Towards a Vendor Neutral Kubernetes

kubernetes

About Me

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@a_sykim

@andrewsykim

kubernetes

What is this talk NOT about?

Multi-Cloud Kubernetes

kubernetes

How-to on supporting new vendors/clouds

kubernetes

Comparing Vendors/Distributions

kubernetes

Customizing & Extending Kubernetes for any Cloud

Cloud Providers

Cloud Provider

Bridging together Cloud & Kubernetes Resources

kubernetes

Cloud Provider

```
// Interface is an abstract, pluggable interface for cloud providers.
type Interface interface {
	// Initialize provides the cloud with a kubernetes client builder and may spawn goroutines
	// to perform housekeeping or run custom controllers specific to the cloud provider.
	// Any tasks started here should be cleaned up when the stop channel closes.
	Initialize(clientBuilder ControllerClientBuilder, stop <-chan struct{})
	// LoadBalancer returns a balancer interface. Also returns true if the interface is supported, false otherwise.
	LoadBalancer() (LoadBalancer, bool)
	// Instances returns an instances interface. Also returns true if the interface is supported, false otherwise.
	Instances() (Instances, bool)
	// Zones returns a zones interface. Also returns true if the interface is supported, false otherwise.
	Zones() (Zones, bool)
	// Clusters returns a clusters interface.  Also returns true if the interface is supported, false otherwise.
	Clusters() (Clusters, bool)
	// Routes returns a routes interface along with whether the interface is supported.
	Routes() (Routes, bool)
	// ProviderName returns the cloud provider ID.
	ProviderName() string
	// HasClusterID returns true if a ClusterID is required and set
	HasClusterID() bool
}
```

Cloud Abstractions/APIs

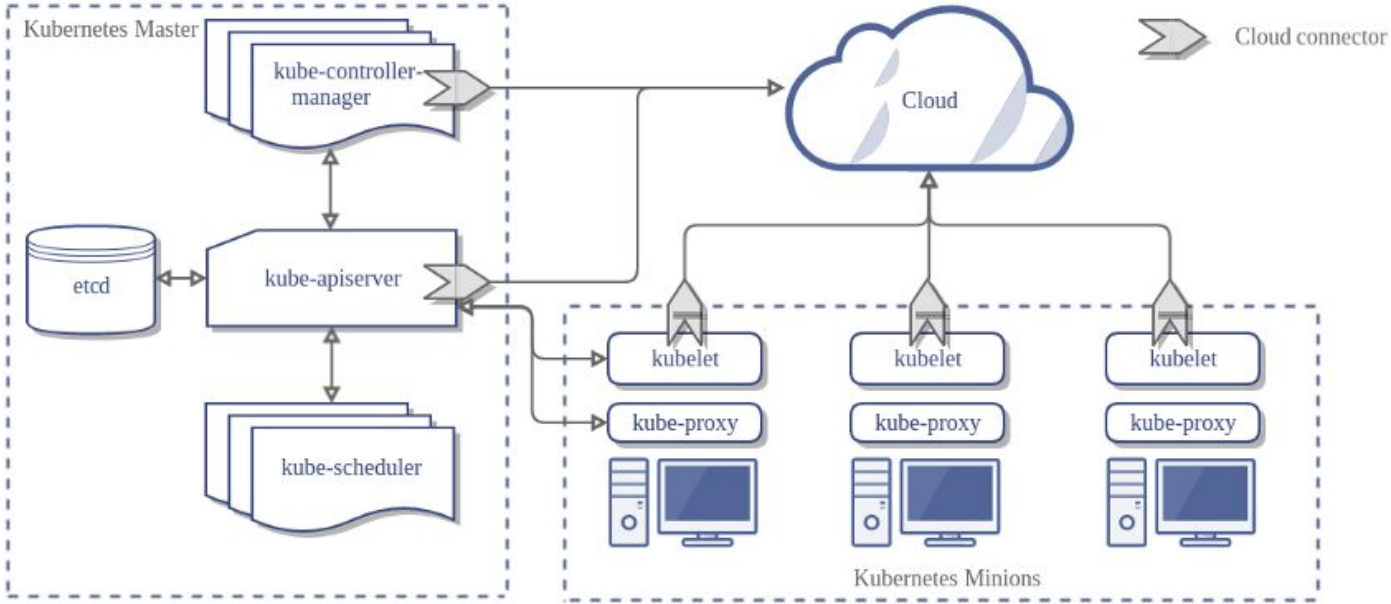
- Nodes
  - instance types
  - regions/zones
  - addresses
  - provider IDs
- Load Balancers
- Routes/IPAM
- Volumes

Is Kubernetes Vendor Neutral?

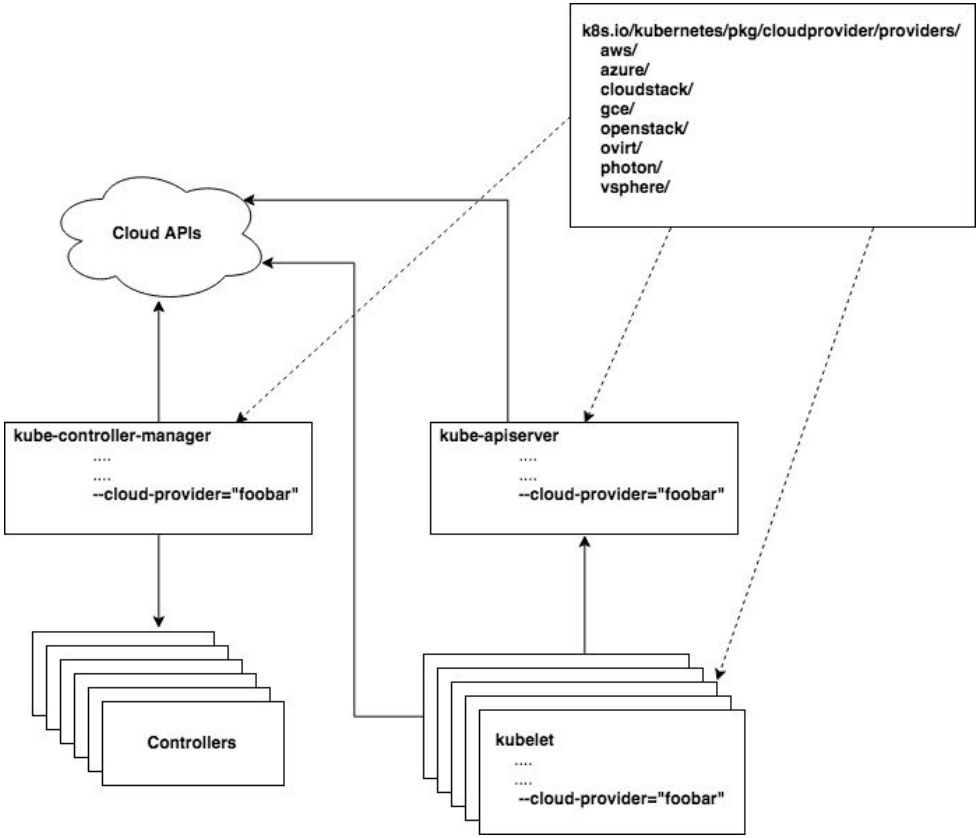
In-Tree & Out-of-Tree Cloud Providers

History of Kubernetes Cloud Providers

In-Tree


Kubernetes Master
kube-controller-manager
etcd
kube-apiserver
kube-scheduler
Cloud
Cloud connector
kubelet
kubelet
kubelet
kube-proxy
kube-proxy
kube-proxy
Kubernetes Minions

In-Tree


k8s.io/kubernetes/pkg/cloudprovider/providers/
aws/
azure/
cloudstack/
gce/
openstack/
ovirt/
photon/
vsphere/
Cloud APIs
kube-controller-manager
....
....
--cloud-provider="foobar"
kube-apiserver
....
....
--cloud-provider="foobar"
Controllers
kubelet
....
....
--cloud-provider="foobar"

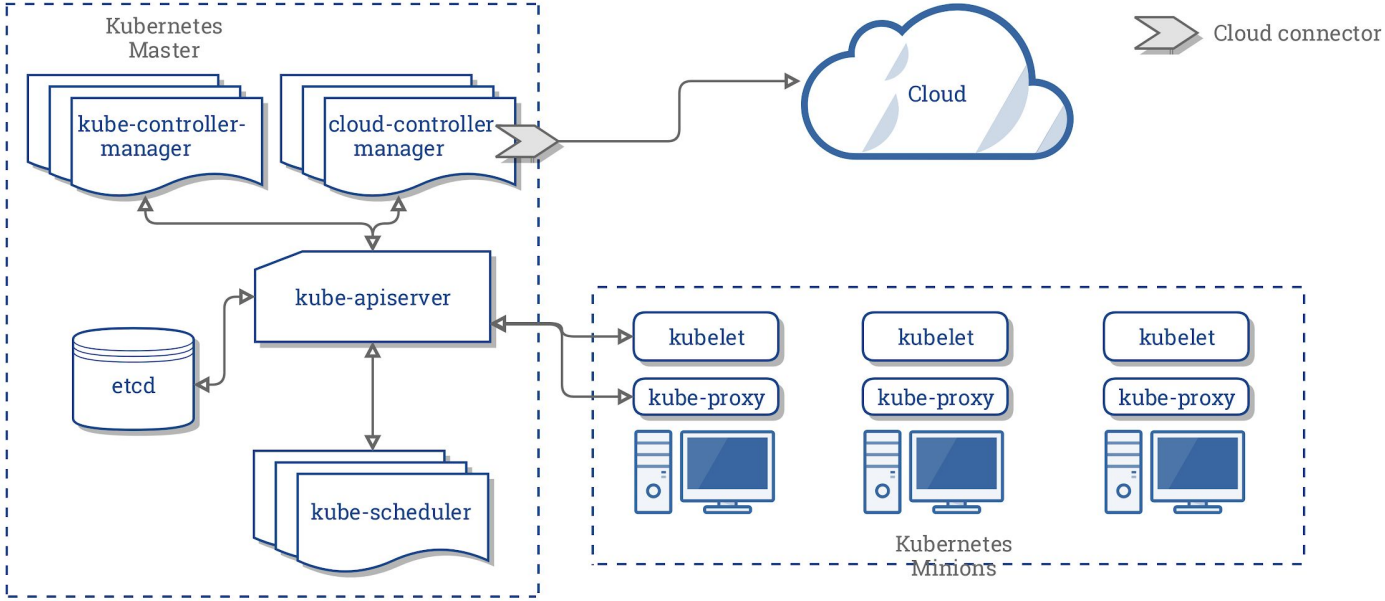
thockin commented on 29 Sep 2016 Member

So this is a tough phase to be in. We know we want to change the way CloudProvider works, but that work hasn't really started yet. Are you guys willing to be a bit of a guinea pig? In broad strokes, here's what I am thinking. Don't build this as a Cloud Provider. Instead, let's make ControllerManager understand that "external" is a valid cloud provider, and write this as a controller. Simply run it somewhere in the cluster and let it watch the various APIs it needs.

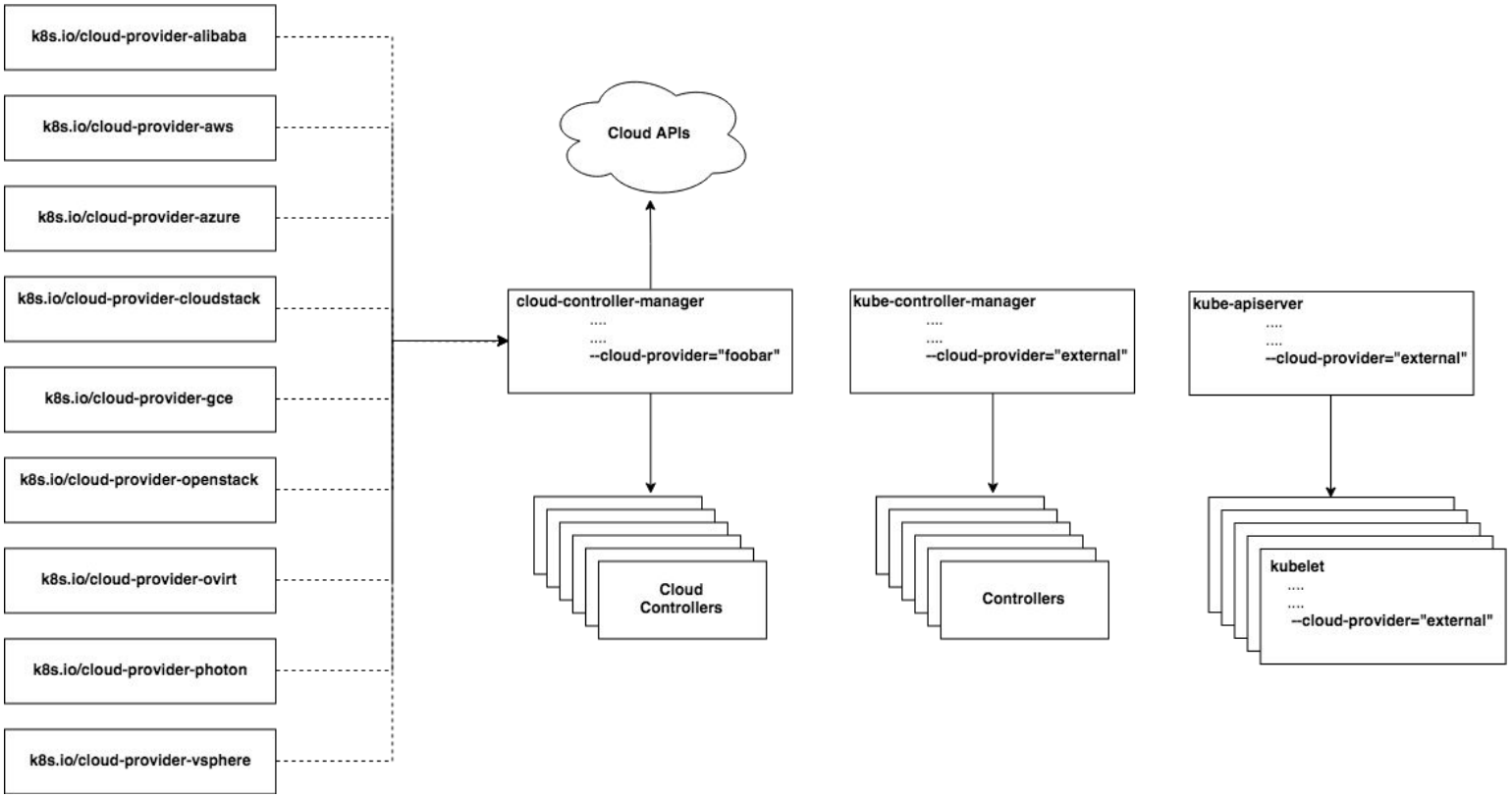
While you do this, you can start to catalog all the places that assume CloudProvider is populated, and your controller can be a starting point for the discussion of how to evict google and amazon and openstack into their own modules.

@errordeveloper

Out-of-Tree


Kubernetes
Master
kube-controller-
manager
cloud-controller
manager
Cloud
Cloud connector
kube-apiserver
etcd
kube-scheduler
kubelet
kube-proxy
kubelet
kube-proxy
kubelet
kube-proxy
Kubernetes
Minions

Out-of-Tree


k8s.io/cloud-provider-alibaba
k8s.io/cloud-provider-aws
k8s.io/cloud-provider-azure
k8s.io/cloud-provider-cloudstack
k8s.io/cloud-provider-gce
k8s.io/cloud-provider-openstack
k8s.io/cloud-provider-ovirt
k8s.io/cloud-provider-photon
k8s.io/cloud-provider-vsphere
Cloud APIs
cloud-controller-manager
....
....
--cloud-provider="foobar"
Cloud Controllers
kube-controller-manager
....
....
--cloud-provider="external"
Controllers
kube-apiserver
....
....
--cloud-provider="external"
kubelet
....
....
--cloud-provider="external"

Is Kubernetes Cloud Provider Neutral?

¯_(ツ)_/¯

Advantage In-Tree: Visibility

Advantage Out-of-Tree: Faster Releases

kubernetes

Advantage In-Tree: Using Upstream Tools

kubernetes

Advantage Out-of-Tree: **NOT** Using Upstream Tools

kubernetes

Advantage In-Tree: Community Contribution

Advantage Out-of-Tree: Flexible Ownership

Inconsistent Integration

Community Acknowledgement

Converging Towards One Model

Where Are We Today?

In-Tree Cloud Providers

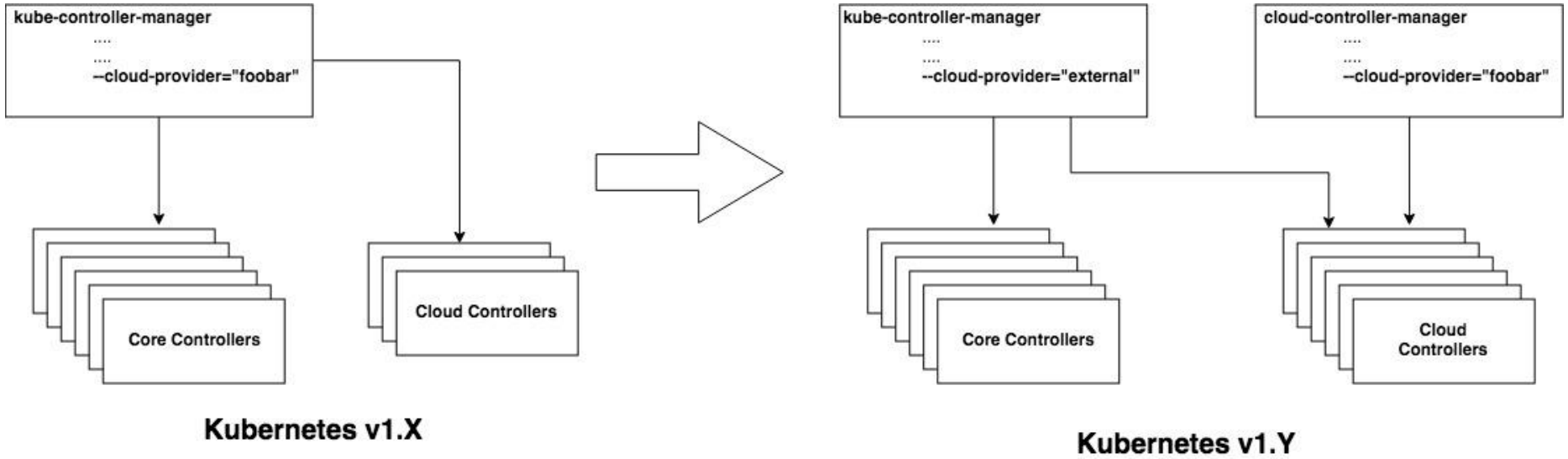
Migrate Out-of-Tree

```
k8s.io/
├── cloud-provider
├── cloud-provider-alibaba
├── cloud-provider-aws
├── cloud-provider-azure
├── cloud-provider-cloud-stack
├── cloud-provider-gcp
├── cloud-provider-openstack
├── cloud-provider-ovirt
├── cloud-provider-cloudstack
├── cloud-provider-photon
└── cloud-provider-vsphere
```

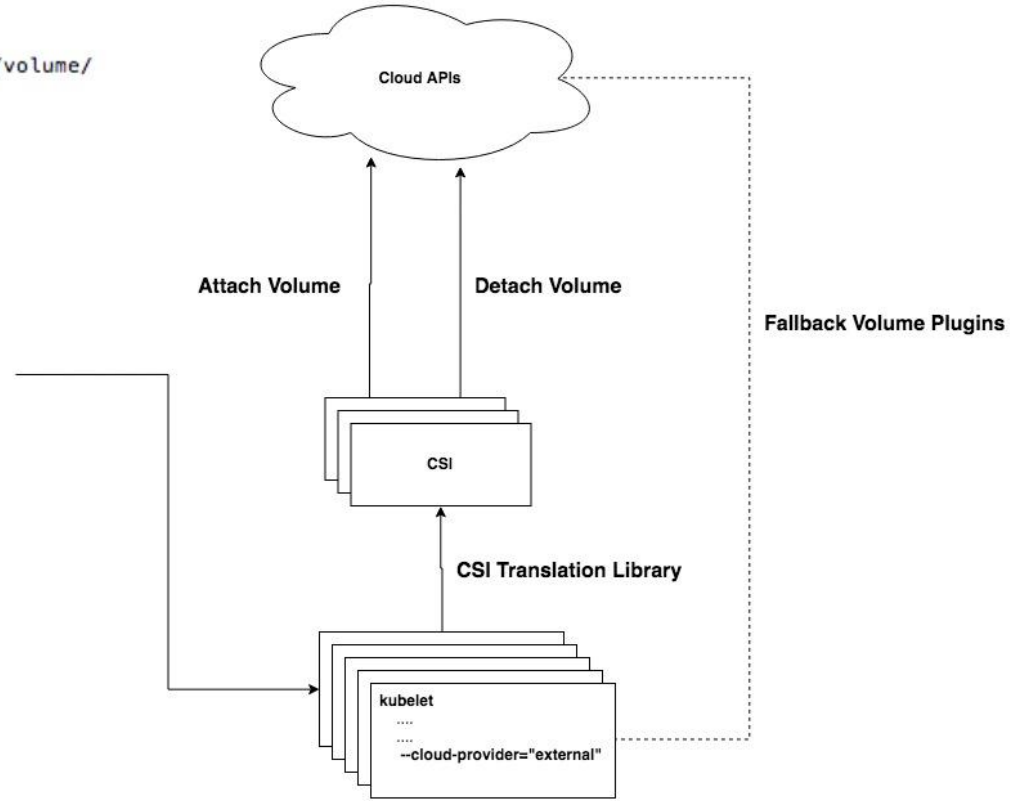
What’s taking so long?

Zero Downtime Migration

kubernetes

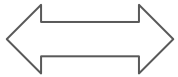

kube-controller-manager
....
....
--cloud-provider="foobar"
Core Controllers
Cloud Controllers
Kubernetes v1.X
kube-controller-manager
....
....
--cloud-provider="external"
cloud-controller-manager
....
....
--cloud-provider="foobar"
Core Controllers
Cloud Controllers
Kubernetes v1.Y

```
k8s.io/kubernetes/pkg/volume/
├── awsebs
├── azure-dd
├── azure-file
├── cephfs
├── cinder
├── configmap
├── csi
├── downwardapi
├── emptydir
├── fc
├── flexvolume
├── flocker
├── gcepd
├── git-repo
├── glusterfs
├── host-path
├── iscsi
├── local
├── nfs
├── photon-pd
├── portworx
├── projected
├── quobyte
├── rbd
├── scaleio
├── secret
├── storageos
├── testing
├── util
├── validation
└── vsphere-volume
```



“Staging” In-Tree Cloud Providers

```
k8s.io/kubernetes/pkg/cloudprovider/
└── providers
    ├── aws
    ├── azure
    ├── cloudstack
    ├── gce
    ├── openstack
    ├── ovirt
    ├── photon
    └── vsphere
```



```
k8s.io/kubernetes/staging/src/k8s.io/
├── cloud-provider
├── cloud-provider-aws
├── cloud-provider-azure
├── cloud-provider-cloud-stack
├── cloud-provider-gcp
├── cloud-provider-openstack
├── cloud-provider-ovirt
├── cloud-provider-cloudstack
├── cloud-provider-photon
└── cloud-provider-vsphere
```

Staging Symlinks

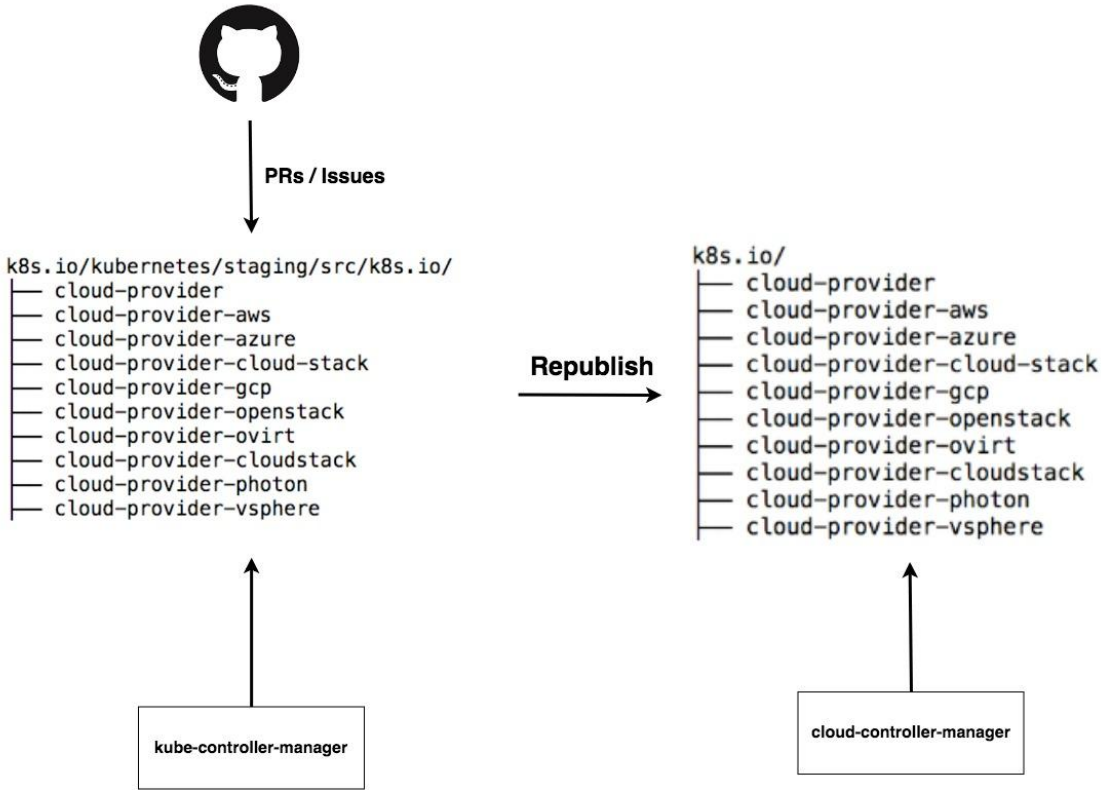
```
~/go/src/k8s.io/kubernetes/vendor/k8s.io $ $ ls -l
lrwxr-xr-x   api -> ../../staging/src/k8s.io/api
lrwxr-xr-x   client-go -> ../../staging/src/k8s.io/client-go
...
...
...
lrwxr-xr-x   cloud-provider -> ../../staging/src/k8s.io/cloud-provider
lrwxr-xr-x   cloud-provider-aws -> ../../staging/src/k8s.io/cloud-provider-aws
lrwxr-xr-x   cloud-provider-azure -> ../../staging/src/k8s.io/cloud-provider-azure
lrwxr-xr-x   cloud-provider-cloudstack -> ../../staging/src/k8s.io/cloud-provider-cloudstack
lrwxr-xr-x   cloud-provider-gcp -> ../../staging/src/k8s.io/cloud-provider-gcp
lrwxr-xr-x   cloud-provider-openstack -> ../../staging/src/k8s.io/cloud-provider-openstack
lrwxr-xr-x   cloud-provider-ovirt -> ../../staging/src/k8s.io/cloud-provider-ovirt
lrwxr-xr-x   cloud-provider-photon -> ../../staging/src/k8s.io/cloud-provider-photon
lrwxr-xr-x   cloud-provider-vsphere -> ../../staging/src/k8s.io/cloud-provider-vsphere
```

“Staging” In-Tree Cloud Providers

```
k8s.io/kubernetes/staging/src/k8s.io/
├── cloud-provider
├── cloud-provider-aws
├── cloud-provider-azure
├── cloud-provider-cloud-stack
├── cloud-provider-gcp
├── cloud-provider-openstack
├── cloud-provider-ovirt
├── cloud-provider-cloudstack
├── cloud-provider-photon
└── cloud-provider-vsphere
```

```
k8s.io/
├── cloud-provider
├── cloud-provider-aws
├── cloud-provider-azure
├── cloud-provider-cloud-stack
├── cloud-provider-gcp
├── cloud-provider-openstack
├── cloud-provider-ovirt
├── cloud-provider-cloudstack
├── cloud-provider-photon
└── cloud-provider-vsphere
```

“Staging” In-Tree Cloud Providers



Breaking Circular Dependencies

```
k8s.io/kubernetes/.../providers
├── aws
├── azure
├── cloudstack
├── fake
├── gce
├── openstack
├── ovirt
├── photon
└── vsphere
```

k8s.io/kubernetes

Removing cloud provider dependencies to kubernetes/kubernetes #69585

Open **andrewsykim** opened this issue on Oct 10 · 31 comments

andrewsykim commented on Oct 10 • edited ▾ Member

Is this a BUG REPORT or FEATURE REQUEST?:
/kind feature

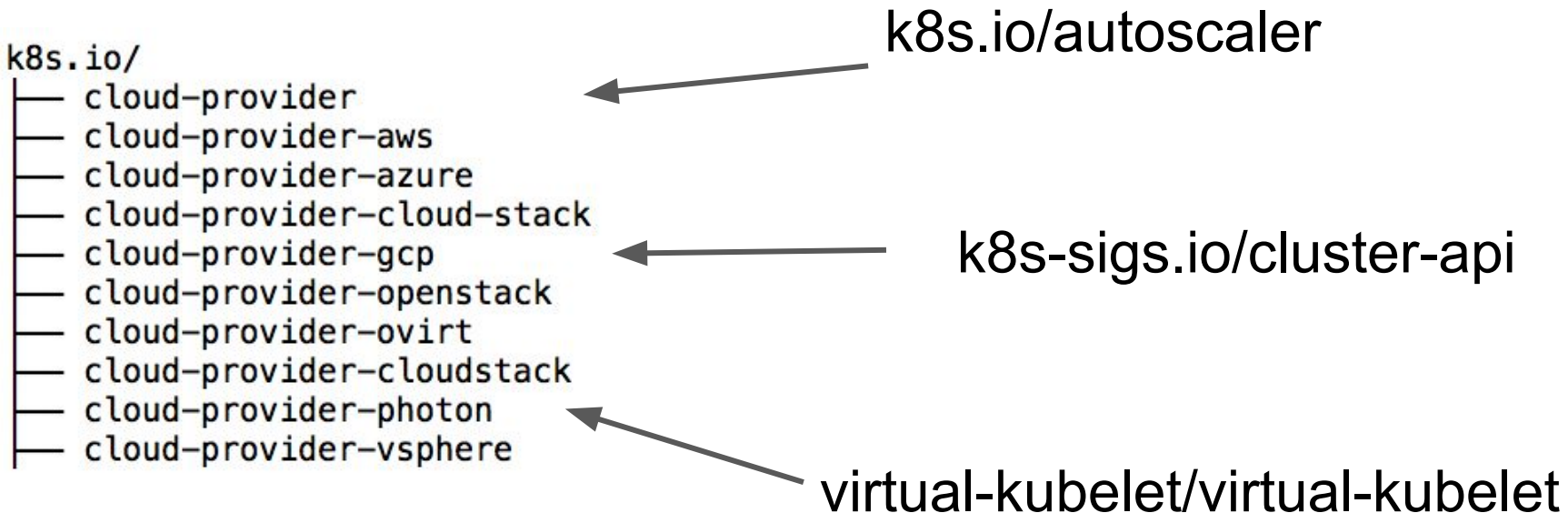
As part of a long running initiative to remove cloud providers out of kubernetes/kubernetes, it's required to remove dependencies to kubernetes/kubernetes so we can place them into a staging directory. The following dependencies need to be removed from `k8s.io/kubernetes/pkg/cloudprovider/providers`:

Dependency checklist:

- [ ] `pkg/api/service` (**@mcrute**)
- [ ] `pkg/api/v1/service` (**@mcrute**)
- [ ] `pkg/apis/core/v1/helper` (**@islinwb**)
- [ ] `pkg/controller` (**@stewart-yu**)
- [ ] `pkg/credentialprovider/aws` (**@yastij**)
- [ ] `pkg/master/ports` (**@d-nishi**)
- [x] `pkg/cloudprovider` (**@cheftako**)
- [ ] `pkg/features`
- [ ] `pkg/kubelet/apis` (**@islinwb**)
- [ ] `pkg/util/keymutex` (**@dims**)
- [ ] `pkg/util/mount` (**@mcrute**)
- [ ] `pkg/util/net/sets` (**@mcrute**)
- [ ] `pkg/util/node` (**@cheftako**)
- [ ] `pkg/util/parsers` (**@cheftako**)
- [ ] `pkg/util/strings` (**@dims**)
- [ ] `pkg/version` (**@islinwb**)
- [ ] `pkg/volume` (**@islinwb**)
- [ ] `pkg/volume/util` (**@islinwb**)
- [ ] `pkg/volume/util/volumepathhandler`

/sig cloud-provider

Consumed for Other Repos



Benefits

Smaller Binaries

kubernetes

Smaller Binaries

Component	With Cloud Providers	Without Cloud Providers
kubelet	126 MiB	56 MiB
kube-controller-manager	146.3 MiB	89.9 MiB
kube-apiserver	147.5 MiB	123.1 MiB

Separation of Concern

kubernetes

Open Cloud

kubernetes

Frameworks Instead of Interfaces

Community & Governance

SIG per Cloud Provider is Not Sustainable

Cloud Providers as Subprojects

New Cloud Providers in Kubernetes

- Conformance certified
- Reporting conformance test results to testgrid
- Well documented
- User experience reports
- Well tested/used CCM
- Tech leads are members of the Kubernetes org

Intro: SIG Cloud Provider

- Dec 12th 1:45 pm - 2:20 pm
- Chris Hoge (Open Stack) & Jago Macleod (Google)

Deep Dive: SIG Cloud Provider

- Dec 13th 10:50 am - 11:25 am
- Chris Hoge (Open Stack) & Jago Macleod (Google)

kubernetes

Thank you!

Questions!