JUMP TO (#)

What are Containers?

Containers are packages of software that contain all of the necessary elements to run in any environment. In this way, containers virtualize the operating system and run anywhere, from a private data center to the public cloud or even on a developer's personal laptop. From Gmail to YouTube to Search, everything at Google runs in containers. Containerization allows our development teams to move fast, deploy software efficiently, and operate at an unprecedented scale. We've learned a lot about running containerized workloads and we've shared this knowledge (https://research.google.com/pubs/pub44843.html) with the community along the way: from the early days of contributing cgroups to the Linux kernel (https://www.kernel.org/doc/Documentation/cgroup-v1/cgroups.txt), to taking designs from our internal tools and open sourcing them as the Kubernetes (https://cloud.google.com/learn/what-is-kubernetes) project.

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Google Cloud is a Leader in The Forrester Wave™: Public Cloud Container Platforms, Q1 2022

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Containers defined

> Containers are lightweight packages of your application code together with dependencies such as specific versions of programming language runtimes and libraries required to run your software services.

Containers make it easy to share CPU, memory, storage, and network resources at the operating systems level and offer a logical packaging mechanism in which applications can be abstracted from the environment in which they actually run.

What are the benefits of containers?

Separation of responsibility

Containerization provides a clear separation of responsibility, as developers focus on application logic and dependencies, while IT operations teams can focus on deployment and management instead of application details such as specific software versions and configurations.

Workload portability

Containers can run virtually anywhere, greatly easing development and deployment: on Linux, Windows, and Mac operating systems; on virtual machines or on physical servers; on a developer's machine or in data centers on-premises; and of course, in the public cloud.

Application isolation

Containers virtualize CPU, memory, storage, and network resources at the operating system level, providing developers with a view of the OS logically isolated from other applications.

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Containers vs. VMs

You might already be familiar with VMs: a guest operating system such as Linux or Windows runs on top of a host operating system with access to the underlying hardware. Containers are often compared to virtual machines (https://cloud.google.com/discover/containers-vs-vms) (VMs). Like virtual machines, containers allow you to package your application together with libraries and other dependencies, providing isolated environments for running your software services. As you'll see below, however, the similarities end here as containers offer a far more lightweight unit for developers and IT Ops teams to work with, carrying a myriad of benefits.

- Containers are much more lightweight than VMs
- Containers virtualize at the OS level while VMs virtualize at the hardware level
- Containers share the OS kernel and use a fraction of the memory VMs require

What are containers used for?

Containers offer a logical packaging mechanism in which applications can be abstracted from the environment in which they actually run. This decoupling allows container-based applications to be deployed easily and consistently, regardless of whether the target environment is a private data center, the public cloud, or even a developer's personal laptop.

Agile development

Containers allow your developers to move much more quickly by avoiding concerns about dependencies and environments.

Efficient operations

Containers are lightweight and allow you to use just the computing resources you need. This lets you run your applications efficiently.

Run anywhere

Containers are able to run virtually anywhere. Wherever you want to run your software, you can use containers.

Related products and services

Backed by the same expertise that developed Kubernetes, Google Kubernetes Engine (https://cloud.google.com/kubernetes-engine) (GKE), the first production-ready managed service for running containerized applications, can help you implement a successful Kubernetes strategy for your cloud workloads.

With Anthos (https://cloud.google.com/anthos), Google offers a consistent Kubernetes experience for your applications across on-premises and multiple clouds. Using Anthos, you get a reliable, efficient, and secured way to run Kubernetes clusters, anywhere.

Google Kubernetes Engine

Easy to use and trusted Kubernetes service to run apps on containers.

Cloud Build

Quickly build, test, and deploy your apps on containers.

Cloud Run

Write code your way using your favorite languages and deploy your apps on containers.

Container Registry

Store, manage, and secure your Docker container images.

Cloud Code

Integrated development environment to write, run and debug your containerized apps.

Deep Learning Containers

Containers with data science frameworks, libraries, and tools.

SOLUTION

Cloud-native app development

Build, run, and operate cloud-native apps using containers in Google Cloud.

SOLUTION

Modernize apps with Anthos

Modernize your existing Java apps and move them to the Cloud using Anthos.

SOLUTION

Mainframe modernization

Move existing workloads previously locked-in to the mainframe environment to containers using GKE.

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