Kubernetes The Hard Way

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Agenda

These slides are my own opinion

Who I am?

- Company：1998.4-2015.12 Traditional IT company in Japan, 2016.1-2017.3 HPE -> 2017.3- SUSE/Novell Japan -> 2019 ???("Further Independence for SUSE")
  - SUSE OpenStack Cloud QE(Quality Engineering) Team
    "SUSE Acquires OpenStack IaaS and CF PaaS Talent and Tech Assets from HPE ..."
- Job: Senior Software Engineer/Open Source Programmer
  - OpenStack QA Up/Downstream development, Core Reviewer (Tempest, OpenStack-Health, Subunit2SQL, Stackviz), stestr
  - stackalytics.com/?user_id=igawa, github.com/masayukig
- Books
  - OpenStack Cloud Integration (OpenStack クラウドインテグレーション)
  - Infra CI Pragmatic Guide - Ansible/GitLab (インフラ CI 実践ガイド) (as a reviewer)
- Hobby
  - Bike, Diet, etc.

Today's Goal

- ▶ Understand "Kubernetes The Hard Way"
- ▶ Motivate to do "Kubernetes The Hard Way" by yourself

Do you feel about Kubernetes,

```
 _ ⅄⅄⅄⅄⅄⅄⅄⅄⅄⅄⅄⅄ _
 >          I have no idea !!          <
 >          what's going on !?          <
 ‾ Y Y Y Y Y Y Y Y Y Y Y Y ‾
```

When you make a k8s cluster by using minikube, kubeadm, Rancher, GKE/AKS/EKS, etc…

Do you want to… - cont.

- ▶ Know its components and architecture
- ▶ Debug it
- ▶ Build a k8s cluster as you like
- ▶ Feel that it's too easy to build a k8s cluster
- ▶ Understand Kubernetes in detail
- ▶ Build a k8s cluster in a harder way :-p

when you make a k8s cluster by using minikube, kubeadm, Rancher, GKE/AKS/EKS, etc…

If it meets you, there's

"Kubernetes the Hard Way"

▶ https://github.com/kelseyhightower/kubernetes-the-hard-way

"Kubernetes the Hard Way" ?

Bootstrap Kubernetes the hard way on GCP. No scripts.

- ▶ Tutorial for Kubernetes
- ▶ Apache License Version 2.0
- ▶ Document consists of 14 chapters

"Kubernetes the Hard Way" ? - components & versions

- ▶ Kubernetes 1.12.0
- ▶ containerd Container Runtime 1.2.0-rc.0
- ▶ gVisor 50c283b9f56bb7200938d9e207355f05f79f0d17
- ▶ CNI Container Networking 0.6.0
- ▶ etcd v3.3.9
- ▶ CoreDNS v1.2.2

"Kubernetes the Hard Way" ? - outline

1. Prerequisites
2. Installing the Client Tools
3. Provisioning Compute Resources
4. Provisioning a CA and Generating TLS Certificates
5. Generating Kubernetes Configuration Files for Authentication
6. Generating the Data Encryption Config and Key
7. Bootstrapping the etcd Cluster
8. Bootstrapping the Kubernetes Control Plane
9. Bootstrapping the Kubernetes Worker Nodes
10. Configuring kubectl for Remote Access
11. Provisioning Pod Network Routes
12. Deploying the DNS Cluster Add-on
13. Smoke Test
14. Cleaning Up

Prerequisites

Google Cloud Platform

This tutorial leverages the Google Cloud Platform to streamline provisioning of the compute infrastructure required to bootstrap a Kubernetes cluster from the ground up. Sign up for $300 in free credits.

Estimated cost to run this tutorial: $0.22 per hour ($5.39 per day).

> The compute resources required for this tutorial exceed the Google Cloud Platform free tier.

Google Cloud Platform SDK

Install the Google Cloud SDK

Follow the Google Cloud SDK documentation to install and configure the `gcloud` command line utility.

Verify the Google Cloud SDK version is 218.0.0 or higher:

```
gcloud version
```

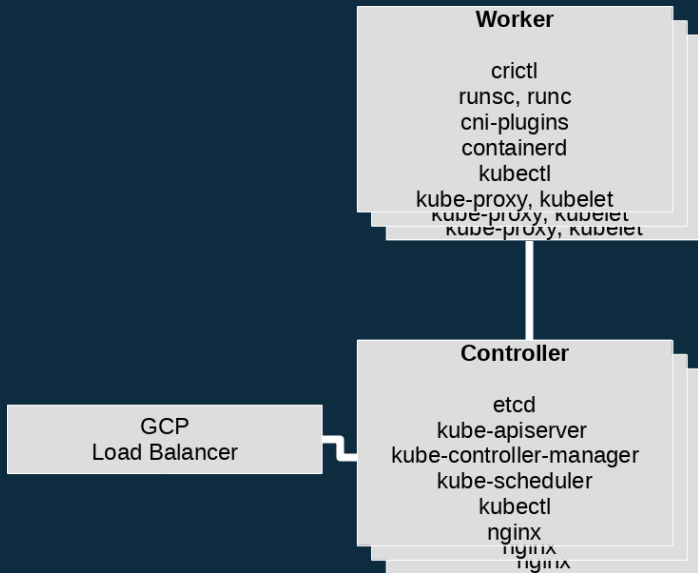#### Set a Default Compute Region and Zone

This tutorial assumes a default compute region and zone have been configured.

If you are using the `gcloud` command-line tool for the first time `init` is the easiest way to do this:

Precondition

- It works on Google Cloud Platform basically.
  But I could run it on an OpenStack cloud with some tricks :)
- n1-standard-1(vCPU*1,MEM: 3.75GB) * 6
  -> Controller * 3 + Worker * 3 + Load Balancer

Architechture, components for this k8s cluster

Worker

crictl
runsc, runc
cni-plugins
containerd
kubectl
kube-proxy, kubelet

Controller

etcd
kube-apiserver
kube-controller-manager
kube-scheduler
kubectl
nginx

GCP
Load Balancer

Conclusion

- ▶ Hours: 2.5H, Cost: less than $1
- ▶ It says "Hard way", but it was not so hard itself.
  -> It took only less than 2.5H
- ▶ I saw some warnings, but you don't need to worry about that that much :)
- ▶ We can read, write and participate its code and community because it's open source!

One more thing - Running in an OpenStack Cloud

It can be run in an public/private OpenStack cloud, too!
But some modifications are necessary.

- ▶ Boot instances
- ▶ Configure network
- ▶ Set security groups
- ▶ Host name resolution is required (such as DNS, /etc/hosts)
- ▶ Load Balancer is also required (such as Octavia, Nginx, HA-Proxy)

Conclusion - challenges, tricks, misc.

- It's better to run and customize it on your own environment, and try/error to understand

  -> I made Bash scripts

  (`https://github.com/masayukig/k8s-the-hard-way-script`)
- This is only for learning not for production (i.e. HA, Persistent Volume, etc.)
- Books and google search could help your understanding
  - Kubernetes: Up and Running: Dive into the Future of Infrastructure (Japanese version: 入門 Kubernetes)
  - Kubernetes完全ガイド (Kubernetes Perfect Guide)
  - コンテナ・ベース・オーケストレーション (Container based orchestration)

Appendix

- Slides: https://bit.ly/k8s-the-hard-way-fossasia2019
- Contact info: masayukig on Freenode, GitHub, Twitter, LinkedIn
- Kubernetes The Hard Way:
  https://github.com/kelseyhightower/kubernetes-the-hard-way