

Cloud Academy is now QA!
[Learn more](#) about how we are making learning more consistent, connected, and collaborative.



OCTOBER 27, 2015

BLOG [VIRTUALIZATION](#)



Container Virtualization: What Makes It Work So Well?

Various implementations of container virtualization (including Docker) are filling compute roles once reserved for hypervisor virtualization.

Increasing demand for efficient and secure application portability across environments and operating systems has forced the industry to look for more powerful virtualization designs. While the hypervisor virtualization model is still used to successfully deploy countless applications across the full range of environments, it does suffer from certain built-in limitations, including...

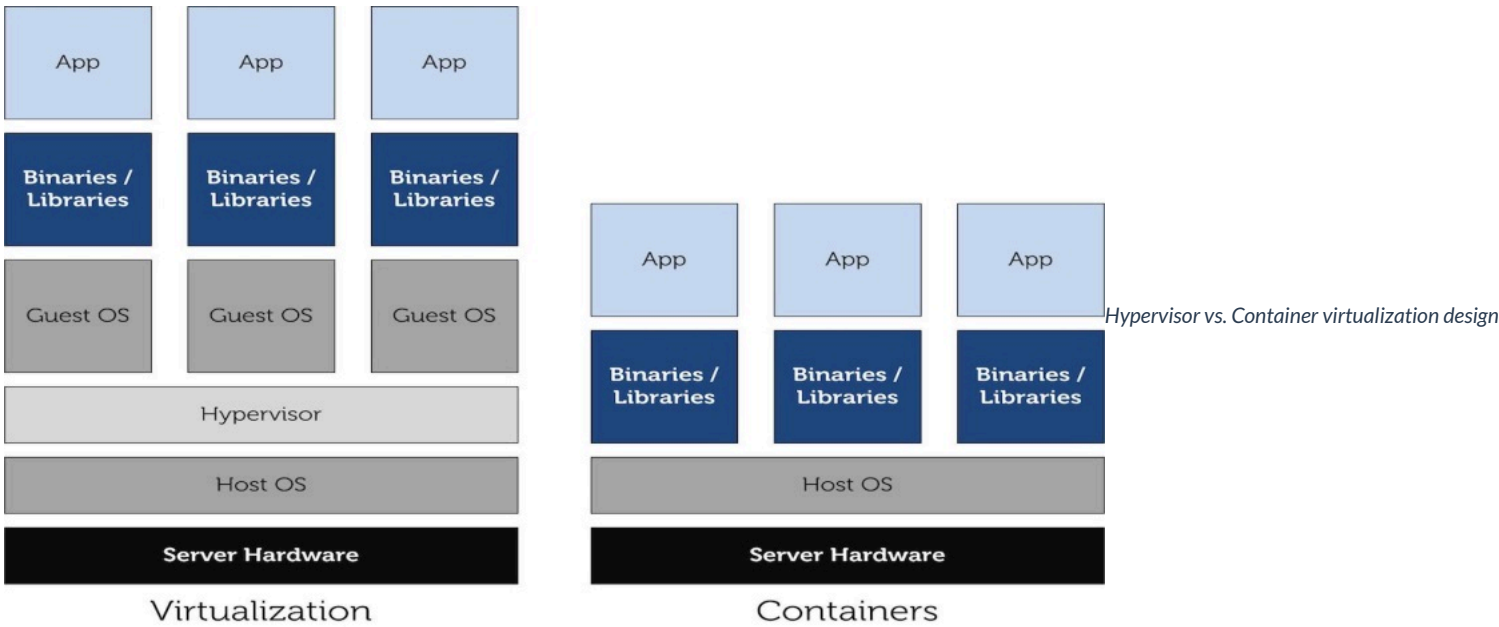
- Increased overhead of running a fully installed guest operating system.
- Inability to freely allocate resources to processes.
- Significant overhead from calls to the hypervisor from the guest OS can sometimes reduce application performance.

Container virtualization exists largely to address some of these challenges.

What is container virtualization and how does it work differently than hypervisor virtualization?

Container virtualization (often referred as operating system virtualization) is more than just a different kind of hypervisor. Containers use the **host operating system** as their base, and **not** the hypervisor.

Rather than virtualizing the hardware (which requires full virtualized operating system images for each guest), containers virtualize the OS itself, sharing the host OS kernel and its resources with both the host and other containers. If you want to deepen your understanding of [the pros and cons of server virtualization](#), [here's a full explanation](#).



Containers provide the bare essentials required for any application to run on a host OS. You could think of them as stripped down Virtual Machines running just enough software to deploy an application.

Many applications – like database servers which work best using block storage – require direct access to hardware resources. Getting that access to disks and network devices through a hypervisor’s hardware emulation will often negatively affect their performance. Container virtualization helps by simply bypassing the emulation layer. As you can see in the above image, containers use the same server hardware and an operating system on top of it, but no hypervisor above that.

What, then, provisions a virtual machine and allocates resources for it? What, in other words, plays the role of the hypervisor for translating VM requests to the underlying hardware?

Technically, the Linux kernel itself has no clue that there are containers living upstairs, but containers can nevertheless *share* kernel resources through features like [Namespaces](#), [cgroups](#), and [chroot](#). These allow containers to isolate processes, fully manage resources, and ensure appropriate security.

Let’s learn some more about those three tools:

- Namespaces** are a way for Linux systems to wrap a global system resource in an abstraction that makes it appear to the processes within the namespace that they have their own isolated instance of the global resource.

Cloud Academy is now QA!

[Learn more](#) about how we are making learning more consistent, connected, and collaborative.

Namespaces, in other words, provide processes with a virtual view of their operating environments. So if your process doesn't actually require all of the properties of a parent process, and can get by with nothing more than a host name, mount point, network, PID, or its own set of users, then namespaces can get the job done.



If namespaces help processes to get to their environment, **chroot** can isolate those namespaces from rest of the system and thereby protect against attacks or interference from other containers on the same host. Using namespaces and chroot, you can create a logical container with its own view of the system, but you'll also need to allocate resources to your new container. This can be done by using **cgroups**. cgroups (an abbreviation of "control groups") is a Linux kernel feature that limits, accounts for, and isolates the use of resources like CPU, memory, disk I/O, and network, from of a collection of processes.

It's these three ingredients that create the magic of container virtualization. The basic architecture is currently used in quite a [collection of implementations](#), the most famous of which is probably [Docker](#).

Now that we've got some idea of how they work, let's review some of the elements that, at least in many scenarios, give the container virtualization its advantage:

- Containers, compared to hypervisor virtualization, are more likely to be secure as, by design, their applications are logically restricted to their own environment.
- Containers provide significantly better performance, as they use native, rather than emulated resources.
- Launching a container is much faster than a virtual machine.
- Containers offer better control on underlying resources.

After this introduction to the technology's principles, you might like to try Cloud Academy's [Introduction to Virtualization Technologies](#).

For a full list of all learning material dedicated to containers, [browse Cloud Academy's library](#).

And feel free to join in by adding your comments below.

Containers Virtualization



WRITTEN BY **CLOUD ACADEMY TEAM**



0 Comments

Login ▼

G

Start the discussion...

LOG IN WITH

OR SIGN UP WITH DISQUS



Share

[Best](#) [Newest](#) [Oldest](#)

Be the first to comment.

[Subscribe](#) [Privacy](#) [Do Not Sell My Data](#)

Subscribe to our blog

Get the latest posts in your email

Email

Cloud Academy needs your email address to send you regular updates. You may unsubscribe from these communications at anytime. For information, check out our [Privacy Policy](#).

[Subscribe](#)

[OR SUBSCRIBE TO THE](#) [RSS FEED](#)

The cloud skills platform of choice for teams & innovators

- Certification Learning Paths.
- Hands-on Labs. Skill Validation.
- Assess your team's tech skills today.

[Tour the Product](#)

Cloud Academy is now QA!
[Learn more](#) about how we are making learning more consistent, connected, and collaborative.

 Docker vs. Virtual Machines: Differences You Should Know	What is Docker: Quick Applications Development with Containers	Kubernetes vs. Docker: Differences and Use Cases	Kubernetes: How to Manage Container Man
Read more	Read more	Read more	Read more

SUGGESTED POSTS

- Get 50% off with the Cloud Academy's Flash Sale!
- Cloud Academy's Black Friday Deal Is Here!
- The Black Friday Early-Bird Deal Starts Now!
- Cloud Academy Wins Again: Fall 2023 G2 Awards
- Navigating the Challenges of Modernization with Cloud Academy
- What is Cloud Migration? Strategy, Processes, Benefits & Risks
- Google Cloud Certifications: Which is Right for You and Your Team?
- The 12 AWS Certifications: Which is Right for You and Your Team?
- Level Up Your Cloud Skills: Oracle Now in Cloud Academy's Training Library
- Get 40% Off Individual Plans at Cloud Academy
- Retaining Your Rockstars: How to Avoid Management Disruptions
- 5 Reasons Why Top Consulting Firms Fail at Multi-Cloud – And How to Fix It
- It's Time for Cloud Academy's New Year Sale!
- The Cloud Skills Shortage: What It Is and How to Solve It
- Workforce Transformation: Building Tech Talent From Within
- Our Black Friday Preview Gets You 20% Off!
- Get Back to School with 20% Off Personal Plans
- Get 40% off with our Pre-Summer Event!
- Skills Intelligence Part 2: The State of Tech Skills Training
- Deciding on Your Cloud Certification
- Skills Intelligence Part 1: Baseline Your Team's Tech Skills
- Cloud Academy's Free Tech Skills Weekend is April 22-25
- How to Become a Software Engineer
- Real-World Cloud Talk: An Interview with a Microsoft Sr. Cloud Solution Architect
- Cloud Academy Remains a Leader in the G2 Spring 2022 Reports
- Navigating the Great Resignation
- What is Skills Intelligence?
- New: AI on Alibaba, Terraform Labs on Google Cloud, plus more
- Baseline Skills to Make the Right Hire
- 5 Tech Skills to Build in 2022
- Start Your New Year With Cloud Academy!
- New Year's Resolution Sale!
- New AWS re:Invent Announcements: Dr. Werner Vogels Keynote
- re:Invent 2021: Faster Cloud Migrations with AWS Mainframe Modernization Platform
- New AWS re:Invent Announcements: Swami Sivasubramanian Keynote
- re:Invent 2021: AWS Announces New Amazon Inspector
- New AWS re:Invent Announcements: Adam Selipsky Keynote
- The AWS re:Invent Global Partner Summit Keynote: All You Need to Know
- AWS Certified Solutions Architect Associate: A Study Guide
- AI, GitHub + More – 5 Key Announcements from Microsoft Ignite 2021
- An Interview With a Real Cloud Marathoner
- The Biggest Challenges for Technology Leaders
- Why Skills Development Is Critical for Tech Success
- Cloud Migration Series (Step 5 of 5): Manage & Iterate
- Join the Cloud Marathon Today
- Cloud Migration Series (Step 4 of 5): Adopt a Cloud-First Mindset
- It's 10:00 AM: Do You Know Where Your Team's Tech Skills Are?
- Cloud Migration Series (Step 3 of 5): Assess Readiness
- Cloud Migration Series (Step 2 of 5): Start Planning
- Cloud Migration Series (Step 1 of 5): Define Your Strategy
- Jump Into Cloud Academy's Tech Skills Assessment
- The Positive Side of 2020: People — and Their Tech Skills — Are Everyone's Priority

Cloud Academy is now QA!

[Learn more](#) about how we are making learning more consistent, connected, and collaborative.

cloud academy

A QA COMPANY

Cloud Academy Referrals: Get \$20 for Every Friend Who Subscribes!

The Art of the Exam: Get Ready to Pass Any Certification Test

Cloud Skills and Real Guidance for Your Organization: Our Special Campaign Begins!

AWS Certification Practice Exam: What to Expect from Test Questions

Cloud Academy Nominated High Performer in G2 Summer 2020 Reports

AWS Security: Bastion Hosts, NAT instances and VPC Peering

AWS Security Groups: Instance Level Security

What Exactly Is a Cloud Architect and How Do You Become One?

How to Use & Install the AWS CLI

S3 FTP: Build a Reliable and Inexpensive FTP Server Using Amazon's S3

How DNS Works - the Domain Name System (Part One)

What is Ansible?

Cloud Academy is now QA!
[Learn more](#) about how we are making learning more consistent, connected, and collaborative.



RECENT POSTS

Get 50% off with the Cloud Academy's Flash Sale!

New AWS Certified Data Engineer - Associate (DEA-C01) exam goes live on March 12th, 2024!

Navigating the Vocabulary of Generative AI Series (3 of 3)

Navigating the Vocabulary of Generative AI Series (2 of 3)

Navigating the Vocabulary of Generative AI Series (1 of 3)

EXPLORE LIBRARY →

[Our Solutions](#) [Explore QA's wider offering](#) [About QA](#)

SELF PACED PLATFORM

- Prices & Plans
- Demo the Platform
- Start a Free Trial
- Request demo
- Self Paced Help Desk

JOB ROLE PATHS

- Front End Engineer
- AWS Cloud Architect
- Site Reliability Engineer
- Python Developer
- DevOps Engineer
- Javascript Developer
- Data Engineer
- Machine Learning Engineer
- Business and Leadership Certifications

TRAINING CONTENT

- See all Library
- Upcoming Training

CERTIFICATIONS

- Cloud Certifications
- AWS Certifications
- Azure Certifications
- Google Cloud Certifications
- Security Certifications
- Software Development Certifications
- IT Operations Certifications
- Data Certifications
- Business and Leadership Certifications

[Release notes](#) [Terms & Conditions](#) [Privacy Policy](#) [System Status](#) [Manage Cookies](#)

Copyright © 2024 Cloud Academy Inc. All rights reserved.