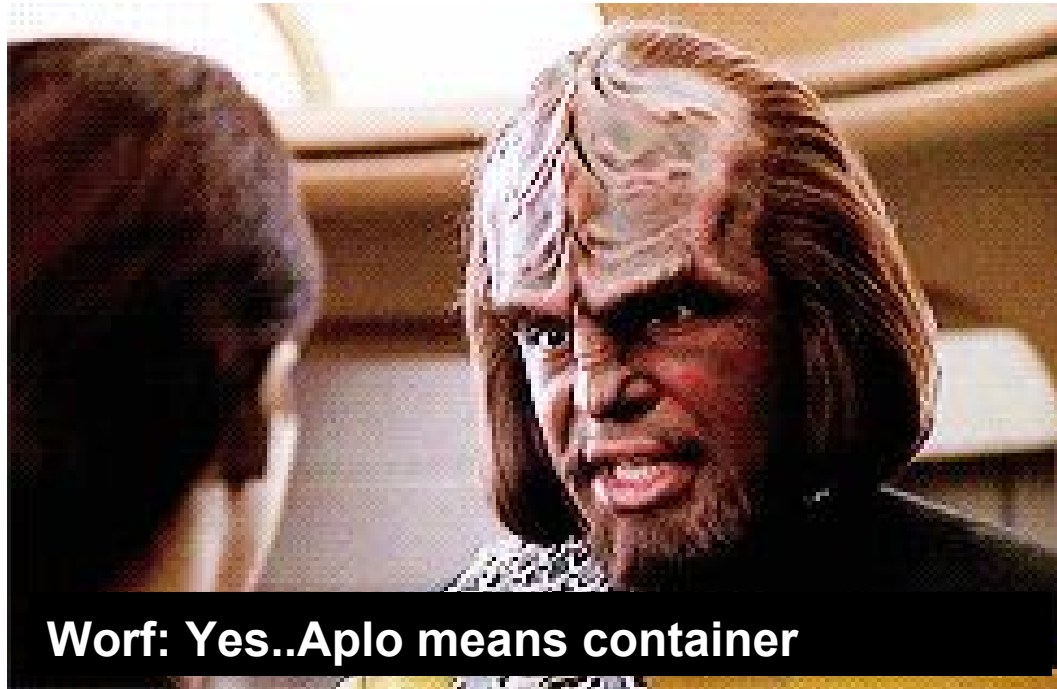

Project Aplo: GlusterFS Container Converged with OpenShift

Luis Pabón
Red Hat Summit / DevNation
2016

What does Aplo mean?

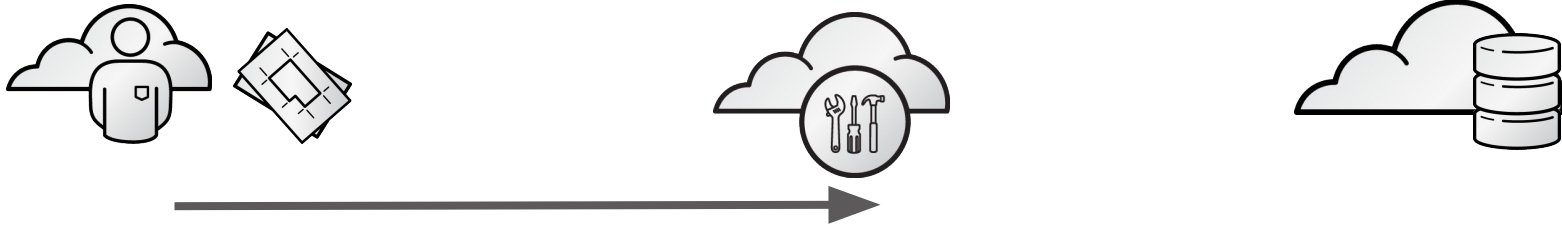


Solution

Provide a solution that will run GlusterFS as containers in OpenShift pods.

Integrate GlusterFS deployment and management with OpenShift services.

Goal Workflow with Dynamic Provisioning



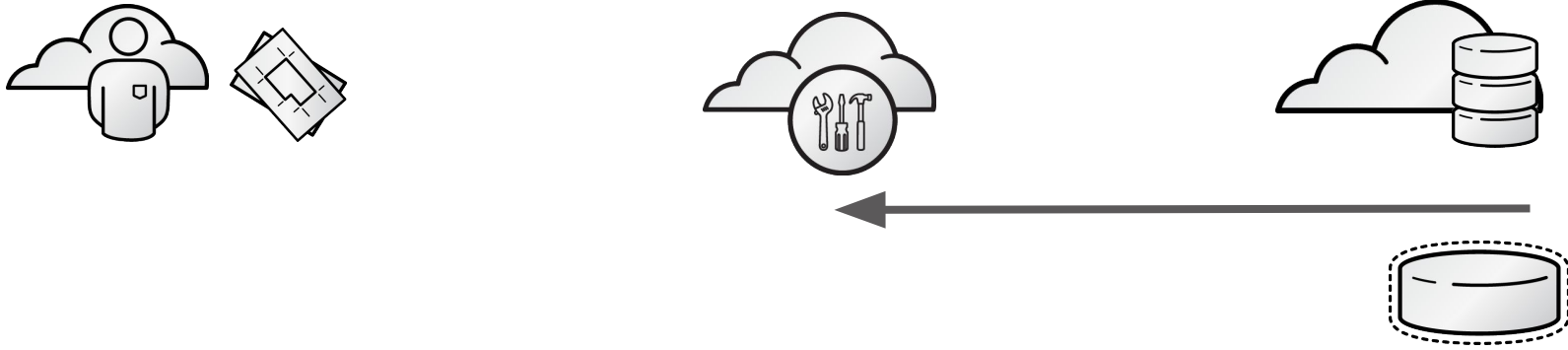
Persistent Volume Claim is submitted

Goal Workflow with Dynamic Provisioning



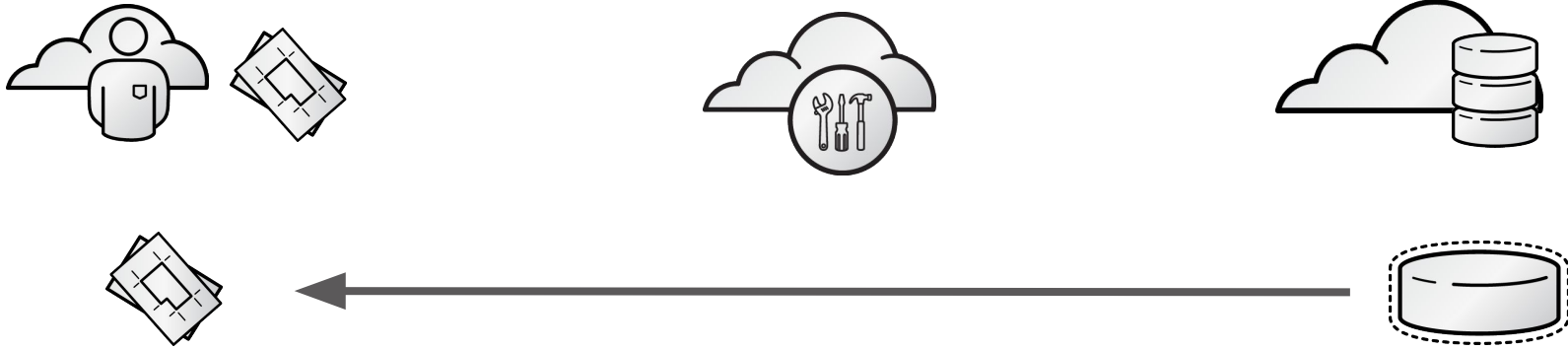
OpenShift request volume to be created

Goal Workflow with Dynamic Provisioning



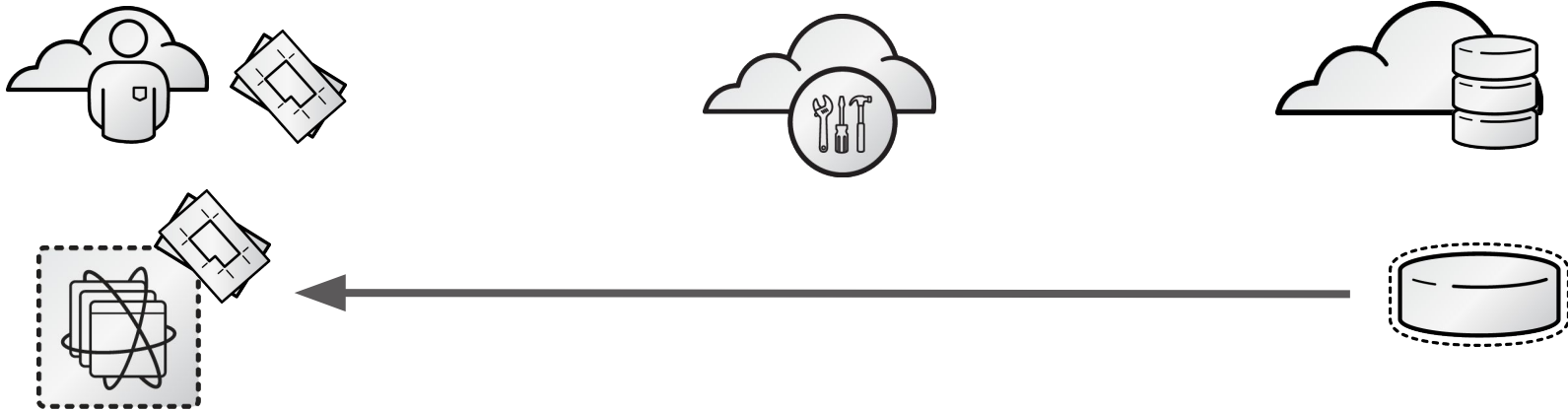
Persistent volume is created by storage system
and registered with OpenShift

Goal Workflow with Dynamic Provisioning



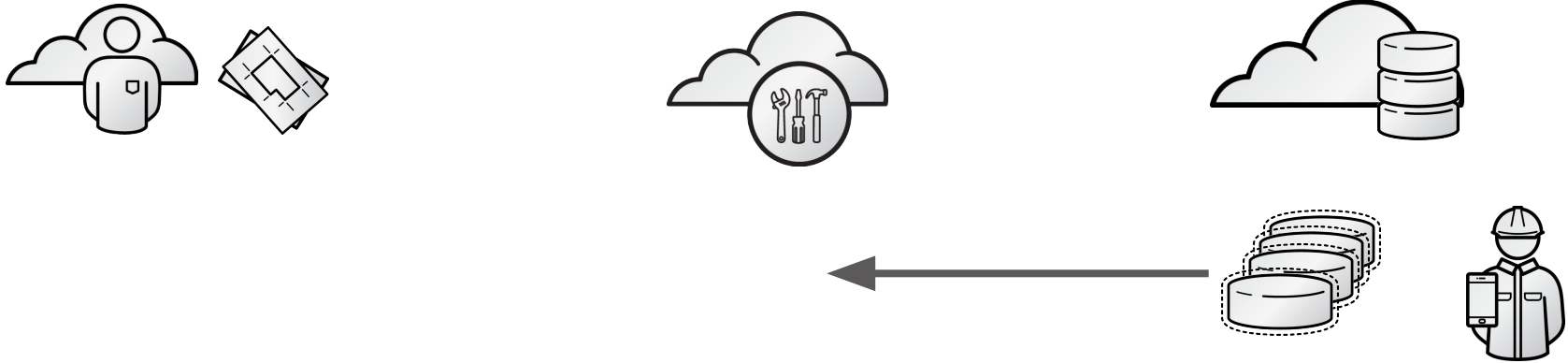
OpenShift binds persistent volume to persistent volume claim request.

Goal Workflow with Dynamic Provisioning



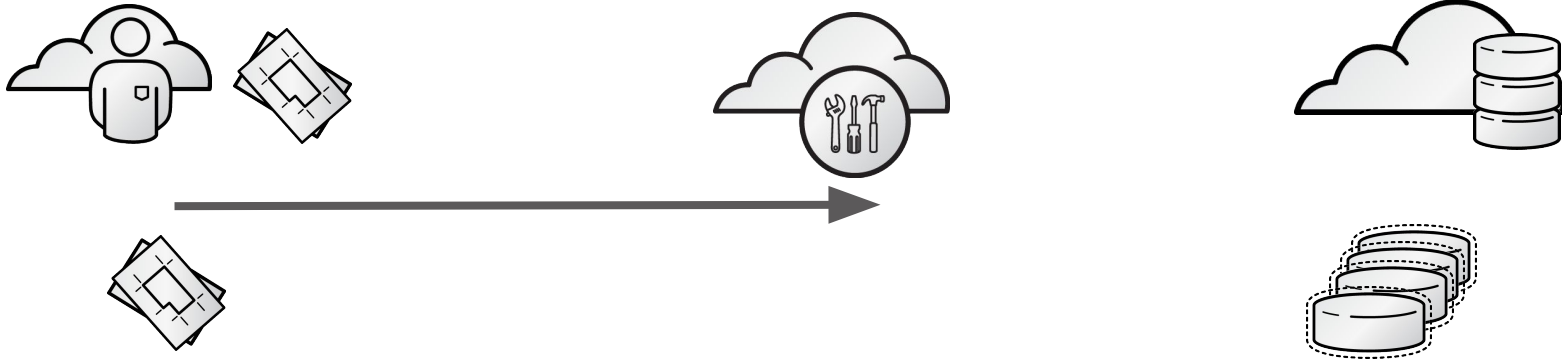
Volume can now be used by Pod to provide persistent storage

Workflow for Release 1.0



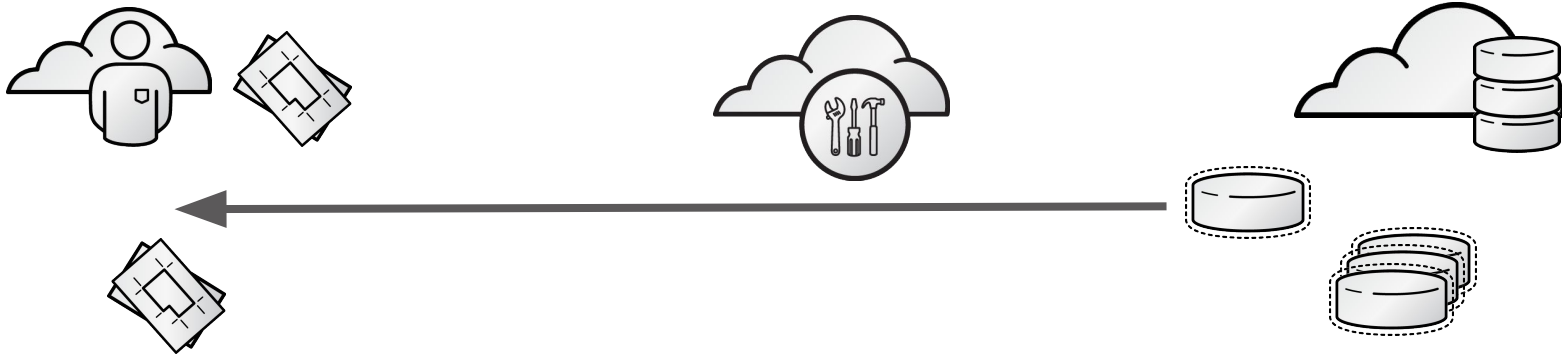
Since dynamic provisioning is not currently available, the Administrator creates many volumes and registers them with OpenShift

Workflow for Release 1.0



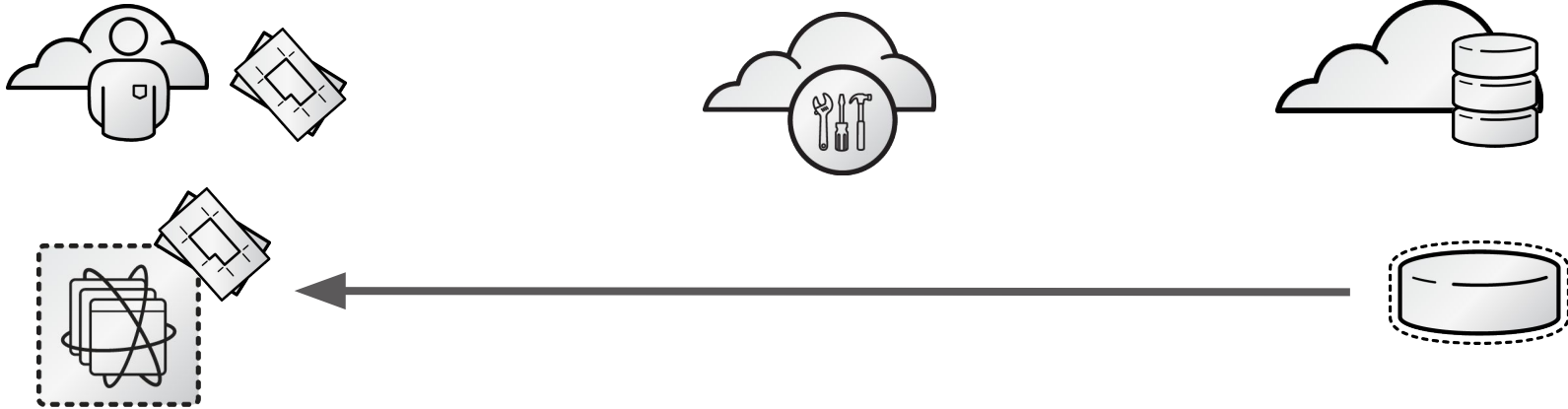
Persistent volume claim is submitted

Workflow for Release 1.0



An available persistent volume is picked out of the pool and bound to the persistent volume claim

Workflow for Release 1.0



Volume can now be used by Pod to provide persistent storage

Paradigm Shift

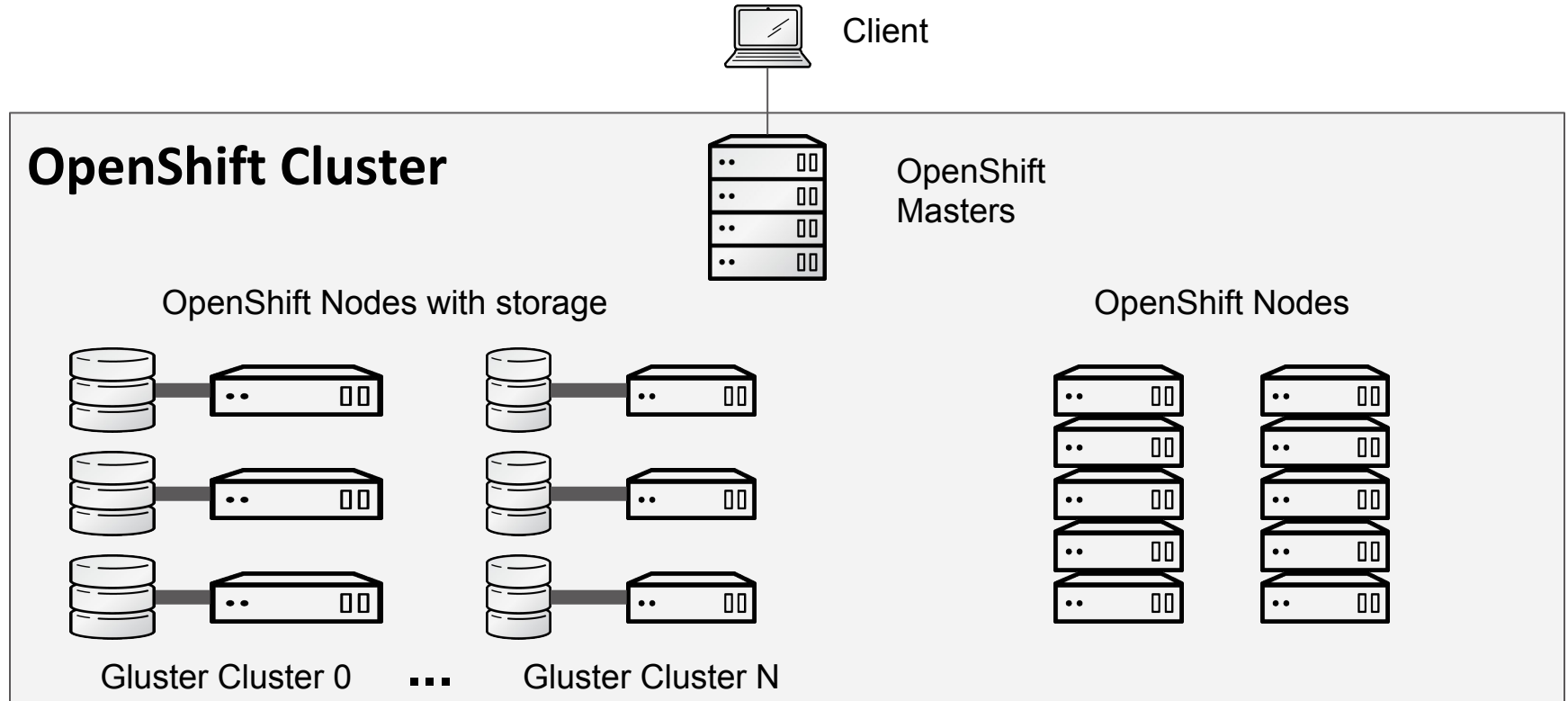


Traditional Storage Management

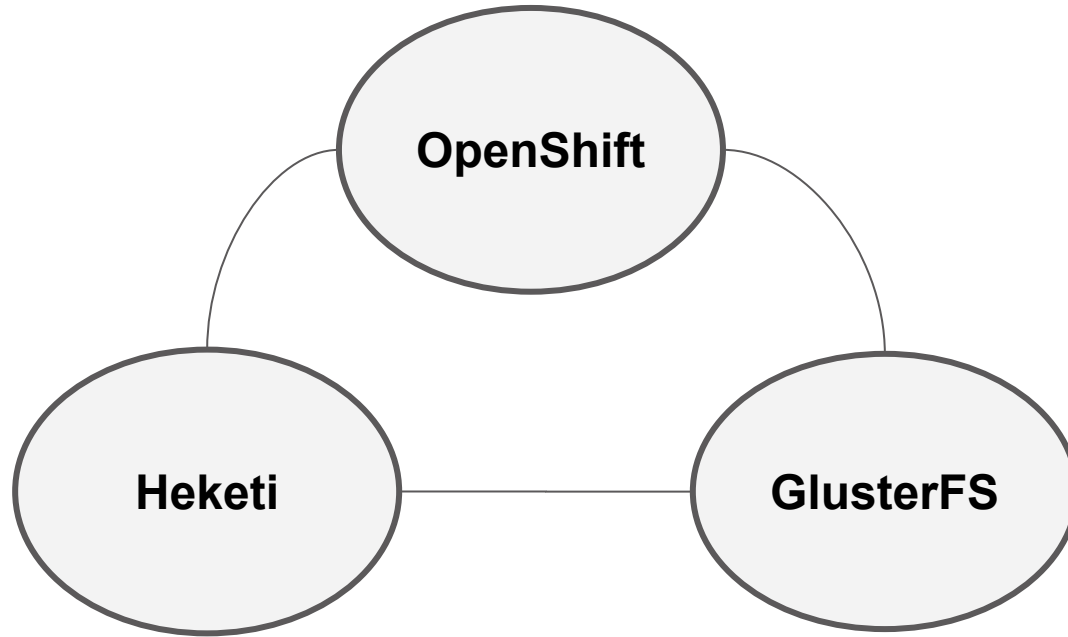


Converged Storage Management

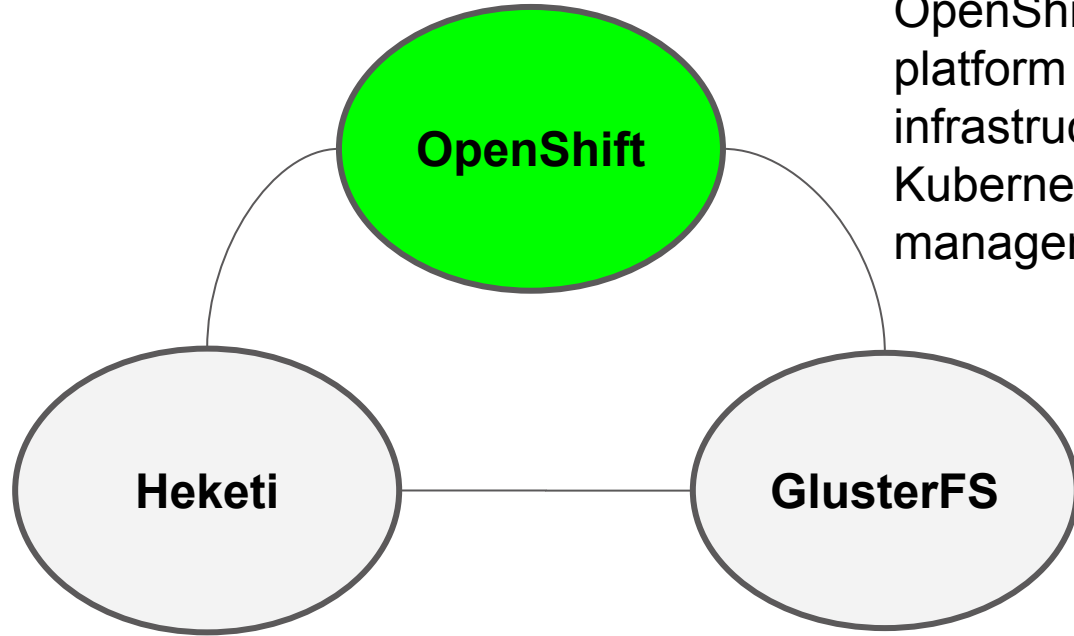
Aplo Architecture



Aplo Technologies

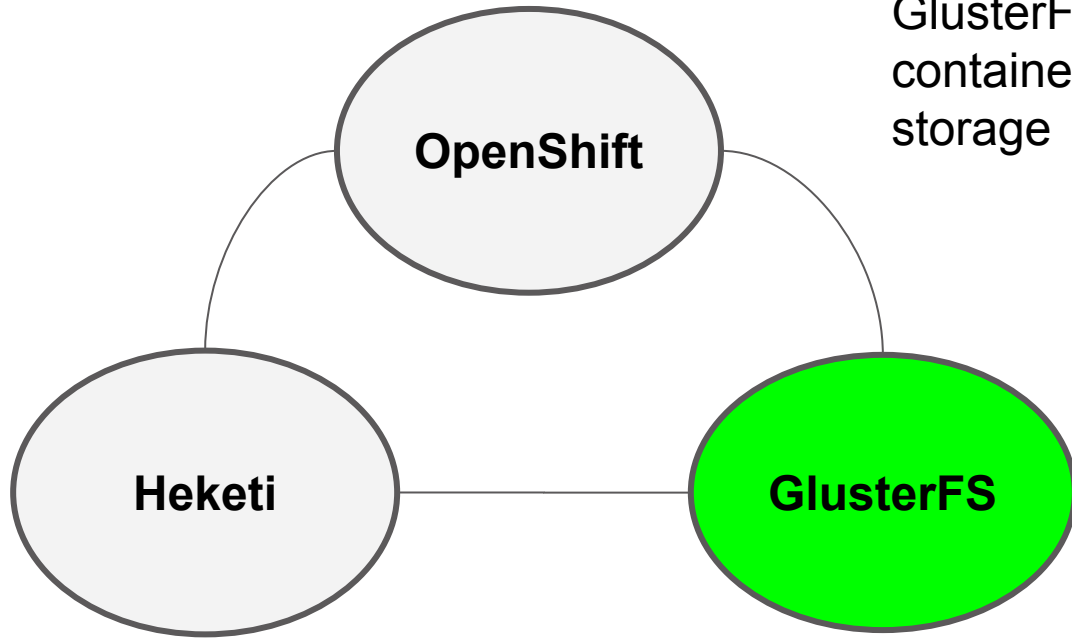


Aplo Technologies



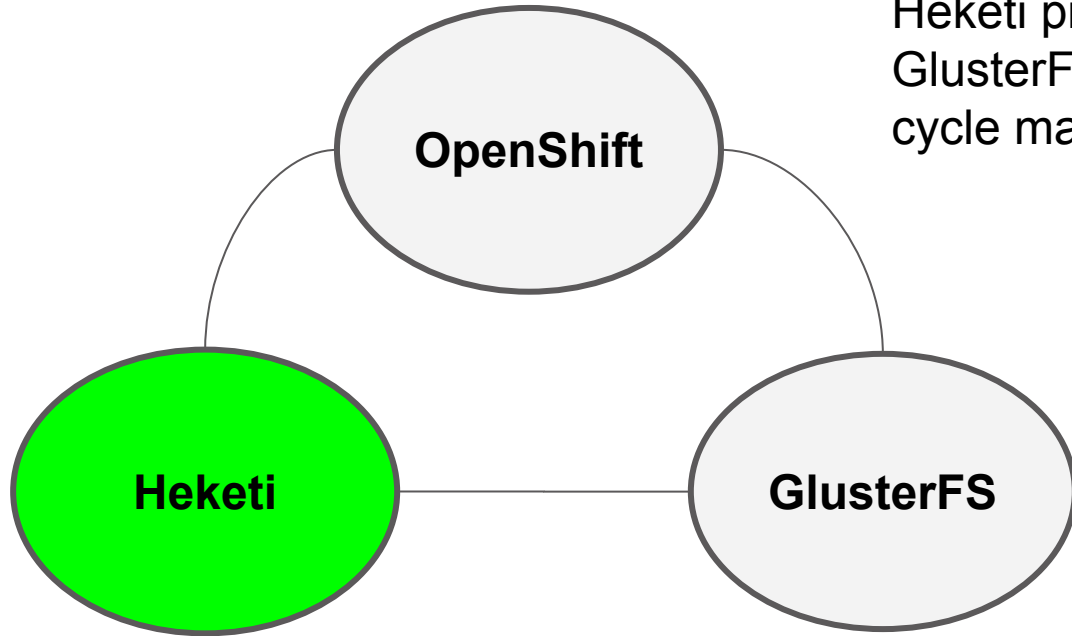
OpenShift provides platform as a service infrastructure based on Kubernetes container management

Aplo Technologies



GlusterFS provides containerized distributed storage

Aplo Technologies



Heketi provides dynamic GlusterFS volume life cycle management

OpenShift

OpenShift

- Based on Kubernetes
- Many improvements over Kubernetes like multitenancy
- Can easily create, deploy, and manage containerized applications
- Composed of a number of master systems, and a set of nodes.
- Can be run on RHEL or RH Atomic Host



Definitions

- Container - Docker container
 - Node - Runs containers
 - Master - Kubernetes Master node
 - Host net - Container can use ports on the host network
 - Cluster net - OVS based SDN
 - Privileged Mode - Root privileges
 - Labels - Key-value pairs that can be attached to objects
 - oc - OpenShift Client
-

OpenShift Object Definitions

- *Pod - A collection of containers
 - Service - Abstraction access point to a Pod
 - Route - Allows external access to a service
 - Endpoints - Describe access points
 - Persistent Volume - Cluster wide definition of a volume
 - Persistent Volume Claim - User volume request
-

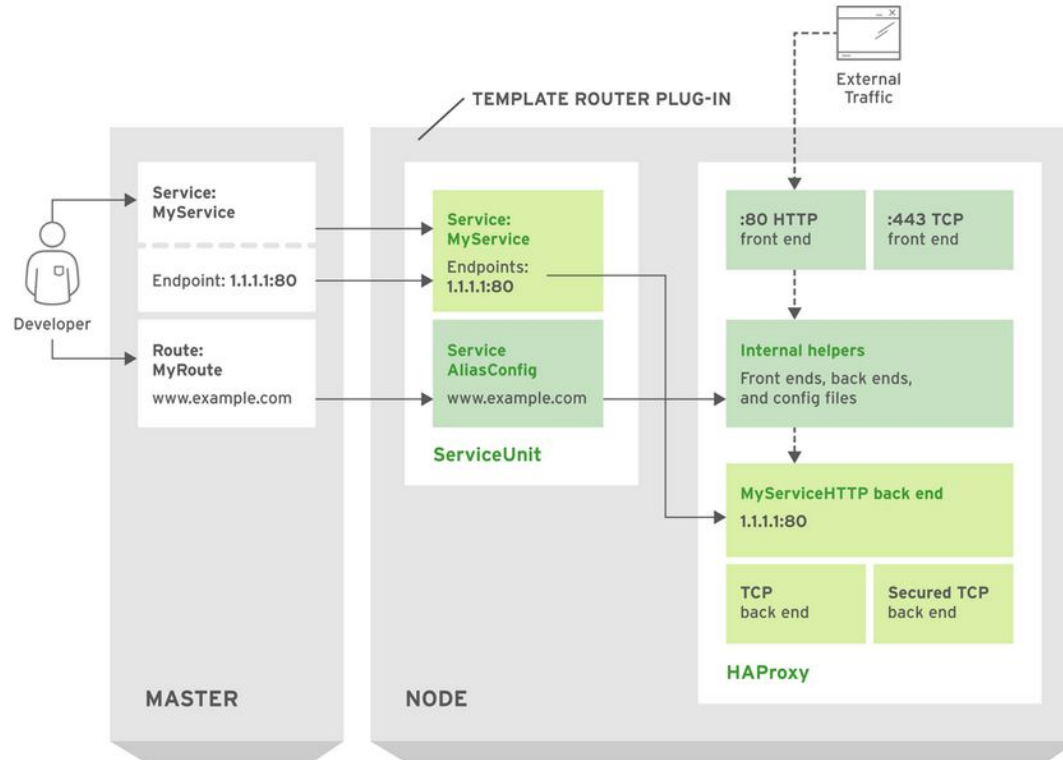
Pod Example

```
apiVersion: v1
kind: Pod
metadata:
  name: busybox
spec:
  containers:
    - image: busybox
      command:
        - sleep
        - "3600"
      name: busybox
      volumeMounts:
        - mountPath: /glusterfs
          name: mypvc
  volumes:
    - name: mypvc
      persistentVolumeClaim:
        claimName: glusterfs-claim
```

OpenShift Object Definitions

- Pod - A collection of containers
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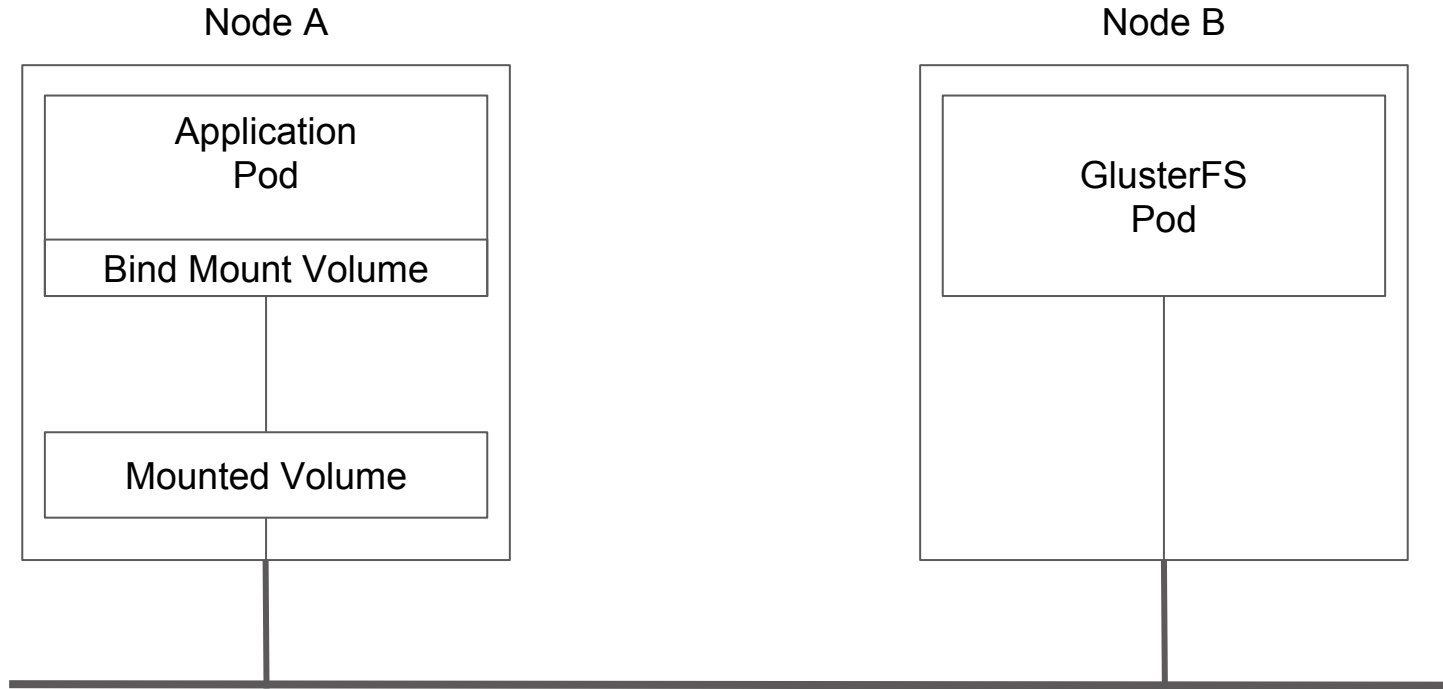
Routing using HAProxy



OpenShift Object Definitions

- Pod - A collection of containers
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-

Kubernetes GlusterFS Mount Plugin

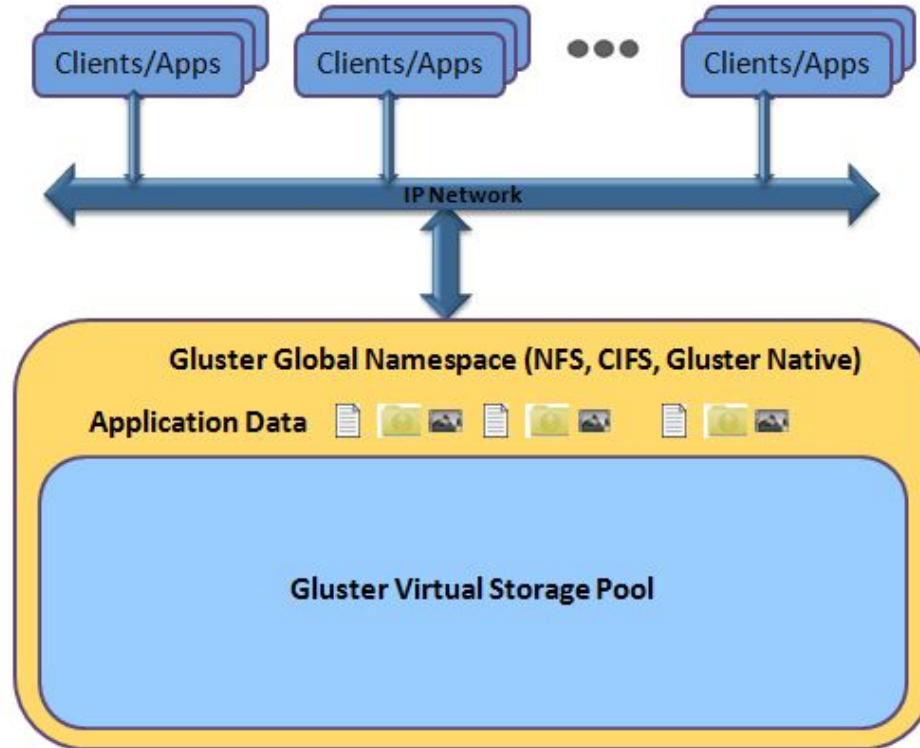


OpenShift Object Definitions

- Job - Container definition that runs to completion
 - Secret - Store opaque data, up to 16MB
 - Deployment Config - Deploys container replicas
 - List - Collection of objects
 - Template - A List with variables
-

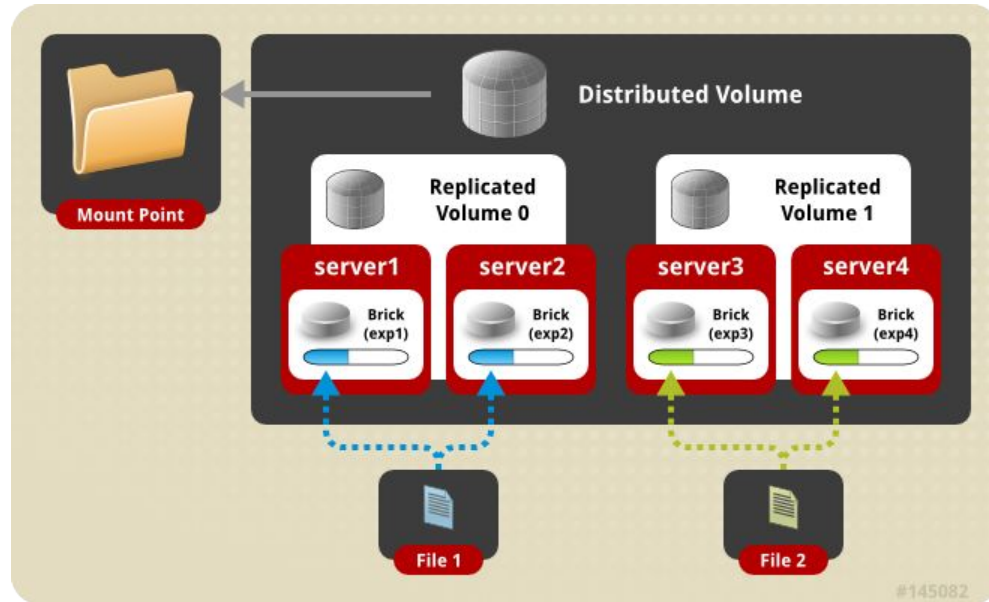
GlusterFS

GlusterFS Overview



GlusterFS Volume

- Brick is the combination of a node and an export directory.
- Volume is a collection of bricks



Creating a volume

```
# gluster volume create myvolume \  
    replica 2 \  
    transport tcp \  
    server1:/export/brick/myvolume1 \  
    server2:/export/brick/myvolume2 \  
    server3:/export/brick/myvolume3 \  
    server4:/export/brick/myvolume4 \  
    server5:/export/brick/myvolume5 \  
    server6:/export/brick/myvolume6  
# gluster volume start myvolume  
# mount -t glusterfs server1:myvolume \  
    /mnt/gluster/myvolume
```

Now do the same for...



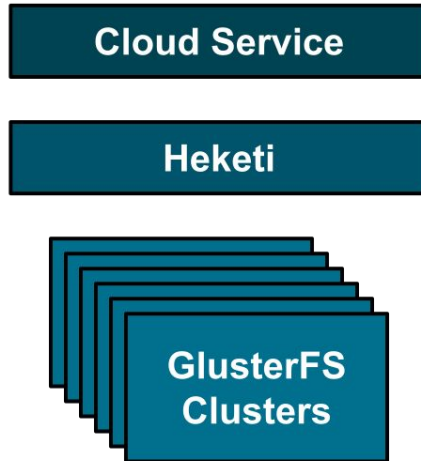
Wait... what?



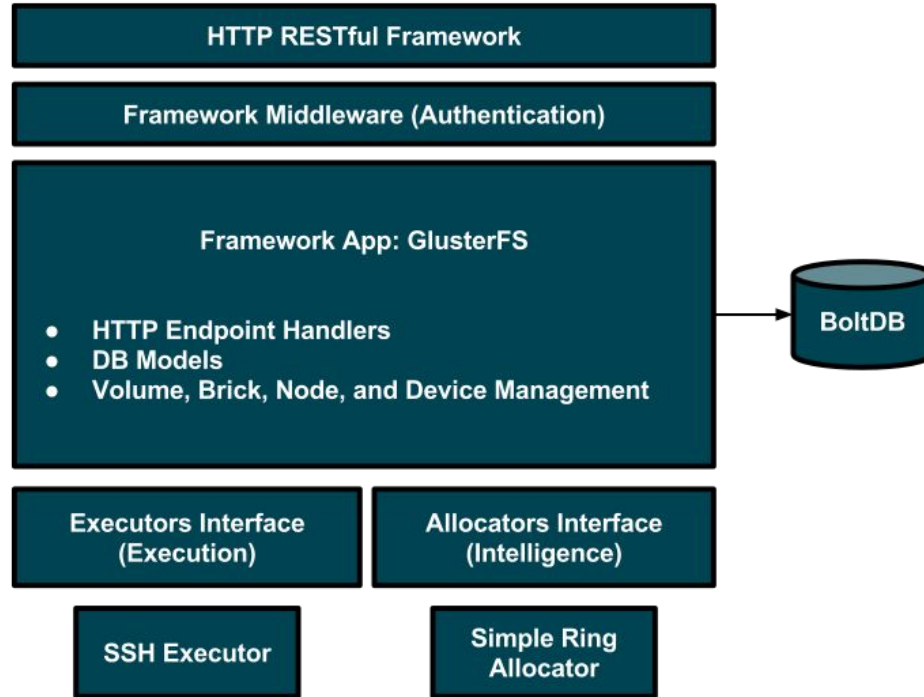
Heketi

Heketi

- Creates GlusterFS volumes dynamically
- Intelligent brick allocator
- REST application with authentication
- Supports multiple GlusterFS clusters



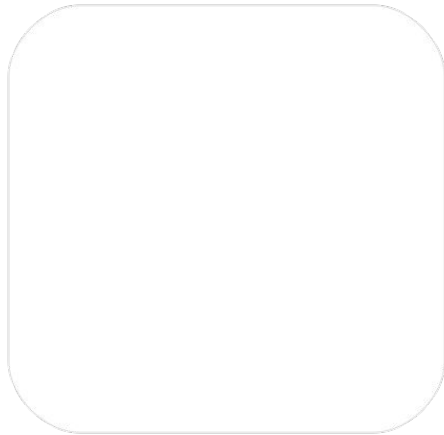
Architecture



Heketi Cluster

Heketi

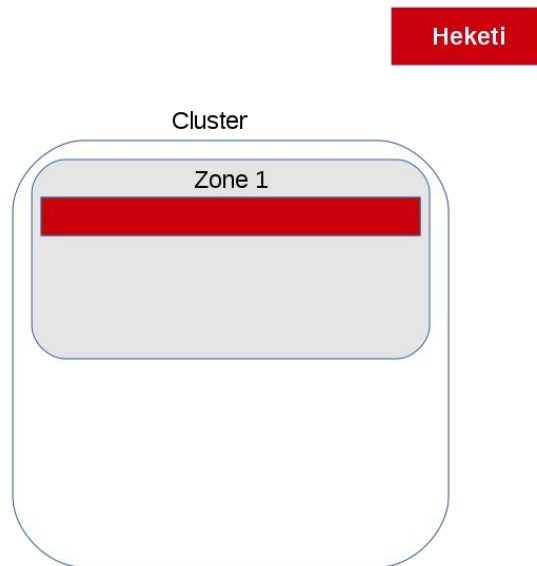
Cluster



Cluster



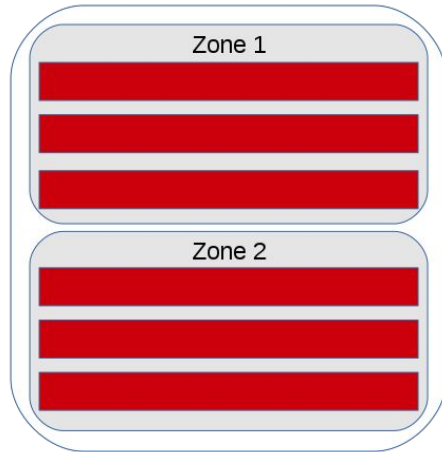
Heketi Cluster



Heketi Cluster

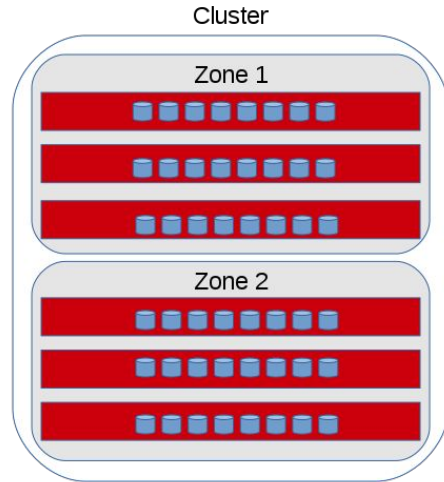
Heketi

Cluster



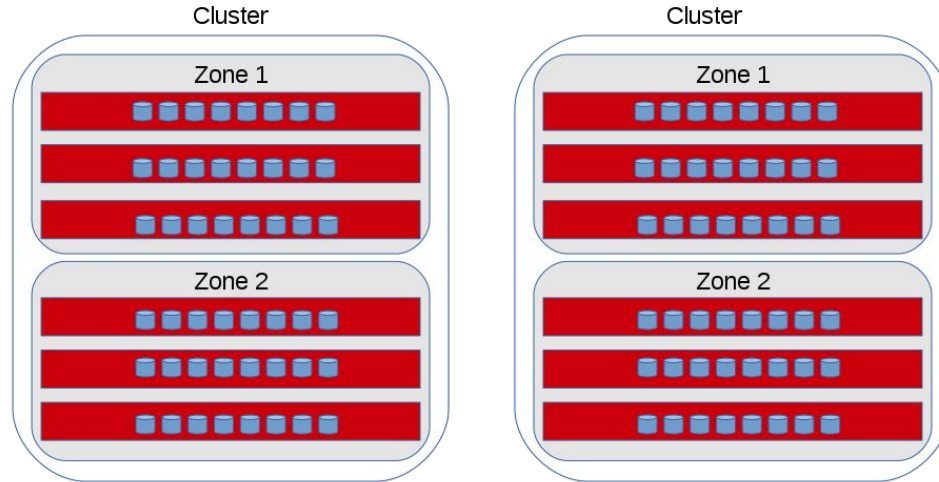
Heketi Cluster

Heketi

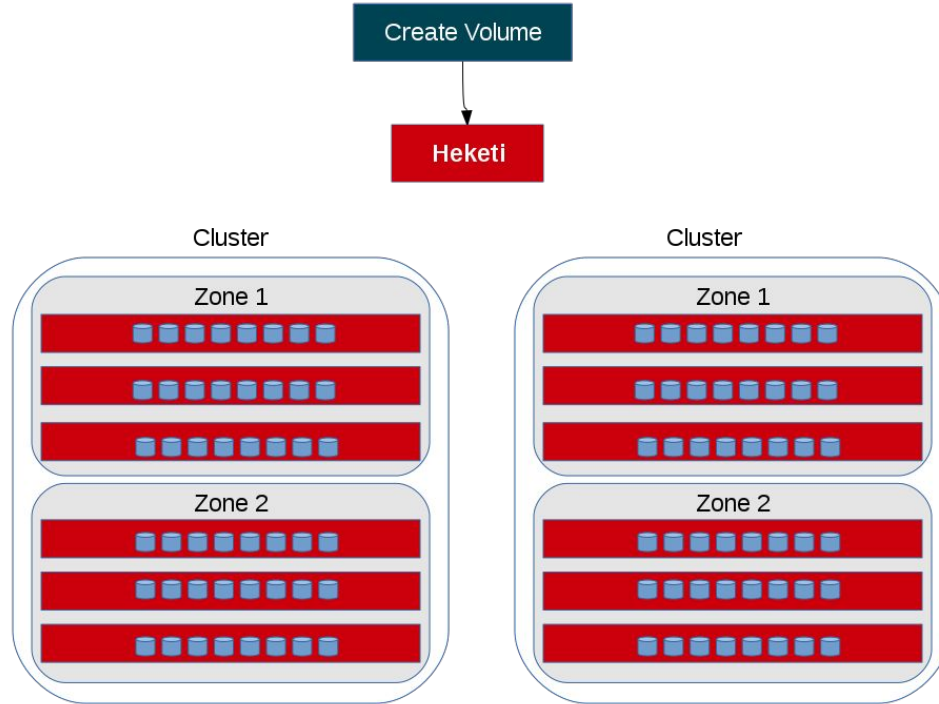


Heketi Cluster

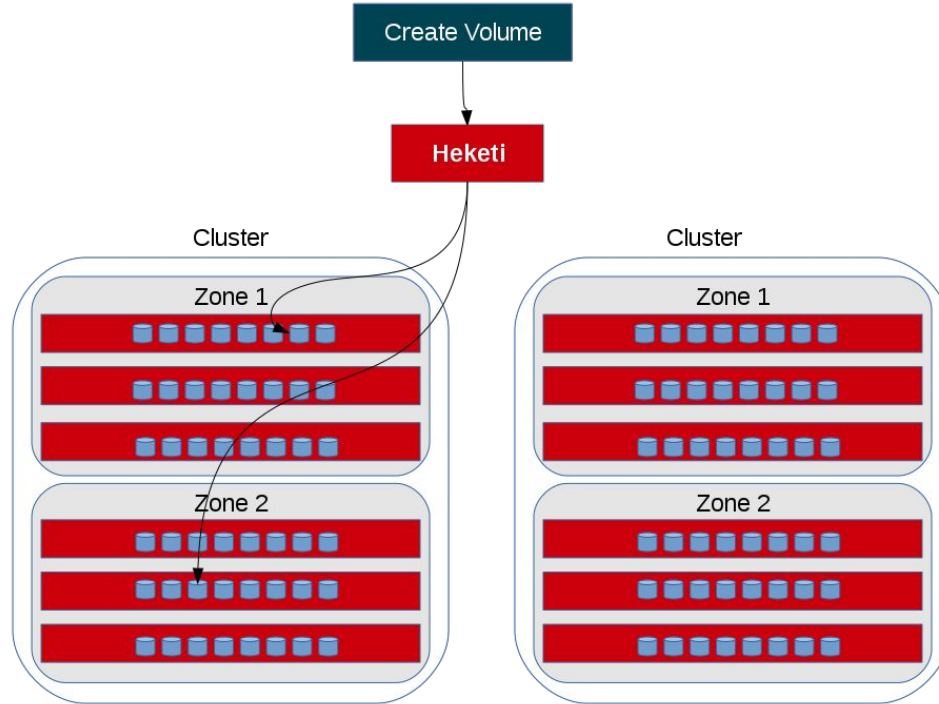
Heketi



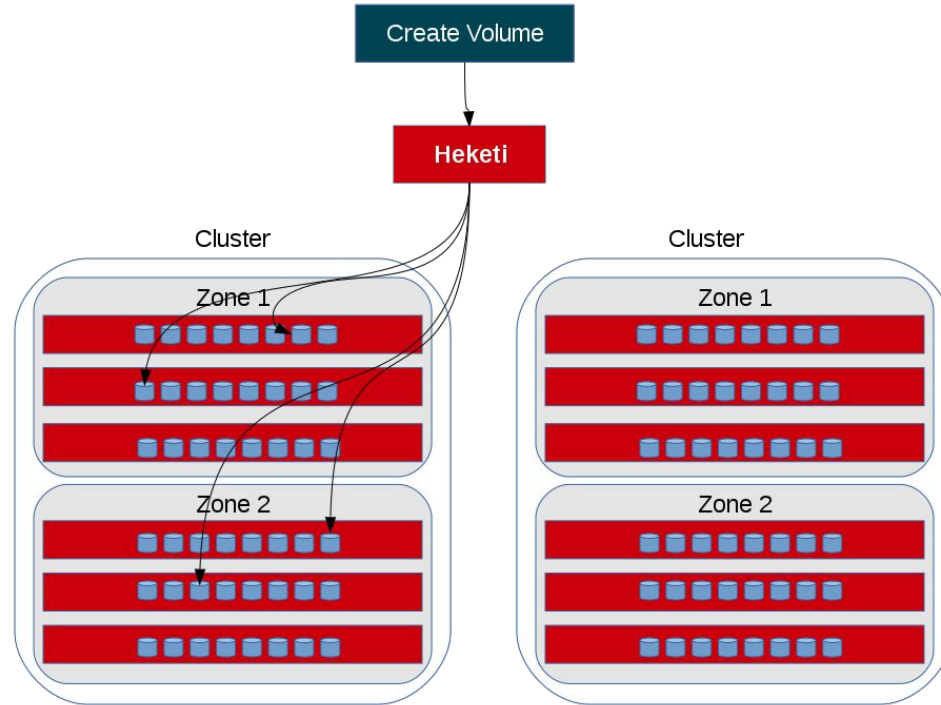
Heketi Cluster



Heketi Cluster

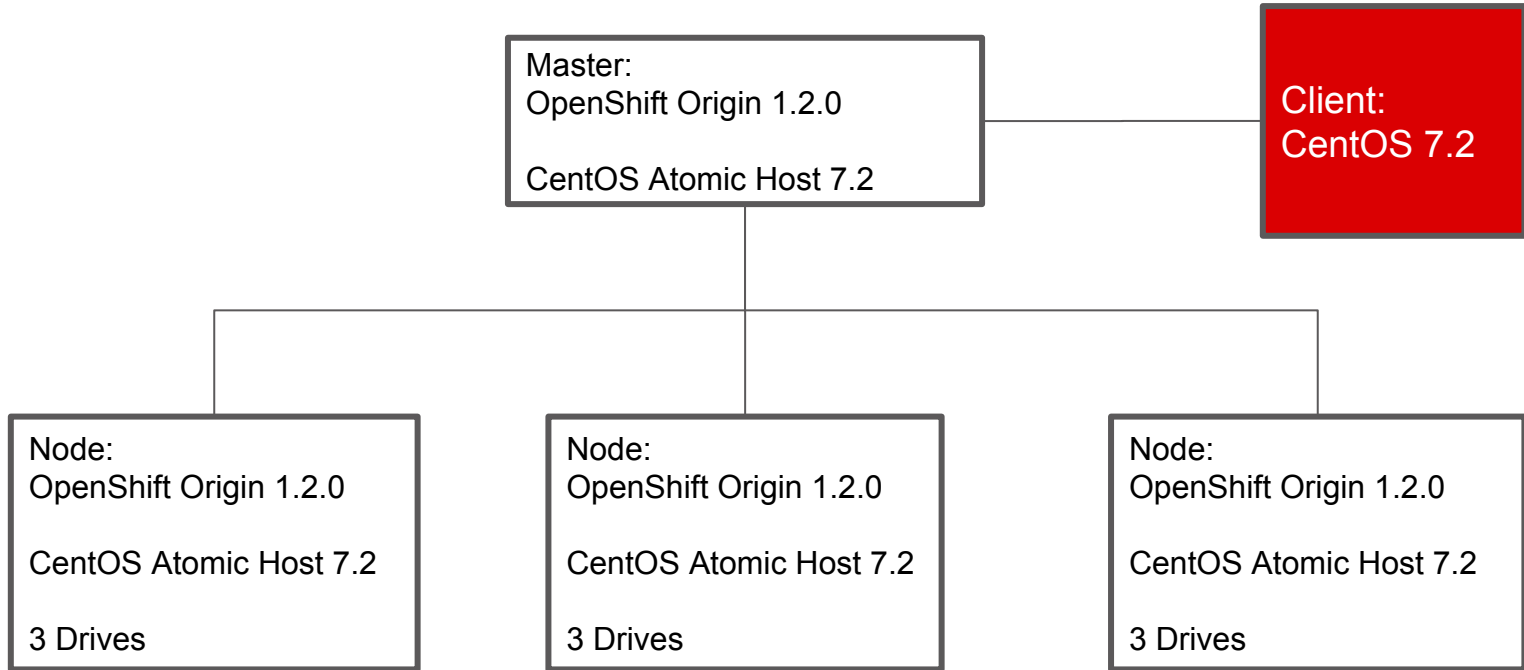


Heketi Cluster



Demo

Demo



Demo

```
tmpfs                100M    0 100M    0% /run/user/
1000
192.168.10.100:vol_8710a0473034be3ff080955073d4d414 100G   67M 100G    1% /mnt
$ sudo bash
# cd /mnt
# ls
# echo 'I love GlusterFS!' > index.html
# ls -al
total 13
drwxr-xr-x.  4 root root 4096 Jun 28 00:52 .
dr-xr-xr-x. 18 root root 4096 Jun  8 10:45 ..
-rw-r--r--.  1 root root    18 Jun 28  15:52 index.html
drwxr-xr-x.  3 root root 4096 Jun 28  15:52 trashcan
# exit
$ sudo umount /mnt
ls
glusterfs-topology.json  heketi-storage.json  nginx.yml
$ less nginx.yml
$ oc create -f nginx.yml
service "my-nginx-svc" created
route "my-nginx-router" created
persistentvolumeclaim "nginx-claim" created
pod "nginx" created
$ oc get pvc
NAME          STATUS    VOLUME          CAPACITY   ACCESSMODES   AGE
nginx-claim   Bound    glusterfs-8710a047  100Gi      RWX            4s
$ curl http://my-nginx-router-default.cloudapps.example.com/
I love GlusterFS!
$
```

More information

<https://github.com/heketi/heketi>

Q&A
