Anthos

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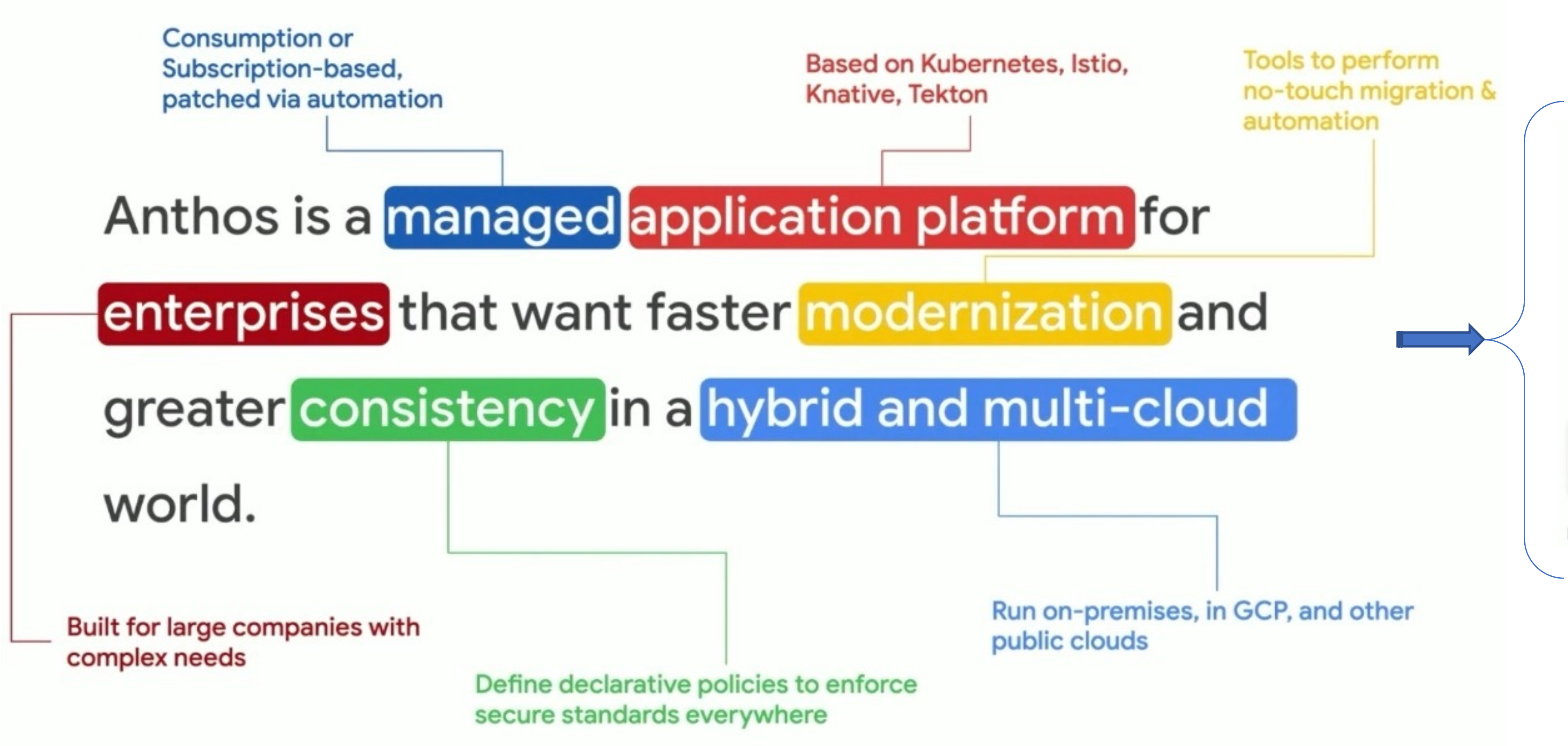
Anthos: Introduction



Anthos is a managed application platform for enterprises that want faster modernization and greater consistency in a hybrid and multi-cloud world.

Consumption or Subscription-based, patched via automation

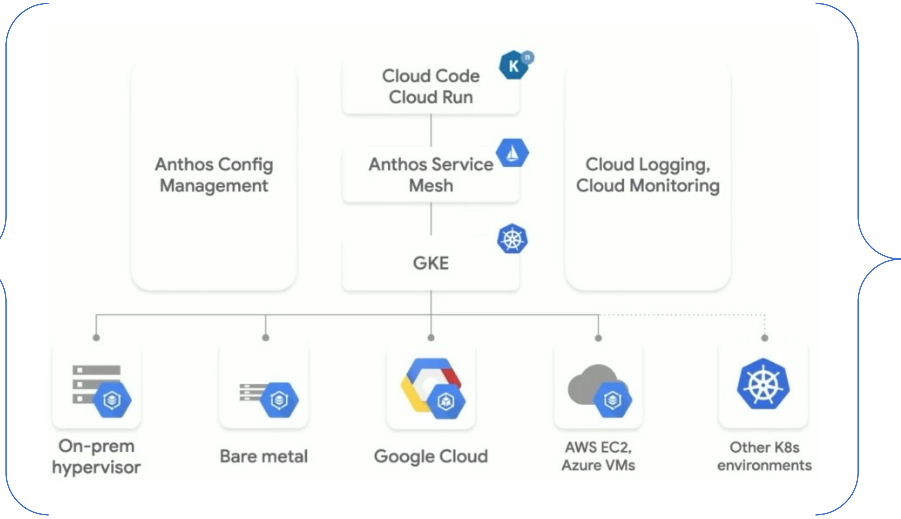
Based on Kubernetes, Istio, Knative, Tekton

Tools to perform no-touch migration & automation

Built for large companies with complex needs

Define declarative policies to enforce secure standards everywhere

Run on-premises, in GCP, and other public clouds



Core Components of Anthos

Source: https://cloud.google.com/docs, https://cloud.google.com/products

Anthos: Technical Overview

Anthos is a modern application management platform that provides a consistent development and operations experience for cloud and on-premises environments.
The following diagram shows Anthos components and features and how they provide Anthos's functionality across your environments, from infrastructure management to facilitating application developm

Unified user interface

The Anthos dashboard in the Google Cloud Console provides a secure, unified user interface to view and manage applications, including an out-of-the-box structured view of all the Anthos resources.

Environ

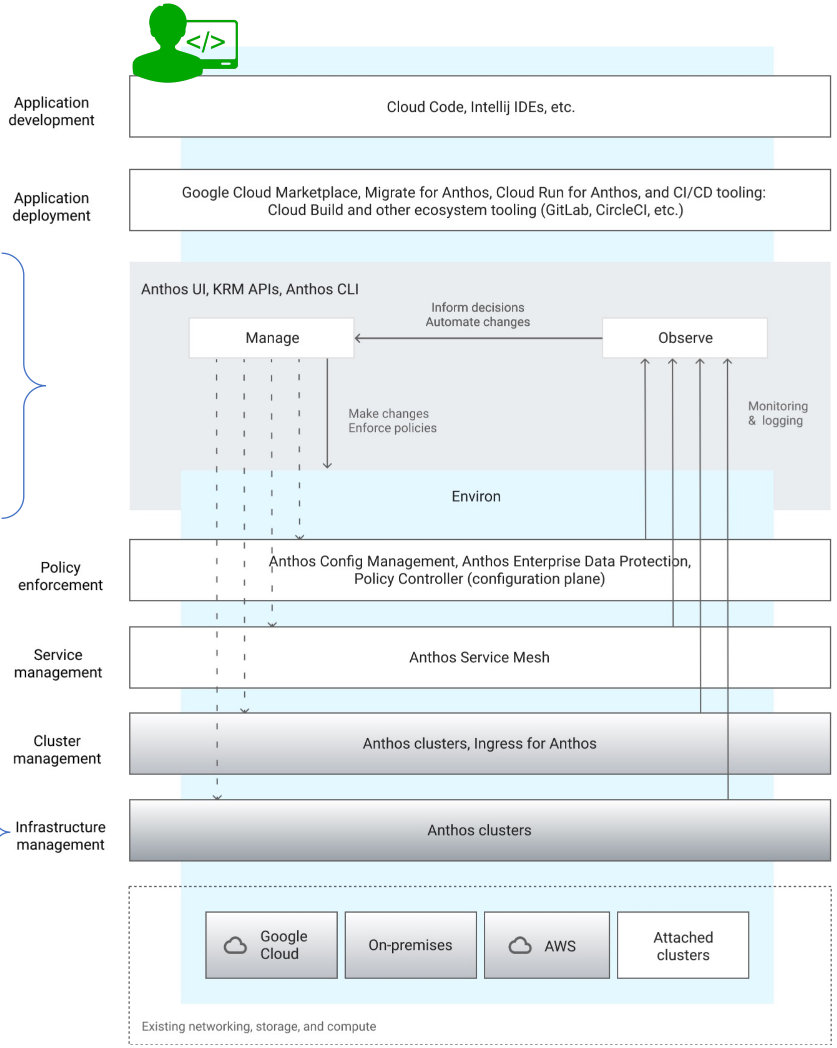
An environ is a domain that groups clusters and infrastructure, manages resources, and keeps a consistent policy across them.

Consolidated logging and monitoring

Anthos includes Cloud Logging and Cloud Monitoring for system components and Kubernetes Engine Monitoring is enabled by default.

Anthos Service Mesh is a suite of tools that helps you monitor and manage a reliable service mesh on-premises or on Google Cloud.

Anthos clusters provide a unified way to work with Kubernetes clusters as part of Anthos, extending GKE to work in multiple environments. You have consistent, unified, and secure infrastructure, cluster, and container management, whether you're using Anthos on Google Cloud (with traditional GKE), hybrid cloud, or multiple public clouds.



Application development

Cloud Code, Intellij IDEs, etc.

Application deployment

Google Cloud Marketplace, Migrate for Anthos, Cloud Run for Anthos, and CI/CD tooling: Cloud Build and other ecosystem tooling (GitLab, CircleCI, etc.)

Anthos UI, KRM APIs, Anthos CLI

Manage

Inform decisions
Automate changes

Observe

Make changes
Enforce policies

Monitoring & logging

Environ

Policy enforcement

Anthos Config Management, Anthos Enterprise Data Protection, Policy Controller (configuration plane)

Service management

Anthos Service Mesh

Cluster management

Anthos clusters, Ingress for Anthos

Infrastructure management

Anthos clusters

Google Cloud

On-premises

AWS

Attached clusters

Existing networking, storage, and compute

The Kubernetes ecosystem is continually expanding and creating a wealth of functionality that can be enabled on top of existing clusters. In the marketplace solution catalog, diverse range of solutions can be found:

- Storage solutions
- Databases
- Continuous integration and delivery tools
- Monitoring solutions
- Security and compliance tools

Anthos Config Management is a key component of Anthos. With Anthos Config Management, you can create a common configuration across all your infrastructure, including custom policies, and apply it both on-premises and in the cloud. Anthos Config Management evaluates changes and rolls them out to all Kubernetes clusters so that your desired state is always reflected

Multi-cluster Ingress is a cloud-hosted multi-cluster Ingress controller for Anthos GKE clusters. It's a Google-hosted service that supports deploying shared load balancing resources across clusters and across regions.

Anthos uses Anthos clusters, which extend GKE for use on Google Cloud, on-premises, or multicloud. These offerings bundle upstream Kubernetes releases and provide management capabilities for creating, scaling, and upgrading conformant Kubernetes clusters.

Source: https://cloud.google.com/docs, https://cloud.google.com/products

Anthos: Service Mesh

A service mesh is an architecture that enables managed, observable, and secure communication across services. It factors out all the common concerns of running a service such as monitoring, networking, and security, with consistent, powerful tools, making it easier for service developers and operators to focus on creating and managing great applications for their users.
Anthos Service Mesh is powered by Istio, a highly configurable and powerful open source service mesh platform.

Istio Architecture:

- ✓ Architecturally, a service mesh consists of one or more control planes and a data plane. The service mesh monitors all traffic through a proxy.
- ✓ On Kubernetes, the proxy is deployed by a sidecar pattern to the microservices in the mesh.
- ✓ On Virtual Machines (VMS), the proxy is installed on the VM.
- ✓ This pattern decouples application or business logic from network functions, and enables developers to focus on the features that the business needs.

Why use Istio?

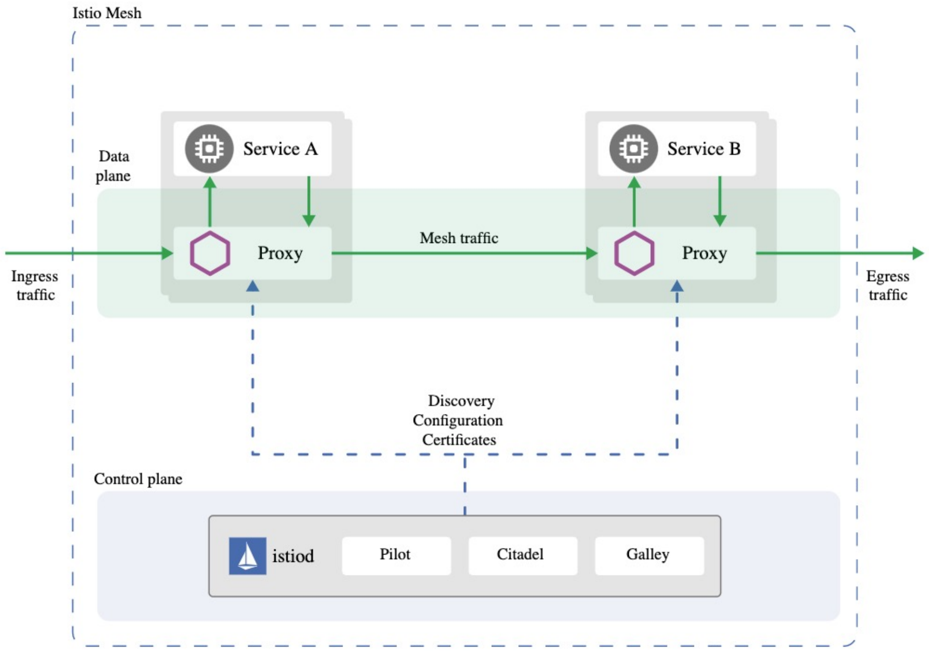
Istio makes it easy to create a network of deployed services with load balancing, service-to-service authentication, monitoring, and more, with few or no code changes in service code.

How to use Istio?

You add Istio support to services by deploying a special sidecar proxy throughout your environment that intercepts all network communication between microservices, then configure and manage Istio using its control plane functionality, which includes:

- Automatic load balancing for HTTP, gRPC, WebSocket, and TCP traffic.
- Fine-grained control of traffic behavior with rich routing rules, retries, failovers, and fault injection.
- A pluggable policy layer and configuration API supporting access controls, rate limits and quotas.
- Automatic metrics, logs, and traces for all traffic within a cluster, including cluster ingress and egress.
- Secure service-to-service communication in a cluster with strong identity-based authentication and authorization.

Istio is designed for extensibility and meets diverse deployment needs. It does this by intercepting and configuring mesh traffic as shown in the following diagram:



Istio Architecture

Anthos: Multi-Cluster Ingress

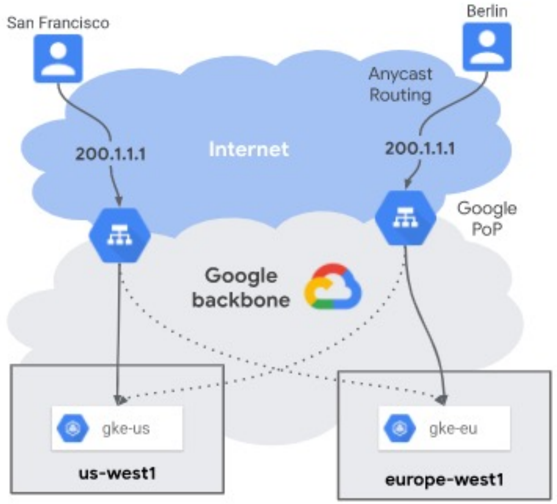
Multi-cluster Ingress (MCI) is a cloud-hosted multi-cluster Ingress controller for Anthos GKE clusters. It's a Google-hosted service that supports deploying shared load balancing resources across clusters and across regions.

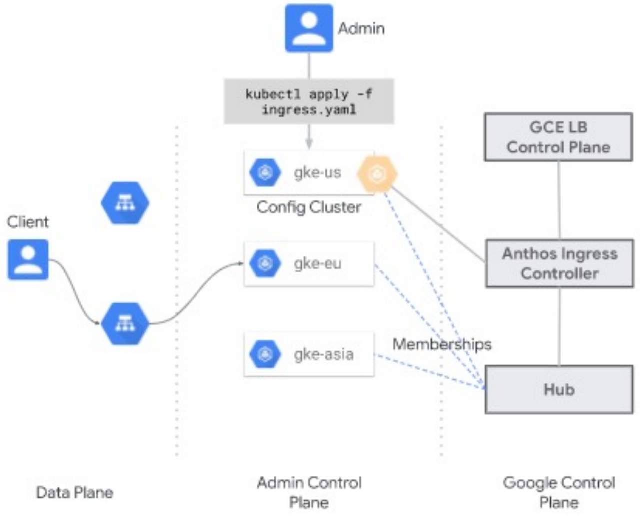
Multi-cluster networking:

Many factors drive multi-cluster topologies, including close user proximity for apps, cluster and regional high availability, security and organizational separation, cluster migration, and data locality. Multi-cluster Ingress is designed to meet the load balancing needs of multi-cluster, multi-regional environments. It's a controller for the external HTTP(S) load balancer to provide ingress for traffic coming from the internet across one or more clusters.

Multi-cluster Ingress's multi-cluster support satisfies many use cases including:

- A single, consistent virtual IP (VIP) for an app, independent of where the app is deployed globally.
- Multi-regional, multi-cluster availability through health checking and traffic failover.
- Proximity-based routing through public Anycast VIPs for low client latency.
- Transparent cluster migration for upgrades or cluster rebuilds.





Multi-cluster Ingress architecture:

Multi-cluster Ingress uses a centralized Kubernetes API server to deploy Ingress across multiple clusters. This centralized API server is called the config cluster. Any GKE cluster can act as the config cluster.
The config cluster uses two custom resource types: MultiClusterIngress and MultiClusterService.
By deploying these resources on the config cluster, the Anthos Ingress Controller deploys load balancers across multiple clusters.

The following concepts and components make up Multi-cluster Ingress:

- Anthos Ingress controller - This is a globally distributed control plane that runs as a service outside of your clusters. This allows the lifecycle and operations of the controller to be independent of GKE clusters.
- Config cluster - This is a chosen GKE cluster running on Google Cloud where the MultiClusterIngress and MultiClusterService resources are deployed.
- Environ - An environ is a domain that groups clusters and infrastructure, manages resources, and keeps a consistent policy across them.
- Member cluster - Clusters registered to an environ are called member clusters. Member clusters in the environ comprise the full scope of backends that MCI is aware of. The Google Kubernetes Engine cluster management view provides a secure console to view the state of all your registered clusters.

Anthos: Benefits & Use Cases

Anthos is a managed application platform that extends Google Cloud services and engineering practices to other environments so that you can modernize apps faster and establish operational consistency across them.

Use Cases:

Benefits:

✓ **Manage applications anywhere**

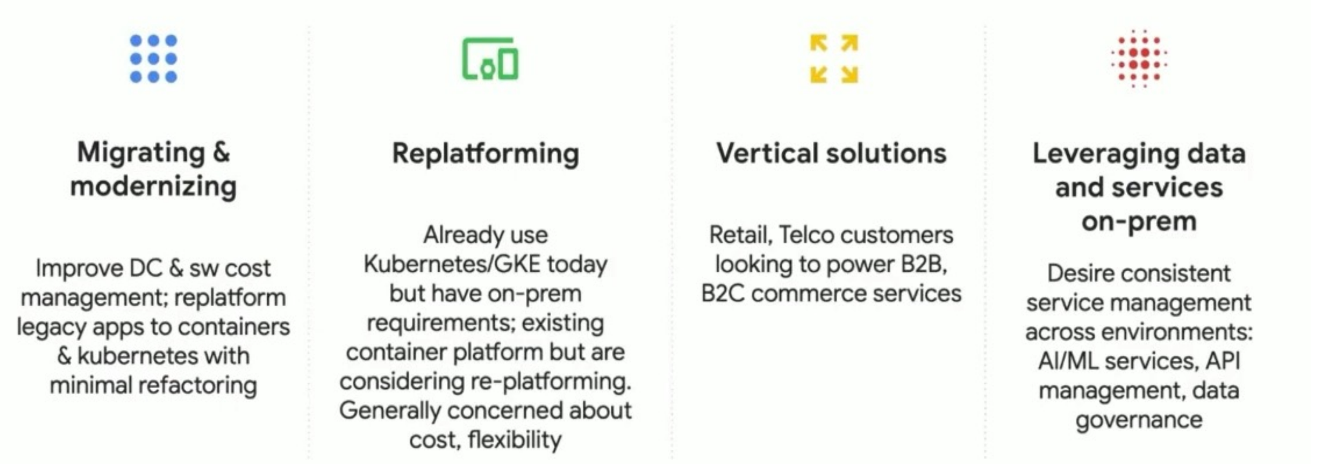
Anthos gives a consistent platform for all application deployments, both legacy as well as cloud native, while offering a service-centric view of all the environments.

✓ **Deliver software faster**

Build enterprise-grade containerized applications faster with managed Kubernetes on cloud and on-premises environments. Create a fast, scalable software delivery pipeline with cloud-native tooling and guidance.

✓ **Protect applications and software supply chain**

Leverage a programmatic, outcome-focused approach to managing policies for apps across environments, and enable greater awareness and control with a unified view of services' health and performance.



Migrating & modernizing

Improve DC & sw cost management; replatform legacy apps to containers & kubernetes with minimal refactoring

Replatforming

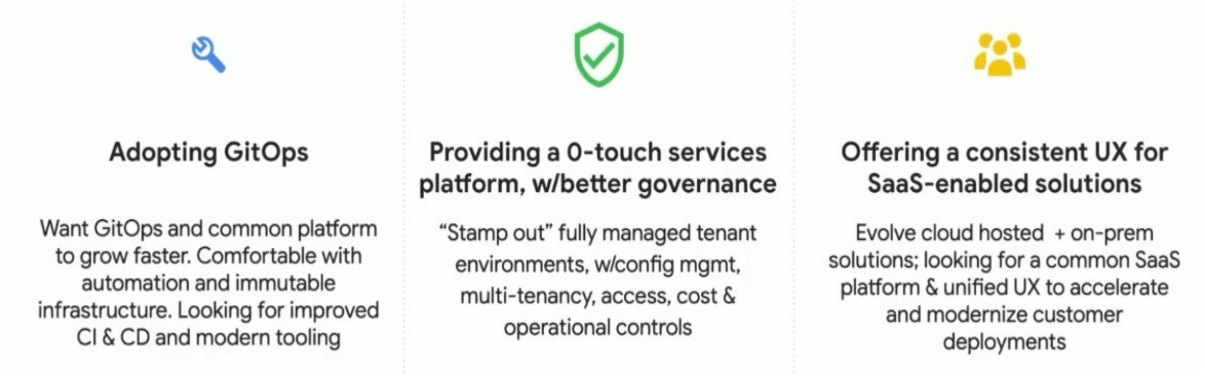
Already use Kubernetes/GKE today but have on-prem requirements; existing container platform but are considering re-platforming. Generally concerned about cost, flexibility

Vertical solutions

Retail, Telco customers looking to power B2B, B2C commerce services

Leveraging data and services on-prem

Desire consistent service management across environments: AI/ML services, API management, data governance



Adopting GitOps

Want GitOps and common platform to grow faster. Comfortable with automation and immutable infrastructure. Looking for improved CI & CD and modern tooling

Providing a 0-touch services platform, w/better governance

"Stamp out" fully managed tenant environments, w/config mgmt, multi-tenancy, access, cost & operational controls

Offering a consistent UX for SaaS-enabled solutions

Evolve cloud hosted + on-prem solutions; looking for a common SaaS platform & unified UX to accelerate and modernize customer deployments