Time to Say Good Bye to Storage Management
with *Unified Namespace, Write Once and Reuse Everywhere* Paradigm

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Agenda

- Software Defined Storage (SDS) overview
- Current state of Storage Management and gaps
- “Open SDS Controller” proposal
- Next Steps and Help Needed
Software Defined Storage (SDS) brings “cloud” benefits to storage, including auto-provisioning, self service, and single pane of glass for management.

A key enabler of the new SDS architecture is an **SDS controller** for single pane of management.

Software Defined Storage (SDS) Architecture

**SDS CONTROLLER**
- Visibility and control of ALL storage resources
- Communication between apps, orchestrator, and storage systems
- Allocates storage resources to meet SLAs

**APPLICATIONS**

**ORCHESTRATOR**

**SDS CONTROLLER**

Storage Systems

- **Open Source + Standard Server**
- **ISV + Standard Server**
- **Traditional (e.g., SAN, NAS, AFA)**
SDS Controller Workflow

**SDS Controller (Interoperable, Open APIs)**

- **Pre Configured Appliances**
  - Servers with OS, SW
  - Provision (Scaleout Storage System)
  - Assign resource
  - Provision resource
  - Note: Servers already have OS. Focus on 3rd party s/w integration with framework

- **Discover (Storage Capabilities)**
  - Discover storage system, tiers
  - Discover fabric and topologies
  - Discover native capabilities and SLOs

- **Compose (Virtual Pools)**
  - CUDL virtual pools
  - Attach/Detach tiers to virtual pools
  - Native capabilities support
  - Admin UI for pool composition
  - Object support (cloud, on-premise)
  - Service catalogues
  - SLO aware pools

- **Data Type Life Cycle Mgmt**
  - CUDL volumes & shares
  - Attach & Detach volumes & shares
  - Clone, Snapshot, Backup, Extend, Shrink
  - Get volume stats
  - Object store mgmt
  - QoS monitor, alert & enforce Policies, data life-cycle mgmt.
  - SLO based provisioning
  - SDN integration

- **Monitoring and Maintenance**
  - Pool maintenance (add, remove, upgrades, degraded)
  - Storage system maintenance
  - Tier 1 Metrics, Health Metering/Billing
  - Automated data migration

**Legend**
- CUDL = Create, Update, Delete, List

**Discovery and Classification**
- Complex policy based orchestration
- Multi-system operations

**Scale, HA**
- Vendor specific
- Largely ignored, manual
- Most of the focus
- Lots of tools
OpenStack – Cloud Orchestration
Cinder Block Storage flows

Virtual Machine
QEMU/KVM

Nova
VM management

Boot or Attach volume

5
Launch VM

iSCSI, iSER, NFS, RBD etc.

Nova
VM management

Get volume info

4
Get image info

Cinder Block Orchestration

Create volume

1
Create volume

Drivers

Drivers

Horizon Dashboard

QEMU/KVM

Manila
File Share Orchestration

Get volume info

2
Create volume on backend

Drivers

Scale up (SAN, NAS, AFA)

Scale Out

Cinder Block Orchestration

Stats (space etc.)

Backup snapshots

Swift
Object Store

Storage images

Glance
VM template management

Backup snapshots

Identify & Auth
Keystone
Network Orchestration
Neutron
Key Management
Barbican
Telemetry
Ceilometer

Legend:
Control Plane
Data Plane

✔ Production maturity
✔ Broad driver support

- Lacks discovery & pooling automation
- Scheduling, monitoring evolving
Kubernetes – Container Orchestration

- Growing community
- Linux container support
- Storage interfaces evolving
- Storage mgmt. mostly out of scope

API Server → Replication controller → Scheduler

kubelet → proxy

Node

kubelet

proxy

pod
Container

Node

kubelet

proxy

pod
Container

apiServer

replicationController

scheduler

etcd

Persistent Volumes

Scale Out

Scale up (SAN, NAS, AFA)
Several Open Source Options

- **Apache Mesos** - API’s for resource management and scheduling across entire datacenter and cloud environments
- **Docker Swarm** – native clustering for docker
- **CoprHD** - open source software defined storage controller and API platform
- **Apache CloudStack™** - Infrastructure as a Service (IaaS) cloud computing platform
- **HPE Helion Eucalyptus** – open solution for building private clouds that are compatible with Amazon Web Services (AWS)
- Many more - Joyent, OpenNebula etc.
Storage Integration in Cloud Native Computing

- **Persistent volumes w/ resource model** (e.g., storage space, storage time, storage operations)
  - Wide variety of drivers (direct plug-ins, driver for pluggable backends)

- **Data volumes w/ mount points**
  - Wide variety of native drivers (Ceph, EMC RexRay, Flocker, GlusterFS, Azure File Service, iSCSI etc.)

- **Persistent Volumes**
  - Vendor agnostic storage orchestration model, API, and reference client and server implementations

- **Vendor agnostic storage orchestration engine**
  - Design goal is to provide persistent storage for Docker containers as well as Mesos frameworks and tasks

- **Open Storage for Linux Containers**
  - Specifications and reference implementations around an open storage protocol for Linux Containers

- **Kubernetes Plugin**
  - Flexible volume is just not another Kubernetes volume plugin. It enables vendors to develop their own backend drivers or extend their capabilities

- **Open Containers Initiative**

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Every one is trying to address storage integration but in a different way
State of Storage Management

Different levels of storage abstraction and maturity

Direct or Multi-driver integration

One driver for each product and orchestrator

Need unified abstraction, driver integration

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An Open SDS Controller Future

OPEN SDS ORCHESTRATION
Provisioning, Data Placement, Data Protection, Data Migration, Local/Remote Replication, Data Security, Lifecycle Management, DR, Tiering, ...

Custom Adapters

Open SDS Adapter (+Cinder +Manila)
CoprHD/ViPR
OceanStor DJ
Others

Common API – Discovery, Configuration, Monitoring

Local Storage  SAN  NAS  AFA  Scale-Out

Common Plug-ins

Simplify integration and re-use open source building blocks

NOTE: Orchestration stacks and vendors is a small subset for illustrating the concept
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Value Proposition

- Solve **real-world storage management problems** for our collective customers
- **Focus on seamless integration** for Kubernetes, Docker, Mesos, OpenStack and others
- **Reuse** open source storage building blocks and driver investments (e.g., Cinder & Manila)
- **Collaborate** among storage vendors, standards bodies, end users in an open source community with momentum and broad developer support
Next Steps and Help Needed

- Discussions in progress with storage vendors, end customers and open source communities
- Tune in for an announcement this year
- Join us in enabling “Open SDS Controller” industry wide effort
THANK YOU