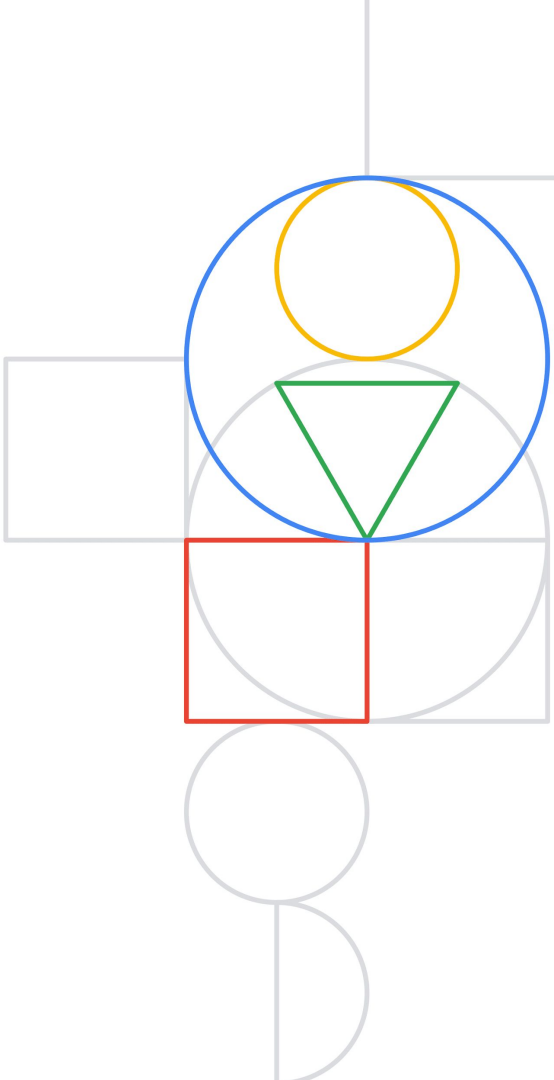
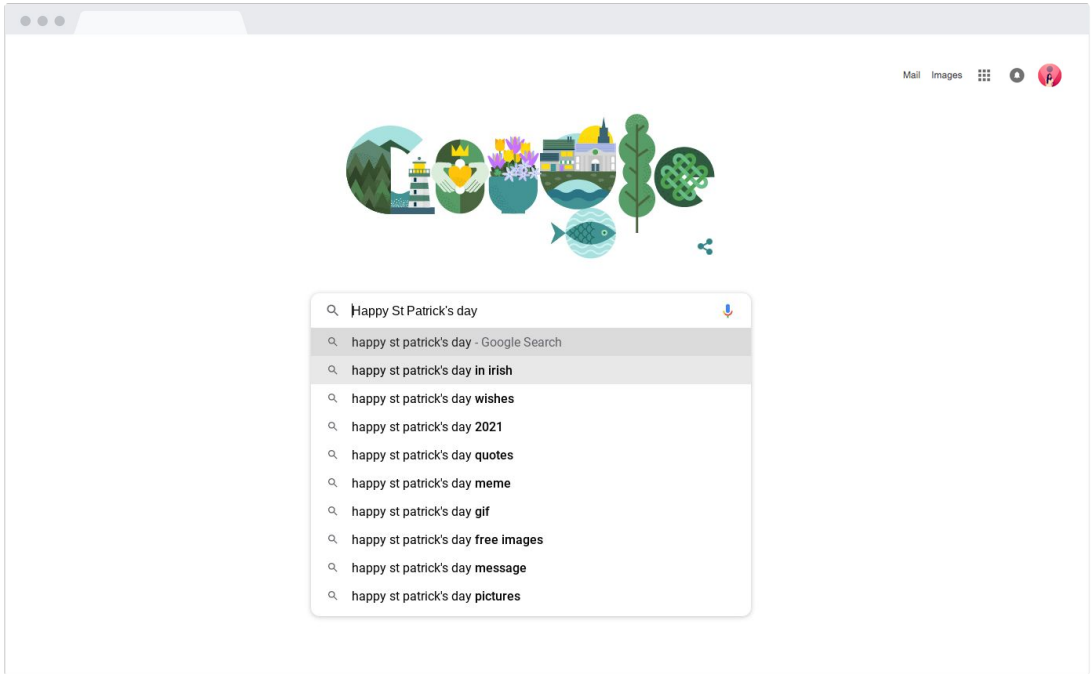
Multi-cloud, Multi-cluster

Where are we, and what's ahead

Mathieu Benoit
Customer Engineer - Google Cloud

March, 2021

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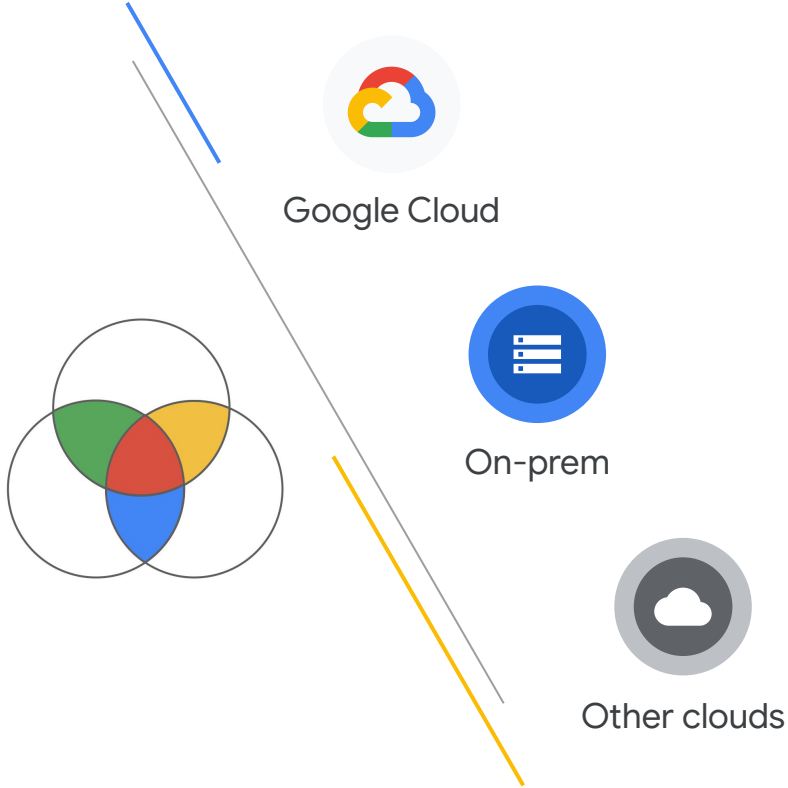
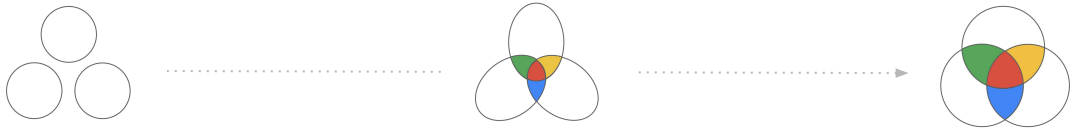
Disclaimers and objectives

- It's not a "battle" between cloud providers
- It's about concepts, here illustrated with Anthos
- Most of them could be applied with your own tools/services
- Kubernetes concepts extended to help you with multi-cloud
- Some use cases won't be applicable (yet) for your own context
- Most of the concepts are applicable to Mono-cloud too
- Personas, beyond devs with a focus on governance and security

- Please, share your own experiences, thoughts, remarks and questions



Cloud Maturity Scale



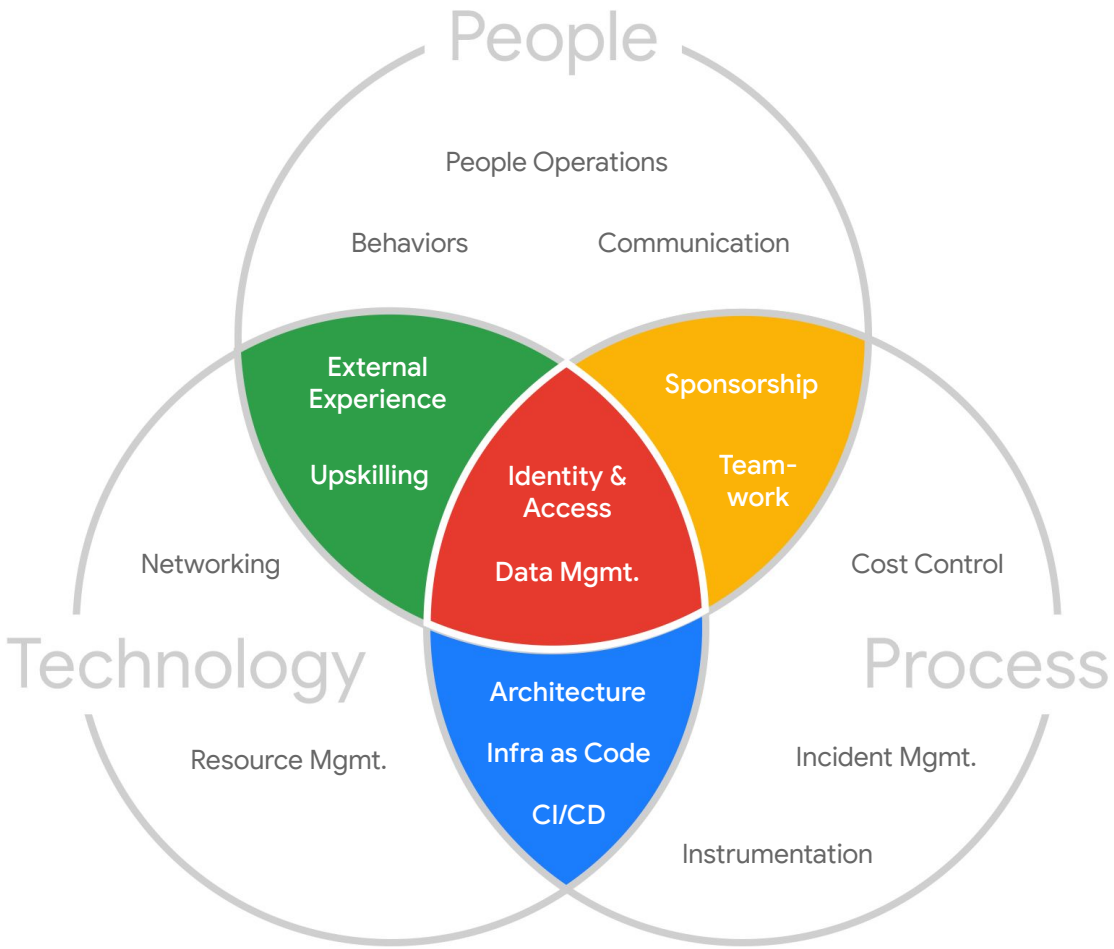
	Tactical	Strategic
Learn	Self-taught, 3rd party reliance	Peer learning & sharing, 3rd party staff aug. only
Lead	Teams by function, heroic project manager	Cross-functional feature teams, greater autonomy
Scale	Change is slow & risky, operations heavy	Change is constant, low risk, low-ops/no-ops
Secure	Fear of public Internet but trust in private network	Trust only the right people, devices & services

Learn

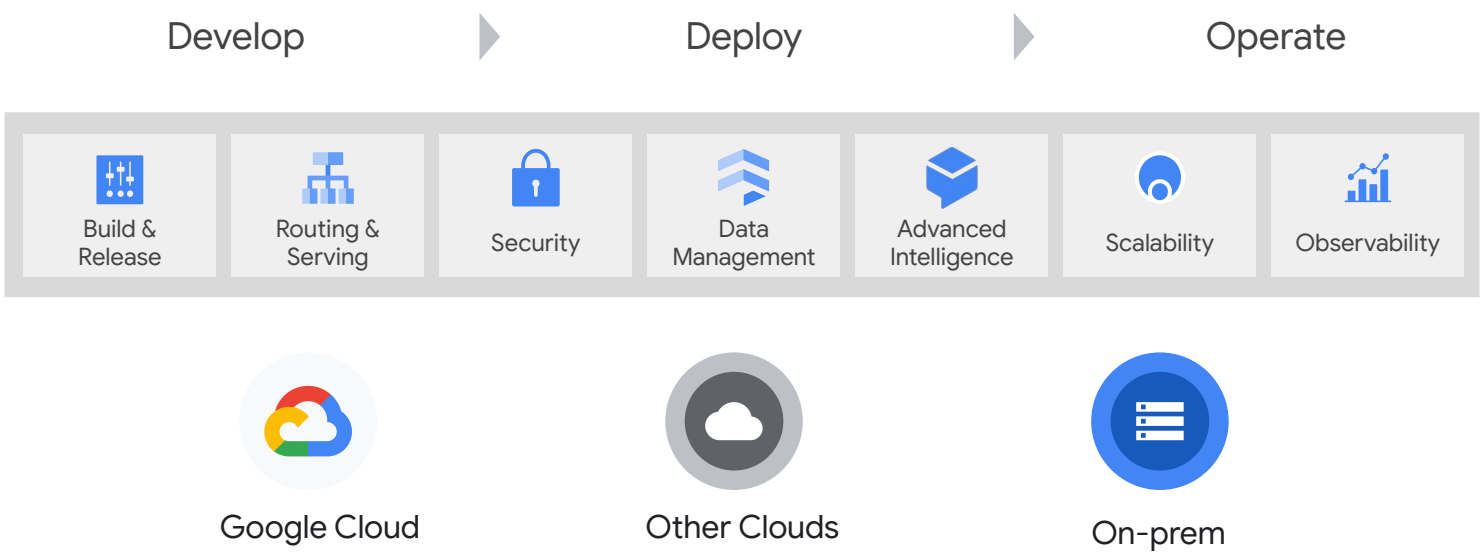
Lead

Scale

Secure



Faster and more secure development, deployment and operations, on different platforms



Multi-cloud challenges

Data Silos

Organizations cannot get single view of there data assets

Security

Different security models across clouds makes it challenging to manage

Tooling

Different tools and services to learn

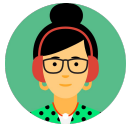
Capabilities

Analytical capabilities are limited on other clouds

Financial Governance

Different pricing models and unpredictable pricing makes it harder to manage

Apps developer



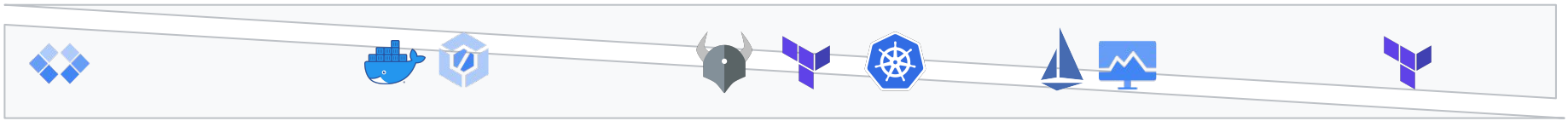
Apps operator

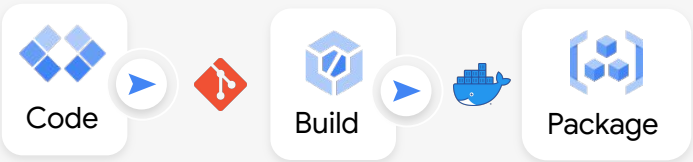
Security operator

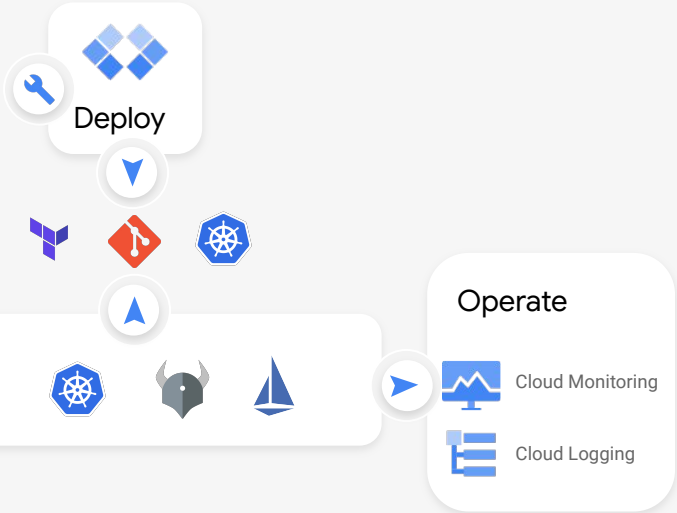
Platform operator

Services operator

Infrastructure operator







Organizations are learning how to develop with Kubernetes

INSIDER

Kubernetes is so hard—but worth the pain

2019 will be a challenging year for some enterprises as they try to turn Kubernetes hype into production reality

By Matt Asay

InfoWorld | DEC 21, 2018

Kelsey Hightower

@kelseyhightower

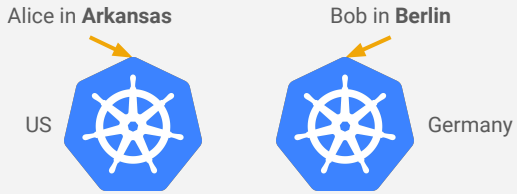
Follow

The value of platforms like App Engine, Cloud Foundry, OpenShift, and Heroku should not be understated. The majority of roll your own solutions don't come close in terms of ability to consistently ship software.

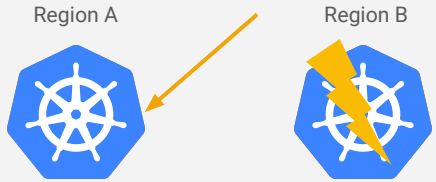
9:37 AM - 27 Nov 2017

Multi-Cluster Use Cases

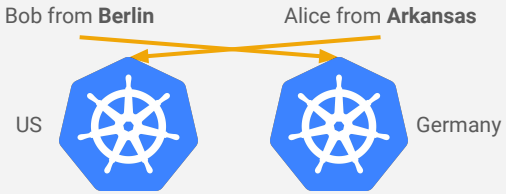
Low-Latency Services



High Availability



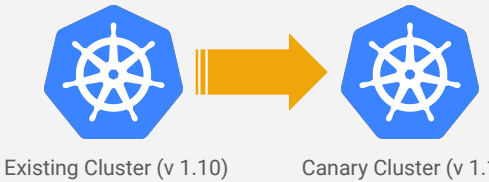
Data Locality*



Environment Separation
(by Team, Tenant, Dev/Stage/Prod)

Multi-Cloud & Hybrid*

Migration & Canary

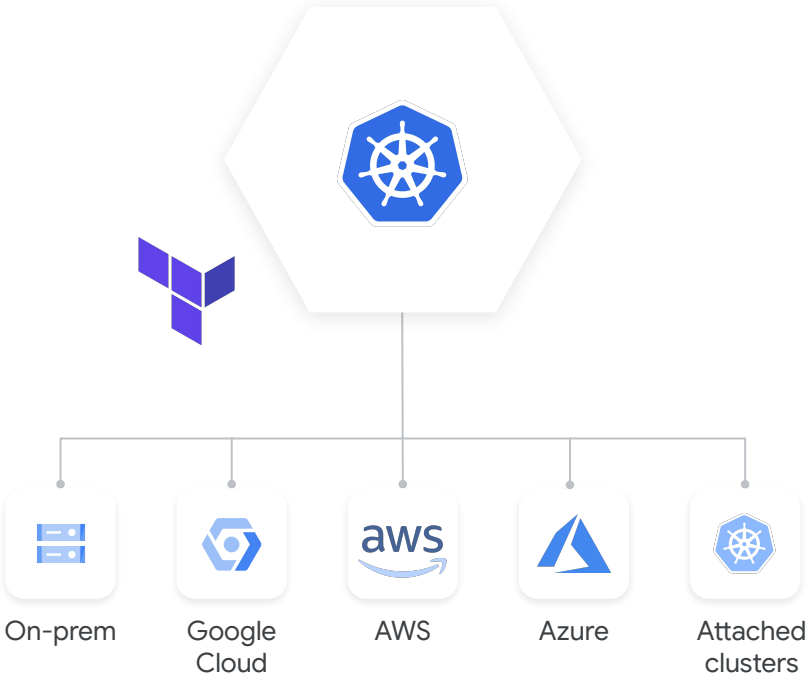


Common platform, consistent tools

Infrastructure operator

Platform operator

> We want to reduce operational overhead, maximize portability, ensure consistency and simplify configuration across all platforms.

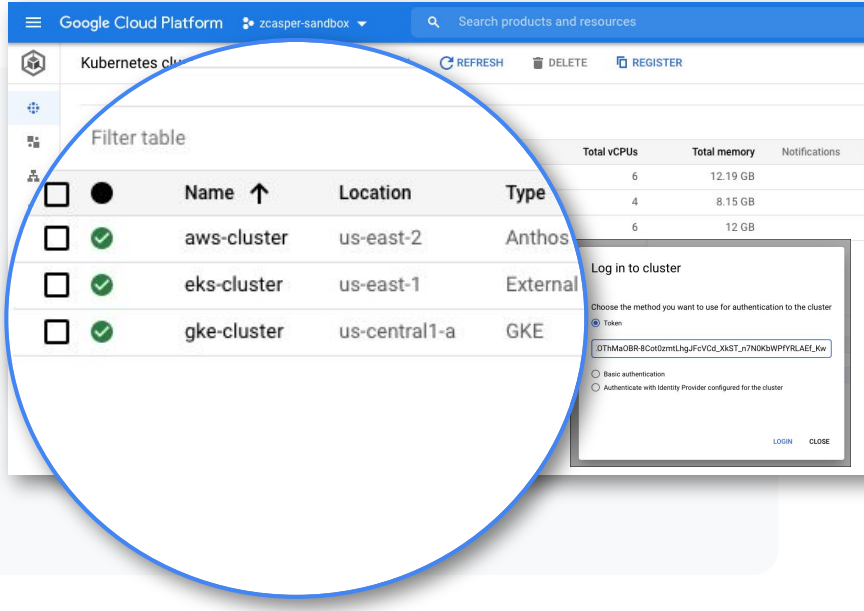


Multi-cluster visibility

Infrastructure operator

Platform operator

> We need to securely view clusters, workloads, services, and custom resources across all platforms.



Cloud Console

On-prem

Google Cloud

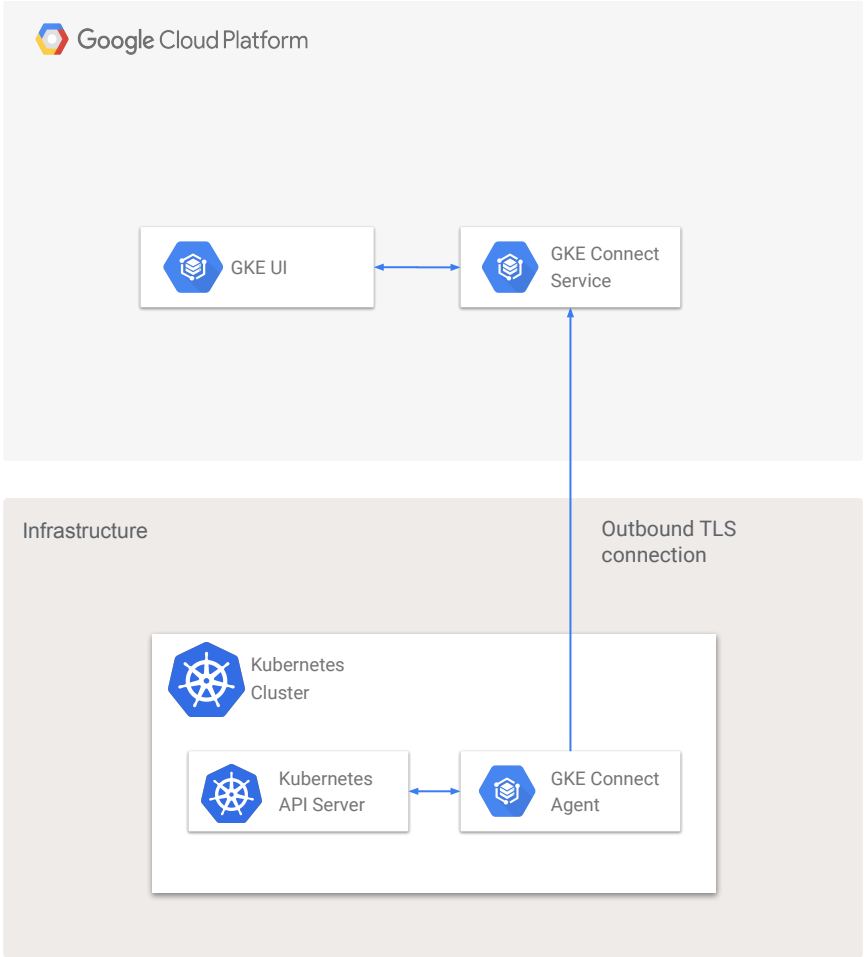
AWS

Azure

Attached clusters

Connecting your cluster to Google

- Register your cluster with GCP and install the GKE Connect Agent in your cluster
- No public IP required for your cluster
- Traverses VPNs, NATs, firewalls, and proxies

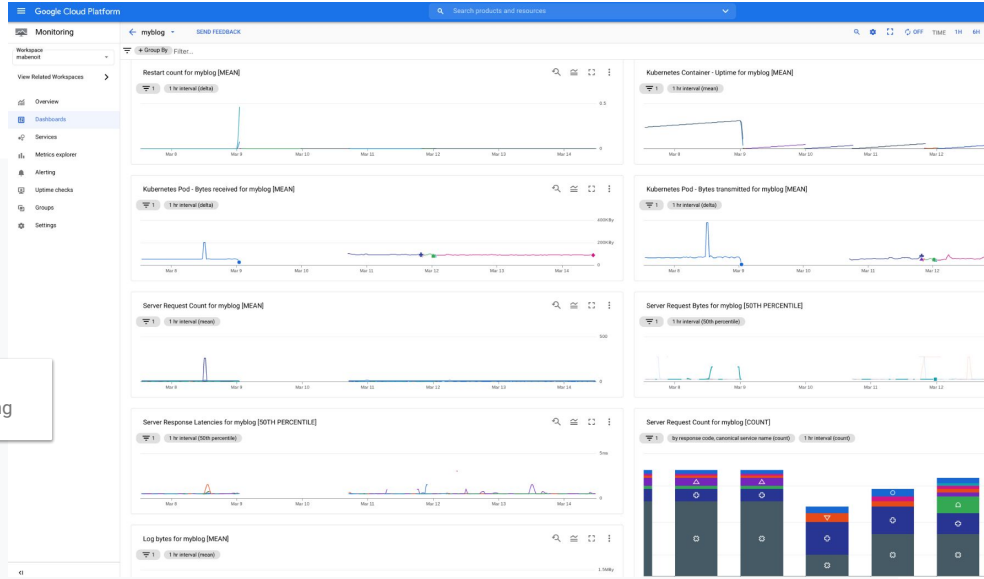


Monitoring & Logging

Services operator

Platform operator

> We need to collect metrics and have uniform observability across all platforms.



Cloud Monitoring

On-prem

Google Cloud

AWS

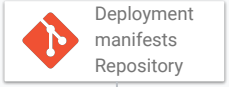
Azure

Attached clusters

Apps and Services

Platform operator

"I need to deploy apps consistently across all platforms."




```
apiVersion: apps/v1
kind: Deployment

    apiVersion: v1
    kind: Service
```

On-prem

Google Cloud

AWS

Azure

Attached clusters

Policy & Security

Security operator

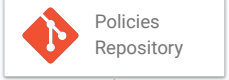
"I need to guarantee a security-first approach across all platforms."

```
apiVersion: constraints.gatekeeper.sh/v1beta1
kind: K8sAllowedRepos
```

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
```

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
```

```
apiVersion: apps/v1
kind: Deployment
...
          securityContext:
            capabilities:
              drop:
                - all
            runAsNonRoot: true
            allowPrivilegeEscalation: false
            readOnlyRootFilesystem: true
```



On-prem

Google Cloud

AWS

Azure

Attached clusters

Infra as Kubernetes resources

Platform operator

"I want a flexible and secure way to provision common cloud resources required for apps."

Manifests Repository

```
apiVersion: storage.cnrm.cloud.google.com/v1beta1
kind: StorageBucket
```

```
apiVersion: azure.microsoft.com/v1alpha1
kind: BlobContainer
```

```
apiVersion: s3.services.k8s.aws/v1alpha1
kind: Bucket
```

On-prem

Google Cloud

AWS

Azure

Attached clusters

Traffic Management

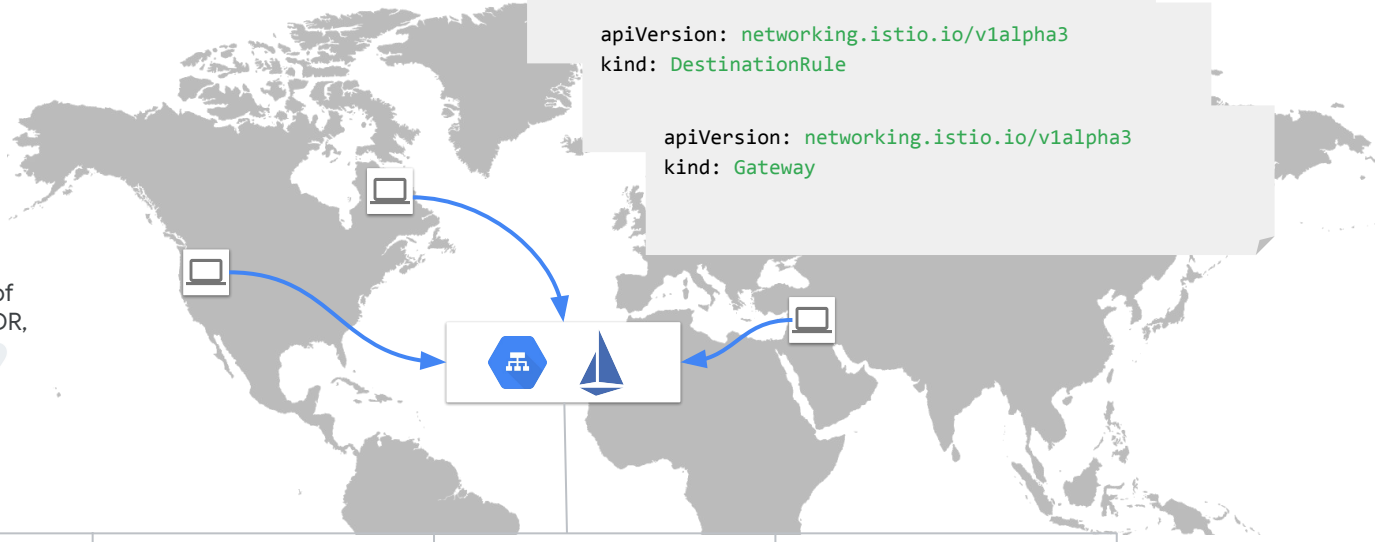
Services operator

"I need to manage and secure traffic of the services across all platforms (HA, DR, Canary, Proximity, mTLS, etc.)"

```
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService

    apiVersion: networking.istio.io/v1alpha3
    kind: DestinationRule

        apiVersion: networking.istio.io/v1alpha3
        kind: Gateway
```



On-prem

Google Cloud

AWS

Azure

Attached clusters

That’s a wrap!

Policy and configuration management

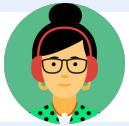
Anthos Config Management

Operations management

Cloud Logging, Cloud Monitoring, Cloud Trace

Application & service management

Anthos Service Mesh, Cloud Run, Cloud Build



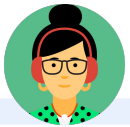
Infrastructure management

Anthos Multicloud API, Anthos Hybrid Networking

Security management

Anthos Identity Services

Binary Authorization



On-prem

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AWS

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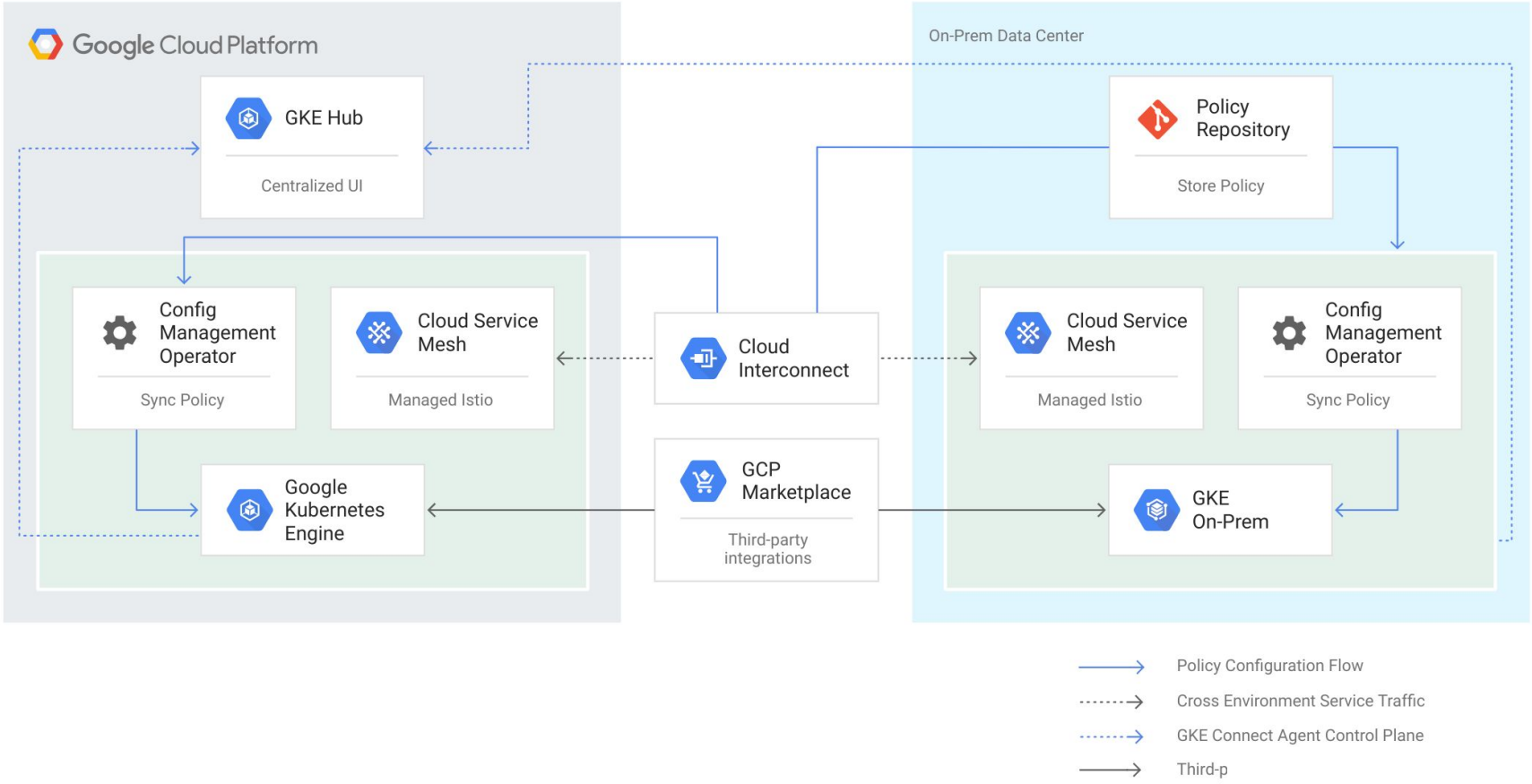
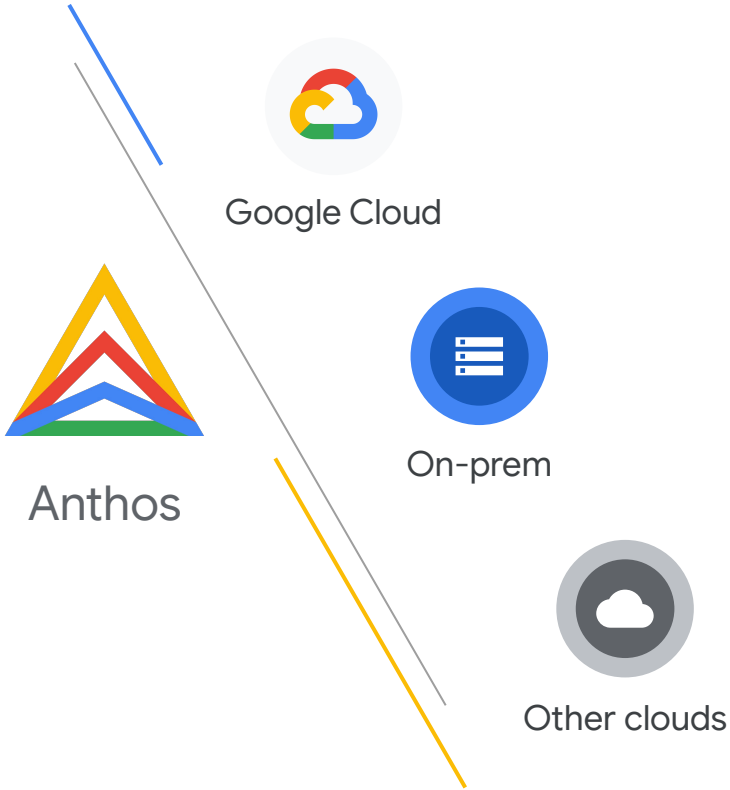
Attached clusters

Architecture example



Resources

- Cloud Adoption Framework (GCP)
- Hybrid cloud vs. multi-cloud
- Practical Guide to Cloud Migration (Google SRE)
- Anthos under the hood
- Config Sync
- Policy Controller
- Binary Authorization



Merci,
Thank you!