GKE: Kubernetes, and beyond

Mathieu Benoit
Customer Engineer - Google Cloud

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Today’s Agenda

01 Containers & Kubernetes

02 GKE

03 CI/CD

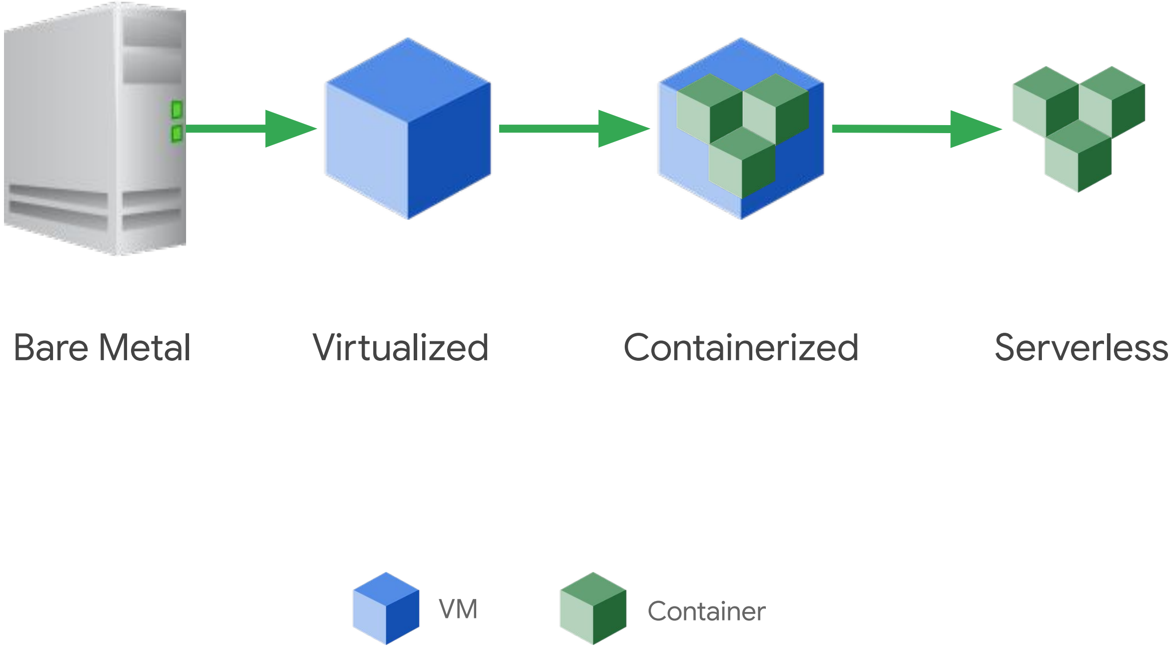
04 Service Mesh

05 Security

06 Anthos

Q&A

Evolution of Dev-Compute



Bare Metal

Virtualized

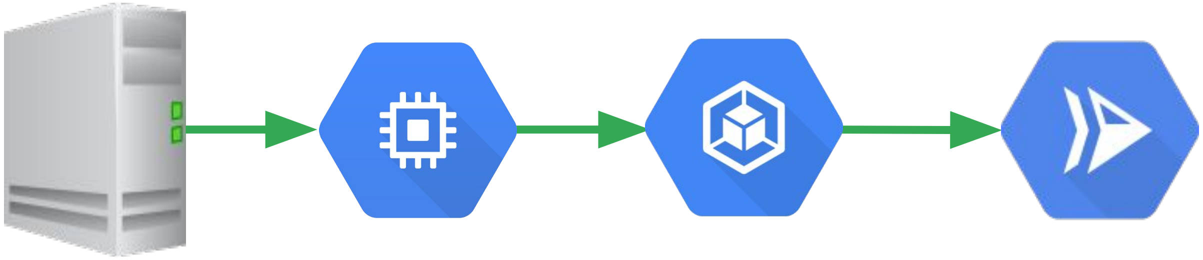
Containerized

Serverless

VM

Container

Evolution of Dev-Compute



On-Prem

Compute Engine

Kubernetes Engine

Cloud Run

Containers

A better way to develop and deploy applications

- Immutable infrastructure
- Faster deployments
- Reusability
- Versioning
- Isolation
- Portability
- Introspection
- Ease of sharing

What is Kubernetes?

- A portable, open-source, **container-centric** management platform
- Built-in primitives for **deployments, rolling upgrades, scaling, monitoring, and more**
- Inspired by **Google's internal systems**
- Get true **workload portability** and increased **infrastructure efficiency**

Kubernetes Handles

Scheduling:
Decide where my containers should run

Lifecycle and health:
Keep my containers running despite failures

Scaling:
Make sets of containers bigger or smaller

Naming and discovery:
Find where my containers are now

Load balancing:
Distribute traffic across a set of containers

Storage volumes:
Provide data to containers

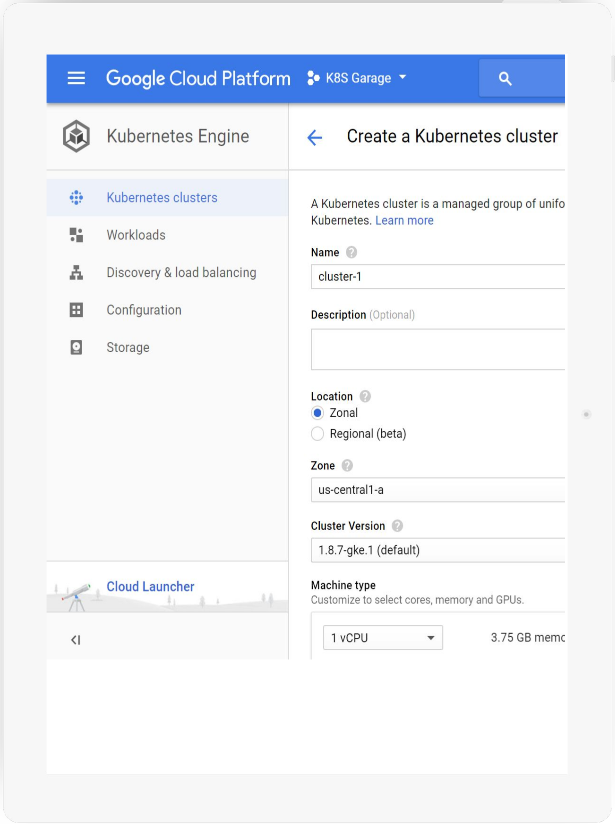
Logging and monitoring:
Track what’s happening with my containers

Debugging and introspection:
Enter or attach to containers

Identity and authorization:
Control who can do things to my containers

GKE,
Kubernetes the Easy Way,
Standard or Autopilot

- Enterprise container management from Google
- Start a cluster with one-click
- View your clusters and workloads in a single pane of glass
- Google keeps your cluster up and running



Create a Kubernetes cluster

A Kubernetes cluster is a managed group of unifo
Kubernetes. Learn more

Name: cluster-1

Description (Optional)

Location
● Zonal
○ Regional (beta)

Zone: us-central1-a

Cluster Version: 1.8.7-gke.1 (default)

Machine type
Customize to select cores, memory and GPUs.

1 vCPU 3.75 GB memc

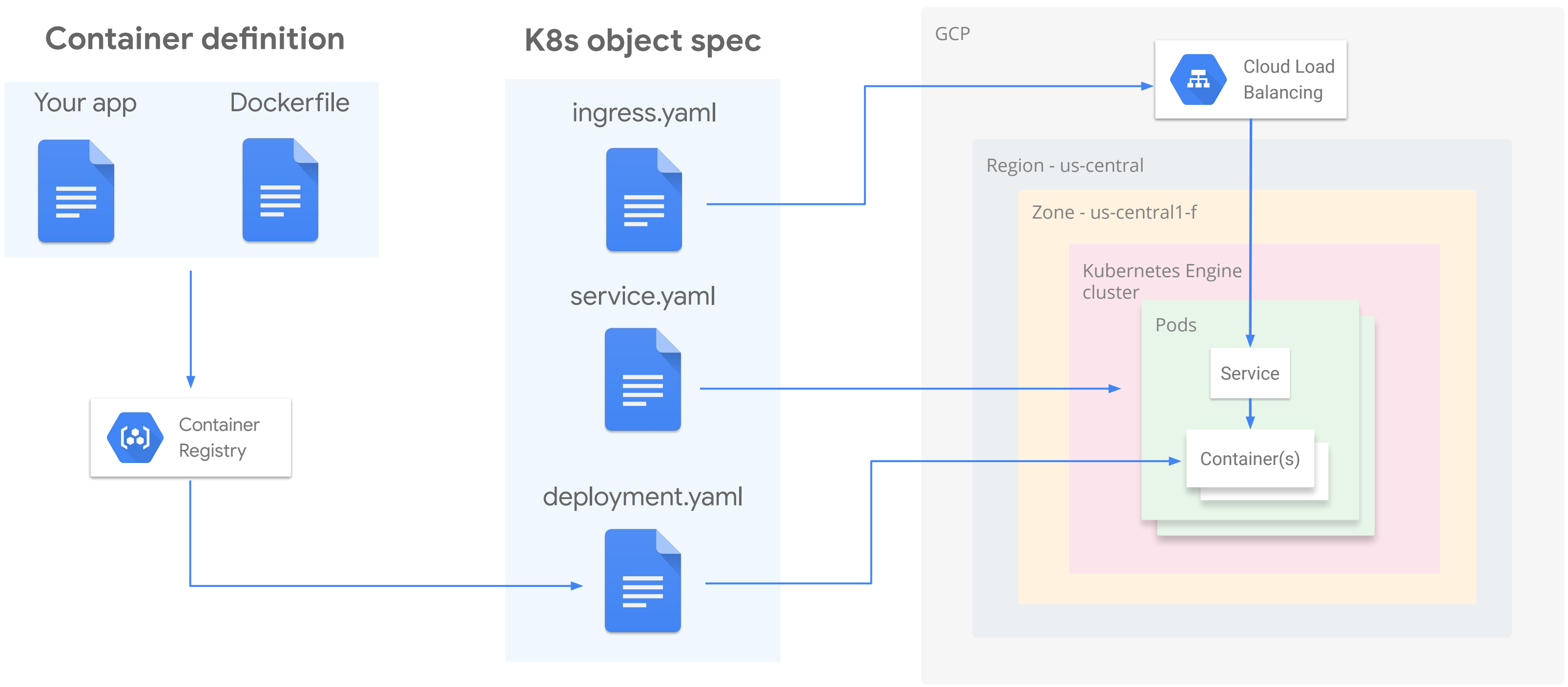
Autopilot: a hands-off Kubernetes experience

- Optimized for production by K8s experts
- **SLA** on control plane, nodes and **Pods** (all monitored by Google)
- Google is your SRE
- Secure by default with hardening guidelines implemented
- Resources provisioned based on workload
- It’s still Kubernetes, still GKE

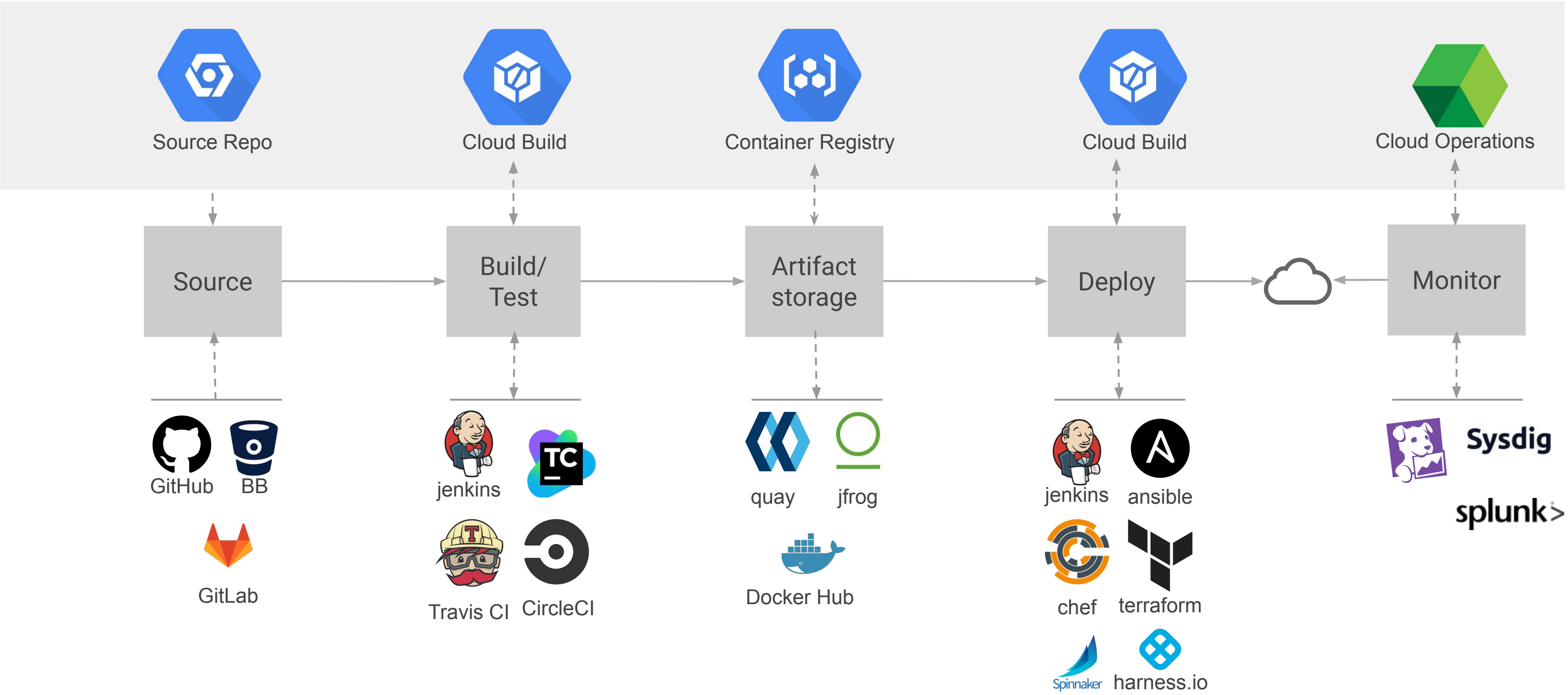
demo

Create a GKE cluster

Deploying containers in GKE



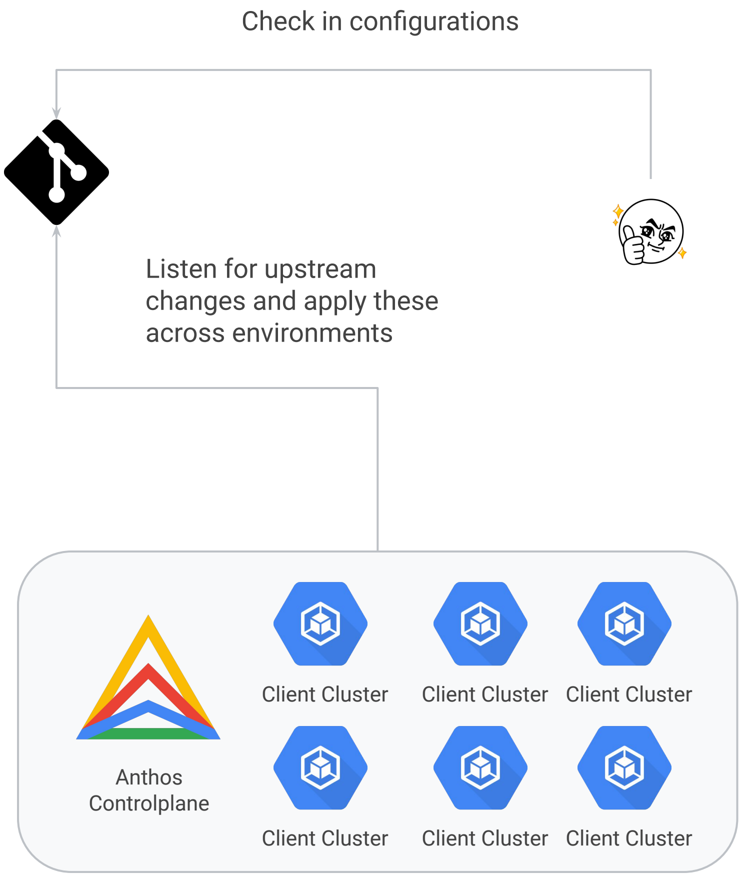
CI/CD with Containers



GitOps At Scale

Anthos Config Management (ACM) is a GitOps automation suite that provides policy and configuration at scale

- Synchronizes configuration for any cluster, either on-prem and in the cloud
- Continuously enforcements compliance policies
- Enables end-to-end auditability and CI peer-review through policy-as-code
- Can **manage all your cloud infrastructure**, not just your Kubernetes apps


Check in configurations

Listen for upstream changes and apply these across environments

demo

Continuous Integration (CI) & GitOps with ACM

Monitoring and Management

Logging

Collect Logs from Platforms, Apps and Services

- Log search/view/filter
- Error reporting & Dashboard
- Log Metrics
- Log Router for easy export

Monitoring

Monitor metrics from Platforms, App, Services and Microservices

- Dashboards
- Metrics Explorer/Custom Metrics
- Uptime Checks
- Service Monitoring
- Alert Management

APM

Monitor and troubleshoot Application performance

- Trace - Latency analysis across distributed apps
- Profiler - CPU and memory profiling
- Debugger - In production debug and conditional snapshots

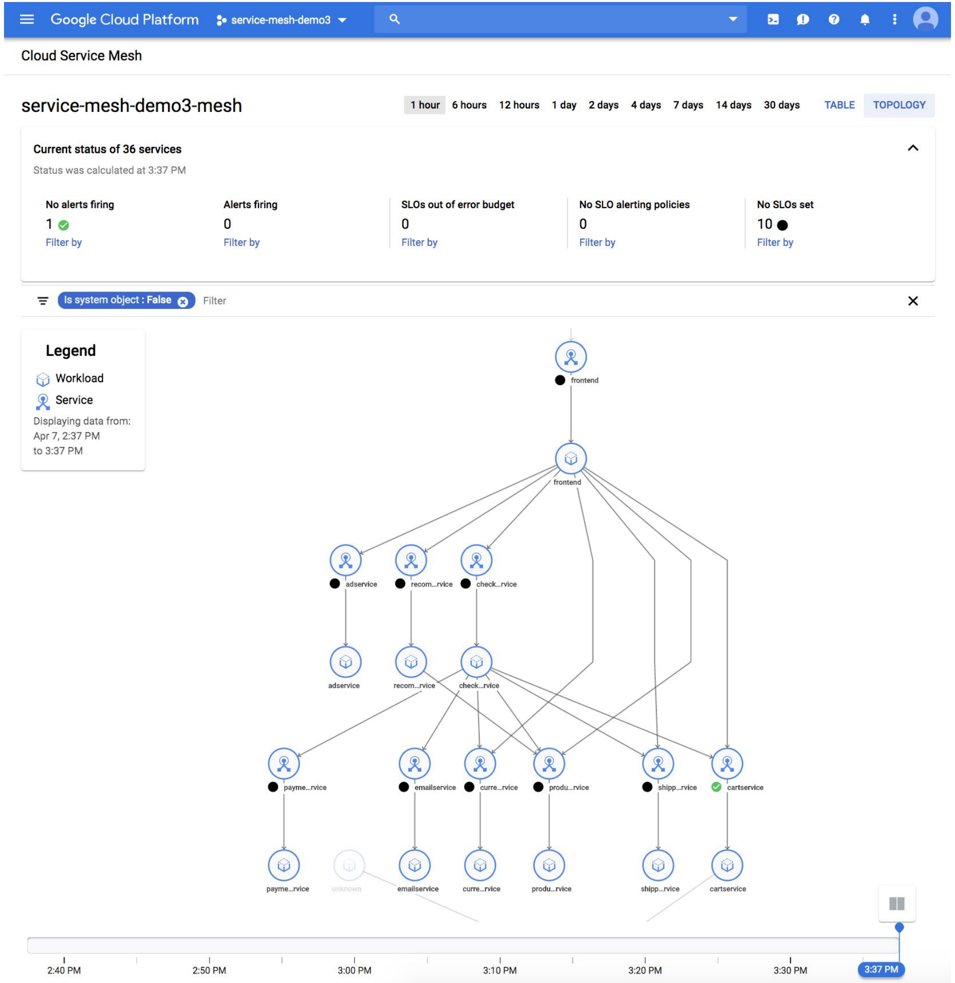
Anthos Service Mesh

Managed control plane

- Managed telemetry backends
- Mesh CA
- Managed control plane

Out of the box service management

- Metrics, logging, tracing, SLOs
- Service security, authentication, encryption, and authorization
- Traffic management: routing, load balancing



Google Cloud Platform · service-mesh-demo3

Cloud Service Mesh

service-mesh-demo3-mesh

1 hour · 6 hours · 12 hours · 1 day · 2 days · 4 days · 7 days · 14 days · 30 days · TABLE · TOPOLOGY

Current status of 36 services

Status was calculated at 3:37 PM

No alerts firing	Alerts firing	SLOs out of error budget	No SLO alerting policies	No SLOs set
1 ✓	0	0	0	10 ●
Filter by	Filter by	Filter by	Filter by	Filter by

Is system object : False · Filter

Legend

Workload

Service

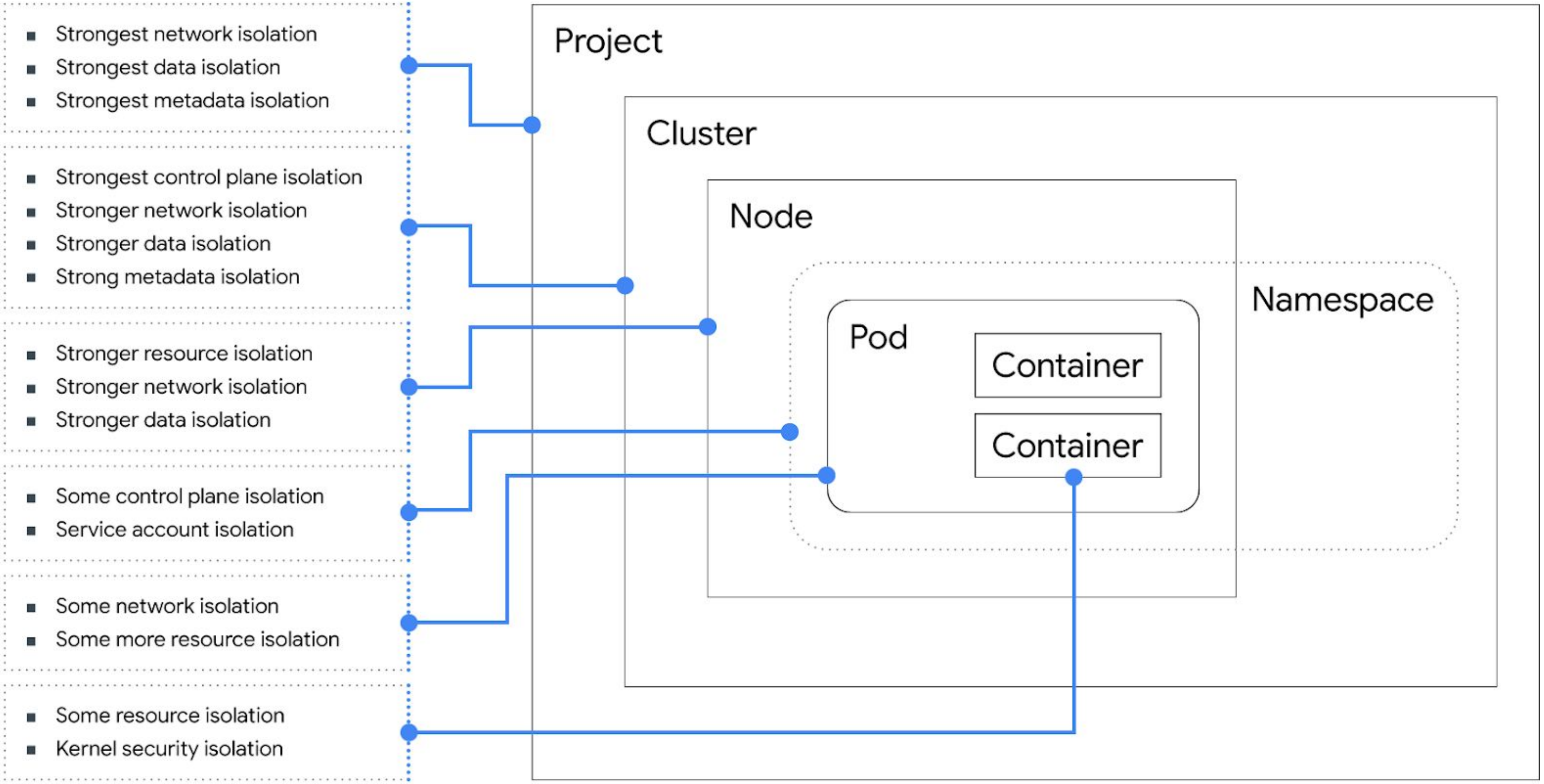
Displaying data from: Apr 7, 2:37 PM to 3:37 PM

demo

Cloud Monitoring & Anthos Service Mesh

At a glance Security

- All GKE components are **encrypted at rest**. This includes etcd where secrets are stored.
- **TLS** for master-to-master and node-to-master communication
- **Container-Optimised OS (COS)** hardened, google tested images on all nodes
- **Network policies** to control pod-to-pod (**Istio** to encrypt), ingress and egress communication
- **Private clusters** makes your master inaccessible from the public internet
- **Metadata concealment** isolates workloads from node metadata



- Strongest network isolation
- Strongest data isolation
- Strongest metadata isolation

- Strongest control plane isolation
- Stronger network isolation
- Stronger data isolation
- Strong metadata isolation

- Stronger resource isolation
- Stronger network isolation
- Stronger data isolation

- Some control plane isolation
- Service account isolation

- Some network isolation
- Some more resource isolation

- Some resource isolation
- Kernel security isolation

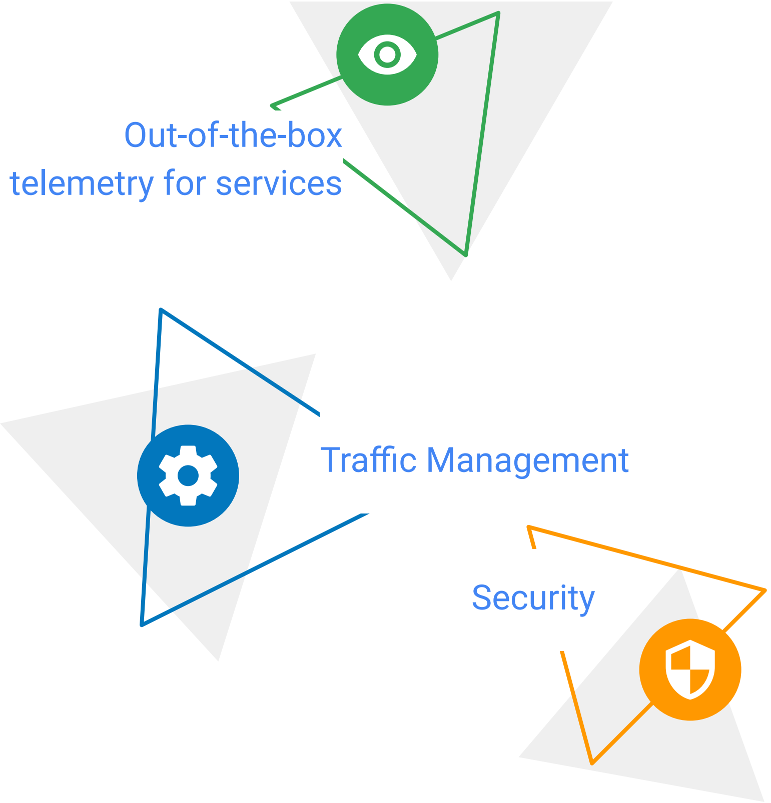
Best practices to harden your clusters

Kubernetes	
Current release	Maintain the latest version of Kubernetes
K8s namespaces	Separate workloads
RBAC	Set permissions at the namespace level, by role
Network policy	Limit pod to pod traffic by whitelist
Audit Logging	Log actions for review and automated alerting
Taints/tolerations	Prevent nodes from running certain pods
Pod Security Policy	Set restrictions for running pods in a cluster
Minimal OS	Limit the surface of attack
GKE	
Min IAM roles	Create a limited service account just to manage GKE
Metadata concealment	Protect user pods from accessing node metadata
Authorized networks	Limit access to the API server to certain IP addresses only
Private clusters	Use only private IPs in the RFC1918 space for a cluster master and nodes
Linux extras	
seccomp	Limit syscalls
AppArmor	Limit filepath accesses for the program

Zero Trust Networking

Anthos Service Mesh (ASM) provides service management and a single pane of glass for

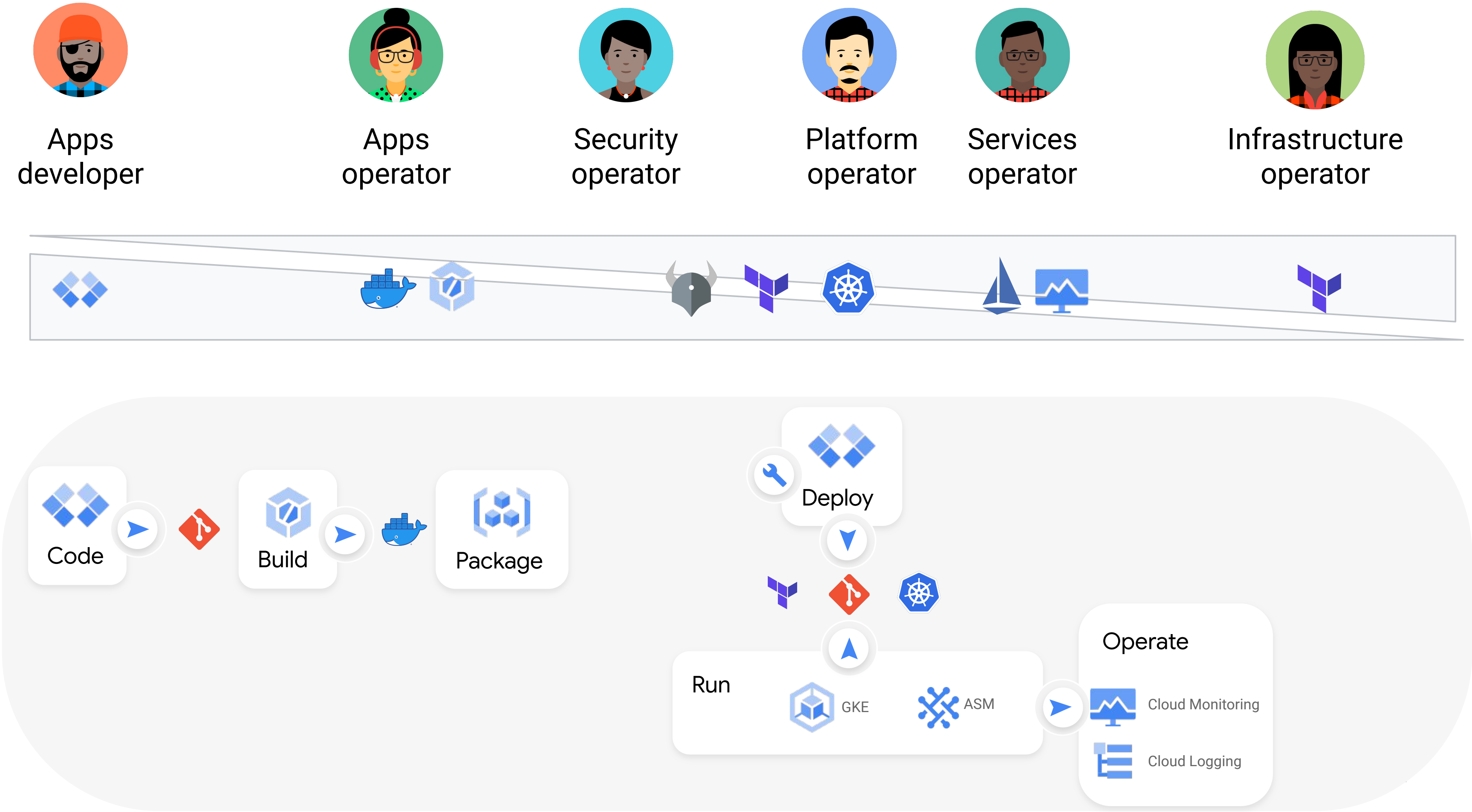
- Logging, metrics, and SLO monitoring
- Service identity, AuthN/Z, and encryption
- Traffic management: routing, and load balancing
- AI-driven curated insights, recommendations, and operating analytics



demo

Security & Governance

Google Cloud



Apps developer

Apps operator

Security operator

Platform operator

Services operator

Infrastructure operator

Code

Build

Package

Deploy

Run

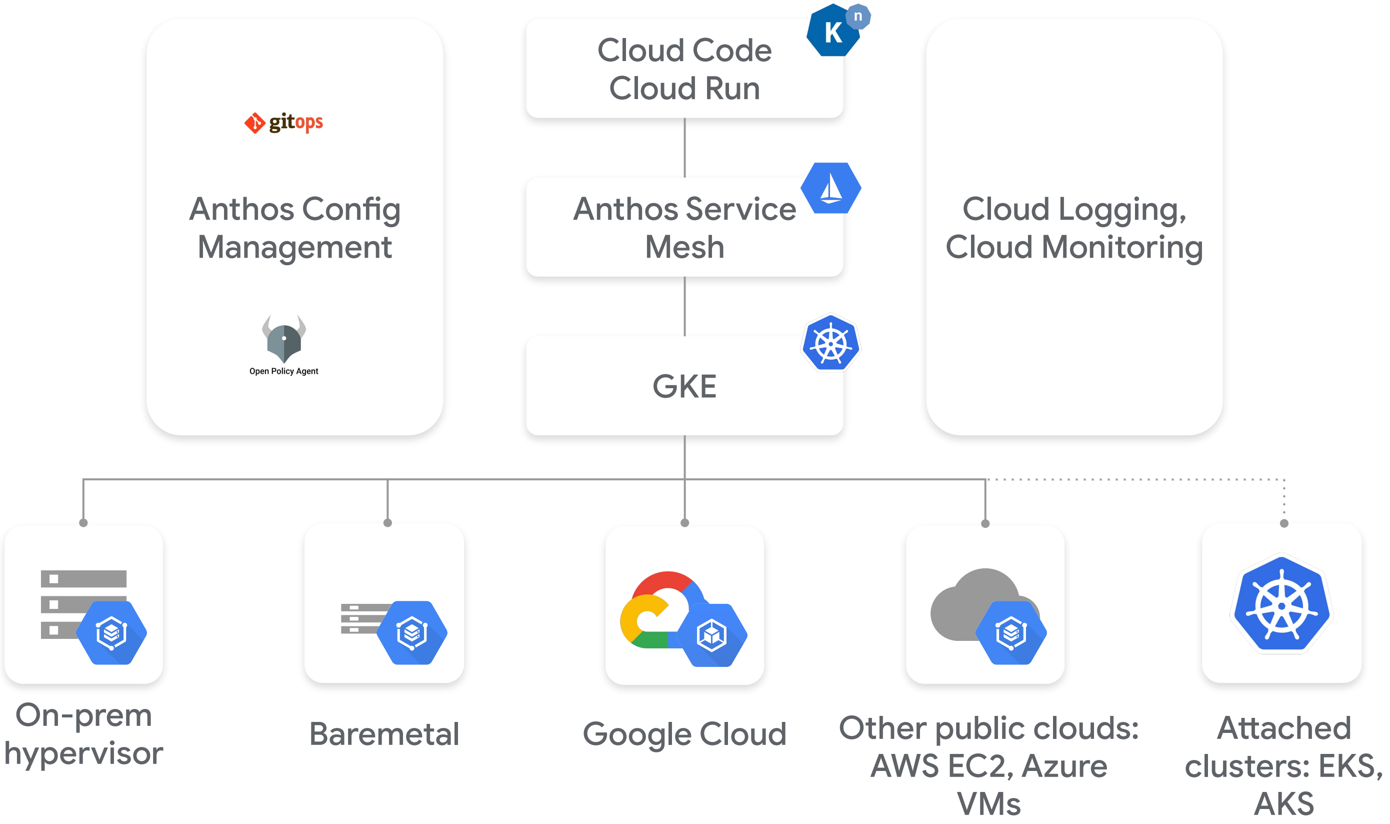
GKE

ASM

Operate

Cloud Monitoring

Cloud Logging


gitops
Anthos Config Management
Open Policy Agent
Cloud Code
Cloud Run
Anthos Service Mesh
GKE
Cloud Logging, Cloud Monitoring
On-prem hypervisor
Baremetal
Google Cloud
Other public clouds: AWS EC2, Azure VMs
Attached clusters: EKS, AKS

Resources

- 6 more reasons why GKE is the best Kubernetes service
- Introducing GKE Autopilot
- GKE Autopilot: run workloads not infrastructure
- Looking ahead as GKE, the original managed Kubernetes, turns 5
- Congrats, you bought Anthos! Now what?

- Start your K8s learning journey with hands-on training at no cost
- App Modernization for CIO ebook
- Anthos ebook

- Script for the demos + `cartservice` source code + ACM repo with Kubernetes manifests

That’s a wrap!
Q&A