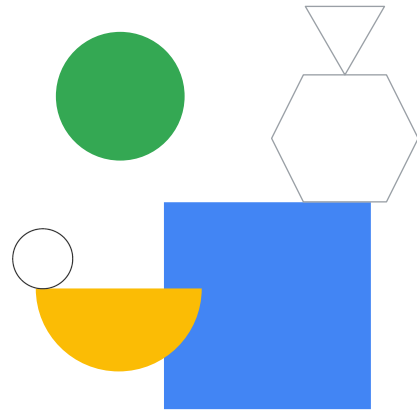




# Introduction to Anthos Clusters on Bare Metal



Welcome to Introduction to Anthos clusters on bare metal.



# Today's agenda




- 01 Anthos on bare metal overview
- 02 Use cases for clusters on-premises
- 03 Anthos on bare metal specifics
- 04 Components and services
- 05 Support
- 06 Billing


Google Cloud

Here is our agenda for the module.

We review Anthos as a platform and discuss how Anthos on bare metal addresses use cases where on-premises clusters make sense.



# Today's agenda



01 [Anthos on bare metal overview](#)

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02 Use cases for clusters on-premises

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Let's begin with a quick review of Anthos as a whole.

## Anthos components overview

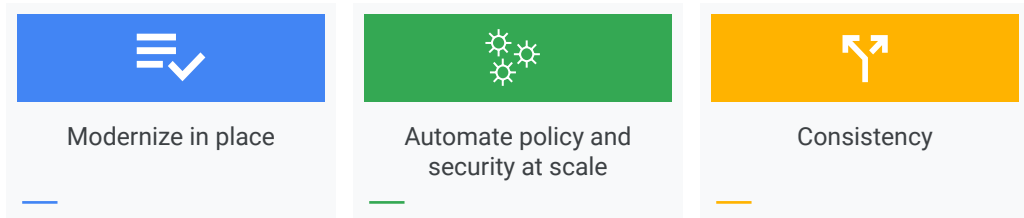
- Anthos is a modern application management platform that provides a unified model for computing, networking, and even service management across clouds and data centers.
- The technology stack is built on a consistent set of APIs based on open source technologies.
- Anthos empowers developers and operators with a single methodology that applies to on-premises, Google Cloud, and other cloud providers.



Anthos is a platform, a collection of Google Cloud products and features, that makes it easier to deploy and manage applications across operating environments in a consistent manner.

Google builds Anthos on open-source technologies that can run on-premises, on Google Cloud, and with other cloud providers. The Google Cloud implementations of these technologies include Google Kubernetes Engine, Anthos Service Mesh, Anthos Config Management, and other supporting products.

# Anthos is the platform of choice for modern application development



Google Cloud

By creating a consistent and modern platform that spans multiple operating environments, Anthos makes building and operating modern applications easier.

Companies can choose when and where to make modernization updates because application components will behave consistently regardless of where they run.

Developers and operators can efficiently define and enforce policies and security settings for multi-environment applications.

This reduces operator effort and increases security at the same time.

# Anthos gives you freedom to modernize without being locked in



Developer

Knative → Cloud Run



Service Operator/SRE

Istio → Anthos Service Mesh



Infrastructure Operator

Kubernetes → Anthos clusters


Google Cloud

Because Anthos is based on open-source products, you avoid vendor lock-in.


Developers can easily deploy workloads that use serverless functionality by using Cloud Run on Anthos clusters or Knative on non-Anthos clusters.

SREs and operators build clusters and service meshes but using GKE and Anthos Service mesh or by using Open Source Kubernetes and Istio in other environments.

Overall, your investment in building out solutions on Anthos is very portable, and you can always pick the environment that's best for you.



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Google Cloud

Although the most common platform for creating Anthos clusters may be GKE, there are many use cases where a hybrid solution, with on-premises clusters, makes sense. Let's look at some of those.

# Organizations are not ready to fully move to the cloud

- Common reasons for keeping a data center on their own premises include:
  - Long-term infrastructure contracts
  - Edge workloads with real-time connectivity such as factories or stadiums
  - Presence of proprietary physical appliances that are not available in the cloud
  - Technologies such as mainframe computers that cannot be easily migrated to the cloud
  - Regulatory and compliance use cases where data must remain on the organization's premises

Google Cloud

Common reasons for keeping a data center on their own premises include:

- Long-term infrastructure contracts.
- Edge workloads with real-time connectivity, such as factories or stadiums.
- Presence of proprietary physical appliances that are not available in the cloud.
- Technologies such as mainframe computers which cannot be easily migrated to the cloud.
- Regulatory and compliance use cases where data must remain on the customer's premises.



## Regulatory challenges result in more complexity

01

### **Introduce complex data governance**

Must address PII, data residency, and monitoring of data movement.

02

### **Create complex architectures**

Operate different platforms in different locations, with different security and management responsibilities.

03

### **Require complex skills**

Extra staff needed to access and manage unique environments, with distinct tools and configurations.

Google Cloud

Let's look a little closer at the issue of dealing with regulations.

When an organization is required to manage varying types of specialized and regulated data, the complexity of storage management increases significantly. You must design for data locality and maintain provenance for your data.

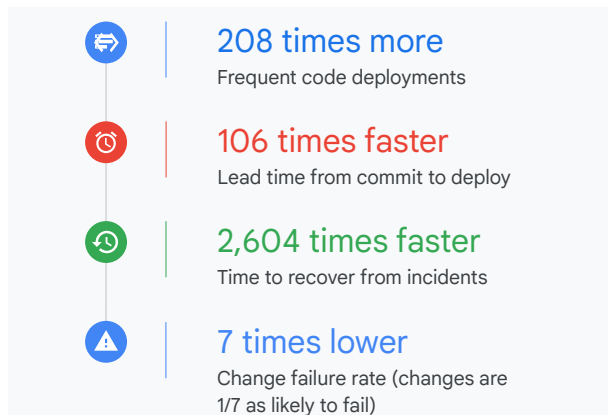
Your architecture must facilitate storing different types of data in different locations and systems, and your management processes must secure the data by using a variety of techniques for a variety of audiences.

Storing data in multiple locations with multiple systems and using multiple security mechanisms demands a wider range of tools and expertise.

Having consistent tools and processes for administering your services across environments is critical to getting this all right.

But organizations still expect constant value and greater stability at lower cost

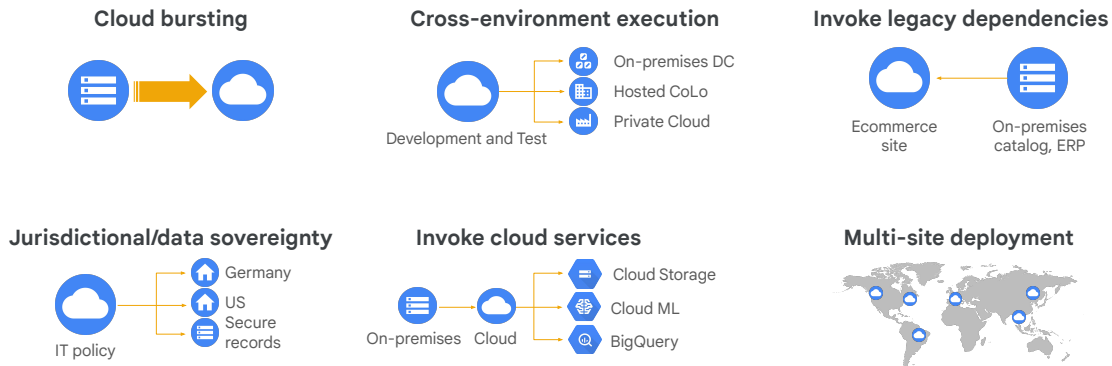
Elite performers experience:



Google Cloud

Even though companies have requirements to keep at least some of their infrastructure on-premises, they still want to achieve constant value and greater stability at lower cost. Elite performers that modernized their applications achieved tremendous value. As you can see, companies that make the investment and build high-performing hybrid systems achieve huge improvements in deployment and recovery times and much lower failure rates when releasing changes. Additionally, new possibilities may appear.

# Hybrid use cases



Google Cloud

You might have a successful application that has been running on-premises for a while, but you need to add capacity. It would be nice to have a common approach to running the workload in the data center and in the cloud, so that if you have peaks in capacity demands, you can autoscale using cloud infrastructure.

You might move development and test into the cloud to increase flexibility and reduce costs. But you continue to develop for on-premises deployments, so you need to ensure consistent behaviors.


It's not unusual to build the majority of your system in the cloud, but have some key services remain on-premises, such as traditional ERP systems. You need the cloud services to be able to interoperate with the on-premises solutions seamlessly.

If you work in an industry that is subject to constraints on where special data is stored, it makes sense to place services and data in specific locations and under specific controls, while placing other services in the cloud.


It may make sense to leave legacy systems on-premises for the foreseeable future, but to extend functionality by integrating a few key cloud-based features.

When you run services that have geographically distributed consumers, you'll probably want to deploy those services in multiple data centers to optimize performance—and you'd like managing and securing all your clusters to be easy, regardless of location or underlying infrastructure.





# Today's agenda

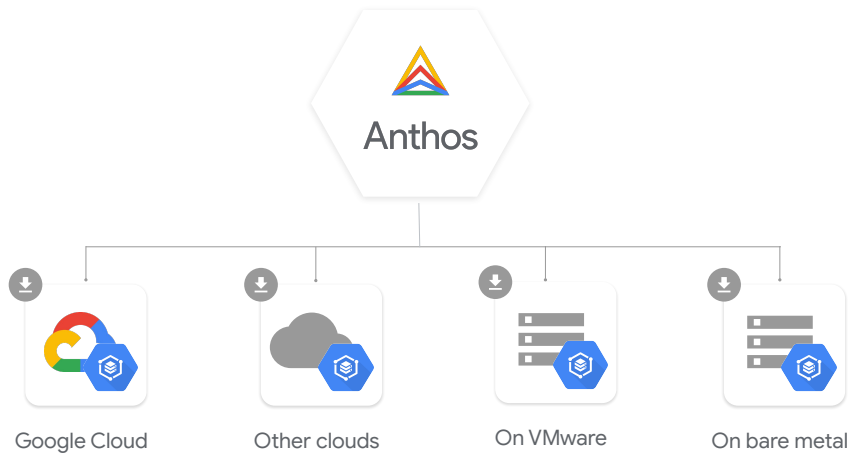


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Google Cloud

So, as part of Anthos, Google provides the ability to build clusters on bare metal. Let's take a quick look at the unique features of bare metal Anthos clusters.

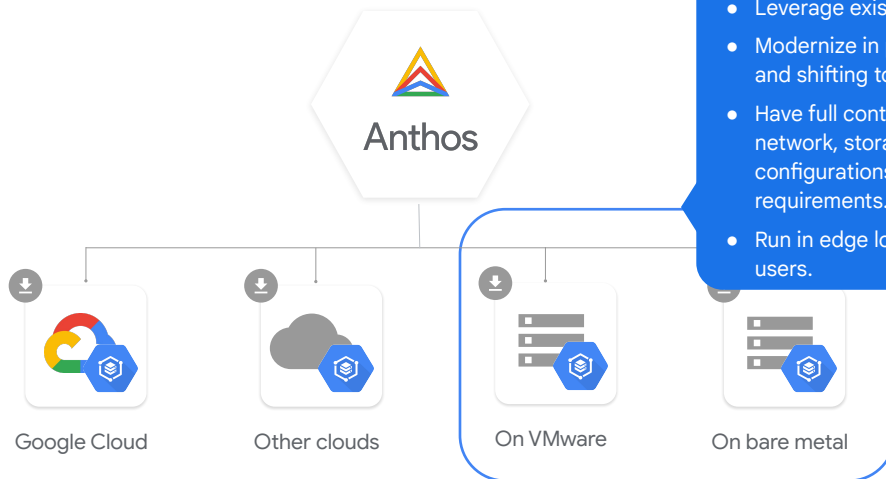
## Anthos has flexible deployment options



Google Cloud

First, we should note that bare metal clusters have much in common with other Anthos cluster types. They are Kubernetes clusters that are integrated with Google's cloud-based management tools, and they can run Istio, configuration management, and Knative solutions.

## Anthos clusters on-premises



On-premises deployments are best for customers who want to:

- Leverage existing CAPEX investments.
- Modernize in place instead of lifting and shifting to other platforms.
- Have full control of their machines, network, storage, and security configurations to meet regulation requirements.
- Run in edge locations closer to the end users.

Google Cloud

Bare metal clusters are typically run on existing hardware in on-premises environments. They make sense as a means of leveraging your existing infrastructure. They allow you to modernize by making small, in-place upgrades to existing solutions. They allow you full control over all aspects of the physical infrastructure, which can be helpful in meeting regulatory requirements. And they can run your workloads in edge locations that are closest to the consumers of your services, which maximizes performance.

# Comparing deployment options for Anthos on-premises

## Anthos on VMware

- Runs on VMware.
- Best for customers who want:
  - vSphere as a corporate standard.
  - Hardware sharing across clusters.
  - Integrated OS lifecycle management.
  - Fully managed clusters with self-healing and autoscaling capabilities.

## Anthos on bare metal

- Runs on bare metal or on-premises IaaS.
- Best for customers who want to:
  - Reduce cost and complexity (due to elimination of vSphere license).
  - Ensure low latency workloads (Telco and HPC).
  - Unlock new use cases for edge computing with a simplified software stack.
  - Run closer to the hardware for better performance.
  - Migrate from existing OpenStack environments.

Google Cloud

There are actually two options for running on-premises Anthos clusters.

The first option is running Anthos clusters on VMware. Obviously, this is best for environments that already have a significant investment in VMware and existing VMware expertise.

Anthos clusters on bare metal don't leverage any of the VMware management mechanisms, but offer several benefits.

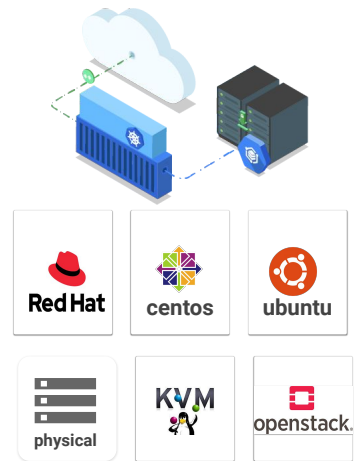
They reduce cost and complexity, lower latencies, and better utilize underlying hardware resources.

They also offer a nice migration path from existing OpenStack environments.



# Anthos on bare metal

- Runs on a variety of operating systems directly on physical servers or on top of VMs.
- Provides an out-of-the-box configuration:
  - Managed Kubernetes experience
  - Overlay network
  - Bundled load balancers
  - Support for storage partners
- Supplies an integrated observability suite:
  - Logging
  - Monitoring
- Offers management capabilities:
  - In-place upgrades
  - Backup and restore functionality



Google Cloud


Bare metal clusters can be deployed directly onto physical servers running CentOS, RedHat, or Ubuntu.

They can also be created using VMs running any of those operating systems if, for instance, you are using a non-VMware hypervisor to implement IaaS on-premises.


Installing an Anthos cluster on bare metal servers provides an opinionated installation of Kubernetes, configures overlay networking, sets up load balancing, and includes Container Storage Interface (CSI) driver support.

By default, bare metal clusters integrate with the Google Cloud operations suite, writing logs and metrics data to Cloud Logging and Cloud Monitoring.

And the Anthos management tools facilitate in-place cluster upgrades and backup and restore functionality.



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Google Cloud


As noted earlier, Anthos is an entire platform comprising many components. Let's review the support for various components provided on bare metal clusters.

# Anthos deployment options


Anthos Feature	Google Cloud	AWS / Azure	Attached Clusters	VMware	Bare Metal
GKE	Y	Y	N	Y	Y
ASM	Y	Y	N	Y	Y
- Anthos ServiceOps Dashboard	Y	N	N	N	N
- Anthos Service Security (Managed CA)	Y	N	N	Y	Y
ACM	Y	Y	Y	Y	Y
- Config Sync	Y	Y	Y	Y	Y
- Policy Controller	Y	Y	Y	Y	Y
- Config Connector	Y	N	N	Y	Y
Cloud Run for Anthos	Y	Preview	Preview	Y	Preview
Google Cloud Marketplace	Y	Y	N	Y	Y
Multi-Cluster Ingress	Y	N	N	N	N
Migrate for Anthos	Y	Y	N	Y	Y (Pre-GA)
Binary Authorization	Y	N	N	Y	N
Cloud Logging and Monitoring	Y	Y	N	Y	Y
Anthos UI and Dashboard	Y	Y	Y	Y	Y

Google Cloud

You can see that most components are currently supported for bare metal clusters. Several of the services are GKE-specific at the moment, and some might be added in the near term.



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Google Cloud

One benefit of working with Anthos installations of Kubernetes, Istio, and configuration management tools is that Google can assist with support. Let's look at the support available by solution component.

# Anthos shared responsibility model

	Anthos on Google Cloud	Anthos on AWS, VMware, bare metal	Anthos attached clusters
<b>Customer workloads</b>	<ul style="list-style-type: none"> <li>Under customer control; no Google Cloud support</li> </ul>	<ul style="list-style-type: none"> <li>Under customer control; no Google Cloud support</li> </ul>	<ul style="list-style-type: none"> <li>Under customer control; no Google Cloud support</li> </ul>
<b>Single management interface</b>	<ul style="list-style-type: none"> <li>Google Cloud Console</li> </ul>	<ul style="list-style-type: none"> <li>Google Cloud Console</li> </ul>	<ul style="list-style-type: none"> <li>Google Cloud Console</li> </ul>
<b>Anthos components and services</b>	<ul style="list-style-type: none"> <li>Break/fix support for on-cluster components</li> <li>Google Cloud hosted services have SLAs</li> </ul>	<ul style="list-style-type: none"> <li>Google Cloud provides software; customer manages it</li> <li>Break/fix Google Cloud support</li> </ul>	<ul style="list-style-type: none"> <li>Google Cloud provides software; customer manages it</li> <li>Break/fix Google Cloud support</li> </ul>
<b>Kubernetes distribution</b>	<ul style="list-style-type: none"> <li>Fully managed by Google with SLAs</li> </ul>	<ul style="list-style-type: none"> <li>Google Cloud provides software; customer manages it</li> <li>Break/fix Google Cloud support</li> </ul>	<ul style="list-style-type: none"> <li>Managed by customer</li> <li>No Google Cloud support</li> </ul>
<b>VM and other infrastructure</b>	<ul style="list-style-type: none"> <li>Fully managed by Google with SLAs</li> </ul>	<ul style="list-style-type: none"> <li>Managed by customer</li> <li>No Google Cloud support</li> </ul>	<ul style="list-style-type: none"> <li>Managed by customer</li> <li>No Google Cloud support</li> </ul>

■ Customer/partner responsibility  
■ Google responsibility  
■ Google-provided; Customer/partner-managed

Google Cloud


Regardless of the cluster type, customers are always responsible for their own workload running on the cluster.

All Anthos cluster types can be managed using the GKE console, offering a unified interface for managing resources in multiple environments.


For Anthos components and services, non-GKE clusters have a shared responsibility model. Google doesn't offer SLAs, but they do offer break/fix support related to component functionality.

For support related to Kubernetes, Google offers support and SLAs for GKE clusters, break/fix support for Anthos clusters outside of Google Cloud, and no support for Anthos attached clusters, which makes sense given that Google had no input on the installation of Kubernetes on those clusters.

For support for the underlying infrastructure, VMs and physical servers, Google only provides support for GKE clusters (which run on resources that Google directly manages).



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Google Cloud

Let's finish our introductory overview by looking at the pricing for Anthos on bare metal clusters.

## Anthos cluster on bare metal pricing

- Two models:
  - Pay-as-you-go
  - Subscriptions, which provide a discounted price for a committed term:

	Pay-as-you-go (hourly)	Pay-as-you-go (monthly)	Subscription (monthly)
Anthos (VMware and bare metal)	\$0.03288/vCPU	\$24/vCPU	\$18/vCPU

- Both models include access to all Anthos services, such as:
  - Cloud Logging/Monitoring, including collection and storage of system logs in Google Cloud for the default retention period of 30 days
  - Anthos Service Mesh
  - Anthos Config Management
- Free tier: \$800 worth of usage, or for a maximum of 30 days

Google Cloud

With pay-as-you-go pricing, the cost for Anthos on bare metal clusters is \$24 per cpu-hour. With a monthly subscription, you save 25% and pay \$18 per cpu-hour.

These fees include collection and retention of observability data and access to Anthos features like Anthos Service Mesh and Anthos Config Management.

There is a free tier you can use to get up to speed with Anthos. It allows for up to \$800 of usage within a 30-day period.