Ceph on Kubic

Deploying Ceph with Rook on Kubic k8s cluster

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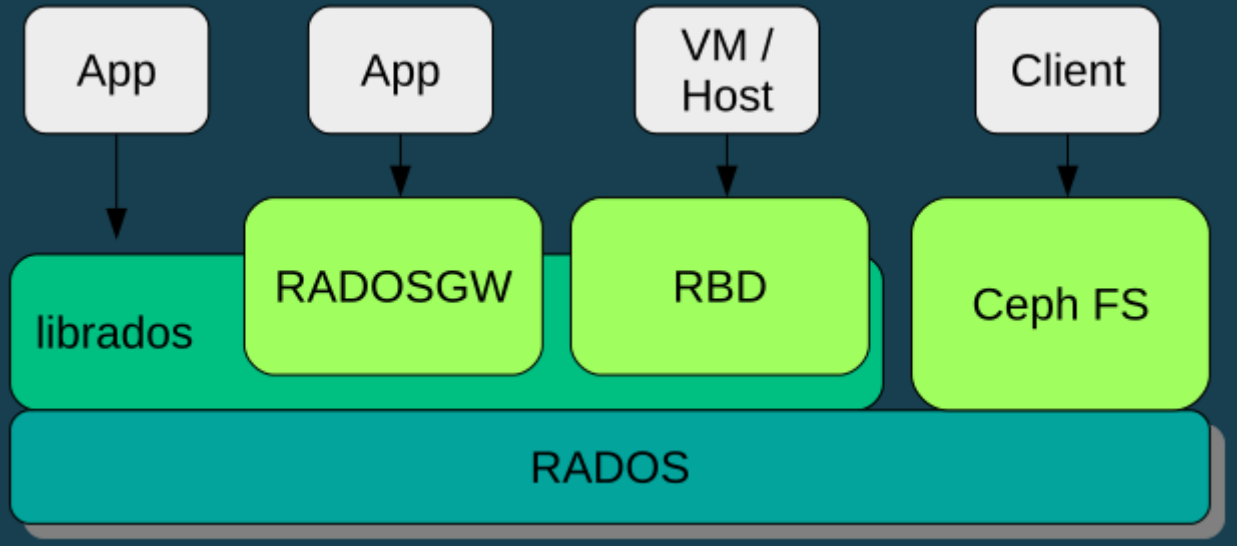
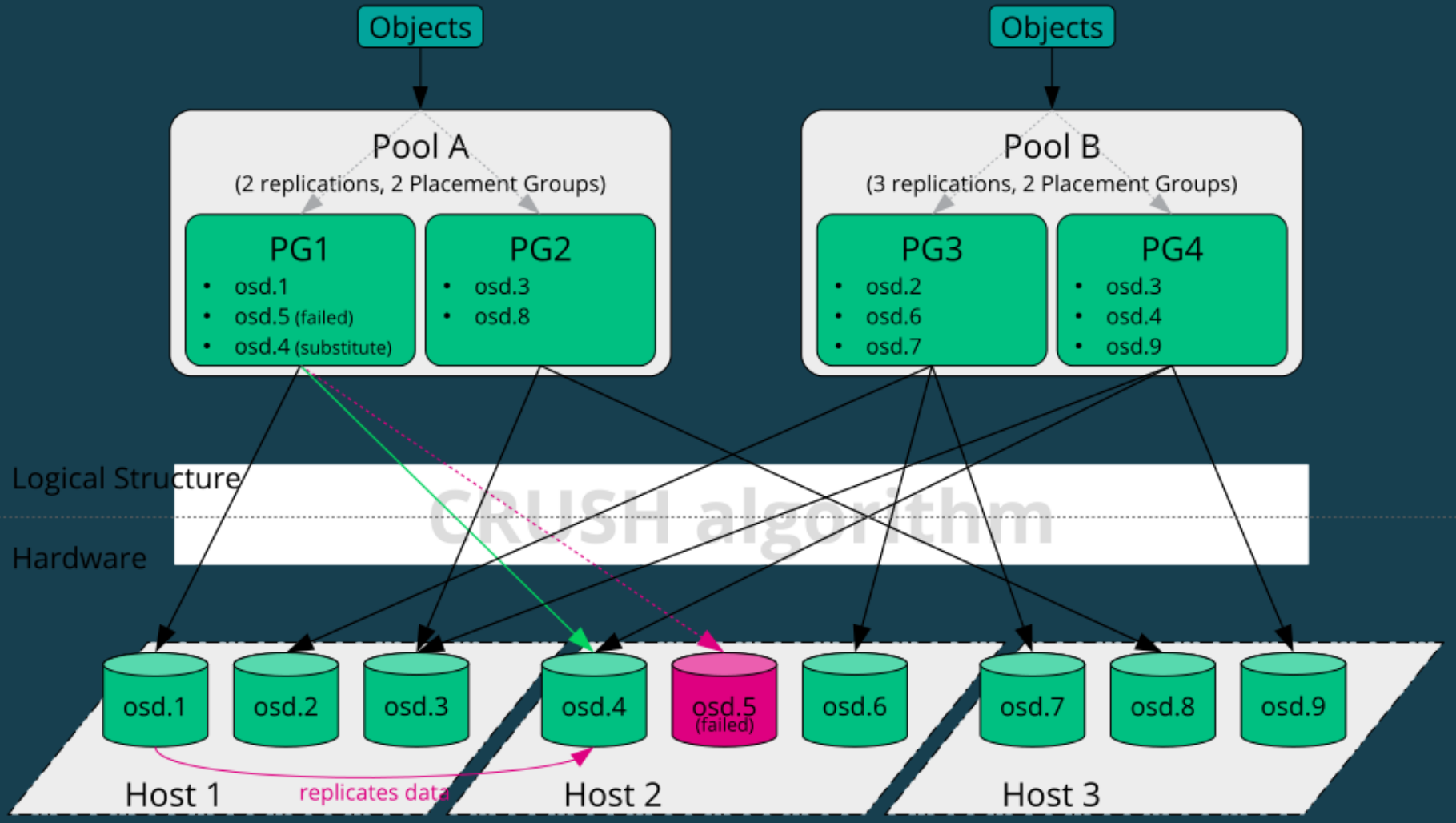
Ceph is a distributed storage system

- designed for scalability, reliability and performance
- can be run on commodity servers in a common network
- scales up well to thousands of servers
- automates management tasks such as
  - data distribution and redistribution
  - data replication
  - failure detection and recovery
- both self-healing and self-managing

Reliable Autonomic Distributed Object Store



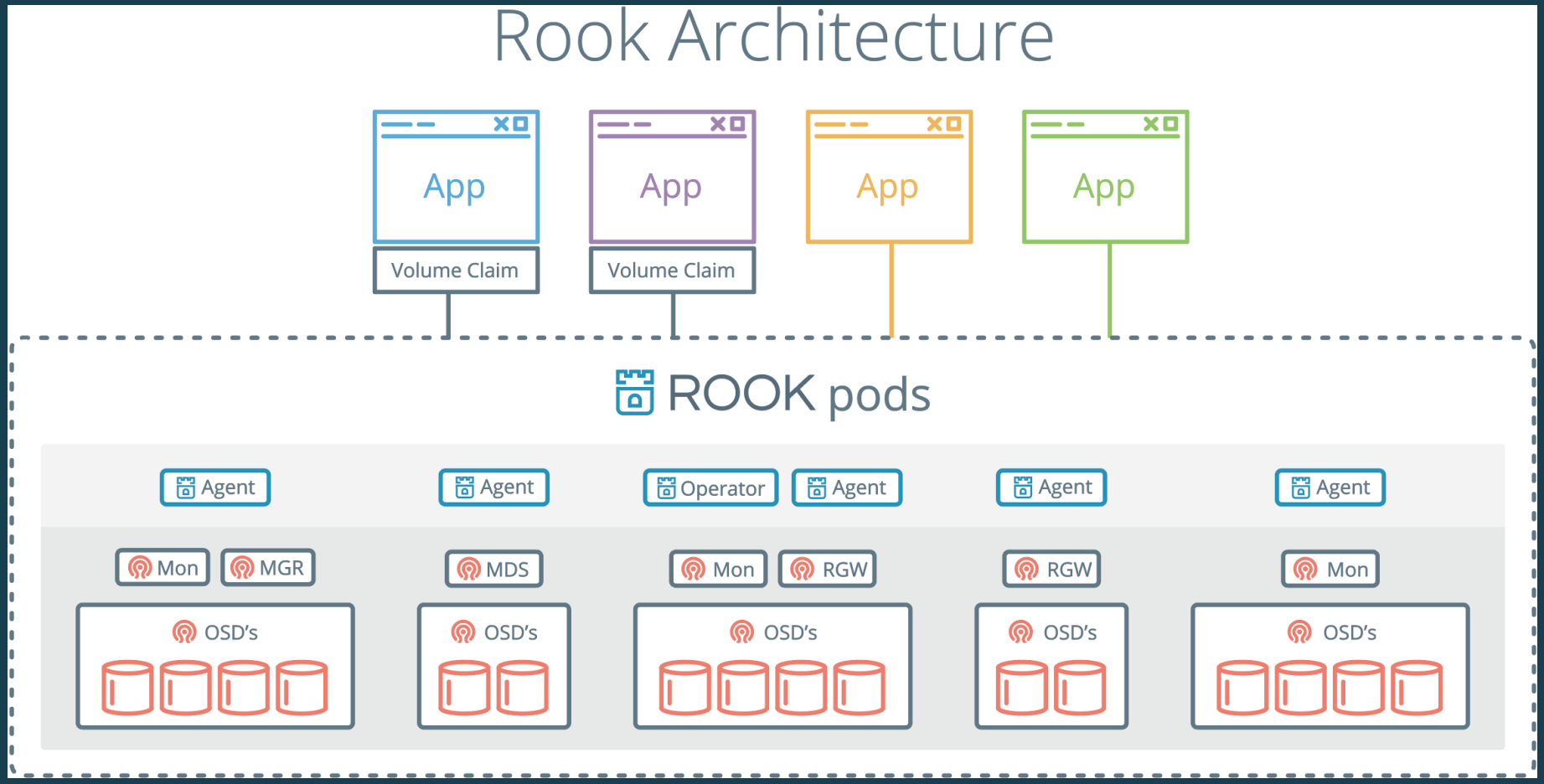
Controlled Replication Under Scalable Hashing



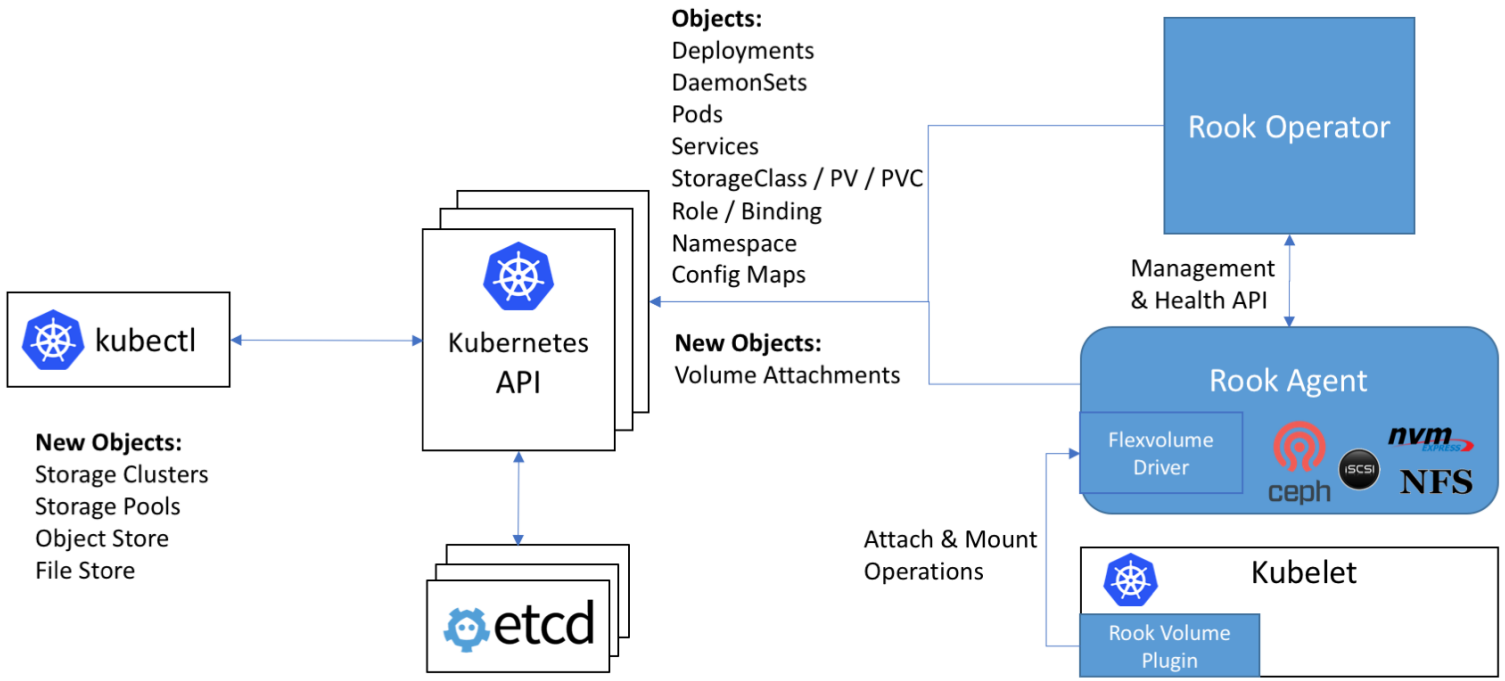
rook.io

- Rook is an open source cloud-native storage orchestrator that turns storage software into the storage services that are
  - self-managing
  - self-scaling
  - self-healing
- It does this by automating
  - deployment, bootstrapping, configuration, provisioning, scaling, upgrading, migration, disaster recovery, monitoring, and resource management.

Rook Architecture



Rook Design


Objects:
Deployments
DaemonSets
Pods
Services
StorageClass / PV / PVC
Role / Binding
Namespace
Config Maps
Rook Operator
Management
& Health API
kubectl
Kubernetes
API
New Objects:
Volume Attachments
Rook Agent
Flexvolume
Driver
ceph
iSCSI
nvm
NFS
New Objects:
Storage Clusters
Storage Pools
Object Store
File Store
Attach & Mount
Operations
Kubelet
Rook Volume
Plugin
etcd

openSUSE Ceph

- openSUSE:Ceph wiki page
- OBS projects filesystems:ceph
- subprojects like filesystems:ceph:nautilus
- Process
  - development version of Ceph filesystems:ceph:octopus
  - submitted to filesystems:ceph
  - filesystems:ceph is submitted to Factory
  - stable version now is filesystems:ceph:nautilus

openSUSE Ceph containers

- rook-ceph-image is Rook container for Ceph
- ceph-image is a Ceph container that contains all need packages
  - ceph (osd, mon, mgr, mds)
  - ceph-mgr-dashboard
  - ceph-mgr-rook
  - ceph-radosgw
  - nfs-ganesha

openSUSE Ceph containers process

- Process plan is to follow openSUSE Building derived containers
  - submit containers from filesystems:ceph to openSUSE:Factory
  - submit containers from filesystems:ceph:nautilus to openSUSE:Leap:15.1:Images

Development cluster on Vagrant

- vagrant-ceph openSUSE project
- openSUSE:Ceph wiki page
  - Rook in Vagrant cluster

vagrant-ceph

- follow instruction on wiki or github to use vagrant-ceph
- box could be found in openSUSE:Factory/openSUSE-MicroOS

```
vagrant box add --provider libvirt --name opensuse/Kubic-kubeadm-
cri-o Kubic.box
BOX="opensuse/Kubic-kubeadm-cri-o" vagrant up
vagrant ssh admin
sudo su
kubectl get nodes
NAME    STATUS   ROLES    AGE   VERSION
admin   Ready    master   89s   v1.14.1
data1   Ready    <none>   47s   v1.14.1
mon1    Ready    <none>   51s   v1.14.1
```

vagrant-ceph k8s deployment

```
      admin:
        - getent hosts admin-management | awk '{ print $1}' | xargs
kubeadm init --cri-socket=/var/run/crio/crio.sock --pod-network-
cidr=10.244.0.0/16 --token 56fa9a.705a6001db6a6756 --skip-token-print
--apiserver-advertise-address

        - mkdir -p $HOME/.kube; cp -i /etc/kubernetes/admin.conf
$HOME/.kube/config; chown $(id -u):$(id -g) $HOME/.kube/config
        - kubectl apply -f https://0y.at/kubicflannel
        - kubectl taint nodes admin node-
role.kubernetes.io/master::NoSchedule-

        - curl -LkSs
https://api.github.com/repos/SUSE/rook/tarball/suse-master -o
/home/vagrant/rook.tar.gz
        - tar -xzf /home/vagrant/rook.tar.gz -C /home/vagrant

      all:
        - ( ( if [ "$HOSTNAME" != "admin" ]; then kubeadm join --
token 56fa9a.705a6001db6a6756 --discovery-token-unsafe-skip-ca-
verification admin-management:6443 >>/home/vagrant/join 2>&1; fi; ) &
)
```

vagrant-ceph Rook deployment

admin#

```
cd SUSE-rook*/cluster/examples/kubernetes/ceph/

kubectl create -f common.yaml -f psp.yaml -f operator.yaml

kubectl create -f cluster.yaml -f toolbox.yaml

kubectl -n rook-ceph get pod
```

vagrant-ceph Rook deploys Ceph cluster

```
kubectl -n rook-ceph exec $(kubectl -n rook-ceph get pod -l
"app=rook-ceph-tools" -o jsonpath='{.items[0].metadata.name}') --
ceph -s
  cluster:
    id:     3d3eb9ab-7416-474d-8e28-fe673f23bd3e
    health: HEALTH_OK

  services:
    mon: 3 daemons, quorum a,b,c (age 4m)
    mgr: a(active, since 3m)
    osd: 6 osds: 6 up (since 3s), 6 in (since 3s)

  data:
    pools:   0 pools, 0 pgs
    objects: 0 objects, 0 B
    usage:   6.0 GiB used, 108 GiB / 114 GiB avail
    pgs:
```

vagrant-ceph Rook defaults

- by default it is a *tiny* cluster from 3 nodes
  - check `Vagrant` file and `config.yml` for more options
- Vagrant changes default containers in yaml (image: key) to
  - `registry.opensuse.org/filesystems/ceph/t`
  - `registry.opensuse.org/filesystems/ceph/t`
- SUSE Rook fork is at `github.com/suse/rook` and `suse`

CI cluster on Openstack

- Terraform, Heat Orchestration Template, and etc
- Heat is supported not on all Cloud instances
- HOT approach has less tools in the middle so less failures and easier to analyze them
- Templates examples could be found here

Creating k8s cluster on Openstack

host#

```
openstack stack create -t ./ceph-kubic-stack.yaml -e ./ceph-kubic-
environment.yaml --parameter keypair=key--wait ceph-kubic

MasterIP=$(openstack stack output show ceph-kubic master-floating-
network-ip -c output_value -f value)
```

master#

```
kubeadm init --cri-socket=/var/run/crio/crio.sock --pod-network-
cidr=10.244.0.0/16

mkdir -p $HOME/.kube; cp -i /etc/kubernetes/admin.conf
$HOME/.kube/config; chown $(id -u):$(id -g) $HOME/.kube/config

kubectl apply -f https://0y.at/kubicflannel
ubectlJoin=$(kubeadm token create --print-join-command)

ssh nodes $KubectlJoin
```

Rook deployment

master#

```
cd rook/cluster/examples/kubernetes/ceph/

kubectl create -f common.yaml -f psp.yaml

kubectl get crd | grep cephclusters
cephclusters.ceph.rook.io           2019-05-23T15:15:14Z

kubectl -n rook-ceph get cephcluster | grep Created
kubectl -n rook-ceph get cephcluster | grep HEALTH_OK

NAME        DATADIRHOSTPATH        MONCOUNT AGE STATE     HEALTH
rook-ceph   /home/ses/var/lib/rook   3      10m Created   HEALTH_OK
```

Gathering info and shutdown

master#

```
kubectl -n rook-ceph get pods
kubectl -n rook-ceph describe pods
kubectl -n rook-ceph logs -lapp=rook-ceph-operator
kubectl -n rook-ceph logs -lapp=rook-ceph-...

cp -R /var/log/containers/* ...
```

host#

```
openstack stack delete --yes --wait ceph-kubic
```

other tools

- terraform-kubic-kvm
- minikube and coreos-kubernetes fork

Bugs

- Some nodes in cluster don't boot
  - bug #1133514
  - needs SUSE bug #1134472 to be fixed
  - workaround images are here home:favogt:dracutfix
- cloud-init or SOC has some bug with routing for second interface
  - bug #1135792
  - disabled second network as workaround

Contribute

- https://github.com/ceph/ceph Ceph
- https://github.com/rook/rook/ Rook
- https://build.opensuse.org/project/show/filesystems:ceph OBS project
- https://en.opensuse.org/openSUSE:Ceph wiki page

Questions?

https://github.com/denisok/oSC19-Rook-on-Kubic