How Container Schedulers and Software-Defined Storage will Change the Cloud

David vonThenen
{code} by Dell EMC
@dvonthenen
http://dvonthenen.com
github.com/dvonthenen

Agenda

- Review of Software-Defined Storage
- Container Schedulers
- Schedulers + Software-Defined Storage = Awesome!
- To the Cloud!!
- Demo

Review of Software-Defined Storage

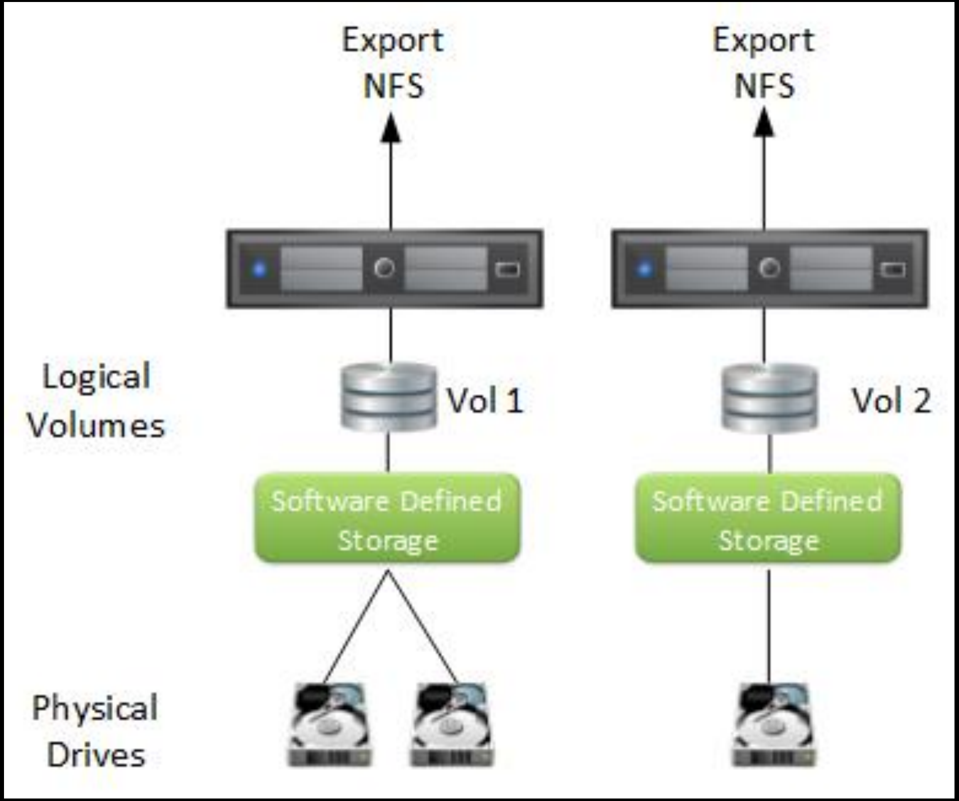
What are they?

- Many definitions… most agree on:
- Software-Defined Storage (SDS) serve as abstraction layer above underlying storage
  - Installed software versus Physical Storage Arrays
- Provides a (programmatic) mechanism to provision storage
- Varying degrees of SDS: NFS, VMware VSAN

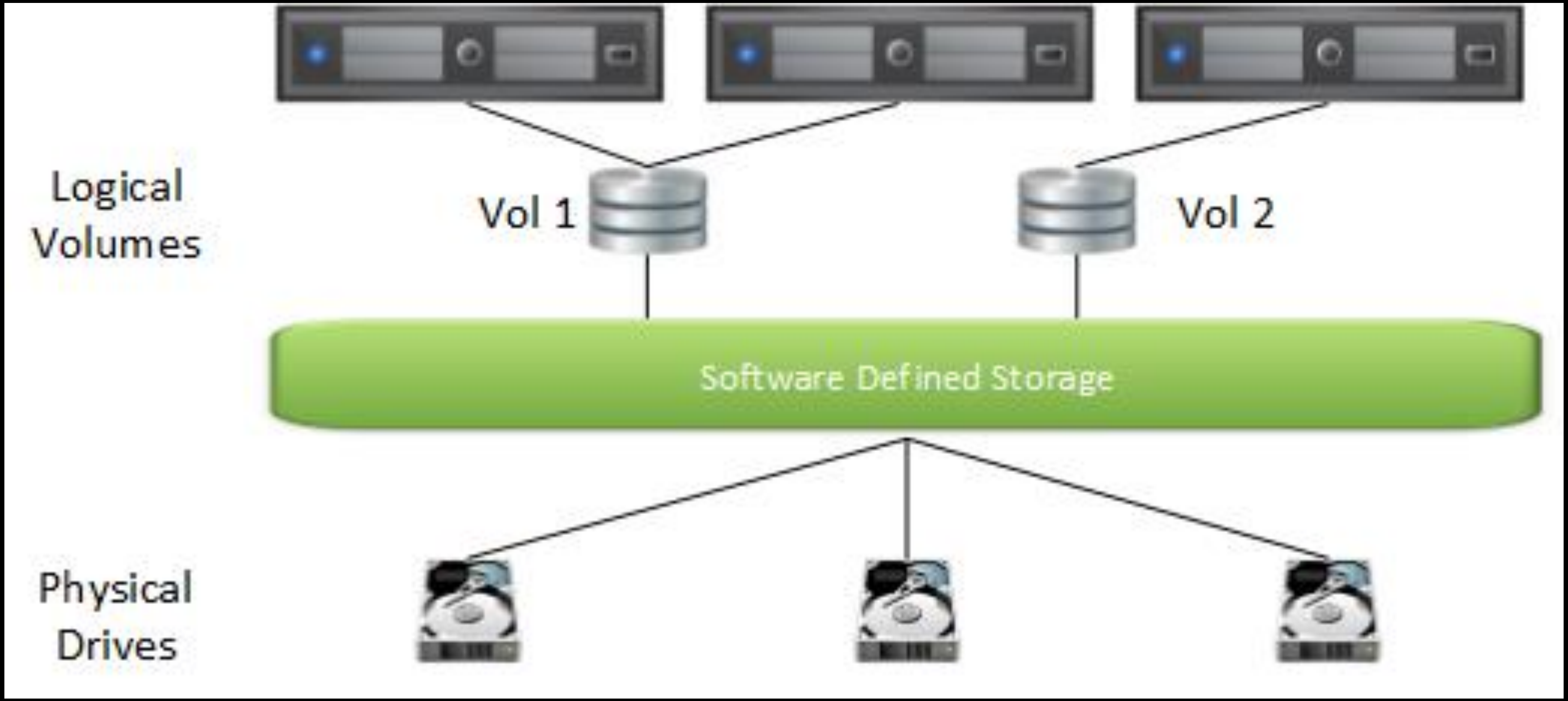
What makes them unique?

- Operational - Manage provisioning and data independent of underlying hardware
- Physical - Abstract consumed logical storage from underlying physical storage
- Policy - Automation of policy driven both external (users) and internal (platform)
- Day 2 Operations - Maintenance is inherently different

What that might look like…



What that might look like…



Container Schedulers

What is a Scheduler?

- Fair and efficient workload placement
- Adhering to a set of constraints
- Quickly (and deterministically) dispatching jobs
- Robust and tolerates errors

Apache MESOS™

kubernetes

Pivotal Cloud Foundry®

Scheduling Work

- Containers like…
  - Docker
  - Mesos Unified Containerizer
  - rkt (CoreOS)
- Cluster Manager
- Task placement based on resource
- Operational constraints

Custom Scheduling

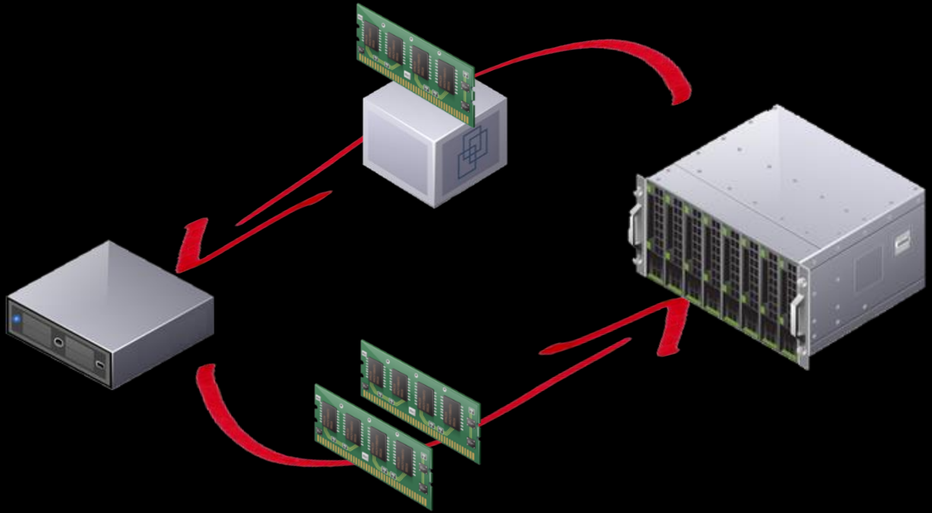
- Many allow creation of own custom Scheduler
- Customization for your application:
  - Run-Time?
  - Availability?
  - Fault Tolerance?
  - Hardware Accel?
  - Location?

Apache Mesos

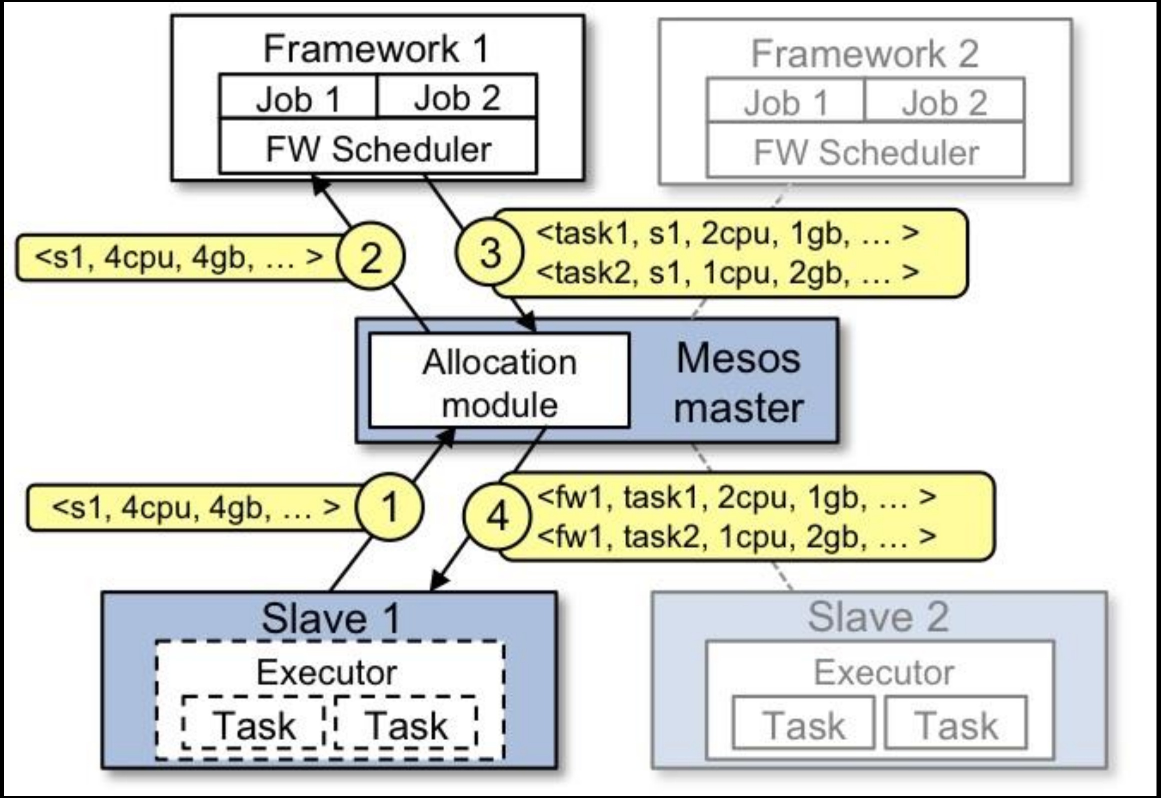
CISCO
UBER
PayPal
NETFLIX
ERICSSON
Atlassian
airbnb
ebay
yelp
More

Mesos Frameworks

- Ability to schedule tasks based on Application needs
- Framework implements a Scheduler and Executor
  - Scheduler – Accepts/Denies resources
  - Executor – Application
- Offer / Accept Mechanism
- Multiple Frameworks run within the cluster



Framework / Offer Mechanism



Schedulers and Software Defined Storage

Better Together

- Let's create a Software-Defined Storage Framework
- ScaleIO + Mesos Framework = Awesome Sauce!
- First released in Sept 2016. Now on version 0.3.1
- https://github.com/codedellemc/scaleio-framework

Let’s take a look: ScaleIO

- Scale-out block storage
- Linear performance
- Elastic architecture
- Infrastructure agnostic
- Try ScaleIO. It’s a free download!

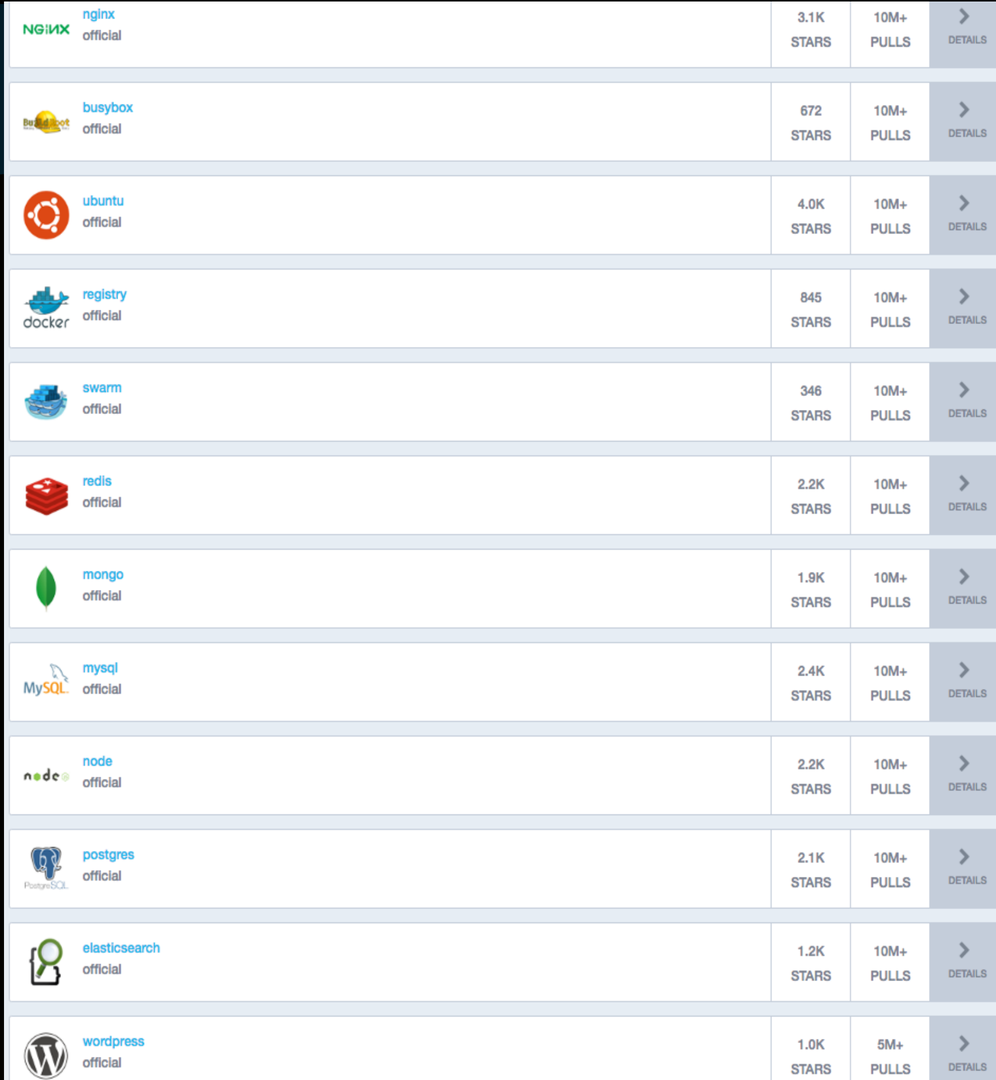
https://www.emc.com/products-solutions/trial-software-download/scaleio.htm

SDS Framework = Mind Blown

- Framework installs and configures Storage Platform on all Scheduler’s compute nodes
  - Persistent storage **native** to scheduling platform
  - Globally accessible storage
  - What Storage array? Reduce complexity
  - Deploy Anywhere!

Containers Today

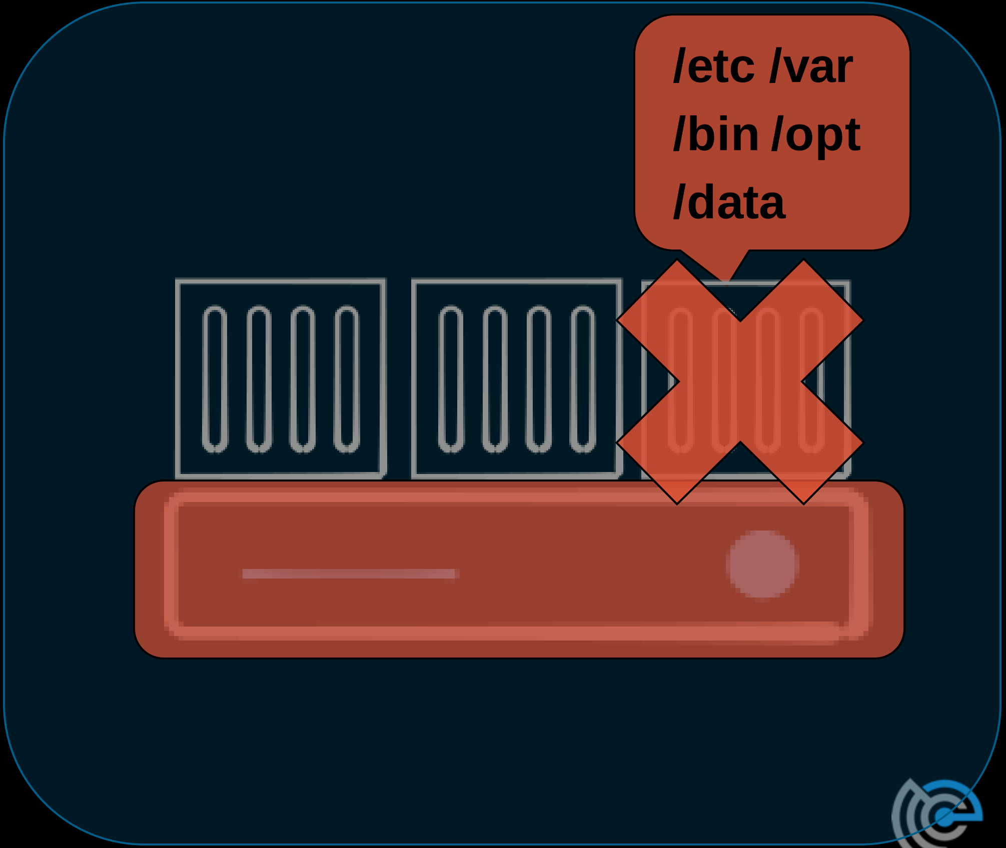
- Many container workloads are long running
- Many have state: user data, configuration, and etc
- Top 7 of 12 Apps in Docker Hub are persistent applications



nginx	official	3.1K STARS	10M+ PULLS	DETAILS
busybox	official	672 STARS	10M+ PULLS	DETAILS
ubuntu	official	4.0K STARS	10M+ PULLS	DETAILS
registry	official	845 STARS	10M+ PULLS	DETAILS
swarm	official	346 STARS	10M+ PULLS	DETAILS
redis	official	2.2K STARS	10M+ PULLS	DETAILS
mongo	official	1.9K STARS	10M+ PULLS	DETAILS
mysql	official	2.4K STARS	10M+ PULLS	DETAILS
node	official	2.2K STARS	10M+ PULLS	DETAILS
postgres	official	2.1K STARS	10M+ PULLS	DETAILS
elasticsearch	official	1.2K STARS	10M+ PULLS	DETAILS
wordpress	official	1.0K STARS	5M+ PULLS	DETAILS

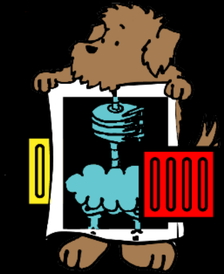
Death of a Container

- Where does my data go?
- Turned to the compute node’s local disk to store data
- What happens on a node failure?
- Production applications require high availability
- External Storage!

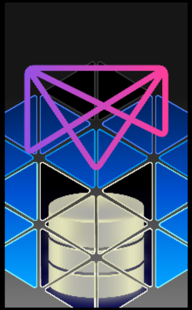


External Storage Enablement

- REX-Ray
  - Vendor agnostic storage orchestration engine
  - AWS, GCE, ScaleIO, VirtualBox, many more
  - https://github.com/codedellemc/rexray



- mesos-module-dvdi
  - Hook for Mesos nodes to manage external storage
  - https://github.com/codedellemc/mesos-module-dvdi
  - Contributed back to and is apart of Mesos proper



What this Means for your Apps

- Tolerates node failures
- Highly Available containers and Apps!
- Insulates changes with:
  - container scheduler (APIs, etc)
  - storage platform (workflows, APIs, etc)
- Production ready!

To the Cloud!

Moving towards the Cloud

- Applications with management APIs
- Cloud is perfect to enable DevOps
- What makes these cloud accessible?

Self Monitoring Apps

- Framework deploy and configure applications.
- Enable application monitoring via Management APIs
- Determine health and remediate!
- Can fix themselves, but to what end?

Self-aware Applications

- AWS SDK – 10 Language bindings
- Software-based Storage Platform with a Cloud Platform driven by APIs
- Applications that change their environment
  - Maintenance, Remediation, Performance, etc
- Self-aware applications! Skynet!

Premise: Self Managing

- Framework can monitor and self remediate Software-based Storage Platform
- The Scenario:
  - ScaleIO has a Storage Pool that is approaching full
  - Identifies the health check warning
  - Creates new EBS volumes in EC2 to expand the Storage Pool

Demo

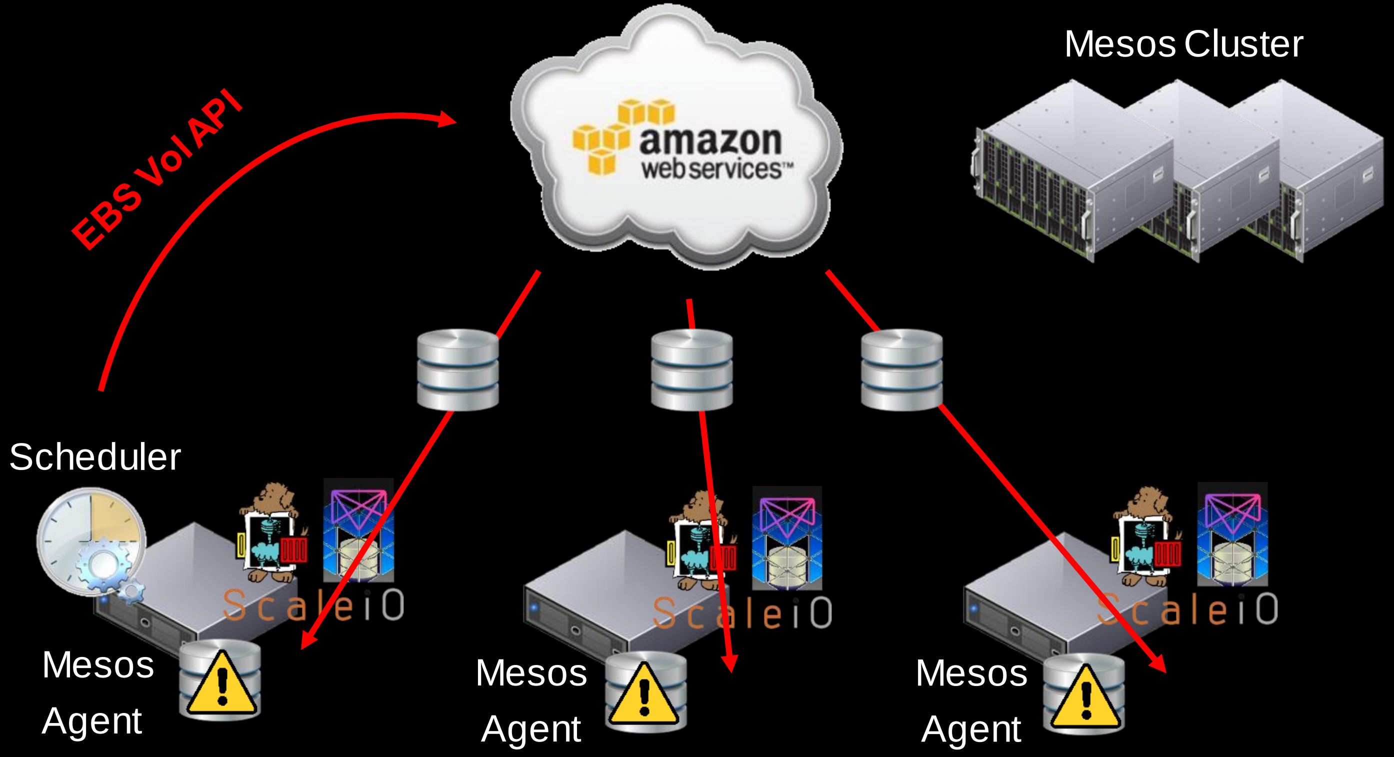
Configuration

- Mesos Configuration
  - 3 Node Mesos Cluster (Management)
  - 3 Mesos Agent nodes (Compute)
- ScaleIO Cluster (Scale-out storage)
  - Will install on top of 3 Mesos Agent nodes
  - 180 GB local disks on <u>each</u> node to make up this Storage Pool

Configuration (Cont.)

- ScaleIO Framework
  - GitHub: https://github.com/codedellemc/scaleio-framework
- Persistent External Storage
  - Using REX-Ray
    - GitHub: https://github.com/emccode/rexray
  - Using mesos-module-dvdi
    - GitHub: https://github.com/emccode/mesos-module-dvdi

The Moving Parts



#CodeOpen

Thank you

codedellemc.com

#CodeOpen

codedellemc.com