervisor

Instantly provision VM storage using simple policies.

Each VM maintains its unique policy in the clustered VSAN datastore.

Storage capacity and performance scale dynamically with your cluster.
VM Storage Policies
VM Deployment based on vSAN Capabilities

- VM Storage Policies are built in advance of VM deployment to reflect the requirements of the applications running in the virtual machine.
- The policy is based on the VSAN capabilities.
- The appropriate policy is selected for the VM at deployment time (based on VM requirements).
DataStore Capabilities visible to Mgmt Ctr.

• When the **Storage Hypervisor** is created, the capabilities of **DataStore** are automatically surfaced up to **Virtual Management Center**
• These capabilities are used for setting **VM Storage Policies**
• **VM Storage Policies** will contain the availability, performance and provisioning requirements of the virtual machine (or specifically the applications running in the virtual machine) in the form of capabilities
vSAN Summary

- Automated Storage Management via Intelligent VM based policies
- Dynamic scalability to grow from a few terabytes to petabytes of data
- Integrated with vSphere and managed in vCenter
- Built-in resiliency/protection from HW failures
- Per-VM SLA management with intelligent data placement
- Instant storage provisioning without complex workflows

- Radically Simple Storage Designed For Virtual Machines
- Fast, Resilient & Dynamic
- Up to 50% Lower TCO For Comparable Performance
From Mgmt. Center to Virtual Stores

Virtual Mgmt. Center Server

Storage Hypervisor

Hypervisor
NextGen IT as a Service using SDDC
The SNIA Education Committee thanks the following individuals for their contributions to this Tutorial.

Authorship History
Anil Vasudeva, Chief Analyst & President, IMEX Research.com Aug 2013
Updates:

Please send any questions or comments regarding this SNIA Tutorial to tracktutorials@snia.org