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# **Project Aplo: GlusterFS Container Converged with OpenShift**

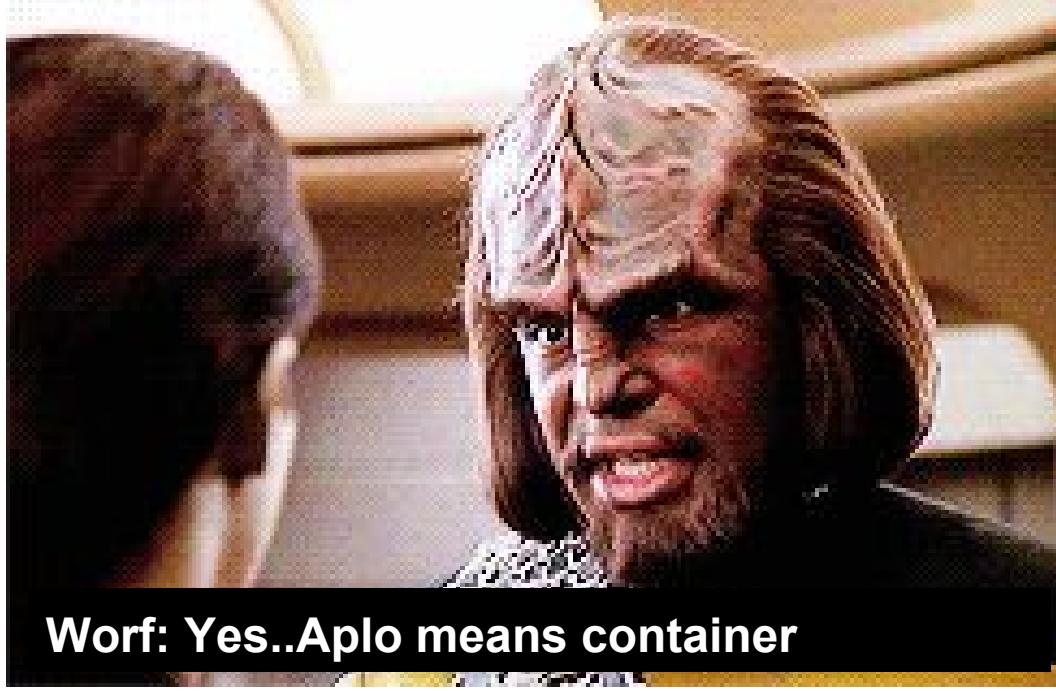
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Luis Pabón  
Red Hat Summit / DevNation  
2016

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*What does Aplo mean?*



**Worf: Yes..Apolo means container**

# Solution

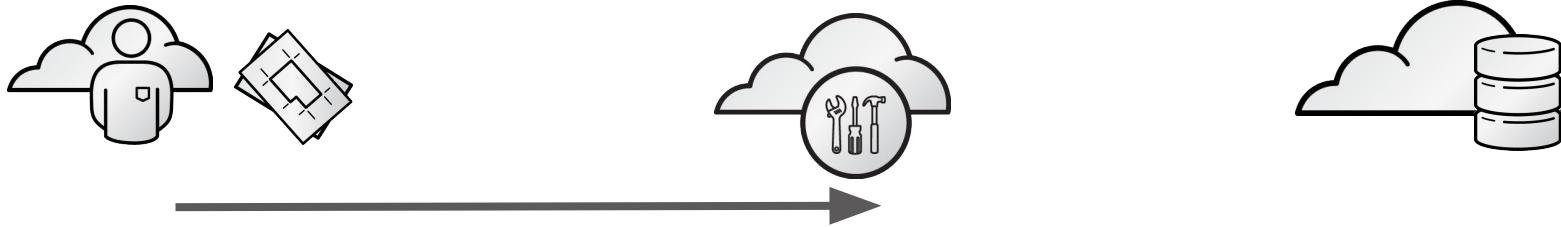
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*Provide a solution that will run GlusterFS as containers in OpenShift pods.*

*Integrate GlusterFS deployment and management with OpenShift services.*

# Goal Workflow with Dynamic Provisioning

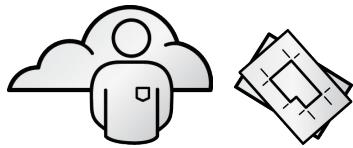
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Persistent Volume Claim is submitted

# Goal Workflow with Dynamic Provisioning

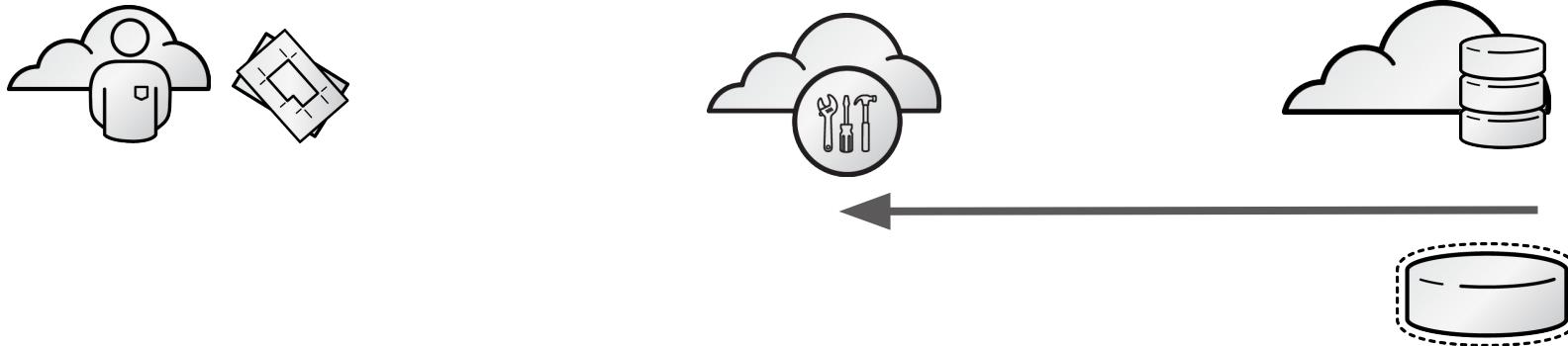
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OpenShift request volume to be created

# Goal Workflow with Dynamic Provisioning

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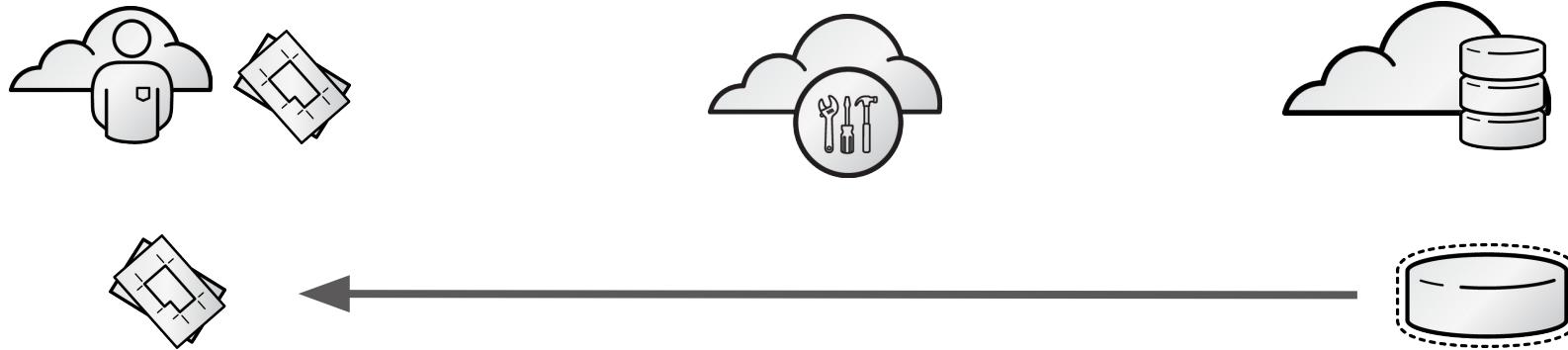


Persistent volume is created by storage system  
and registered with OpenShift

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# Goal Workflow with Dynamic Provisioning

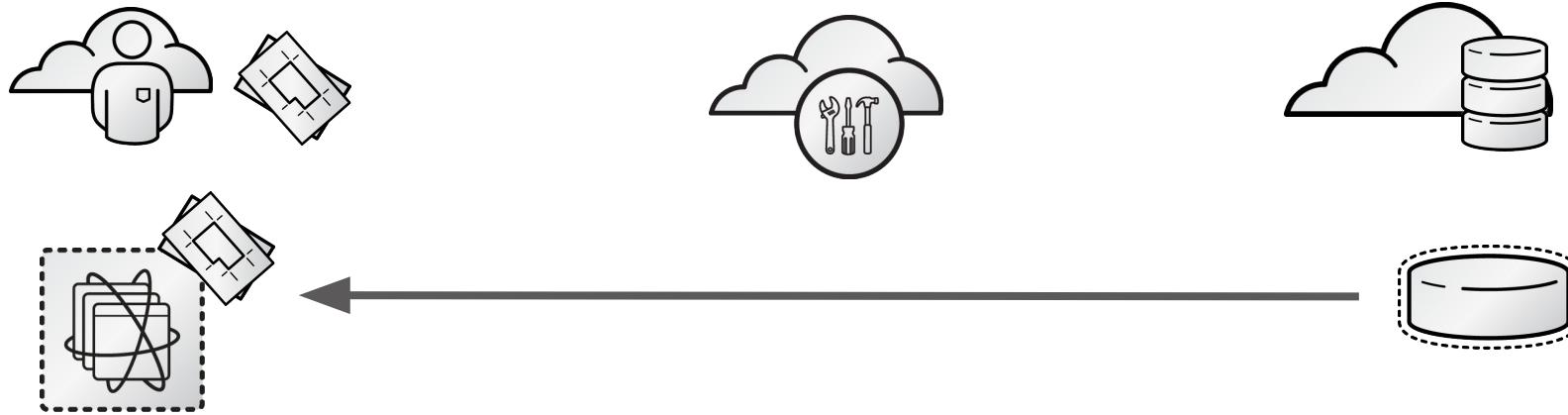
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OpenShift binds persistent volume to persistent volume claim request.

# Goal Workflow with Dynamic Provisioning

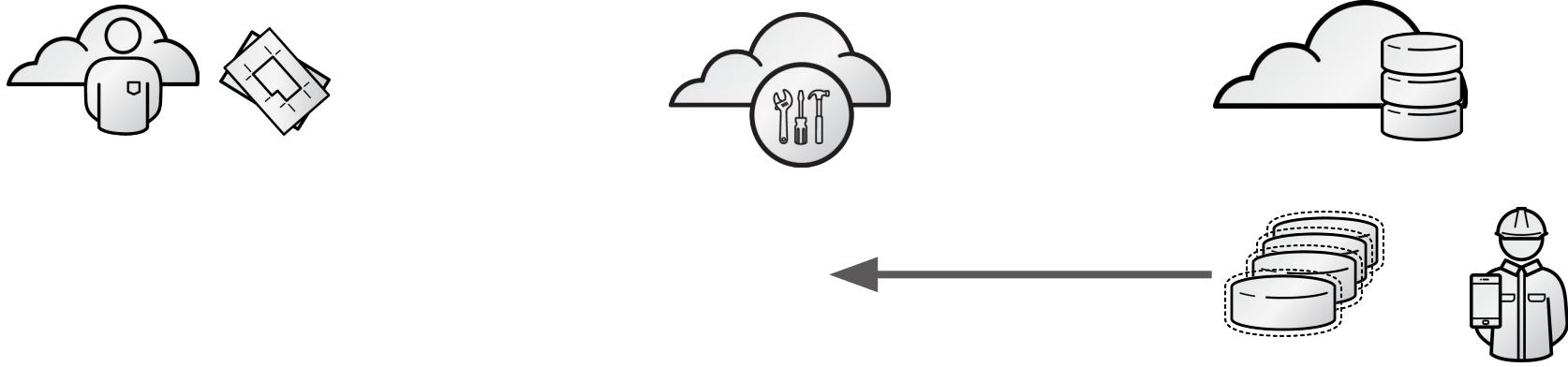
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Volume can now be used by Pod to provide persistent storage

# Workflow for Release 1.0

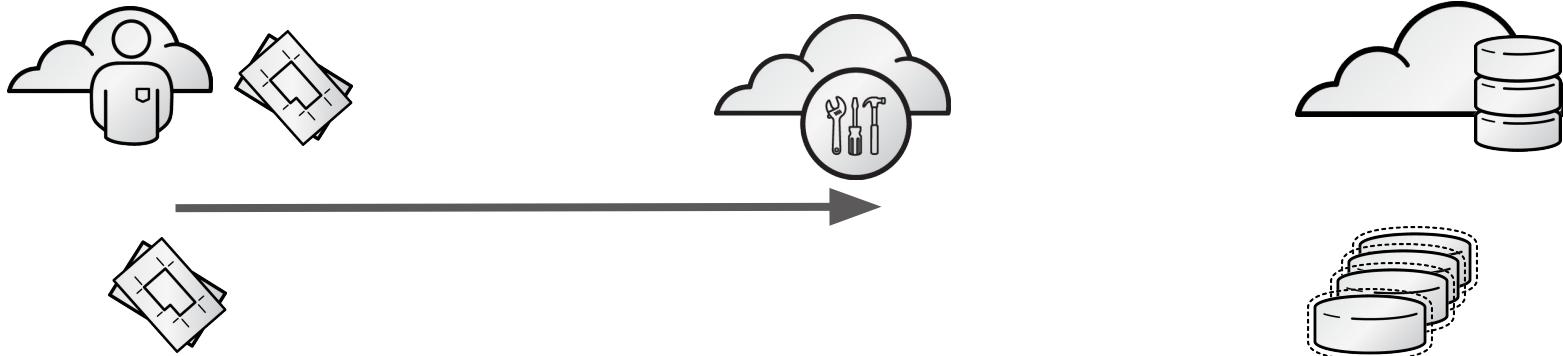
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Since dynamic provisioning is not currently available, the Administrator creates many volumes and registers them with OpenShift

# Workflow for Release 1.0

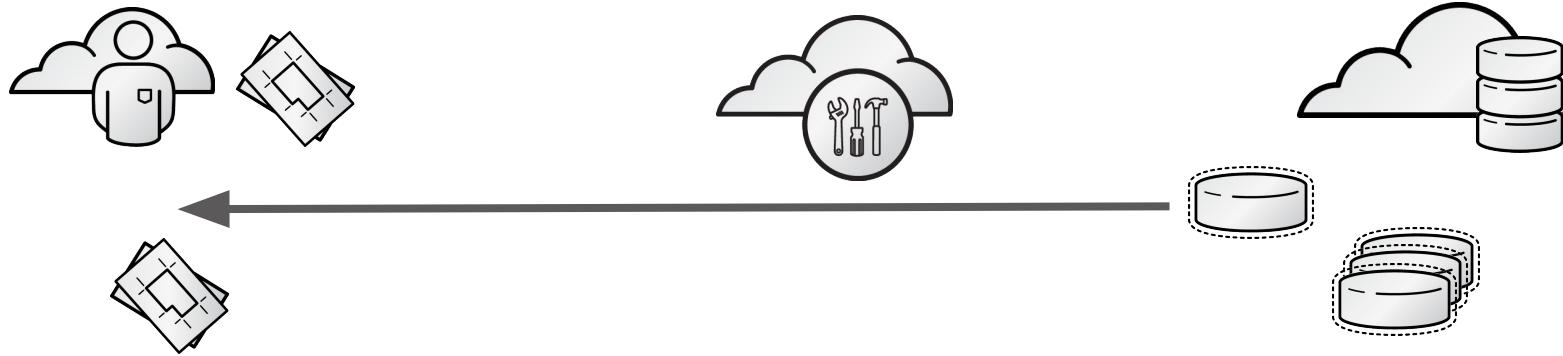
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Persistent volume claim is submitted

# Workflow for Release 1.0

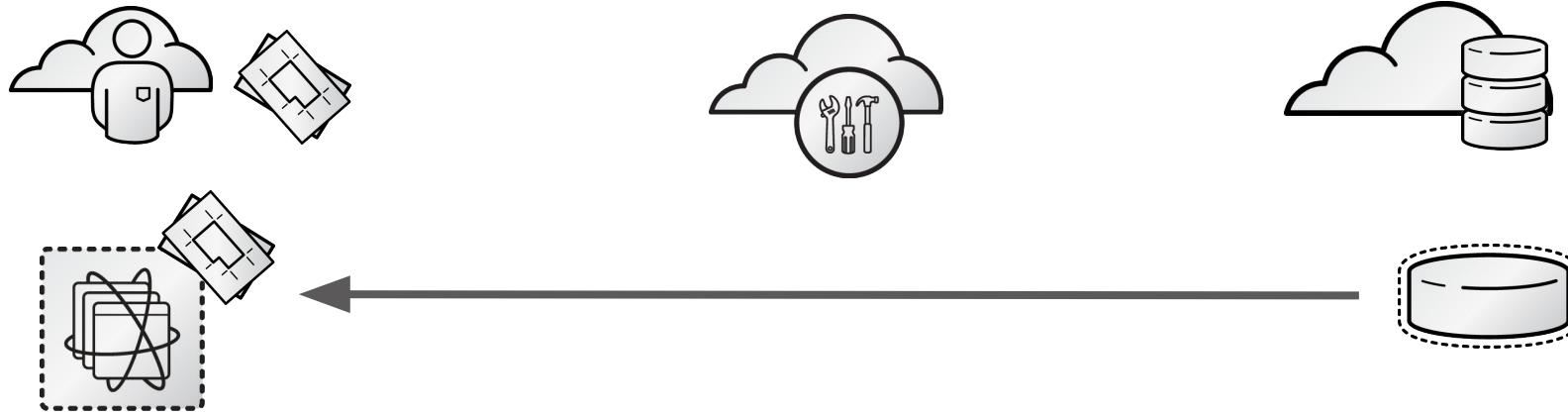
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An available persistent volume is picked out of the pool and bound to the persistent volume claim

# Workflow for Release 1.0

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Volume can now be used by Pod to provide persistent storage

# Paradigm Shift

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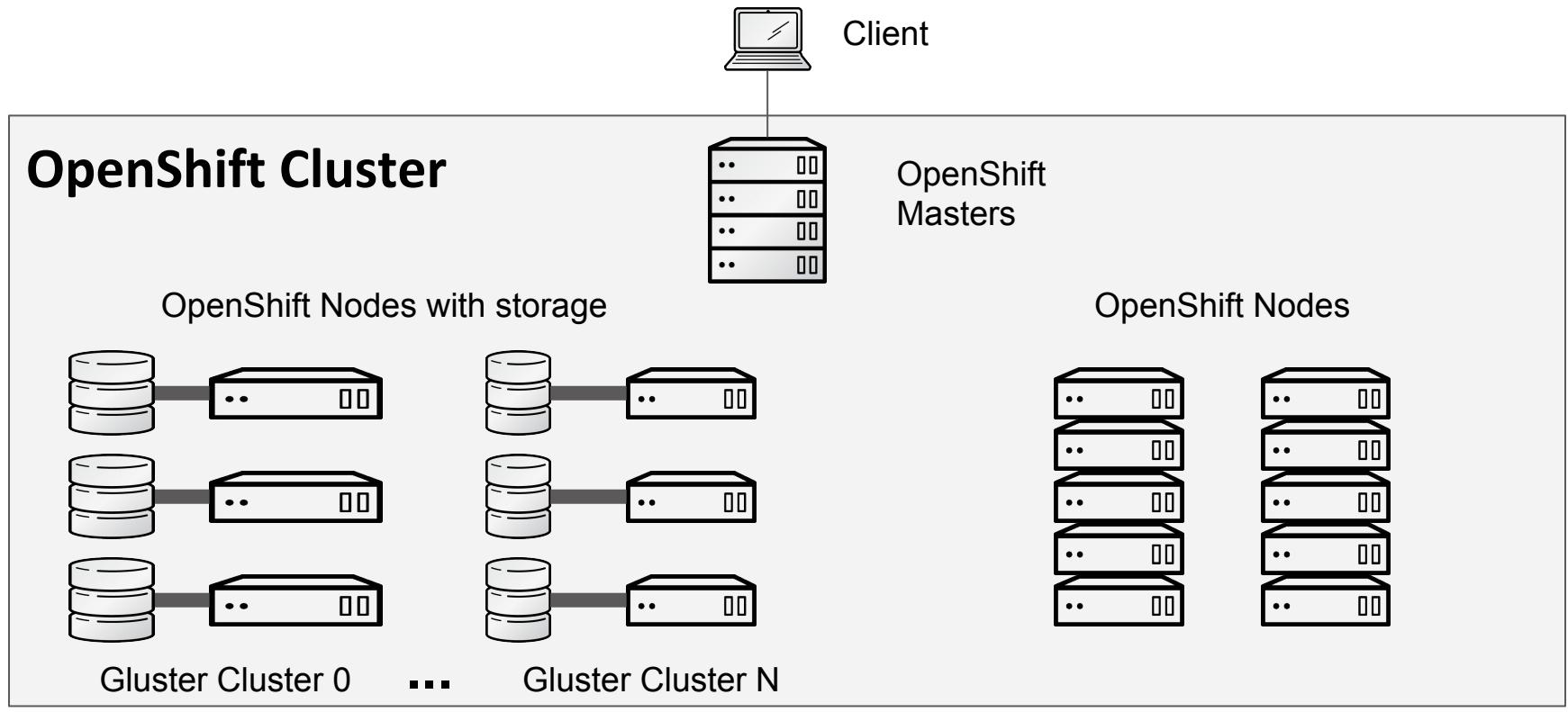


Traditional Storage Management



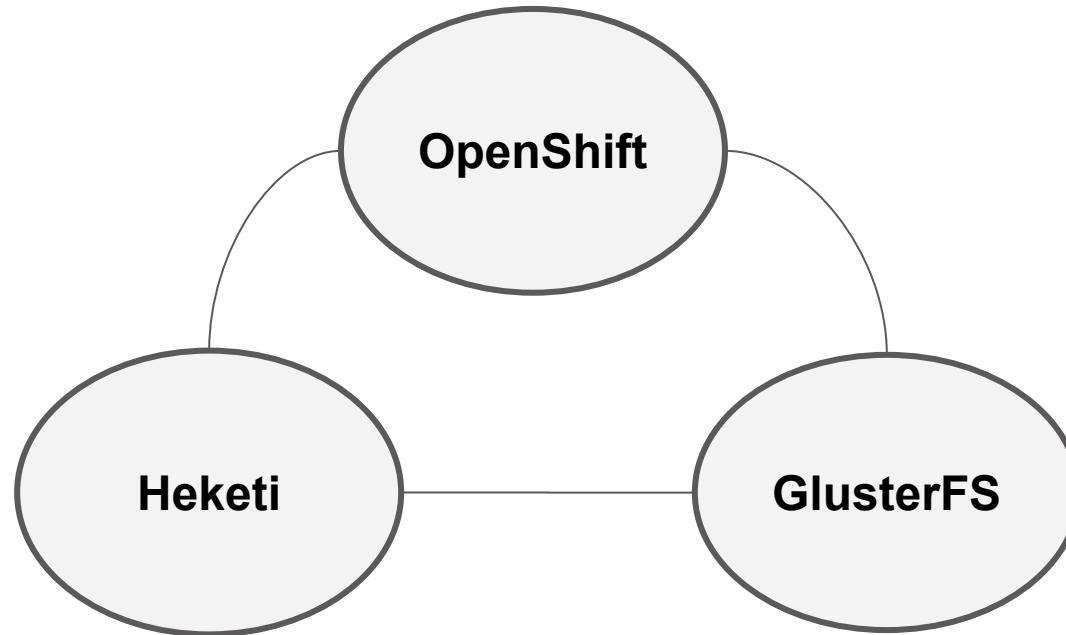
Converged Storage Management

# Aplo Architecture



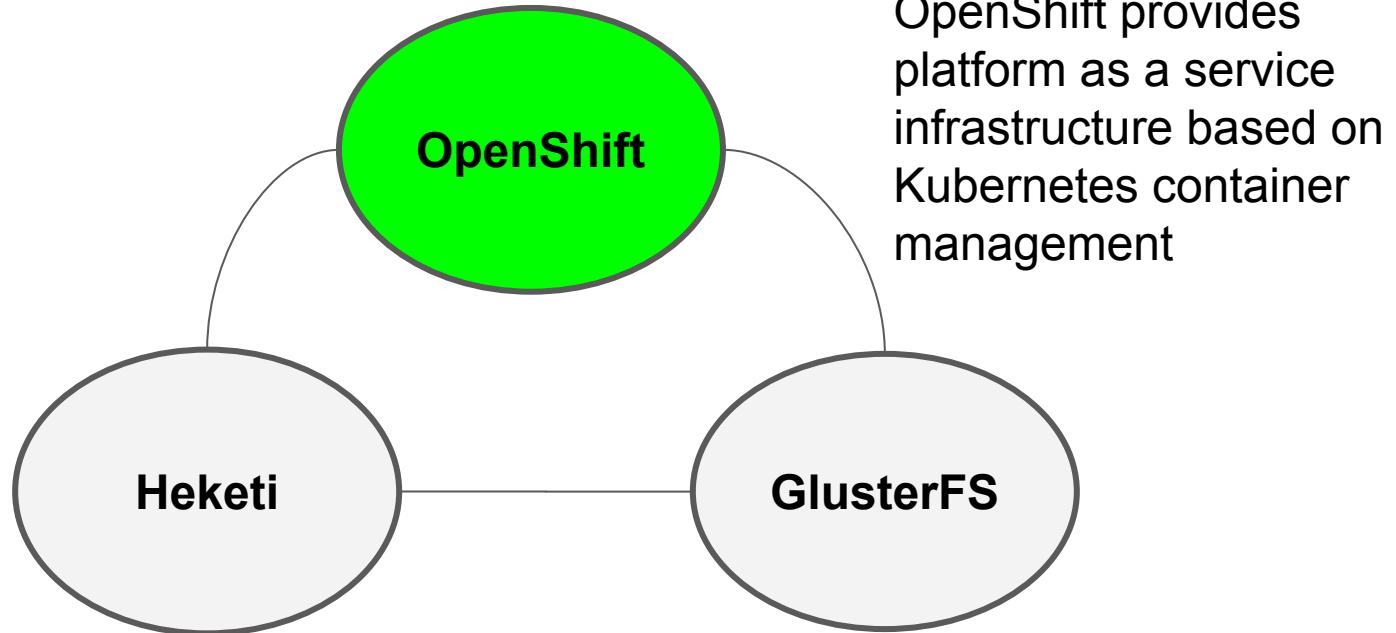
# Aplo Technologies

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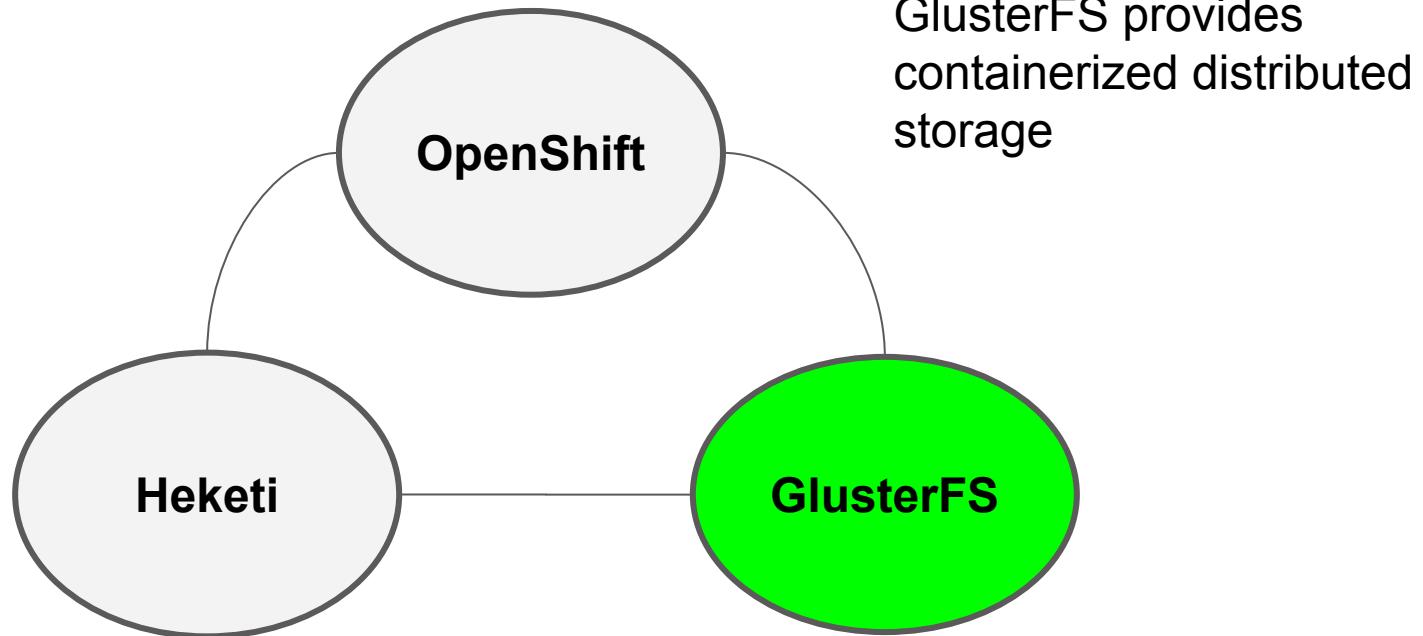
# Aplo Technologies

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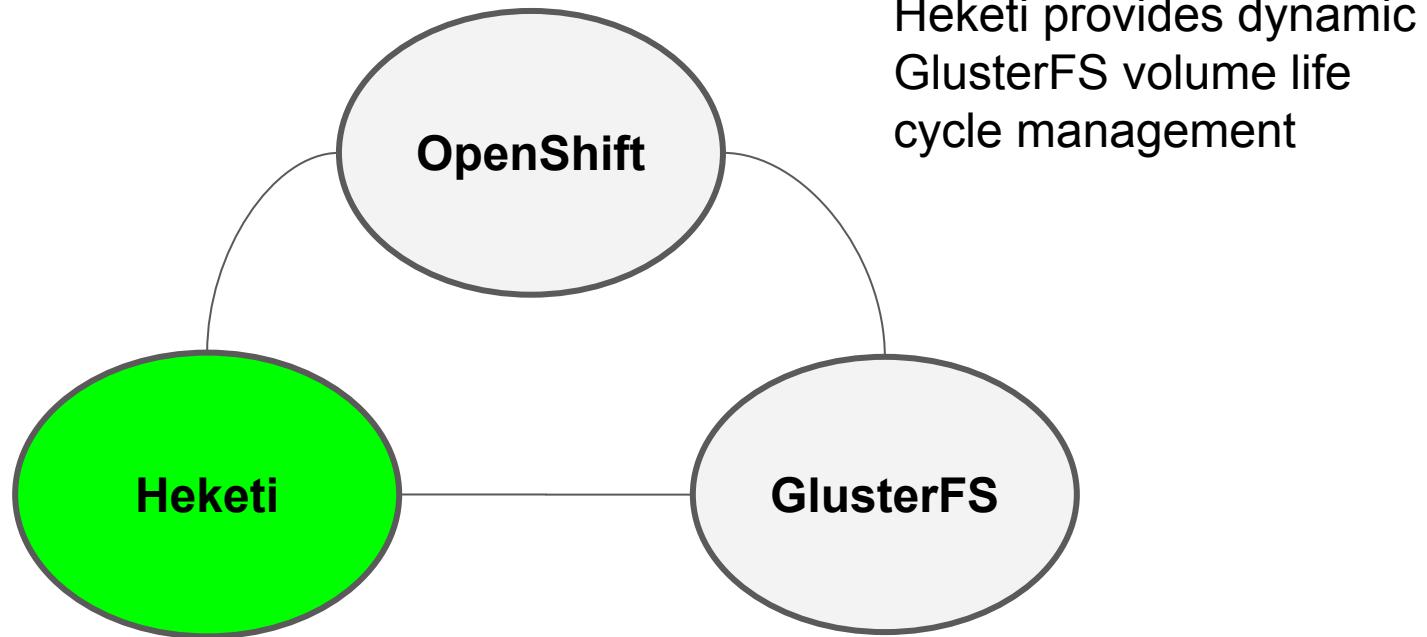
# Aplo Technologies

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# Aplo Technologies

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# OpenShift

# OpenShift

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- 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

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- 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

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- \*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

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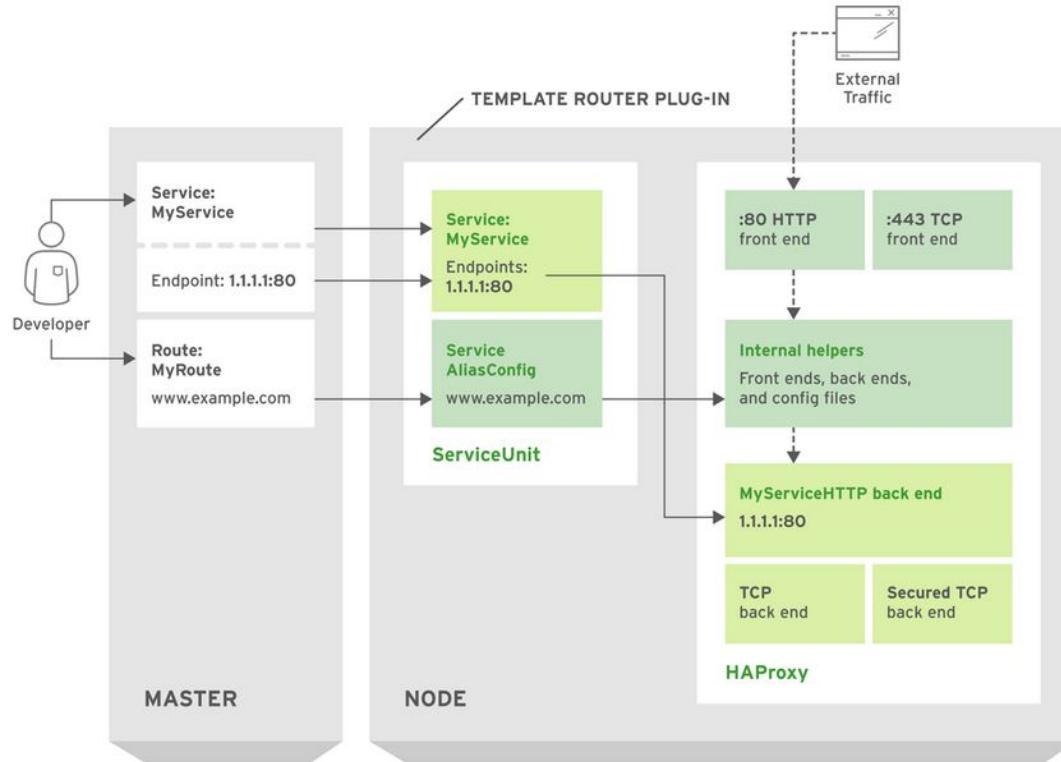
```
apiVersion: v1
kind: Pod
metadata:
  name: busybox
spec:
  containers:
    - image: busybox
      command:
        - sleep
        - "3600"
      name: busybox
  volumeMounts:
    - mountPath: /glusterfs
      name: mypvc
  volumes:
    - name: mypvc
      persistentVolumeClaim:
        claimName: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

# OpenShift Object Definitions

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# Routing using HAProxy



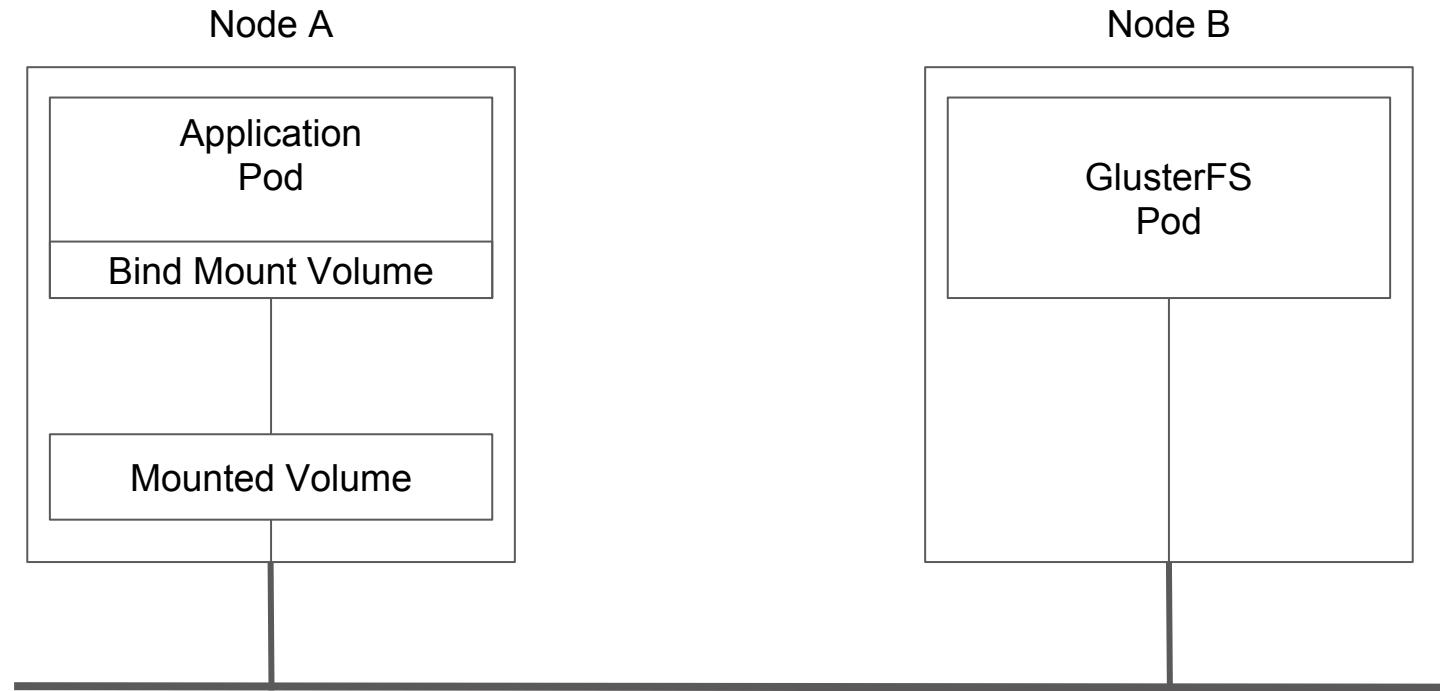
# OpenShift Object Definitions

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# Kubernetes GlusterFS Mount Plugin

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# OpenShift Object Definitions

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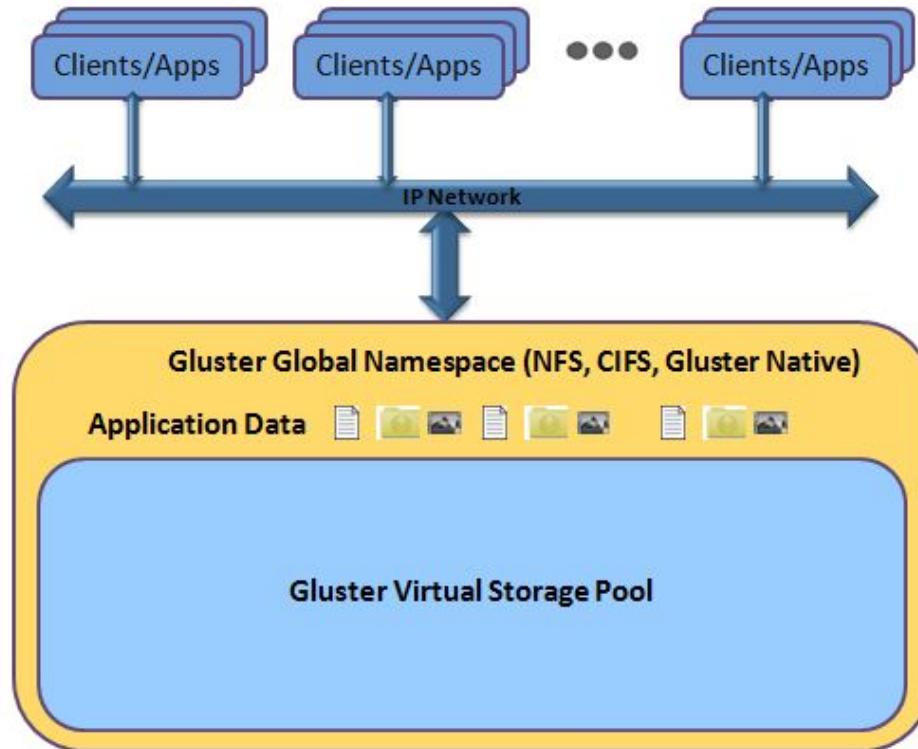
- Job - Container definition that runs to completion
- Secret - Store opaque data, up to 16MB
- Deployment Config - Deploys container replicas
- List - Collection of objects
- Template - A List with variables

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# GlusterFS

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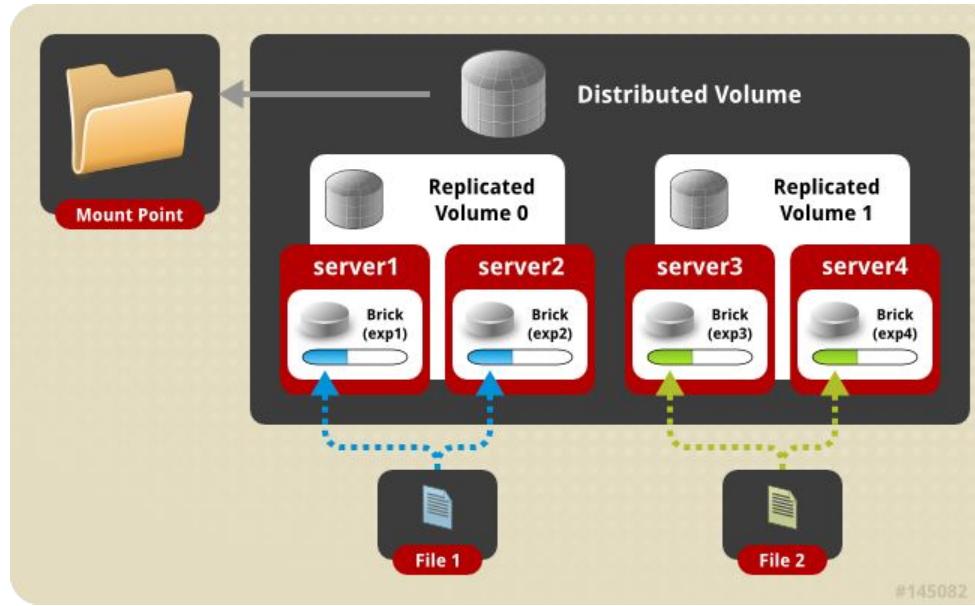
# GlusterFS Overview



# GlusterFS Volume

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



# Creating a volume

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```
# 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...

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# Wait... what?

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# Heketi

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# Heketi

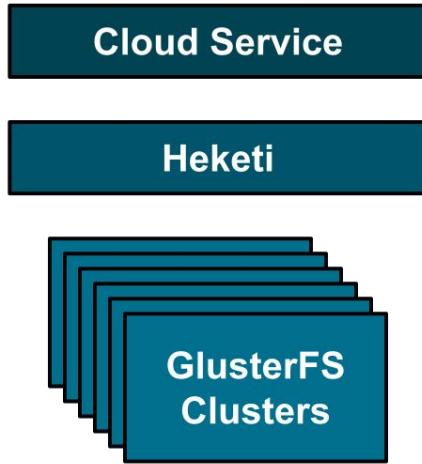
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- Creates GlusterFS volumes dynamically
- Intelligent brick allocator
- REST application with authentication
- Supports multiple GlusterFS clusters

Cloud Service

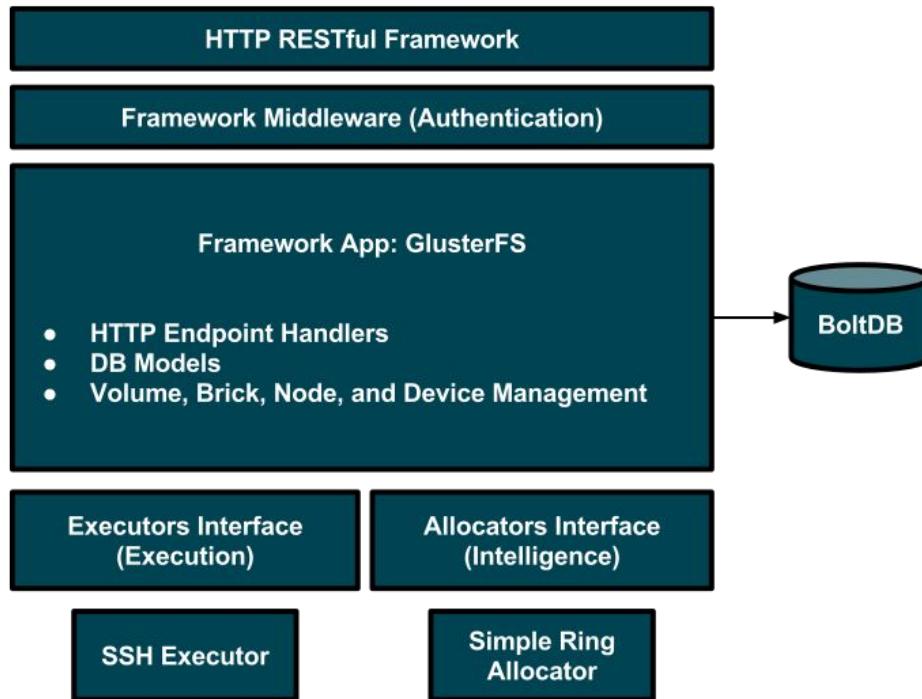
Heketi

GlusterFS  
Clusters



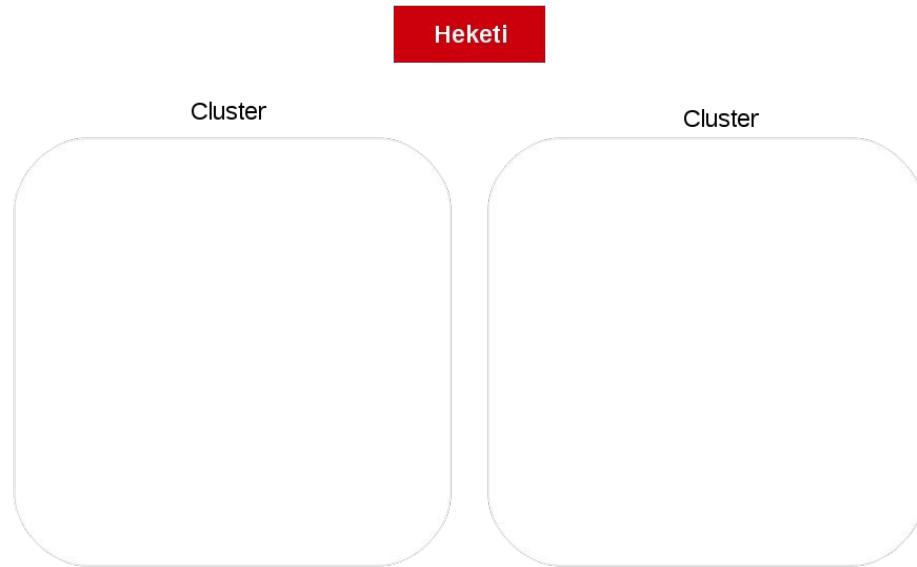
# Architecture

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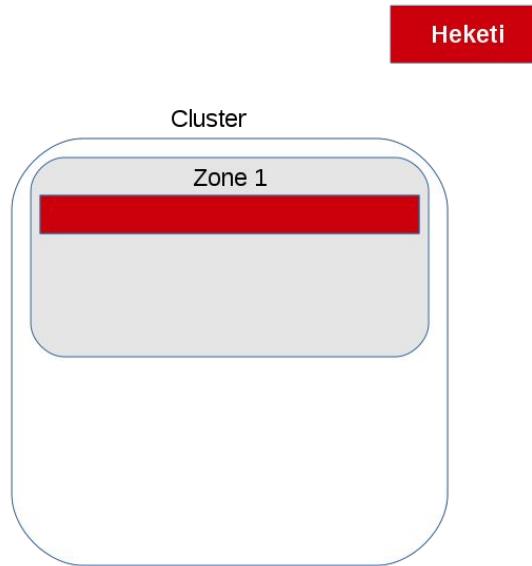
# Heketi Cluster

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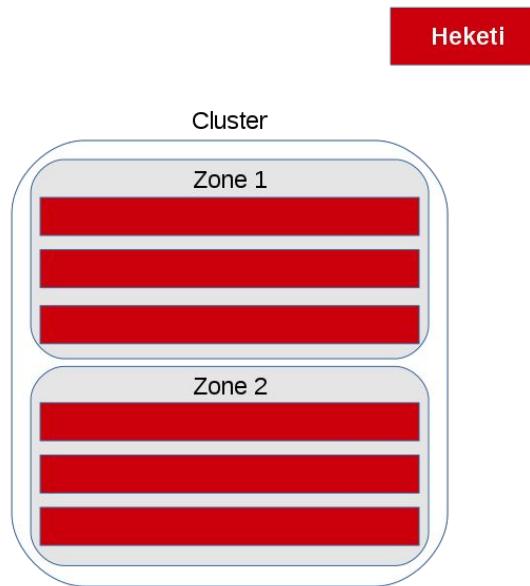
# Heketi Cluster

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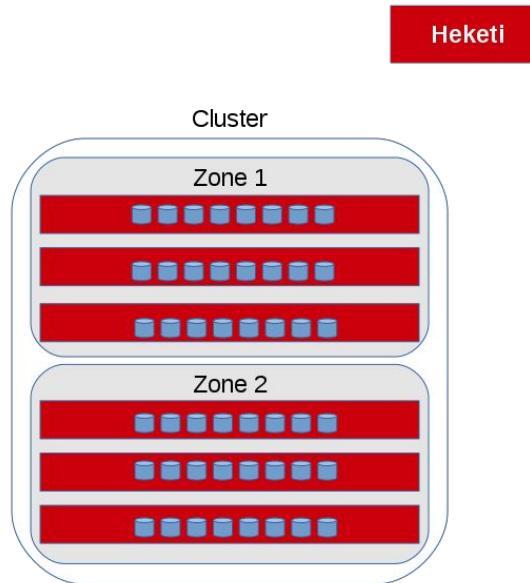
# Heketi Cluster

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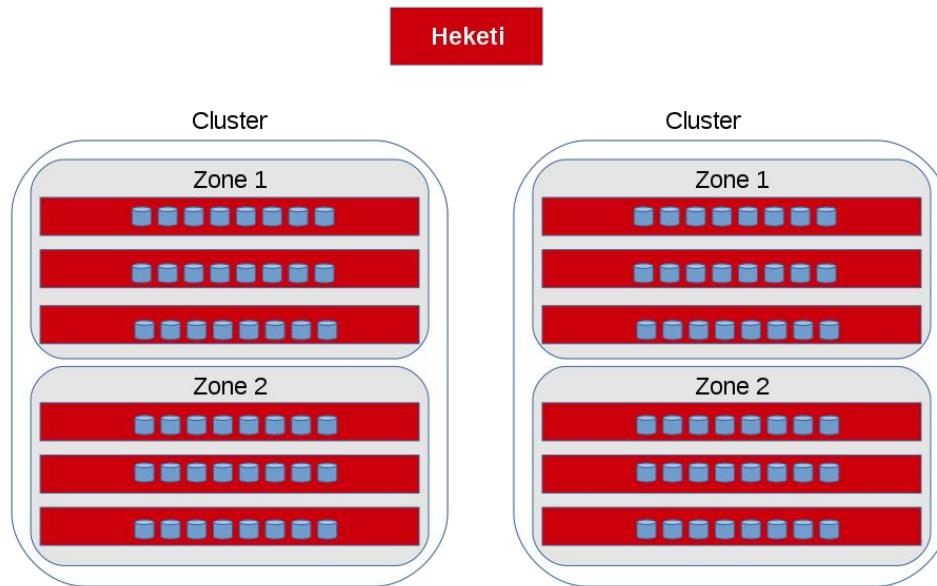
# Heketi Cluster

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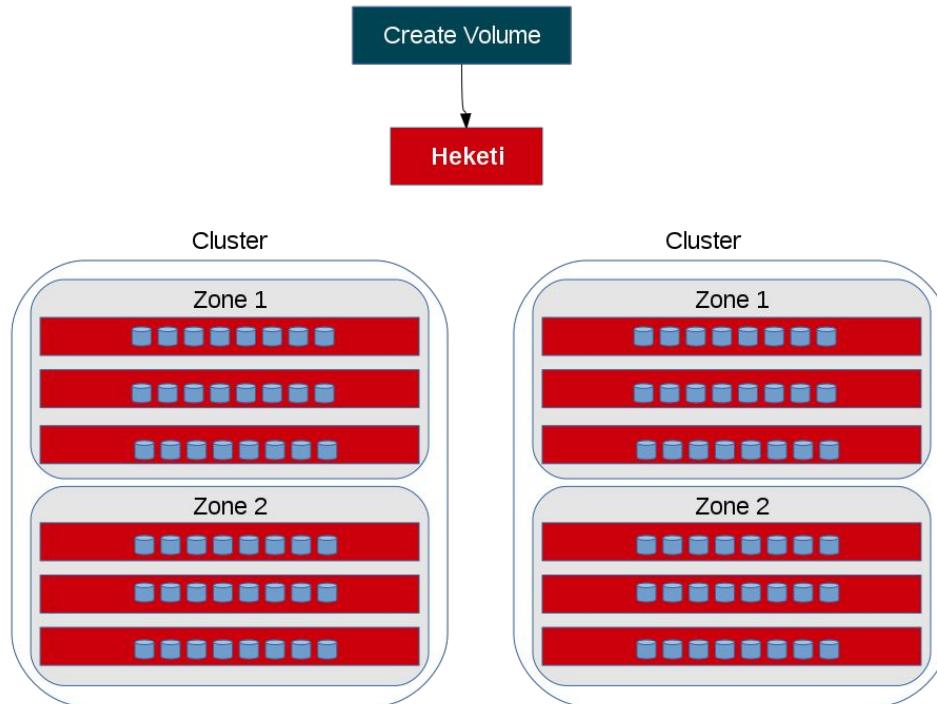


# Heketi Cluster

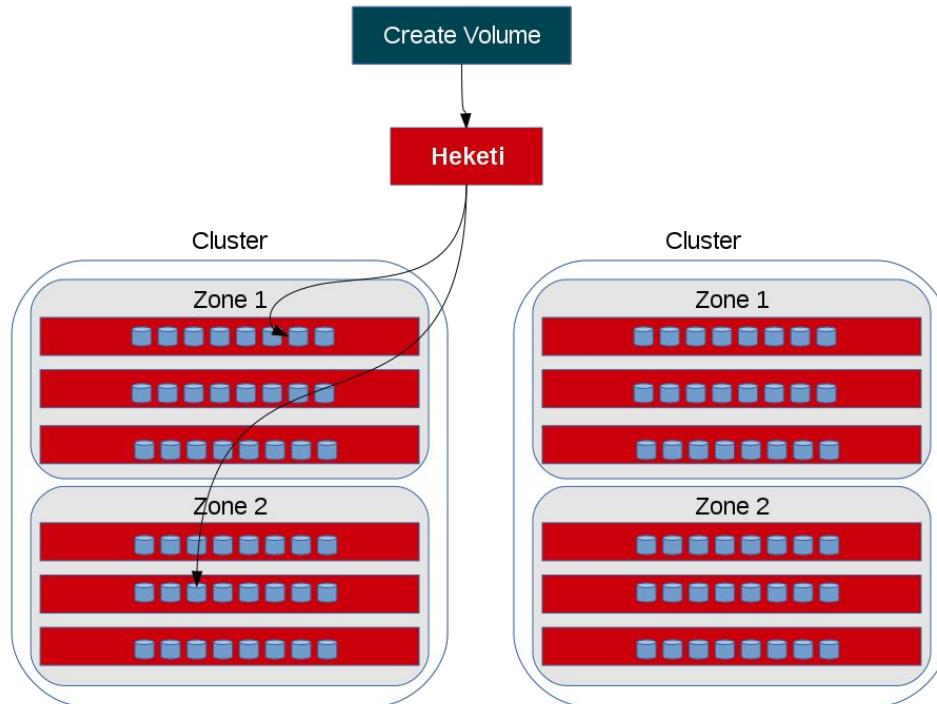
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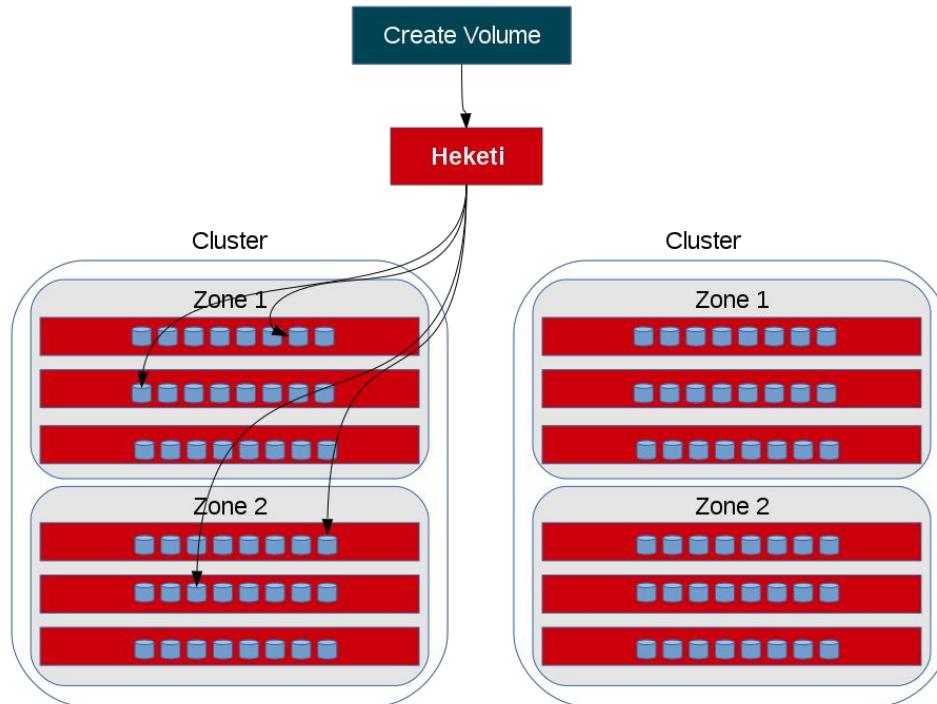
# Heketi Cluster



# Heketi Cluster



# Heketi Cluster



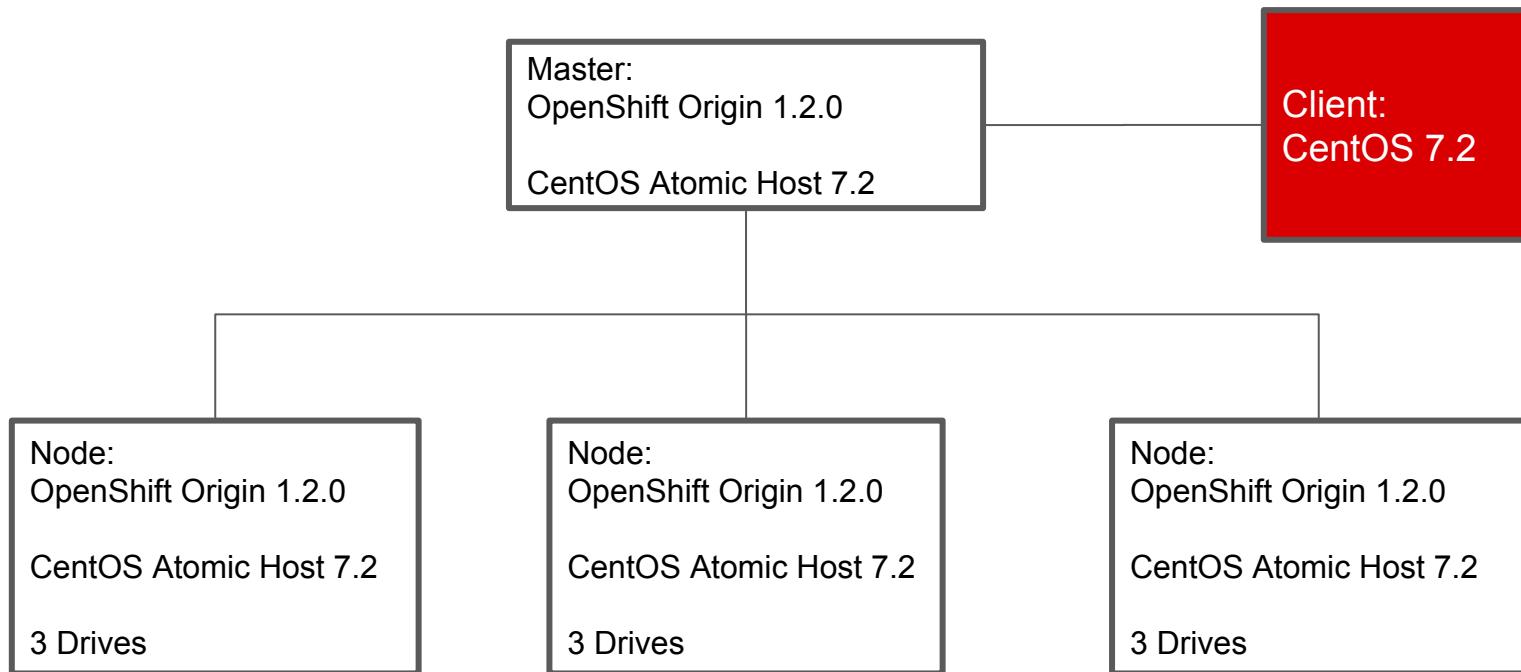
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# Demo

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# Demo

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# 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 00:52 index.html
drwxr-xr-x.  3 root root 4096 Jun 28 00:52 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

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

# Q&A