



DETROIT 2022

How CNET (And Friends) Use the CNCF Landscape To Run High Traffic, Dynamic, Scalable, And Cost-Effective Websites

Corey McGalliard / Red Ventures

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BUILDING FOR THE ROAD AHEAD

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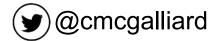


Corey Mcgalliard
Engineering Manager,
Red Ventures



Volume & Tech History

- Established in 1994 by Halsey Minor and Shelby Bonnie
- Originally a TV network
- ~45B requests monthly at edge
- ~10B requests monthly at origin
- CNET Networks acquires quite a few brands leading to it's 2008 acquisition
- CNET Networks acquired by CBS Interactive in 2008
- CBS Interactive 2019 Merged with Viacom
- CNET Media Group acquired by Red Ventures in 2020
- Technology leadership
 - Apache SOLR
 - MooTools
 - <u>Docker Swarm Adoption</u>
 - GCP Migration





Why Kubernetes?

- Incredible flexibility
- Industry adoption
- Comfortable with containers
- Managed Kubernetes!
 - Visibility
 - Control
 - Click-Ops?
 - GKE autopilot
- CNCF ecosystem
- Developer/Customer Experience



Why Kubernetes?



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5h2o7n87vaag _ cnet-alpha-api_fpm.2 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (137): do" u5mq4ckcvuai cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Running Running 15 hours ago ui7t71300bve _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)" ksl3zfxw3nsa _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)" zqe2aewd6ng2 _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)" Failed 15 hours ago "task: non-zero exit (1)" Shutdown Failed 15 hours ago "task: non-zero exit (1)" Failed 15 hours ago "task: non-zero exit (1)" Shutdown Failed 15 hours ago "task: non-zero exit (1)"
u5mq4ckcvuai cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Running Running 15 hours ago ui7t71300bve _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)" ksl3zfxw3nsa _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)" zqe2aewd6ng2 _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)" Failed 15 hours ago "task: non-zero exit (1)"
ksl3zfxw3nsa _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)" zqe2aewd6ng2 _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (137): do"
zqe2aewd6ng2 _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (137): do"
n19xbp2viuve \ cnet-alpha-api fpm.3 us.acr.io/dev-acp-project/apps/api/fpm:alpha-api-fe4740 swarm-worker-1 Shutdown Shutdown 13 days ago
n0aka53ph5qt _ cnet-alpha-api_fpm.3 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-d46d5a swarm-worker-1 Shutdown Shutdown 3 weeks ago
xe8qgg2ix4be cnet-alpha-api_fpm.4 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
x423ab53f0ku _ cnet-alpha-api_fpm.4 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
s20f6z1naiyj 🔪 cnet-alpha-api_fpm.4 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
zqij@ujp2fr8 _ cnet-alpha-api_fpm.4 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
s9f4m9512ruj _ cnet-alpha-api_fpm.4 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
p9339jxfffc8 _ cnet-alpha-api_fpm.4 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (137): do"
fmfq3ofv93t0 cnet-alpha-api_fpm.5 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)"
el86q38caf3l _ cnet-alpha-api_fpm.5 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (1)"
p4tvtlliwbln _ cnet-alpha-api_fpm.5 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
vjkknfi0lp0s _ cnet-alpha-api_fpm.5 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
ma63ucs8m09f _ cnet-alpha-api_fpm.5 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-2 Shutdown Rejected 15 hours ago "No such image: us.gcr.io/dev-p"
2zuqncnwyvxb _ cnet-alpha-api_fpm.5 us.gcr.io/dev-gcp-project/apps/api/fpm:alpha-api-c2fe5f swarm-worker-1 Shutdown Failed 15 hours ago "task: non-zero exit (137): do"





OVERVIEW **DETAILS REVISION HISTORY EVENTS** LOGS YAML 1 hour 6 hours ✓ 12 hours 1 day 2 days 4 days 7 days 14 days 30 days Custom ▼ CPU @ વ ≅ ∷ : Memory @ থ ≅ ∷ : Disk @ વ ≅ ∷ : 300GIB 200G/B 100 1TIB 100GiB



4:00 PM

6:00 PM

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2:00 PM

UTC-4 10:00 AM

12:00 PM

2:00 PM

4:00 PM

6:00 PM

8:00 PM

UTC-4 10:00 AM

12:00 PM

Active revisions

UTC-4 10:00 AM

12:00 PM

2:00 PM

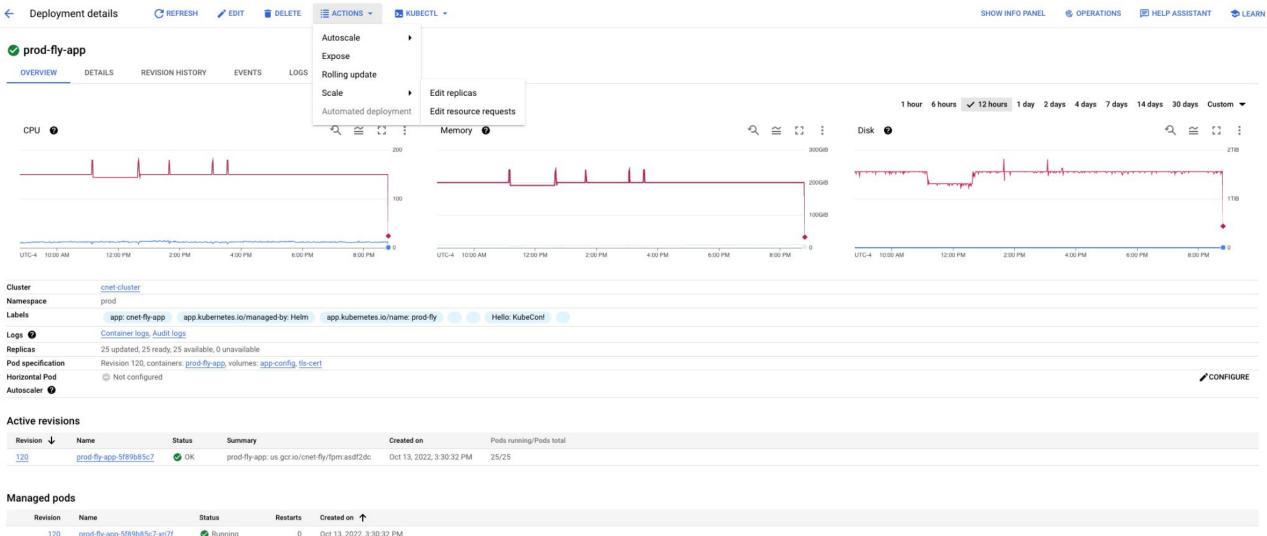
4:00 PM

6:00 PM

8:00 PM

Managed pods

Revision	Name	Status	Restarts	Created on ↑
120	prod-fly-app-5f89b85c7-xrj7f	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-46wln	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-8t9f9	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-zsmp7	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-cf95r	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-58xxt	Running	0	Oct 13, 2022, 3:32:14 PM
120	prod-fly-app-5f89b85c7-s4g7h	Running	0	Oct 13, 2022, 3:32:17 PM
120	prod-fly-app-5f89b85c7-qfjnf	Running	0	Oct 13, 2022, 3:32:18 PM
120	prod-fly-app-5f89b85c7-wf4rm	Running	0	Oct 13, 2022, 3:32:26 PM
120	prod-fly-app-5f89b85c7-h4f9c	Running	0	Oct 13, 2022, 3:32:37 PM



Revision	Name	Status	Restarts	Created on ↑
120	prod-fly-app-5f89b85c7-xrj7f	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-46wln	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-8t9f9	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-zsmp7	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-cf95r	Running	0	Oct 13, 2022, 3:30:32 PM
120	prod-fly-app-5f89b85c7-58xxt	Running	0	Oct 13, 2022, 3:32:14 PM
120	prod-fly-app-5f89b85c7-s4g7h	Running	0	Oct 13, 2022, 3:32:17 PM
120	prod-fly-app-5f89b85c7-qfjnf	Running	0	Oct 13, 2022, 3:32:18 PM
120	prod-fly-app-5f89b85c7-wf4rm	Running	0	Oct 13, 2022, 3:32:26 PM
120	prod-fly-app-5f89b85c7-h4f9c	Running	0	Oct 13, 2022, 3:32:37 PM



Current Tool Chain

- Helm
- Prometheus
- Grafana
- Cloud Logging / Metrics
- External DNS
- Cert-Manager
- Ingress
 - Traefik
 - GCE Ingress
 - Service Load Balancers
- Deckhand (Internal Tool)
- Jenkins





BUILDING FOR THE ROAD AHEAD

DETROIT 2022

Putting it all together

How It Starts



10:59 AM Karan Katyal ...

10:59 AM Karan Katyal Hey can you take a look at this ticket

10:59 AM Corey McGalliard Yep, on it!

Updates!



Description

Hey can you please update the font to Comic-Sans ?

Priority = Medium



Developer Workflow



Pipeline sandbox

This build requires parameters:

branchName

Which git branch to deploy.

cmcga1125/kubecon

sandboxName

Which sandbox name to deploy as {sandboxName}.nonprod.cnet.com.

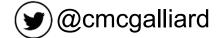
corey-test

autoPurge

How long do you need the sandbox?

1 day 💙

Declarative: Checkout SCM	git checkout + param creation	Setup Nuxt	Build Images	Build Node
14s	2s	4s	183ms	10min 21s
13s	2s	4s	200ms	17ms





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Google's Pixel Watch Could **Keep You From Dumping** Android

The Apple Watch has helped lock people into Apple's ecosystem. Google needs to do the same.

BY IMAD KHAN



Why You Might Want To Wait Before Buying an EV

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How Bad Is Flu Season 2022? Everything You Need to Know

BY JESSICA RENDALL



How 3 People Started New Paths to **Financial Success**

BY JACKIE LAM



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BY JACKSON RYAN



Google Pixel Event Live Blog: How to Watch and More

. LIVE BLOG



Kubernetes Native Objects

- Workload / Deployment
- Service
- Ingress
- ConfigMaps / Secrets



Workload / Deployment



<pre>[~]\$ kubectl get deployments.apps</pre>	-n core	y-test-fe-san	dbox		
NAME	READY	UP-TO-DATE	AVAILABLE	AGE	
corey-test-fe-sandbox-app	1/1	1	1	6m27s	
corey-test-fe-sandbox-nginx	1	1	6m27s		
[~]\$					
[~]\$ kubectl get pods -n corey-te	st-fe-sa	ndbox			
NAME	READ	Y STATUS	RESTARTS	AGE	
corey-test-fe-sandbox-app-767b5b8	l 1/1	Running	0	6m27s	
corey-test-fe-sandbox-nginx-ffff8	5 1/1	Running	0	6m27s	
F_7\$					

Networking

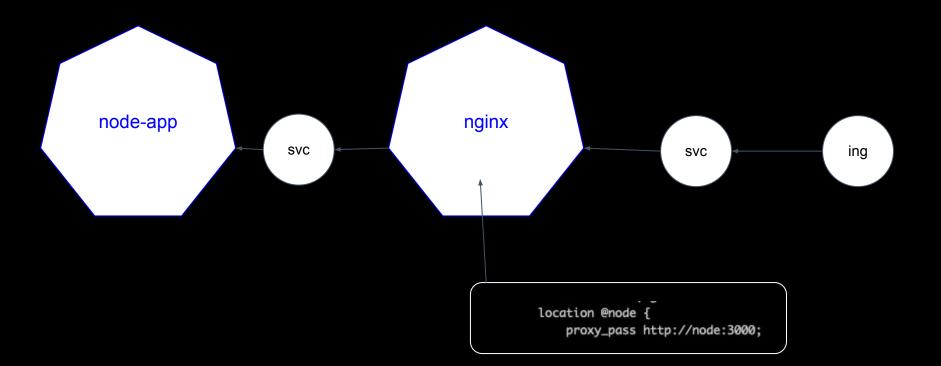


[~] * Kubectt get service - 11 corey-test-1	e-suriabox					
NAME	TYPE	CLUSTER-IP	EXTERNAL-IF	PORT(S	5)	AGE
corey-test-fe-sandbox-nginx-service	ClusterIP	10.163.50.97	<none></none>	80/TCF	,443/TCP	34h
node	ClusterIP	10.163.89.131	<none></none>	3000/7	ГCР	34h
[~]\$						
[~]\$ kubectl get ingress -n corey-test-f	e-sandbox					
NAME	CLASS	HOSTS		ADDRESS	PORTS	AGE
corey-test-fe-sandbox-nginx-ingress	<none></none>	corey-test.sandbox	x.cnet.com		80, 443	6m27s
[~]\$						

Networking



[~] * Kubecti get service - Il corey-test-	e-suriubux					
NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)		AGE
corey-test-fe-sandbox-nginx-service	ClusterI	P 10.163.50.97	<none></none>	80/TC	80/TCP,443/TCP	
node	ClusterI	P 10.163.89.131	<none></none>	3000/TCP		34h
[~]\$						
[~]\$ kubectl get ingress -n corey-test-f	e-sandbox					
NAME	CLASS	HOSTS	A	DDRESS	PORTS	AGE
corey-test-fe-sandbox-nginx-ingress	<none></none>	corey-test.sandbox	x.cnet.com		80, 443	6m27s
[~]\$						



Networking



```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  annotations:
    cert-manager.io/cluster-issuer: letsencrypt-production
    external-dns.alpha.kubernetes.io/target: traefik.sandbox.cnet.com
    kubernetes.io/ingress.class: traefik
    meta.helm.sh/release-name: corey-test-fe-sandbox
    meta.helm.sh/release-namespace: corey-test-fe-sandbox
    traefik.ingress.kubernetes.io/insecureSkipVerify: "true"
    traefik.ingress.kubernetes.io/router.tls: "true"
spec:
  rules:

    host: corey-test.sandbox.cnet.com

    http:
      paths:
      - backend:
          service:
            name: corey-test-fe-sandbox-nginx-service
            port:
              number: 443
        path: /
       pathType: ImplementationSpecific
  tls:
  - hosts:
    - corey-test.sandbox.cnet.com
   secretName: corey-test-fe-sandbox-certificate
```

[~]\$ kubectl get ingress -n corey-test-fe-sandbox corey-test-fe-sandbox-nginx-ingress -o yaml

ConfigMaps / Secrets



```
[~]$ kubectl get secrets -n corey-test-fe-sandbox corey-test-fe-sandbox-certificate -o yaml
apiVersion: v1
data:
 tls.crt: LS0tL....0tCq==
 tls.key: LS0tL....AD3G==
kind: Secret
metadata:
  annotations:
   cert-manager.io/alt-names: corey-test.sandbox.cnet.com
   cert-manager.io/certificate-name: corey-test-fe-sandbox-certificate
   cert-manager.io/common-name: corey-test.sandbox.cnet.com
   cert-manager.io/ip-sans: ""
   cert-manager.io/issuer-group: cert-manager.io
   cert-manager.io/issuer-kind: ClusterIssuer
   cert-manager.io/issuer-name: letsencrypt-production
   cert-manager.io/uri-sans: ""
 name: corey-test-fe-sandbox-certificate
 namespace: corey-test-fe-sandbox
type: kubernetes.io/tls
```



OSS and Internal Tools

- Helm
- Cert-Manager
- External DNS
- Traefik
- Deckhand
- Observability Suite
 - Prometheus
 - Alert Manager
 - Grafana
 - Google Cloud Logging
 - Google Cloud Metrics, Dashboards, and Alerts





Helm

- Tiller no more
- Deployment history and rollback
- Kubernetes manifest Flexability:
 - Templating
 - Logic gates
 - loops





Traefik Ingress Controller

- Carry over form Docker Swarm
- Similar to nginx ingress controller
 - Host Based Routing
 - Path Based Routing
- Support for
 - Cert-Manager
 - External DNS
 - GCP Load balancing



Traefik



```
[~]$ kubectl get ingress -n corey-test-fe-sandbox corey-test-fe-sandbox-nginx-ingress -o yaml
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  annotations:
    cert-manager.io/cluster-issuer: letsencrypt-production
    external-dns.alpha.kubernetes.io/taraet: traefik.sandbox.cnet.com
    kubernetes.io/ingress.class: traefik
    meta.helm.sh/release-name: corey-test-fe-sandbox
    meta.helm.sh/release-namespace: corev-test-fe-sandbox
    traefik.ingress.kubernetes.io/insecureSkipVerify: "true"
    traefik.ingress.kubernetes.io/router.tls: "true"
spec:
 rules:
  - host: corey-test.sandbox.cnet.com
   http:
      paths:
      - backend:
          service:
            name: corey-test-fe-sandbox-nginx-service
            port:
             number: 443
        path: /
       pathType: ImplementationSpecific
  tls:
  - hosts:
    - corey-test.sandbox.cnet.com
    secretName: corey-test-fe-sandbox-certificate
```

External DNS



containers: - args: - --log-level=info - --log-format=text - --policy=upsert-only - --provider=google - --registry=txt - --interval=1m - --txt-prefix=true - --source=service - --source=ingress - --google-project=dev-project

```
- --google-project=dev-project

[~]$ k get serviceaccounts -n external-dns external-dns -o yaml
apiVersion: v1
kind: ServiceAccount
metadata:
annotations:
iam.gke.io/gcp-service-account: dns@dev-project.iam.gserviceaccount.com
name: external-dns
namespace: external-dns
```

External DNS



```
[~]$ kubectl get ingress -n corey-test-fe-sandbox corey-test-fe-sandbox-nginx-ingress -o yaml
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  annotations:
    cert-manager.io/cluster-issuer: letsencrypt-production
    external-dns.alpha.kubernetes.io/target: traefik.sandbox.cnet.com
    kubernetes.io/ingress.class: traefik
    meta.helm.sh/release-name: corey-test-fe-sandbox
    meta.helm.sh/release-namespace: corey-test-fe-sandbox
    traefik.ingress.kubernetes.io/insecureSkipVerify: "true"
    traefik.ingress.kubernetes.io/router.tls: "true"
spec:
 rules:
  - host: corey-test.sandbox.cnet.com
   http:
      paths:
      - backend:
          service:
            name: corey-test-fe-sandbox-nginx-service
            port:
              number: 443
        path: /
       pathType: ImplementationSpecific
  tls:
  - hosts:
    - corey-test.sandbox.cnet.com
    secretName: corey-test-fe-sandbox-certificate
```

Cert Manager



```
[~]$ kubectl get clusterissuers.cert-manager.io letsencrypt-production -o yaml
apiVersion: cert-manager.io/v1
kind: ClusterIssuer
spec:
 acme:
   email: devops@redventures.com
   privateKeySecretRef:
     name: issuer-account-key
   server: https://acme-v02.api.letsencrypt.org/directory
    solvers:
    dns01:
        cloudDNS:
         project: devproject
[~]$ kubectl get serviceaccounts -n cert-manager cert-manager -o yaml
apiVersion: v1
kind: ServiceAccount
metadata:
 annotations:
   iam.gke.io/gcp-service-account: dns@devproject.iam.gserviceaccount.com
   meta.helm.sh/release-name: cert-manager
   meta.helm.sh/release-namespace: cert-manager
 name: cert-manager
 namespace: cert-manager
[~]$
```

Cert Manager



```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  annotations:
    cert-manager.io/cluster-issuer: letsencrypt-production
    external-dns.alpha.kubernetes.io/target: traefik.sandbox.cnet.com
    kubernetes.io/ingress.class: traefik
    meta.helm.sh/release-name: corey-test-fe-sandbox
    meta.helm.sh/release-namespace: corey-test-fe-sandbox
    traefik.ingress.kubernetes.io/insecureSkipVerify: "true"
    traefik.ingress.kubernetes.io/router.tls: "true"
spec:
  rules:

    host: corey-test.sandbox.cnet.com

    http:
      paths:
      - backend:
          service:
            name: corey-test-fe-sandbox-nginx-service
            port:
              number: 443
        path: /
       pathType: ImplementationSpecific
  tls:
  - hosts:
    - corey-test.sandbox.cnet.com
    secretName: corey-test-fe-sandbox-certificate
[~]$ kubectl get certs -n corey-test-fe-sandbox
                                         READY
                                                 SECRET
                                                                                           AGE
corey-test-fe-sandbox-certificate
                                                 corey-test-fe-sandbox-certificate
                                                                                           6m27s
                                         True
[~]$
```

[~]\$ kubectl get ingress -n corey-test-fe-sandbox corey-test-fe-sandbox-nginx-ingress -o yaml

Cert Manager



```
[~]$ kubectl get secrets -n corey-test-fe-sandbox corey-test-fe-sandbox-certificate -o yaml
apiVersion: v1
data:
 tls.crt: LS0tL....0tCq==
 tls.key: LS0tL....AD3G==
kind: Secret
metadata:
  annotations:
   cert-manager.io/alt-names: corey-test.sandbox.cnet.com
   cert-manager.io/certificate-name: corey-test-fe-sandbox-certificate
   cert-manager.io/common-name: corey-test.sandbox.cnet.com
   cert-manager.io/ip-sans: ""
   cert-manager.io/issuer-group: cert-manager.io
   cert-manager.io/issuer-kind: ClusterIssuer
   cert-manager.io/issuer-name: letsencrypt-production
   cert-manager.io/uri-sans: ""
 name: corey-test-fe-sandbox-certificate
 namespace: corey-test-fe-sandbox
type: kubernetes.io/tls
```



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Deckhand (internal)



Pipeline sandbox

This build requires parameters:	
branchName	
Which git branch to deploy.	
cmcga1125/kubecon	
sandboxName Which sandbox name to deploy as {sandboxName	ne}.nonprod.cnet.com.
corey-test	
autoPurge	
How long do you need the sandbox?	
1 day 💙	



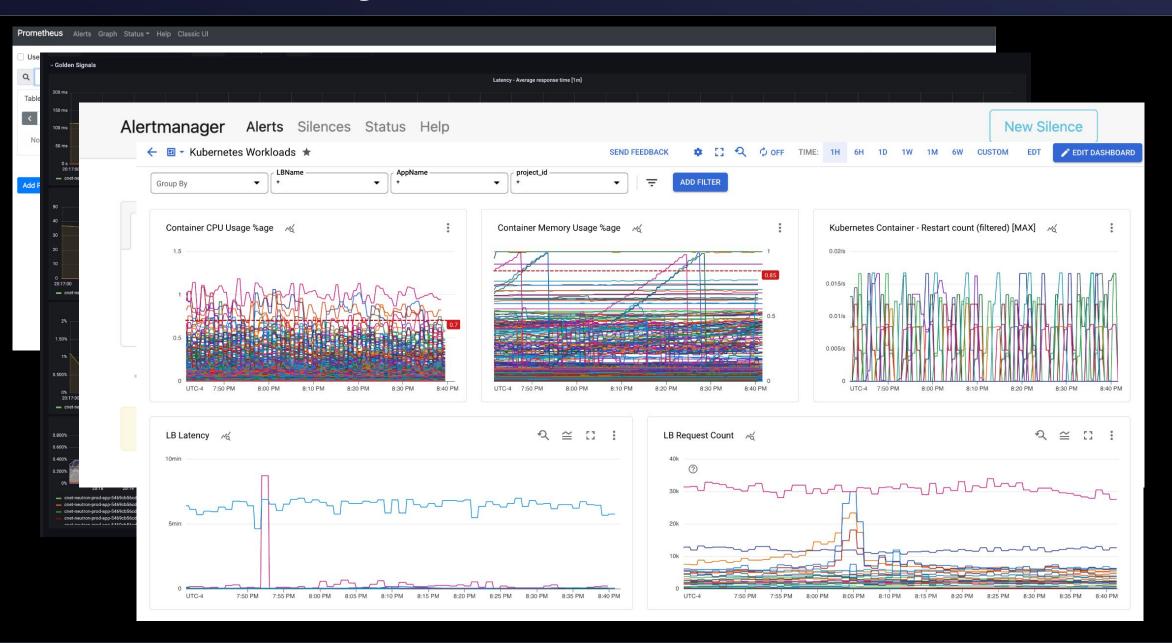
Deckhand (internal)



```
[~]$ kubectl get configmaps -n corey-test-fe-sandbox corey-test-fe-sandbox-purge -o yaml
apiVersion: v1
data:
  purge: 2022-10-06 14:59:53 +0000
kind: ConfigMap
metadata:
  labels:
    app.kubernetes.io/managed-by: Helm
    deckhand.io/purge: "true"
  namespace: corey-test-fe-sandbox
[~]$ kubectl logs deckhand-27750425-z4qk8
--- config ---
dry-run: false
labelMatcher: deckhand.io/purge=true
                                                                                                                  NamespaceDeleted
          Namespace
                                              Created
                                                                                PurgeDate
PURGE
                                              2022-10-04 17:01:11 +0000 UTC
                                                                                2022-10-06 14:59:00 +0000 UTC
false
          corey-test-neutron-sandbox
                                                                                                                  false
[~]$
```

Observability







Integration & Promotion

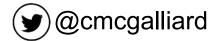
- Very little changes between Sandboxes, Development, and Production
 - Internal vs external ingress
 - Replica count
 - Resource requests/limits
 - Workload separation





RoadMap

- GCP Managed Prometheus
- Ingress to Gateway API?
- Policy management / kyverno
 - Admission controller
 - Mutating webhooks
- Supply chain hardening
- Improved observability stack
- GitOps / Pull Methodology



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Thanks!