VMware SIG
Moving Cloud Provider out of tree
+ CSI: what is means to users

Fabio Rapposelli, Steven Wong
Co-chairs, VMware SIG
Kubernetes cloud providers and volume plugins used to be “in-tree” meaning that their source code is included in the main Kubernetes repo. They were compiled in, and shipped only in a Kubernetes release.

The drawbacks of this monolithic approach were that Kubernetes was larger than needed, and feature + patch activity was locked to Kubernetes release schedules.

Going forward, new features are exclusive to the new replacements: an out-of-tree vSphere cloud provider + a CSI storage plugin. Legacy implementations remain for the short term but destined are for deprecation.

Agenda:

- Deep Dive : Install and configure of out-of-tree cloud provider + CSI storage
- Migration options for current users

This session will be useful to:

- Users running Kubernetes on VMware infrastructure
- Authors of installers and Kubernetes distributions which target the vSphere platform
Fabio Rapposelli

Italy
Staff Software Engineer, VMware

Fabio is responsible for many of the Open Source integrations between Vagrant, Docker and VMware.

GitHub: @frapposelli

Steven Wong

Los Angeles
Open Source Community Relations Engineer, VMware

Active in Kubernetes community since 2015 – storage, IoT+Edge, running K8s on VMware infrastructure.

GitHub: @cantbewong
Agenda

Background: Why Kubernetes Cloud Provider are moving out of tree

Deep Dive - Install and configure of out-of-tree cloud provider + CSI storage

Migration options for current users
As of Kubernetes 1.14, there are several in-tree cloud providers. When you download Kubernetes, you run these by default through direct configuration.

<table>
<thead>
<tr>
<th>Legacy in tree</th>
<th>Original Kubernetes Cloud Providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWS</td>
<td>OpenStack</td>
</tr>
<tr>
<td>Azure</td>
<td>OVirt</td>
</tr>
<tr>
<td>Cloudstack</td>
<td>Photon</td>
</tr>
<tr>
<td>GCE</td>
<td>vSphere</td>
</tr>
</tbody>
</table>
Why is in tree code a problem
If it works now, Why change it?

Legacy cloud providers and storage plugins were built directly into the Kubernetes release

- Could not be patched or enhanced independent of a full Kubernetes release
- Resulted in undesirable bloat of Kubernetes itself – any particular deployment needs only a subset, yet irrelevant code is part of the release.
- Runs as a privileged component of Kubernetes itself – security and stability risk
- Kubernetes should be an orchestration kernel, with drivers maintained independently by domain experts

This isn’t urgent – Kubernetes deprecation policy applies, granting at least a year of notice

- However: new features are already exclusive to out of tree cloud provider and storage
How the move to out of tree is structured

Two elements – cloud provider and storage

A new Cloud Controller Manager Interface was developed, replacing control loops that were in kube-controller-manager

- Out of tree plan and architecture KEP [link](#)
- Cloud Controller Manager KEP [link](#)
- vSphere out of tree cloud provider KEP [link](#)

In tree volume plugins are being replaced by a Kubernetes interface using CSI, a cross orchestrator standard for using storage with containers. CSI drivers are out of the Kubernetes tree.

- Kubernetes CSI KEP [link](#)
- Migration KEP [link](#)
CSI for vSphere 1st release
  • Beta - available now (version 0.?.0)
  • GA - July 2019

Features
  • VM independent volume management (FCD)
  • Kubernetes clusters can straddle mutli-vCenter, multi-Datacenter
  • Provision from multiple datastores or datastore clusters
  • Conventional + “raw” mounts
  • Zone support

https://github.com/kubernetes-sigs/vsphere-csi-driver
Interaction with Pod Scheduling and Zones

vSphere Cloud Controller Manager (CCM)
https://github.com/kubernetes/cloud-provider-vsphere
• CCM performs pod scheduling (aka placement) via zones
• kubectl get nodes --show-labels

vSphere CSI
• Can have datastore and datastore clusters on the same name in different VCs/DCs
• Keys off the same Kubernetes zone labels for provisioning, creation, etc
Migration – in tree to out of tree

Recorded Demo

Photo by Jan-Niclas Aberle on Unsplash
References

vSphere Installation, Configuration, Best Practices

Install
https://github.com/kubernetes-sigs/vsphere-csi-driver/blob/master/docs/deploying_csi_vsphere_with_rbac.md

Configuration

• Requires vsphere.conf identical format to in-tree
• Example conf and yaml files:
  https://github.com/kubernetes-sigs/vsphere-csi-driver/tree/master/manifests

Kubernetes Zone Support (single cluster backed resilient resources)

• Requires vSphere Cloud Controller Manager
• https://github.com/kubernetes-sigs/vsphere-csi-driver/blob/master/docs/deploying_ccm_and_csi_with_multi_dc_vc_aka_zones.md
• KubeCon NA 2018 presentation https://sched.co/Grd6

Pending doc upgrade staged for review here:
https://mylesagray.github.io/vsphere-storage-for-kubernetes/documentation/index.html
Thank You
Contacts
This deck: link tbd

Join SIG VMware
- Slack channel: https://kubernetes.slack.com/messages/sig-vmware
- List: https://groups.google.com/forum/#!forum/kubernetes-sig-vmware
- Zoom meetings (join mailing list group for schedule)

Fabio Rapposelli
@frapposelli

Steven Wong
@cantbewong