



How Anthos

enables your multi-cloud strategy

Google Cloud

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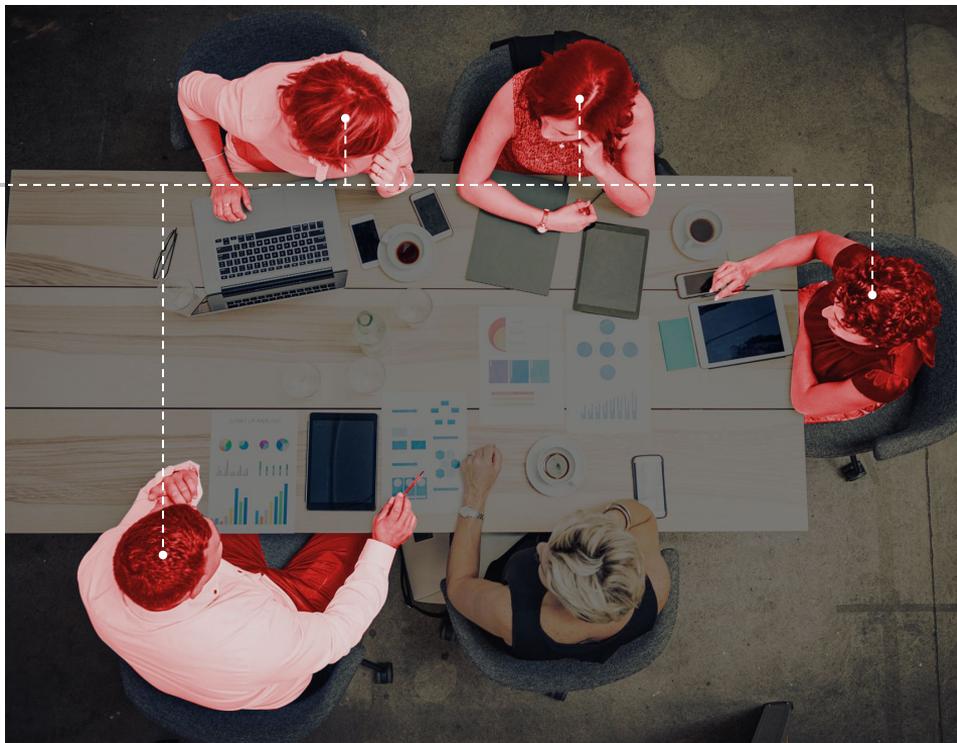


+75%

of medium and large businesses will have adopted a multi-cloud or hybrid strategy by 2021

80%

of CIO's report that they were not satisfied with cloud migration results





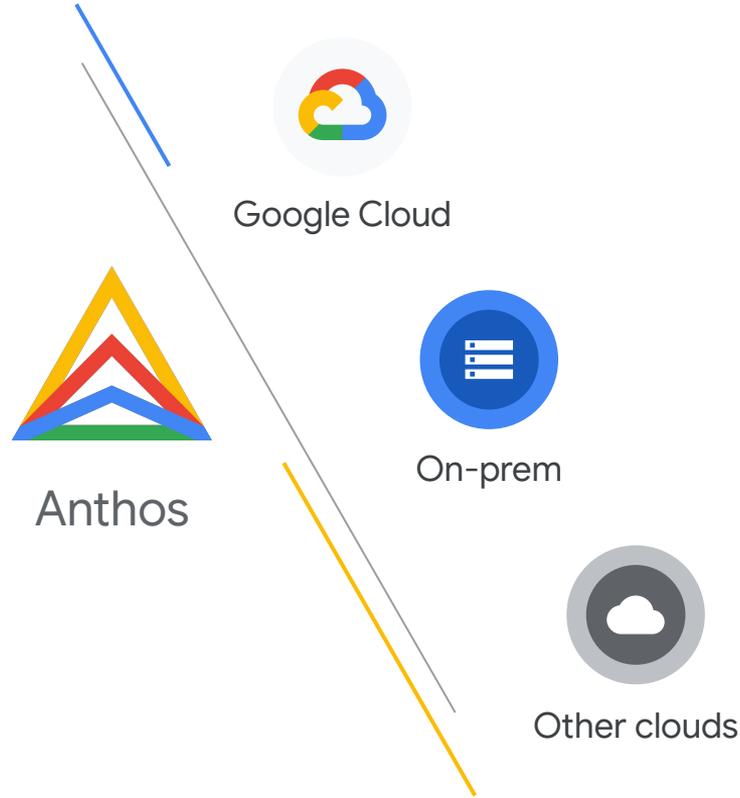
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of CIOs report that they were not satisfied with migration results

Modernize independently from cloud migration

Recognize complexity in their IT stack

Build apps for hybrid and multi-cloud



Anthos, hybrid done right.



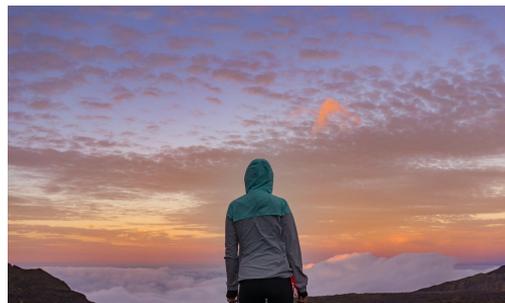
Runs where you run

A software-based stack means no hardware purchases required. Zero to deployed in hours instead of months.



Built on open source software

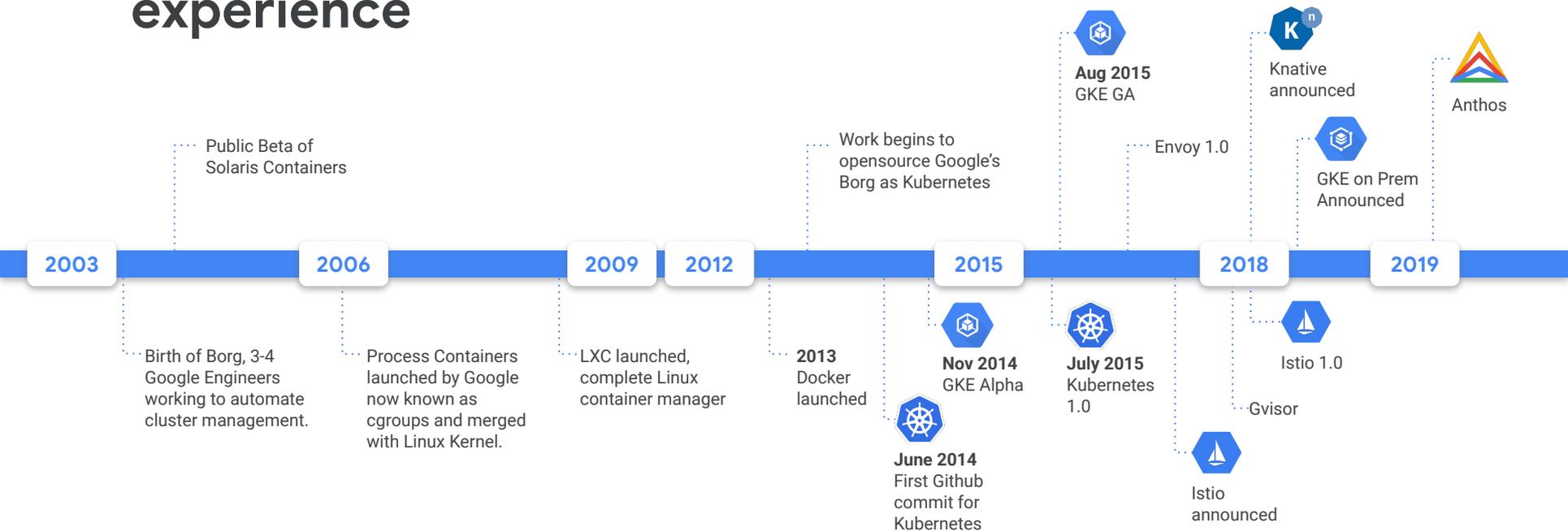
Ensuring workload portability; one platform that can run your applications both on-prem and in the cloud, without vendor lock-in.



Ready for the cloud(s)

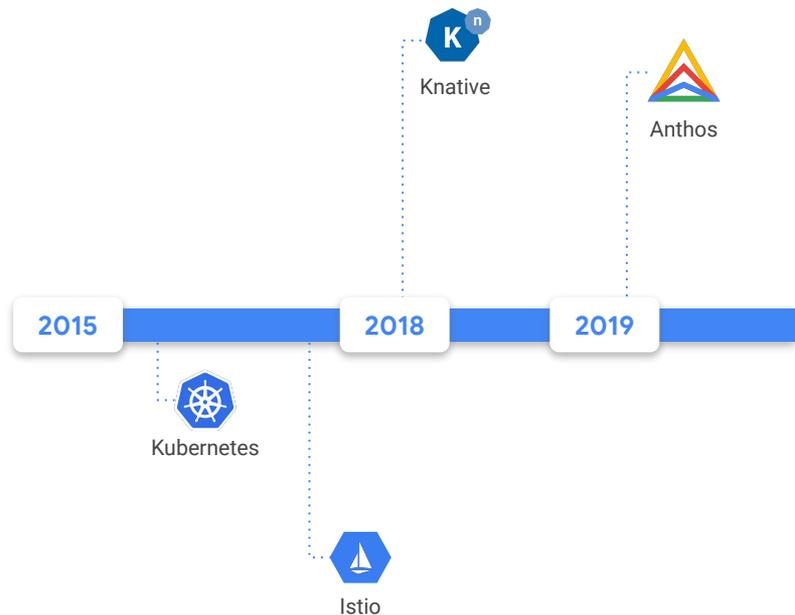
Focus on building cloud-native applications, not managing the underlying infrastructure.

Anthos builds on 15+ years of experience



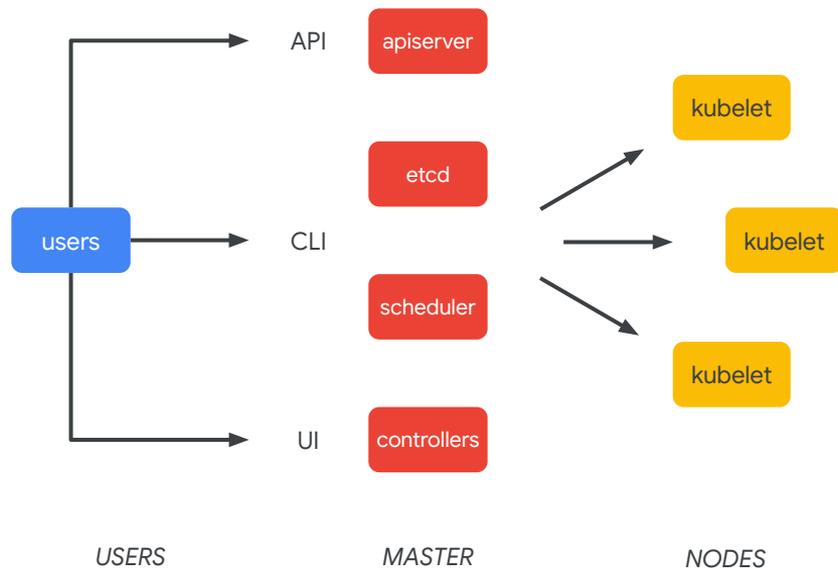
The Anthos open source stack

- **Kubernetes – container orchestration**
 - Portable: runs on most clouds, hypervisors, and even bare-metal
 - The *lingua franca* of containers
- **Istio – service mesh for Kubernetes and VMs**
 - Connect, secure, manage, and monitor microservices
 - Application layer smarts: A/B testing, gradual rollouts, etc.
- **Knative – serverless primitives for Kubernetes**
 - Enabling Platform-as-a-service (PAAS) without vendor lock-in
 - Lets developers be developers – not Kubernetes experts



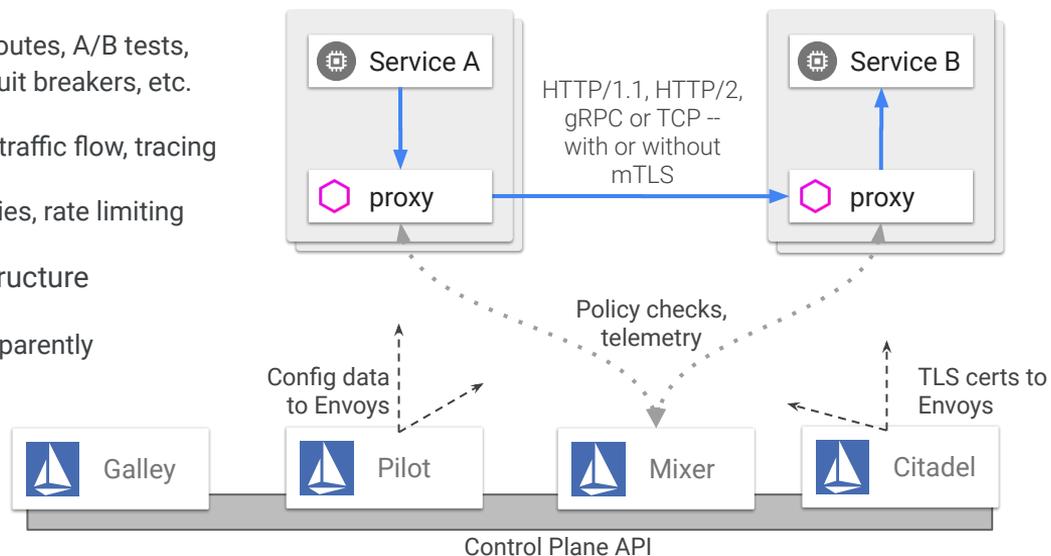
The Anthos stack: *Kubernetes*

- Container orchestrator modelled after [Borg](#)
 - Open sourced in 2014
 - To this day, [Google makes 40% of contributions](#)
- Manages containers across a cluster of servers
 - Scheduling, scaling, and high-availability
 - Networking and load-balancing
 - Centralized logging and monitoring
 - Role-based access control and audit logs
- Declarative – not procedural
- Runs on most clouds, hypervisors, and bare-metal



The Anthos stack: *Istio*

- Organizes microservices into a *service mesh*
 - **Routing and resiliency** – Dynamic routes, A/B tests, canaries, retries, health checks, circuit breakers, etc.
 - **Telemetry** – service dependencies, traffic flow, tracing
 - **Security and policies** – mTLS, policies, rate limiting
- Traffic control is decoupled from infrastructure
 - Sidecar proxies capture traffic transparently
- Supports microservices deployed in Kubernetes and VMs

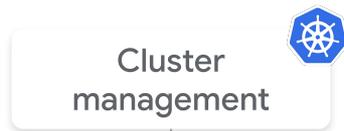


The Anthos stack: *Knative*

- Kubernetes-based building blocks for serverless
 - Used by vendors to build managed services, e.g. Google's [Cloud Run](#), or organizations to build their own opinionated PAAS
 - Protects from vendor lock-in
- Three main components
 - **Build** (now [Tekton](#)) – turns code into containers
 - **Serving** – revisions, gradual roll outs, auto-scaling
 - **Eventing** – binds event sources and consumers
- Backed by Google, Pivotal, IBM, RedHat, SAP, and others.

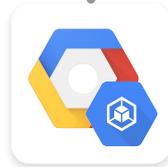
What developers actually do	What developers want to do
Write code	Write code
Build docker image	
Upload image to registry	
Deploy service	
Expose to the internet	
Set up monitoring	
Set up autoscaling	

We started with GKE, our managed service for Kubernetes



Google Cloud

Cluster management 

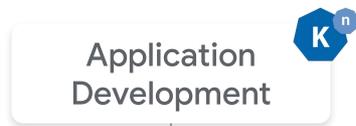


Google Cloud

In Anthos, we tuned GKE for enterprise requirements and added a financially backed SLA



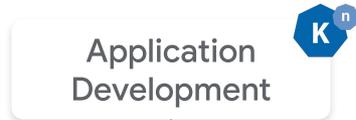
*Kubernetes doesn't solve all problems, so we added **Cloud Run**, a management layer for Knative...*



Google Cloud



*Kubernetes doesn't solve all problems, so we added **Cloud Run**, a management layer for Knative...*

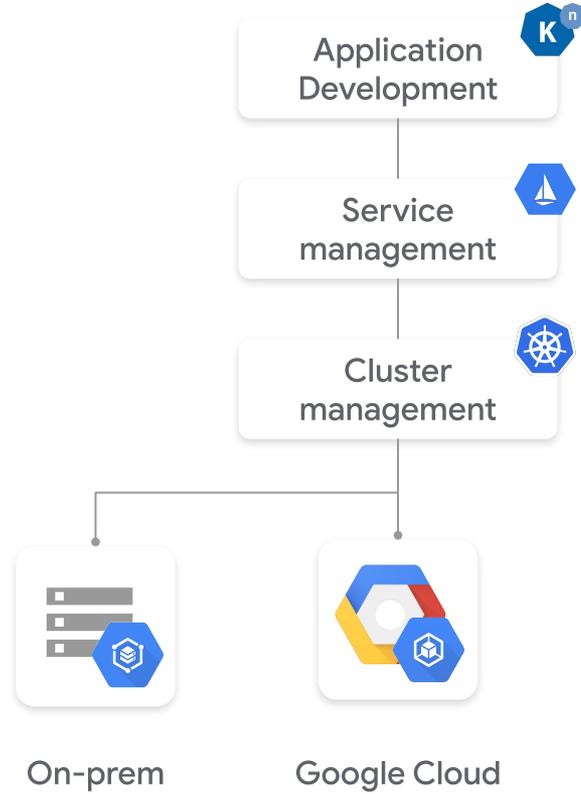


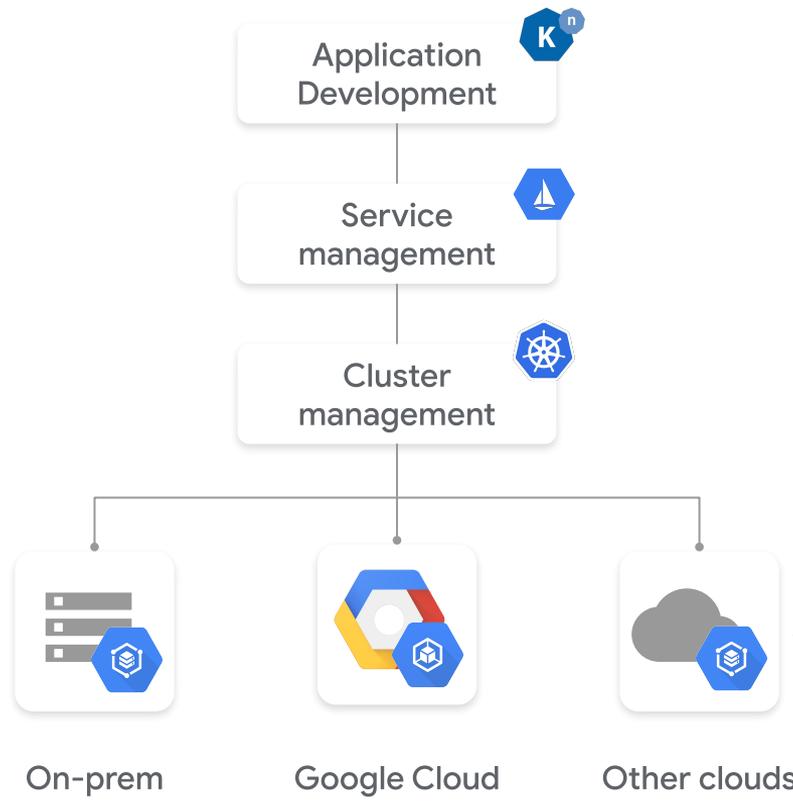
Google Cloud

*... and **Anthos Service Mesh**, managed backends for Istio*

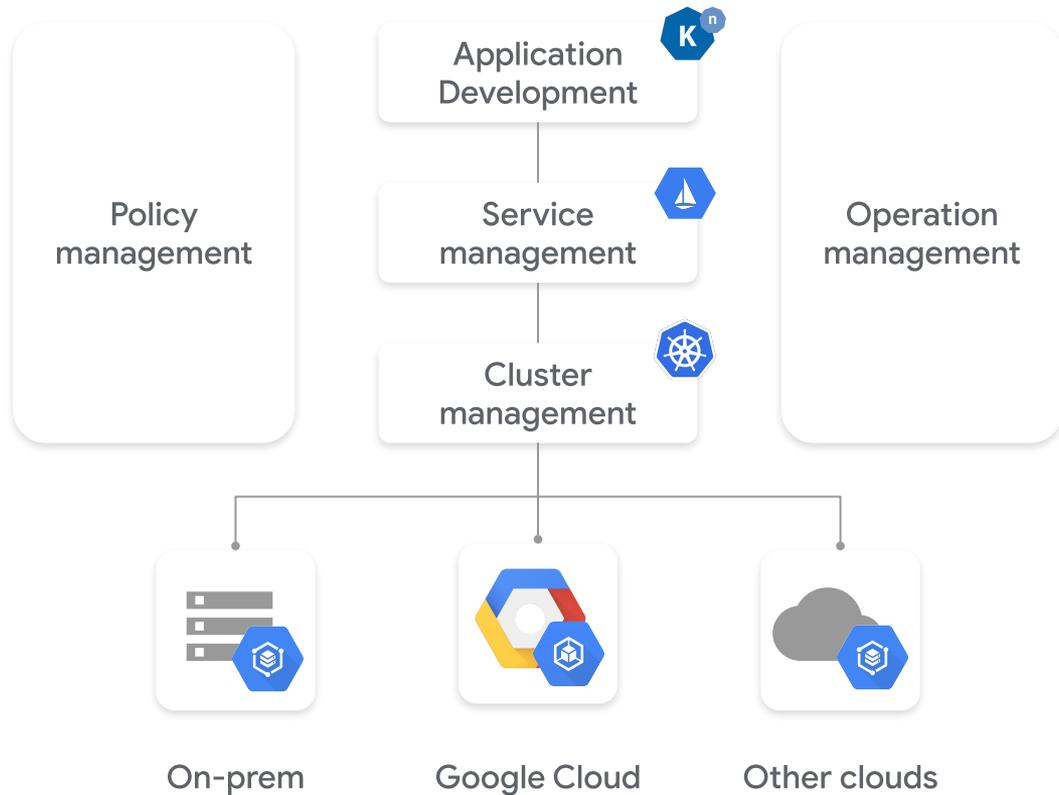


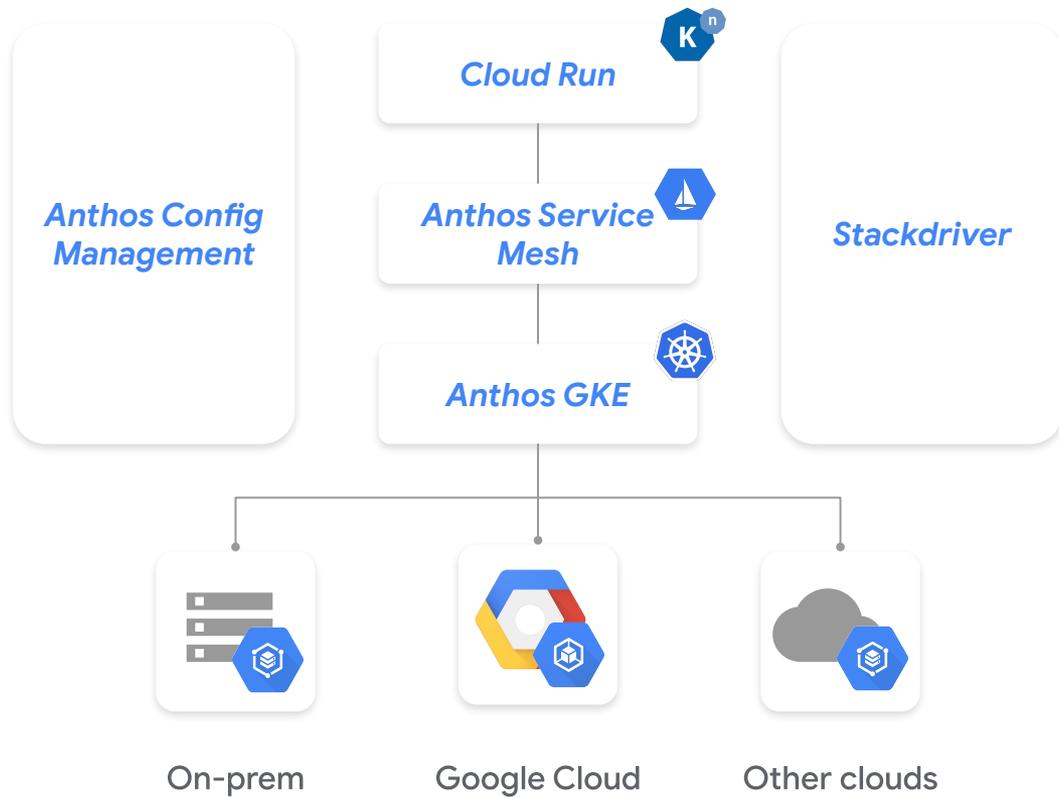
*Previously known as GKE
On-prem, Anthos on VMware
takes the whole stack to
on-prem, with the control
plane in GCP*





We're working to take Anthos to AWS and Azure, too







Kubernetes Engine

Kubernetes clusters

+ CREATE CLUSTER

+ DEPLOY

REGISTER CLUSTER

REFRESH



SHOW INFO PANEL



Clusters



Workloads



Services & Ingress



Applications



Configuration



Storage



Marketplace



A Kubernetes cluster is a managed group of VM instances for running containerized applications. [Learn more](#)

Filter by label or name

<input type="checkbox"/> Name ^	Location	Cluster type	Cluster size	Total cores	Total memory	Notifications	Labels
<input type="checkbox"/> gke-sandbox	europa-north1-a	GKE	3	3 vCPUs	11.25 GB		Connect
<input type="checkbox"/> kops-cluster	registered	Kubernetes	3	5 CPU	19.58 GB		Logout
<input type="checkbox"/> mini-cluster	australia-southeast1-b	GKE	1	1 vCPU	3.75 GB		Connect

Anthos – the long story short.



Modernize in place

Take advantage of **cloud technology from the comfort of your home.**



Automate policy and security at Scale

Let the **platform do the grunt work** to keep all your apps in sync.



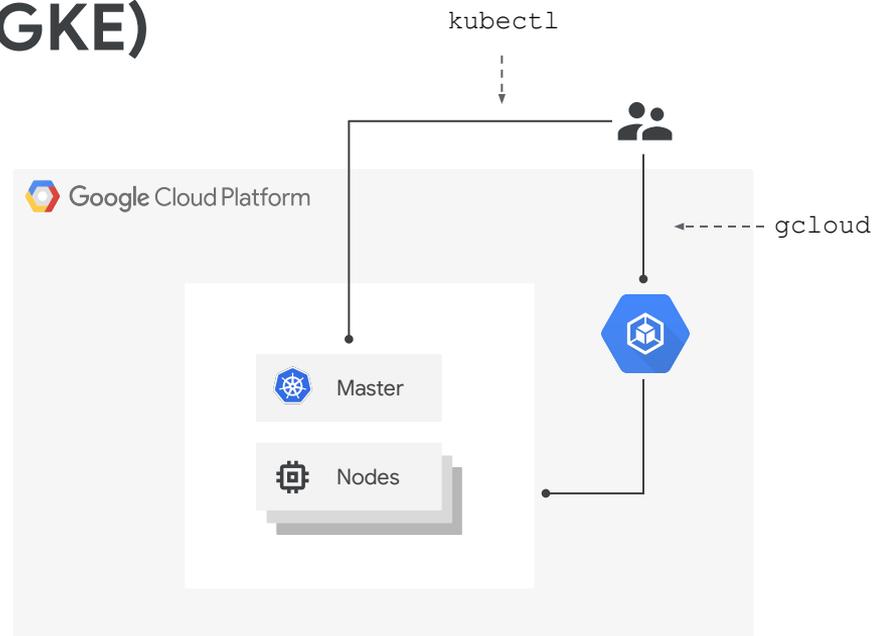
Consistency

Build your application once, deploy and manage it **anywhere.**

Anthos core components

Google Kubernetes Engine (GKE)

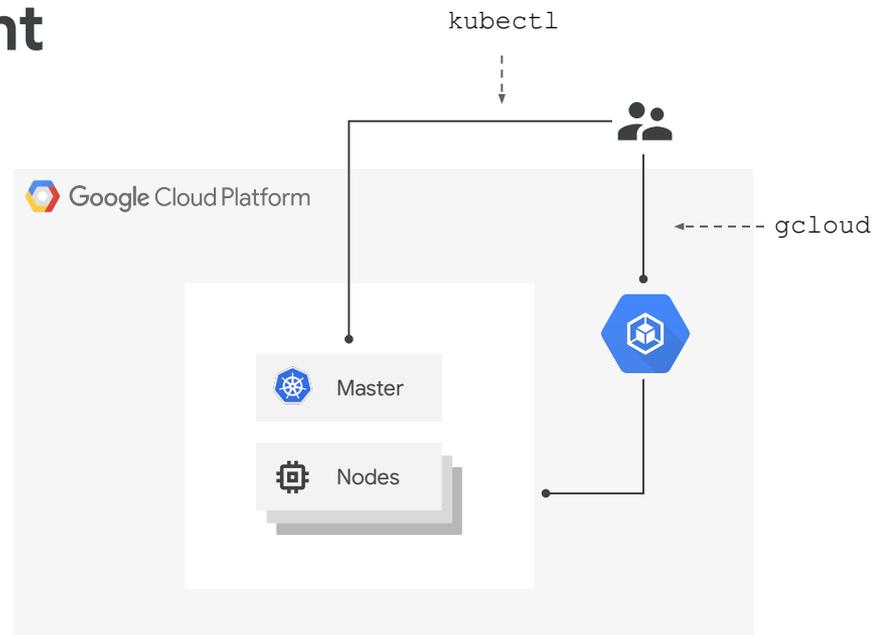
- Turn-key solution to Kubernetes
 - Provision a cluster in minutes
 - Curated node OS and Kubernetes versions
 - Dedicated SRE (ops) and TSE (support) teams
- Generally Available since [August, 2015](#)
- Deep GCP integration
 - VPC and network services
 - Secure software delivery
 - Monitoring and logging



GKE, Kubernetes-as-a-service

Automatic node management

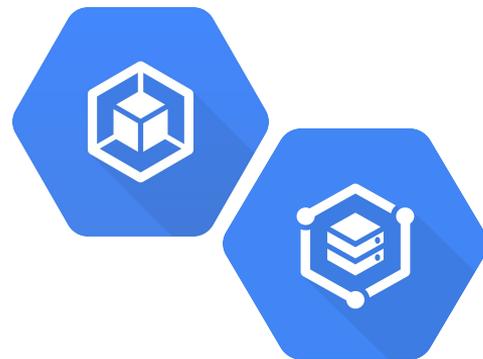
- Fully managed master node(s). Workers opt-in.
- Auto-repair
 - Watches for signals of under-performing or failing nodes and replaces them
- Auto-upgrade
 - Keeps worker nodes up-to-date
- Auto-scale
 - Cluster auto-scaling (CA) to handle ups and downs as needed



GKE, Kubernetes-as-a-service

Anthos GKE and Anthos deployed on VMware

- Everything in **Google Kubernetes Engine (GKE)**, as well as
 - *Automation*: Vertical Pod Autoscaler and Node Auto Provisioning
 - *Multi-tenancy*: GKE Sandbox and Usage metering
 - *Security*: Binary Authorization and Vulnerability Scanning
 - *Networking*: Multi-cluster ingress and layer 7 ILB
- Runs on Google Cloud or VMware vSphere
 - More deployment targets to follow
- Additionally, **Anthos GKE** comes with a financially backed SLA that guarantees availability of 99.95% for regional clusters



Anthos GKE and Anthos on VMware



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

- Metrics, logging, tracing, and SLO monitoring
- Service identity, AuthN/Z, and encryption
- Traffic management: routing, and load balancing

Additionally, ASM provides insights and recommendations, and analytics.



The screenshot displays the Google Cloud Platform interface for reviewing service incidents. At the top, it shows the project name 'Google Prod' and namespace 'books-demo'. The main section is titled '[Service Details Page] Reviews' and includes a 'Filter service' option. A timeline shows 9 incidents between 7:00am and 1:30pm. Below the timeline, there are tabs for Overview, Health, Metrics, Connected Services, Diagnostics, Infrastructure, and Config Explorer. The 'Service Status: Unhealthy' section indicates 5 items needing attention, including 4 Non-Compliant SLOs, 1 Trending Non-Compliant SLO, and 3 Unauthorized Services. The '3 Insights' section provides recommendations to adjust SLO targets. The 'Metrics' section shows Error Rate (0.2%), Latency (350 ms), and Requests (300/sec). The 'Authentication' section shows 8 Authenticated, 2 Unauthenticated, and 2 Mixed services. The 'Topology' diagram shows a network of services including istio-telemetry, istio-policy, details-v1, productpage-v1, and reviews-v3 workload.



Cloud Run is a fully managed serverless product, compatible with Knative.

- Stateless containers via HTTP(s) requests
- Built-in domain handling
- Scales to zero – or as high as you need

Cloud Run for Anthos enable serverless on your own cluster – wherever Anthos runs.

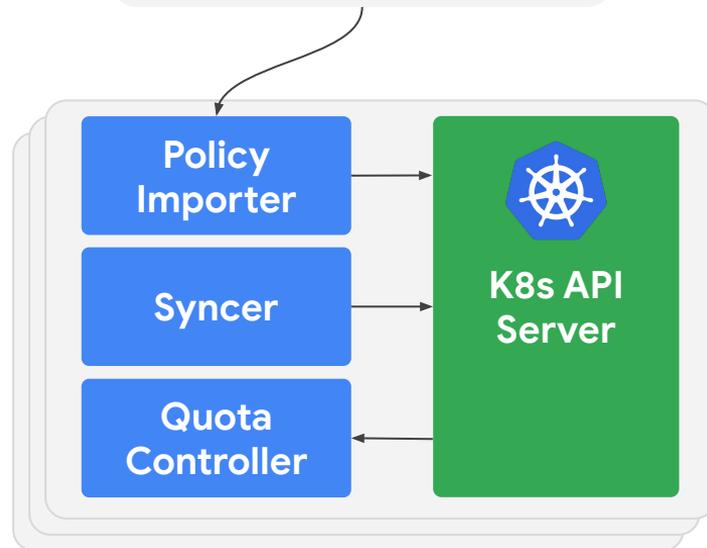
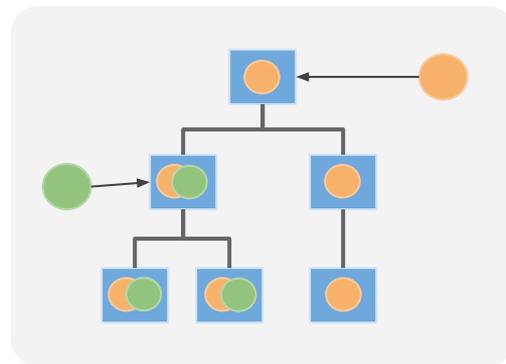
The screenshot shows the Google Cloud Platform console interface for a Cloud Run service. The service is named 'hello' and is located in the 'us-central1' region. The URL is 'https://hello-b6iakzbbqbc.a.run.app'. The console displays the service details, including the YAML configuration for the service. The YAML configuration is as follows:

```
1  apiVersion: serving.knative.dev/v1
2  kind: Service
3  metadata:
4    name: hello
5    namespace: '283578073083'
6    selfLink: /apis/serving.knative.dev/v1/namespaces/283578073083/services/hello
7    uid: fc545373-ca1-483e-b57b-9e20c2f3229e
8    resourceVersion: AAMURGFYcpg
9    generation: 1
10   creationTimestamp: '2019-10-15T10:23:25.449579Z'
11   labels:
12     cloud.googleapis.com/location: us-central1
13   annotations:
14     run.googleapis.com/client-name: cloud-console
15     serving.knative.dev/creator: majohansson@google.com
16     serving.knative.dev/lastModifier: majohansson@google.com
17   spec:
18     traffic:
19       - percent: 100
20     latestRevision: true
21     template:
22       metadata:
23         annotations:
24           autoscaling.knative.dev/maxScale: '1000'
25       spec:
26         timeoutSeconds: 300
27         serviceName: 283578073083-compute@developer.gserviceaccount.com
28         containerConcurrency: 80
29         containers:
30           - image: gcr.io/cloudrun/hello
31             resources:
32               limits:
33                 memory: 256Mi
34                 cpu: 1000m
```



Anthos Config Management (ACM) automates policy and configuration at scale.

- Synchronize configuration across clusters on-prem and in the cloud
- Continuous enforcement and admission control of compliance policies
- Based on Git, enables auditability, review and CI through policy-as-code

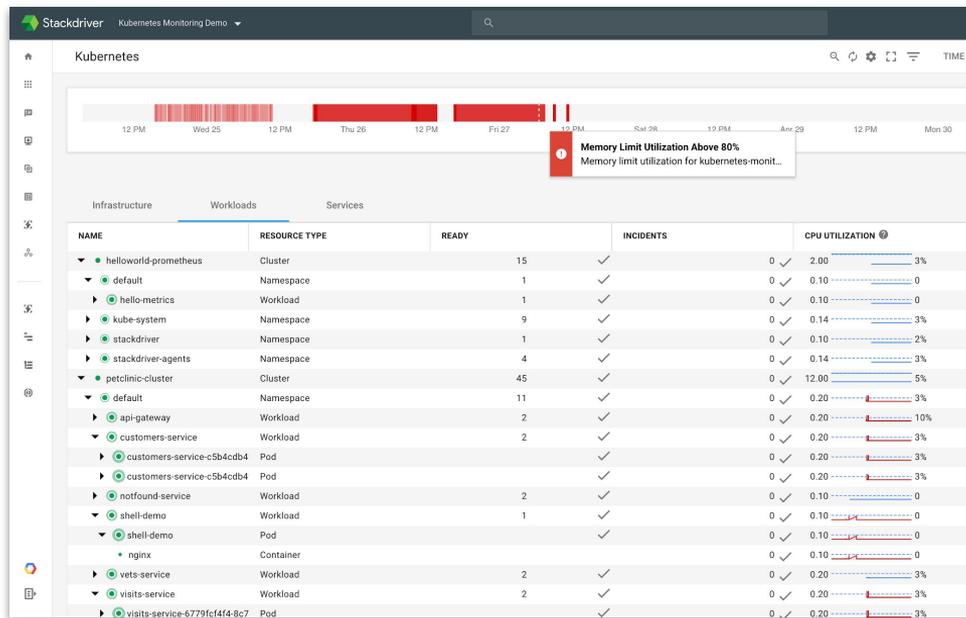




Stackdriver is a general-purpose platform for Logging, Monitoring, Tracing, Profiling and Debugging.

- Support for all of GCP, but can also monitor AWS EC2 and on-prem resources
- Native support for Kubernetes, on GCP and elsewhere.

In **Anthos**, Stackdriver is included, but optional.





GCP Marketplace for Anthos lets you manage production-grade 3rd party software in just a few clicks.

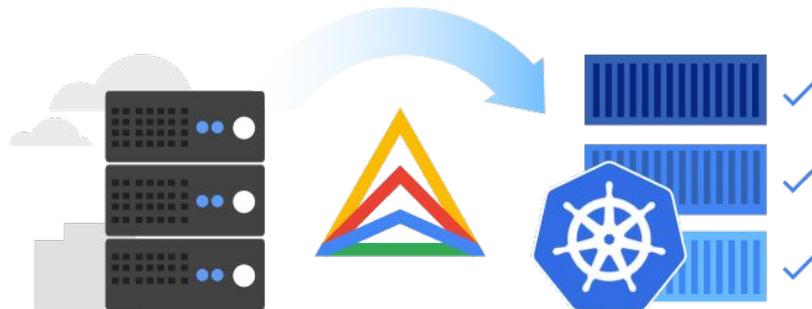
- Deploy packaged Kubernetes applications to wherever Anthos runs
- Single bill for GCP and 3rd party services
- Managed updates



Migrate for Anthos

Bringing the power of containers to existing workloads.

- Live migrate VMs into containers in GKE:
 - Service processes converted into Dockerfiles
 - Disks imported to Persistent Volumes
 - Everything assembled in a StatefulSet
- Capitalize on Kubernetes logging and monitoring
- Supports VMware on-prem, AWS EC2, Azure Virtual Machines and Google Compute Engine
- Currently for Linux-based VMs only



Anthos - Tools for every role



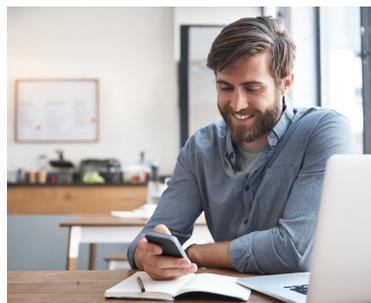
Platform engineering

- Centralized management
- Consistent infrastructure
- Frequent upgrades
- Managed by Google



Developers

- IDE & CI integrations
- Serverless
- Migration
- Marketplace



Service operators

- Simple deploy and rollback
- Visibility & observability
- Service mesh
- Service level monitoring



Security & compliance

- Central identity & policy
- Software supply chain
- Isolated multi-tenancy
- Auditing



Thank you.

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Google Cloud