Must-have controllers in Kubernetes

by Jim Tario

Before the fun… Intro!

- Origin: Santa Ana, CA. Hispanic (2nd gen).
- Family: of 4; wife and 2 kiddos (1 and 4 years of age)
- School: Graduated from Cal State Northridge (CSUN) 2016
- Work: SRE at Blizzard Entertainment (~5 years)
- Hobbies: Poker, Fantasy Football, Manga/Anime, Snowboarding, and of course video games.
- Social Media: @j3enx

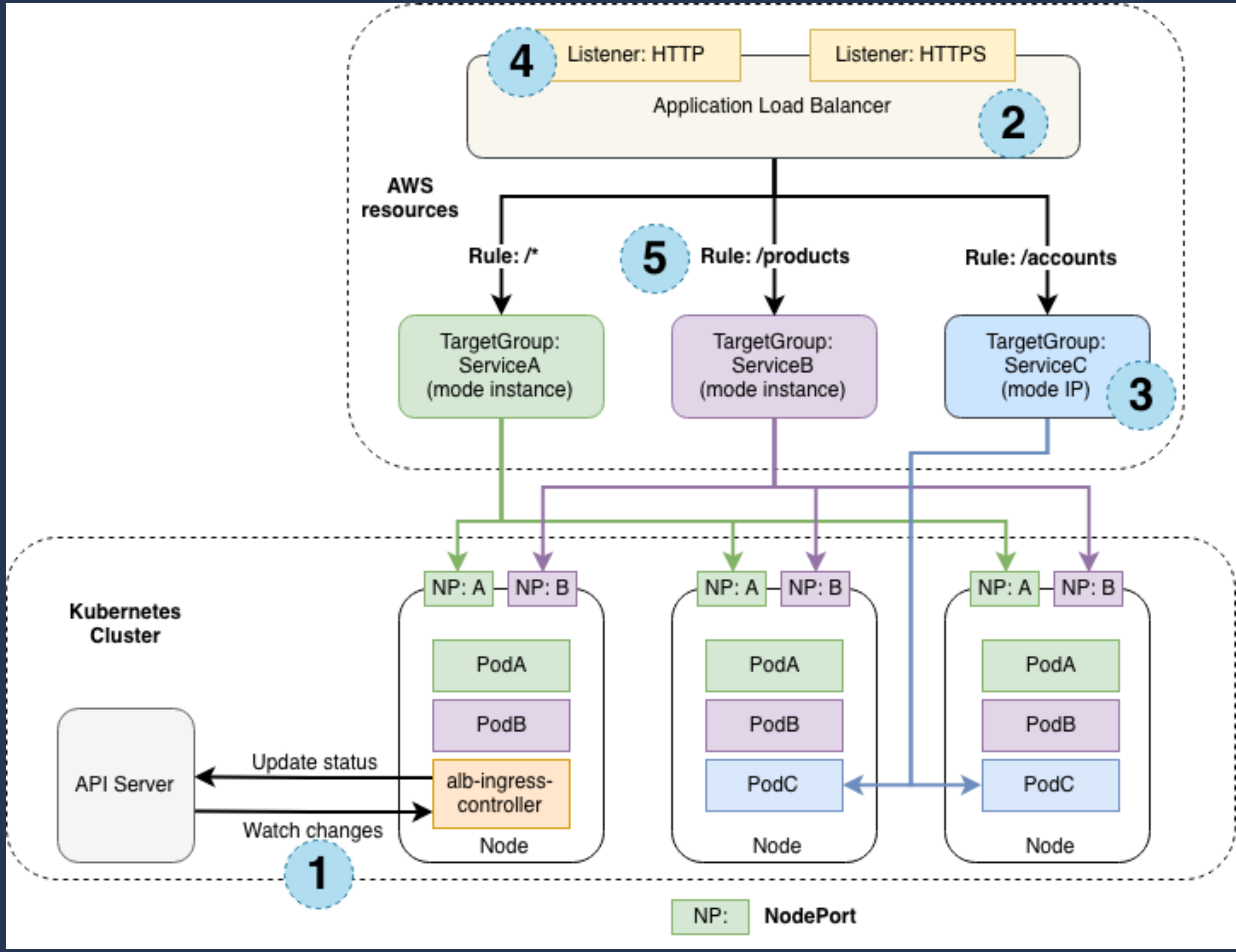
What are controllers?

- Control loops
  - Bring the current state closer to the desired state
- Watch the state of your cluster, and make changes where needed.
- Operators
  - Domain specific controller
    - adds an object to the k8s API
    - configure and manage the application

Ingress Controller(s)

Supported by the K8s Project
- NGINX Ingress controller[1]
- AWS Load Balancer controller[2]
- Ingress GCE (GLBC)[3]

- Many, many, many ingress controllers..
  - https://kubernetes.io/docs/concepts/services-networking/ingress-controllers/#additional-controllers



[1] https://github.com/kubernetes/ingress-nginx

[2] https://github.com/kubernetes-sigs/aws-load-balancer-controller

[3] https://github.com/kubernetes/ingress-gce

Monitoring

- Prometheus Operator[4]
  - Creates custom resources to deploy and manage prometheus
    - Example of CRDs created: serviceMonitors, PodMonitors, PrometheusRules, and various others
  - Operator detects changes in k8s API to any of the CRDs
- Kube-prometheus-stack[5]
  - Helm chart with a collection of k8s manifest, Grafana dashboards, Prometheus rules, and Prometheus Operator

[4] https://github.com/prometheus-operator/prometheus-operator

[5] https://github.com/prometheus-community/helm-charts/tree/main/charts/kube-prometheus-stack

Secrets

- External Secrets[6]
  - Operator that integrates with external secret management systems
    - Backends like: AWS secrets manager, HashiCorp Vault, Google Secrets Manager
  - This operator interfaces with the external APIs (backends)
    - still a control loop and tries to maintain the desired state

[6] https://github.com/external-secrets/external-secrets

DNS

- External DNS[7]
  - The controller interfaces with the k8s and looks at services and ingress resources
    - Those this by looking for annotations
  - Configures DNS providers to create the DNS records.

[7] https://github.com/kubernetes-sigs/external-dns

Autoscaling

- Vertical Pod Autoscaler (VPA)[8]
  - Sets the pod resource requests automatically based on usage
  - Use with caution, uses an Admission Controller
    - requests to the k8s API are intercepted before modifying any object
  - Consists of 3 components: Recommender, Updater, and Admission plugin
    - Start with Recommender before enabling other components
- Shoutout to Cluster Autoscaler[9]

[8] https://github.com/kubernetes/autoscaler/tree/master/vertical-pod-autoscaler

[9] https://github.com/kubernetes/autoscaler/tree/master/cluster-autoscaler

Certificates

- cert-manager[10]
    - simplifies the process of obtaining, renewing and using those certificates
    - can issue certificates from Let's Encrypt, Vault, Venafi, even private PKI (self-signed)

[10] https://github.com/cert-manager/cert-manager

Awesome, but how do I install?

- Many different methods to install apps onto k8s
- Helm and Kustomize are two popular open-source tools to package k8s applications
- Automation tools exists to deploy applications
    - ArgoCD
    - Spinnaker
    - Jenkins
    - Terraform/Ansible

Tech debt

- Be conscious of all the different apps that are being installed
  - Different release cycles, vulnerabilities, etc.
- Who is maintaining them?
- Set a cadence or cycles to tackle tech debt

Closing words

The Golden Rule: Treat others how you want to be treated

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